CISTM18 – abstract submissions

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The Challenges of Rabies Prevention through Canine Vaccination in Tourism Destination Sanur, Bali, Indonesia

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Background: Rabies was first reported occurred in Bali, Indonesia, an Island previously declared free of transmission, in November 2008. In 2022, mass canine vaccination was implemented as primary prevention, along with door-to-door canine vaccination, since the virus is reported re-emerged in Jembrana and Buleleng Districts just when Bali Reborn was relaunched. However, this strategy has not successfully controlled rabies outbreak and the low coverage of canine vaccination is suspected as the cause of on-going transmission. This study is intended to explore facilitators and barriers to rabies prevention through canine vaccination in tourism destination Sanur.

Stray Dogs in Padang Galak Beach, Sanur, Bali

Methods: We conducted semi-structured interview in the tourism destination Sanur to explore facilitators and barriers of canine vaccination during mass vaccination campaign. The study was conducted on 9 May 2022 until 30 June 2022. Fifteen key informants were purposively selected (13

male and 2 female, age median was 34.5 years, 13 were dog owners). All interviews were transcribed and coded independently by two coders. The data was analyzed inductively, and the themes emerged were integrated in the social ecological model.

Social Ecological Model

Results: At the personal level, we found that lack of knowledge regarding rabies transmission among dog owners was the barrier of canine vaccination. At the organizational level, poor-organised announcement of mass vaccination campaign also hindered the program. Low dog owners' trust on vaccinators decreased the motivation to bring their dogs to the vaccination spots.
Conclusions: A well-designed risk communication could enhance knowledge about canine rabies. Timely announcement of mass canine vaccination would improve dog owners' participation. Small alterations in the vaccination spots could increase public's trust and hence enhance their motivation.

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Neurocysticercosis and Bruns' Syndrome, a Rare Association in an Endemic Area. Clinical Case Report

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Background: Neurocysticercosis (NCC) is the most common parasitic infection in the central nervous system. In half of the cases, NCC takes place in the brain parenchyma, however, its appearance is less frequent in the posterior fossa and the spinal cord.
Methods: **Objective:** The case of a patient with an atypical location of NCC at the medulla oblongata, between parenchymal and spinal areas, is presented.
Results: **Case presentation:** A male patient, 37 years old, farmer without history of chronic non-communicable diseases was admitted with an eight-month clinical history of neck pain treated with analgesics with incomplete response. The neurological assessment found a patient with pain in the posterior cervical region, permanent headache, stiff neck, discreet meningeal stripe, hyperesthesia in eyeballs and drowsiness. ELISA technique was initially indicated for *T. solium*, as well as a complete blood count reporting reactivity and marked eosinophilia, respectively. Treatment against NCC with was begun. After 12 days, the neurological examination determined left hypotonia, headache did not diminish and muscle stretch reflexes showed hyperreflexia in lower extremities. A simple and contrast

Magnetic Resonance Imaging (MRI) was requested, concluding a cystic lesion adjacent to the medulla oblongata and enhancement of the walls that, in association with chambered images of multicystic appearance in the subarachnoid space of the posterior fossa and cortico-subcortical calcifications (Figure 1), lead to discard NCC.

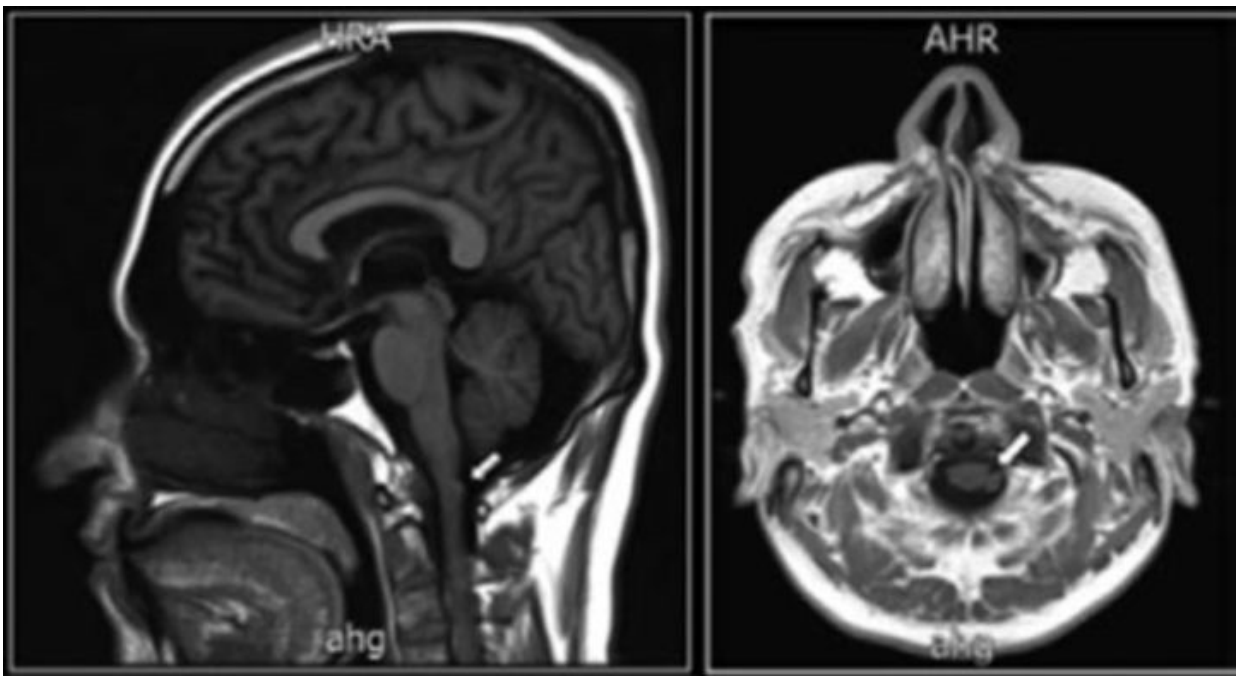

Figure 1. Head MRI showing a cystic lesion adjacent to the medulla oblongata.

Discussion: The patient had critical days with acute headache, dizziness, complete abnormal gait due to ataxia and lateralization with compromised state of consciousness, manifestations explained by Bruns' syndrome. In 1902, Bruns described ataxia caused by frontal lesions, similar to what was observed in diseases of the cerebellum that fundamentally compromised statics, lateropulsion and retropulsion of gait originated by a malfunction of the fronto-ponto-cerebellar tract. Bruns' syndrome is typically characterized by episodes of severe headache, vomiting and associated vertigo related to sudden changes in head position that may persist for a few minutes to an hour and, in worst cases, cause sudden death.
Conclusions: This case shows an atypical manifestation of the larva of *T. solium*, which should always be considered within the diagnostic possibilities currently obtained through the use of imaging tools and the detection of antibodies.

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Higher Malaria Incidence in Foreign Born U.S. Active Duty Service Members and their Family Members

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Background: Travel-related infections in foreign-born immigrants living in the United States (U.S.) occur at higher rates as compared to U.S. born citizens. Foreign-born persons make up approximately 5% of the all active-duty service members (ADSM) in the U.S. military. We assessed the incidence of malaria in ADSM and their dependent family members ('dependents') and stratified the data based on risk of exposure, as determined by country of birth. We hypothesized a higher incidence for those born in malaria-endemic countries.
Methods: We performed a retrospective cohort study utilizing the Military Health System (MHS) Data Repository database between October 2012 and September 2018. All ADSM and their dependents eligible for care in the MHS were included. Participants were divided into two groups, high-risk (HR) and low-risk (LR), as determined by the presence of malaria endemicity (HR) in the ADSM's country of

birth. The HR group was sub-divided into six world regions. Individual malaria cases were identified by ICD-code with each case counted once every 365 days. Demographics were obtained for all participants for comparison. Incidence rate of malaria was calculated for the HR group, LR group, and every world region within the HR group. Incidence rate ratios (IRR) were calculated comparing the HR group and LR group.
Results: There were 149,407 participants in the HR group and 5,570,673 participants in the LR group with a total of 723 cases of malaria (128 HR and 595 LR) during the six-year study period. The majority of cases occurred in ADSM (61.7%) but up to 14% occurred in children <18 years of age. The greatest number of cases occurred in ADSM of the LR group, despite a low incidence rate of 1.3 cases per 10,000 persons. The HR group had eight-times the incidence rate of malaria than the LR group (IRR 8.0, 95% CI 6.6-9.7, p<0.001). Those born in Sub-Saharan Africa region had an incidence rate of 30.7 cases per 10,000-persons, accounting for 78.9% of all HR cases (see table). There was no difference between groups on age, sex, marital status, beneficiary status, or pre-travel counseling.

	Population n	Cases n (%)	Incidence Rate per 10,000 persons
Total	**5,720,080**	**723**	**1.3**
LR group	**5,570,673**	**595**	**1.1**
HR group	**149,407**	**128**	**7.9**
Europe & Central Asia	*3,015*	*0 (0)*	*0*
Latin America & Caribbean	*28,355*	*10 (7.8)*	*3.5*
Middle East & North Africa	*1,424*	*1 (0.8)*	*7*
Sub-Saharan Africa	*32,902*	*101 (78.9)*	*30.7*
South Asia	*8,100*	*4 (3.1)*	*4.9*
East Asia & Pacific	*88,993*	*12 (9.4)*	*1.3*
Relative Risk = 8.0 (95% CI 6.6-9.7)			

Conclusions: There was over eight-times higher incidence of malaria in the HR group as compared 4ot he LR group. These findings highlight the increased incidence for travel-related infectious diseases in people born outside 4ot he U.S. Additional studies are needed to determine underlying etiologies and if there are interventions that could reduce travel-related disease burden.
Conflict of Interest: The views expressed are the sole responsibility 4ot he authors and does not reflect the views, opinions or policies of Uniformed Services University 4ot he Health Sciences, Department of Defense, or The Henry M. Jackson Foundation 4ot he4 Advancement of Military Medicine, Inc. The authors have no conflicts of interest.

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Japanese Encephalitis Vaccine Risk-benefit Analysis Tool

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Background: Japanese encephalitis (JE) is endemic in >20 Asia-Pacific countries. Effective JE vaccines are available, but travellers often find it challenging to make decisions about vaccination because 4ot he low incidence but severe consequences of disease. The 'Steffen-ogram' is a powerful tool which provides a visual representation of travel health risks in developing countries; however, this tool cannot be tailored to specific travellers.
The risk-benefit analysis of JE vaccination depends on multiple factors (age, destination, season and duration of trip, and expected travel activities). This challenge lends itself to a digital solution to ensure consistency across a wide range of practitioners. 4ot he4 developed a user-friendly JE vaccine risk-benefit tool to support better decision making, using a Bayesian network modelling framework.

Methods: The structure 5ot he Bayesian network (Figure) was designed in consultation with experts in travel medicine, vector-borne diseases, and vaccination. The model inputs (used for defining scenarios) include the characteristics 5ot he traveller (e.g., vaccination status, destination). The outcomes relate to risks of a traveller suffering from adverse events of both the vaccine and JE infection (e.g., death). The model was parameterised using a combination of scientific literature, government reports, and expert opinion. A sensitivity analysis was used to compare the risk of negative outcomes from the vaccine compared 5ot he risk of serious consequences from JE.

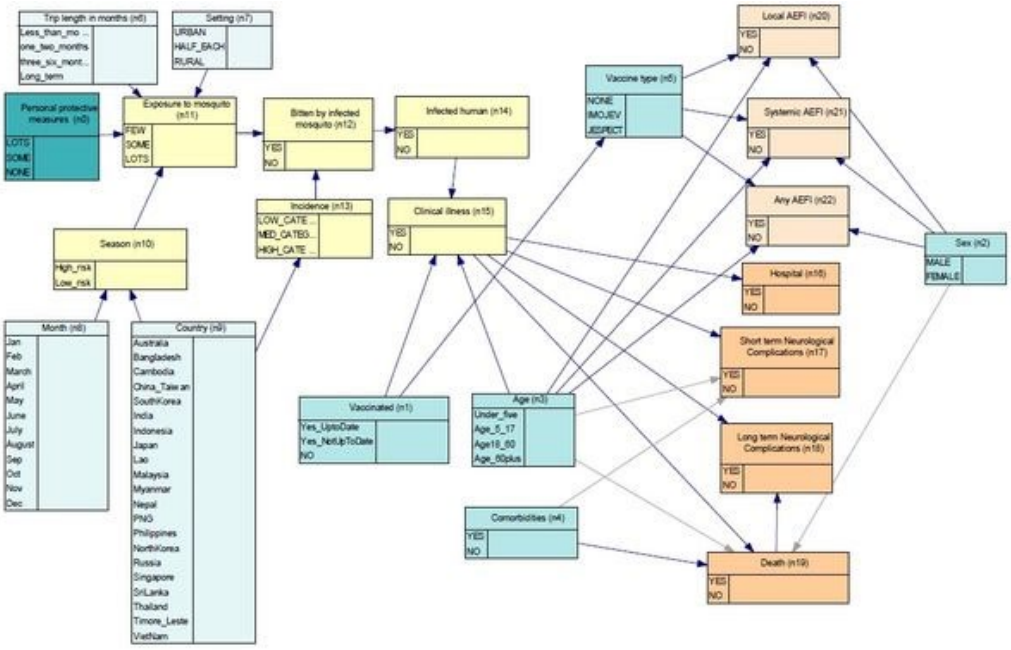

Figure. Bayesian network for assessing risk versus benefit of JE vaccines in travellers

Results: Scenario analysis showed that an unvaccinated, short-term (<1 month) traveller, to a JE endemic country going to rural areas during transmission season had a 1 in 60,000 chance of hospitalisation from JE and a 1 in 230,000 chance of dying from JE. Although JE vaccine causes mild adverse events following immunisation in 9% people, the risk of dying from JE drops to 1 in 1,100,000 if vaccinated.
Conclusions: The JE vaccine risk-benefit analysis tool enables scenario analysis to provide a personalised risk assessment, and may increase vaccine uptake by facilitating more informed decision making between clinicians and travellers. The platform developed in this project could be adapted for other travel vaccines (e.g., yellow fever, rabies) or medications (e.g., malaria chemoprophylaxis) benefiting pre-travel clinical practice. A beta-version of the tool will be presented at CISTM18.
Conflict of Interest: The project was funded by the International Society of Travel Medicine Research Awards

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Molecular Detection of *Toxoplasma gondii* and *Sarcocystis* spp. Co-infection in Tunisian Merguez, a Traditional Processed Sausage Beef Meat

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Background: *Toxoplasma gondii* (*T. gondii*) and *Sarcocystis* spp. (Eucoccidiorida: Sarcocystidae) are protozoan parasites that infect a wide range of humans and domestic and wild animals' species. For

humans, *T. gondii* and *Sarcocystis* risky food products are mainly undercooked contaminated farm animals' meat.
Objectives: This study was performed to identify in popular processed beef meat-based sausages (Merguez) the prevalence of *Toxoplasma gondii* and the zoonotic species of *Sarcocystis*
Methods: A total of 99 samples, collected from four Tunisian regions, were used for molecular analyses. For each sample, DNA was extracted from 4 equal pieces and PCR reactions were performed. Phylogenetic analyses were performed to identify *Sarcocystis* species. The infection prevalences were compared using the Chi-square Mantel-Haenszel test (Epi Info). Risk factors were evaluated using stratified odds ratio.
Results: Prevalences of *T. gondii* and *Sarcocystis* spp. DNA in Merguez samples were 47.5% and 52.5%, respectively. Important differences between regions were found. The DNA of both parasites was detected in 14.1% of the same samples. For *Sarcocystis* spp. infection, the percentage of samples having one positive piece was significantly higher than those having two, three or four positive pieces. Whereas, for *T. gondii*, the majority of tested samples had two positive pieces (16.2%) ($p = 0.002$). Sequencing showed the presence of *Sarcocystis tenella* and *Sarcocystis cruzi* species.
Conclusions: Our findings suggest a high prevalence of *T. gondii* and *Sarcocystis* spp. in Merguez sausages with a potential high human health risk if the latter are undercooked. This study is important at different levels of the animal source food value chain particularly to the animal health services at both the field and the food processing levels.
previously_presented: As a poster in the 28th International Conference of the World Association for the Advancement of Veterinary Parasitology

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Pre-travel Health Preparation in the General Pediatrics and Pediatric Travel Medicine Clinics

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Background: Children account for ~10% of US global travelers, but little is known about pre-travel health care provided by general pediatricians compared with pediatric travel medicine specialists in the US. We examined the pre-travel health preparation of children and adolescents, and determined how care differs between general pediatrics and pediatric travel medicine clinic.
Methods: A retrospective chart review of children receiving pre-travel health care at two general pediatric clinics over a five-year period Sept. 1, 2014, to Aug. 31 2019. Patients had either 1) a Travel Clinic visit with a pediatric travel medicine specialist or 2) a General Pediatrician (Gen Ped) visit and received a "counseling for travel" diagnosis, travel vaccine and/or antimalarial prescription. Descriptive statistics were used to describe patient characteristics, travel plans, and provision of pre-travel health services including vaccinations, antimalarial prophylaxis, and travel advice. Chi-square tests were used to determine differences in patient characteristics, travel plans and pre-travel health services provided at Travel and Gen Ped visits.
Results: Between Sept 2014 and Aug 2019, 629 children received pre-travel health preparation; 202 (32%) at Travel and 427 (68%) at Gen Ped visits. Children attending Travel clinic were older compared with Gen Ped clinic (median age 10 years vs 18 months, $p<0.01$), less likely to have public insurance (7.9% vs 14.3%, $p=0.02$), and more likely to have a chronic medical problem (52.0% vs 38.9%, $p<0.01$) (Table 1). Although time to departure was similar, reason for travel, trip duration and destination characteristics differed between Travel and Gen Ped visits (Table 2). Although travel vaccines were equally recommended ($p=0.94$), children were more likely to receive anti-malarial prophylaxis recommended by the Centers for Disease Control (93.5% vs 79.1%, $p<0.01$), travelers' diarrhea antibiotic (50% vs 8.4%, $p<0.01$) and pre-travel counseling (99.6% vs 61.8%, $p<0.01$) at Travel versus Gen Ped visits (Table 3).

Table 1. Patient Characteristics in General Pediatrics and Pediatric Travel Medicine Clinics

Characteristics		General Pediatrics Clinic	Travel Clinic	p-value
Sex		*n=427*	*n=202*	
	Female	246 (57.6%)	104 (51.5%)	0.15
	Male	181 (42.4%)	98 (48.5)	
Age	*Median* [25^{th}, 75^{th}]	18 months [9mo, 9yo]	10 years [4yo, 15yo]	<0.01
Race/Ethnicity		*n=427*	*n=202*	
	White, non-Hispanic	147 (34.5%)	97 (48.0%)	<0.01
	White, Hispanic	38 (8.9%)	8 (4.0%)	
	Black	24 (5.6%)	2 (1.0%)	
	Asian/Pacific Islander	84 (19.7%)	48 (23.8%)	
	Mixed/Other	134 (31.4%)	47 (23.3%)	
Insurance		*n=427*	*n=202*	
	Public	61 (14.3%)	16 (7.9%)	0.02
	Private	366 (85.7%)	186 (92.1%)	
Chronic medical problems		*n=427*	*n=202*	
	None	261 (61.1%)	97 (48.0%)	<0.01
	≥1	166 (38.9%)	105 (52.0%)	

Table 2. Travel Visit Characteristics in General Pediatrics and Pediatric Travel Medicine Clinics

Characteristics		General Pediatrics Clinic	Travel Clinic	p-value
Primary Reason for Travel		*n=187*	*n=225*	
	VFR	95 (50.8%)	93 (41.3%)	<0.01
	Leisure/tourism	34 (18.2%)	72 (32.0%)	
	Education/service	28 (15.0%)	44 (19.6%)	
	Living Overseas	27 (14.4%)	14 (6.2%)	
	Other	3 (1.6%)	2 (0.9%)	
Type of Destination		*n=158*	*n=230*	
	Urban	106 (67.1%)	85 (37.0)	<0.01
	Rural	6 (3.8%)	17 (7.4%)	
	Both	46 (29.1%)	128 (55.7%)	
Time from visit to Departure		*n=310*	*n=229*	
	1-7 days	42 (13.5%)	33 (14.4%)	0.95
	8-14 days	52 (16.8%)	35 (15.3%)	
	15-28 days	71 (22.9%)	55 (24.0%)	
	>28 days	145 (46.8%)	106 (46.3%)	
Trip Duration		*n=176*	*n=229*	
	1-28 days	87 (49.4%)	160 (69.9%)	<0.01
	>28 days	89 (50.6%)	69 (30.1%)	
Total Trip Destination WHO Regions		*n=461*	*n=231*	
	1	441 (95.7%)	193 (83.5%)	<0.01
	2 or more	20 (4.3%1)	38 (16.5%)	
Total Trip Destination Countries		*n=461*	*n=231*	
	1	412 (89.4%)	164 (71.0%)	<0.01
	2 or more	49 (10.6%)	67 (29.0%)	

VFR = visiting family and relatives, WHO = World Health Organization

Table 3. Pre-Travel Health Care in General Pediatrics and Pediatric Travel Medicine Clinics

Pre-Travel Health Care		General Pediatrics Clinic Visit	Travel Clinic Visit	p-value
Routine Vaccines Recommended		*n=461*	*n=231*	
	Yes	210 (45.6%)	68 (29.4%)	<0.01
	No	251 (54.4%)	163 (70.6%)	
Travel Vaccines Recommended		*n=461*	*n=231*	
	Yes	414 (89.8%)	207 (89.6%)	0.94
	No	47 (10.2%)	24 (10.4%)	
Travel Vaccines administered or prescribed (total number)	Early MMR	192	24	n/a
	Early Hepatitis A	15	4	
	Early meningitis	9	7	
	Typhoid, injectable	141	142	
	Typhoid, oral	44	24	
	Yellow Fever	5	19	
	Cholera	0	0	
	JE virus	5	11	
	Rabies	0	4	
Anti-malarial prophylaxis recommended#		*n=409*	*n=231*	
	Yes	115 (28.1%)	139 (60.2%)	<0.01
	No	294 (71.1%)	92 (39.8%)	
Anti-malarial prophylaxis prescribed##		*n=115*	*n=139*	<0.01
	Yes	91 (79.1%)	130 (93.5%)	
	No	24 (20.9%)	9 (6.5%)	
Empiric travelers' diarrhea antibiotic prescribed		*n=428*	*n=228*	<0.01
	Yes	36 (8.4%)	114 (50%)	
	No	392 (91.6%)	114 (50%)	
Pre-travel counseling documented		*n=461*	*n=231*	
	Yes	285 (61.8%)	230 (99.6%)	<0.01
	No	176 (38.2%)	1 (0.4%)	

MMR = measles, mumps, rubella, JE = Japanese encephalitis

*Routine vaccines include all vaccines recommended by the Center for Disease Control (CDC)/American Committee on Immunization Practices for the US.

**Travel vaccines include all vaccines recommended for the CDC for international travel including MMR and Hepatitis A vaccines administered between 6-11 months old for travel, meningitis vaccine administered prior to 11 years old for travel, typhoid vaccine, yellow fever vaccine, cholera vaccine, Japanese encephalitis vaccine and rabies vaccines.

#Anti-malarial prophylaxis recommended by the CDC for a specific travel itinerary

##Anti-malarial prophylaxis prescribed *only if recommended by the CDC for a specific travel itinerary*

Conclusions: General pediatricians provided the majority of pre-travel care over a 5-year period, including for those with public insurance, but children were more likely to receive recommended antimalarial prophylaxis and travel advice at travel medicine specialist visits. This highlights the need for more travel medicine training for general pediatricians, and for equitable access to travel medicine services for children with public insurance.

Conflict of Interest: No conflict of interests

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Identification and Characterization of the Cofactor-independent Phosphoglycerate Mutases of *Strongyloides stercoralis* as a Novel Antigen for Diagnosis of Strongyloidiasis

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Background: Strongyloidiasis is prevalent in the tropics and subtropics. However, it has been frequently reported in travelers returning from Southeast Asia. Although most patients are asymptomatic and maintained chronic infections for decades, parasite numbers can rapidly increase in immunocompromised patients, leading to hyperinfection and fatal dissemination if undiagnosed. The diagnosis of strongyloidiasis relies on detecting larvae in feces that show low sensitivity and need skilled parasitologists. Serodiagnosis shows advantages, but crude antigen preparation requires abundant parasites isolated from patients. The novel antigen identification will be useful in developing a rapid test for the diagnosis of strongyloidiasis. Cofactor-independent phosphoglycerate mutase (iPGM) is an enzyme in glycolytic and gluconeogenic metabolic pathways found in nematodes but absent in humans. In this study, we identified and characterized the enzyme activity of iPGM of *Strongyloides stercoralis*. The expression levels of *ipgm* in each stage of parasites were also analyzed to determine the possible roles for diagnosis. Moreover, we evaluated the efficacy of iPGM for early diagnosis and follow-up treatments.
Methods: The full-length *ipgm* gene of *S. stercoralis* was identified and amplified. Recombinant iPGM antigen was produced. Serum samples were collected from 88 patients with strongyloidiasis, 44 patients with other parasites, and 88 healthy controls. Serum samples were also collected from 24 treated patients at 1 year after ivermectin treatment. Detections of IgM and IgG subclass antibodies against recombinant iPGM antigen and crude antigens were performed by indirect ELISAs.
Results: The complete sequence of *S. stercoralis* iPGM ORF; 1554 bp; was submitted to GenBank (KY697305). The *ipgm* gene was expressed in all stages of the parasite. ELISAs for anti- *S. stercoralis* iPGM Ig4 provided the highest sensitivity (100%) and high specificity (79.54%). The detection of IgG2 antibody showed the highest specificity (93.18%). Moreover, the Ig4 antibody levels were significantly decreased after treatment.
Conclusions: The iPGM antigen was more effective for the diagnosis of strongyloidiasis than crude extract antigens. The detection of anti-*S. stercoralis* iPGM IgG4 antibody could be a potential screening test and follow-up treatment. Moreover, the detection of anti-*S. stercoralis* iPGM IgG2 antibody could be applied to confirm the diagnosis of strongyloidiasis.

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Analysis of Sexually Transmitted Disease among International Travelers in Shanghai, China, 2014 to 2019

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Background: To assess the trends and risk factors of sexually transmitted disease (STD) among international travelers entry or exit Shanghai, China.
Methods: We conducted a retrospective review of STD (HIV and syphilis) surveillance results among international travelers during 2014 to 2019. Patients diagnosed with STD were interviewed to analyze the characteristics and risk factors of STD infection.
Results: A total of 376,165 international travelers were enrolled. Among these participants,1122 STD cases were identified. The average detection rate of HIV infection was 0.08 per cent. Most of them (88 per cent) were travelers from overseas. The average detection rate of syphilis was 0.22 per cent.Most of them (71 per cent) were travelers from overseas.Assessment of annual detection rate revealed an increasing trend. The predominant characteristics were male gender, sexually active age (20-40years). There is an increasing trend of teenager girl and old age male infection. A questionnaire reviewing 876 patients showed that casual sexual activities remained the main route of STD transmission. Men who have sex with men (MSM) are also an important route. Sixty-four cases of

HIV/syphilis co-infection were found during this period of time. As the two infections may interact adversely with each other, it is necessary to take intervention strategies.
Conclusions: There has been an increasing trend of STD infection among international travelers in Shanghai. Promoting safer sex, screening of high-risk groups and education are essential in the health care of travelers.

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Without Skipping a Beat: Symptoms and Sequelae of Chagas Disease among Migrants in a Non-endemic Region

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Background: There are limited data about cardiac manifestations of Chagas disease (CD) in migrants in the United States.
Objective: To describe CD manifestations, including cardiac disease severity by American Heart Association (AHA) stage, in 109 patients at a Boston, Massachusetts tertiary hospital.
Methods: This retrospective cohort analysis of patients with confirmed CD (diagnosed with two positive tests) at Boston Medical Center between January 2016-December 2022 includes symptoms and available cardiac testing (electrocardiogram [EKG], echocardiogram, cardiac MRI). Patients were identified through screening migrants from endemic regions or through other in-network referral.
Results: Of the 109 patients, 67 (61%) were female, the mean age was 43 years (range 19-76, SD=13) and 93 (85%) were born in El Salvador. 86 (79%) patients were screened via screening protocol and 23 (21%) were tested given symptoms or EKG abnormalities. 56% were asymptomatic. Palpitations (21%), chest pain (15%), and dyspnea (14%), were the most common symptoms. Of the patients with EKGs, 52/102 (51%) were normal. Right bundle branch block (19/102, 19%), T-wave changes (18/102, 18%), and left anterior fascicular block (11/102, 11%) were the most common EKG abnormalities. Cardiomyopathy stage was determined in 106 patients. Overall, 59/106 (56%) were AHA stage A (no EKG/echocardiographic changes), 31 (29%) were stage B1 (EKG or echocardiographic changes, normal ventricular function), 7 (7%) were stage B2 (ventricular dysfunction), 8 (8%) were stage C (ventricular dysfunction and symptomatic heart failure), and 1 (1%) was stage D (heart failure refractory to medical therapy). Among patients with echocardiograms or cardiac MRI, 8/88 (9%) had apical aneurysm; half (n=4/8) were asymptomatic. Apical thrombus was seen in 4/88 (5%), including one asymptomatic patient. No patient with aneurysm or thrombus had a normal EKG, but some had non-specific EKG changes, including sinus bradycardia or T-wave inversions. Embolic strokes occurred in 4/109 (4%) of patients. Pacemaker or implantable cardioverter-defibrillator was required in 7/109 (6%) of patients.
Conclusions: In our study the majority of migrants with CD were asymptomatic. Apical aneurysm was seen in 9% of echocardiograms, suggesting that echocardiography should be routine. Screening at risk individuals for Chagas disease, regardless of symptoms, may identify important cardiac involvement, including apical aneurysm or thrombus, and mitigate disease burden.
Conflict of Interest: Natasha Hochberg is also now employed by Novartis, but she was not employed Novartis at the time of data collection.

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Point of Care Ultrasound Findings in Three Pediatric Dengue Cases

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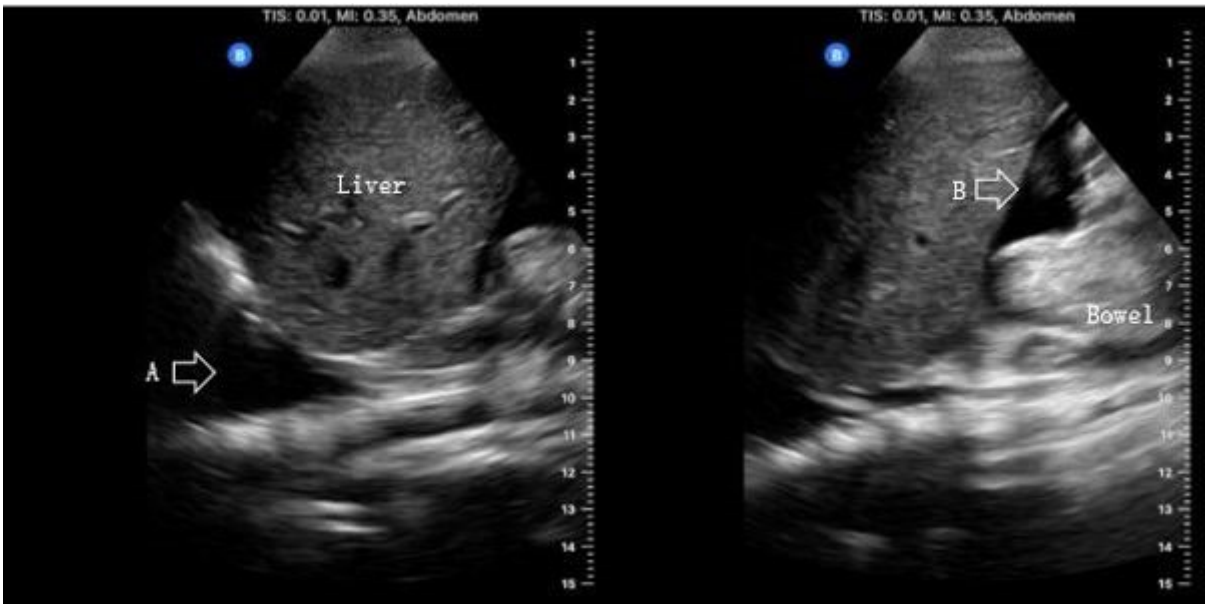
Background: Dengue is a mosquito borne virus that is prevalent in the world and endemic in over 100 countries. The disease it causes can be severe leading to shock, multi-organ involvement and death.

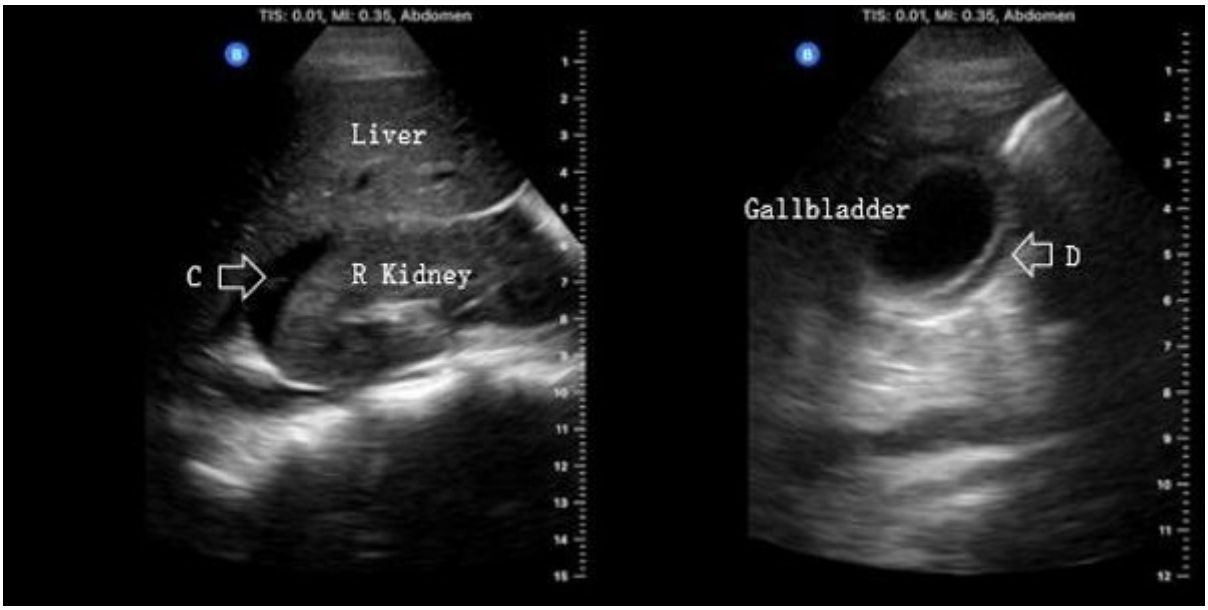
The World Health Organization classifies dengue into dengue fever, dengue with warning signs, and severe dengue. Plasma leakage from vasculature is prominent in the progression to severe dengue. Clinically this can be difficult to determine at times. Ultrasound findings noted to occur during the plasma leakage stage of dengue fever include pleural effusions, ascites and gallbladder wall edema. Given the widening use of point-of-care ultrasound (POCUS), we present this case series to demonstrate some of the POCUS findings of plasma leakage in dengue with warning signs and severe dengue.

Methods: Pediatric Dengue patients (age range 6-13 yrs, N=3, all diagnosed clinically) were observed during academic rounds within the dengue unit of Robert Reid Cabral Hospital, Santo Domingo, Dominican Republic in September 2022. POCUS was done with permission from patients/families using a Butterfly iQ® portable ultrasound to look for sonographic signs of plasma leakage with discussion of the clinical importance done at bedside during rounds.

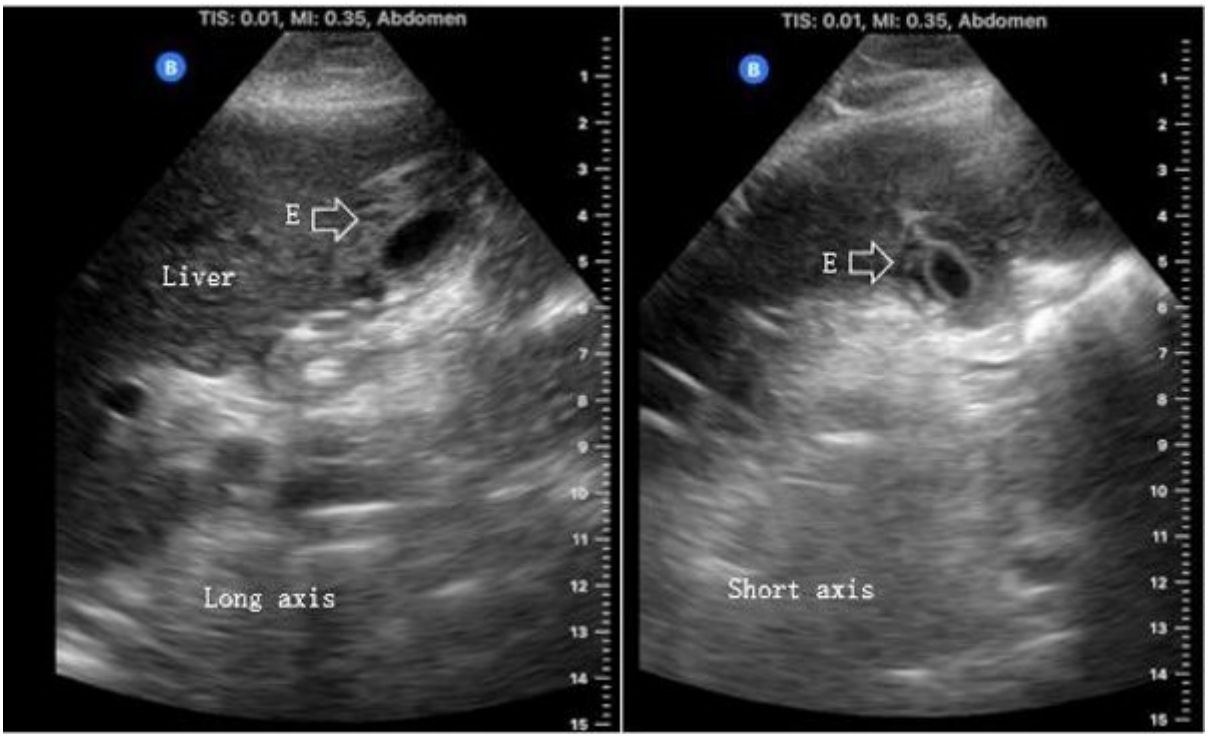
Results: Our 3 cases identified signs of plasma leakage by POCUS. Case 1 demonstrates pleural effusion (A) and ascites (B) in a 6 year old male with dengue with warning signs. Case 2 demonstrates free fluid in the hepatorenal recess (C) and pericholecystic fluid (D) in a 13 year old female with severe dengue. Case 3 demonstrates gallbladder wall edema (E) in a 6 year old male with dengue with warning signs.



Case 1



Case 2



Case 3

Conclusions: POCUS can be a helpful tool in dengue patients as it can help determine if plasma leakage is present when the diagnosis of dengue with warning signs/severe dengue is in doubt. This can help determine the need for hospitalization and can help predict severity of the illness.

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Travel-related Infectious Disease Notification Trends in Australia, 2012-2022 and the Impact of COVID-19

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Background: International travellers may import non-endemic infectious diseases with potential for secondary local transmission into Australia; such infections, which include malaria, dengue and measles, are notifiable. International departures from Australia were rising before the COVID-19 pandemic in 2020, with Australians making a record 11.3 million short-term overseas trips in 2019. The objective of this study was to describe trends in notifications of imported infections and the impact of the COVID-19 pandemic on notification incidence in Australia from 2012 to June 2022.
Methods: We conducted a retrospective analysis of imported infections notified to the National Notifiable Disease Surveillance System (NNDSS) from 1 January 2012 to 30 June 2022. Diseases of interest included malaria, dengue, chikungunya, Japanese encephalitis, flaviviruses (including Zika), leptospirosis, typhoid, paratyphoid, cholera, measles, hepatitis A, hepatitis E, Yellow fever, Middle Eastern Respiratory Syndrome (MERS), poliomyelitis, rabies and viral haemorrhagic fever (VHF).
Results: There were 24,207 notifications of imported infections over the 10.5 years of the study. Dengue comprised 53% (12,902 notifications: mean incidence 4.9/100,000 per year), with 95% of cases acquired overseas. Malaria comprised 13% of notifications (3,069 notifications; mean incidence 1.2/100,000/year) and typhoid/paratyphoid fever 8% (2,025 notifications; 0.76/100,000/year). There were zero notifications of Yellow fever, MERS, poliomyelitis, rabies and VHF. Notified cases were most common among the 20-39 year-old age group (43% of notifications). Typhoid and paratyphoid were most commonly acquired in Southern and Central Asia (72% of cases), particularly India (51%). Dengue fever was most commonly acquired in Southeast Asia (71% of cases), especially Indonesia (44%). Although malaria was most commonly acquired in Sub-Saharan Africa (45% of cases), the

most common single country of acquisition was Papua New Guinea (15% of cases). COVID-related international border restrictions in 2020 and 2021 resulted in a significant and expected decrease in the notification incidence of all imported infections, with incidence rebounding in 2022 following the re-opening of national borders.

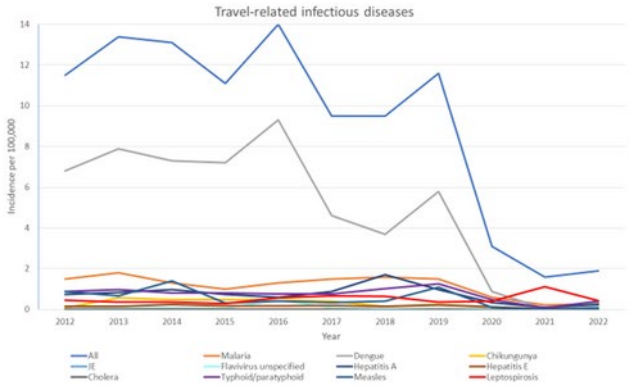

Figure 1: Incidence of travel-related infectious disease notifications, Australia 2012-June 2022

Conclusions: Recent imported infection notification trends reflect the frequency and destination patterns of Australian travellers, with incidence rates of 9-14/100,000/year from 2012-2019 and dengue comprising over half the imported disease notifications. Unsurprisingly, the notification incidence decreased significantly in the face of COVID-19 pandemic-related international travel disruptions.

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The Emergency Complex Response in Returning of People from Ukraine to Thailand during COVID-19 Pandemic

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Background: In early 2022 (in the middle of COVID-19 pandemic), the war has started in Ukraine. For humanitarian aspect, Thailand had prepared and provided quarantine facilities for the returning of Thais and their families from war-affected areas in Ukraine to Thailand under the regulations during the situation of COVID-19.
Objectives: To humanitarian respond to the complex situation of war and COVID-19 pandemic (free of charge, under Thai government).
Methods: Quarantine facilities was provided to more than 200 returnees. Standard Operating Procedures for quarantine and testing was prepared in advance.
Results: Under this emergency complex response, we took care of these 224 returnees from Ukraine. Among these returnees, we found 15% COVID-19 infection rate. No quarantine staff found infected with COVID-19 after the quarantine period.
Conclusions: To cope with the COVID-19 pandemic, good preparation to the dynamic situation of infectious disease pandemic could strengthen the country's capabilities in coping with the pandemic response.

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To Study the Clinical Features and Incidence of New Onset ECG Changes Following Scorpion Sting and its Correlation to Clinical Outcome

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Background: Scorpion stings are more common in tropical countries. India inhabits a few poisonous species of scorpions in the world, of which -Deathstalker scorpion, Buthacus Agarwal inhabit in the Thar Desert. In this study we are going to study the clinical presentations and ECG changes associated with these scorpion sting cases reported in our hospital located in Thar Desert.
Methods: Study type: Prospective observation study,
Duration: June 2021 to July 2022 Sample size: 67 cases.
Inclusion criteria: All reported cases of scorpion sting.
Exclusion criteria: Referred cases without ECG, post treatment.
The data was collected and analysed
Results: 98% of cases were male and 2% cases were females. The average age of the population is 32 years, minimum 25 years and maximum age being 36. More than 70% of the cases were reported during late evening. The most common site of sting was upper limbs. Most common presentation being severe pain at the sting site with pain score between 7-8/10. Burning sensation was present in 67% of the cases. Restlessness, palpitation, sweating, anxiety and dizziness was present in 17% of the cases. 87% of the patients presented with tachycardia, 38% with tachypnoea. No lab abnormality was noted in any of the cases. ECG was within normal limit in all the patients. Patients were treated with Inj Avil and Inj Hydrocortisone and ice pack was applied at the site of sting. Almost all the patients were relieved of the symptoms within 4-5 hours. No mortality reported in the study population.
Conclusions: We conclude all cases reported were mild to moderate severity, though it was poisonous specious scorpion sting. Most patients were in class I or Class II envenomation. No severe cases were reported. Tachycardia was the only ECG changes noted in the patients. All cases of scorpion sting should be admitted and observed for minimum 24 hours for late reactions.
Conflict of Interest: No Conflict of Interest

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Angle of Death Viral Zoonoses Rabies Infection - An Indian Experience

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Background: Rabies dated back to the Vedic period i.e 1500-500BC in ancient Indian scripture *Atharvaveda*, Yama, the mythical God of Death, has been depicted as attended by 2 dogs as his constant companions, the emissaries of death. This is one of very few studies which details about the clinical profile of rabies. This study was done to bring a awareness and explain the current situation of rabies in India.
Methods: This a retrospective hospital study done during 2017-2019 in Epidemic diseases hospital Bangalore. The diagnosed case of rabies patient records were analyzed and the data was collected on predesigned format in xcel sheet and later analyzed. Inclusion criteria – diagnosed cases of rabies. Exclusion criteria no clear history of animal bite. The patients data was kept confidential during the entire study.
Results:

1. In Our study we have found that most of patients were in the age group of 35-45.
2. The most common sex in which dog bite was reported was males..
3. Most cases of dog bite were unprovoked bites.
4. The dog bites were more from rural areas than urban.
5. The most common site of injury was the lower limbs.
6. Around 68% of bite were grade 3 , 32% of the bites were grade 2.
7. The duration of symptoms to bite was around 1 months.
8. High grade fever, anxiety were initial symptoms which were followed by hydrophobia and aerophobia in all cases. 20% of the patients had seizure episode.
9. All patients had autonomic dysfunction with in 4-5 days of onset of disease.
10. Minimum duration of hospital stay was 12 days.
11. Mortality was 100%.
12. The mortality was with 1 week in patients who used Alternative Medicine, Example closing the wound which was note in more than 30% of cases, which lead to sepsis and faster spread of virus.
13. The 18% cases reported were from dogs which were vaccinated –This can attributed cold chain maintenance of vaccine.

Conclusions: **Conclusion:** Rabies is a 100% fatal disease but the complications and fatality case be prevented by taking prompt first aid and immediate anti-rabies immunoglobulin and anti-rabies vaccination, and completing course of the vaccination. Physicians should update themselves from time to time regarding rabies for better case management. The patients should be counselled about the importance of this so that patient compliance will improve.
Conflict of Interest: No Conflict of Interest

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Study on Tetanus Infection - An Indian Experience

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Background: Tetanus is an old world disease where 2 centuries ago people had realised the link between wound leading to muscle spasm and fatality, Even today there are many cases fatalities of tetanus being reported from different parts of the country even after viability of a Tetanus toxoid and Immunoglobulin injections. This one of very few recent studies done in India on Tetanus. As there is very less data available on Tetanus so we are trying to share our experience on Tetanus, so it will help the physicians to get a better understanding.
Methods: This a retrospective study done collecting the patients detail from 2017- 2019, detailed case sheet review was done and the patients clinical presentation and prognosis was noted in predesigned format. Inclusion criteria – All diagnosed case of tetanus, Exclusion criteria – patient already received treatment from local hospital. The patient details were kept confidential during all times.
Results: The total of 58 cases -35 males and 23 females, The average duration of hospital stay was 15 days.The most common occupation were farmers (bare foot workers). The site of injury was foot in 65% cases followed by injuries to the fingers or the hand in 30% and 5% cases due to injury while tooth picking with pin, splinter removal using pins. Clinical symptoms - Trismus “Lock jaw”(41), difficulty in walking(2), limb pain/stiffness(17), back muscle ,pain/stiffness(12,) Dysphagia(7), 72% autonomic dysfunction. Opisthotonus position and Riscus sardonicus developed after 7-8days of infection. 20% cases were vaccinated still developed diseases. 18% mortality was noted most cases were unvaccinated cases.
Conclusions: Tetanus is preventable diseases; If TT vaccination and immunoglobin are administered on time. In all primary health care levels cold chain should maintained for vaccines. The patients should be made sensitized about the consequence of the diseases process.
Conflict of Interest: No conflict of interest

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Travel Medicine in Africa - The Senegalese Perspective

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Background: A presentation of the mining sector with the mine of Sabodala Gold operations, in the south-east of Senegal.
The care offered by the mining system is vast, comprehensive, and diversified. It includes the three levels of medicine:
- first level (general medicine, dental care, pharmacy, optical care, nursing care)
- second level (specialist medicine, medical analysis)
- third (hospital medicine, follow-up care and rehabilitation).
Methods: A specific system has been put in place within the clinic to manage the employees. The movement of travel, in and out of the site for both expatriate and national employees, is very important.
We will give you an overview of the profile of the employees entering and leaving the mine site, the illnesses found in this multicultural and diverse population and what is being done to assist them.
Results: The mining population is predominantly older, with the majority aged between 30 and 50. The number of employees on the site varies around 3000 on average.
In the last 4 years, the mine site has welcomed 1031 expatriate workers (visitors and residents)

despite the global health crisis of covid-19. In 2022, more than 322 expatriate workers have already passed through.
In addition to expatriate workers, there is a significant number of local national travelers from the other 13 regions of Senegal. More than 65% of national employees travel regularly across the country to return to their families or to work.
Conclusions: The number of visits to the clinic is around 18,000 per year. The main activities are medical consultations, treatment of traumas or work-related injuries, industrial hygiene activities and vaccinations campaign.
The most common diseases treated are musculoskeletal, ENT, gastrointestinal, tropical diseases including malaria and respiratory.

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Global Landscape and Challenges of Travel Medicine Practice: A Survey of ISTM Members

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Background: Travel medicine practice has evolved significantly in recent decades in response to changing global travel and tourism trends. The COVID-19 pandemic also posed challenges to travel medicine providers worldwide.
Objectives: We surveyed travel medicine practitioners who are members of the International Society of Travel Medicine (ISTM) to gather information about their practice settings, pre-travel advice, costs, payment schemes, and challenges in providing travel health care pre- and post-COVID-19 pandemic.
Methods: An online questionnaire was distributed to travel medicine practitioners through the ISTM's email list in April – May 2022. Data on demographics, settings of travel clinics, services provided, and pre-travel advice to the sample case scenarios regarding confidence in practice, costs, and payment schemes were collected. We also enquired about challenges in their travel medicine practice before and after the COVID-19 pandemic and asked the practitioners to rank factors that hindered travelers from accessing travel medicine care.
Results: Among 2,044 travel medicine members of the ISTM, 211 (10.3 %) participated at least partially, and 117 (5.7 %) completed the survey. Most of the respondents were doctors (69.8 %), aged ≥ 60 years (40.9 %), and practiced in North America (63.5 %). Private clinics (22.7%) were the most common setting. Pre-travel advice was available in most clinics (98.1 %), and less than three-quarters offered post-travel care. Forty percent of the clinics provided telemedicine consultations. Advice on typhoid and rabies vaccinations, standby antibiotics for moderate-severe travelers' diarrhea, and malaria chemoprophylaxis varied between those from different geographical locations but not among providers with and without travel health qualifications. Almost all respondents (96.6-98.3%) expressed confidence in their practice. The highest proportion of the consultation cost was for vaccines and administration, which was generally out-of-pocket. The most significant barrier to travel medicine care both pre- and post-COVID-19 pandemic included the lack of awareness of travel-related health risks and the low proportion of travelers seeking travel medicine-related services.

Table: Intervention administered or prescribed to sample travel cases by geographical location

Intervention administered/ prescribed	No. of practitioners who administered/ prescribed the intervention (%)						
	North America	Europe & Central Asia	East Asia & Pacific	Latin America & Caribbean	Sub-Saharan Africa	Middle East	p-value*
Case 1: A 42-year-old healthy male traveling from sea level to Cusco, Peru for 5 days							
Hepatitis A vaccine (n = 116)	75 (98.7)	20 (100)	13 (100)	3 (100)	3 (100)	1 (100)	1.00
Typhoid vaccine (n = 116)	67 (88.2)	9 (45.0)	8 (61.5)	2 (66.7)	3 (100)	1 (100)	**<0.01**
High altitude illness drug: Acetazolamide (n = 117)	72 (93.5)	16 (80.0)	12 (92.3)	3 (100)	3 (100)	1 (100)	0.42
Antibiotic self-treatment for severe symptoms of travelers' diarrhea (n = 116)	68 (89.5)	12 (60.0)	10 (76.9)	2 (66.7)	3 (100)	1 (100)	**0.03**
Case 2: A 50-year-old healthy woman going to VFR in Nigeria for 8 weeks							
Yellow fever vaccine (n = 117)	77 (100)	20 (100)	13 (100)	3 (100)	3 (100)	1 (100)	-
Malaria Chemoprophylaxis (n = 117)							
Yes	77 (100)	20 (100)	13 (100)	3 (100)	3 (100)	1 (100)	
- Atovaquone-proguanil	65 (84.4)	9 (45.0)	9 (69.2)	1 (33.3)	3 (100)	1 (100)	**<0.01**
- Doxycycline	7 (9.1)	0	3 (23.1)	1 (33.3)	0	0	
- Mefloquine	3 (3.9)	8 (40.0)	1 (7.7)	1 (33.3)	0	0	
- Not specified	2 (2.6)	3 (15.0)	0	0	0	0	
Case 3: A 28-year-old healthy male animal breeder going to Northern Thailand for 3 months							
Japanese encephalitis vaccine (n = 116)	75 (98.7)	20 (100)	13 (100)	3 (100)	3 (100)	1 (100)	1.00
Rabies pre-exposure prophylaxis (n = 116)							
Yes	76 (100)	20 (100)	13 (100)	3 (100)	3 (100)	1 (100)	
- Intradermal 2-dose regimen	6 (7.9)	4 (20.0)	3 (23.1)	0	0	1 (100)	**0.02**
- Intradermal 3-dose regimen	5 (6.6)	2 (10.0)	1 (7.7)	1 (33.3)	1 (33.3)	0	
- Intramuscular 2-dose regimen	28 (36.8)	7 (35.0)	1 (7.7)	2 (66.7)	2 (66.7)	0	
- Intramuscular 3-dose regimen	37 (48.7)	7 (35.0)	8 (61.5)	0	0	0	
Malaria Chemoprophylaxis (n = 116)							
Yes	68 (89.5)	8 (40.0)	7 (53.9)	2 (66.7)	3 (100)	1 (100)	**<0.01**
- Atovaquone-proguanil	55 (80.9)	3 (37.5)	4 (57.1)	0	1 (33.3)	1 (100)	
- Doxycycline	11 (16.2)	4 (50.0)	1 (14.3)	0	0	0	
- Mefloquine	1 (1.5)	0	1 (14.3)	2 (100)	0	0	
- Primaquine	0	0	0	0	1 (33.3)	0	
- Tafenoquine	1 (1.5)	1 (12.5)	0	0	1 (33.3)	0	
- Not specified	0	0	1 (14.3)	0	0	0	
No	8 (10.5)	12 (60.0)	6 (46.2)	1 (33.3)	0	0	

*p-values were calculated using Fisher exact test

Conclusions: Similarities and differences in travel medicine practice were observed across practitioners' backgrounds. Improving travel health care requires efforts to raise awareness of travel-related health risks and travel medicine services, with improvements in reimbursement structure.
Conflict of Interest: LHC reports honoraria and advisor fees from Shoreland, Valneva, Takeda, Sanofi Pasteur, and Merck; none for this work. Others declare no conflict of interest.

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Chronic Chagas Disease: A Descriptive Analysis from the GeoSentinel Network, 2014–2021

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University School of Medicine. Department of Global Health, Boston University School of Public Health, Boston, United States

Background: Chagas disease, caused by *Trypanosoma cruzi*, is a major health problem affecting around 7 million people in Latin America. Due to migration and increased awareness of this parasitic infection, a growing number of patients with chronic Chagas disease (CDD), e.g., those with indeterminate phase or cardiac/gastrointestinal complications, are being detected outside endemic areas, especially in Spain and North America.
Objectives: To describe clinical and epidemiological characteristics of patients diagnosed with CCD in the GeoSentinel network.
Methods: We analyzed demographic, clinical, and diagnostic information of patients with CCD in the GeoSentinel database between October 2014 and June 2021.
Results: We included 1,421 patients with CCD. Three Spanish sites reported 86% (n=1,225) of the cases, other European sites reported 8.3% (n=118), and the United States and Canada 5.3% (n=76). Most patients were born in Bolivia (N:1,245; 88%), El Salvador (n=64; 4.5%), and Paraguay (n=34; 2.4%). The median age was 44 years (interquartile range: 37–52) and 72% (n=1,021) of patients were female. In >99% (n=1,417) of patients, the diagnosis was made by serology. Indeterminate form of CCD was the most frequent presentation (n=967; 68%). One hundred nine patients (7.7%) presented with cardiovascular symptoms and 131 (9.2%) with gastrointestinal complaints (constipation, abdominal discomfort). Fifty-six (3.9%) were diagnosed with cardiomyopathy and 42 (2.9%) with gastrointestinal involvement. *Strongyloides stercoralis* co-infection was diagnosed in 147 (10%). Almost all patients (n=1,240; 99%) were managed as outpatients.
Conclusions: CCD cases evaluated at GeoSentinel sites were predominantly Latin American immigrants diagnosed in Spain. This analysis comprised mostly female patients of child-bearing age. Because Chagas disease may be transmitted vertically, enhanced screening of this subset of the population may be warranted. Data on treatment outcomes or long-term prognosis of CCD cannot be extracted from this cross-sectional analysis. There is a need for prospective studies of CCD in Latin American immigrants to high-income countries in Europe and North America to improve knowledge of the evolution and prognosis of this debilitating neglected tropical disease and to obtain high-quality data that can inform best practices for clinical management.

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Ukrainian War Refugees in Poland in the Aspect of Epidemiological Threats

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Background: The armed aggression of the Russian Federation against Ukraine in February 2022 forced over 10 million Ukrainians to flee their country. More than 8 million Ukrainian war refugees have entered Poland in the last nine months. Currently (December 2022), there are over 3 million Ukrainians staying in Poland (including at least 1.3 million economic migrants who arrived before 2022).
Methods: An analysis of the most common health problems of Ukrainian residents in recent years and war refugees staying in Poland in 2022 was made on the basis of a review of international and national literature and epidemiological data of the Chief Sanitary Inspectorate in Poland.
Results: The epidemiological situation in Ukraine characterized by high incidence of infectious diseases (tuberculosis, HIV/AIDS, hepatitis B, hepatitis C, syphilis, measles, poliomyelitis, multi-drug resistant infections), low vaccination rates and high morbidity associated with non-communicable diseases (cardiovascular diseases, diabetes, cancer, mental illnesses and disorders) is one of the worst in Europe. Nevertheless, the massive influx of millions of war refugees has not resulted in a significant deterioration of the epidemiological situation in Poland.
This was possible due to excellent organization of comprehensive assistance for Ukrainian refugees provided by Polish local governments and volunteers, and is also due to the fact that the majority of Ukrainians arriving in Poland in recent months are in good health (unlike many Ukrainian inhabitants who have stayed in their country, often because they were unable to finance their travel abroad).
Conclusions: The prolonged armed conflict in Ukraine may cause further breakdown of the health care system in this country, impoverishment of the population and a significant increase in the incidence of infectious and non-infectious diseases (war injuries, multi-drug resistant infections, STD's,

mental illnesses).
With the next wave of war refugees from Ukraine, their epidemiological status may be significantly worse than that observed in the last nine months of 2022, therefore epidemiological surveillance in European countries should be constantly intensified.
Conflict of Interest: None
previously_presented: article in Polish in 'Forum Medycyny Rodzinnej' journal titled 'Ukraińscy uchodźcy wojenni w Polsce' (October 2022)

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Analysis by Next-generation Sequencing for the Diagnosis of Infectious Diseases in Febrile Returning Travelers

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Background: One hundred and sixty-four returning travelers visited Kurume university hospital between 2008 and 2020. However, 18 febrile returning travelers could not be diagnosed despite various examinations. The aim of our study is to analyze causative microorganism against febrile returning travelers with unknown origin.
Methods: Next-generation sequencing (NGS) was performed against 8 samples (5 whole blood, 1 serum, 1 cerebrospinal fluid and 1 nasopharyngeal swab) obtained from 7 febrile returning travelers with unknown origin. In addition, virus isolation using VeroE6 cells was performed against the 2 of 8 samples.
Results: NGS detected human coronavirus OC43 (HCoV-OC43) gene in 6 of 8 samples, HCoV-OC43 and Herpes simplex virus-1, and HCoV-OC43 and Mumps virus in 1 of 8 samples, respectively. HcoV-OC43 gene fragments was actually obtained by conventional RT-PCR. HCoV-OC43s were also isolated in the 2 of 8 samples in the virus culture identification test.
Conclusions: Our data suggests that quite a few febrile returning travelers with unknown origin exist, and coronavirus potentially engage with high frequency in such infections before COVID-19 pandemic.

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Travel-related Influenza Risk: Transmission Based on FluNet Data 2016-2019

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Background: Influenza is among the most common vaccine-preventable disease among international travelers.
Objectives: We aimed to identify high-transmission periods for each world region based on the FluNet data from the World Health Organization (WHO).
Methods: Worldwide influenza transmission patterns were sought for a 4-year period (1/1/2016-12/31/2019) using FluNet's Influenza Laboratory Surveillance Information (ILSI) webpage (https://app.powerbi.com/view?r=eyJrIjoiZTkyODcyOTEtZjA5YS00ZmI0LWFkZGUtODIxNGI5OTE3YjM0IiwidCI6ImY2MTBjMGI3LWJkMjQtNGIzOS04MTBiLTNkYzI4MGFmYjU5MCIsImMiOjh9). Data were collated across the 6 WHO regions and further subcategorized by Northern (NH) or Southern (SH) Hemisphere.
Results: Data were collected on 10 different regions and subregions (Figure 1): Northern Hemisphere (NH) and Southern Hemisphere (SH) region of the Americas (AMR), European region (EUR), Eastern Mediterranean region (EMR), NH and SH African region (AFR), NH and SH South-East Asian region (SEAR), and NH and SH Western Pacific region (WPR).

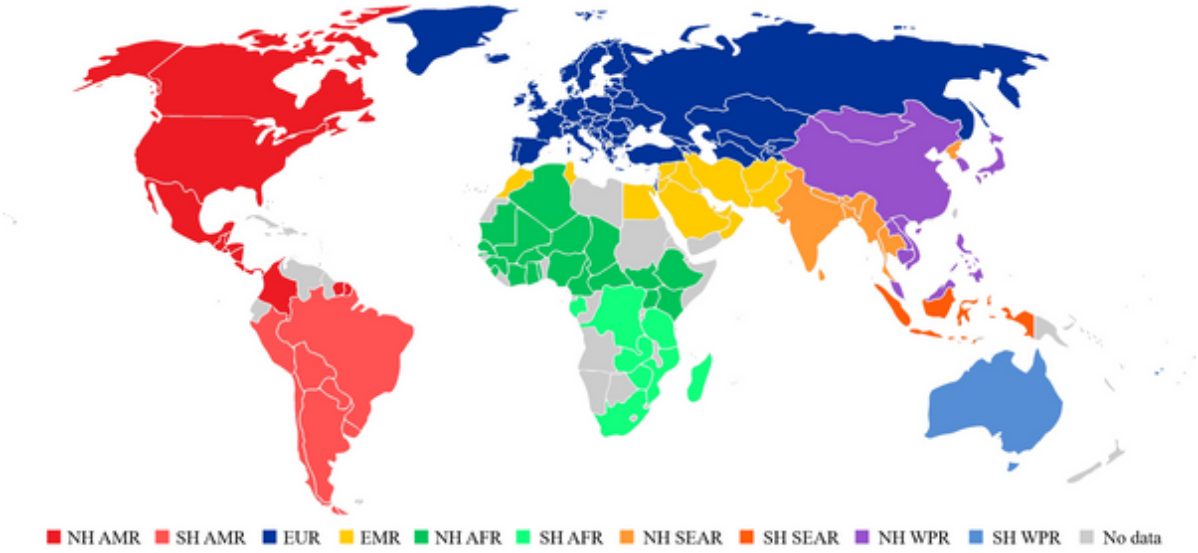

Figure 1: Map demonstrating countries included in each region and subregion on the FluNet database. Abbreviations: NH, Northern hemisphere; SH, Southern hemisphere; AMR, region of the Americas; EUR, European region; EMR, Eastern Mediterranean region; AFR, African region; SEAR, South-East Asian region; WPR, Western Pacific region.

NH influenza seasons generally begin between September and November and end between April-May (Table 1). SH influenza seasons tended to begin between March-May and end between September-October. There was a 2nd distinct influenza B outbreak in AFR between July and October 2018 and an additional outbreak was recorded in SEAR between September and December 2017.

Table 1: Analysis of FluNet data on peak influenza transmission periods for 2016-2019 in the 6 WHO regions, based on whether the country/territory is located in Northern or Southern Hemisphere.

WHO region	**Northern Hemisphere**	**Southern Hemisphere**
Region of the Americas (AMR)	October-May	March-October
European Region (EUR)	November-May	N/A
Eastern Mediterranean Region (EMR)	September-April	N/A
African Region (AFR)	September-April	April-September 2018: 2nd season, Influenza B July-October
South-East Asian Region (SEAR)	January-April, June-September (October in 2018)	January-June 2017: 2nd season, September-December
Western Pacific Region (WPR)	November-May/April 2017: 2nd season June-September	May-October

Conclusions: Influenza seasonality differs around the world, generally peaking between November and April in temperate climates of the NH and between May and September in temperate climates of the SH, while its seasonality is far more variable in the tropics. As vaccines are adapted biannually for NH and SH, respectively, the current immunization schedules create a period of vulnerability during their respective spring and summer months. Travel medicine providers should be aware of influenza activity in their travelers' destinations, provide alerts accordingly, while advising on prevention, diagnostic and treatment options. Ideally, shelf life of influenza vaccines should be prolonged to be able to immunize travelers leaving their home countries in the summer months. One should not only focus on the 'on-site epidemiology', but also on the fact that other travelers originating from regions with ongoing transmission might join.

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Acquisition of Pandemic *Escherichia coli* Clones in the Intestinal Microbiota of International Travelers Departing from Rio de Janeiro, Brazil

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Background: International travel has an impact on the spread of multidrug-resistant (MR) bacteria due to the frequent mobilization of individuals. MR bacteria may be acquired during travel possibly due to ingestion or contact with contaminated food, water and environment. Acquisition of *Escherichia coli* high-risk and pandemic clones, defined by multilocus sequence typing, such as sequence type (ST)131, has been observed in the microbiota of travelers after return. Newly acquired MR clones may enhance the local spread of antimicrobial resistance and accelerate the expansion of those lineages in Brazil.
Objectives: To describe pandemic *E. coli* clones obtained from the intestinal microbiota and acquired during international trips by travelers departing from Rio de Janeiro.
Methods: Subjects over 18 years of age attending a travelers' clinics from 2015 to 2020 were oriented to collect an anal stool specimen with a cotton swab before travel and after return. Stool specimens were stored in skim-milk, tryptone, glucose, and glycerin media (STGG) at -20°C. Aliquots were seeded onto MacConkey (MAC) agar, and MAC agar containing ceftriaxone. We identified isolates by MALDI-TOF mass spectrometry. We prepared a pool with all the isolates from before and from after travel (up to 3 isolates per participant) and screened all the pools for the *E. coli* pandemic clones ST131, ST69, ST73, and ST95 by multiplex PCR. If the results were positive for one of the clones, we repeated the PCR for single isolates.
Results: From 243 travelers included in the study, carriage of ESBL-producing *E. coli* isolates was detected in 17 (7%) before travel and in 49 (22%) only after return. Of 1344 isolates from these subjects, 197 (15%) belonged to one of the pandemic *E. coli* ST. The most frequent clone was ST69 (95 isolates obtained from 197 subjects). Comparing pre- and post-travel data, in 6 subjects the same ST was detected before and after travel; in 10, a different ST was detected before and after; in 37, a different ST was acquired during travel; and in 29, a pandemic ST was detected only before travel.
Conclusions: Intestinal colonization with pandemic *E. coli* clones occurs in Brazil before travel and traveling poses an impact on the acquisition or loss of these high-risk clones.

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Epidemiology of Travel-associated Dengue from 2007 to 2022: A GeoSentinel Analysis

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Background: Dengue is an important cause of febrile illness among returning travelers, and globally reported dengue cases have increased over the past 15 years.
Objectives: To describe epidemiological, demographic, and travel characteristics of returning travelers with dengue at GeoSentinel clinics over the past 15 years, the largest and most diverse cohort described to date.
Methods: We retrieved all records with a dengue diagnosis entered between January 2007 to May 2022. Cases were considered confirmed when diagnosed by nucleic acid amplification, NS-1 antigen detection, or four-fold increase in antibody titers, and probable when diagnosed by single IgM detection. Complicated dengue was defined as dengue with warning signs or severe disease (WHO 2009 guidelines). We performed a descriptive analysis with detailed breakdown of region of exposure as well as nature and duration of travel.
Results: This analysis included 5,958 travelers with confirmed (n=4,859) or probable (n=1,099) dengue. The median age was 33 years (range 0-91) and 50.5% of 5,950 were female. The median travel duration was 21 days (interquartile range [IQR] 15-32), and median delay between illness onset and clinic visit was 7 days (IQR 4-15). The most frequent reasons for traveling were tourism (67.3%), visiting friends or relatives (12.2%), and business (11.0%). The most frequent regions of acquisition were Southeast Asia (50.4%), South-Central Asia (14.9%), the Caribbean (10.9%), and South America (9.2%). The top three countries of exposure were Thailand (20.8%), Indonesia (10.7%), and India (8.5%). Ninety-five (1.6%) patients had complicated dengue and one died. Prior to 2020, GeoSentinel observed a steady increase in the number of reported dengue cases. The highest caseload (n=835) was reported in 2019.
Conclusions: Travelers to endemic areas remain at risk of dengue, with cases spanning multiple age groups, travel types, and regions of exposure. Capture of reported dengue cases in GeoSentinel has increased steadily over time. Complicated dengue in travelers was rare in our study population. The risk of serious and prolonged morbidity requires further study, but counselling regarding preventive measures remains important for a broad range of international travelers.
Conflict of Interest: ***Funding****: This project was funded through a Cooperative Agreement between the US Centers for Disease Control and Prevention and the International Society of Travel Medicine (ISTM) (Federal Award Number: 1 U01CK000632-01-00). Public Health Agency of Canada also provides a grant to ISTM. The analysis was co-funded by the GeoSentinel Foundation.*

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Travel Health-related Preparation Practices of Institutes of Higher Education and the Occurrence of Health-related Events among Undergraduate Students Studying Abroad, 2018–2021

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Background: Health-related events of students studying abroad may be different from other travelers. Knowledge about resource availability at institutes of higher education (IHE) and health-related events encountered by students while abroad is lacking. We characterized health-related events experienced by students while overseas and identified gaps at IHEs regarding health preparation for students who study abroad.
Methods: IHEs with student study abroad offices (SAOs) were recruited through ISTM's Student Travel Abroad Interest Group. During January 2018–December 2021, anonymous web-based questionnaires were sent to participating SAOs, their student health centers, and undergraduate students (≥18 years) within two weeks after studying abroad. Relative risks (RR) and 95% confidence intervals (95% CI) were calculated. Chi-squared p-values were significant at $p < 0.05$.
Results: Seven IHEs, 6 SAOs, 7 student health centers, and 686 students completed the survey. Only one SAO reported requiring a pretravel consultation. Overall, 61.1% of students reported no pretravel consultation. Students reported 307 infectious and 1,588 non-infectious health-related issues; 12 (1.7%) students were hospitalized. The most common infectious conditions were colds (24.2%), travelers' diarrhea (7.7%), and food poisoning (6.7%). The most common non-infectious conditions were jet lag (50.9%), an insect bite or sting (38.2%), and generalized anxiety (27.3%). There was only one reported sexually transmitted infection (*Chlamydia*). Studying abroad for <8 weeks (RR 0.32; 95% CI 0.27–0.39) or seeing a healthcare professional in the four weeks before departure (RR 0.76; 95% CI 0.67–0.86) was associated with a decreased risk of health-related events. Students with generalized anxiety reported more alcohol consumption compared to students without generalized anxiety, and students with other mental health diagnoses were more likely to use illicit drugs than students who did not report those diagnoses (Table). There was no increased risk of alcohol use among students who reported that their mental health conditions worsened while abroad.

Table. The association of mental health conditions with alcohol and drug use among students studying abroad, 2018–2021

Mental health condition	Used alcohol, n (%)	RR (95% CI)	p-value	Used illicit drugs, n (%)	RR (95% CI)	p-value
Anxiety, generalized (n=187)	167 (89.3)	1.08 (1.02–1.16)	0.028	47 (25.1)	1.58 (1.15–2.18)	0.006
Bipolar disorder (n=2)	2 (100)	1.19 (1.15–1.23)	1	1 (50.0)	2.76 (0.68–11.15)	0.802
Depression (n=124)	105 (84.7)	1.00 (0.92–1.09)	0.913	35 (28.2)	1.75 (1.25–1.47)	0.02
Panic attacks/ severe anxiety (n=78)	69 (88.5)	1.05 (0.96–1.15)	0.309	21 (26.9)	1.59 (1.06–2.38)	0.032
Post-traumatic stress disorder (n=18)	16 (88.9)	1.06 (0.89–1.25)	0.836	9 (50.0)	2.87 (1.76–4.69)	0.001
Psychosis (n=2)	2 (100)	1.19 (1.15–1.23)	1	1 (50.0)	2.75 (0.68–11.15)	0.802
Stress (n=183)	163 (89.1)	1.07 (1.00–1.14)	0.061	50 (27.3)	1.81 (1.15–2.18)	<0.001
Other[a] (n=12)	11 (91.7)	1.09 (0.91–1.29	0.776	4 (33.3)	1.86 (0.82–4.20)	0.322

[a]Obsessive compulsive disorder (n=4), attention deficit hyperactivity disorder (n=3), eating disorder (n=2), seasonal affective disorder (n=1), borderline personality disorder (n=1), other (n=1)

Conclusions: IHEs in this study might benefit from coordination between the SAO and student health center, including promoting pretravel consultations and implementing mental health assessments and counseling. Further prospective cohort studies are warranted to address the optimal timing and best practices to reduce health events in students studying abroad.
Conflict of Interest: None

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Humanitarian Aid Deployment during Military Conflict

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Background: Catholic Relief Services (CRS) supports emergency response during periods of natural disasters, unrest, and conflict. Through the recent invasion of Ukraine and subsequent staff deployment, the Health Operations team has learned valuable lessons to promote the health and safety of staff.
Methods: We observed staff health needs and patterns through volatile deployments to identify areas for improvement. We worked with our medical assistance/evacuation vendor to recognize trends in contact, including health advice, care coordination, and escalation of care.
Results: Nearly one year after the initial Ukraine response, approximately 20 CRS staff have completed long-term temporary duty assignments. While most staff were able to meet their health needs, identified challenges included the following: 1). War risk exclusions in existing benefits policies 2). Working with medical assistance/medical evacuation vendor to identify preferred providers and 3). Access to a higher level of care for urgent or emergent health needs.
Conclusions: Deploying seasoned humanitarian aid staff to conflict zones requires additional awareness and preparation. This includes advance notification of insurance agencies and medical assistance/evacuation vendors. If not already implemented, consider measures to strengthen and streamline a medical clearance process. Expand health education to include trauma first aid training and risks specific to the area of deployment and/or existing health threats. If resources in the field are limited, it is helpful to source recommended first aid supplies or kits specific to the office, vehicle, and individual traveler. Prior to deployment, identify preferred providers and/or reliable pharmacies, laboratories, and emergency facilities. During (and immediately after) active deployment, proactively conduct individual outreach and share resources for mental health support. Lastly, we recommend advance planning to include a medical action plan with emergency cross-border transport plays a critical role in escalating care.

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Experiencing Telemedicine for Pre-travel Consultation; Pros and Cons

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Background: Over the last years, international travel exponentially increased. However, travel medicine almost stopped during the coronavirus pandemic, when international travel became either impossible or unwise. Soon afterwards, as travel bans loosened, people with familiar or professional demands, together with the bold and less concerned, resumed traveling. Under this scenario, teleconsultation has become a convenient choice.
Telemedicine was first proposed in the 1950s, advancing with the spread of internet access, particularly during the COVID-19 pandemic. Telemedicine decreases the cost of healthcare, provides access to medical care from anywhere, and eliminates the time for patient displacement. However, these advancements come with constraints, such as the limitation of physical exam and dependence on technical support for connectivity and use of software. Such issues impose heavier obstacles for people under lower socioeconomic status or with difficulties in the use of technology. Additional concerns involve individual privacy and control of data sharing.
Methods: To describe the experience with telemedicine consultations in a Travel Medicine Centre in the city of Rio de Janeiro, Brazil, during the Covid-19 pandemic, we conducted a descriptive and retrospective study with a literature review.
Results: From November 2020 to June 2022, 101 travelers were consulted using videoconference. Subjects median age was 39 years, and 66% were women. Most (53%) were from Rio de Janeiro State, followed by São Paulo State (15%), South Region states (14%), and other regions of the Country. The main destinations were Tanzania (51%), Kenya (22%), and other Sub-Saharan countries (23%). The North region of Brazil was the destination of 15%. Most (70%) traveled for leisure.
Conclusions: In Brazil, the travel medicine centers are concentrated in the capitals of the states of Rio de Janeiro and São Paulo. With the implementation of telemedicine for travel medicine, we could offer consultations for people from all over the country. The constrains imposed to physical examination were not impeditive for the travelers we consult. On the other side, a small number of travelers did not take the appointment as a typical medical consultation and were not in an adequate environment. For a more thorough analysis of this new resource, we plan to compare travelers' comprehension and adhesion to preventive measures following a teleconsultation with the

performance after a presential consultation. We demonstrate that medicine must adapt to changes in human environment and health conditions to provide the best possible advice for international travelers.

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Health of Children who Experienced Australian Immigration Detention

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Background: Australian immigration policy resulted in large numbers of children being held in locked detention. We examined the physical and mental health of children and families who experienced immigration detention.
Methods: Retrospective audit of medical records of children exposed to immigration detention attending the Royal Children's Hospital Immigrant Health Service, Melbourne, Australia, from January 2012 – December 2021. We extracted data on demographics, detention duration and location, symptoms, physical and mental health diagnoses and care provided.
Results: 277 children had directly (n=239) or indirectly via parents (n=38) experienced locked detention, including 79 children in families detained on Nauru or Manus Island. Of 239 detained children, 31 were infants born in locked detention. Median duration of locked detention was 12 months (IQR 5-19 months). Children were detained on Nauru/Manus Island (n=47/239) for a median of 51 (IQR 29-60) months compared to 7 (IQR 4-16) months for those held in Australia/Australian territories (n=192/239). Overall, 60% (167/277) of children had a nutritional deficiency, and 75% (207/277) had a concern relating to development, including 10% (27/277) with autism spectrum disorder and 9% (26/277) with intellectual disability. 62% (171/277) children had mental health concerns, including anxiety, depression and behavioural disturbances and 54% (150/277) had parents with mental illness. Children and parents detained on Nauru had a significantly higher prevalence of all mental health concerns compared with those held in Australian detention centres.
Conclusions: This study provides clinical evidence of adverse impacts of held detention on children's physical and mental health and wellbeing. Policymakers must recognise the consequences of detention, and avoid detaining children and families.
previously_presented: Presented at ICRC Health in Detention Conference (2022)

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Extensively Drug Resistant (XDR) *Salmonella* typhi Infection in a Traveller Returning to Singapore

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Background: *Salmonella enterica* serovar typhi (*Salmonella* typhi) is a common food and water borne bacterium causing typhoid fever in many developing countries. The proportion of typhoid cases that are resistant to antibiotics is increasing globally. Of particular concern is a multi-drug resistant (MDR) strain of typhoid , namely H58 haplotype which has been identified in many parts of Asia, sub-Saharan Africa, and most recently, Latin America. Extensively drug-resistant (XDR) typhoid fever first identified in 2016, is a threat to travellers especially those visiting Pakistan. Occurring mostly in Sindh province in Pakistan , these strains are resistant to at least five classes of antibiotics, resulting in carbapenem and azithromycin being the few effective treatment options available.
Methods: We describe a case of XDR typhoid fever in a traveller returning from India and Pakistan in 2019, and possibly the first such report in Singapore.
Results: A 27-year old female , previously well, presented with prolonged fever for a month, associated with non - bloody diarrhoea , vomiting and abdominal cramps. A transient rash in the third week was also noted.
Her symptoms started less than a week into her trip to Amritsar (India) followed by Lahore and

northern Pakistan. She claimed to eat mainly in restaurants and drank bottled water. Her travel companion had only one day of mild gastrointestinal symptoms. She had not received any pre-travel vaccination or advice.
Investigations showed normal FBC. (TW 7200/ UL) Raised inflammation markers included CRP 80.9 mg/dL and procalcitonin 1.03 ng/mL. Mild transaminitis was also noted (ALT 120 U/L , AST 122 U/L). Blood culture yielded XDR *Salmonella* typhi.

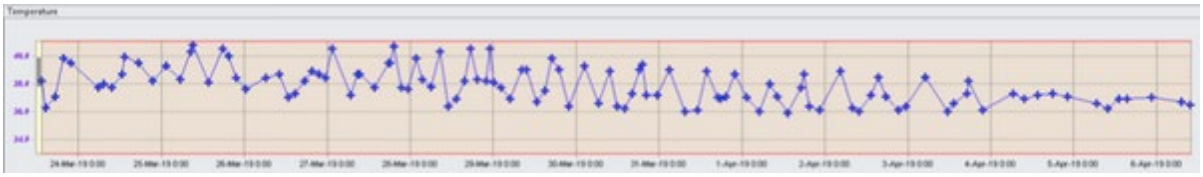
Specimen Source:	Blood (Bacterial, Anaerobic)
Specimen Site:	Blood Peripheral
Sample Description:	
None	
Test Status:	
FINAL REPORT (Test Completed)	
Culture Result:	CULTURE RESULT
Organism 1:	Salmonella typhi
Organism 1:	Salmonella typhi
Ampicillin:	R
Ceftriaxone:	R
Ciprofloxacin:	R
Cotrimoxazole:	R
Gentamicin:	R
Meropenem:	S

Comment:
The categorical interpretation which has been applied for meropenem in this report uses the Clinical and Laboratory Standards Institute (CLSI) breakpoints for Enterobacteriaceae.

Minimum inhibitory concentration Ciprofloxacin (mg/L) = 4
The categorical interpretation for Ciprofloacin against Salmonella spp which has been applied in this report uses CLSI breakpoints i.e. (S) <= 0.06 mg/L, (I)= 0.12 - 0.5 mg/L, (R) >= 1 mg/L.
The use of ciprofloxacin to treat bacteremia caused by these non-susceptible strains may be associated with clinical treatment failure, or delayed clinical response.

Minimum inhibitory concentration Azithromycin (mg/L) = 8
The epidemiological cut-off value (ECV) for azithromycin and Salmonella typhi is <=16 mg/L, and breakpoints have been based on limited clinical data.

Her empiric antibiotic therapy was switched from ceftriaxone (resistant) to iv meropenem and finally oralised to azithromycin. Her fever lysed after 11 days of treatment and recovered fully.



Conclusions: XDR typhoid infection is an increasing concern especially amongst travellers returning from Pakistan , India and other developing countries. Empiric use of a carbapenem or azithromycin may be considered. Increasing rates of drug-resistant typhoid highlight the urgency for preventative measures such as vaccination and improved hygiene. Pre-travel typhoid vaccination and counselling are necessary interventions, including travellers visiting friends and relatives.

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The Spectrum of Animal Bite and Potential Rabies Exposure in Travelers to Western Nepal

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Background: Rabies has the highest documented case fatality rate close to 100%. A developing country like Nepal with poor management of stray animals poses a major risk for animal bites in travelers. Raising awareness regarding animal bites is very crucial in preventing rabies. In Nepal, more than 50000 cases of dog and other animal bites are reported every year. In a survey done in one of the major touristic hubs in western Nepal Pokhara; there were 1767 stray dogs.
Objectives: To study the risk population among travelers related to epidemiology, activity, type of animal, and pretravel advice.
Methods: A total of 184 non-Nepalese travelers visited The Canadian International Water and Energy Consultants (CIWEC) Hospital, located in Pokhara with animal bite between the period of January 2018 to November 2022. Data from a retrospective review of hospital records were analyzed via IBM SPSS 29.

Results: Of 184 travelers with animal bites in the study period, young adults aged 18-30 accounted for the majority of bites i.e. 66.8 %. A higher incidence of bites was seen in females at 57.6%. Most bites were unprovoked at 82.1%, while provoked bites were due to interaction with animals like feeding, playing, petting, etc. WHO Category II accounted for 45.7% of bites followed by Category III at 44.6%. The predominant animal bite was due to dogs at 77.2% followed by monkeys at 12.5% and cats 9.2%. Only 33.2% of travelers sought pre-travel advice and 39.1% of travelers had received pre-exposure prophylaxis (PrEP) rabies vaccine. Only 28.2% of travelers did wound washing with soap and water.
Conclusions: Animal bites carry significant concern in travelers leading to modifications in their travel itinerary and treatment costs. In a developing country like Nepal vaccines and rabies immunoglobulins (RIG) are not readily available throughout the travel destination, therefore, pre-travel advice about rabies awareness can play a major role in prevention, proper management, and timely treatment of animal bites.

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Different Rabies Neutralizing Antibody Responses According to One Week IPC Intradermal Regimen versus TRC Intradermal Regimen with Purified Vero Cell Rabies Vaccine for Post-exposure Prophylaxis

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Background: The key to success of a reduction of dog-mediated human rabies in Asia has been increasing of dog vaccination and accessibility to rabies PEP (post-exposure prophylaxis) using TRC-intradermal (ID) regimen after suspected rabies exposure. Attempt to reduce costs of PEP by reducing the number of visits or vaccine cost has produced on several variation such as one-week IPC-ID regimens as WHO recommendation. We conducted the prospective study to compare rabies neutralizing antibody (Nab) response up to one year after simulated PEP with IPC-ID regimen compared with TRC-ID regimen.
Methods: 59 seronegative volunteers were randomly allocated for receiving IPC-ID regimen (ID 2-2-2-0-0; group I; n=30, aged range 25-56 years) compared with TRC-ID regimen (ID 2-2-2-0-2; group II; n=29, aged range 22-54 years) concomitantly with full-dose purified equine rabies immune globulin (ERIG) intramuscularly for simulated PEP. The vaccine used was purified Vero cell rabies vaccine (Sanofi Pasteur; potency,4.7 IU per 0.5 mL). The purified ERIG was manufactured by Queen Saovabha Memorial Institute (batch RF 02118), Thailand. Blood samples were obtained from each subject for determination of Nab titers by RFFIT before vaccination and on days 28,90,180 and 365 after vaccination.
Results: The pattern of Nab response was similar in each group. It was highest on day 28 then slowly decreased up to day 365. All had Nab levels ≥ 0.5 IU/mL (acceptable protective level) on day 28 after vaccination. Geometric mean titers (GMTs) of Nab in group II (TRC-ID regimen) were significantly higher than GMTs of Nab from group I (IPC-ID regimen) on day 90 (1.25 VS 2.53 IU/mL) and day 180 (0.57 VS 1.03 IU/mL) after vaccination ($p < .001$). All subjects who received TRC ID regimen (group I) had NAb levels ≥ 0.5 IU/mL through day 90 after vaccination, but 5 and 11 subjects (16.7% and 36.7%)) in group I (IPC-ID regimen) whose Nab level was < 0.5 IU/mL on day 90 and day 180 after vaccination respectively.
Conclusions: Rabies Nab titers waned over time after PEP, and this decreasing of antibody response is significantly greater among individuals who received one-week IPC-ID regimen with ERIG.
Conflict of Interest: no conflict of interest

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Do People Living with HIV Travel Safely? Assessment of Pre-travel Consultations and Self-reported Travel Habits in a Cohort of People Living with HIV in Belgium

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Background: The current profile of people living with HIV (PLWH) (advancing age, polymedication, VFR travel) makes pre-travel counselling crucial.
We aimed to assess the trends in pre-travel consultations among PLWH followed-up at the HIV Reference Centre (HRC) of Saint-Pierre Hospital, Brussels, and to survey the self-reported pre-travel habits in a subset of PLWH.
Methods: We identified PLWH who attended the Travel Clinic of our Center between 2005 and 2020 and a survey was conducted in all individuals presenting at the HRC.
Results: There was a significant increase in pre-travel visits of PLWH between 2005 and 2020 ($p<0.0001$). The survey was completed by 1024 PLWH (35% women, median age 49 years, the majority being virologically controlled). A substantial number of PLWH traveled in low-resources countries as VFR and 65% sought pre-travel advice before travelling: if not, the reason was that they did not know it was necessary (91%).
Conclusions: Travel health education should be addressed with this population at every opportunity of care.

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Seroconversion and Persistence of Neutralizing Antibody Response after Yellow Fever Vaccination in Patients with Perinatally Acquired HIV Infection

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Background: To describe the dynamics of neutralizing antibody (NAbs) response after yellow fever (YF) vaccine in young adults and adolescents with perinatally acquired HIV (pHIV).
Methods: *Design:* A retrospective cross-sectional study at three time points around YF vaccination and a matched case-control comparison of NAbs titers several years after YF vaccination.
Methods: We selected patients who had both documented YF vaccination and perinatally acquired HIV (n=46). The NAbs titers were measured in plasma samples from the following three time points: during the two years before (TP0), within the year after (TP1) and more than one year after (TP2) administration of the YF vaccine. The impact of perinatal infection was assessed by comparing pHIV YF vaccinees with 44 controls infected with HIV during adulthood.
Results: The median time between the YF vaccine and TP1 and TP2 was 123 days and 7,3 years respectively. After YF vaccination, 85% of vaccinees experienced seroconversion. The proportion of pHIV patients with NAbs above the protective threshold was stable between TP1 and TP2 (91% and 86% respectively) but levels of NAbs decreased significantly between TP1 and TP2 ($p=0.0122$). The case-control analysis found slightly higher geometrical mean titers (GMT) in pHIV than patients infected during adulthood.
Conclusions: Patients with pHIV showed high seroconversion rate and NAbs persistence at levels above the protective threshold after first YF vaccination. However, a decline in antibody levels over time suggests that at least one revaccination may be necessary to maintain circulating antibodies, contrary to recommendations for the general population.

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Travel-related Malaria: A 20-year Retrospective Study from a Public Tertiary Hospital in Brussels, Belgium

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Background: Imported malaria still causes a significant number of infections in non-endemic regions. In this study, we describe the epidemiological trend and morbidity of travel-related malaria diagnosed in a tertiary care hospital in Brussels, Belgium.
Methods: We conducted a retrospective study describing a cohort of imported malaria episodes diagnosed and treated (as in- and outpatients) at Centre Hospitalier Universitaire (CHU) Saint-Pierre from 1998 to 2017. Epidemiological and clinical data were collected by reviewing all medical files.
Results: A total of 1011 malaria episodes were analyzed. The average age at diagnosis was 35 years in 66% men (672/1011). An increase in the number of cases was observed over the years (from 17 in 1998 to 51 in 2008 and 79 in 2017). *Plasmodium falciparum* malaria was most often diagnosed (846/935, 89%), mostly from Central (530/935, 57%) and West Africa (324/935, 35%). A large number of cases (383/764, 50%) has been diagnosed in patients "visiting friends and relatives (VFR)". HIV-infected patients and other immunocompromised patients were significantly more likely to present with severe malaria (at least one severity criteria as defined by the WHO) compared to other patients (24/57, 42% vs 138/732, 19%, $p<0.01$ and 15/21, 71% vs 147/767, 19%, $p<0.001$). The rate of severe malaria was 14% and the mortality rate was low (5/1011, 0.5%).
Conclusions: Travel-related malaria has increased in our institution over the years with a large, although stable, number of cases diagnosed in VFR patients. This, with the higher rate of severe malaria in HIV and immunocompromised patients, highlights the urgent need of adequate malaria cases surveillance and targeted preventive interventions.

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Involvement and Recruitment of Migrant Communities in Research: An Explorative Embedded Investigation

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Background: Migrants fleeing political instability and persecution encounter difficult and traumatic circumstances during their migration, which can negatively affect health and well-being. During an epidemiological investigation into the health status of Eritrean and Somali migrants in Zurich, Switzerland, we encountered significant difficulties recruiting participants. This led to the initiation of an embedded investigation to further develop and improve the recruitment strategies.
Objectives: To learn how to engage the Somali and Eritrean communities in health research and improve recruitment for migration medicine studies in Zurich.
Methods: A scoping review on factors affecting migrant recruitment (e.g. reasons for non-participation, recruitment strategies) was conducted, which facilitated interviews with five individuals from the Eritrean (3) and Somali (2) communities. The participants were selected from our network and included men (2) and women (3) with diverse educational backgrounds. Interviews consisted of open-ended questions concerning cultural values, beliefs and perceptions that could affect research participation and information dissemination. Key themes were summarized by content analysis.
Results: The scoping review revealed that migrants are reluctant to participate in health research due to lack of trust, cultural barriers and fear of discrimination. This finding was mirrored in the interviews, with both communities expressing mistrust of researchers and their institutions, even when the recruiter was from their own community. In the literature, successful recruitment strategies varied depending on the setting, participants' culture, destination country and research topics, but overall involved a community-oriented approach that engaged community leaders from the beginning. Interviewees stressed the importance of recruiting trusted community leaders who could communicate Western research principles within their own culture of knowledge generation and early community involvement to avoid culturally inappropriate procedures.
Conclusions: Researchers should consider engaging early with migrant communities to discuss knowledge generation, research needs and study procedures, as well as recruit community leaders

trained in communication to act as cultural translators and research advocates. Fostering patient and public involvement (PPI) establishes trust and community buy-in and ensures that research objectives and methods are culturally appropriate and acceptable. Researchers benefit from allocating adequate financial and human resources for this type of approach from the outset.

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Do Light Coloured Textiles Reduce Vector Mosquito Biting Pressure? A Simulated Field Study in Mali, West Africa

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Background: The malaria recommendations of seven European countries uniquely suggest that travellers should wear long-sleeved clothes for mosquito protection. They disagree on the question if light colours are preferable.
Objectives: To determine the impact of black, white, and black/ white contrasted clothing on the attraction rates of different vector mosquito species during day and night times.
Methods: In simulated field tests, in Mali West Africa, we used Mosquito-Magnet traps as a substitute for humans in combination with black, white, and black/ white contrasted textile cover targets. The CO2 traps were operated continuously for 10 consecutive days during the day and during light (full moon) and dark nights (new moon). Trial targeting *Aedes aegpti* were conducted in a sub-urban setting (Bamako), *Anopheles gambiae* s.l. and *Culex pipiens* s.l. were studies in rural settings. Mosquito catches were recovered every hour.
Results: The examined mosquitos demonstrated species-specific biting patterns:
***Ae. aegypti*:** day catches were significantly higher than night catches. During day and light nights, the black/ white contrasted targets were significantly more attractive than black and white, while black was significantly more attractive than white. In dark nights the contrasted and black targets attracted more mosquitoes than white targets but the results were not significant.
Cx. pipiens s.l.: hardly any specimens were collected during day time. During light nights there was no significant difference between black/white contrasted and black targets but both attracted significantly more mosquitoes than white targets. In dark nights the trend was the same but results were not statistically significant.
An. gambiae s.l.: molecular analysis of a subsample of 100 anophelines showed that during the trial *An. coluzzii* was the dominant species with 87% with the remaining being *An. gambiae* s.s. During light nights the black targets attracted significantly more anophelines than contrasted and white targets. There was no significant difference between contrasted and white targets. In dark nights no preferences for the different colored targets could be observed.
Conclusions: The results suggest that wearing light-coloured clothing may significantly reduce mosquito biting pressure. This may impact travellers as they often spend dark nights in partially illuminated areas which are the equivalent of light nights.

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Perception and Awareness about Monkeypox in an At-risk Population in Brescia, Italy: An Investigative Survey

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Background: Before 2022, monkeypox virus (Mpx) infection in humans was seldom reported outside African regions where it is endemic. Since May 2022, many outbreaks have been reported in the EU and worldwide, with the vast majority of cases detected among men who have sex with men (MSM).
Objectives: Since Mpx is largely unknown to the general population, we investigated the behaviors and knowledge of a population that is considered to be at risk of infection.
Methods: Here we report the results of a self-completion anonymous questionnaire addressed to the population belonging to the sexually transmitted infection (STI) outpatient clinic of the Infectious Diseases Unit of the ASST Spedali Civili of Brescia, Italy, between August and October 2022. Most patients that took part in the compilation belong to our population of HIV positive MSM. The other participants were HIV-seronegative patients with other STIs.
Results: Overall, 144 questionnaires have been compiled. The vast majority of the participants were Italians (130;90%) and males (139;96.5%) between 30 and 60 years of age (118;82%). The main results are summarized in Table 1. Almost all (136;94%) reported having heard about Mpx and more than half (80;56%) received information about the transmission. Despite being a population considered at risk of infection and followed at our clinic, only 24 respondents (16%) received information from health professionals and only 14 (10%) believed that the information received was complete. Although 44% of respondents affirm they thought they were at risk of getting the infection and 65% are afraid to get it, 60% did not increase the precautions taken. When asked if they would accept a vaccine to prevent the disease, more than a third (35%) of respondents expressed hesitation or complete refusal to be vaccinated.

TABLE 1. Questions	Answers with percentages calculated on the total of responders per question
Have you ever heard about Mpx?	Yes 136 (94.4%)
Have you ever received information about the transmission?	Yes 80 (55.9%)
The information received was?	Insufficient 43 (29.9%)
Do you think Mpx is a dangerous disease?	Yes 109 (77.3%)
Do you know what preventive measures should be taken?	No 86 (61%)
Are you afraid of Mpx?	Yes 89 (65%)
Do you consider yourself at risk of getting Mpx?	Yes 59 (43.7%)
Since the emergence of monkeypox virus are you taking more precautions?	No 81 (60%)
If a vaccine was available, would you get it?	Would wait a while/would never get it 46 (35.8%)

Conclusions: Based on the results of the questionnaires, in a population that should already be sensitized and informed on the issue of STIs, what emerges is that there is still a lack of knowledge and awareness about Mpx.
To address this issue, targeted health promotion and education strategies that provide the necessary resources to reduce risk behaviors and enhance connections with healthcare professionals are needed.

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Cape Town Hotel Norovirus Outbreak: Traveler Carriage or Venue Acquired?

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Background: A conference for about 170 delegates was held at a well renowned Cape Town hotel in July and August 2022. A preparatory 40 member multinational team arrived by 10 July 2022. From 11th to 12th July, 7 members had acute and severe symptoms of nausea, vomiting and diarrhea. Four delegated were from the USA, and one each from Canada, South Africa and Egypt. An investigation was launched to determine the cause of the outbreak.
Methods: Despite all 7 being fully examined and counselled about the need to investigate the outbreak, only 3 submitted stool samples. The 40 member group was immediately counselled about infection control. The local environmental health (EH) department did a detailed health and safety inspection of the hotel. Attendees of an unrelated concurrent event who also resided at the hotel and shared the buffet breakfast facilities were questioned about gastrointestinal tract (GIT) symptoms.
Results: The 3 stool samples had PCR GIT viral, bacterial and parasite panel tests completed. Microscopy and culture was undertaken as well as staining for cryptosporidium. All 3 tested positive for *Norovirus G2*. The hotel was found to be compliant with EH standards except with one issue at the 24 hour bakery which was rectified within 24 hours. No interviewed staff or attendees of the concurrent event reported GIT symptoms nor were any reported to hotel management. The South African member of the group was the last to develop symptoms and was not aware of any contacts outside her 40 member group who had GIT symptoms. An additional staff member arrived from the USA on 5th August 2022 and only had contact with members of the initial 40 member group. On 6 August the new arrival reported GIT symptoms and *Norovirus G2* was detected in the stool sample supplied. One other member of the initial 40 developed GIT symptoms on 6 August and *Campylobacter jejuni* resistant to tetracyclines and quinolones but sensitive to macrolides was isolated.
Conclusions: The norovirus outbreak was confined to the one specific multinational group with no evidence of other hotel residents or staff being affected. Two further norovirus outbreaks occurred in October 2022 amongst travelers. A Scottish rugby team due to play a match in Johannesburg and an Irish team due to play in Durban had to cancel their matches. No locals were affected. This raises the possibility that the virus may have been introduced by the travelers.
Conflict of Interest: Nil

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Domestic Saudi Arabian Travellers' Understanding about COVID-19 and Its Vaccination

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Background: There is a lack of data on Saudi domestic air travellers' understanding regarding COVID-19 and their attitude towards the COVID-19 vaccination. This study aimed to assess Saudi domestic air travellers' understanding regarding COVID-19 and attitude towards mandating the COVID-19 vaccination for travellers.
Methods: A survey using a self-administered, structured, and closed-ended questionnaire was conducted among domestic air travellers in Saudi Arabia. Participants' socio-demographic information, travel history, health status, and attitudes and willingness to accept the COVID-19 vaccination were collected and analysed.
Results: Of the 2236 respondents who participated in the survey, 542 (24.25%) had a history of COVID-19, 803 (35.9%) were exposed to a COVID-19 case, 1425 (63.7%) were concerned about catching COVID-19 during air travel, 796 (35.6%) thought the COVID-19 vaccination should be obligatory for travellers, 1105 (49.4%) thought it should be optional, and 335 (15.0%) thought the vaccination was unnecessary. Being of the male gender (adjusted odds ratio [aOR] 1.41, 95% confidence interval [95% CI] 1.14–1.69), being concerned about contracting COVID-19 (aOR 1.34, 95% CI 1.12–2.10) and frequent travelling (aOR 1.40, 95% CI 1.10–3.40) were predictors of vaccination uptake.
Conclusions: This study demonstrates that although domestic Saudi travellers were concerned about COVID-19 infection, vaccine hesitancy was prevalent among them.

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Are International Saudi Travelers Willing to Receive the Vaccine against the Monkeypox Virus?

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Background: Vaccines are the most effective method for preventing the spread of infection, as evidenced by early COVID-19 experience. However, vaccine reluctance is one of the greatest obstacles to preventing the spread of new infections. The WHO has already declared monkeypox (Mpox) a global health emergency. Saudi Arabia has already confirmed multiple Mpox cases; thus, it is essential to initiate timely protective measures, including vaccination. There is a lack of information regarding Saudi travelers' knowledge of Mpox and their attitude toward the Mpox vaccination. Consequently, it is of the utmost importance to comprehend the willingness to receive Mpox vaccine among this particular at-risk group.
Methods: In this cross-sectional study, international Saudi travellers' were given an online, self-administered, structured, and closed-ended questionnaire to determine their willingness to receive the Mpox vaccine. Sociodemographic information, travel history, vaccination history, attitudes, and willingness to receive the Mpox vaccination were investigated for travelers.
Results: 443 (or 45%) of the 743 Saudi international travelers who participated in the study were willing to receive the Mpox vaccine. The study discovered that sociodemographic factors had a negligible effect on vaccine acceptance. However, 177 (23.8%) were concerned about contracting Mpox during their trip, and of those, 129 (73.2%) believed that the Mpox vaccination should be required for all travelers. Early vaccination experiences had a significant impact. Thus, more than 523 (70%) travelers who had been vaccinated against influenza or COVID-19 were willing to receive the MPX vaccine. The vaccine's safety and effectiveness were two of the most influential factors in determining its acceptability. Female gender (adjusted odds ratio [aOR] 2.31, 95% confidence interval [95% CI] 1.37–3.85), concern about contracting Mpox during the trip (aOR 1.72, 95% CI 1.18–2.93), and influenza and COVID-19 vaccinations (aOR 1.80, 95% CI 1.18–4.71) were associated with Mpox vaccination uptake.
Conclusions: Therefore, it is strongly recommended to emphasize the dissemination of information regarding the safety and efficacy of the Mpox vaccine among travellers.

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Cutaneous Leishmaniasis Acquired in Afghanistan among Refugees and U.S. Deployed Soldiers

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Background: Afghanistan is a high prevalence country for cutaneous leishmaniasis (CL) with 44,000 CL cases reported in 2020. With the arrival of >76,000 Afghan evacuees in the U.S. during the Fall 2021 through Operation Allies Welcome (OAW) cases of CL were identified. CL was also diagnosed among the >775,000 U.S. Service Members (SMs) who deployed to Afghanistan. Characteristics of CL infection acquired by Afghan local nationals versus U.S. SMs deployed to Afghanistan were analyzed to inform practitioners in non-endemic countries.
Methods: Clinical presentation and results of laboratory parasitological assessment were acquired for U.S. SMs enrolled between 2003-6 in a sodium stibogluconate treatment protocol for *Leishmania* parasitologically confirmed cases. Diagnostic support for dermal specimens from OAW evacuees and U.S. SMs was provided by the *Leishmania* Diagnostics Laboratory (LDL) at the Walter Reed Army Institute of Research.
Results: For the OAW cohort, specimens from seventeen (17) Afghan evacuees were submitted to LDL: 8 male, 9 female with a median age of 14.9 years. Fifty-nine percent (59%) of the dermal specimens were from facial lesions. RT-PCR for 14/17 (82%) specimens was positive for *Leishmania* genus. Among positive cultures (7/12 [58%]) *Leishmania tropica* was the infecting species identified by cellulose acetate electrophoresis (CAE). For the SM cohort, 17 U.S. soldiers with CL were identified, most presenting in September-December. The median age of the cohort was 26 years, 16/17 (94%) male, one black, two Hispanic, and 14/17 (82%) white. The median number of skin lesions was 6; 41% SMs had lesions on the head. Dermal specimens were *Leishmania* RT-PCR positive in 16/17 cases (94%) and culture positive in 88% with 15/17 identified as *Leishmania major* by CAE.

Conclusions: Two different populations who acquired CL in Afghanistan were compared. The frequency of CL in evacuees was higher than in deployed US SMs; infecting species, probably representing different geographic exposures, were different. Adults living in endemic areas may have a degree of protection, not seen in travelers. In both populations, persistent and cosmetically concerning lesions likely motivated requests for diagnostic testing to guide medical management.
Conflict of Interest: Dr. Aronson receives US federal grant funding for study of leishmaniasis, receives royalties from Elsevier, royalties from UpToDate for writing chapters, honoraria writing for BMJ Best Evidence on leishmaniasis, she receives honoraria for Wellcome Trust Program Advisory Board service and for reviewing grant applications. .

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The Adult Immunization Board: A Platform to Provide Multidisciplinary Support for the Implementation and Optimization of Adult Immunization in Europe

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Background: The low adult vaccination coverage and the barriers experienced during the implementation of the COVID-19 vaccination strategies in almost all European countries underline the need for a thorough reflection on adult immunization programs in Europe. Therefore, the teams of Prof. Bonanni - University of Florence and Prof. Van Damme - University of Antwerp joined forces to create an adult immunization board (AIB) based on years of experience with the Viral Hepatitis Prevention Board (created in 1992) and the HPV board (created in 2015). The AIB is an independent, international, and multidisciplinary group of experts in adult immunization. The experts set the strategy and define the actions of the AIB.
Methods: The AIB operates by organizing two yearly meetings:
1) Technical meeting covering technical aspects of adult immunization such as tailored vaccine services and communication for adults, electronic vaccine registries, adult immunization schedules, vaccine equity, coadministration of vaccines etc.
2) Country meeting to discuss country/region-specific aspects of adult immunization together with local experts.
Results: In November 2022, the AIB secretariat organized a Kick-off meeting with experts to establish the basic structure/functions of the Board, discuss the main objectives, and plan future meetings. Experts from different disciplines/sectors welcomed the AIB initiative. It was indicated that it is timely to have a closer look into adult vaccination and it was recognized that immunization needs a lifelong course and does not end after childhood. The new platform was well received and endorsed as an appropriate and effective way to share information and exchange ideas and experiences across disciplines and borders. In Q2/Q4 2023, the first AIB technical/country meetings are scheduled.
Conclusions: AIB will be a platform that brings together the different key European stakeholders on adult immunization in order to effectively contribute towards the implementation and optimization of adult immunization in Europe.
Conflict of Interest: The AIB is supported for its activities and meetings by an unrestricted grant from Vaccines Europe. Meeting topics and editorial control of the output and website (www.adultimmunizationboard.org) rests entirely with the executive secretariat of the Adult Immunization Board according to all ethical rules of both Universities.

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The Impact of COVID-19 Travel Bans on the Inbound Tourism Industry of South Africa

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Background: Travel bans have extremely limited value in controlling SARS-CoV-2 spread yet have major implications to a country's tourism industry and economy. Following identification of the Omicron variant, 90 countries had imposed restrictions on southern Africa by 13th December 2021. We describe the impact of these travel bans on South Africa's inbound tourism industry.
Objectives: Assess the impact of the November-December 2021 travel bans on South Africa's tourism and allied industries.
Methods: Federated Hospitality Association of South Africa, Southern Africa Tourism Services Association, and African Travel and Tourism Association members who operate in inbound tourism predominantly in South Africa but across southern Africa, participated in an anonymous online questionnaire over 2 time periods: 27-28 November and 7-12 December 2021. The second survey reflected increasing numbers of countries instigating bans. We assessed the number of cancellations over the high season period from December 2021 to March 2022, and the financial impact on their businesses.
Results: The first survey was completed by 583/1982 respondents surveyed in the first 48 hours after the UK's travel ban was announced on 25th November 2021. A total of 37 773 bookings were cancelled for trips over the December 2021 to March 2022 period, equating to 65 bookings cancelled per business. Of the 371/583 respondents who indicated the value of cancellations, the average loss was USD132 375, a total value lost over 48 hours of USD49.1 million.
The second survey was completed by 237/2582 respondents; 228/237 recorded 18 138 booking cancellations. The average number of cancellations increased to 80 per business. The value of cancellations per respondent had increased to USD216 781 (n=163), a total value loss of USD35.3 million. Indicating cancellations were ongoing, and average value lost had increased by 64%. Assuming all 583 respondents who completed the first survey had the same experience as those in second survey, they would have lost USD126.4 million.
Conclusion: The second set of international travel bans to hit South Africa in November 2021 had a major impact on its inbound tourism industry, affecting the country's economy and peoples' livelihoods. COVID-19 travel restrictions had no clear public health benefit, but had a significant financial impact.

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From Publication to Practice: Implementation Challenges for Travel Health Scope & Standards

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Background: In the United States nurses working in recognized specialties are mandated by the American Nurses Association (ANA) to adhere to established scope and standards and are obligated to be familiar with these foundational texts. In 2021, in conjunction with the recognition of travel health nursing (THN) as a distinct specialty, the American Travel Health Nurses Association (ATHNA) and the American Nurses Association (ANA) co-published *Travel Health Nursing: Scope and Standards of Practice* (THNSS). This volume includes a definition of the specialty as "Travel health nursing is the specialized nursing practice that advances the well-being of all travelers in all phases / stages of travel and in all settings." It describes the scope of the practice (the who, what, when, where, how, and why), delineates 17 competencies for travel health nursing performance, adapts Benner's competency model for THN professional development, and includes a code of ethics.
Objectives: The purpose of this study was:
1) to determine if and how this text has been received by nursing professionals and
2) to identify barriers and opportunities for maximum utilization of the THN Scope and Standards
Methods: A survey was emailed to a convenience sample of ATHNA members during January 2023. The survey included a mixture of close-ended and open-ended questions.
Results: The results of this survey identified an implementation gap that impinges on the full realization of the THN scope and standards. The survey demonstrated different levels of awareness of the THNSS and its value to the specialty. It also described several important individual and organizational barriers to its maximum utilization and impact. Respondents reported implementation challenges as well as educational opportunities across multiple clinical settings with diverse travel populations.
Conclusions: These results have implications for the improvement of quality of care both inside the US and in other countries hoping to implement their own universal standards.

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SASTM Recommendations for the Use of Fractional Dose of Yellow Fever Vaccine during Vaccine Stock Shortages

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Background: On Friday 29 July 2022 Sanofi the sole supplier of yellow fever vaccine (Stamaril®) in South Africa, announced that the vaccine was out of stock and would not be available in South Africa until end September 2022 at the earliest.The SASTM Executive Committee approached Sanofi, the local authorities (NDoH and SAPRHA) by email on Monday 1 August 2022 in an attempt to address this problem.
Methods: As a temporary measure the SASTM executive committee proposed that practitioners should consider the use of fractional dosing as temporary measure in order to extend available stock. A literature search was performed and the following publications were identified by the executive committee for further consultation.
WHO SAGE recommendation published in July 2016 titled "fractional dose yellow fever vaccine as a dose-sparing option for outbreak response" as well as an Advisory Committee Statement (ACS) by the Canadian Committee to Advise on Tropical Medicine and Travel (CATMAT) titled "Interim Canadian recommendations for the use of fractional dose of yellow fever vaccine during a vaccine shortage".
Results: On the 4th of August SASTM members were issued with interim SASTM recommendations for the use of fractional dose of yellow fever vaccine. It was made clear to members that this was a temporary measure that was available for those travellers who required vaccination for travel purposes during the current stock shortage.
Members were advised to administer 0.1ml via the subcutaneous route after which members were advised to complete the ICVP with a date of one year from the date of administration of the fractional dose and then to recall the travellers for the full dose and completion of the ICVP as soon as the vaccine once again became available from the supplier.
Conclusions: Many SASTM members made use of these recommendations during the vaccine stock shortage, this allowed practitioners to provide travellers with vaccination despite a stock shortage which lasted until the end of October of 2022.
SASTM feels that the available evidence supports the use of fractional dosing of yellow fever vaccines as an option for travel medicine practitioners during times of stock shortages or unavailability, despite its use currently being "off label" for travellers.
Further research into the use of fractional dosing especially in special populations such as paediatrics and immunocompromised travellers is required.

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Corticosteroid was Not Compulsory in Delayed Hemolytic Anemia after Treatment with Artemisinin-based Therapy in Severe Malaria and Influenza Co-infection: A Case Report

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Background: Parenteral artesunate, the first line treatment of severe malaria, was associated with delayed hemolysis in non-immune patients, especially within the first three weeks of therapy. Corticosteroid had proved beneficial in treatment of several reported cases of post-artesunate delayed hemolysis (PADH).
Objectives: We present a case of PADH occurring after the severe *Plasmodium falciparum* malaria and Influenza B virus co-infection acquired after travelling to Nigeria which was treated successfully without corticosteroid administration.
Methods: A 36-year-old Thai woman presented with 3 days of fever and respiratory tract symptoms was initially diagnosed with Influenza B virus infection. Despite treatment with oseltamivir, the symptoms worsen and she developed thrombocytopenia and mild transaminitis. The travel history of travelling to Nigeria twice in the past month was later obtained and she was eventually diagnosed with *Plasmodium falciparum* malaria. By then, the patient had developed into severe malaria from the evidence of hypotension, pulmonary edema and hyper-parasitemia of 12.8%. She was successfully treated with intravenous artesunate for 4 days followed by 3 days of oral Dihydroartemisinin-Piperaquine combination therapy and was discharged in good health. One week later, the patient

noted having dark-colored urine, excessive fatigue and jaundice. She was once again admitted for severe acute hemolytic anemia. The laboratory investigation showed positive Lactate Dehydrogenase, positive direct antiglobulin test and a hemolytic blood picture. Systemic lupus erythematosus was suspected but the criteria for diagnosis was not met despite positive Antinuclear Antibody pattern (homogenous 1:320, speckled 1:320). She was treated with blood transfusion and supportive treatment.

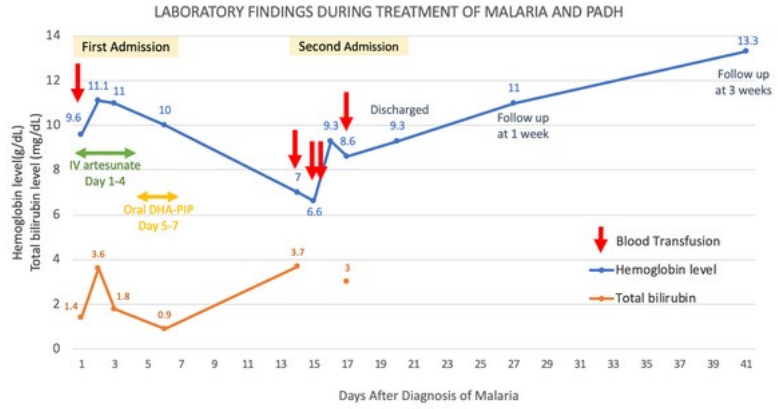

Figure 1: Figure showing progression of anemia and jaundice in terms of hemoglobin level (g/dL) and total bilirubin level (mg/dL) during the patient's treatment and follow up duration.

Results: Upon follow-up, the hemolysis gradually ceased and the anemia improved steadily without treatment with corticosteroid. The episode of hemolysis was self-limiting, and repeated investigation for autoimmune disease yield equivocal results leading to the diagnosis of PADH.
Conclusions: Co-infection of malaria and influenza in not uncommon. It was clear that the delayed diagnosis led to severe malaria and hyper-parasitemia, of which was the known risk factor of PADH. Corticosteroid had proved to be beneficial in other cases of PADH, but in our patient it was unnecessary. Thus, this could prompt further research of how artesunate could induced a immune-mediated hemolysis and the benefit of corticosteroid.

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A Descriptive Analysis of Dengue Cases in Claims Data within the US and Germany in 2010-2019

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Background: Dengue virus (DENV) can cause significant illness in travelers who visit dengue-endemic countries, but it has not been well-characterized in healthcare claims data in non-endemic countries.
Objectives: To identify patient characteristics and clinical care pathways of individuals residing in the US and Germany who have been diagnosed with dengue over the last 10 years (2010-2019).
Methods: Data from two large administrative claims databases in the United States (US; Merative MarketScan Research Database) and Germany (IQVIA Disease Analyzer) were used to define incident DENV diagnosis date (index date), patient characteristics, incident medical conditions, and treatment dispensing in patients in the 30-days before and 30-days after the DENV diagnosis. In the US source, individuals with unknown locations (n=719) or residing in Puerto Rico (n=380) were excluded.
Results: In total, there were 3,654 (3,185 in the US and 469 in Germany) individuals with incident DENV diagnoses over the 10-year period. About half were females (51.4%, 50.7%) and the majority were adults ≥20 years of age (80.0%, 90.5%) in the US and Germany, respectively. There was no evidence of diagnostic testing for DENV infection recorded. In the US, the top four prescribed medications in the 30-days post-index date included doxycycline (4.2%), acetaminophen (4.1%), hydrocodone (2.8%), and oxycodone (2.2%). In Germany, the prescribed medications 30-days post-index date were only ibuprofen (1.9%) and dipyrone (1.3%); on the index date ciprofloxacin (2.4%) and acetaminophen (1.9%) were also prescribed. The number of cases were higher within the months

of July to November. Lastly, about 1% of individuals had a dengue claim 180-365 days after the index diagnosis, suggesting prolonged sequelae of dengue infection.
Conclusions: This claims-based study allowed a better understanding of the presentation of dengue infection in a traditional healthcare setting in two non-endemic countries. Dengue diagnoses were infrequent with low frequency of prescribed medications in these datasets, and the extent to which it is undiagnosed in travelers returning to the US and Germany is unknown. As travel becomes more accessible and spread of disease between countries more common, there is a growing interest in characterizing the current standard of care among those with imported dengue infection.
Conflict of Interest: JG, JR and RD are employees of Janssen Research and Development, LLC, and SS is an employee of Johnson & Johnson (J&J). JG, JR, SS, and RD are shareholders in J&J. RR was on temporary contract with J&J at the time of this study.

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A Complete Negative Result of the RDT Caused by a Postzone-effect of the Highly Parasitized Blood Sample from an Imported Falciparum Malaria Case in Japan

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Background: Malaria is endemic mainly in tropical and sub-tropical countries and causes more than 200 million infection and 600,000 death annually. Indeed, in malaria non-endemic countries, imported malaria cases in travelers from endemic countries are big problem. Currently, the rapid malaria diagnosis test (RDT) is an excellent method for the diagnosis of malaria, and the PfHRP2 is widely used for the target antigen to be detected. Sensitivity and specificity of the test are most crucial.
Objectives: We experienced a case of a false negative RDT most probably due to the excess amount of the antigen, or a prozone-effect, and a detailed analysis was conducted to prove the cause of the false negativity.
Methods: The patient was a Japanese woman who traveled back from Nigeria. BinaxNOW® Malaria was used for the RDT.
For the detection of the suspected non-visible PfHRP2 antigen captured on the T1 band of the RDT, the immunochromatograph was peeled off from the tested RDT kit and then reacted with a labeled anti-PfHRP2 antibody.
Another analysis was conducted to determine the sensitivity of the RDT kit, using the healthy blood sample mixed with the commercially available recombinant PfHRP2 at different concentrations.
Results: Parasitemia of the patient was 7.3% with *P. falciparum* microscopically. The result of the T1 band of the RDT was negative. However, the non-visible PfHRP2 antigens on the T1 band turned out to be strongly positive after the treatment with the labeled anti-PfHRP2 antibody.
The detection range of PfHRP2 concentration by the RDT was found to be at a concentration of 0.067—67 ng/μL, but 670 ng/μl was showing false-negative.
Conclusions: It could be considered that both the gold colloid-labelled antibodies prepared on the starting edge of the immunochromatograph and the capture antibodies on the T1 band were both saturated with excess amount of PfHRP2 antigen in this patient's blood. Then, it became impossible for them to form a sandwich structure with the PfHRP2 on the T1 band, resulting in the false-negative RDT result.
In countries where malaria is nonendemic, few microscopists are able to diagnose imported malaria correctly. However, it might be too soon to rely perfectly on the RDT for its diagnosis.

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Malaria and COVID-19 Co-infection in a Returning Traveler: Case Report and Diagnostic Alert

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Background: Malaria is an acute infectious disease, potentially fatal, caused by a protozoan of the Plasmodium genus. Despite the success of overall management measures that have enabled a

substantial drop in malaria cases and deaths, the COVID-19 Pandemic, by damaging assistance services, has enabled an increase in malaria incidence and fatalities, notably in Africa.
Objectives: We describe a case of malaria and COVID-19 co-infection in a returning traveller from Africa to highlight differential diagnoses of acute febrile illness in the context of a COVID-19 pandemic.
Methods: Descriptive clinical-epidemiological study of a patient seen at a reference centre for emerging infectious diseases (NEEDIER-UFRJ) in Rio de Janeiro (RJ) with acute fever after returning from Angola in July 2022. Nasopharyngeal swabs were collected for rapid antigen detection test (RADT) and PCR for SARS-CoV-2, and blood samples for parasite detection (thick smear and blood distension). The participant signed an informed consent form.
Results: M.P.S.F., 55 years old, male, born in RJ, engineer, residing in Cabinda (Angola) for 1,5 years, returned to Brazil on July 6th, 2022. Four days after, he developed fever associated with cough, nasal congestion, and mild dyspnea and performed a positive COVID RADT. As the fever persisted, he was referred to NEEDIER/UFRJ, where a co-infection of SARS-CoV-2 (RADT and PCR both positive) and Plasmodium falciparum (blood smear - parasitemia ~25,000 /field) was confirmed. Artemether-lumefantrine PO was immediately started. However, due to progressive thrombocytopenia (~ 20,000 platelets on the 2nd day of treatment), he was admitted to a semi-intensive unit for clinical monitoring and intravenous antimalarial treatment. He evolved well, parasitemia progressively decreased, following discharge on the 4th day. Control smear was negative on the 6th day, though COVID-19 PCR remained positive for 21 days.
Conclusions: The COVID-19 pandemic promoted the displacement of human, financial, and diagnostic resources, resulting in a setback in disease control. Recent increases in international mobility resulted in higher exposure risk to other neglected pathogens, such as malaria. Considering overlapping symptoms and potential diagnostic delay, the need for a careful clinical evaluation that leads to an active search for differential diagnoses is evident.

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Seroprevalence of Dengue, Japanese Encephalitis, and Zika and Risk Factors for Infection among Long-term Expatriates from Non-endemic Countries in Thailand

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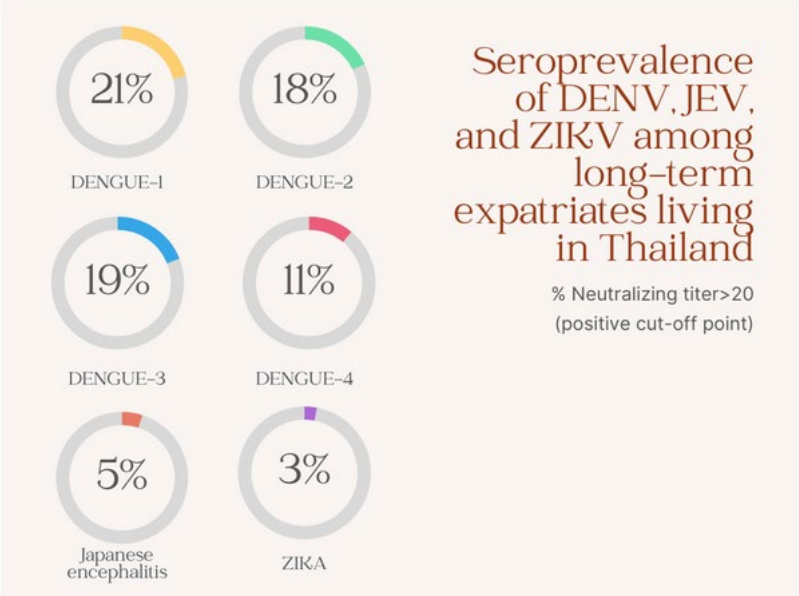
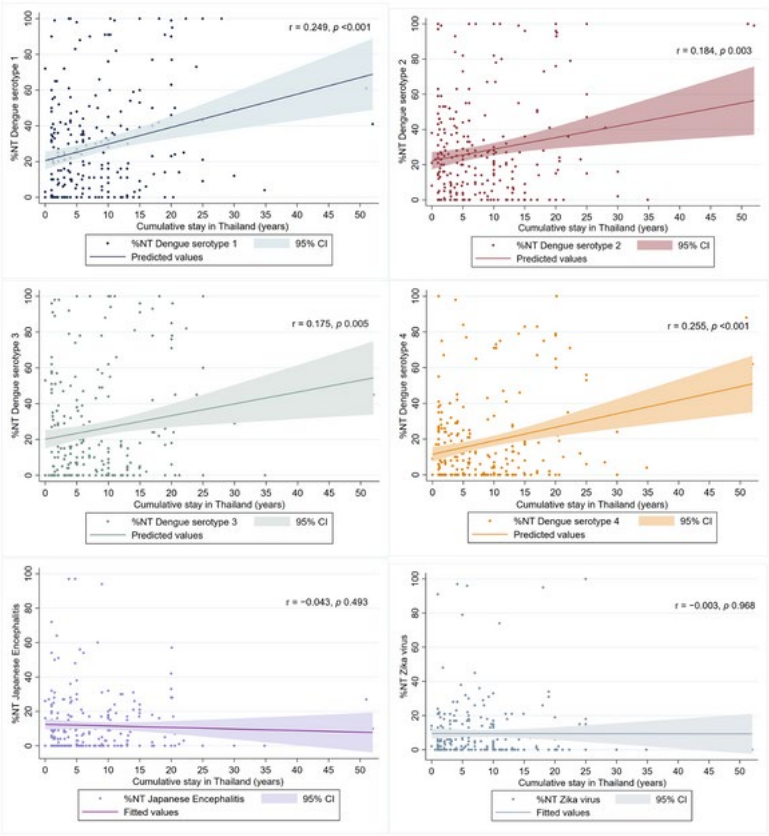
Background: Travel to Southeast Asia has increased the likelihood of mosquito-borne Flavivirus infections such as dengue, Japanese encephalitis (JE), and Zika. Expatriates are long-term travelers who are more susceptible to health hazards in their destination country and become unwell. The purpose of this study was to evaluate the seroprevalence of dengue, Japanese encephalitis, and Zika among expatriates living in Thailand, as well as the determinants that contribute to seroconversion.
Methods: A cross-sectional study was done from December 2017 to February 2020. Expatriates from non-Flavivirus endemic countries were invited to the study. Five ml blood samples were taken for DENV 1-4, JEV, and ZIKV antibody testing by the plaque reduction neutralization test (PRNT).
Results: Two hundred fifty-four participants were available for analysis with a median age of 65 years. The mean duration of stay in Thailand was eight years. Dengue type 1-4, JE, and Zika seroprevalence rates among expatriates living in Thailand were 20.5%, 18.1%, 18.9%, 10.6%, 4.7%, and 2.8%, respectively. Dengue seropositivity was associated with the duration of stay (aOR 1.26, 95% CI 1.05-1.51), living in an urban area (aOR 2.56, 95% CI 1.13-5.83), and having recreation outdoor activities in the early morning (aOR 2.16, 95% CI 1.01-4.63). Expatriates were less likely to develop natural immunity to JEV regardless of time spent in a JE-endemic area. There was no significant association established between Japanese encephalitis and Zika seropositivity. Only 48.4% received pre-travel counseling services, while only 18.9% visited a travel medicine specialist.





Conclusions: Seropositivity to common DENV, JEV, and ZIKV was found in a minority (2.8-20.5%) of expatriates living in Thailand. Travel medicine practitioners should provide adequate pre-travel health risk information on mosquito-borne Flavivirus infection and recommend appropriate travel vaccination such as JE vaccination.
Conflict of Interest: No conflct of interest

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Travel Medicine Professionals' Perception on their Skills in Maritime Medicine: Case of Enrolled 2022 SASTM Professionals in Travel Medicine Training

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Background: An impressive number of doctors and other health personnel are getting interested in travel medicine regarding the number of travellers and issues, the diversity 41ob e41 medical practice, the self-awareness towards the field. Despite this, a paucity of literature is available addressing the perception of maritime medicine which is also rapidly evolving. We aimed to describe demographics, qualifications, professional pathway, experiences level of travel medicine professionals as well as skills and exposure regarding maritime medicine.
Methods: A questionnaire was distributed 41ob e41 health professionals who attended the SASTM travel medicine course in May 2022. The google form was sent through internet. The data obtained was used to describe self perception on their skills, exposure in maritime medicine as travel medicine professionals.
Results: 41ob e41 54 attendees, 37 were contacted and 20 responded (37% overall, 54% of those contacted). 60% were female. The age varied between 30 and 58 years. 75% were medical doctors, 10% nurses and 5% pharmacists. 90% obtained their degree in South Africa and was still working there. A wide range of courses and diplomas were undertaken: 35% held a master, 45% of medical doctors had a speciality in the medical field. None took part 41ob e41 travel medicine course through hazard nor childhood dream but informed by colleagues, internet or encouraged by employers. The main motivation was the added value 41ob e41 course. 65% of participants affirmed to have knowledge in maritime medicine prior 41ob e41 course. During the course, all participants found few time was reserved to maritime medicine. 20% had already navigated, 30% had constant interest in navigation, 30 % had intentions to join navy or cruise ships. Over the 45 specific questions on maritime skills, 10 topics were estimated 41ob e known by the majority. The topic estimated 41ob e best known was diving accidents with 70% average.
Conclusions: Maritime and travel medicine are emerging as interdisciplinary fields. A close association might be forged between those areas. The role of health professionals at the bedside of sea users is of incredible importance and specific training is a must for this category.

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BCG Vaccination for Travelers: Stakeholder Assessment

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Background: BCG U.S.P. vaccination (BCG) is currently unavailable in the U.S, although approved by the Food and Drug Administration to prevent TB in uninfected persons at high risk for exposure. Many North American travelers visit or work in highly endemic tuberculosis (TB) regions where infection control may be challenging. Among >one million travelers, a cumulative travel-related TB incidence was estimated 41ob e 2.3%, highest in health care workers (HCWs). A Geosentinel analysis identified 201 patients with culture-confirmed TB, including 67.7% with multidrug resistance. Our objective was to conduct a BCG needs assessment among U.S. TB controllers and international travel medicine providers to clarify groups who may benefit from BCG in the U.S. and to identify concerns regarding using BCG in travel medicine.
Methods: The National TB Controller's Association (NTCA) and the International Society of Travel Medicine (ISTM) distributed the electronic survey to membership in April-May 2021. The multiple-choice survey was tailored to each group, with 4 questions for NTCA and 9 for ISTM. The analysis is descriptive.
Results: Responses were received from 107 NTCA participants and 75 ISTM participants. The NTCA respondents include state and local public health, academia, and TB control leadership. 45% reported receiving questions about BCG several or more times per year and 18% responded that they were

never asked about BCG. The types of questions reported included: HCWs interested in BCG (17%), parents traveling with an infant to TB endemic country (31%), and other types of travelers going to TB endemic areas (24%). Among ISTM respondents, 21.5% responded that they prescribed BCG several times per year, 79% less than once a year. BCG was given to infants (31%) and children <5 years old (32%) most commonly. Among U.S. ISTM responders (49% total) when asked if BCG was available would you use it, 51% agree, 30% were unsure and 19% disagree. Among ISTM responders the following concerns were elicited.

BCG concerns	% yes response
Adverse Effects	18
Not able to obtain	37.5
Unfamiliar with vaccine	10
Doesn't work	20
Affects TST	23
No concerns	32

Conclusions: These surveys suggest a need to clarify guidance for use of BCG in travelers, that U.S. TB controllers are regularly asked about BCG vaccine access. Additionally, U.S. travel medicine providers report concerns regarding adverse effects, lack of access and little familiarity with BCG vaccine administration. The NTCA is developing a BCG toolkit to address practical guidance for public health programs.
Conflict of Interest: Dr. Aronson received federal grants to study BCG vaccine and has received travel funds to present BCG topic at international meeting.

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Cloning and Expression of the *Taenia solium* Recombinant Tc24H Protein in *Pichia pastoris* for Use in a Neurocysticercosis Immunodiagnostic Assay

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Background: Neurocysticercosis (NCC) is a central nervous system infection caused by the larval "cyst" stage of the pork tapeworm *Taenia solium*. NCC affects 2.56–8.30 million people globally and is a common cause of seizures in endemic countries. Despite its prevalence, no consensus on screening for NCC exists. The current clinical serologic reference standard for detecting NCC is an enzyme-linked immunoelectrotransfer blot (EITB). Unfortunately, EITB requires a scarce resource, *T. solium* cyst tissue; for this reason, EITB is challenging to produce in clinical laboratories. Use of recombinant protein technology to develop an inexpensive, accurate, and accessible rapid assay would 1) reduce morbidity by permitting timely diagnosis and administration of antiparasitic therapy, and 2) guide public health interventions for high-risk populations, including at-risk US migrant communities.
Objectives: To reproducibly produce a recombinant immunodominant *T. solium* protein (rTc24H) in the yeast *Pichia pastoris* X-33 for use in the development of a rapid immunoassay for NCC diagnosis/screening.
Methods: The hydrophilic loop of an immunodominant *T. solium* glycoprotein, Tc24H, was cloned into a yeast expression vector pPICZaA and then transformed into the yeast *Pichia pastoris* X-33 by electroporation. The recombinant protein (rTc24H) with His-tag expressed at C-terminus was induced with 1% methanol and purified via immobilized metal affinity chromatography (IMAC).
Results: Sequencing confirmed that DNA encoding rTc24H was correctly cloned into vector pPICZaA. Tc24H/pPICZaA plasmid DNA was transformed into *P. pastoris* X-33, and the clone with the highest expression was used to make seed stock. Tc24H was successfully expressed as soluble recombinant protein in *P. pastoris* X-33 at high yield, purified with IMAC, and recognized by anti-His antibody.
Conclusions: Scarcity of *T. solium* cyst material (which is required for EITB, the current clinical serologic reference standard) has challenged NCC diagnosis and development of screening algorithms. As a step towards overcoming this challenge, we demonstrate that recombinant *T. solium* protein Tc24H can be reliably mass-produced in yeast. The next steps are to (1) develop rTc24H into a low-cost, scalable immunoassay and (2) evaluate its test performance for NCC diagnosis.

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The Clinical Spectrum of Patients at CIWEC Kathmandu in the 2022 Nepal Dengue Outbreak

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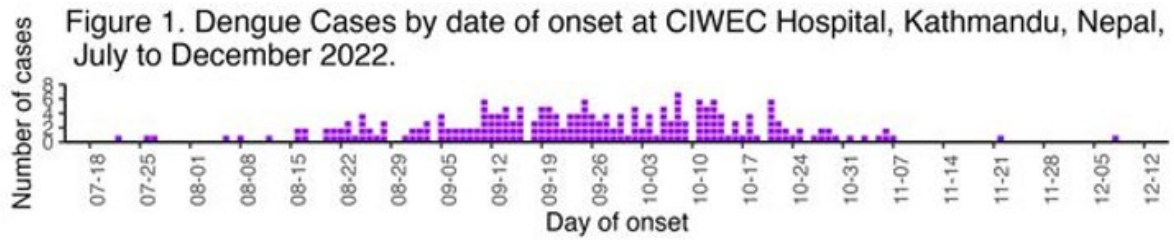
Background: The 2022 dengue outbreak in Nepal coincided with the busy tourist season, and was the largest to date. CIWEC Hospital and Travel Medicine Center, Kathmandu catered to many dengue patients, including travelers.
Objectives: The study aimed to see the clinical characteristics of all patients presenting with dengue at CIWEC from July to December 2022.
Methods: Medical record review was done for the dengue patients identified from the daily diagnosis sheets and lab records. Descriptive analyses of demographics, clinical and laboratory characteristics were done.
Results: Among 219 dengue cases, most had symptom onset in September (98, 44.7%) (Figure 1). The median age was 38 years (range 8-92), mostly 31-40 years (44, 20.1%), with 51.1% males. There were 94 travelers (42.9%), 80 locals (36.5%), and 45 expatriates (20.5%). Among 28 nationalities, the top three among the travelers group were USA, Netherlands, and France. Dengue NS1 antigen was positive in 142, NS1 and IgM positive in 27, IgM, IgG both positive in 8, all three positive in 14, and only IgG was positive in 6 indicating prior infection. The highest SGOT and SGPT were 1770 and 1228 respectively. Minimum serum sodium, platelets, and WBC were 122, 12000, and 1000 respectively. Dengue was mainly acquired in Kathmandu (158, 72.1%). Twenty-three were helicopter evacuated, mostly from Everest (11, 47.8%) region. The longest fever duration was 11 (median 3) days. Abdominal pain was present in 35 (16%), nausea in 84 (38.4%), anorexia in 105 (47.9%), rash in 63 (28.8%), diarrhea in 40 (18.3%), and vomiting in 14 (6.4%). Out of 23 patients having pulmonary symptoms, cough was present in 19 (8.7%) and dyspnea in 4 (1.8%). Most were outpatients (147, 67.1%), 56 were inpatients (25.6%), 13 were day-observations (13%) and 3 were in ICU (1.4%). 65 needed intravenous fluids (29.7%), and one needed platelet transfusion. There was one mortality, which was in an elderly male with an out-of-hospital sudden cardiac arrest.



Conclusions: Nepal had havoc wrecked by dengue leading to trip disruption among travelers. People from varied nationalities from many corners of the globe with no pre-existing dengue became sick with mild or severe disease.

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Safety and Antibody Responses in Adults and Elderly after Immunisation with a Reduced Recombinant Pertussis Booster Dose

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Background: A genetically detoxified two-component acellular pertussis vaccine ($aP5_{gen}$), containing 5 µg of genetically detoxified Pertussis Toxin (PT_{gen}) and 5 µg Filamentous Hemagglutinin (FHA), and $TdaP5_{gen}$ vaccine (tetanus and reduced-dose diphtheria combined to $aP5_{gen}$), manufactured by BioNet, Thailand, are safe, highly immunogenic and licensed in Singapore and Thailand. The reduced PT_{gen} vaccines with adequate immunogenicity for pertussis protection should be considered for use in the national immunization program including maternal immunization. We conducted a phase 3, observer-blind, randomized controlled study in healthy adults and older to compare safety and immunogenicity of recombinant reduced dose 2µg of PT_{gen} and 5µg FHA ($ap2_{gen}$vaccine) and $ap2_{gen}$ combined to tetanus and reduced-dose diphtheria ($Tdap2_{gen}$ vaccine) with commercial pertussis vaccines.
Methods: 750 healthy adults and older (18 to 75 years of age) were enrolled in 5 randomised groups (1:1:1:1:1) to receive one intramuscular dose of $ap2_{gen}$, $Tdap2_{gen}$, $aP5_{gen}$, $TdaP5_{gen}$ or chemically detoxified acellular pertussis ($Tdap_{chem}$) vaccine (manufactured by Sanofi Pasteur, Canada). Participants were monitored for immediate adverse events (AEs) and diary cards were distributed to record solicited AEs for 7 days after vaccination. Blood samples were collected from all participants before and 28 days after vaccination for PT neutralizing antibody, anti-PT IgG and anti-FHA IgG. Serious AEs were monitored during the entire study period.
Results: Non-inferiority of safety of $ap2_{gen}$ and $Tdap2_{gen}$ with respect to $Tdap_{chem}$ vaccine was met. No vaccine-related SAE was reported. At day 28 post-vaccination, anti-PT seroconversion rates were significantly higher in $ap2_{gen}$ group (94.7%: 95% CI = 86.9-98.5) and $Tdap2_{gen}$ group (90.7%: 95% CI = 81.7-96.2) than those in $Tdap_{chem}$ group (74.3%:95% CI=62.8-83.8; $p<0.05$[tt1] [SM2]). Anti-FHA seroconversion rates of all vaccine groups were comparable. For PT neutralizing antibody, seroconversion rates were significantly higher in $ap2_{gen}$ and $Tdap2_{gen}$ groups [93.3% (95% CI = 85.1-97.8) and 86.7% (95% CI = 76.8-93.4), respectively] than the rate in $Tdap_{chem}$ group (64.9% :95%CI=52.9-75.6; $p<0.05$). Seroconversion rates against PT antigen of all recombinant pertussis vaccine groups were similar.
Conclusions: Low-dose recombinant acellular pertussis vaccines ($ap2_{gen}$ and $Tdap2_{gen}$) provide a safe and immunogenic option for pertussis vaccination in low-middle income countries.
Conflict of Interest: Wassana Wijagkanalan, Librada Fortuna, Chawanee Kerdsomboon, Vilasinee Yuwaree, Souad Mansouri and Pham Hong Thai work at Bionet-Asia Ltd, Thailand. Thai Goverrment gave support grant for this research but Bionet-Asia Ltd.,Thailand gave a support grant for some parts of viccine productions. Others have no conflicts of interest.

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Pre-travel Information Needs, Attitudes, and Drivers of Vaccine Uptake: A Population-based Cross-sectional Survey of Australians

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Background: Pre-travel vaccination is a key risk mitigation strategy for travel-related vaccine-preventable diseases (VPDs), but many travellers do not seek or receive vaccines before travelling. Reasons for low pre-travel vaccine uptake are multifactorial, but include lack of perceived risk, cost and fear of adverse events. Tools designed to support vaccine decision-making, such as vaccine decision aids, could help travellers to better understand VPD risks and make better-informed decisions about pre-travel vaccines. To date, no studies have reported on attitudes towards, or development of, decision aids for travel-related VPDs. We aimed to investigate pre-travel information- and health-seeking behaviours of Australians to identify drivers of vaccine uptake and information needs in relation to travel vaccine decision aids.
Methods: Population based cross-sectional online survey of Australian adults in December 2022. We recruited Australian residents with a history of, or interest in overseas travel through Dynata, a health market research company. We captured self-reported data on past pre-travel health seeking behaviours and reasons for receiving or not receiving pre-travel vaccines. We also evaluated determinants of individuals' decisions to vaccinate through responses to hypothetical scenario-based questions adapted from the WHO Behavioural and Social Drivers of vaccine uptake framework. We

measured vaccine confidence using questions from the Vaccine Confidence Index and also evaluated trust in vaccine information from different sources.
Results: We received survey responses from 1223 Australians (median age 64 [range 18-92]; 51% female). A third of respondents were born overseas and 15% spoke a language other than English at home. State-based representation was reflective of the Australian population. Amongst 1161 participants reporting a history of overseas travel, 63% were primarily tourist travellers; 40% had undertaken >10 previous overseas trips and 65% intended to undertake future travel. The most commonly cited reason for both receiving or not receiving vaccination pre-travel was a recommendation from a health professional (Figure 1). Approximately two thirds of respondents were interested in using a decision aid (63% agree/strongly agree), with most preferring to do so with a trusted health professional.

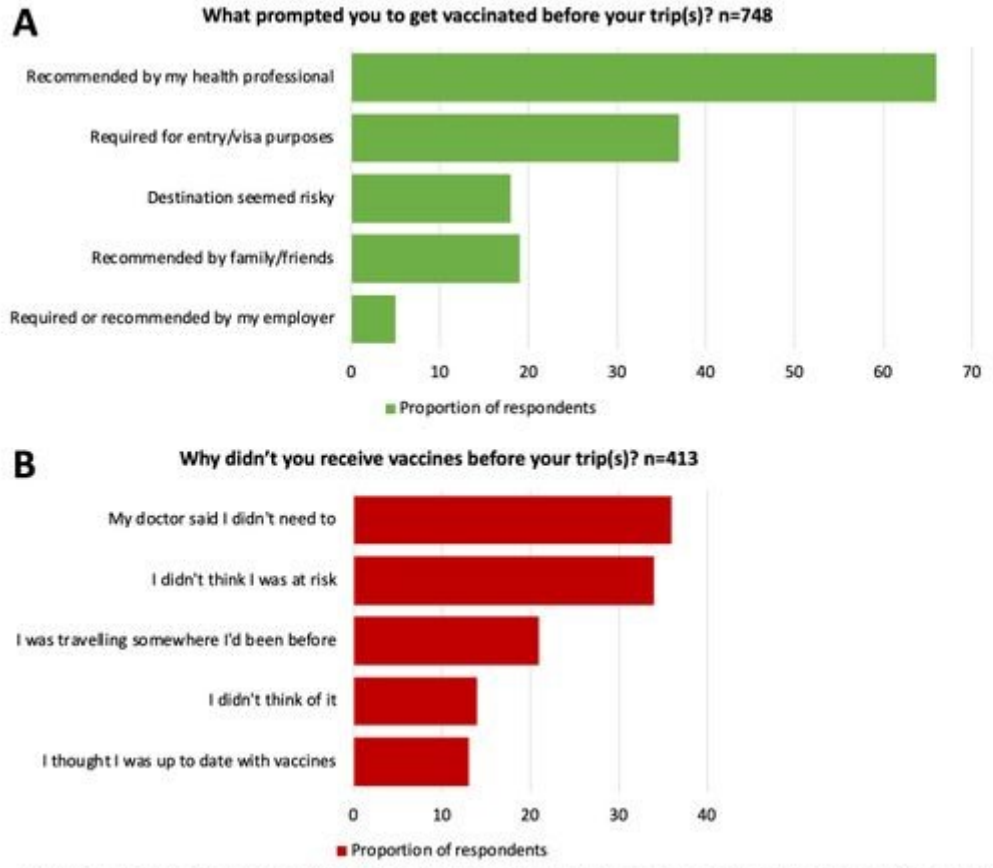

Figure 1. Top 5 reported reasons for receiving (A) or not receiving (B) vaccines pre-travel. Note: more than one response was allowed.

Conclusions: While health professionals remain integral to supporting informed vaccine decision-making for travellers, decision aids could support clinical consultations.
Conflict of Interest: This work was supported by an ISTM research grant. Dr McGuinness is supported by an NHMRC Investigator Grant (2017229).

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Changes in the Development of the Nursing Professional Group of the Japanese Society of Travel and Health

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Background: In recent years, both the number of epidemics of infectious diseases and the number of people traveling abroad have increased greatly. This increased globalization has led to more demand for healthcare abroad, in which nursing plays a significant role. The Japanese Society of Travel and

Health was established in 1997, and thanks to the early efforts of nurses and other founders, in 2003, they approved the establishment of a nursing professional group. This report discusses the progress and activities of the Nursing Professional Group within the Japanese Society of Travel and Health.
Objectives: The Nursing Professional Group was designed to:
1) address various health-related problems of overseas travelers through the activities of nursing professionals,
2) to improve and develop the knowledge and skills of nursing professionals involved in promoting the health of overseas travelers, and
3) to promote exchanges among nursing professionals.
Methods: The organization has six pillars to achieve its purpose.
1. Annual symposiums
2. Annual nursing seminars
3. Human resource development
4. International exchange
5. Development of competency models
6. Research on travel health nursing.
Results: Since 1997, the number of nurses on staff has increased from 12 to 201 in 2022. The nurses work in a variety of areas, including occupational health (25%), travel clinics (17%), hospitals (12%), school health (6%), and others.
Unique point: Japan often has additional restrictions on medical practice compared to other countries, including that all vaccinations require a doctor's prescription and instructions.
Conclusions: The Nursing Professional Group is working to develop the definition and role of travel health nursing in Japan and systematic learning methods based on travel Health nursing competencies. In the future, the organization will continue to work to support travel health nursing professionals in an era of infectious disease threats, as well as environmental and geopolitical risks.

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Dengue Infection in Immunocompromised Patients: A Systematic Review

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Background: Immunocompromised individuals residing in or travelling to dengue-endemic countries are at risk of infection. Both mild and severe infections have been described. Antibody-dependent enhancement contributes to severe outcomes in secondary dengue infections; an immunocompromised state which blunts the immune response could therefore be a protective factor or alternatively could lead to a higher risk of severe outcomes. The impact of malnutrition, a known cause of immune impairment, on dengue infection in children is also unclear. We aimed to better understand the clinical course and outcome of dengue infection in immunocompromised patients.
Methods: We searched five electronic databases (EMBASE, MEDLINE, CINAHL, Google Scholar, SCOPUS) and manually searched reference lists to identify relevant studies with no date and language limits. Study selection and data extraction were conducted independently by at least two authors.
Results: We identified 4,507 unique records, excluded 4,249 on title and abstract screening, undertook full text-review of 258 studies and identified 115 studies meeting our eligibility criteria. Included records comprised 61 (53%) case series and case reports, 21 (18%) cohort studies, 15 (13%) cross sectional studies and 4 (3%) case control studies. Immunocompromised patient groups studied were mainly solid organ transplantation (SOT) (n=41), malnutrition (n=24), inflammatory /autoimmune disease (n=19), Human Immunodeficiency Virus (HIV) (n=14), solid organ and haematological malignancies (n=17) and haematopoietic stem cell transplantation (n=7). Preliminary results showed that majority of studies (75%) were of hospital inpatients and that symptoms of dengue were similar to the non-immunosuppressed population except that a lower frequency of arthralgia was suggested. Severe dengue was reported among 12% of patients, and other complications were rare. Among renal transplant recipients, 42% had acute graft dysfunction during dengue infection, with 18% suffering graft loss, but exacerbation of inflammatory/autoimmune disease and HIV did not seem to be increased even if immunosuppressive treatment was withheld. Malnutrition was not a risk factor for

dengue shock. Dengue-related mortality was reported for 15 patients, with all occurring as a result of severe dengue.
Conclusions: Preliminary analysis suggests that the clinical course and outcome of dengue infections in immunocompromised patients is similar to that of immunocompetent patients.

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Hepatitis A and B Immunity in South Africa. Who Should Be Vaccinated?

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Background: South Africa, similarly to other developing countries, e.g India, has recently transitioned from high to intermediate endemicity for Hepatitis A. We looked at rates of detectable Hepatitis A antibodies in travelers for work that were tested during their "pre-deployment medicals" to determine if the typical expatriate traveler is falling within national incidence rates. Along a similar line, Hepatitis B data was pulled to ascertain whether candidates born during/after 1995 when Hepatitis B was added to the South African Expanded Program of Immunisation (EPI) had detectable levels of Hepatitis B antibodies. Our data provides a snapshot informing us whether candidates require vaccination against Hepatitis A and B prior to travel and conversely whether Hepatitis A and B vaccination remains indicated for travellers to South Africa.
Objectives: Determine the need for Hepatitis vaccination in travellers to and from South Africa.
Methods: We collected retrospective data for Hepatitis A and B immunity. Our cohort consisted mostly of seafarers and mine workers. We reviewed clinical records from January 2019 to December 2022. We documented HAIgG and HAIgM, HBsAb and HBsAg as well as demographic data.
Results: We reviewed 210 patient records:
Hepatitis A: 82 candidates were tested for Hepatitis IgG and 59% were immune either through natural immunity or prior immunisation. This compares to an NICD study showing a seroprevalence of 88% positivity for IgG.
Hepatitis B: 162 candidates were tested for Hepatitis B surface antibody and 41% were immune (66). This is lower when compared to national statistics; however the age group tested for the national study was younger than 25 years whereas the average age of our cohort was 36.
22 candidates were young enough to have been vaccinated (EPI) but only 32% showed HBsAb immunity.
Conclusions: We noted a lower prevalence in immunity against both Hepatitis A and B in our sample group than in three similar South African studies. It supports the notion that South Africa is moving from a high to intermediate endemicity for both Hepatitis A and B; that immunity in outbound travelers cannot be assumed, that non-immune South Africans and travelers to South Africa are at risk and should be vaccinated.
Conflict of Interest: N/A

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Impact of Pre-travel Consultation on Preventing Malaria in Tunisian Traveler's

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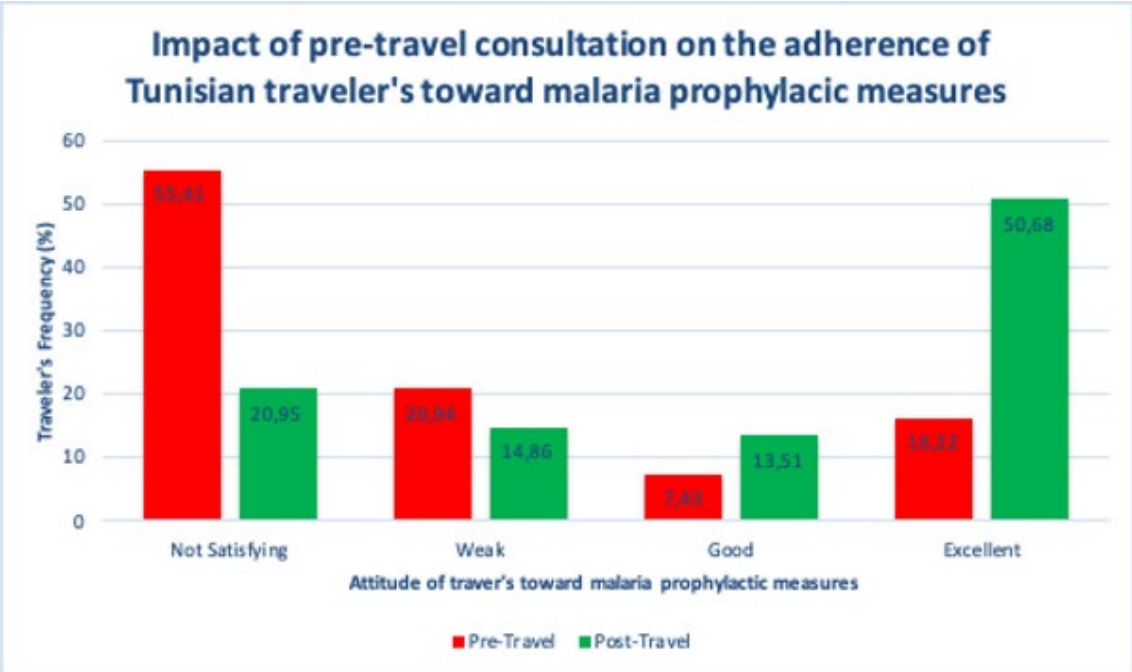
Background: Malaria is among major worldwide health problem. In Tunisia, it was eliminated in 1979. However, the continuous increase of imported malaria cases with the persistence of Anopheles mosquitoes represents a risk of re-introduction of aboriginal transmission of the disease. Thus, with the increase of traveling to malaria endemic areas, knowledge of malaria risk factors and prophylactic measures is very important to prevent this disease and can help avoiding severe cases. It can also prevent re-introduction of the pathogen in malaria-free countries.
Objectives: The purpose of this study is to assess Tunisian travelers' knowledge about malaria and its prevention and the impact of pre-travel consultation on their adherence to prophylactic measures.
Methods: We conducted a survey based on two anonymous questionnaires (pre- and post-travel) among adults traveling to endemic countries. The first questionnaire was followed by a medical interview focusing on risk level, recommended prophylactic measures and chemoprophylaxis prescription. The study protocol has been pre-approved by the bio-medical ethics committee of Pasteur Institute of Tunis referenced under 2017/23/I/SVIAIPT. The consent of the participants was given after reading a document summarizing the study.
Results: We recruited 289 travelers. They mainly moved within sub-Saharan Africa (99%). Their average age was 42.3 years and sex ratio (male/female) was 3.1. About 71% of them traveled for the first time in malaria endemic areas and 84.4% did it for professional reasons. Prior to departure and pre-travel consultation, 88.4% of travelers said that they knew about Malaria but only 53.3% of them were aware of the risk of this disease. Recommendations for chemoprophylaxis were known by 62.3% of subjects and only 43.6% intended to use chemoprophylaxis ($p < 0.01$). Better adherence to protective measures, including chemoprophylaxis, was reported after the travel, with attitudes qualified as good or excellent by 64.2% upon return against 23.7% before the interview ($p < 0.001$).



Conclusions: This study revealed significant deficiencies among Tunisian traveler's in terms of malaria knowledge and prophylactic modalities. It has also demonstrated the positive impact and the usefulness of pre-travel consultation on improving the adherence of travelers to malaria prophylactic measures. Therefore, strengthening information through specialized consultations is more than required.

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Older Age in Subarachnoid Neurocysticercosis Reflects a Long Pre-patent Period

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Background: Neurocysticercosis (NCC) is the infection of the central nervous system (CNS) by the larvae of the pork tapeworm *Taenia solium.* Subarachnoid disease is the most severe form, with much higher mortality than parenchymal disease. In all published series patients with subarachnoid disease are older than those with parenchymal disease, suggesting a delayed diagnosis and/or a long incubation period, as seen in reports of migrants or home-returning travelers from an endemic area.
Objectives: Using available data from a large consecutive series of patients with suspected NCC seen in a referral center, we compared the age at symptom onset between parenchymal and subarachnoid disease after adjusting for factors that could distort this relationship.
Methods: Patient selection is depicted in the study flowchart (Figure 1). From 408 eligible patients, we retrospectively compared the age at symptom onset in 140 patients diagnosed with parenchymal (pure viable or pure calcified) and pure subarachnoid NCC who had a confirmatory image available not more than two years after the beginning of symptoms to reduce the likelihood of changes in the type of NCC between symptom onset and imaging, and minimizing recall bias. Additionally, a sensitivity analysis using all eligible patients (n=408) was conducted to confirm our findings in the target subgroup.

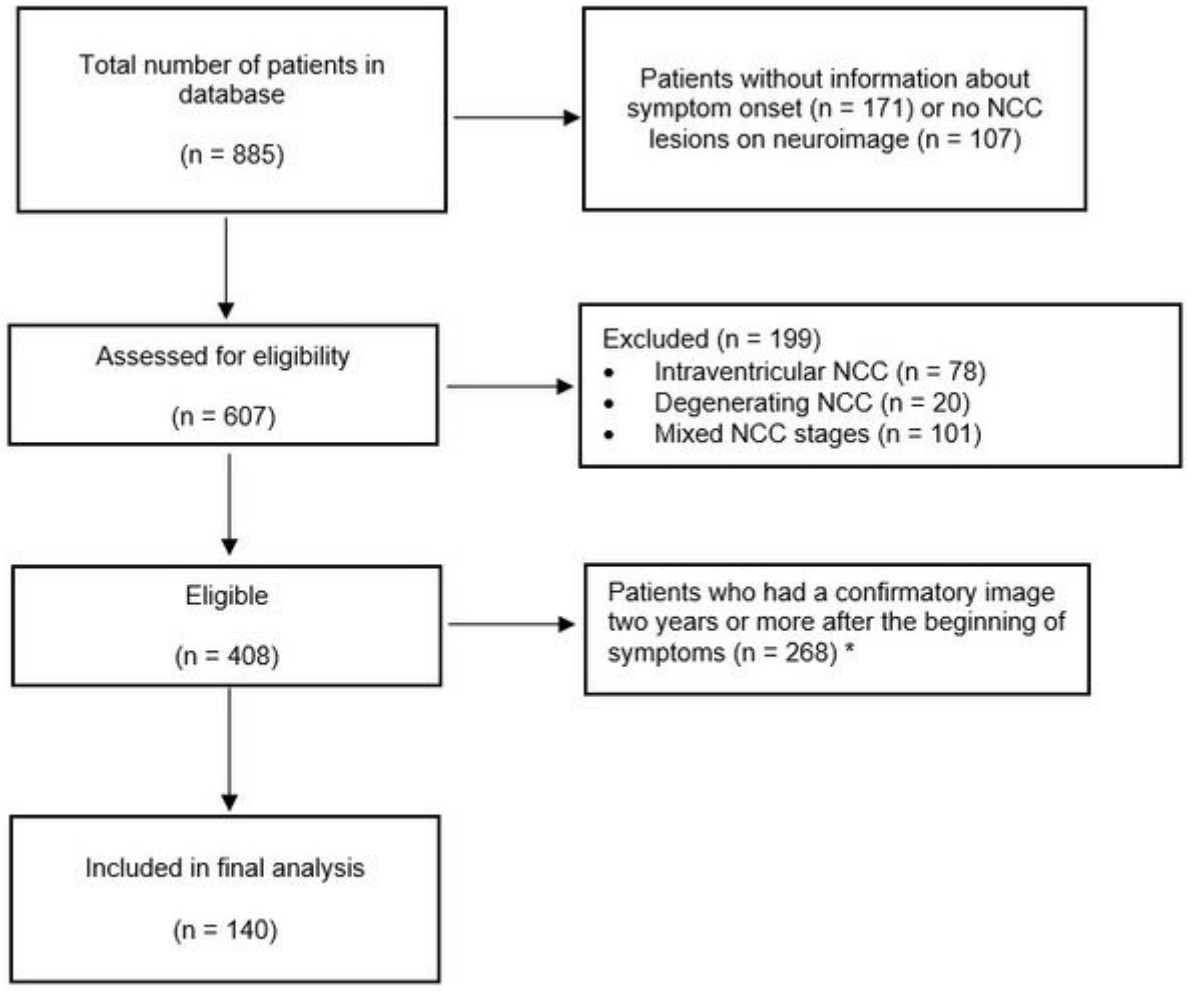

Figure 1. Study flowchart.

Results: After controlling by sex and place of residence, the mean age at symptom onset in patients with subarachnoid NCC was 13.69 years (CI95%: 6.57-20.81) and 4.78 years (CI95%: -0.72-10.29) older than that observed in patients with viable parenchymal NCC ($p<0.001$) and pure calcified parenchymal NCC ($p=0.089$), respectively. Likewise, the mean age at symptom onset in patients with calcified parenchymal NCC was 8.91 years (CI95%: 1.92-15.89) older than that observed in patients with viable parenchymal NCC ($p = 0.012$). Our results showed consistency across all cut-off points of years between symptom onset and neuroimage evaluated (Table 1).

Years between symptom onset and neuroimage	N (viable/calcified/subarachnoid)	Viable vs. Calcified*	Viable vs. Subrachnoid*
<2 years	140 (30/62/45)	8.91 (0.012)	13.69 (<0.001)
<3 years	168 (36/78/54)	10.41 (0.002)	13.37 (<0.001)
<4 years	195 (36/100/59)	10.47 (<0.001)	13.19 (<0.001)
<5 years	213 (40/114/59)	9.98 (0.001)	12.38 (<0.001)
<10 years	278 (48/163/67)	8.99 (<0.001)	11.61 (<0.001)
<20 years	336 (55/201/80)	7.02 (0.004)	11.48 (<0.001)
Total	408 (59/259/90)	4.90 (0.043)	10.15 (<0.001)
* Differences in years of age at symptom onset. The analysis was made using GLM (link identity family gaussian) adjusted by sex and place of residence.			

Conclusions: We found that patients with subarachnoid disease began symptoms much later than those with viable parenchymal disease adding evidence that a long incubation period is a major contributing factor to older age at presentation in subarachnoid NCC, independent of delayed diagnosis or access to care.
previously_presented: This content is under revision for publication in the American Journal of Tropical Medicine and Hygiene

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Modeling Approaches to Inform Travel-related Policies for COVID-19 Containment: A Scoping Review and Future Directions

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Background: Travel-related strategies to reduce the spread of COVID-19 have rapidly evolved in response to changes in the understanding of SARS-CoV-2 transmission, viral dynamics, and options for diagnosis, prevention, and treatment. Simulation modeling is increasingly used to investigate the possible outcomes from different disease containment strategies. We reviewed COVID-19 travel-related modeling studies to evaluate travel-related COVID-19 containment strategies and identify areas of focus for future modeling approaches to guide policy regarding travel-related strategies for infectious diseases.
Methods: We reviewed the literature and selected 30 articles published from December 2019 to September 2022 that used simulation modeling of travel-related COVID-19 cases and containment strategies. We extracted and synthesized study objectives, modeling methods, populations, settings and strategies examined, costs, and model outcomes.
Results: We found that the most frequently used model structure was an aggregate-level compartmental model, with a focus on international air travel. The most frequently examined strategies were quarantine, isolation, or testing; screening strategies with antigen testing were rarely considered,

and cost estimates were infrequently included. The modeling studies projected outcomes and assessed strategies that reflected the interests and available tools at the time of the study as the pandemic evolved, though modeling methods lacked transparency. Early in the pandemic, in an attempt to prevent any travel-related cases of COVID-19, simulation models focused on individual-level outcomes and examined broad strategies such as travel restrictions, quarantine without testing, social distancing, and on-arrival polymerase chain reaction testing. More recently, after the development of diagnostic tests and vaccines, model-based analyses projected population-level outcome measures and investigated strategies such as antigen testing and vaccinations. Cost-effectiveness of these strategies has not been examined.
Conclusions: As the pandemic continues to evolve, simulation modeling approaches must be revised to account for trends in the global pandemic. Future modeling analyses should leverage open-source data, make modeling methods more transparent, and include assessments of costs and cost-effectiveness. Simulation modeling that assesses uncertainty in future SARS-CoV-2 variants of concern and other competing travel-related infectious diseases (e.g., mpox and ebolaviruses) should be developed to inform travel-related health policy.
Conflict of Interest: This work was supported by the US Centers for Disease Control and Prevention. The findings and conclusions of this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.

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International University Students' Pre-travel Preparedness, Knowledge and Practices towards Travel Health in Thailand: A Nationwide Cross-sectional Study

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Background: University students are a vulnerable group of travelers due to their adventurous nature and poor risk perception. To provide an optimal pre-travel consultation, studies assessing pre-travel preparation and preventive behaviors of international university students from diverse backgrounds are needed. The study aims to determine the characteristics of professional pre-travel advice, level of knowledge about travel-related health issues, and preventive practices of international university students attending universities in Thailand.
Methods: In July-October 2022, a cross-sectional survey was administered electronically to international students who had been enrolled in 14 universities across Thailand .
Results: 324 international university students completed the survey. Fifty percent were male. The median age was 24 years. The majority came from Asia (78.7%, n=255/324), followed by Europe (16.4%, n=53/324), Africa (3.4%, n=11/324), and other continents (1.5%, 5/324). The median length of expected stay was 24 months. Half of the students (49.7%) enrolled in graduate and post-graduate programs. The overall uptake of professional pre-travel advice was 53.7%. Almost all European students attended a pre-travel consultation before coming to Thailand (81.1%, n=43/53), whereas Asian students had the lowest uptake compared to other regions (47.5%, n=121/255). The primary sources of advice were primary care providers (74.1%) and travel medicine specialists (23.0%). The level of knowledge about travel-related health issues was generally low. Only 31.8% recognized Japanese encephalitis as a mosquito-borne disease. One in five (21.6%) incorrectly understood that Thailand drives on the right-hand side. Over 58.1% of the students were unaware of Thailand's emergency hotline. Twenty-nine students reported having new casual sex partners. Less than half of the respondents always used condoms during sexual intercourse (41%, n=12/29). Of 210 respondents who had been on a motorcycle, just 41% described always wearing a helmet (41%, n=86/210).
Conclusions: The inadequate knowledge about travel-related health issues and suboptimal preventive behaviors among international students in our study highlight the need to tailor the pre-

travel preparation to the characteristics of these travelers. Greater priority should be given to non-infectious health risks and destination-specific travel information during the pre-travel consultation.

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Diseases among Migrants and Non-migrant Travelers Presenting to US GeoSentinel Sites, 2012–2021

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Background: Detecting diseases among travelers provides valuable information to improve case identification, clinical management, and public health prevention.
Objectives: We describe characteristics and health conditions of migrants and non-migrant travelers presenting at US GeoSentinel sites.
Methods: Subjects with at least one confirmed or probable travel-related diagnosis that were evaluated after migration or travel at a US GeoSentinel site during January 2012–December 2021 were included. Proportions of demographic, travel, and clinical characteristics were calculated. Before November 2018, travel purpose and exposure region were not linked to a diagnosis and are presented separately.
Results: Twenty US GeoSentinel sites submitted data on 17,389 subjects; 7,530 (43.3%) were migrants and 9,859 (56.7%) were non-migrant travelers. Among migrants, 52.6% were male, 35.9% were between 19–39 years old, 89.8% were seen as outpatients, and 88.8% (4,148 of 4,672) received no pre-travel health information. The most frequent diagnoses among migrants were vitamin D deficiency (20.2%), *Blastocystis* (10.9%), and latent tuberculosis (10.3%). Malaria was diagnosed in 53 (<1%) migrants. Migrants were most often exposed in Central America and sub-Saharan Africa (Table 1).
Among non-migrant travelers, 55.7% were female, 44.1% were between 19–39 years old, 90.6% were outpatients, and 65.6% (5878 of 8967) received no pre-travel health information. Diagnoses among non-migrant travelers were most frequently gastrointestinal (43.2%). The top diagnoses included acute diarrhea (16.9%), viral syndrome (4.9%), and irritable bowel syndrome (4.1%). Non-migrant travelers most often reported traveling for tourism and were most frequently exposed in Central America or sub-Saharan Africa (Table 1). Malaria was diagnosed among 421 (3.5%) non-migrant travelers who most frequently reported visiting friends and relatives (VFRs) and were exposed in sub-Saharan Africa; most reported not taking malaria prophylaxis or receiving pre-travel health information.

Top 5 Travel Reasons and Regions of Exposure for Migrants and Non-migrant Travelers							
Migrants							
	Before November 2018				**After November 2018**		
	n	N	%		n	N	%
Exposure Region				**Exposure Region**			
Sub-Saharan Africa	655	2,892	22.7	Central America	556	2,012	27.6
Caribbean	615	2,892	21.3	Sub-Saharan Africa	528	2,012	26.2
Central America	387	2,892	13.4	South East Asia	340	2,012	16.9
South East Asia	379	2,892	13.1	Caribbean	169	2,012	8.4
South Central Asia	265	2,892	9.2	South America	141	2,012	7.0
Non-migrant Travelers							
	n	N	%		n	N	%
Travel Reason				**Travel Reason**			

Tourism	2919	6,518	44.8	Tourism	1109	2,068	53.6
Visiting friends or relatives	1432	6,518	22.0	Visiting friends or relatives	443	2,068	21.4
Business	871	6,518	13.4	Business	254	2,068	12.3
Missionary	852	6,518	13.1	Missionary	129	2,068	6.2
Student	343	6,518	5.3	Student	92	2,068	4.4
Exposure Region				**Exposure Region**			
Central America	1210	6,296	19.2	Sub-Saharan Africa	528	2,068	25.5
Sub-Saharan Africa	1114	6,296	17.7	Central America	357	2,068	17.3
Caribbean	821	6,296	13.0	South East Asia	232	2,068	11.2
South East Asia	654	6,296	10.4	Caribbean	225	2,068	10.9
South America	594	6,296	9.4	South Central Asia	186	2,068	9.0

Conclusions: Based on our findings, to prevent illness during and after travel, pre-travel care and education in travelers should be tailored to the type of traveler (e.g., migrant, tourist, or VFR), travel destination (e.g., sub-Saharan Africa), and the most common diagnoses seen among travelers in these groups. Post-arrival care at GeoSentinel sites should focus on preventing disease progression and spread within vulnerable populations.
Conflict of Interest: Ralph Huits, David Hamer, Michael Libman, and Phyllis Kozarsky all serve in leadership capacities within GeoSentinel, which receives funding to provide support for salary, site incentives, and operational costs. Co-authors serve as advisors, chairs, and other positions related to travel medicine. COI forms available.

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First Molecular Detection and Genetic Identification of *Ehrlichia canis* and *Anaplasma platys* in *Rhipicephalus sanguineus* Ticks Infesting Dogs in Taiwan

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Background: The increasing amount of urban populations rear dogs as a companion animals and the frequency of acquiring tick-bite in accordance with variety of outdoor activities of humans. The *Rhipicephalas sanguineus* ticks parasitized mainly on dogs and have been recognized as vectors for various tick-borne pathogens. It is deserved to investigate the pathogens carried by this potential vector tick in Taiwan.
Methods: We employed nested polymerase chain reaction assay targeting the small-subunit 16S ribosomal RNA genes to detect *Ehrlichia canis* and *Anaplasma platys* infections in *Rh. sanguineus* ticks collected form dogs in northern Taiwan. Sequence and phylogenetic analysis were performed by Neighbour-Joining (NJ) compared with Maximum Likelihood (ML) methods to estimate the phylogeny of the entire alignment using MEGA X software package.
Results: The prevalence of *E. canis* and *A. platys* infections in *Rh. sanguineus* ticks was detected with an infection rate of 1.4% and 3.5%, respectively. The prevalence of co-infection with *E. canis* and *A. platys* was detected in 1.7% of *Rh. sanguineus* ticks. The highest month of infection was observed on August, with an infection rate of 5.9% and 7.1% for *E. canis* and *A. platys*, respectively. Phylogenetic analysis demonstrated a highly genetic homogeneity affiliated to the genetic speices of *E. canis* and *A. platys*.
Conclusions: We provide the first detection and molecular identification of *E. canis* and *A. platys* infections in *Rh. sanguineus* ticks in Taiwan, and this observation may highlight the potential threat for animal and human infections in Taiwan.

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Development of a Scalable Pre-travel Education Program for Students Doing Fieldwork abroad and Establishment of a Travel Clinic at a University Located in Rural Japan

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Background: In Japan, where travel medicine has lagged behind, travel clinics have been increasing in urban areas in recent years, but there is still a lack of travel clinics in rural areas, and travel medicine education at universities is uncommon. The faculty of international resource sciences, newly established in 2014 at Akita university, a national university located in rural Japan, began a resource sciences fieldwork abroad program in 2016 that is mandatory for all students, although there were no resources for travel medicine at that time.
Objectives: To develop the educational and medical systems for the fieldwork abroad program.
Methods: A new pre-travel education lecture series was planned and implemented for students conducting fieldwork abroad. The series includes exercises on preparation and handling before, during, and after the trip, guiding students to actively research and learn about their planned trips from reliable sources. Special lectures were also given by practitioners with experience in overseas activities. In 2018, the learning management system WebClass (Data pacific, Tokyo, Japan) was introduced, and lectures were remotely held via Zoom from 2020. In parallel, preparations were initiated for the opening of a travel clinic offering vaccinations and other medical services.
Results: First, the responsible physician acquired a Certificate in Travel Health™ in 2016. Since the course began in April 2016, as many as 566 fieldwork students have taken the course in 5 years, and their destinations were thirty countries, sixteen of which were not high-income countries according to the World Bank's classification. No serious health problems have been reported by fieldwork students to date. In addition, with the support of the Japanese society of travel and health, the only travel clinic in the region has been established to provide pre-travel medical care not only for fieldwork students but also for other students and residents.
Conclusions: Despite the temporary stagnation caused by COVID-19, the trend of revitalizing international exchange continues. Our efforts have contributed to improving the health and safety of travel students in areas where travel medical resources are scarce. In particular, the development of scalable educational programs is valuable in protecting the travel of less wealthy students.

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Pre-departure Testing Reduces SARS-CoV-2 Positivity among Arriving International Travelers - Results from the Traveler-based Genomic Surveillance Program, March–September 2022

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Background: During December 6, 2021–June 11, 2022, passengers boarding flights to the United States were required to show a negative result from a COVID-19 test taken ≤1 day before departure or proof of COVID-19 recovery. This requirement ended June 12. Modeling studies suggest that pre-departure testing can mitigate SARS-CoV-2 spread, but real-world data are lacking. The U.S. Centers for Disease Control and Prevention Traveler-Based Genomic Surveillance (TGS) Program collects post-arrival nasal samples from international travelers to detect new SARS-CoV-2 variants and follow trends.
We used post-arrival TGS testing data to determine the extent to which pre-departure testing reduced SARS-CoV-2 positivity among travelers.
Methods: TGS traveler samples were pooled (5–25/pool) by flight origin country and sent to a lab for SARS-CoV-2 polymerase chain reaction testing. Test results were matched with normalized World Health Organization COVID-19 incidence data based on collection date and flight origin country. We compared positivity during Period 1 (March 20–June 11, 2022), when pre-departure testing was required, with Period 2 (June 12–September 3), when testing was voluntary. The association between period and pool positivity was analyzed using multivariable mixed effects logistic regression, adjusting for COVID-19 incidence in the flight origin country, pool size, and airport. Sensitivity analyses considered alternative time periods.
Results: During March 20–September 3, 2022, 3,049 pools (28,056 traveler samples) were tested for SARS-CoV-2. Fewer pools were positive during Period 1 (291/1,622, 17.9%) than Period 2

(400/1,427, 28.0%) (Figure). In the multivariable model, post-arrival pool positivity was 52% lower during Period 1 than Period 2 (Adjusted Odds Ratio: 0.48, 95% Confidence Interval: 0.39–0.58, P<.001). Sensitivity analyses considering 4- and 8-week periods before and after June 12 showed similar results.

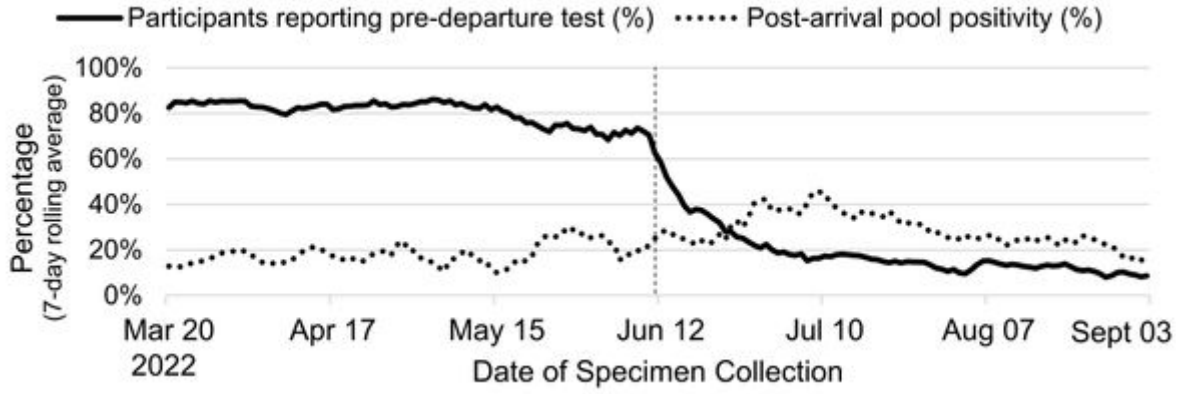

Figure: Percentage of TGS participants reporting a pre-departure test (solid line) and TGS pool positivity during post-arrival testing (dashed line). Pre-departure testing was no longer required beginning June 12 (vertical dashed line).

Conclusions: Pre-departure testing was associated with a >50% decrease in post-arrival positivity among international travelers, even when adjusting for factors including SARS-CoV-2 incidence in the origin country. These findings underscore the importance of pre-departure testing before international travel.
Conflict of Interest: CDC contract award 75D30121C12036 to XpresCheck and Ginkgo Bioworks. B.H.R, S.L.L, T.W.S.A., and R.C.M. employed by Ginkgo Bioworks and own Ginkgo Bioworks employee stocks and/or Restricted Stock Units (RSU) grants. E.E. employed by XWELL and owns XWELL employee stocks and/or Restricted Stock Units (RSU) grants.

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Travel Practices and Associated Risks in Thoracic Transplant Recipients: A Monocentric Survey

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Background: Data addressing the travel practices of heart and lung transplant recipients and potential associated risks remain scarce.
Objectives: To describe the characteristics of thoracic organ transplant recipients travelling outside metropolitean France and their health issues during travels.
Methods: A questionnaire was distributed to thoracic organ transplant recipients in the transplant clinic at a French center between October, 2015, and October, 2018. Questions addressed demographics, transplant history, current immune suppression, knowledge regarding vaccination status, past history of travel (any destination outside metropolitan France), including pre-travel advice, health issues during travels outside Europe, and travel intentions during the following year.

Results: The survey was completed by 135 patients (86 lung, 13 heart and 21 heart-lung transplant recipients, thoracic organ transplant not specified in 15 cases). Mean age was 49.5 years, 60% were female. 21 patients (15%) were born outside metropolitan France. At the time of survey completion, 72%, 70%, 96% and 14% of patients were receiving steroids, mycophenolate, calcineurin inhibitors, and mTOR inhibitors, respectively. 39%, 15%, and 9% of respondents considered that being a transplant recipient increased their risk of travel-related health issues mildly, moderately, and greatly, respectively. Sixty-two patients (46%) had traveled outside metropolitan France after transplant (mean number of travels=7). Among 29 subjects who had traveled outside Europe in the last 5 years, 22 had received pre-travel advice, predominantly by their transplant physician. Among respondents having traveled outside metropolitan France, 6 (9.7%) had experienced health issues (all outside Europe), which led to consultation in 3 cases and hospitalization in one. No immunosuppressives shortage was reported. Among 117 respondents, 68 (58.1%) intended to travel within the following year, and 57 (83.8%) to sought medical advice before departure, predominantly from their transplant physician.
Conclusions: We observed, in the pre-COVID19 era, a significant number of international travels undertaken by thoracic transplant recipients, with a relatively low travel-associated morbidity. Very few patients intend to seek advice from travel medicine specialists, and transplant physicians will continue to play a key role in pre-travel counselling in this population. However, a closer collaboration with travel medicine specialists could be useful, in particular in case of travel to a high-risk area.
previously_presented: This communication was accepted at ISHLT congress in april 2020, but NOT PRESENTED because the congress has to be canceled. Abstract remains thus only in the abstract book. [ISHLT = international society for Heart and Lung Transplantation]

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Epidemiological and Clinical Characteristics of Imported Schistosomiasis in a Terciary Teaching Spanish Hospital, 2015-2022

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Background: Schistosomiasis considered a neglected tropical disease is the second most prevalent parasite disease, after malaria, with nearly 240 million people affected. Is a parasitic disease greatly present in tropical and subtropical areas, and frequently diagnosed in travelers and migrants, most of the times in a late stage.
Methods: With the aim of presenting demographic, clinical, and geographic features of imported schistosomiasis in a non-endemic area, we performed a retrospective observational study of schistosomiasis cases attended in the referral tropical Unit in Hospital La Paz- Carlos III in Madrid, Spain from January 2015 to May 2022. We included all cases over 18 years old with a positive microbiologic test for schistosomiasis.
Results: From a total of 9,929 patients attended in our clinic in the study period there were 477 schistosomiasis diagnosis (4,4%). Time elapsed from travel to diagnosis was 120 days (IQR 26-680), 171 days for patients of endemic country and 88 days for tourist, laboral travels and volunteers. Most cases (28.1%) were diagnosed in immigrants from endemic areas, followed by 24.5% of travelers. The reason for consultation were in up to 34.5% of cases screening in asymptomatic subjects, 17% presented fever and 15% diarrhea. Almost all cases were diagnosed by serology and eggs in urine or feces were identified in only 11 patients (2.2%).
Conclusions: Imported schistosomiasis is a chronic and asymptomatic disease that can be diagnosed in most patients by serology. It is important to advice travelers to avoid freshwater baths in endemic areas and get screened if they have been exposed to the parasite.

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Assessment of Knowledge of Monkeypox Viral Infection among the General Population in Saudi Arabia

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Background: Monkeypox is re-emerging and spreading over the world, posing a serious threat to human life, especially in non-endemic countries, including Saudi Arabia. Due to the paucity of research on knowledge about monkeypox in Saudi Arabia, this study aimed to evaluate the general population's knowledge of monkeypox in a sample of the country.
Methods: A web-based cross-sectional survey was conducted from 25 May 2022 to 15 July 2022. Participants' knowledge about monkeypox on a 23-item scale and socio-demographic characteristics were gathered in the survey. Pearson's Chi-square test was used to compare knowledge level (categorized into high and low) and explanatory variables.
Results: Out of 480, only 48% of the respondents had high knowledge (mean score of 14). The participants' level of knowledge about monkeypox was linked to their age, marital status, where they lived, whether they lived in a rural or urban area, their level of education, their job, whether they worked in healthcare, their income, and whether or not they smoked ($p = 0.01$). Overall, social media (75.0%) was the most frequently reported source from where participants obtained monkeypox-related information, followed by TV and radio (45.6%), family or friendss (15.6%), and healthcare providers (13.8%).
Conclusions: We found that the Saudi population as a whole didn't know much about the monkeypox infection. These findings highlight the urgent need for public education on monkeypox to promote awareness and engage the public ahead of the outbreak.

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Post-infectious Irritable Bowel Syndrome (PI-IBS) among Travellers to Benin, West Africa

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Background: Travellers' diarrhoea (TD) is the most common health problem encountered by travellers. Its incidence varies between destinations with overall attack rates of 10–60%. Previous investigations into the persistence of gastrointestinal symptoms after gastroenteritis have found the diagnostic criteria for post-infectious irritable bowel syndrome (PI-IBS) to be met by 4–32% of their participants. Much of this research is retrospective.
Objectives: We studied prolonged gastrointestinal symptoms among travellers to the tropics, roughly half of whom were recruited prospectively, and the other half retrospectively.
Methods: We recruited participants of OEV123, a randomised double-blinded trial on ETVAX, an oral vaccine against enterotoxigenic *E. coli* for a follow-up study, PGIS (Prolonged gastrointestinal symptoms). All participants of the OEV123 trial stayed 12 days in Benin, West-Africa and were recruited to the PGIS study after return home. Here they were asked to fill in 3 questionnaires: at 3 (Q-PGIS3), 6 (Q-PGIS6), and >6 months (Q-PGIS>6). The prospectively recruited group filled in Q-PGIS3 and Q-PGIS6, while those recruited at >6 months only completed Q-PGIS>6. PI-IBS was defined by the Rome IV criteria.
Results: Of the 749 OEV123 participants, 487 gave informed consent to participation; 112 were excluded (mostly for not returning follow-up questionnaires). Of the 375 final PGIS participants, 190 returned Q-PGIS3, 174 Q-PGIS6, and 178 Q-PGIS>6. A total of 204/375 (54%) had TD during travel or <6 days after return. Over the follow-up, two of these reported a newly diagnosed IBS. The questionnaires showed that two additional participants with a TD during travel met the Rome IV criteria for PI-IBS. Of all participants with TD, PI-IBS was recorded for 2%. Further analyses are ongoing.
Conclusions: PI-IBS was recorded for 2% of travellers after TD, a rate lower than in most previous studies.

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Immunogenicity of Yellow Fever Vaccines Administered in Endemic Regions Compared to Non-endemic Area Setting: A Systematic Literature Review and Meta-analysis

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Background: Since 1937, several safe and effective yellow fever vaccines (YFV) derived from the YF-17D strain have been used to prevent yellow fever disease. They are indicated for immunization of persons 9 months of age and older who live or travel to endemic regions. The use of the vaccine, however, can be different between these two contexts, with routine immunization in endemic countries usually happening during childhood, and immunization in non-endemic countries happening in adults before the risky exposition.
Objectives: To evaluate the immunogenicity of 17D-YF vaccines in endemic regions compared to non-endemic areas based on a systematic literature review and meta-analysis.
Methods: Searches were carried out in scientific databases, ClinicalTrials.Gov, grey literature, and Sanofi internal clinical study reports. Studies reporting immunogenicity data for 17D-YF vaccines licensed by Sanofi in all age groups/settings (endemic and nonendemic) were assessed for screening. Additional details of the methodology are available on the Register of Systematic Reviews (PROSPERO). Random-effect meta-analyses were conducted for seroconversion and seroprotection results, using logit-transformed proportions from individual studies to estimate an overall proportion.
Results: 1,353 articles were assessed, out of which 57 articles fulfilled the selection criteria, with 170 interventional groups (n=14,198). 43 groups were vaccinated in endemic regions (n=6,890) and 127 groups in non-endemic (n=7,308). In endemic regions, most studies were conducted in pediatric populations (38 groups, 88.3%), and in non-endemic most were in adults (110 groups, 86.6%). Seroconversion after short-term YFV (up to 35 days after vaccination) was 96% (endemic=95%, non-endemic=96%, p-value=0.21), and seroprotection for the same period was 98% (endemic=98%, non-endemic=98%, p-value=0,73) (**Table 1**). For long-term immunity, only non-endemic results were available, with maintenance of seroprotection at 93% (CI 95% 0.88 – 0.96, time after vaccination ranging from 5 to 39 years).

Table 1. Subgroup analysis of seroconversion and seroprotection results based on the endemicity setting of the participants, considering results up to 35 days after vaccination.

Endemicity Setting	Number of Study Groups	Number of Subjects	Seroconversion	SC	CI 95%	Random-Effect Model Weight	p-value
Endemic	17	1,918		0.95	0.91 – 0.97	31.7%	
Non-Endemic	54	2,552		0.96	0.94 – 0.98	68.3%	
Overall Meta-Summary	**71**	**4,470**		0.96	0.94 – 0.97	**100%**	**0.21**
Endemicity Setting	**Number of Study Groups**	**Number of Subjects**	**Seroprotection**	**SP**	**CI 95%**	**Random-Effect Model Weight**	**p-value**
Endemic	5	870		0.98	0.96 – 0.99	34%	
Non-Endemic	27	1,360		0.98	0.97 – 0.99	66%	
Overall Meta-Summary	**32**	**2,230**		0.98	0.97 – 0.98	**100%**	**0.73**

Footnote: The criteria for seroconversion and seropositivity varied from study to study since a standardized assay was not used across them. The most commonly used test was a plaque-neutralization test, with the percentage of plaque reduction varying between 50% and 90%. The other used assay was a constant serum–varying virus neutralization test, where the cutoff for positivity (serum dilution at which LN1 0.7 occurs) has been classically described as a surrogate for protection. Most frequently, seroconversion was defined as a four-fold or more increase in neutralizing antibody levels compared to baseline, and seroprotection was defined as a neutralizing antibody titer equal or superior to 10 (1/dil).

Conclusions: YFV are effective at inducing seroconversion and seroprotection in both endemic and non-endemic populations. Long-term immunity was also observed in non-endemic populations, with a high rate of seroprotection maintained for several years. These results indicate that YFV are a reliable and effective way to prevent YF infection and should be considered for travelers from non-endemic regions who may be at risk of exposure.
Conflict of Interest: **Conflict of interest:** All the authors are Sanofi employees and may hold company shares/stock options.
Funding: This work was funded by Sanofi.

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Immunogenicity and Safety of Yellow Fever Vaccines Administered to Elderly Compared to the General Population: A Systematic Literature Review and Meta-analysis

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Background: Live attenuated vaccines based on the yellow fever virus strain 17D-204 have been used for decades to prevent Yellow Fever (YF), however age ≥ 60 years is considered a warning for YF vaccination and careful consideration should be given to the risks and benefits of vaccination.

Objectives: Assess the immunogenicity and safety profiles of 17D-YF vaccines administered to elderly populations (age ≥ 60 years) compared to younger subjects (age < 60 years).
Methods: A systematic literature review of 17D-YF vaccines licensed by Sanofi was conducted. The outcomes of interest included seroconversion and seroprotection, and rates of serious adverse events (SAEs) such as anaphylaxis, yellow fever vaccine associated neurotropic disease (YEL-AND), yellow fever vaccine associated viscerotropic disease (YEL-AVD), and fatal outcomes causally related to the vaccination. Additional details of the methodology are available on PROSPERO.
Multiple random-effect meta-analyses were conducted for each outcome. For immunogenicity, different time-points were used to estimate meta-summaries for short-term and long-term responses. For safety, incidence rates were estimated per outcome, but no continuity correction was applied for zero-event studies.
Results: 1,353 articles were assessed, 82 articles met the selection criteria, with 248 intervention groups. Seroconversion and seroprotection rates by age group are described in the tables below (**Table 1**; **Table 2**). Although the data are rather limited for elderly populations, the results point to statistically comparable immunogenicity outcomes to younger individuals.

Table 1. Subgroup analysis of seroconversion and seroprotection results based on the age of the participants, considering results up to 35 days after vaccination (short term)

Age Subgroup	Number of Study Groups	Number of Subjects	Seroconversion	SC	CI 95%	Random-Effect Model Weight	p-value
< 60 years	70	4,442		0.96	0.94 – 0.97	99%	
≥ 60 years	1	28		1.00	0.88 – 1.00	1%	
Overall Meta-Summary	**71**	**4,470**		**0.96**	**0.94 – 0.97**	**100%**	**0.54**
Age Subgroup	**Number of Study Groups**	**Number of Subjects**	**Seroprotection**	**SP**	**CI 95%**	**Random-Effect Model Weight**	**p-value**
< 60 years	33	2,241		0.97	0.96 – 0.98	98.1%	
≥ 60 years	1	28		1.00	0.88 – 1.00	1.9%	
Overall Meta-Summary	**34**	**2,269**		**0.97**	**0.96 – 0.98**	**100%**	**0.78**

Footnote: The criteria for seroconversion and seropositivity varied from study to study since a standardized assay was not used across them. The most commonly used test was a plaque-neutralization test, with the percentage of plaque reduction varying between 50% and 90%. The other used assay was a constant serum–varying virus neutralization test, where the cutoff for positivity (serum dilution at which LNI 0.7 occurs) has been classically described as a surrogate for protection. Most frequently, seroconversion was defined as a four-fold or more increase in neutralizing antibody levels compared to baseline, and seroprotection was defined as a neutralizing antibody titer equal or superior to 10 (1/80).

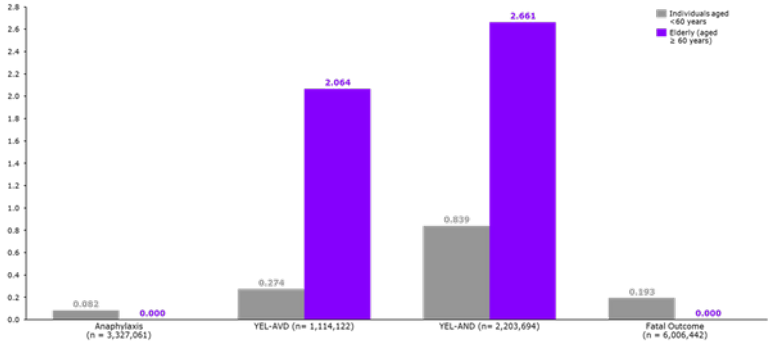
Table 2. Subgroup analysis of seroconversion and seroprotection results based on the age of the participants, considering results 10 years after vaccination (long term)

Age Subgroup	Number of Study Groups	Number of Subjects	Seroconversion	SC	CI 95%	Random-Effect Model Weight	p-value
< 60 years	1	14		1	0,85 – 1	49.7%	
≥ 60 years	1	22		1	0,77 – 1	50.3%	
Overall Meta-Summary	**2**	**36**		**0.97**	**0.83 – 1**	**100%**	**0,83**
Age Subgroup	**Number of Study Groups**	**Number of Subjects**	**Seroprotection**	**Seroprotection**	**CI 95%**	**Random-Effect Model Weight**	**p-value**
< 60 years	10	576		0,93	0,87 – 0,96	96,1%	
≥ 60 years	1	22		1	0,85 – 1	3,9%	
Overall Meta-Summary	**11**	**598**		**0,93**	**0,88 – 0,96**	**100%**	**0,39**

Footnote: The criteria for seroconversion and seropositivity varied from study to study since a standardized assay was not used across them. The most commonly used test was a plaque-neutralization test, with the percentage of plaque reduction varying between 50% and 90%. The other used assay was a constant serum–varying virus neutralization test, where the cutoff for positivity (serum dilution at which LNI 0.7 occurs) has been classically described as a surrogate for protection. Most frequently, seroconversion was defined as a four-fold or more increase in neutralizing antibody levels compared to baseline, and seroprotection was defined as a neutralizing antibody titer equal or superior to 10 (1/80).

The occurrence rate of YEL-AVD (per 100,000 doses) in elderly was 2.06 versus 0.27 in the younger age group (p-value < 0.01) and the rate of YEL-AND was 2.66 in elderly versus 0.83 (p-value= 0.09) (**Figure 1**). Due to the rarity of these events, multiple studies did not present events (also known as “double-zero-event studies”) and were excluded from the analysis, which may introduce an estimation bias. Nevertheless, present results are consistent with previously published literature. Additional analysis with continuity corrections may be conducted to address this limitation.

Figure 1. Incidence of adverse events associated with the Yellow Fever Vaccines licensed by Sanofi, per 100,000 doses, up to 28 days following administration of the vaccine



Conclusions: Good safety and immunogenicity profiles of 17D-YF vaccines were demonstrated in all ages. Although SAEs occur rarely, these results indicate more reports in the elderly, supporting the cautionary recommendation for this age group.
Conflict of Interest: All the authors are employees of Sanofi and may hold company shares/stock options.
Funding: This work was funded by Sanofi.

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Comparing Immunogenicity of Two Rabies Vaccines (HDCV, PVRV), in Pre and Postexposure Prophylaxis: A Literature Review and Meta-analysis

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Background: The number of available rabies vaccines in Europe is limited (mainly purified chick embryo cell vaccines [PCECV] and human diploid cell culture rabies vaccines [HDCV]) and supply is regularly challenging. Purified Vero cell rabies vaccine (PVRV), which has been mainly used in endemic countries since 1984, is becoming available in additional high-income countries to sustain rabies vaccine supply.
Objectives: Compare the immunogenicity of two Sanofi rabies vaccines, as measured by rabies virus neutralizing antibodies (RVNA).
Methods: Review of scientific databases and internal Sanofi sources, searching publications using rabies vaccines (HDCV and PVRV) as Pre-Exposure Prophylaxis (PrEP) and Post-Exposure Prophylaxis (PEP, or simulated PEP), presenting RVNA geometric mean titers (GMT) and/or percentage of subjects with titers ≥ 0.5 IU/mL using rapid fluorescent focus inhibition tests (RFFIT), from 1985 to 2022.
We conducted random-effect meta-analyses, calculating mean values for the outcomes in each study group with inverse variance method for pooling. Two endpoints were considered for PEP (14 and 28 days after the first vaccination) and one for PrEP (28 days), based on the clinical relevance of a quick response when vaccination is provided after real-life exposure. Sub-analyses of meta-means were conducted by vaccine type.
Results: Our search led to the selection of 50 articles, consisting of 103 unique interventional groups (n= 6,261 individuals). The distribution of groups according to the vaccine and prophylaxis regimen is further described in **Figure 1**.

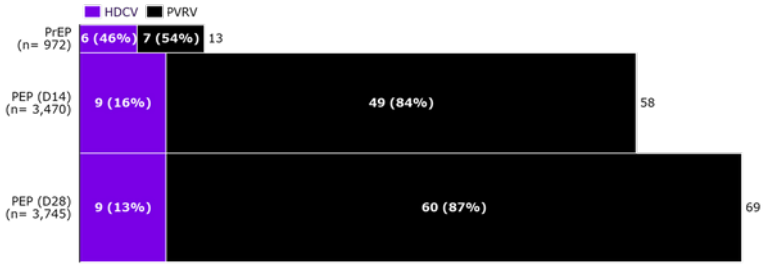

Figure 1. Absolute and percentage distribution of study groups according to the vaccine administered and the prophylaxis regimen. The height of the bars is proportional to the number of individuals composing each group. The same participant could contribute to more than one data point when available data was present for both days in the Post-Exposure Prophylaxis (PEP).

At day 14, mean GMT was not statistically different between vaccines, although mean percentage was lower in HDCV groups (95% in HDCV, and 98% in PVRV, p-value <0.01; **Table 1**). At 28 days, this was no longer observed, and mean outcomes were not statistically significant for both PrEP (p-values = 0.21 and 0.38, respectively; **Table 2**) and PEP regimen (p-value= 0.63 and 0.55; **Table 3**).

Table 1. Subgroup analysis of Rabies Virus Neutralizing Antibody titers and percentage of subjects with titers ≥ 0.5 IU/mL results based on the vaccine, regardless of Rabies Immunoglobulin (RIG) coadministration, considering results at 14 days after vaccination in a Post Exposure Prophylaxis (PEP) Regimen or Simulated PEP (Sim-PEP) Regimen

Vaccine	Number of Study Groups	Number of Subjects	GMT	CI 95%	Random-Effect Model Weight	p-value
HDCV	7	441	9.03	3.31 – 24.65	12.4%	
PVRV	49	3,000	9.08	7.06 – 11.68	87.6%	
Overall Meta-Summary	**56**	**3,441**	**9.07**	**7.07 – 11.68**	**100%**	**0.99**

0.1 1.0 10.0 100.0 GMT (Log Scale)

Vaccine	Number of Study Groups	Number of Subjects	Subjects with titers ≥ 0.5 IU/mL (%)	CI 95%	Random-Effect Model Weight	p-value
HDCV	9	470	0.95	0.92 – 0.97	21.7%	
PVRV	48	2,956	0.98	0.97 – 0.99	78.3%	
Overall Meta-Summary	**57**	**3,426**	**0.98**	**0.97 – 0.98**	**100%**	**< 0.01**

0.75 0.80 0.85 0.90 0.95 1.00

Table 2. Subgroup analysis of Rabies Virus Neutralizing Antibody titers and percentage of subjects with titers ≥ 0.5 IU/mL results based on the vaccine, considering results at 28 days after vaccination in a Pre-Exposure Prophylaxis (PrEP) Regimen

Vaccine	Number of Study Groups	Number of Subjects	GMT	CI 95%	Random-Effect Model Weight	p-value
HDCV	6	461	28.00	9.70 – 80.82	44.2%	
PVRV	5	430	11.72	5.06 – 27.16	55.8%	
Overall Meta-Summary	**11**	**891**	**17.24**	**8.70 – 34.17**	**100%**	**0.21**

0.1 1.0 10.0 100.0 GMT (Log Scale)

Vaccine	Number of Study Groups	Number of Subjects	Subjects with titers ≥ 0.5 IU/mL (%)	CI 95%	Random-Effect Model Weight	p-value
HDCV	5	441	0.99	0.97 – 1.00	38.2%	
PVRV	7	511	0.98	0.93 – 1.00	61.8%	
Overall Meta-Summary	**12**	**952**	**0.99**	**0.96 – 1.00**	**100%**	**0.38**

0.75 0.80 0.85 0.90 0.95 1.00

Table 3. Subgroup analysis of Rabies Virus Neutralizing Antibody titers and percentage of subjects with titers ≥ 0.5 IU/mL results based on the vaccine, regardless of Rabies Immunoglobulin (RIG) coadministration, considering results at 28 days after vaccination in a Post Exposure Prophylaxis (PEP) Regimen or Simulated PEP (Sim-PEP) Regimen

Vaccine	Number of Study Groups	Number of Subjects	GMT	CI 95%	Random-Effect Model Weight	p-value
HDCV	6	423	13.61	6.62 – 27.98	15.5%	
PVRV	33	1,814	11.25	8.22 – 15.38	84.5%	
Overall Meta-Summary	**39**	**2,237**	**11.58**	**8.72 – 15.39**	**100%**	**0.63**

0.1 1.0 10.0 100.0 GMT (Log Scale)

Vaccine	Number of Study Groups	Number of Subjects	Subjects with titers ≥ 0.5 IU/mL (%)	CI 95%	Random-Effect Model Weight	p-value
HDCV	9	470	0.98	0.96 – 0.99	30.9%	
PVRV	29	1,546	0.99	0.98 – 0.99	69.1%	
Overall Meta-Summary	**38**	**2,016**	**0.99**	**0.98 – 0.99**	**100%**	**0.55**

0.75 0.80 0.85 0.90 0.95 1.00

Conclusions: PVRV clinical experience is large, and its immunogenicity is comparable to that of HDCV regardless of the regimen (PrEP and PEP), supporting the use of PVRV whichever the endemicity of the country.

Conflict of Interest: All the authors are employees of Sanofi and may hold company shares /stock options.
Funding: This work was funded by Sanofi.

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Intradermal Administration of a Purified Vero Cell Rabies Vaccine (PVRV) as an Effective Option for Rabies Prophylaxis: A Literature Review and Meta-analysis

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Background: Immunization is an essential measure against rabies, a fatal encephalitis still occurring in more than 150 countries/territories. Vaccine supply, however, continues to be a challenge given world demand. Intradermal (ID) administration of the vaccine has been used as a dose-sparing alternative, particularly in endemic countries, and a growing body of evidence is becoming available to support its use.
Objectives: To summarize the immune response to Sanofi Purified Vero Cell Rabies Vaccine (PVRV) used either intramuscularly (IM) or intradermally (ID) in a Post-Exposure Prophylaxis (PEP), with or without rabies immunoglobulins (RIG), as measured by rabies virus-neutralizing antibodies (RVNA).
Methods: Review of scientific databases and internal Sanofi sources, searching publications using PVRV presenting RVNA geometric mean titers (GMT) and/or percentage of subjects with titers ≥ 0.5 IU/mL using rapid fluorescent focus inhibition tests (RFFIT), from 1985 to 2022.
We conducted random-effect meta-analyses, calculating mean values for the outcomes in each study group with inverse variance method for pooling. PEP regimens were assessed 14 days after the beginning of vaccination, based on the clinical relevance of a quick response when vaccination is provided after real-life exposure. Sub-groups were compared by route of administration.
Results: The review led to 33 publications, consisting of 53 interventional groups (n= 3,228 individuals). The analysis for all PEP regimens (with/without RIG) indicates that whatever the route of administration, both meta-summaries for GMT and percentage of subjects with titers ≥ 0.5 IU/mL were statistically comparable 14 days post initial dose (p=0.41 and 0.86, respectively for GMT and percentage of patients when RIG was administered, and p=0.25 and 0.16, respectively, when RIG was not used, **Table 1** and **Table 2**). Furthermore, regardless of the coadministration of RIG, equivalent results were obtained for both outcomes (p=0.18 and 0.54, respectively, **Table 3**).

Table 1. Subgroup analysis of Rabies Virus Neutralizing Antibody titers and percentage of subjects with titers ≥ 0.5 IU/mL results based on the route of administration, with Rabies Immunoglobulin (RIG) coadministration, considering results at 14 days after the end of vaccination in a Post Exposure Prophylaxis (PEP) Regimen or Simulated PEP (Sim-PEP) Regimen.

Route of Administration	Number of Study Groups	Number of Subjects	Geometric Mean Titers		CI 95%	Random-Effect Model Weight	p-value
Intradermal	14	902		5.98	3.40 – 10.51	51.2%	
Intramuscular	13	690		8.58	4.52 – 16.31	48.8%	
Overall Meta-Summary	**27**	**1,592**		**7.13**	**4.67 – 10.88**	**100%**	**0.41**

0.1 1.0 10.0 100.0 GMT (Log Scale)

Route of Administration	Number of Study Groups	Number of Subjects	Subjects with titers ≥ 0.5 IU/mL (%)		CI 95%	Random-Effect Model Weight	p-value
Intradermal	13	858		0.97	0.92 – 0.99	51.1%	
Intramuscular	13	690		0.97	0.93 – 0.99	48.9%	
Overall Meta-Summary	**26**	**1,548**		**0.97**	**0.94 – 0.99**	**100%**	**0.86**

0.84 0.86 0.88 0.90 0.92 0.94 0.96 0.98 1.00

Table 2. Subgroup analysis of Rabies Virus Neutralizing Antibody titers and percentage of subjects with titers ≥ 0.5 IU/mL results based on the route of administration, without Rabies Immunoglobulin (RIG) coadministration, considering results at 14 days after the end of vaccination in a Post Exposure Prophylaxis (PEP) Regimen or Simulated PEP (Sim-PEP) Regimen.

Route of Administration	Number of Study Groups	Number of Subjects	Geometric Mean Titers		CI 95%	Random-Effect Model Weight	p-value
Intradermal	12	787		6.03	4.16 – 8.75	46.3%	
Intramuscular	14	849		8.64	5.33 – 14.03	53.7%	
Overall Meta-Summary	**26**	**1,636**		**7.32**	**5.35 – 10.02**	**100%**	**0.25**

0.1 1.0 10.0 100.0 GMT (Log Scale)

Route of Administration	Number of Study Groups	Number of Subjects	Subjects with titers ≥ 0.5 IU/mL (%)		CI 95%	Random-Effect Model Weight	p-value
Intradermal	12	787		0.99	0.98 – 0.99	34.6%	
Intramuscular	13	834		0.98	0.96 – 0.99	65.4%	
Overall Meta-Summary	**25**	**1,621**		**0.98**	**0.97 – 0.99**	**100%**	**0.16**

0.84 0.86 0.88 0.90 0.92 0.94 0.96 0.98 1.00

Table 3. Subgroup analysis of Rabies Virus Neutralizing Antibody titers and percentage of subjects with titers ≥ 0.5 IU/mL results based on the route of administration, regardless of Rabies Immunoglobulin (RIG) coadministration, considering results at 14 days after the end of vaccination in a Post Exposure Prophylaxis (PEP) Regimen or Simulated PEP (Sim-PEP) Regimen.

Route of Administration	Number of Study Groups	Number of Subjects	Geometric Mean Titers		CI 95%	Random-Effect Model Weight	p-value
Intradermal	26	1,689		6.04	4.30 – 8.47	48.7%	
Intramuscular	27	1,539		8.62	5.84 – 12.73	51.3%	
Overall Meta-Summary	**53**	**3,228**		**7.24**	**5.57 – 9.40**	**100%**	**0.18**

0.1 1.0 10.0 100.0 GMT (Log Scale)

Route of Administration	Number of Study Groups	Number of Subjects	Subjects with titers ≥ 0.5 IU/mL (%)		CI 95%	Random-Effect Model Weight	p-value
Intradermal	25	1,645		0.98	0.96 – 0.99	47.6%	
Intramuscular	26	1,524		0.97	0.96 – 0.98	52.4%	
Overall Meta-Summary	**51**	**3,169**		**0.98**	**0.97 – 0.99**	**100%**	**0.54**

0.84 0.86 0.88 0.90 0.92 0.94 0.96 0.98 1.00

The studies had a considerable heterogeneity (I^2 = 99%), and although random-effects meta-analyses adjusted for it, caution should be applied when interpreting the results.
Conclusions: Overall, whatever the route of administration, PVRV showed a strong immunogenic response, 14 days after the first vaccination of PEP regimens, Furthermore, the ID route induced similar immune responses as the IM route, with or without RIG co-administration.
Conflict of Interest: All the authors are employees of Sanofi and may hold company shares/stock options.
Funding: This work was funded by Sanofi.

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Rabies Exposure among International Travelers to Brazil: An 11-year Retrospective Description of Cases

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Background: Rabies is a fatal encephalitis transmitted by infected mammals. Pre-exposure prophylaxis (PrEP) is recommended for travelers visiting rabies-endemic regions. However, many fail to follow this recommendation and are at risk of exposure.
Objectives: To describe the clinical characteristics of travelers who sought medical assistance due to contact with potentially rabid animals in a rabies-endemic country (Brazil) compared to residents.
Methods: This study describes all the reported "Antirabic Medical Appointments" in the SINAN database from 2010 to 2021. This is a mandatory nationwide Brazilian database that captures medical information on all patients who sought healthcare after contact with an animal considered as a potential vector of rabies. We applied descriptive statistics to express the absolute and relative frequency of the characteristics of interest, which included demographic and clinical information, animal characteristics, type of exposure, treatment, and health outcome. Information about patients' nationality is not routinely collected since all individuals can have free access to healthcare regardless of nationality. However, country of residence is a mandatory field for all patients who do not have a residential address in Brazil.
Results: During the study period, 6,856,421 medical appointments were conducted due to contact with potential rabid animal, out of which 1,407 were international travelers. 48.4% (n = 682) of travelers were female, with a mean age of 29.6 years, and only 2.0% (n = 28) had received PrEP before. The most frequently reported species of contact were dogs (81% for residents, 58% for travelers). Post-exposure prophylaxis (PEP) was medically recommended for 70% of residents and 85% of travelers, and proportionally more travelers received rabies immunoglobulin (RIG) coadministration (40% versus 8%) (Figure 1). More travelers (31.9%) than residents (12.6%) abandoned their treatments over this period, mostly because they decided to continue the treatment in another healthcare unit (Figure 2). No rabies death was reported among travelers in Brazil.

Figure 1. Comparison of distribution of characteristics between residents (upper plots) and travelers (lower plots) who sought medical care due to contact with potentially rabid animals.

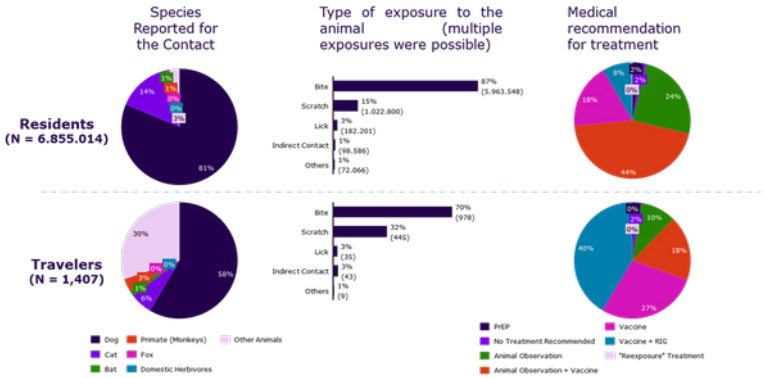
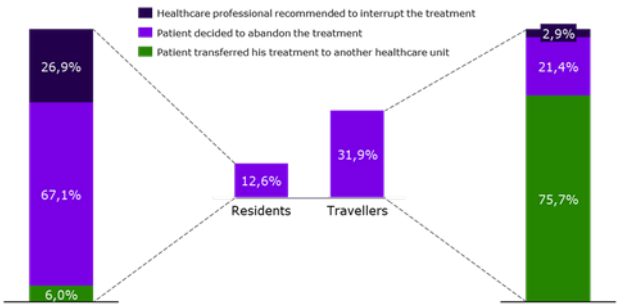


Figure 2. Comparison of the percentage of patients with treatment interruptions according to country of residence and reasons for interruption.



Conclusions: While travelers' vaccination is recommended based on the country's rabies epidemiological situation, only a small percentage received PrEP, and they proportionately needed RIG more frequently than residents. Travelers' PrEP vaccination could be more frequently considered to remove RIG's need, increase treatment completion, and minimize costs.

Conflict of Interest: All the authors are employees of Sanofi and may hold company shares /stock options.
Funding: This work was funded by Sanofi.

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Travel-related Respiratory Infections in Travellers (2000-2022): A Systematic Review and Meta-analysis

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Background: Travellers are susceptible to respiratory tract infections (RTIs) because they come into close contact with numerous individuals and respiratory pathogens are present year-round in most areas visited. No study has systematically examined the burden of these infections among travellers. We examined the incidence of RTIs and also the incidence of symptoms suggestive of RTIs among travellers stratified by risk groups and/or geographic regions and evaluated the spectrum of RTIs.
Methods: Our systematic review and meta-analysis (PRISMA 2020 guidelines) was registered in PROSPERO (CRD42022311261). We searched Medline, Embase, Scopus, Cochrane Central Register of Controlled Trials (CENTRAL), Web of Science, Science Direct, and preprint servers MedRxiv, BioRxiv, SSRN, and IEEE Xplore on February 1, 2022. We included articles reporting at least one RTI or symptom suggestive of RTIs in international travellers after January 1, 2000. Deduplication, inclusion and exclusion criteria, title and abstract screening, full-text assessment, and bias assessment were performed by two reviewers. Data extraction was performed manually twice for each study and merged. Descriptive analyzes and maps were used to represent RTIs cases, respiratory symptoms, and their distribution. Two proportional meta-analyzes were utilized to obtain estimates of the incidence of respiratory symptoms and RTIs in travellers and predefined risk groups.
Results: Our search yielded 2,042 articles, and a total of 429 articles were included of which 268 were found by screening and 161 by a citation search of included studies. 78% of reported symptoms suggestive of RTIs and 60% of RTIs with available location data were acquired at mass gathering events. Cough was the most common symptom suggestive of respiratory infections, and the upper respiratory tract was the most common site for RTIs in travellers. We found an incidence proportion of respiratory symptoms and RTIs of 0.38 [0.28; 0.49] and 0.12 [0.09; 0.16], respectively among travellers. We found that the incidence of RTIs in travellers was closely correlated to global waves of emerging respiratory infections.
Conclusions: These results demonstrate the high burden of RTIs in travellers regardless of traveller group. This is the first meta-analysis to estimate the incidence proportion of RTIs among travellers by specific area of acquisition.

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Water, Sanitation and Hygiene (Wash) in Nepal and International Travellers' Travel-health Experiences

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Background: Tourism is one of the main sectors in Nepal, contributing in its economic growth. It is influenced by various factors including the situation of water, sanitation and hygiene (WASH) and WASH practices. For travelers, poor WASH provisions are considered risk factors for different food and water-borne diseases.
This study aims to describe the perceptions of international travelers regarding their experiences on WASH facilities or practices, and how it influences their health, and travel experiences.

Methods: This is a cross-sectional pilot study conducted among 150 international travelers in Nepal. The travelers were selected conveniently from the Kathmandu valley. The data on different WASH related variables, travelers' health and travel experiences were collected using semi-structured questionnaire. The quantitative data was entered into SPSS for descriptive analysis and qualitative data was transcribed through thematic analysis.
Results: Of 150 international travelers, 56.7% were females and 42% of them from age group 20-30 years. A majority of the participants were from Europe (60.7%), followed by Asia (18.7%), North America (9.3%), South America (6%), Australia (4.7%) and Africa (0.7%). Sixty one percent of the travelers had stayed in Nepal for < 2 weeks, while 30.7% had stayed for 2-4 weeks, and 8% had stayed for more than 4 weeks.
During the trip, the travelers had carried a number of medications: oral rehydration solution/product (40.6%), antibiotic (36%), antiemetic (28.6%), probiotic (23.3%), antimotility agent (22.6%), antiparasitic (5.3%) and 4% of them have carried other drugs.
About 2/3rd of the travelers had inadequate perception of WASH condition. Nearly 23% of them experienced gastrointestinal symptoms, including diarrhea in the past week during their visit. Among those travelers who experienced gastrointestinal symptoms, 21.4% of them reported of their travel plans being affected.
Conclusions: Perception and experience with WASH facilities was found inadequate among international travelers visiting Nepal. Such facilities seem to have affected the travelers' health (nearly a quarter of them experienced gastrointestinal symptoms, including diarrhea) and their travel plan. Hence, this pilot study demonstrates that there is an urgent need to improve the WASH facilities in the travel and tourism sector of Nepal.
Conflict of Interest: Nothing

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Recreational Substance Use among International Travellers: A Scoping Review

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Background: Recreational drug use among international travellers may be an underestimated problem. The growing trend of drug tourism reflects the expanding illicit drugs market. Substance use can lead to adverse health problems that may be complicated by the unfamiliar environment of travel destinations. Existing knowledge specifically addressing substance use among international travellers is sparse and has not been reviewed to date. The objective of this study is to describe substance misuse prevalence, common recreational substances used and adverse health problems among international travellers.
Methods: A literature search was conducted on PubMed, Google Scholar, and Scopus (1989 - 2022) using keywords related to recreational substance use and its adverse health effects. The data were reviewed by a panel of travel medicine experts and summarized.
Results: Estimated prevalence of recreational drugs use among travellers varied widely from 5% to 50%. Commonly used drugs were cannabis, MDMA, cocaine, psychedelic agents and methamphetamine. The prevalence of use varied according to travellers' characteristics and travel destinations with higher prevalence found in the Spanish Balearic Islands. Direct adverse health effects included neuropsychiatric problems, among which common neuropsychiatric problems were panic disorder, depressive disorders, anxiety disorders and acute psychosis. Indirect effects included accident and unintentional injuries, crime and violence, risky sexual behaviors, and blood-borne infections.

Table 1: Estimated prevalence, mode of use and adverse health effects of popular recreational substances among travellers

Recreational substances	Estimated prevalence among travellers who use substances	Mode of use	Adverse health effects

Cannabis	70-80%	Smoking, vaporizing, mixing with food	Impaired attention, memory and psychomotor skills which increased risk of accident and psychiatric symptoms.
MDMA	2-90%*	Ingesting capsule/tablet, swallowing liquid form, snorting	Increased energetic feeling, elevated mood, increased heart rate and blood pressure. Large amount can result in hyperthermia and death.
Cocaine	2-90%*	Snorting, rub into gum, injection, smoking	Feeling of euphoria, hypersensitivity and paranoia. Long-term use effects include cognitive impairment, respiratory infection, anosmia, cardiovascular collapse and death.
Psychedelic agents	4-15%	Ingesting raw, boiled or cooked with other food	Felling euphoria, relaxation, delusion, altered perception, hallucination, panic reactions and psychosis-like state.
Methamphetamine	5%	Smoking, ingesting pills, snorting, injection	Emotional and cognitive problems, mental health problems, weight loss, sleep problems and violence behaviour.

* High prevalence in Spanish Balearic Islands

Conclusions: Substance use among international travellers is alarmingly high. It can pose harm to tourists' health, security and well-being. Travel medicine physicians should advise on these risks to travellers whose itinerary may include drug tourism destinations. Further studies and preventive measures on recreational substance use are needed to protect travellers' health.

Conflict of Interest: No conflict of interest to be declared.

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Role of Asia Dengue Voice and Action (ADVA) Dengue Task Force in Monitoring Dengue Infections in Travelers

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Background: Dengue is a major public health burden with infections reported in over 129 countries. Asia bears 70% of the global dengue burden, with dengue being endemic in most tropical and sub-tropical countries, which are very popular among tourists. It is estimated that dengue is responsible for

2% of illnesses among travelers returning from dengue-endemic areas. Dengue-infected travelers put the local population at risk of infection and play an important role in the spread of dengue to non-endemic regions.

Methods: Asia Dengue Voice and Action (ADVA) is a scientific working group dedicated to dengue prevention and control in Asia. The objective of the ADVA Task Force set up in June 2022 during the 5th Asia Dengue Summit, is to consolidate dengue control efforts to reduce disease burden and prioritize dengue preparedness and responsiveness in Asia. The ADVA Task Force consists of governmental and non-governmental organizations, United Nations agencies, scientific partner institutions, and industry partners. The Task Force consists of 7 working groups: Diagnostics and Case Management, Surveillance, Vaccine Advocacy, Education and Training, Community Engagement and Social Sciences, Industry partnership and Policy Shaping.

Results:

The Task Force will generate a robust dengue database with epidemiological, clinical, entomological, and environmental data, which can be used to strengthen dengue surveillance and develop prediction models to determine the incidence of dengue among travelers. The attached schematics outlined the consensus reached by the Task Force on prioritization and procedures moving forward.
Conclusions: ADVA Dengue Task Force can play a critical role in the surveillance of travelers returning from dengue-endemic areas and predict epidemics in dengue-endemic regions.

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Incorporation of eHealth Tools in the Integrative Travel Health Process

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Background: The use of eHealth tools and technology on travel health consultations can facilitate and improve the process of preparing a traveler going to a higher risk location. Accurate and user-friendly data visualization applications, mobile tools, and health applications with travel consultation tools demonstrated to be effective to reduce time when performing a travel health consultation, to enable resources allocation, to facilitate communication and to improve the information latency on the Travel Health Process. This article describes the process of incorporating eHealth tools in traveler care and outline impacts, challenges and opportunities that have to be considered while using these tools.

Methods: The eHealth tools available to be used were reviewed by the travel health specialists and based on their availability, business needs and user interface they were selected to be part of the Travel Health Process. A robust process was created to maintain and to train users on how to navigate the process using the eHealth tools. A program evaluation was created to continuous evaluate and improve the process.
Results: The eHealth tools selected are a data visualization application, workflows and lists and an electronic medical record software. All tools selected were evaluated to confirm if they were capable to be parameterized by an end user with no programing skills. All the tools were parametrized with a friendly interface, fit for purpose information and real time updates. A robust process to maintain the tools and train the users was created. The trainings were presented digitally and made available as recoding versions on the digital training library. The entire process took 800 working hours to be implemented, using ~400 hours per year to be maintained. The company provides ~5000 travel consultations per year and the implemented process helps to save ~2500 working hours per year.
Conclusions: Currently, a large number of eHealth tools are available, however, these tools can be better leveraged to support the Travel Health Process and implemented based on business needs and evaluated based on user experience.

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A Retrospective, Matched Case–control Analysis of Tick-borne Encephalitis Vaccine Effectiveness by Booster Interval in Switzerland, 2006–2020

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Background: Tickborne encephalitis (TBE) is a serious and potentially life-threatening infection caused by the TBE virus (TBEV) and transmitted by Ixodid ticks. Vaccination is highly protective against TBE; eliciting virus-neutralizing antibodies which are associated with disease prevention, but are not universally considered the 'correlate of protection'. Licensed European vaccines are administered as a series of three doses at day 0, 1–3 months and 5–12 months with booster doses every 36–60 months (3–5 years) thereafter, depending on age and vaccine formulation. Previous studies have demonstrated sustained levels of virus-specific antibodies 10+ years after TBE vaccination. Whether this translates to sustained effectiveness, however, is not clear. In 2006, the Swiss Federal Office of Public Health (FOPH) amended its official recommendation for TBE vaccination, extending the booster interval to 120 months (10 years). Whether the prolonged TBE booster intervals used in Switzerland impact VE is of great public health interest as reducing unnecessary vaccinations can improve cost-effectiveness and vaccine compliance.
Objectives: To estimate the effectiveness of tickborne encephalitis (TBE) vaccination in Switzerland by incomplete or complete vaccination and time (<5, 5–10, 10+years) post-vaccination.
Methods: We conducted a retrospective case–control study. Cases included all adult (age 18–79) TBE cases in Switzerland reported via the national mandatory disease reporting surveillance system from 2006 to 2020 (final n=1868). Controls included community controls from a database of randomly selected adults (age 18–79) participating in a 2018 cross-sectional study of TBE vaccination coverage in Switzerland (final n=4625). VE was determined using the formula (1 - Odds Ratio x 100).
Results: VE for incomplete vaccination was 76.8% (95% CI 69.0-82.6;). For complete vaccination, overall VE was 95.0% (93.5-96.1). When the most recent dose was received <5 years prior VE was 91.6% (88.4-94.0), 95.2% (92.4-97.0) when the most recent dose was received 5–10 years prior, and 98.5% (96.8-99.2) when the most recent dose was received 10+ years prior.
Conclusions: Incomplete vaccination conveys appreciable protection from infection, with important implications for travelers. Following complete vaccination, VE remains high over 10+ years. Our findings support the effectiveness of the 10-year TBE booster intervals currently used in Switzerland.
previously_presented: International Scientific Working Group on TBE

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Lessons from an Integrative International Travel Health Preparation Process and Utilization of Company Global Emergency Response System

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Background: Global corporations have a mobile workforce with short-term international travel assignments, rotation, or long-term expatriate assignments. Employees may not have access to regular health care systems, prescription medications, immunizations, and may have increased exposure to health-related risks. Businesses/Corporations have developed pre-travel health processes to prepare employees for international assignments, with a focus on disease prevention and health promotion practices. Pre-travel health consultations prepare travelers for safe and healthy travel by providing country-specific immunizations, chemoprophylaxis, and travel education. These consultations also provide opportunities for updating routine health screenings to mitigate associated health risks and need for emergency services. The ExxonMobil global **E**mergency **ME**dical **R**esponse **S**ystem (EMERS) provides 24-hour medical assistance ranging from telephone consultation to medical evacuation of seriously ill individuals. The integrative international travel health preparation process is described, as well as shared lessons from EMERS.
Objectives: Objectives are (1) Key elements of integrative international travel health preparation process; (2) conduct a periodic review of international travel EMERS calls to evaluate and refine pre-travel health services for improved health outcomes of the EMERS process.
Methods: Outline pre-travel health preparation process including risk-based reviews in relationship to short-term assignments, rotation, or long-term expatriate assignments. We also retrospectively reviewed the EMERS calls for medical assistance from 2020 – November 2022.
Results: Out of the 625 EMERS calls, majority resulted in receiving medical information, advice, and other services (405). The top groups that resulted in medical treatment were infectious diseases (100), gastrointestinal diseases (53), injuries (41), and respiratory diseases (34). The cases reported for medical treatment were handled as out-patient (222) or in-patient (18), with 12 evacuated for further treatment.
Conclusions: Travelers from 2020-November2022 were prepared by the integrative pre-travel health process. The EMERS data shows that most calls for medical treatment is related to the guidance from the pre-travel consultation. One clear objective of pre-travel health consultation is the dissemination of valuable information regarding travel-related health risks, the prevention of such risks and recognition of early signs and symptoms.
Conflict of Interest: None

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Safety and Immunogenicity of an Adjuvanted Chikungunya Virus Virus-like Particle (CHIKV VLP) Vaccine: Results of Two Phase 2, Parallel-group, Randomized Trials

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Background: Unadjuvanted CHIKV VLP vaccine has been shown to be well-tolerated and immunogenic in phase 1/2 trials. Previous studies have suggested that immune responses to CHIKV vaccines may be impaired when heterologous alphavirus vaccines are administered sequentially. Our objective was to assess the safety and immunogenicity of an alum-adjuvanted CHIKV VLP vaccine in 475 healthy adults, including in those having previously received heterologous alphavirus vaccines.
Methods: In study 1, subjects 18-45 years (n=415) were given a 1- or 2-dose series of CHIKV VLP at doses of 6-40µg over a 2- or 4-week period, with or without adjuvant, and followed for 2 years. The primary endpoint was anti-CHIKV serum neutralizing antibody (SNA) GMT 28 days after the last dose. In study 2, subjects 18-65 years with prior receipt of an investigational alphavirus vaccine (N=30) and gender/age matched alphavirus vaccine-naïve controls (N=30) were administered 1 dose of 40µg adjuvanted CHIKV VLP vaccine. The primary immunogenicity endpoint was the CHIKV SNA seroconversion rate at Day 22. Safety was monitored throughout both studies.

Results: In study 1, across 8 dosing regimens, seroconversion occurred in 72% to 98% of subjects within 7 days after 1 dose, and in 100% of subjects by 28 days after the last dose, with GMTs ranging from 920 to 2057 (primary endpoint). The immune response was durable, with 100% seroconversion and a GMT of 280 at 731 days after a single adjuvanted 40µg dose. In study 2, the anti-CHIKV SNA seroconversion rate at Day 22 was 100% in both groups. A higher percentage of prior alphavirus vaccine recipients (93.3%) had a 4-fold SNA rise at Day 8 than alphavirus vaccine-naïve controls (66.7%, p=0.021). In both studies, all regimens were well-tolerated and there were no vaccine-related discontinuations or serious adverse events. There were no significant differences in the incidence of solicited adverse events between prior recipients of alphavirus vaccines and alphavirus-naïve control subjects.
Conclusions: Adjuvanted CHIKV VLP vaccine was well-tolerated, including in prior recipients of a heterologous alphavirus vaccine, and generated a rapid SNA response which persisted for 2 years. Phase 3 studies of a 40µg single dose are ongoing.
Conflict of Interest: McCarty is a paid consultant of Emergent BioSolutions. Richardson, Mendy, Bedell, and Warfield are stockholders and full-time employees of Emergent BioSolutions.
previously_presented: This particular abstract has not been submitted/presented elsewhere. However, data included in this abstract has been previously presented.

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Seasonal Pattern of Malaria Risk in Senegal - Time to Change Malaria Prevention Strategies for Travelers?

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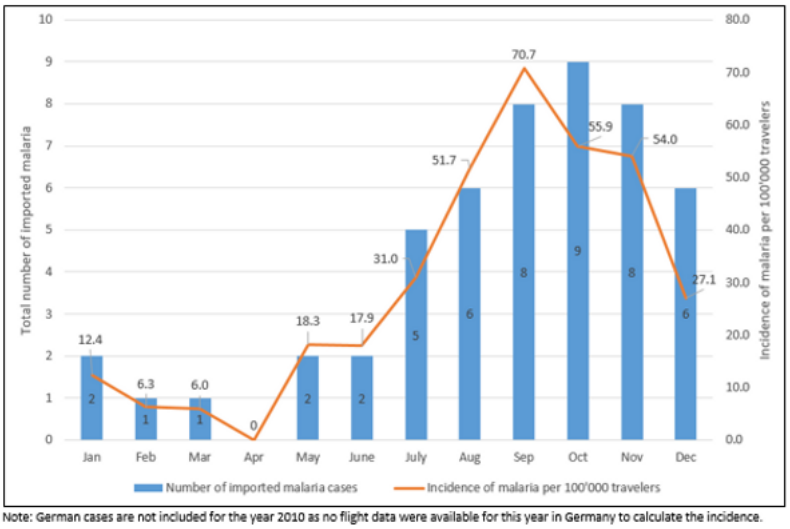
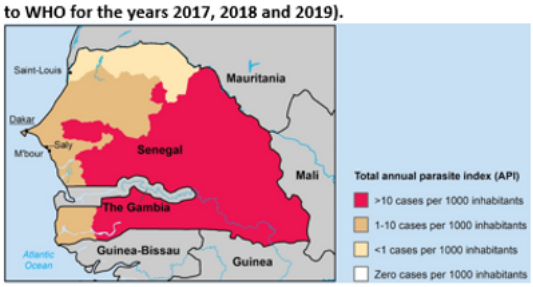
Background: Year-round chemoprophylaxis (CP) against malaria is generally recommended for travelers to all regions in Senegal.
Objectives: To describe the number and incidence of malaria cases imported from Senegal to Germany and Switzerland as well as the seasonal importation pattern.
Methods: All malaria cases imported from Senegal to Germany and Switzerland that were reported to the national health authorities (Robert Koch Institute, Berlin and the Federal Office of Public Health, Bern) between January 2010 and December 2019 were included. Flight departures from Germany and Switzerland with final destination Senegal reported to the Federal Statistical Office, Germany and Federal Office for Civil Aviation, Switzerland served as dominator for calculating the incidence of imported malaria per 100'000 travelers to Senegal. Case numbers and incidences were compared between two 5-year periods: 2010-2014 and 2015-2019. Maps showing the annual parasite index per 1000 population in Senegal in 2017, 2018 and 2019 (pre-pandemic data), provided by the World Health Organization, were compiled into a map illustrating the highest incidence in these years.
Results: Between 2010 and 2019, 50 imported malaria cases (*Plasmodium falciparum,* including mixed infections: n= 47, unknown: n= 3) were reported among travelers from Germany and Switzerland to Senegal, resulting in an overall incidence of 28.1/100'000 travelers. There was a sharp decline from period 2010-2014 (32 cases; incidence: 39.9/100'000) to period 2015-2019 (18 cases; incidence: 18.4/100'000). The importation of malaria from Senegal shows a seasonal pattern with a peak in September/October/November (Figure 1). Most autochthonous malaria cases in Senegal are reported in the southern and eastern parts of the country (Figure 2).

Figure 1. Imported malaria cases to Germany and Switzerland with history of travel to Senegal by months of diagnosis between 2010 and 2019 (n=50).



Note: German cases are not included for the year 2010 as no flight data were available for this year in Germany to calculate the incidence.

Figure 2: Autochthonous malaria incidence in Senegal according to the annual total parasite index (API) in the local population (the map shows the worst case szenario of the annual API data reported to WHO for the years 2017, 2018 and 2019).



Conclusions: Between 2010 and 2019 there was a significant decline in malaria cases imported from Senegal to Germany and Switzerland. A seasonal pattern of imported malaria by travelers returning from Senegal was seen, peaking in September/October/November and correlating with the seasonal pattern of autochthonous cases as reported in literature. Based on these data, supported by the epidemiology of malaria cases in Senegal, consideration could be given to changing the malaria prevention strategy for international travelers to the northern and coastal parts of Senegal from year-round to seasonal CP (i.e. July to December).

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An Unusual Cryptosporidiosis Outbreak Investigation during British Military Exercises in Kenya, February-May 2022

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Background: We report findings from an unusual cryptosporidiosis outbreak in exercising British military personnel in Kenya.
Methods: Epidemiological and clinical data were collated from diarrhoea cases and symptomatic contacts. Stool samples were analysed using multiplex PCR BioFire® FilmArray®. Domestic and recreational water sources were tested using Colilert testing kits. DNA was extracted from repatriated

stools and water pellets using spin-column kits (QIAamp Fast DNA Stool kit, Qiagen) and tested initially for *C. hominis* and *C. parvum* by duplex real-time PCR targeting A135 and Lib13 genes respectively. Other *Cryptosporidium* spp. were sought by real-time PCR of the ssu rRNA gene. *C. hominis* cases were further subtyped by DNA sequencing an 820 bp fragment of the *gp60* gene.
Results: The diarrhoea attack rate was 14.8 % (187 personnel) over 12 weeks; 74/124 (59.7%), including 11 repeats were positive for *Cryptosporidium* spp. on initial FilmArray® analysis. Of 106 primary samples, 63 (59.4%) were positive for *Cryptosporidium* spp. 38/63 of these had *Cryptosporidium* spp. alone, and 25/63 (39.6%) were also positive for ≥ 1 other enteric pathogens. Following duplex real-time PCR analysis, 54/74 (73.1%) were positive for the highly divergent *C. hominis* and none for *C. parvum.* A single sequence of the *Cryptosporidium gp60* gene representative of identical ImA13G1 subtypes from 26 case specimens was placed on GenBank. Locally tested water contained faecal coliforms including *E.coli* but repatriated water was unsuitable for *Cryptosporidium* spp. detection.
Conclusions: Investigations suggested an initial point source freshwater recreational activity-related cryptosporidiosis outbreak, then early secondary cases and later discrete foodborne multiple pathogen outbreaks. *C. hominis* Im subtype family were previously limited to macaque monkeys in China but, our findings suggest a greater geographic range and potential for human transmission.
Conflict of Interest: No conflicts of interest declared.
previously_presented: Microbiology Society Conference, UK

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Increased Rate of Artemisinin-based Combination Treatment Failure in Patients Returning from Sub-Saharan Africa with *P. falciparum* Malaria

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Background: Artemisinin-based combination therapies (ACTs) are recommended as first-line treatment against uncomplicated *P. falciparum* infection. However the emergence of mutations in the *PfKelch13* propeller domain have resulted in resistance to artemisinin in Southeast Asia. ACT failures have been sporadically reported in Africa.
Objectives: Our aim is to report an increase in rate of ACT treatment failure in malaria patients returning to Israel from Africa and propose a possible new genetic mechanism.
Methods: Data of Israeli travelers returning from Sub-Saharan Africa with *P. falciparum* malaria who showed ACT failure were retrieved. Blood samples were tested for mutations in *Pfkelch13* (PF3D7_1343700) and *Pfcoronin* (PF3D7_1251200) genes. Initial parasite load was evaluated through real-time PCR analysis of 18S rRNA and *Pftubulin* (PF3D7_1008700) genes. Parameters were compared to responders (Patient characteristics, n=24 and *Pfcoronin* status n=55).
Results: From 2009-2020, 338 patients had *P. falciparum* malaria acquired in Africa. Of those, 15 (14 males, 24-69 years old) were clinically resistant to artemether-lumefantrine. Two cases were diagnosed between 2009-2014, and 13 between 2015-2020. Four had parasites in the blood after three days of treatment and 11 had malaria recrudescence 1-3 weeks later. No significant differences were found in average age and weight between the ACT failure and non-failure groups. In all patients the *Pfkelch13* propeller domain had wild type sequence. We did find the P76S mutation in the propeller domain of *Pfcoronin* in 4/15 (28.6%) of the treatment failure cases compared to only 3/56 (5.5%) in the successfully treated patients (p=0.027).
Conclusions: We observed an increasing rate of artemether-lumefantrine treatment failure in *P. falciparum* patients that could not be explained by patient characteristics, nor by a *Pfkelch13* mutation. However, P76S mutation in the *Pfcoronin* gene was present more often in the treatment failure group and merits further investigation. The recent reports of increasing malaria incidence in Sub-Saharan-Africa partly attributed to COVID-19 related disturbances might also be a reflection of the wider spread of ACT resistance.

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Single Dose Oral Vaxchora Vaccine (CVD103-HgR) for the Prevention of Cholera in Travelers

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Background: Cholera remains an ongoing threat for travelers to areas with endemic or epidemic *Vibrio cholerae* infections. A single dose oral cholera vaccine which provides rapid protection, especially for those leaving on short notice, is desirable. Our objective was to assess the safety, immunogenicity, and efficacy of Vaxchora vaccine for the protection against cholera diarrhea in adult and pediatric travelers.
Methods: Vaxchora vaccine was evaluated in 5 prospective, randomized, double-blind, placebo-controlled trials in adult and pediatric subjects 2 to 64 years of age in the US. Endpoints included safety, immunogenicity, shedding, protective efficacy (challenge), lot consistency, and immunologic bridging.
Results: **Vaxchora Clinical Development Program**

Study	Age Range (Years)	Dose (CFU)	# Subjects (Active)	Objectives	Results
Phase 1 002	18 to 50	4.4×10^8	66 (55)	Safety Immunogenicity Kinetics (shedding)	Well-tolerated SVA 88.9% (Day 14) Stool + 11% (through Day 7)
Challenge Phase 3 003	18 to 45	5.0×10^8	197 (95)	Efficacy (challenge) Immunogenicity	SVA 79.8% (Day 8) SVA 89.4% (Day 11) Efficacy 90.3% (Day 11) Efficacy 79.5% (Day 91)
Lot Consistency Phase 3 004	18 to 45	1.0×10^9	3146 (2795)	Lot consistency Safety Immunogenicity	Met consistency criteria Well-tolerated SVA 93.5% (Day 11)
Older Adult Phase 3 005	46 to 64	1.0×10^9	398 (299)	Safety Immunogenicity Bridging	Well-tolerated SVA 90.4% (Day 11) Non-inferior to 004
Pediatric Phase 4 006	2 to 17	1.0×10^9	550 (468)	Safety Immunogenicity Bridging	Well-tolerated SVA 98.5% (Day 11) Non-inferior to 004

In the challenge trial, serum vibriocidal antibody (SVA) seroconversion, which occurred in 80% and 90% of subjects within 7 and 10 days of vaccination, respectively, was strongly linked to protection against cholera diarrhea, which occurred in only in 2/62 (3%) seroconverters, and was used as correlate of protection in the bridging studies. An adolescent sub-study of the pediatric trial documented persistence of SVA seroconversion at 2 years in 64.5% of vaccine recipients.
Conclusions: A single oral dose of Vaxchora vaccine provides safe and rapid protection in adults and children traveling to areas with cholera. SVA seroconversion, the correlate of protection in the cholera challenge trial, occurs in most individuals in as little as 7 days.
Conflict of Interest: McCarty is a paid consultant for Emergent BioSolutions. Bedell is a stockholder and full-time employee of Emergent BioSolutions.
previously_presented: This particular abstract has not been submitted/presented elsewhere. However, data included in this abstract has been previously presented.

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Malaria Prophylactic Medication Prescriptions during Pregnancy in the US Military Health System: Trends in Fetal Exposure from 2012-2021

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Background: Malaria prophylactic medications are essential to prevent malaria infections for non-immune United States (US) military, federal civil servants, and families traveling in and assigned to malaria-endemic countries. However, prophylactic medication options for malaria prevention are sparse for pregnant travelers, who are particularly susceptible to severe malaria that can result in poor maternal and fetal morbidity and mortality outcomes. Malaria prophylaxis prescription use in pregnancy has not been quantified in the US Military Health System (MHS), despite more than 100,000 pregnancies annually. Our objective is to describe the overall distribution and trends in malaria prophylaxis prescriptions that plausibly overlapped with pregnancy in reproductive age female travelers who received care in the MHS.
Methods: Our yearly repeated cross-sectional study analyzes a decade's worth (2012-2022) of electronic medical records data for pregnant military service members and MHS beneficiaries. Eligible pregnancies include pregnant people who received care in the MHS for at least 12 months prior to and throughout their pregnancy within the study window. Possible malaria prophylaxis medication exposure during pregnancy includes prescriptions for mefloquine, chloroquine, doxycycline, tafenoquine, primaquine or atovaquone/proguanil with dispense date during pregnancy or in the biologically-plausible pre-pregnancy period. Variables of interest include maternal age, parity, military status (active duty or beneficiary), and rank (enlisted, officer, other). We report descriptive statistics and make group comparisons of exposed versus unexposed pregnancies using Wilcoxon Rank Sum or chi-square tests. We report yearly rates of potential prescription exposure during pregnancy for each medication type and test each for differences in trend.
Results: We report the frequency and percentage of pregnancies plausibly exposed to any malaria prophylactic medication overall and annually for 2012-2022, and describe sociodemographic characteristics of exposed and unexposed groups. Further, we describe the distribution of medication types overall, and calculate prescription trends by year.
Conclusions: Atovaquone-proguanil prescriptions have increased over time in the MHS without a strong body of safety evidence. Further study of maternal, fetal and infant outcomes of pregnancies exposed to atovaquone-proguanil taking into account duration and trimester of exposure is warranted.

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Randomized Prospective Open-label Study Reveals Decreased Immune Response to Hepatitis A when Co-administered with Pneumococcal Conjugate Vaccine

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Background: Travel clinics not only provide travel vaccines but also update basic vaccinations. Although it is common for travelers to receive several vaccines simultaneously at pre-travel visits, data on how co-administration influences the immunogenicity of the individual vaccines remain scarce.
Objectives: We investigated if co-administration of pneumococcal conjugate vaccine (PCV), increasingly used both at home and before travel, has an impact on the humoral response to inactivated hepatitis A vaccine (HepA), the most common travelers' vaccine.

Methods: Volunteers aged ≥18 years were randomized to receive 13-valent PCV together with HepA (PCV13+HepA group, N=101) or a single dose of HepA alone (HepA group, N=102). Total hepatitis A antibody (anti-HAV) concentrations were measured before and one month after vaccination. Only volunteers with no previous hepatitis A vaccination or infection were included in immunogenicity analyses.
Results: The post-vaccination anti-HAV geometric mean concentration (GMC) was significantly lower in the PCV13+HepA than the HepA group (anti-HAV GMCs of 34.47 mIU/ml for PCV13+HepA versus 72.94 mIU/ml for HepA group, p<0.001) . When Anti-HAV ≥ 10mIU/mL was used as a surrogate of protection a significantly lower seroprotection rate was reached after vaccination in PCV13+HepA than in HepA group.
Conclusions: Concomitantly administered PCV13 impaired the humoral response to HepA decreasing the proportion of vaccinees reaching protective levels of Hep A antibodies. The data encourage separate administration of these vaccines.
Conflict of Interest: The work was supported by an investigator-initiated grant from Pfizer Inc., the Finnish Governmental Subsidy for Health Science Research and the Doctoral School in Health Sciences, University of Helsinki.

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Influence of COVID-19 Pandemic on Travel Medicine Practice in Slovenia

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Background: The global pandemic of COVID-19 has changed international travel trends and the practice of travel medicine. In Slovenia, travel medicine practices are almost exclusively offered in 9 regional units of the National Institute of Public Health (NIPH).
Objectives: The aim of our study was to analyse changes in use of travel medicine services during the pandemic and in the early post-pandemic period.
Methods: Demographic and travel characteristics analysis of all travellers visiting travel medicine practices at NIPH from 2019 to 2022 was performed.
Results: In 2019, 8.194 travellers visited travel medicine practices at NIPH. In the first year of the pandemic, a 65 % reduction in the number of travellers was observed. Number of travellers decreased additionally in 2021 when it was 80 % lower than in 2019. Number of travellers gradually increased in 2022, but it was still 62 % lower than in 2019. In 2020 and 2021, a 76 % and 63 % drop of yellow fever vaccinations were observed and in both years, 74 % less prescriptions of antimalarial drugs compared to 2019 were issued. Hepatitis A and typhoid fever vaccination decreased by 63 % and 79 % in 2020 and by 83 % and 86 % in 2021, respectively. In 2022, vaccination against yellow fever, hepatitis A and typhoid fever reached 62 %, 38 % and 46 % of those performed in 2019. In 2019, the majority of travellers visiting NIPH travelled to countries of Southeast Asia. From the beginning of COVID-19 pandemic the biggest drop was observed in travellers visiting NIPH before travelling to Southeast Asia (93%), followed by Latin America (77%) and Africa (67%). In 2021 and 2022, the majority of travellers visiting NIPH travelled to African countries, reflecting covid-19 entry requirements and travel restrictions in specific destinations.
Conclusions: Since the beginning of COVID-19 pandemic in 2020, number of travellers visiting travel medicine practices in Slovenia has dropped significantly compared to prepandemic period and was still more than 60% lower in 2022 compared to 2019. Important changes in travel destination patterns were observed, which reflects COVID-19 entry and travel requirements.

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Royal College of Nursing Competency Update; A Brave New World of Travel

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Background: Standards in travel medicine practice are unquestionably essential. The most important aspect of the delivery of care is not which professional group delivers that care, but that each person

doing so exceeds the minimum standard of practice and meets the health needs of the individual traveller. At CISTM10 in 2007, members of the Royal College of Nursing (RCN) Travel Health Forum presented a new guidance document, *RCN Travel Health Nursing: Career and Competence Development.* This and subsequent editions of the publication (2012 and 2018), have inspired nurses in Australia, Japan, the Netherlands, New Zealand and the USA to develop their own guidance.
Objectives: To review, revise and publish a fourth edition of this publication.
Methods: In January 2023, three of the original authors, completed writing and published a fourth edition of this publication.
Results: The document has been updated and expanded in content and support, particularly for practitioners delivering travel health care in the UK. Expansion of topics such as gender identity, establishing the purpose of a trip, for example, for forced marriage or female genital mutilation are addressed. The training and validation of competency requirements for practitioners are discussed. As we are all aware, the impact of the SARS-CoV-2 pandemic affected travel medicine practice in many dramatic ways. The guidance for timing of appointments and process of the consultation have been expanded upon, taking into consideration the advancement in technology that now enables different ways of conducting the pre-travel risk assessment.
Conclusions: This poster presentation highlights some of the key statements and guidance within this updated publication, helpful for all those conducting travel medicine consultations on a regular basis. Whilst written by nurses and published from a UK professional nursing body, its content remains equally applicable for all registered health professionals including doctors and pharmacists practising travel medicine no matter which country or profession they are from.

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Residency Training in Travel Medicine: What Changed and What We've Learnt during 9 Years

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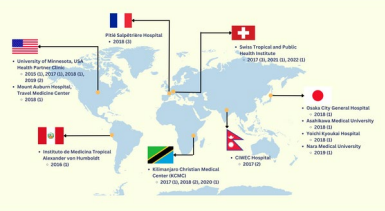
Background: It has been 9 years since the Faculty of Tropical Medicine, Mahidol University established the first residency training program in travel medicine in 2014. It is a three-year program and the doctors who graduated will be recognized as Board-Certified Travel Medicine specialists.
Objectives: To review our residency training program, describing what has been changed from our last perspective which was published in the JTM in 2016.
Methods: All major stakeholders of this program were interviewed including the current residents and the alumni. All major events/changes in the program during this 9 year were also included.
Results: From 2014 to 2022, there were in total 31 doctors from 9 batches enrolled in this program, and so far, 19 doctors from 6 batches have graduated and are recognized as a Travel Medicine specialist. Our alumni work in travel medicine field in various settings including 7 in university hospitals, 3 in Ministry of Public Health, 2 in other government sectors and the remaining 7 in private sectors. So far, 11 manuscripts from residents/alumni were published in international journals, and some theses were also presented in international conferences.
The main objective of the program remains the same i.e., to train the doctor to become expert in travel medicine. Apart from tropical/travel medicine experiences provided in-house, residents also have elective rotation to experience travel medicine practice in different parts of the world. To our alumni, this elective is considered to be one of the most enjoyable parts in our training.
One major change of our program was in 2017, when we adopted the latest World Federation for Medical Education (WFME) standard. We set three Entrustable Professional Activities (EPAs) that trainees must be able to perform independently i.e., 1) expertise in pre-travel counselling, 2) comprehensive post-travel care, and 3) proficiency in surveillance of travel-related diseases.



	Number of publications and presentation	Journal - Year of publication (number)
Published in International Journal	11 publications	Journal of Travel Medicine – **2019 (1)** American Journal of Tropical Medicine and Hygiene – **2020 (1)** Travel Medicine and Infectious Disease – **2019 (1)** Tropical Medicine and Infectious Disease – **2022 (2)** Tropical Diseases, Travel Medicine and Vaccines – **2020 (1)**, **2021 (1)** Southeast Asian Journal of Tropical Medicine and Public Health - **2020 (4)**
Presented at International Conference	7 poster presentations 1 oral presentation	Joint International Tropical Medicine Meeting (JITMM)

Conclusions: The practice of travel medicine is dynamic and constantly evolving, so does the training in this field. Our program is absolutely not perfect and needs an ongoing evaluation and revision in order to

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Carriage of Methicillin-resistant *Staphylococcus aureus* among Refugees, Asylum Seekers and Undocumented Migrants

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Background: Rapidly increasing antimicrobial resistance (AMR) is a major global health problem. The impact of forcibly displaced people to the spread of AMR has been scarcely characterised.
Objectives: Our objective was to explore the prevalence of methicillin-resistant *Staphylococcus aureus* (MRSA) among refugees, asylum seekers and undocumented migrants.
Methods: All refugees and asylum seekers admitted to the Helsinki University Hospital (HUH) are screened for MRSA. Our screening guidelines do not cover undocumented migrants. To investigate the carriage of MRSA among refugees, asylum seekers and undocumented migrants, we collected clinical and microbiological data from HUH records 2017–21.
Results: The 223 patients came originally from 39 different countries, mainly Iraq, Syria, Afghanistan, and Somalia; one third (31.8%; 7/22) of undocumented migrants came from Romania. Their median age was 28 years and 58% were females. Nearly one in five of both refugees and asylum seekers (17.9%; 36/201), and undocumented migrants (18.2%; 4/22) carried MRSA. The highest rate of MRSA was seen among patients from Syria (32.6%; 14/43). A more detailed analysis of the results will be presented at the meeting.
Conclusions: Our study shows a high rate of MRSA carriage among refugees, asylum seekers, and undocumented migrants. The data suggest that also undocumented migrants should be considered as one of the risk groups requiring MRSA screening and infection control measures at hospitals.
previously_presented: The abstract was presented as a slightly different version in ECCMID 2022.

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Single-visit Rabies Vaccination as Pre-exposure Prophylaxis Induces a Rapid and Effective Anamnestic Antibody Response

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Background: Travelers are hesitant to opt for rabies vaccination as pre-exposure prophylaxis (PrEP) due to high costs or insufficient time between PrEP and departure, even though PrEP eliminates the need for scarcely available rabies immunoglobulins in case of possible rabies exposure. Reducing the amount of rabies vaccinations would make PrEP more cost- and time-efficient, thus removing important barriers for travelers.
Objectives: We investigated whether single-visit rabies PrEP is non-inferior to the current standard PrEP.
Methods: In a randomized controlled multicenter non-inferiority study (EudraCT: 2017-000089-31), 288 participants were randomized to (A) single-visit intramuscular (1.0 mL), (B) single-visit intradermal (0.2 mL), (C) standard two-visit intramuscular (1.0 mL; day 0 and 7) PrEP or (D) no rabies vaccination. Six months later, participants received simulated rabies post-exposure prophylaxis (PEP) (1.0 mL intramuscular vaccination; day 0 and 3). Rabies virus neutralizing antibody (RVNA) concentrations were measured before as well as after PrEP and simulated PEP. The primary outcome was the fold increase in RVNA geometric mean concentrations between day 0 and 7 after simulated PEP. Non-inferiority was established if the lower bound of the confidence interval of the fold increase in the single-visit groups was not less than 2/3 (0.67) of the fold increase in the standard group.
Results: 214 participants (aged 18-50) were evaluated for the primary outcome. Single-visit intramuscular PrEP induced an anamnestic antibody response that was non-inferior regarding the fold increase in RVNA concentration compared with the standard two-visit intramuscular schedule, but single-visit intradermal PrEP did not. The fold increase in the single-visit intramuscular and the single-visit intradermal schedule was 2.32 (95% CI [1.43, 3.77]) times and 1.11 (95% CI [0.66, 1.87]) as high as the fold increase in the standard schedule, respectively. Seroconversion rates (RVNA concentration ≥ 0.5 IU/mL) seven days after simulated PEP were 100%, 96% and 100% in the single-visit intramuscular, single-visit intradermal and standard two-visit intramuscular groups, respectively, and 15% in the group without PrEP. Mild adverse events occurred after both intradermal and intramuscular vaccination, confirming their safety.
Conclusions: Effective and robust anamnestic antibody responses can be achieved with a single intramuscular rabies vaccination in adults up to 50 years of age.
Conflict of Interest: Lisanne Overduin and Leo Visser are currently conducting a study sponsored by Bavarian Nordic, the manufacturer of Rabipur vaccine. Bavarian Nordic had no role in designing, conducting, analysing or reporting the trial on which this abstract reports. All other authors declare no competing interests.
previously_presented: During the 2022 annual meeting of ASTMH, an earlier version of this abstract was presented.

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Perspectives and Experiences of Health Professionals on Integrated Sexual Health Pre-travel Counseling in the Era of PrEP

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Background: Sexual health of travelers is influenced by changes in epidemiology and behavior compared to their home setting, particularly the risk of contracting HIV or other sexually transmitted infections (STIs). Pre-travel counseling may mitigate such risks. However, little is known about integrated sexual health interventions, in particular Pre-Exposure Prophylaxis (PrEP) for HIV.

Objectives: As part of a practice development project at the Centre for Travel Medicine, University of Zurich, the aim of this qualitative study was to describe perceptions, experiences and practices of health professionals in respect to integrated sexual health counselling in pre-travel counseling.
Methods: Data from 11 semi-structured interviews with health professionals (3 nurses, 7 physicians, 1 other) from different services providing pre-travel counseling in Switzerland were analyzed using reflexive thematic analysis. All participants had experience in travel medicine, 7 also in sexual health counseling.
Results: Professionals' perceptions, experiences, and practices are described by 3 themes: First, "**Sexual health is important but a sideshow"** describes professionals' perceptions that sexual health issues are highly relevant but inadequately addressed. The challenge is to identify clients at risk and to make the most of limited counseling time. Risk assessment varies among professionals depending on expertise and available guidelines. Second, "**Attracting travelers to talk about sex"** describes participants' experience of travelers not expecting or hesitating to talk about sex. Their strategies for raising awareness ranged from "highlighting the risks of sex and travel" to "highlighting the normality and joy of sex and travel". The emotions they feel vary from feeling comfortable to concerns about offending clients. Third, "**Coping with diversity of sexual health counseling"** describes participants perception of clients' needs, which influences their counseling practice. Whereas most professionals focus on vaccinations and condoms, other risk minimizing strategies and in particular HIV-PrEP is poorly addressed. Experienced professionals describe a challenge of integrating knowledge from STI and travel medicine in pre-travel counseling.
Conclusions: Integrating sexual health counseling into pre-travel practices requires structural changes and educational support for professionals. They might benefit from reflecting on their own beliefs and attitudes to increase their knowledge of prevention strategies, especially HIV-PrEP.
Conflict of Interest: For the named pratice development project we recieved a grant by Gilead.

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Assessment of Rabies Knowledge and Risk Behavior in Dutch Travelers

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Background: Although dog-mediated rabies has been eliminated from most European countries, European travelers are still at risk for rabies infection when visiting rabies-endemic countries. Identifying knowledge gaps in their attitude towards rabies can help guide pre-travel risk education.
Objectives: We assessed travelers' knowledge and attitude about rabies as well as risk behavior during travel.
Methods: Dutch adults were screened for a study on improving rabies vaccination schedules. As a part of this study, participants were asked to fill out two surveys: one before their trip, to assess their knowledge and attitude about rabies, and one after their return, to identify risk behavior during travel.
Results: 302 participants completed the first survey, and 265 completed the second survey after travel. The mean travel duration was 21.3 days. Participants reported that the most important factors in the decision to take rabies pre-exposure prophylaxis (PrEP) were the risk of rabies, the risk of being bitten, and the availability of post-exposure prophylaxis (PEP) at the destination. Despite pre-travel advice, certain knowledge gaps about rabies risk were identified. 21.5% of the participants judged their rabies knowledge to be poor. Some participants did not know monkeys or bats can transmit rabies (11.6% and 13.9%, respectively), or that PEP is required for certain category II or III exposures, such as licks on damaged skin or skin abrasions without bleeding (19.2% and 35.8%, respectively). 28.1% of participants did not know that PEP needs to be administered within one day. During travel, many participants reported risk activities such as hiking (43.4%), visiting a monkey park (12.8%) or a cave (27.2%). 135 participants (49.1%) reported any form of contact with any animal. There was no difference in animal contact between the participants who received standard rabies PrEP and participants who did not receive rabies PrEP. Two participants reported category III contact with an animal, of whom one took adequate PEP measures.

Conclusions: The study population, involved in a rabies vaccination study, still has considerable gaps in rabies knowledge and shows risk behavior. Considering the fact that these outcomes may be even worse in the general population, there are opportunities for improving pre-travel rabies risk education.
Conflict of Interest: Lisanne Overduin and Leo Visser are currently conducting a study sponsored by Bavarian Nordic, the manufacturer of Rabipur vaccine. Bavarian Nordic had no role in designing, conducting, analysing or reporting the trial on which this abstract reports. All other authors declare no competing interests.

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Usefulness of Serial Testing for the Diagnosis of Malaria in Travellers with Fever upon Return

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Background: When malaria is suspected in case of fever after travel in endemic areas, the current recommendation is to repeat the malaria test at 24-hour intervals, with up to two additional tests, as long as the test result is negative. A retrospective analysis was conducted to investigate the appropriateness of this recommendation by estimating the proportion of tests with negative result at first and subsequently with a positive one at second or third attempt.
Objectives: To investigate the appropriateness of repeating malaria tests when the initial test result is negative.
Methods: A retrospective study was conducted at the Centre for Primary Care and Public Health and in the University Hospital, Lausanne, covering a period of 15 years (2005-2020). All patients tested once for malaria were included. The main outcome measure was the proportion of patients with a first negative test result, subsequently positive on second or third test over the total patients with suspected malaria assessed. Demographic, travel, clinical, and laboratory variables were collected from patients' records to identify potential predictors of an initially negative and then positive test result.
Results: 4,972 patients were included retrospectively. Of those, 4,557 (91.7%) had definitive negative test results. 415 (8.3%) had a positive result on the first test [332/415 (80%) *Plasmodium falciparum*, 40/415 (9.6%) *vivax*, 21/415 (5.1%) *ovale*, 12/415 (2.9%) *vivax*/*ovale*, 9/415 (2.2%) *malariae*, and 1/415 (0.2%) *knowlesi*]. 3/4972 (0.06%) had a positive result on the second test after a first negative result, 1/4972 (0.02%) had a positive test result after 2 negative results, all with *Plasmodium falciparum*. One of the four patient positive after initial negative test was 5-week pregnant and another one simultaneously had pneumonia associated with pleural effusion and acute hepatitis E. The very small number of patients with an initially negative test result and secondarily positive did not allow for risk factor analysis.
Conclusions: The current recommendation of serial malaria testing is not supported by the present study, *a fortiori* for those who do not present with a strong clinical or laboratory predictor of malaria.

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***Aedes*-borne Infections in Europe, 2000-2022; A Systematic Review**

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Background: The *Aedes* mosquito is an important vector of several viral diseases, including dengue, Zika, and chikungunya. Although these infections are not yet endemic in Europe; a changing climate and the introduction of cases through travel results in imported and autochthonous cases each year.
Objectives: This systematic review aims to review the literature of the last 22 years, gathering information on the number, location, and types of cases of *Aedes*-borne arboviruses in humans and examining trends for the future.

Methods: Following PRISMA guidelines, a systematic search of the literature was conducted, searching PubMed, Wed of Science, Embase, Cochrane reviews, and IEE Explore for papers with information on cases of *Aedes*-borne arboviral infections in humans in Europe between 2000 and 2022. The review was registered on PROSPERO. The results were screened according to inclusion criteria, and data was extracted on the number, type, and location of infections as well as time of infection, type of transmission, and where applicable, prevalence. This data was then consolidated to examine trends over time, hotspots of infection, and the spread of arboviral infections. Included papers were evaluated for risk of bias using the JBI critical appraisal tools.
Results: The initial search of the literature resulted in 2519 papers, of which 442 were included after the first screening. The numbers and types of infections are shown over time, and maps of past outbreaks. Different trends for the different viruses were seen, and expanding ranges of infection, as well as uncommon methods of transmission, including sexual transmission of Zika virus, and viral transmission through blood transfusion. The threat of further infections in the future, due to a warming climate, and new vector competencies, including for West Nile virus is also discussed.
Conclusions: With the increase of international travel, and a changing climate, the threat of arboviral infections in Europe is growing. Viral infections such as dengue and chikungunya have the potential to become a reality for the population of mainland Europe, as they are in many southern parts of the world.

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Mosquito on Board: Lessons Learned from the MOB Project Examining Mosquitoes Imported through Air Travel

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Background: A changing climate and the subsequent expansion of the range of vector mosquitoes means it is crucial to examine routes for their introduction into Europe. Air travel has been identified as one possible route.
Objectives: We examined the possibility of exotic mosquitoes being imported into Europe through air travel.
Methods: This study planned to examine aircraft arriving at Zürich airport through two different methods. The first consisted of performing sweeps of the passenger areas of aircraft after passengers have disembarked using a handheld vacuum system. The second involved placing passive box traps in the cargo hold of aircraft during their travel to their destination country and back, and then examining the traps for the presence of mosquitoes. The content of the vacuum sweeps and traps were then examined under a dissecting microscope to identify the presence of mosquitoes and identify them to species. Close contact with airline companies was fostered to facilitate the study, and airline safety requirements and airport security measures were taken into account. In addition, as indirect evidence of mosquito importation, we performed systematic reviews of the literature to identify reports of stowaway mosquitoes and studies on airport malaria in Europe.
Results: Through close collaboration with airline companies and the Zürich international airport, we were able to perform sweeps of incoming aircraft starting November 2021 using the first proposed method. The results of this will be used to conduct a risk assessment of exotic mosquitoes entering Germany through the same pathway. Through numerous collaborations with different airlines, different types of traps, with and without power, and of different configurations were discussed for feasibility. Time and personnel constraints, and the impact of COVID-19 on the airline industry are also discussed.
Conclusions: This study examined the risk of exotic mosquitoes being imported through air travel, in Switzerland, and neighboring Germany and also systematically evaluated the literature. Although the risk of mosquitoes on board aircraft is small, its importance may increase due to the expansion of mosquito-favourable climatic conditions in Europe. The study revealed important lessons when working with airlines, and what is possible for the future.

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A New Frontier - Infection Tracking in Travellers (ITIT): The First 500 Participants

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Background: Current traveller health surveillance is top-down and captures only a small fraction of infection cases. Mobile-based surveillance offers the opportunity to capture additional disease reports in real time, complementing and enhancing the existing health system.
Objectives: We aimed to evaluate patterns of infection and identify clusters in travellers and refugees from the Ukraine using self-reported symptom information through a mobile app-based system called ITIT (Illness Tracking in Travellers).
Methods: The novel app (ITIT) records travel-related symptoms with associated geolocation and weather data. Participant recruitment via travel clinics, universities and media across Europe and South Africa began in April 2022 and is currently ongoing. Data from the app were used to examine travel and illness patterns and link them to location and weather/climate information to create profiles of travel-related infection.
Results: 396 participants were recruited as of January 10th, 2023, with an average age of 38 years old (18 to 88 years old), and an average travel duration of 22 days. The majority of participants were travelling for leisure/tourism (61.9%), followed by visiting friends and relatives (18.2%), and business travel (14.4%). Every UN global subregion was visited by at least one traveller, most commonly Western Europe, followed by Southern Europe, Sub-Saharan Africa, and Latin America and the Caribbean. A total of 2352 daily symptom questionnaires were completed, 9.7% of which had reported symptoms. The most commonly reported symptoms were gastrointestinal (n=115), followed by respiratory (n=102). Symptom type, location, and severity were visualized using maps to see clusters of infection.
Conclusions: ITIT is a valuable tool to examine patterns of infection in travellers and refugees, complements existing surveillance systems and adds a new frontier in travel medicine real-time surveillance.

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Epidemiological and Clinical Trends of Imported Strongyloidiasis in a Referral International Health Unit, Barcelona, Spain: A 12-year Period Experience

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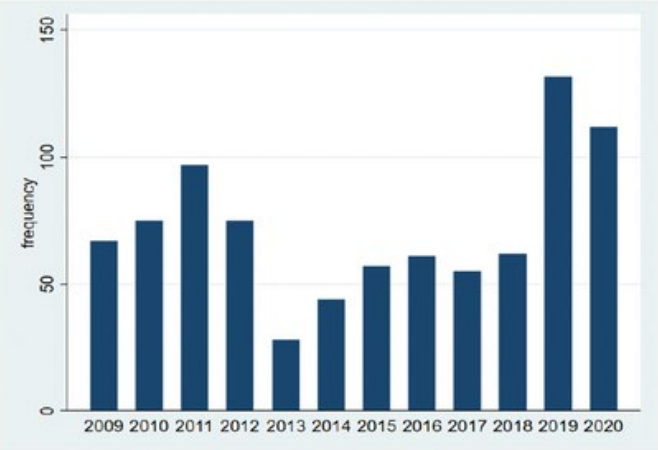
Background: It is estimated that 600 million people is infected by *S. stercoralis* worldwide. The distribution of this parasitic disease is wide, but it is more frequent in tropical and sub-tropical areas. Imported strongyloidiasis in non-endemic countries has increasingly been diagnosed due to the high mobility of the population.
Objectives: To describe the main epidemiological and clinical characteristics of patients with imported strongyloidiasis attended in a referral International Health Unit during a 12-year period.
Methods: Observational retrospective study where all imported strongyloidiasis cases seen at the International Health Unit Vall d'Hebron-Drassanes (Barcelona, Spain) from 2009 to 2020 were included. Diagnosis of strongyloidiasis was defined by the presence of *S. stercoralis* larvae in stools or the positivity of a *S. stercoralis* specific serological technique. Epidemiological and clinical characteristics from included patients were collected: demographic information (age, gender, and country of birth), epidemiological data (country of origin for immigrants, country of destination for travelers), and clinical information (reason for consultation, immunosuppression, severe presentation, eosinophilia).

Results: 865 cases of imported strongyloidiasis were diagnosed, of whom 472 (54.6%) were men and mean age was 38.7 years. Figure 1 shows the number of diagnosed cases by year. The majority of cases were diagnosed in immigrants (830, 96%) with a mean time of residence in our country of 7.9 (SD 7) years, and 35 (4%) cases were diagnosed in travelers. Among immigrants, the geographical area of provenance were as follows: Latin America (561, 67.6%), Sub-Saharan Africa (148, 17.8%), Asia (113, 13.6%), North Africa (5, 0.6%), Eastern Europe (2, 0.2%), and North America (1, 0.1%). The main reasons for consultation at the Unit were screening of health status (371, 42.9%), laboratory test alteration (367, 42.4%), gastrointestinal symptoms (56, 6.5%), cutaneous symptoms (26, 3%), and other clinical symptoms (45, 5.2%). Overall, 578 (66.8%) patients had eosinophilia, and 35 (4%) patients had an immunosuppressant condition. Only two (0.2%) patients had hyperinfection syndrome.



Conclusions: Imported strongyloidiasis has increasingly been diagnosed in our referral unit, mostly due to screening strategies implementation. Most of the patients were young migrants coming from Latin America, with no symptoms at the time of diagnosis.
Conflict of Interest: N/A

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Long-term Consequences of Chikungunya, Dengue, Zika and Falciparum Malaria in Travelers: An Interim Analysis

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Background: Arboviral diseases and falciparum malaria are leading causes of fever in travelers returning from the tropics, but their long-term health impacts remain unclear.
Objectives: To describe persistent symptoms following chikungunya, dengue, or Zika virus disease or *Plasmodium falciparum* malaria among international travelers and to identify risk factors for non-recovery.
Methods: Travelers with a laboratory-confirmed diagnosis of recent infection with one of the four diseases at GeoSentinel sites were prospectively followed up to 18 months. Clinical status was assessed using standardized questionnaires.
Results: We recruited 302 patients from 2016 to 2021, including falciparum malaria (N=132), dengue (N=113), chikungunya (N=37), and Zika (N=20). Median age was 38 years (interquartile range 29-49), 56% were female, and 42% reported chronic underlying conditions, especially overweight (30%) and obesity (12.5%) or past infection (falciparum malaria: 9.3% and dengue: 3.0%). Main reasons for travel were tourism (39%) and visiting friends and relatives (38%). The most frequent persisting symptoms were rheumatological symptoms (mostly tendon and joint pain, axial pain and joint stiffness), fatigue, and headache (Table). Potential risk factors for persistence of symptoms for 3 months or longer, including age, sex, pre-travel consultation, chronic conditions and region of exposure were investigated for the four diseases. No independent risk factor was found for any persisting symptoms among patients with viral infections. Age over 40 years and female sex were independently associated with persistence of fatigue in malaria patients while no factor was associated with the persistence of other symptoms.

Table: Prevalence of symptoms at inclusion and at follow-up among 302 patients with falciparum malaria, dengue, chikungunya, and Zika virus disease

Symptoms (%)		Enrollment	1 month	3 months	6 months	12 months	18 months
Rheumatological	Chikungunya	97.3	71.9	66.7	28.0	11.5	0.0
	Dengue	65.5	35.1	17.4	10.1	1.2	1.2
	Zika	100.0	61.1	53.9	40	11.8	11.8
	Falciparum malaria	34.9	14.1	9.0	3.0	1.9	1.0
Fatigue	Chikungunya	NA	65.6	29.6	16.0	11.5	0.0
	Dengue	NA	54.3	30.4	7.9	2.3	0.0
	Zika	NA	44.4	53.9	46.7	5.9	5.9
	Falciparum malaria	NA	36.4	11.0	5.9	2.9	1.0
Headache	Chikungunya	48.7	31.3	14.8	4.0	3.9	0.0
	Dengue	81.4	39.4	18.5	6.7	0	0.0
	Zika	70.0	44.4	38.5	33.3	11.8	11.8
	Falciparum malaria	81.8	18.2	4.0	3.0	1.9	1.0

NA – not available, data not collected

Conclusions: Fatigue was common in patients recovering from all four conditions at one month, especially those with chikungunya and dengue. Rheumatologic symptoms often lasted at least 6 months, with about one third of chikungunya and Zika patients affected. Despite the low recruitment of patients with Zika, this infection was associated with substantial long-term burden with a sizeable proportion reporting persisting rheumatological symptoms (12%) and headaches (12%) at 18 months of follow-up. Such results need confirmation in a larger cohort of patients. The burden of medium-term persistence of symptoms among patients with arboviral infections underlines the need for prevention with strengthened education about personal protection measures and vaccines as they become available.
Conflict of Interest: None

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Background: Dengue is an arboviral disease with far-reaching impact. In recent years, the range of dengue vectors *Ae. Aegypti* and *Ae. Albopictus* has expanded, yet studies on the epidemiology and burden of dengue in the US are limited.
Objectives: This systematic review sought to characterize the epidemiology and burden of dengue within the US.
Methods: Studies reporting on travel-related and endemic dengue in US states/territories (Puerto Rico (PR), American Samoa, and US Virgin Islands (USVI)) were identified and summarized.
Results: Among 1,969 studies screened, 115 were included (58% published 2011-2021). In US states, dengue incidence was rare from 1980-2005 (<0.05 cases/100,000 person-years) with outbreaks in 2006-2007 and 2012 and major spikes in 2013-2016 (0.17-0.31 cases/100,000). Cases peaked at 0.35 cases/100,000 in 2019. Most cases (94%, N=7,895) reported to ArboNET (2010-2021) were travel-related and were most reported from Florida, California, and New York. Dengue was more common in PR, with annual average of 200 cases/100,000 (1980-2015); 99.9% of cases were locally-acquired (ArboNET; 2010-2021). Serotypes in highest incidence years were DENV-1 in US states (2009, 2015) and DENV1-2,4 (2010, 2013) and DENV1-4 (1998, 2007, 2012) in PR. Severe dengue and mortality were low in US states (<50 cases/year) and higher in PR (173 cases, 1998; 65 cases, 2008; 76 cases, 2021). Significant risk factors included residing in/traveling to endemic regions, and environmental (residing with birds)/socioeconomic factors (weekly income <$100 [Texas]). Commonly reported symptoms included fever, headache, and rash; median disease duration was 3.5-11 days. Hospitalization rates increased following 2009 WHO guideline changes, which classified dengue into with/without warning signs and severe (pre-2009: 0%-54%; post-2009: 14%-75%); median length of stay ranged 2.7-8 days in PR and 2-3 days in US states. Hospitalization costs/case were $14,350 USD (US states), $1,764-$5,497 (PR), and $4,207 (USVI). Average workdays missed ranged 0.2-5.3 days, and school days missed of 2.5 in PR.
Conclusions: This review highlights the considerable clinical and economic burden of dengue within the US and demonstrates the urgent need for treatment options and vaccines for protection of individuals living in or traveling to endemic regions. Further data are needed to elucidate the current disease burden.
Conflict of Interest: Takeda provided research funding for the literature review. Open Health received consulting fees from Takeda to conduct the research.

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Using Traveler Surveillance Data to Predict SARS-CoV-2 Incidence Trends as Surveillance Declines Globally

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Background: As SARS-CoV-2 testing and reporting declines globally, obtaining accurate estimates of disease incidence is increasingly challenging. CDC's Traveler-based Genomic Surveillance (TGS) program fills gaps in global SARS-CoV-2 surveillance by using travelers as sentinels to track SARS-CoV-2 incidence trends by testing nasal swab samples from arriving US international travelers who volunteer.
Objectives: We assessed the correlation between TGS post-arrival traveler positivity rates and WHO SARS-CoV-2 incidence to determine if TGS data reflect country level incidence trends.
Methods: TGS data from samples collected and pooled based on the passenger's flight origin country during December 2021– September 2022 were analyzed. We included countries (Brazil, France,

Germany, India, South Africa, and the United Kingdom) with at least six months of data and classified data from each country into 3–4 time windows corresponding with local SARS-CoV-2 waves. Time window boundaries were set at the minimums of SARS-CoV-2 waves based on WHO incidence data; a boundary was also set on June 12th, 2022 (removal of the US pre-departure testing requirement). Weekly individual SARS-CoV-2 positivity rates were estimated from pool positivity rates using maximum likelihood estimation (MLE). Within each window, the correlation between MLEs (three-week moving average) and corresponding WHO incidence rates was assessed (Spearman rank). Windows averaging fewer than 50 TGS participants per week or fewer than 8 timepoints were excluded.
Results: Our analysis included 37,221 TGS participants and 3,728 pools. Of the 16 time periods investigated, 11 showed a significant correlation between TGS SARS-CoV-2 positivity and WHO-reported incidence data ($p < 0.05$) (Table 1). The median weekly ratio of TGS positivity to WHO incidence was low when global testing was high and increased >2.6 times across the analysis period for each country as global testing volume declined.

Table 1. Spearman's correlations between traveler COVID-19 incidence from TGS and WHO incidence data by country of origin.

Country	Window 1			Window 2			Window 3			Window 4		
	Date range	Spearman's		Date range	Spearman's		Date range	Spearman's		Date range	Spearman's	
		Rho	p-value		Rho	p-value		Rho	p-value		Rho	p-value
India	12/6–4/10	0.87	$2.5 * 10^{-6}$	4/11 – 6/12	0.53	0.15	6/13 – 9/11	0.43	0.14	NA		
South Africa	12/6 – 3/20	0.91	$2.4 * 10^{-6}$	3/21 – 6/12	0.73	0.015	6/13 – 9/11			NA		
Brazil	12/6 – 4/17	0.50	0.028	4/18 – 6/12	0.90	0.0046	6/13 – 9/11			NA		
France	12/6 – 2/27	0.69	0.017	2/28 – 5/22	0.57	0.055	5/23 – 6/12			6/13 – 9/11	0.66	0.016
United Kingdom	12/6 – 2/20	0.67	0.023	2/21 – 5/22	-0.17	0.59	5/23 – 6/12			6/13 – 9/11	0.88	$<2.2 * 10^{-16}$
Germany	12/6 – 2/27	0.20	0.56	2/21 – 5/22	0.70	0.010	5/23 – 6/12			6/13 – 9/11	0.76	0.0040

*Green cells indicate time windows where the correlation between TGS positivity and WHO incidence data was statistically significant.

Conclusions: There was high concordance between TGS and WHO data, though the proportional relationship changed as testing declined. As testing and reporting continues to decline globally, TGS and sentinel traveler data are increasingly useful for determining trends in global SARS-CoV-2 incidence.
Conflict of Interest: CDC contract award 75D30121C12036 to XpresCheck and Ginkgo Bioworks. B.H.R, A.P.R, S.L.L, T. A, and R.C.M. employed by Ginkgo Bioworks and own Ginkgo Bioworks employee stocks and/or Restricted Stock Units (RSU) grants. E.E. employed by XWELL and owns XWELL employee stocks and/or Restricted Stock Units (RSU) grants.

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Impact of Pre-travel Consultation on the Adherence of Tunisian Travelers to Vaccines for a First Travel to Sub-Saharan Africa

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Background: Sub-Saharan Africa is currently experiencing a significant expansion in the labor market and the tourism industry. Such an expansion turned the region into a highly sought for destination for both business travelers and tourists. However, these destinations remain at high infectious disease

risk, a matter that is poorly perceived by travelers. For that matter, traveler's health management is an important factor to reduce this risk and promoting pre-travel vaccination is a priority.
Objectives: The aim of our study was to determine the impact of pretravel consultation on the adherence of Tunisian travelers to recommended vaccines before a first travel to Sub-Saharan Africa.
Methods: We conducted a cross-sectional and observational study among Tunisian's traveling for the first time to sub-Saharan Africa. An anonymous questionnaire in two parts was presented after getting their informed consent. The first part focused on traveler's spontaneous knowledge and adherence to vaccines before a pre-travel consultation. Once a pre-travel consultation was made and recommended vaccines were prescribed, the second part was fulfilled.
The study protocol has been pre-approved by the bio-medical ethics committee of Pasteur Institute of Tunis referenced under 2021/25/I/V1.
Results: We selected 61 participants. The average age was 41 years old and the sex ratio (M/F) was 1.54. Among them, 70% knew about yellow fever vaccine, mandatory for their destination, while 79% were unaware of the recommended vaccines. Only 23% of travelers perceived the health risk as high. Our travelers did not intend to do the recommended vaccines even if they knew the benefit of doing them except for the meningitis and the typhoid vaccine ($p<0.001$). The refusal of vaccination was mainly due to a lack of information. Following the pre-travel consultation, the traveler's adherence to recommended vaccines significantly increased. For travelers who did not adhere, the reasons for refusal were lack of time before departure (30%) and fear of vaccine side effects (27%).
Conclusions: This study revealed the importance of pre-travel consultation in improving the adherence of traveler's to recommended vaccines and thus the risk health management related to infectious disease. So, it is more than necessary to strengthen and recommend such specialized consultations.

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The Implications of Migration and Travel - American Trypanosomiasis in a Portuguese Hospital

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Background: *Trypanosoma cruzi* (*T. cruzi*), the etiological agent of Chagas Disease (CD), is an endemic parasite in Latin America. Although vector-borne transmission is limited to restricted areas, the clinical manifestations and other routes of transmission (including congenital) may occur in nonendemic areas. The increase in travel and migration from South America, especially Brazil, impacts the clinical practice in Portugal.
Objectives: Review of clinical manifestations and epidemiological clues of CD that nonendemic countries might find in clinical practice.
Methods: Retrospective analysis of serological tests of *T. cruzi* requested at a secondary Portuguese Hospital between between 2017 and 2022. Clinical records of patients with positive serology were assessed to evaluate the epidemiological risk factors, clinical manifestations and management.
Results: Of the 24 requested serologies, three were positive: 2/3 females, with ages comprised between 41 and 67 years old. All patients had been in Latin America: two were migrants from Brazil, and one worked occasionally in Panama. Two patients reported familiar history of CD (mother or siblings) and two patients were immunocompromised: one with HIV infection under antiretrovirals, and another with discoid lupus under hydroxychloroquine.
Serologies were requested due to clinical manifestations compatible with CD (cardiomyopathy and a skin lesion that developed after contact with a triatomine resembling an inoculation chagoma) or as screening for chronic CD in an immuncompromised patient with high epidemiologic risk.
Cardiac involvement was present in one patient, and was excluded in the other two. None of the patients had gastrointestinal involvement. All patients received standard benznidazole treatment.
Conclusions: We analysed three cases of CD, each at a different stage: intermediate form, acute and chronic disease (namely chronic cardiomyopathy, the most significant consequence of CD). As this infection can be lifelong in the absence of effective treatment, with higher risk in immunosuppressed patients, decision to treat an asymptomatic immunocompromised patient, and a patient with HIV and acute infection was made. Despite the small sample size, we intend to increase the levels of awareness among health care in nonendemic countries to recognize the risk factors for this disease and to screen symptomatic and asymptomatic patients.

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Impact of COVID-19 Pandemic State on Decision to Travel

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Background: Travelling is considered almost an essential part of human living. According to World tourism, in 2019 there 1.5 billion international tourist arrival worldwide. The top ten countries with the highest expenditure in 2018 were China, United States, Germany, United Kingdom, France, Australia, Russia, Canada, South Korea, and Italy. In 2017, UN World Tourism Organization (UNWTO), United States, Spain and France had the top three highest revenue from international tourist.
Objectives: To determine the impact of COVID-19 on global travel trend.
Methods: Literature search of global travel trends will examine the top 10 countries visited in the last 3 years (2017, 2018, and 2019) and compare to the trend in 2020, 2021 and 2022.
Results: The top ten countries visited in 2017 to 2019 were France, Spain, USA, China, Italy, Turkey, Mexico, Germany, Thailand, and United Kingdom with over 600million travelers and generation of GDP for these countries. The top ten African countries visited were Morocco, South Africa, Tunisia, Zimbabwe, Mauritius, Togo, Cabo Verde, Reunion, Madagascar, and Seychelles. In 2020, UNWTO documented a 73% reduction in international pre covid tourist arrival. In 2021 and 2022, these values were 72% and 65% respectively. About 5 million students travelled outside their own country for education in 2014 with a projection of this to be 8 million.
Conclusions: There are several factors that affect these reduced post pandemic values including economic environment, higher transport and accommodation, travel restriction, pandemic state and airport congestion. Most of these nations might depend on the GDP generated from tourism. The impact might not be felt nationally but in countries that most of the low-class individuals depend on tourist, the negative impact can be long lasting. This will indirectly impart education and training, medical tourism etc.

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Immunogenicity and Safety of Serum-free Purified Vero Rabies Vaccine-next Generation in Comparison with Licensed PVRV Zagreb Regimen as Simulated Rabies Post-exposure Prophylaxis in Healthy Adults

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Background: A serum-free, highly purified rabies Vero vaccine-next generation (PVRV-NG2) is under development.
Objectives: This randomized, observer blinded, phase 3 trial (NCT04594551) conducted in 3 centers in Thailand evaluated the safety and immunogenicity of the Zagreb post-exposure prophylaxis (PEP) regimen with PVRV-NG2 compared to the current licensed purified Vero cell rabies vaccine (PVRV), when co-administered with human rabies immunoglobulin (HRIG) at day (D)0 in a simulated rabies exposure.
Methods: A total of 201 (with 170 seronegative at baseline) healthy adults aged ≥ 18 years were randomized to receive simulated PEP with the ratio of 2:1, either PVRV-NG2 (n=135) or licensed PVRV (n=66). All were given one dose of vaccine intramuscularly at both deltoids on D0 and one dose of vaccine on D7 and D21 (Zagreb PEP regimen: 2-1-1). All participants received HRIG (20 IU/Kg) intramuscularly in the thigh on D0.
Rabies virus neutralizing antibodies (RVNA) were evaluated at D14, D35, and D90 using the rapid fluorescent focus inhibition test. The geometric mean titers (GMTs) and proportion of participants with RVNA titers ≥ 0.5 IU/mL were calculated. Safety was evaluated after each dose and monitored throughout the study.

Results: Similar proportions of adults reached RVNA titers ≥ 0.5 IU/mL in the PVRV-NG2 and PVRV groups at D14, D35 and D90. Based on the per protocol analysis set (PPAS), the seroconversion rates and GMTs for each group at the different timepoints are listed in Table 1. There was no safety finding of concern and the safety profiles of both vaccines were overall similar.

TABLE 1: Immunogenicity criteria: RVNA titers and GMTs at D14, D35, and D90

Time points	D14 Based on PPAS for D14		D35 Based on PPAS for D35		D90 Based on PPAS for D35	
Study Groups	Subjects with RVNA titer >= 0.5 IU/mL (95% CI)	GMT (IU/mL) (95% CI)	Subjects with RVNA titer >= 0.5 IU/mL (95% CI)	GMT (IU/mL) (95% CI)	Subjects with RVNA titer>= 0.5 IU/mL (95% CI)	GMT (IU/mL) (95% CI)
PVRV-NG2 + HRIG	101/111 (91.0) (84.1 ; 95.6)	2.15 (1.75 ; 2.64)	113/113 (100) (96.8 ; 100)	7.83 (6.79 ; 9.03)	102/113 (90.3) (83.2 ; 95.0)	1.51 (1.29 ; 1.77)
PVRV + HRIG	53/55 (94.6) (85.1 ; 98.9)	2.34 (1.76 ; 3.11)	55/55 (100) (93.5 ; 100)	8.95 (7.33 ; 10.9)	52/55 (94.5) (84.9 ; 98.9)	1.98 (1.56 ; 2.52)

Conclusions: This study demonstrated similar immunogenicity defined as the proportion of adults with RVNA titers ≥ 0.5 IU/mL and GMTs, between PVRV-NG2 and licensed PVRV vaccination using the PEP Zagreb regimen at all time points. PVRV-NG2 was well tolerated, with a similar safety profile to the current licensed PVRV standard of care.
Conflict of Interest: **Funding:** The study was funded by Sanofi. The study investigators received grants to conduct the research at their respective sites. Some of the authors are current Sanofi employees and may hold shares and/or stock options in the company.

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How is Sexual and Reproductive Health Information and Care Delivered to Departing Travellers? A Survey of Australian Travel Medicine Clinicians

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Background: Rates of sexually transmissible infection (STI) acquisition can be three times higher among people engaging in casual sex during international travel. The inclusion of sexual and reproductive health information and clinical services as part of pre-travel medical advice could play a critical role in STI, HIV and other blood borne viruses detection and prevention. However, knowledge of what sexual and reproductive health information and clinical services are currently being provided pre-departure by travel medicine clinicians is limited.
Objectives: This study explored the practice of travel medicine clinicians in delivering sexual and reproductive health information and clinical services to departing travellers, to identify opportunities for further professional development.
Methods: A quantitative cross-sectional survey, delivered as an anonymous online and hard-copy survey, was distributed to travel medicine clinicians at the Southern Cross Travel Medicine conference and through established networks.
Results: The majority of the 69 respondents were Australian based travel medicine clinicians (84%, 58). Thirteen (18%) reported taking a sexual history for all clients. Others reported determining STI risk based on the reason for travel (67%,46) or disclosed risk behaviours (58%,42). STI testing was most commonly conducted on client request (72.5%,50), or if clients were symptomatic (47.8%,33). Client request was also the most common reason for providing sexual and reproductive health information (60.9%,42), with the importance of safer sex practices (78.3%,54) and STI testing on return (50.7%,35) the most frequently discussed topics. Fewer reported discussing emergency contraception (37.7%,26), HIV post-exposure prophylaxis (PEP) (30.4%,21) or pre-exposure prophylaxis (PrEP)

(29%,20), though the proportion discussing PrEP (59.4%,41) and PEP (53.6%,37) increased when male clients.
Conclusions: Travel medicine consultations provide a valuable opportunity for promoting sexual and reproductive health amongst travellers However, our study highlights that currently there is an ad-hoc approach to providing sexual and reproductive health information and clinical services. A more proactive approach would enhance the sexual and reproductive health of individuals while also facilitating an important public health role for the wider community. Professional development, particularly around the provision of biomedical HIV prevention (PrEP/PEP) would support travel medicine clinicians to provide comprehensive sexual and reproductive health care.

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Tick-borne Encephalitis Morbidity and Mortality in the Czech Republic

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Background: Tick-borne encephalitis (TBE) is a severe acute neuroinfection transmitted predominantly by tick bite or consumption of raw milk. The incidence of TBE is particularly high in Central Europe but foci of infection are still spreading to other countries as well as to higher altitudes. The disease affects all age groups including children. With increasing age, both the clinical severity of the disease and the risk of complications and sequelae increase. There is an effective, safe and well-tolerated vaccine against TBE, which in practice shows 96-99% effectiveness.
Objectives: To describe the trends and characteristics of tick-borne encephalitis cases in the Czech Republic and in the context of current epidemiological situation in Europe.
Methods: Retrospective descriptive analysis of case-based TBE data from the Czech nationwide infectious disease reporting system.
Results: In 2020, 854 TBE cases were reported in the Czech Republic with an incidence of 7.98 per 100,000 inhabitants, which represents the highest morbidity in the last 9 years and a continuation of the increase in incidence for six years, although the highest number of cases reported in 2006 was not exceeded. In 2021, a total of 589 cases of TBE were reported (incidence rate of 5.5 per 100,000 inhabitants), breaking the continuous increase between 2015 and 2020. According to preliminary data for 2022, the number of cases increased again, reaching 697 cases with an incidence of 6.6 per 100,000 inhabitants. The incidence of TBE in children and adolescents increased from 11.3% in 2015 to 17.7% in 2021.
The number of deaths from TBE ranges between 2 and 6 cases per year, i.e. less than 1% of patients. Deaths are mainly recorded in people over 60 years of age, but occasionally affect a young adult or child.
Conclusions: The Czech Republic is one of the countries with the highest TBE incidence in Europe and the number of cases is moreover increasing. The proportion of TBE in children and adolescents is growing. Vaccine prevention is desirable in all age groups.
Acknowledgement: The study was supported by the Czech Science Foundation, project 22-24920S.

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Antibody Kinetics and Dose-response to the Chikungunya Vaccine Candidate VLA1553 Confirmed with the Regulatory-endorsed Serological Endpoint Assay

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Background: VLA1553 is a live-attenuated, single dose investigational vaccine candidate targeting the chikungunya virus, the only vaccine candidate that completed phase 3 testing to date. In a phase 1 study which included frequent sampling to determine antibody kinetics, a micro Neutralization Test (μNT) was performed. For phase 3 development a micro Plaque Reduction Neutralization Test (μPRNT) was applied to determine seroresponse, used as a surrogate endpoint for licensure trials. In addition, different VLA1553 formulations were used: in the phase 1 study liquid frozen drug product

was given and for the subsequent clinical trials, a lyophilized drug product with an improved stability profile has been applied.
Objectives: Re-evaluation of phase 1 sera with the µPRNT assay used in phase 3.
Methods: A blinded, randomized phase 1 clinical trial evaluated the immunogenicity of three dose levels (low dose $3.2x10^3$/0.1mL; medium dose $3.2x10^4$ /1mL or high dose of $3.2x10^5$ half maximal tissue culture infectious dose/1mL) of VLA1553, administered as a single intramuscular immunization in 120 participants (NCT03382964). Immunogenicity data was collected at Day 7, 14, 28, 84, 180, and 365 post-vaccination. Seroresponse was defined as CHIKV-specific neutralizing antibody titer of $\mu PRNT_{50} \geq 150$. Retesting of samples from phase 1 study VLA1553-101 with the µPRNT was performed for comparison.
Results: High Geometric Mean Titers (GMTs) were already reached at Day 14 post-vaccination (range of different dose groups $\mu PRNT_{50}$ of 1815-3013; 90 participants tested) and peaked at Day 28 post-vaccination (range of different dose groups 4471-5034; 90 participants tested). GMTs decreased until Day 365 but remained at high levels (range of different dose groups 851-1138; 91 participants tested). Seroresponse was achieved in all participants from Day 14 onwards, except for one participant at Day 365.
Conclusions: Re-evaluation of phase 1 sera with the µPRNT assay showed 100% seroresponse from Day 14 post-vaccination. Immunogenicity data for the three different dose levels of liquid-frozen formulation of VLA1553 used in the phase 1 study were at a similar magnitude to titers seen in phase 3 studies of the lyophilized product presentation intended for licensure, confirming comparable immunogenicity of both formulations.
Conflict of Interest: All authors are employees of Valneva.

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One Year Antibody Persistence and Safety of a Live-attenuated Chikungunya Virus Vaccine Candidate (VLA1553) in Adults Aged 18 Years and Above

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Background: VLA1553 is a live-attenuated chikungunya virus (CHIKV) vaccine candidate designed for active immunization as a prophylactic measure for individuals travelling to or living in endemic areas. Due to the sporadic epidemic occurrence of chikungunya, an immunological surrogate to assess clinical efficacy was accepted by regulators (FDA and EMA).
Objectives: To evaluate persistence of antibodies annually from 1 to at least 5 years after a single immunization with VLA1553.
Methods: This phase 3 open-label, single arm long term antibody persistence and safety trial (VLA1553-303) follows a subset (N=363) of VLA1553 vaccinees from the pivotal phase 3 trial (VLA1553-301) where 4,115 adult participants received VLA1553 or placebo. The main aim of VLA1553-303 is to annually assess (at least until Year 5) the proportion of participants from study VLA1553-301 with seroresponse (defined as $\mu PRNT_{50} \geq 150$). Additionally, the frequency and relatedness of any serious adverse event (SAE) until Year 2 is monitored. This presentation outlines the immunogenicity and safety data collected until Year 1.
Results: VLA1553-303 met its primary endpoint with a participant seroresponse rate of 98.9% at Year 1. Regarding GMTs, the initial Day 29 GMT for the group followed in the long term study was 3489 and remained high, with 1009 at Day 180 and 1056 at Year 1. Moreover, in older adults aged ≥65 years, antibody persistence was similar to younger adults throughout the follow-up. Four SAEs were reported in participants in study VLA1553-303 from 6 to 12 months post-vaccination. All cases were assessed as not related by the investigators, furthermore there was no persistent adverse event of special interest thus confirming that no safety concern was identified in study VLA1553-303 until Year 1.
Conclusions: VLA1553-303 demonstrated that antibody persistence was confirmed at Year 1 post-vaccination as a high seroresponse was maintained throughout the study. Furthermore, no safety concern was identified with all four SAEs being assessed as not related by the investigators; the safety profile from earlier studies was confirmed. This study further reinforces the VLA1553-301 results showing VLA1553 as a possible effective prevention of CHIKV disease.
Conflict of Interest: All authors are Valneva employees and own stock and share options in Valneva

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SARS-CoV-2 Infection Rates and Outcomes in Ethnic Minorities in Finland

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Background: Ethnic minorities in high-income countries have been reported to be at increased risk of SARS-CoV-2 infection and death.
Objectives: Our objective was to explore the infection rates and outcomes of COVID-19 in language minorities compared to the rest of the population.
Methods: In a retrospective observational population-based quality registry study covering a population of 1.7 million, we studied the incidence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), admissions to specialist healthcare and the intensive care unit (ICU), and all-cause case fatality in different language groups during the first pandemic wave in 2020 in Southern Finland. A first language other than Finnish, Swedish or Sámi served as a surrogate marker for a foreign ethnic background.
Results: In total, 124 240 individuals were tested, 4005 were COVID-19 positive, 623 were admitted to hospital, 147 were admitted to ICU and 254 died. Those with a foreign first language hade lower testing rates, higher incidence, and higher positivity rates. There was no significant difference in ICU admissions, disease severity at ICU admission, or ICU outcomes. Case fatality by 90 days did not differ between the groups after adjustments for age and sex.
Conclusions: The population with a foreign first language was tested less frequently and had a higher incidence of infections, but the risk for severe disease or death did not differ from those in the native, domestic language population. This suggests that special attention should be paid to the prevention and control of infectious diseases among language minorities.
Conflict of Interest: No conflicts of interests.

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Complicated Dengue in Travelers from Non-endemic Areas: A GeoSentinel Analysis, 2007–2022

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Background: Dengue is an important cause of travel-associated morbidity. Data on the epidemiology and clinical characteristics of “complicated” dengue (warning signs or severe dengue) in travelers are limited.
Objectives: We aimed to describe the epidemiology, clinical manifestations, and outcomes of complicated dengue in international travelers.
Methods: We conducted a chart review of epidemiologic, demographic, and clinical data of travelers with complicated dengue reported to GeoSentinel from January 2007 to July 2022. Warning signs and severe dengue criteria were adapted from WHO 2009 guidelines.
Results: Of 5,958 patients with dengue, 95 (2%) had complicated dengue. Eighty-six (91%) had chart review completed and were included. Sixty-eight cases were confirmed (RT-PCR, NS-1 antigen detection, or four-fold increase in antibody titers); diagnosis was probable (single IgM-detection) in 11, and clinical in 7. The median age was 34 years (range 8–91); 56% were female. Patients acquired dengue in the Caribbean (31%), Southeast Asia (24%), Oceania (13%), sub-Saharan Africa (12%), South America (11%), and South-Central Asia (9%). Frequent reasons for travel were tourism (46%), visiting friends and relatives (32%), and business (12%). Two-thirds (67%) of patients traveled less than four weeks; 25% had medical comorbidities.
Seventy-eight patients (91%) were hospitalized, for a median duration of 5 days [interquartile range (IQR) 3–8]. Thirteen of 77 (17%) patients were admitted to an intensive care unit (median duration 3.5 days [IQR 2.5-8]).
Twenty-five (29%) had severe dengue. One patient died from non-dengue-related illnesses. Common laboratory findings and signs were thrombocytopenia (78%), elevated transaminases (62%), bleeding (52%), and plasma leakage (20%). We observed neurologic symptoms (5 of 80 patients; 6%), myocarditis (2 of 77 patients; 3%), and abnormal ophthalmological exams (6 of 27 patients; 22%).
Prior dengue was reported by 6 patients. Thirty-two confirmed cases with dengue IgM+/IgG- acute phase sera were classified as primary, and twelve IgM-/IgG+ acute phase sera were classified as secondary infections.

Table 1. Clinical characteristics of 86 patients with complicated dengue* reported to GeoSentinel, 2007–2022

Characteristics		n/N	%
Symptoms	○ Abdominal pain	40/78	51
	○ Vomiting	38/83	46
Clinical findings	Evidence of plasma leakage	15/75	20
	○ Mild / Moderate *(pleural, pericardial, or peritoneal effusion, but no hemodynamic instability or respiratory compromise)*	9/75	12
	• Severe *(Hemodynamic instability or respiratory compromise)*	6/75	8
	Bleeding manifestations	44/85	52
	○ Mild *(submucosal or subcutaneous bleeding)*	18/85	21
	○ Moderate *(Required intervention, but no hemodynamic instability)*	18/85	21
	• Severe *(Hemodynamic instability, blood transfusion, ICU, bleeding involving a critical organ, or leading to death/ disability)*	8/85	9
	Signs of neurologic disease	5/80	6
	○ Mild *(Lethargy, restlessness)*	3/80	4
	• Moderate *(GCS < 15 but ≥ 12 for < 48 hrs)*	1/80	1
	• Severe *(GCS < 11, ICU, death, or sequelae > 48 hrs)*	1/80	1
	• Myocarditis	2/77	3
	○ Hepatomegaly (>2 cm)	8/73	11
Lab findings	Liver disease	47/81	58
	• Severe (*ALT > 10 x ULN)*	16/81	20
	• Other end organ damage/ dengue eye disease [a]	3/27	11
Other	Splenomegaly	6/72	8
	Thrombocytopenia	63/81	78
	Mild *(platelet count 150,000-50,000/µL)*	2/81	2.5
	Moderate *(platelet count 50,000–20,000/µL)*	44/81	54
	Severe *(platelet count <20,000/µL)*	17/81	21
	Elevated ALT <10 x ULN	31/81	38
Hospitalization	At any point in clinical course	78/86	91
	During travel	31/86	36
	Median duration of hospitalization *(days, IQR)* [b]	5 (3–8)	
	Intensive care admission	13/77	17
	Median duration of ICU stay *(days, IQR)*	3.5 (2.5–8)	
Deaths		1/86	1

*Legend Table 1: * Complicated dengue is defined as dengue with warning signs or severe dengue.*
n/N denotes the proportion of the count (n) and the number (N) of records available for analysis.
○ denotes warning signs (cf. WHO 2009 guidelines); • denotes severe disease.
ALT = alanine aminotransferase; ULN = upper limit of normal.
GCS = Glasgow Coma Scale
ICU = admission to an intensive care unit
IQR = interquartile range
Lab = Laboratory
Respiratory compromise = increased respiratory rate for age, or signs of increased work of breathing, or need for additional support (including oxygen supplementation or intubation).
[a] Findings included acute vision loss, maculopathy, and retinal hemorrhage.
[b] Of 75 with information available.

Conclusions: Complicated dengue is relatively rare in travelers with dengue virus infection. Clinicians should monitor patients with dengue closely for laboratory findings and signs that may indicate progression to severe disease. Complications, including eye disease, need further study to determine their frequency and outcomes in travelers.

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Use of Online Business Profiles in Marketing Travel Medicine Practitioners and Assessing Demands of Clients Seeking Travel Medicine Services in Kenya

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Background: Finding travel medicine services in Kenya continues to pose various challenges, especially due to inadequate awareness of the availability of these services as well as the low number of clinics offering these services. Online searches remain one of the best ways for people seeking travel medicine services to locate them and these services can objectively assess the exact services that are being demanded.
Objectives: To assess the utility of online business profiles in increasing visibility and evaluating the demand for travel medicine services in Kenya.
Methods: Through an online business profile, the Google Business Profile of the Tropical/Travel Medicine and Infectious Disease service at CA Medlynks Medical Centre and Laboratory in Nairobi, Kenya, a review of the searches and interactions made by clients was undertaken to assess the demand for travel medicine services.
Results: Between August 2022 and January 2023, 7108 people viewed the business profile of the travel medicine service, with 2327 Google searches showing the travel medicine business profile in the search results. Of these searches, 1417 (60.9%) were travel medicine-related searches, with 1338 (94.4%) of these being for yellow fever-related services.
Conclusions: Online business profiles are important in offering objective assessments of the demand for travel medicine services in Kenya, which is quite high with the majority of these services being yellow fever related. Thus, there is a need to maximize the benefits of these profiles in tailoring and expanding travel medicine services to serve this growing demand.

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Safety and Tolerability of Miltefosine Treatment for Cutaneous Leishmaniasis: An Observational Study

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Background: Treating cutaneous leishmaniasis (CL) is a major challenge for clinicians worldwide. Miltefosine, an orally administered drug, is an important component in the therapeutic arsenal against leishmaniasis. However, data focusing on its safety and tolerability in CL is limited.
Objectives: The aim of this observational study was to evaluate the safety, adverse events (AEs) and tolerability of miltefosine treatment for patients with CL.
Methods: We reviewed medical records of all miltefosine-treated patients at military dermatology clinics and 2 large tertiary medical centers for epidemiological and clinical data.
Results: 68 patients (54 males, 14 females) at a mean age of 30.3 years (range 18-88) were included in the study. The causative agent was identified as *L. major* in 37 cases, *L. tropica* in 12 cases, *L. brasiliensis* in 18 cases and *L.infantum* in one case. Most patients had received previous topical or systemic treatment to which they failed to respond satisfactorily.
Forty-four patients (65%) completed the 28-day miltefosine treatment while 24 patients (35%) required early discontinuation of treatment due to the development of AEs. Nine patients (13%) were referred to emergency departments or were hospitalized because of severe AEs. AEs were categorized as mild in 29 patients (43%), moderate in 16 patients (23%) and severe in 17 patients (25%). To note, only 6 patients (9%) were free of any AEs. The most common adverse effects were GI symptoms reported by 66% of patients, followed by malaise (24%). AEs related to male genito-urinary system including scrotal pain, epididymitis, and decreased volume of ejaculate were common among males (40%). Six patients (9%) experienced a sudden onset of severe chest pain that necessitated treatment discontinuation and referral to medical treatment. Suppuration of existing cutaneous lesions, acne

exacerbation, arthritis and rash were also documented.
Laboratory abnormalities included acute elevation of serum creatinine (21%), elevated liver enzymes (17.7%), anemia, neutropenia, thrombocytopenia and hyperkalemia (<5% of cases)..
Conclusions: In our study, miltefosine tolerability was moderate and AEs, including serious AEs, were common. Some of the AEs described herein have not been previously reported. Close clinical and laboratory monitoring during miltefosine treatment is therefore required to prevent the development of severe AEs.
Conflict of Interest: None

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Availability of Antimalarial Medications at Community and Hospital Pharmacies in the Greater New Orleans Metropolitan Area

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Background: The availability of antimalarial medications remains a barrier to the treatment of malaria in non-endemic settings. New Orleans is an urban center in the Southern United States that receives millions of international visitors annually and is a hub for travel to Central America and the Caribbean.
Objectives: The objective of the study was to survey community and hospital pharmacies in the Greater New Orleans (GNO) Area regarding the availability of antimalarial medications.
Methods: We identified all retail community and inpatient pharmacies in the GNO Area. Pharmacists at each community pharmacy were asked about the availability of the following antimalarial medications: hydroxychloroquine, chloroquine, atovaquone-proguanil, artemether-lumefantrine, quinine, primaquine, mefloquine, and tafenoquine. Inpatient pharmacy formularies were reviewed for the availability of the same antimalarial medications, as well as intravenous artesunate. In addition, we inquired about the turnaround time to acquire medications not in stock and the cost to the pharmacy of antimalarial medications.
Results: We identified 111 community pharmacies, including 32 independent pharmacies and 4 chain pharmacies with multiple locations, and 7 hospital pharmacies. Aside from hydroxychloroquine, which was available at 100% of pharmacies, the availability of antimalarial medications was low (Table 1). Artemether-lumefantrine was only available at one retail chain pharmacy in 4 out of 27 chain locations. Tafenoquine was not available in any outpatient pharmacy. If not in stock, the average turnaround time to acquire antimalarial medications at community pharmacies was 1 business day within New Orleans city limits and 2 business days outside of city limits. The availability of antimalarial medications at hospital pharmacies was as follows: hydroxychloroquine (100%), atovaquone-proguanil (100%), primaquine (100%), artemether-lumefantrine (63%), quinine (63%), chloroquine (0%), tafenoquine (0%), IV artesunate (0%). The per-dose cost to the pharmacy of antimalarial medications ranged from $0.25 for chloroquine to $5,246.25 for IV artesunate.

	Independent Pharmacies (n = 32)	Chain A (n = 27)	Chain B (n = 27)	Chain C (n = 11)	Chain D (n = 14)
Hydroxychloroquine	100%	100%	100%	100%	100%
Chloroquine	4%	7%	0%	0%	0%
Atovaquone-proguanil	20%	44%	41%	33%	41%
Artemether-lumefantrine	0%	4%	0%	0%	0%
Quinine	11%	11%	7%	0%	8%
Primaquine	2%	0%	31%	0%	8%
Mefloquine	2%	19%	10%	0%	17%
Tafenoquine	0%	0%	0%	0%	0%

Table 1: Availability of Antimalarial Medications at Community Pharmacies in the Greater New Orleans Metropolitan Area

Conclusions: Except for hydroxychloroquine, the overall availability of antimalarial medications at pharmacies in the Greater New Orleans Metropolitan Area is inconsistent and is a barrier to treatment. With the increasing risk of malaria transmission in non-endemic settings due to international travel and climate change, the inaccessibility of antimalarial medication poses a growing public health risk.

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Profile of International Travelers Visiting a Chilean University Travel Center

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Background: An international travel brings some risks especially traveling from industrialized to developing countries. Travel medicine addresses these problems and advice travelers to prevent them. Travelers from South America have been less studied, as most of the travel medicine knowledge comes from developed regions.
Objectives: To determine the characteristics of travelers seeking pre-travel advice at a Chilean travel medicine center.
Methods: This is a retrospective cross-sectional study that included all travelers who consulted prior to a trip at the Center of Travel Medicine of the UC-Christus Health Network, in Chile, during the period 2012 to 2020. Electronic clinical records were revised and demographic data, travel characteristics and recommendations were collected in an Excel spreadsheet.
Results: During the period, 1412 travelers consulted, 63 were excluded because the visit was for post-travel morbidity or lack of information in the clinical record. We analyzed 1349 travelers, 755 women (56%), 1297 Chileans (96,1%). The median age was 31 years (SD 17. 5; range 4 months-84 years old). The median duration of the trip was 3 weeks (SD 31. 8; range 1 week-5 years). We considered 765 subjects (56.7%) as complex travelers because of pregnancy, extreme ages, immunosuppression, advice on yellow fever vaccination, malaria prophylaxis and anticonception. The main reason for the travel was tourism (81%) followed by business (9%). The most visited regions were South America (35%), Southeast Asia (26%) and Africa (12%). Thailand was the most visited country (18.2%), followed by Brazil (14.9%) and India (11.3%). Repellent with DEET ≥30% was indicated in 1037 (76.8%) travelers. Prevention of traveler's diarrhea was given in 1029 (76.3%) travelers, of whom 704 (68.4%) were advised to use antibiotics as self-treatment (ciprofloxacin 298/698 or azithromycin 402/698). In addition, 491 (36.3%) of the travelers required malaria prophylaxis. The most frequent was atovaquone/proguanil (66%), followed by mefloquine (16.9%) and doxycycline (13.8%). The most indicated vaccines were tetanus (605;46.6%), typhoid fever (553;42.6%), hepatitis A (527; 40.6%), yellow fever (438;33.7%) and hepatitis B (313;24.1%).
Conclusions: The profile of travelers corresponded to Chilean young and young adults, traveling for tourism, within South America followed by Southeast Asia. Many travelers needed recommendations that require a trained professional in travel medicine. The knowledge of the characteristics and needs of international travelers in Chile is a contribution for development of clinical guidelines and to decision-making on resources, availability of vaccines and prophylaxis at the country level.

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Incorporating Pretravel Consultation into Primary Care Clinics

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Background: Canadian residents made 12.3 million trips overseas (to countries other than the United States) in 2019. In Canada, specialized travel medicine clinics exist, which for a consultation fee, provide pretravel assessment and recommendations. However, many individuals are not aware that by traveling they are at an increased risk of travel-related morbidity and thus may not seek advice from travel clinics. Others are deterred by the cost of pretravel consults at the travel clinics. Yet, provision of comprehensive pretravel health advice is essential to reduce travel-related illness. Primary care clinics (family practice) are well positioned to provide such high-quality pretravel advice.
Objectives: To establish a travel medicine program within our primary care clinics, Harrison Healthcare, in Vancouver, British Columbia, and Calgary, Alberta in order to provide comprehensive pretravel advice and preparation.
Methods: 1. Training appropriate personnel: a traveler's health and safety depend on a practitioner's level of expertise in providing pretravel counseling and vaccinations. At Harrison Healthcare, a nurse practitioner (NP) with the ISTM Certificate in Travel Health established the program in Vancouver and

an NP with extensive experience in travel medicine established the program in Calgary. Jointly, they created the standard operating procedures and trained registered nurses to provide high-quality pretravel consults. Both NPs are members of the ISTM.
2. Obtaining the Yellow Fever Designation from the Public Health Agency of Canada in order to provide yellow fever vaccines at our clinics.
3. Procuring various travel vaccines from different suppliers, including rabies and Japanese encephalitis vaccines.
4. Educating the primary care patients that pretravel consultations are an essential aspect of health maintenance and affirming that their primary care clinic is a "one-stop shop" where they can obtain such pretravel consults.
Results: Over the past year, we have solidified our travel medicine program and trained 6 registered nurses to provide travel consults along with the two nurse practitioner leads. A comprehensive risk assessment for each individual traveler is conducted in order to accurately evaluate the risks, and to advise on the most appropriate risk management interventions to promote health and prevent adverse health outcomes during travel. The most common topics in pretravel consultation were immunizations, malaria chemoprophylaxis, advice on exposure prophylaxis, and general health promotion and disease prevention advice. Utilization of our travel consultation program exceeded our expectations. Patients reported high level of satisfaction.
Conclusions: Primary care clinics with practitioners knowledgeable in travel medicine are well positioned to provide comprehensive pretravel advice.

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Benefit of Primaquine in *Plasmodium ovale* Infections: A Systematic Review

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Background: Although the burden of malaria remains high, some *Plasmodium* species are still neglected including *P. ovale*. The World Health Organisation recommends treating *P. ovale* with a 14-day course of primaquine, in all transmission settings, to prevent relapses, but the evidence refers predominantly to research on *P. vivax*. The potential benefit of radical treatment is questionable.
Objectives: We performed a systematic review of the literature to evaluate current evidence for relapses, their potential mechanisms, and the benefit of primaquine in *P. ovale* infections.
Methods: All publications from 1923 to September 30th, 2022, were searched in PubMed, 221 were identified and screened, and 31 were found eligible.
Results: Eighty-seven cases of relapsing *P. ovale* have been reported. Although a prospective study noted that relapses could occur according to the sub-species (out of 26 infections, no relapse of *P. ovale wallikeri* was observed vs 12 of *P. ovale curtisi*), relapses in *P. ovale wallikeri* have been reported elsewhere. One study on the underlying mechanism was carried out in mice engrafted with human hepatocytes and red blood cells and suggested that *P. ovale* could display hypnozoites. The clinical benefit of primaquine was addressed in 4 studies. In two observational studies in travellers treated with primaquine after a *P. ovale* infection (n=4 and 19, respectively), no relapse was observed, unlike for *P. vivax* (3/9 and 5/7, respectively). A nationwide retrospective study in Sweden showed that relapses were significantly more frequent in *P. vivax*- than in *P. ovale*-infected patients (9.3%, 80/857 and 4.1%, 9/220, p=0.01). Treatment with primaquine was associated with a reduced risk of relapse of 80% for *P. vivax* (p <0.001, HR 0.2, 95% CI 0.1-0.3) but was non-significant for *P. ovale* (p=0.09, HR 0.3, 95% CI 0.1-1.3). A randomised double-blind placebo-controlled trial in Papua New Guinea found a significantly lower number of infections in the primaquine versus placebo group, both for *P. vivax* and *P. ovale* (63 vs 167 infections, p < 0.001, HR 0.18 95% CI 0.14-0.25 and 7 versus 17 infections, p=0.011, HR 0.31 95% CI 0.13-0.77). Safety was addressed in the two observational studies, with adverse effects in 1/14 and 3/60 patients.
Conclusions: It now seems recognized that *P. ovale* can cause relapses although they remain rare. Further trials in non-endemic settings are required to correctly address the remaining question of primaquine’s benefit in these infections.

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The Clinical Case of Diffuse Cutaneous Leishmaniasis Imported to the Czech Republic from Central America

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Background: Cutaneous leishmaniasis (CL) represents rare, chronic parasitic skin infection imported to the Czech Republic from Mediterranean, Middle East and Latin America predominantly. There are managed two cases of CL at our department each year in average.
Objectives: We are presenting the case of diffuse CL caused with Leishmania mexicana complex in immunosuprressed patient with history of travel to the Central America treated at the University Hospital Bulovka in Prague.
Methods: CL are diagnosed using the biopsy or the tissue smear from the edge of skin ulcer stained with hematoxylin-eosin or Giemsa. The infection and species determination are confirmed with PCR and subsequent sequencing of the ribosomal RNA.
Results: A 57 year old man presented to our department with three non-healing lesions on the right knee, on the left cheek and over his upper lip and nasal mucosa since March 2019. He was diagnosed with Crohn disease in 1988, but he was in remission since 2012. The bacterial culture from ulcers was positive for MSSA, lesions were diagnosed as pyoderma gangrenosum, but systemic and local antibiotic treatment was unsuccessful. He was investigated at our department for the first time in January 2021. As there was history of travel to Mexico and Belize in November 2018, a biopsy and smears from ulcers were performed and have shown leishmanial amastigotes. PCR and sequencing of ribosomal DNA have proven infection with Leishmania mexicana complex. Cellular immunity investigation detected lymphopenia (744/µl) and CD3 (530/µl), CD4 (260/µl), CD8 (240/µl) deficiency. The treatment with high dose (cumulated dose 37 mg/kg) liposomal amphotericin B for more than 2 months was unsuccessful and smears from lesions continued to be positive for amastigotes. Detailed immunology investigation was performed and other immunodeficiency causes were excluded. The patient had achieved complete clinical, parasitology and immunology recovery with combined systemic treatment with miltefosine 50 mg tid for 5 weeks, local application of 15% paromomycine ointment and supportive therapy with swine-derived transfer factor.
Conclusions: CL has to be considered in patients with non-healing skin lesions from endemic regions. Our experiences with diagnostics and treatment of CL will be presented.

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A Combined Cross-sectional Analysis and Case-control Study Evaluating Tick Borne Encephalitis Vaccination Coverage, Uptake and Vaccine Effectiveness in Children 0-17 in Switzerland

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Background: TBE is an important, tick-transmitted viral infection of the central nervous system. While TBE is generally considered to be milder in children compared to adults, evidence points toward an underdiagnosis of TBE cases in children and suggests that even mild TBE in children can lead to lasting cognitive impairments. TBE vaccination has been recommended in Switzerland in defined risk areas from 6 years of age since 2006. However, the level of coverage, as well as patterns of TBE vaccine uptake have not yet been well-described. Furthermore, vaccination coverage and vaccine breakthroughs among childhood TBE cases, are also not well-understood.
Objectives: We will evaluate TBE vaccination coverage, uptake and compliance among children and TBE cases reported in Switzerland aged 0-17. We will also assess TBE vaccine effectiveness among those 0-5 and 6-17.

Methods: Using data from the Swiss National Vaccination Coverage Survey and mandatory disease reporting data from the Swiss Federal Office of Public Health, we assessed national and regional vaccination coverage among children and reported TBE cases aged 0-17 between 2006 and 2021.
Results: 401 TBE cases were reported in children and adolescents aged 0-17. 22% occurred in children <6, 39% in those 6-11, and 39% in those 12-17. Disease severity was similar among age groups. Among cases with a known vaccination status (n=337), 10% had a history of vaccination; 44% had received 1-2 doses (incomplete vaccination), while 56% had received 3 or more doses (complete vaccination). 4.1% of those <6 were vaccinated (all incomplete), 7.5% of those 6-11 (40% incomplete, 60% complete), and 16.2% of those 12-17 (38% incomplete, 62% complete). For comparison, vaccination (1+ doses) among 8 and 16 year-olds in the general population was 33% and 26% from 2008-2010 and increased to 64% and 55%, respectively, by 2021. Coverage varied by region, but, was highest in Zurich and Eastern Switzerland (areas with high TBE incidence and longstanding vaccination recommendations), and lowest in Geneva and Ticino (low incidence and no current vaccination recommendations).
Conclusions: Awareness of nationwide TBE vaccination patterns and a better understanding of vaccination breakthroughs can provide valuable information to lend support and improve the current vaccination schedule in Switzerland.

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Validation of FeverTravelApp: A Clinical Decision Support Algorithm for Managing Fever in the Returning Traveler or Migrant

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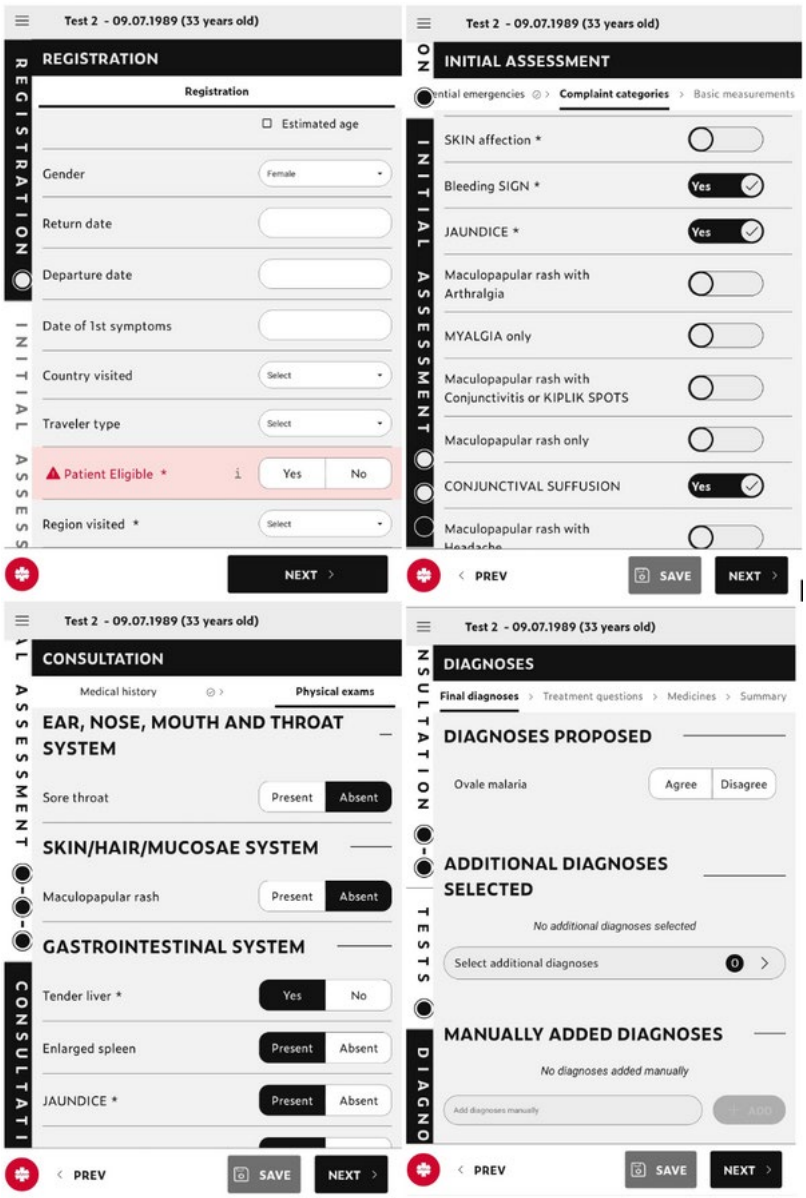
Background: Most infections causing fever in returning travelers and migrants are self-limiting, but some pose a difficult management challenge. To address this problem, we conceived FeverTravelApp, an app developed by a team of medical and IT specialists, based on a systematic review of relevant literature on management of fever in the returning traveler or migrant. A working prototype of FeverTravelApp was presented at the CISTM16 and was then completely reprogrammed with a new suite of tools.
Objectives: - To determine the diagnostic accuracy provided by the use of FeverTravelApp
- To assess whether evaluating a clinical case with FeverTravelApp is safe
- To evaluate the impact of FeverTravelApp use on the number of laboratory tests performed and the rate of empirical antibiotics prescribed.
Methods: We conduct a retrospective validation of the tool based on 765 febrile travelers or migrants collected during a previous study (EFFORT). Clinical data (demographic, exposure, symptoms and signs) is extracted from EFFORT's dataset and entered into FeverTravelApp. The output is compared with the EFFORT's diagnosis(es) established by the experts.
We then measure safety by the rate of serious and critical diagnoses missed by the app that could have led to poor outcomes.
Finally, the rate of empiric antibiotic prescription and laboratory tests recommended by the app are compared to those performed by the expert clinicians in the EFFORT Study.
Results: Final results are still pending. In the database, among 765 enrolled participants, 310 (40.5%) had a clear source of infection (mostly traveler's diarrhea or respiratory infections) and 455 (59.5%) were categorized as Acute Undifferentiated Febrile Illness. Among them, 132 had viral infections, including 108 arboviruses (mainly Dengue), 96 malaria and 82 bacterial infections. The sensitivity and specificity of FeverTravelApp for each diagnosis is being calculated, as well as the rate of serious diseases missed, the difference in antibiotic prescription rate and in the median number of laboratory tests performed per patient.
Conclusions: The development of FeverTravelApp, intended for use by general practitioners, may promote development and evaluation of safe, effective and appropriate care of fever in returning travelers and migrants.
Beyond its function as a decision support tool, the App could represent an innovative approach for "almost real-time" epidemiological surveillance and play a significant role in a data-driven health system.



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Clinical-epidemiological Profile of Suspected Mpox Cases Diagnosed in a Reference Center

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Background: Mpox virus (MPXV) has been known to infect humans since 1970. As of May 2022, due to unusual outbreaks outside of the African continent, mpox was declared a public health emergency of international concern by the World Health Organization. In Brazil, the Universidade Federal do Rio de Janeiro (UFRJ) has been designated as one of the national reference centers for molecular diagnostics of mpox and viral isolation. The first case of the state of Rio de Janeiro (RJ) was diagnosed on June 14th. Classically, the disease presents with systemic symptoms preceding a generalized, synchronous rash. In the current outbreak, there are some atypical features among confirmed cases, such as absence of systemic symptoms, presence of fewer and polymorphic cutaneous lesions, and genital/perianal involvement.
Objectives: To describe suspected mpox cases in RJ and features associated with mpox diagnosis.

Methods: Suspected cases from RJ diagnosed at UFRJ were included and clinical/epidemiological information was extracted from the RJ notification form database. The study was approved by the institutional ethics review board (CAAE: 62281722.5.0000.5257). MPXV PCR was used for diagnostic confirmation and differential diagnoses were explored when applicable. Statistical analyses were performed using R version 4.2.2.
Results: Up to December 31st, 2915 patients had been notified as suspected mpox, and 784 tested positive (27%). Among confirmed cases, median age was 32 years, most (92%) were male and auto-declared (84%) as men who have sex with men (MSM). The most reported symptoms were rash, fever, headache and adenomegaly. Rash in anal (OR 4.87, 95% CI 3.40-7.02) or genital (OR 4.80, 95% CI 3.96-5.81) regions were most strongly associated with a mpox diagnosis. Although not as frequently reported, the presence of proctitis was also strongly associated with mpox diagnosis (OR 6.39, 95% CI 3.31-13.0). Seven patients reported having returned from a foreign country in the 21 days preceding symptoms onset.
Conclusions: Clinical characterization of mpox in the current outbreak is fundamental to guide rational diagnostic investigation. Given the wide clinical picture and similarities to other exanthematous diseases and STIs, clinicians must have a low threshold for suspicion. Early testing favors quick diagnosis, isolation, and interventions most adequate for each etiology.

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An Update on Japanese Encephalitis Disease Burden and Vaccine among Travelers: A Scoping Review

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Background: Japanese encephalitis (JE) remains the main public issue for individuals living in endemic areas, as well as international travelers. The majority were reported travelers' cases in Southeast Asia. Most of them are mild but a few had long term consequences and death. However, these are preventable by effective vaccine. The true incidence among travelers is under report. In addition, diseases awareness and vaccine acceptance are needed.
Objectives: The objectives of this review are to describe the current JE situation in 2017-2022, vaccine acceptance and vaccine strategies for travelers.
Methods: We identified potential studies from MEDLINE via PubMed, as well as the reference lists of selected studies published up to 2022. Two investigators (Amornphat Kitro and Punyisa Asawapaithulsert) developed search strategies that were accepted by the team. The search terms and strategies for each database were "Japanese encephalitis," "traveler", "travel", "expatriate", "Japanese encephalitis vaccine," and "acceptance" included the search terms.

Results:

Approximately, 3 billion people reside in JE endemic countries. Between 2017 and 2022, the incidence among local individuals has been reduced from 67,900 to around 2,000 cases per year, owing to increasing vaccine coverage or natural immunity. From 1973 to 2022, of 85 JE cases among travelers from non-endemic countries were documented. The overall risk for travelers from nonendemic countries was approximately 1 case per million. However, incidence among local residents could not be directly inferred the risk of infection among travelers. Risk for JE among travelers determined by travel destinations, duration of stay, itinerary, activities, travel season, and history of immunization. Only 0.2-28% of Western travelers were vaccinated against JE following pre-travel consultation. The main reasons of incomplete immunization were lack of time, high vaccine costs, and unawareness. An accelerated 2-dose regimen of Vero cells (JE-VC) is a promising choice for travelers that provides adequate seroprotection similar to a standard 2-dose regimen. Moreover, a single dosage of live-attenuated vaccine (JE-LV) may be an alternative for last-minute travelers with 96.2% vaccine effectiveness after 5-year.
Conclusions: The estimated JE incidence and burden local residents were much lower than travelers. The key role of travel medicine doctors should focus on knowledge sharing, awareness enhancement and vaccine encouragement to diminish travelers' risk of JE along their trip.
Keywords: Japanese encephalitis, disease burden, Japanese encephalitis vaccine, traveler, reported cases, pre-travel consultation

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Evaluating the First Year of 'Respond': A Novel Service for Asylum-seekers in the UK

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Background: In 2021, an unprecedented number of individuals came to the UK to claim asylum, and the impact of the pandemic compounded pre-existing delays to the processing of asylum claims. As a result, many people were placed in 'contingency accommodation' around the country, and many struggled to access appropriate healthcare. Our team designed a community-based model of delivering care for asylum-seekers to meet this need called 'Respond'. The model is designed to

overcome barriers in access to healthcare for asylum-seekers, providing a holistic and trauma-informed service to deliver equitable healthcare for an underserved group.
Objectives:

1. To summarise the Respond service metrics in the first year of activity
2. To describe the population accessing the Respond model of care
3. To assess the health needs of asylum-seekers accessing the Respond service
4. To assess the acceptability of the Respond service to service users and service providers

Methods: This was a mixed-methods service evaluation of the study period from 6th July 2021 to 25th October 2022. We analysed quantitative data from routinely collected electronic health records and performed semi-structured qualitative interviews with service users and service providers to assess acceptability.
Results: There were 1075 patients assessed in the Respond service during the study period. The majority were male (74.8%), with a mean age of 27.6 years. Patients were mostly from Iran (250/1053, 23.7%), Iraq (142/1053, 13.5%) and Afghanistan (89/1053 8.5%) but came from 74 countries in total. The majority came to the UK via the informal route (78.4%) and there was a high rate of reported health complaints, with 51.1% of people being diagnosed with a mental health issue and 44% diagnosed with an infection during screening. Semi-structured interviews demonstrated high acceptability of the service and reported the ease with which the service can be accessed, in contrast to experiences with healthcare prior to this.
Conclusions: This service evaluation represents the largest clinical dataset of asylum-seeking patients in the UK who have arrived via the informal route. There was a high level of reported health needs, and we demonstrated our ability to overcome common barriers to healthcare for asylum-seekers using our novel approach.

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Safety of Yellow Fever Vaccine in 58 Pregnant Women

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Background: Vaccination against yellow fever (YF) during pregnancy is contraindicated on theoretical grounds. The little data available, retrospectively collected from mass vaccination campaigns in yellow fever endemic areas, is reassuring. Few is available on pregnant women vaccinated for travel.
Objectives: We aimed to describe safety and efficacy of YF vaccination during pregnancy at our International Vaccination Center.
Methods: All pregnant women who received YF vaccine between January 2019 and December 2022 were identified retrospectively and subjected to a questionnaire on vaccination history, post-vaccination events, pregnancy outcome, and on any avalaible result of YF neutralising antibodies.
Results: A questionnaire was obtained from 58 pregnant women of median age 31 at vaccination [range 21-41]. Forty four women were vaccinated during the first trimester, 13 during the second and one during the third. It was a primary vaccination in 41 cases, a revaccination in 17 (1 lacking data). Eight women reported a local side effect, 13 general symptoms : nausea (5), delayed vomiting (1), tachycardia (1), transient fever (2), weeklong febrile episode leading to hospitalization 2 months after the vaccination (1), infections (3 : SARSCov2 mild infection 2 days after vaccination and pyelonephritis at the 9th month [1], diarrhea during travel [1], and malaria before delivery [1]). The imputability of YF vaccine appears unlikely in these last 4 cases.
Ten women were still pregnant at the time of the survey and declared no obstetrical complication. Forty four women gave birth at term, one prematurely at 32 weeks. Among those 45, there were 3 low weight newborns, one of which after a preeclampsia. Three women had a early spontaneous miscarriage (5,2%, lower than expected in the general population).
YF neutralizing antibody titers were available only in 9 women, but all above the protective level (>10).
Conclusions: The data collected in this survey argue in favor of the good tolerance of yellow fever vaccination during the first two trimesters of pregnancy. They provide safety information in women vaccinated outside yellow fever endemic areas, and deserve to be extended with prospective collection of clinical and immunological data.

previously_presented:: This abstract was selected for the CISTM17 in 2021 but was not presented (complete presentation was send out of delay). But this abstract was updated with a total number of available data much more important than for the first submission.

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Rabies Pre-exposure Prophylaxis, Comparison among Three Different Schedules

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Background: Rabies is a neglected disease with a case-fatality rate of almost 100% in humans who develop symptoms. By April 2018, World Health Organization changed the recommendation for pre-exposure prophylaxis (PreP), reducing the number of doses from three to two. The previous three doses schedule, followed by booster doses has never failed to prevent rabies, being considered 100% effective. Studies of meta-analysis have confirmed that even one or two doses still leads to long-term anamnestic response, but it is still required to accumulate experience in different countries and setting to ensure long-term confidence in this short schedule.
Objectives: To compare the seroconversion rate among three schedules of rabies PreP. Group 1: 3 doses administered by intramuscular injection (IM) at intervals of 0, 7, and 28 days. Group 2: 2 doses administered IM at intervals of 0 and 7 days. Group 3: 2 doses administered by intradermal injection (ID) at intervals of 0 and 7 days.
Methods: Participants were recruited in the Travel Medicine Clinic of the National Institute of Infectious Diseases (INI - Fiocruz), between September 2019 and July 2021 and distributed randomly among the three groups. Antibodies titers were analyzed by Simplified fluorescent inhibition microtest (SFIMT) 14 days and one year after the last vaccine dose. Those with non-reactive titers received a vaccine booster dose.
Results: We evaluated 313 subjects, 63 travelers, and 250 with an occupational indication for receiving PreP, randomized among the three arms: 104 (Group 1), 105 (Group 2), and 104 (Group 3). The median age was 39 years (IQR 33-45) and 80 percent were males. Group 1 was slightly younger (median age 36, compared to 41 and 40). All, except one in Group 2, seroconverted two weeks after the last dose. The median antibodies titer was significantly lower in group 2 (3,5), compared with group 1 (4,2) and 3 (3,9) p=0,042. After one year, 63 attended for blood collection, and 40 (64%) had reagent antibody titers. There was no significant difference among the Groups, although group 3 had the major number of participants with reagent antibodies after one year (71%). All those with non-reagent titers received a vaccine booster dose, and seroconverted.
Conclusions: This study also finds that the 2 ID doses PreP have similar results to those obtained with the previous schedule. This is very important to dimmish the costs, and the adhesion and allow immunization of last-minute travelers.

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Characterization of Travelers who Have a Travel Consultation in Portugal before and during the Covid-19 Pandemic

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Background: The SARS-CoV-2 pandemic has strongly affected international travel and reinforced the importance of pre-travel consultation, vaccination and risk assessment for disease prevention while traveling. We question whether the profile of the traveler and the respective trip has changed with the development of the pandemic in Portugal.
Objectives: To characterize and compare the traveler who gets a travel consultation in Portugal and the respective trip before and in 2 periods during the COVID-19 pandemic.

Methods: Observational, retrospective and descriptive study of travelers of the Travel Medicine Consultation at a Hospital Center in Portugal. Travelers from 3 periods were compared: before the pandemic (April to September 2019) and in 2 periods after the beginning of the pandemic (April and September 2021 and the same period in 2022). Data was collected through consultation of clinical files. Statistical analysis was performed with Microsoft Excel® and SPSS® version 25. The χ 2 and Kruskal-Wallis tests were used. A statistical significance level <0.05 was considered.
Results: In the 3 periods analysed, 257 users attended the consultation (105 in 2019, 37 in 2021 and 115 in 2022). The characteristics of the travelers and the trip are shown in Table 1. Post-pandemic travelers tended to be older and with more comorbidities, although these differences were not statistically significant. Regarding travel, although the main reason for travel was tourism in the 3 periods, in 2021 there was an increase in the proportion of professional trips and, in 2022, there was a recovery in tourist trips and visits to friends/relatives ($p<0.05$). The average duration of the trip was higher in 2021 ($p<0.05$), possibly explained by the increase in the proportion of travelling for work that year. The destinations also varied significantly in the three periods, but the most frequent remained the African continent, South America and Asia. It should be noted that Europe, usually a residual destination, accounted for 10.8% of total users in 2021 possibly due to restrictions and doubts regarding travel safety. In 2022, we observe a number of travel consultations similar to pre-pandemic numbers, which could be related to the normalization of the pandemic situation in Europe and the lifting of restrictions on travellers.

	2019 (n=105)	2021 (n=37)	2022 (n=115)	p value
traveler characteristics				
Median age (years)	35,7 [1-76]	39,8 [5-76]	37,7 [0-83]	0,33
Male	56 (53,3%)	20 (54,1%)	54 (47,0%)	0,58
Portuguese nationality	99 (94,3%)	36 (97,3%)	111 (96,5%)	0,735
Co-morbidity	28 (26,7%)	15 (40,5%)	45 (39,1%)	0,103
Pregnancy	2 (4,2%)	0	0	0,100
Consultation on time	64 (61%)	16 (43,2%)	49 (42,6%)	<0,05
Trip characteristics				
Median duration (days)	14 [4-365]	14 [4-180]	10 [5-365]	<0,05
Purpose				
Tourism	63 (60%)	18 (48,6%)	77 (67%)	<0,05
Profissional	23 (21,9%)	15 (40,5%)	11 (9,6%)	
VFA	5 (4,8%)	1 (2,7%)	21 (18,3%)	
Volunteering/mission	5 (4,8%)	1 (2,7%)	4 (3,5%)	
other	1 (1%)	2 (5,4%)	1 (0,9%)	
Destination				
Europe	1 (1%)	4 (10,8%)	1 (0,9%)	<0,05
Africa (North)	11 (10,5%)	3 (8,1%)	16 (13,9%)	
Africa (sub-Saharan)	38 (36,2%)	19 (51,4%)	52 (44,3%)	
America (North)	4 (3,8%)	0	3 (2,6%)	
America (Central)	9 (8,6%)	3 (8,1%)	8 (7%)	
America (South)	11 (10,5%)	0	14 (12,2%)	
Middle East	2 (1,9%)	1 (2,7%)	0	
Asia	24 (22,9%)	6 (16,2%)	12 (12,2%)	
Oceania	3 (2,9%)	0	1 (0,9%)	
Several	2 (1,9%)	1 (2,7%)	6 (5,2%)	

Conclusions: The COVID-19 pandemic in Portugal changed the profile of the trip (destination, purpose and duration) and of the traveler (tendentially older and with more comorbidities), which is in line with the literature.
previously_presented: Portuguese National Congress of Infectious Disease 2022

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Antigenic Diversity and Association with Outcome of Dengue Infection Following Tetravalent Dengue Vaccination

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Background: Dengue disease is caused by four related, but distinct, virus serotypes. Takeda's live attenuated tetravalent dengue vaccine (TAK-003) is comprised of structural proteins from each serotype in an attenuated dengue virus type 2 (DENV-2) genomic backbone. Data from the pivotal, Phase III clinical trial (DEN-301) showed that TAK-003 is safe and efficacious regardless of baseline dengue serostatus. However, vaccine efficacy varied by serotype and exploratory analysis suggests lack of efficacy against DENV-3 in baseline seronegative recipients. The virus envelope (E) protein, the main target of the neutralizing antibody (NAb) response, is known to accumulate intra-serotype genetic diversity over time. Antigenic diversity could potentially impact vaccine coverage against circulating dengue strains.
Objectives: In the present study, we asked if virologically confirmed dengue (VCD) and disease outcome were linked to antigenic diversity between vaccine and contemporaneous DENV-3 strains.
Methods: Vaccine DENV-3 E protein sequence was aligned with viral E protein sequences from confirmed cases of DENV-3 in Asia during the DEN-301 study, and sequences of circulating DENV-3 strains from collaborating laboratories. Phylogenetic trees were generated to assess genetic diversity across viral strains. Logistic regression was performed to assess possible links between genetic diversity of DENV-3, viral load in VCD cases, and outcome of DENV exposure when adjusting for age, gender, and treatment group.
Results: Most incidences of DENV-3 infection throughout the entire DEN-301 clinical trial occurred in the Philippines, followed by Sri Lanka, Thailand, and Colombia. DENV-3 strains causing VCD, clustered with circulating strains of DENV-3 in the Philippines or Sri Lanka during the trial. Additionally, neither phylogenetic distance between virus E sequences, nor genomic location or cumulative burden of accumulated amino acid changes in the E sequences from DENV-3 infections, were associated with viral load post-infection, or hospitalization due to dengue during the trial.
Conclusions: Phylogenetic analysis reveals the evolution of DENV-3 E protein sequences from time of isolation of the vaccine strain in 1964, to contemporaneously circulating DENV-3 strains. However, regression analysis revealed no correlation between genetic diversity of virus E protein and the outcome of DENV-3 exposure in the phase 3 efficacy trial.
Conflict of Interest: This analysis was funded by Takeda Pharmaceuticals Inc and medical writing support was provided by Envision Pharma Group. The authors wish to thank Eduardo Nascimento for reviewing the abstract.

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Risk Behaviours and Health Problems in Humanitarian Travellers

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Background: Although humanitarians are known to be at higher risk of having heath issues because of the harsh conditions they travel in, data for this subset of travellers is still scarce.
Objectives: To assess risk behaviours and health problems in humanitarian travellers.

Methods: We performed a retrospective observational study and included all humanitarians seen upon return between January 1st, 2018 and December 31st, 2021. A standardized medical form was used for each consultation. We analysed risk behaviours and health problems that occurred during or after the mission.
Results: A total of 1529 medical forms were analysed, 47% were woman (718/1529) with a median age of 37.2 years (IQR: 31.7-44.3). The median mission length was 6 months (IQR 3-12), 73% (1116/1529) of missions were in Africa, 14% (217/1529) in the Middle East, 4% (63/1529) in Southeast Asia, 5% (73/1529) in the Americas, 2% in the Pacific Ocean (37/1529) and 1% in Europe (9/1529).
A risk behaviour was identified in 35.3% (540/1529) of humanitarians, including 187 potential exposures to schistosomiasis (12.4%) and 56 to rabies (3.7%). Accidental exposure to blood occurred in 44 humanitarians (2.9%) and 138 (9%) reported unprotected sexual intercourse. Security problems occurred in 87 humanitarians (15%). Risk behaviours occurred more in patients < 30 years and during missions > 1 month, in Africa, and in rural areas.
Among the 923 (60.4%) humanitarians with health issues, 487 (31.9%) had gastrointestinal problems, 199 (13.0%) had malaria confirmed by RTD and 52 (3.4%) without RTD confirmation. Respiratory infections occurred in 94 humanitarians (6.2%) including 11 confirmed episodes of Covid-19. Among the 1529 missions, 15 resulted in hospitalizations (1%) and 19 in medical evacuations (1.2%).
Humanitarians serving in rural areas in Africa, > 1 month, and without malaria prophylaxis were at higher risk of malaria. Gastrointestinal diseases occurred more in rural areas in Africa, and among woman < 30 years.
Conclusions: Our study confirms high risk behaviours in humanitarians, in particular exposure to schistosomiasis and sexual risks, as well as health problems such as malaria. Pre-travel and post-travel consultations are necessary for these travellers who are particularly vulnerable.
previously_presented:: In a local french infectiology congress (presentation in french) = Journées nationales d'infectiologie, june 2022.

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Impact of the COVID-19 Pandemic on International Travel

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Background: The advent of the COVID-19 pandemic declared in early 2020 was responsible for a major health crisis that generated to date more than 668 million cases and more than 6.7 million deaths. Its economic impact has been major, especially on global tourism: international travel has dropped by 73%, 71% and 43% in 2020, 2021 and the first 7 months of 2022 compared to 2019 according to the World Tourism Organization.
Objectives: We study here the impact of the pandemic on travel in a French international vaccination center.
Methods: Using data from the computerized medical record of the International Vaccinations Center (IVC), we analyzed records of international travelers who came for vaccination from 2018 to 2022.
Results:

	2018	2019	2020	2021	2022
Africa	23613 (52%)	25160 (56,2%)	8385 (63,1%)	13335 (79%)	21279 (63,3%)
America	8757 (19,3%)	8104 (18,1%)	2273 (17,1%)	2018 (12%)	5965 (17,8%)
Asia	10950 (24,1%)	9365 (20,9%)	1944 (14,6%)	824 (4,9%)	4304 (12,8%)
Europe	224 (0,5%)	247 (0,6%)	96 (0,7%)	86 (0,7%)	200 (0,6%)
Oceania	308 (0,7%)	246 (0,6%)	56 (0,4%)	29 (0,2%)	203 (0,6%)
"Tours"	1497 '3,3%)	1599 (3,6%)	529 (4%)	577 (3,4%)	1639 (4,9%)
TOTAL	44210	43819	13064	16632	32857

The total number of travelers decreased by 75%, 62%, and 25% respectively between 2019 and 2020, 2021, and 2022.
Compared to 2019, there is a particularly drastic decrease in travel to Asia (-79% in 2020 and -92% in 2021), and a smaller decrease to Africa (-67% in 2020 and -47% in 2021). Thus, trips to Asia represent only 4.9% of trips in 2021 compared to 20.9% before the COVID-19, and those to Africa

increase from 56.2% to 79% of all trips in 2021. The year 2022 marks a small but incomplete rebalancing.
Over these 5 years, 4 or 5 of the 5 most visited countries remain in Africa, in particular Senegal, Tanzania and the Ivory Coast.
Regarding journeys in several countries (or "tours"), a drop was observed in 2020 (-67%) and 2021 (-64%) with a return to normal in 2022.
Conclusions: The COVID-19 pandemic has had a major impact on international travel and IVC activity, with a huge reduction in the number of visits to our center and a gradual return to pre-COVID numbers that have not yet been reached. This effect has particularly affected the Asian continent, whose countries have maintained the highest level of travel restrictions. The impact on travel in Africa was less in our center, probably reflecting VFR travel, which was more often maintained than tourist travel.

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Retrospective Study of Malaria Cases Reported in the Montérégie Region of Québec (Canada) in 2021-2022

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Background: Malaria cases have been on the rise in the province of Québec (Canada) where the incidence rate has increased from 1.05 per 100 000 in 2012 to 2.17 per 100 000 in 2019. The same phenomenon has been observed in the Montérégie region. From 2012 to 2019, in this region, an increase in reported cases has been noted with most cases acquired in African countries. After a decrease when international travel was disrupted during the pandemic, we observe again an increase in malaria cases starting in the latter half of 2021 and continuing into 2022.
Objectives: Epidemiological data related to all reported cases of malaria in the Montérégie region on the South Shore of Montréal (Canada) was analyzed to identify risk factors associated with patients' demographics, country of acquisition, clinical presentation and prevention. Moreover, the objective was to assess the use of pretravel consultation and the use of chemoprophylactic measures in the confirmed cases in travellers.
Methods: In Québec, malaria is a mandatory reportable disease to the public health authorities. Using a provincial database and epidemiological questionnaires, data was extracted from all cases of malaria notified in the Montérégie region between January 2021 and December 2022. Data from 57 cases was obtained and 48 of them were eligible for analysis.
Results: The incidence rate of malaria in the Montérégie has increased to 2.24 per 100 000 in 2022, the highest rate in the last decade, compared to 1.05 per 100 000 in 2012. Of the 48 cases that were analyzed, 60% acquired the infection during a trip to an endemic region in sub-Saharan Africa with the remaining 33% reported in recent immigrants/refugees. Of the total cases, 85% were caused by P. falciparum. 90% of the cases in travellers were VFRs, 6% of travellers consulted a travel clinic with only 2% reported having taken the chemoprophylaxis that was prescribed. Median time between the onset of symptoms and the diagnosis of malaria was 3.6 days.
Conclusions: The burden of malaria has steadily risen in the Montérégie region, affecting mainly VFR travellers and recent immigrants/refugees, with sub-Saharan Africa the main region of acquisition. With VFRs representing a growing proportion of travellers and increasing immigration from endemic countries, the burden of malaria is expected to increase. Delay between the onset of symptoms and the diagnosis of malaria remains problematic. Providing adequate pre and post-travel care to VFRs is essential.

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Risk of Non-communicable Diseases Is an Emerging Health Issue among the Migrants Stayed in Northern Taiwan

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Background: Migrants from foreign countries always perform mandatory health checkups before they apply for Alien Resident Certificate in Taiwan. The contents of health exams depend on their home countries or occupational risks.
Objectives: This study aims to investigate the risks of non-communicable and communicable diseases in migrants in Norther Taiwan.
Methods: The adult migrants completed mandatory health exams in a hospital of northern Taiwan in the first season of 2021 were included. Age, sex, body weight, body height, blood pressure, serologies of syphilis, measles and rubella, and amoebiasis or ova of parasites in stool were recorded or tested. Descriptive statistics was used to present the characteristics of the population. Logistics regression was performed to analyze the possible correlation. The statistical software is SAS 9.4.
Results: There were 293 adult migrants included. One hundred and sixteen(39.6%) were male. Mean age was 36.1 years with standard deviation 10.0. One hundred and 2(34.8%) of the study population were 40 years or older. The oldest migrant was 78 years old. In the adult migrants with record of body weight, body height and blood pressure, 36.4% had risk of non-communicable diseases(BMI 27 kg/m^2 or more, or blood pressure 140/90 mmHg or more). Among the migrants with tests of rubella and measles antibodies, 15% with inadequate titer hinted risk of infection. Among the migrants with syphilis and stool tests, 2.8% was confirmed active infections. Logistic regression with adjusted variable of sex revealed higher risk of non-communicable diseases in middle and old-aged (40 years or older) migrants than young migrants. The adjusted odds ratio was 2.06(95% confidence interval: 1.15-3.68, p=0.02).
Conclusions: Risk of non-communicable diseases is an emerging health issue among the migrants stayed in northern Taiwan. Not only medical treatment but also health promotion is important for them. Health education materials with multiple languages should be considered for more comprehensive health care.

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Vaccine Responsiveness to COVID-19 mRNA Vaccines and Implications for Primary Vaccination in Immunocompromised Travelers

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Background: Patients with immunocompromising conditions are at increased risk for several vaccine-preventable infectious diseases. However, because different vaccines have been shown to be less immunogenic in immunocompromised patients, it is unclear how well these patients are protected and whether personalized vaccinations schedules need to be identified and if antibody testing should be a routine procedure to guide vaccination – questions also relevant for travel vaccines.
Objectives: We aimed to investigate immune responses to primary and booster vaccinations in patients with different immunocompromising conditions using monovalent SARS-CoV-2 mRNA vaccines.
Methods: We included patients with solid tumors of the lung or breast (SoTu, n=63), hematooncological tumors (multiple myeloma (MM), n=70) as well as inflammatory bowel disease (IBD, n=130) and healthy controls (n=66). We measured S1-specific antibody levels to the ancestral virus hu-1 and a current Omicron variant before and after each vaccination up to the fourth dose. In a subgroup of participants, we further determined cellular responses before and after booster doses. In addition, breakthrough infections were recorded. This trial was approved by the Ethics Committee of the Medical University of Vienna and written informed consent was obtained from all participants before study inclusion.
Results: Although the majority of SoTu and MM patients seroconverted, 7% of SoTu and 17% of MM showed early antibody waning and became seronegative already before six months after primary vaccination. Similar findings were obtained in IBD patients on anti-TNF treatment. Of note, in these patients spike-specific B cell memory also declined. While after the third vaccine dose antibody concentrations increased markedly in all immunocompromised patients, breakthrough infections (28%

SoTu, 26% MM, 39% IBD and 24% controls), though with mild course, occurred during the Omicron wave.
Conclusions: Immunocompromised patients showed earlier antibody waning and reduced memory responses to the mRNA COVID-19 vaccines, possibly associated with reduced long-term protection. These findings may be of importance for other vaccines, including travel vaccines, when applied first time during immunosuppressive therapy. Thus, vaccine responsiveness needs to be assessed after primary vaccination and additional vaccine doses might be necessary, implying that immunocompromised travelers should consult pre-travel clinics well in time before departure.

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Early Onset of Protection of the TAK-003 Dengue Vaccine

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Background: The vaccination schedule of the tetravalent live attenuated dengue vaccine (TAK-003) consists of two doses administered 3 months apart and the phase 3 efficacy trial (NCT02747927) was conducted according to this schedule. A protocol-defined exploratory analysis was conducted to evaluate the level of protection observed before participants completed the vaccination schedule. The trial was performed in participants in dengue endemic areas.
Objectives: Explore the onset of protection induced by TAK-003 after the 1st dose and before the 2nd dose.
Methods: Children and adolescents aged 4–16 years old were randomly assigned 2:1 to receive either two doses of TAK-003 or two doses of placebo, respectively, 3 months apart. The primary endpoint was overall vaccine efficacy (VE) in preventing virologically confirmed dengue (VCD) caused by any dengue virus (DENV) serotype. An exploratory analysis was performed to evaluate the VE of TAK-003 between the 1st and 2nd vaccine dose.
Results: Of the 20,071 participants who were given at least one dose of TAK-003 or placebo, 19,021 (94.8%) received both injections and were included in the per-protocol set (PPS) analysis. Within the 3 months between the 1st and 2nd vaccine dose, there were 34 participants with VCD in the placebo group vs. 13 participants in the TAK-003 group. In this exploratory analysis, the PPS VE was 81% (CI: 64.1–90.0). The primary endpoint analysis for VE against VCD from 30 days up to 12 months post 2nd dose resulted in an efficacy of 80.2% (CI: 73.3–85.3) (Table 1).

Table 1. VE against VCD in the PPS study population including exploratory data between the 1st and 2nd doses and primary endpoint data from 30 days post 2nd dose until 12 months post 2nd dose

	Participants with VCD in TAK-003 group, n	Participants with VCD in placebo group, n	VE against VCD, % (95% CI)
Exploratory analysis	13	34	81 (64.1–90.0)
Primary endpoint	61	149	80.2 (73.3–85.3)

CI, confidence interval; PPS, per-protocol set; VCD, virologically confirmed dengue; VE, vaccine efficacy.

Conclusions: Results indicate that TAK-003 is efficacious against VCD between the 1st and 2nd dose of the 2-dose schedule. Due to the statistical limitations with exploratory analyses, results should be interpreted with caution.
Conflict of Interest: The study was funded by Takeda Pharmaceuticals Inc and medical writing assistance was provided by Envision Pharma Group

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Beach Volleyball and Cutaneous Larva Migrans

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Background: Cutaneous larva migrans (CLM) is an infectious syndrome caused by larval stages of animal hookworms, typically manifesting as an erythematous, serpiginous track in the skin. Larvae, which are able to penetrate human skin, are commonly found on sandy beaches in tropical countries. Despite characteristic signs and symptoms many patients with post-travel CLM experience diagnostic delay.
Objectives: The aim of this case series is to raise awareness of travel-related CLM with the focus on exposure history analysis and skin lesions assessment in returned travelers.
Methods: We present a cluster of 12 cases of CLM among amateur beach volleyball team members returned from Zanzibar. The case series includes a vast photographic documentation of cutaneous manifestations and the discussion on sports activities on the beach as CLM risk factor in travelers.
Results: 12 persons with the history of recent travel to Zanzibar have been consulted at the dermatology clinic for skin lesions on their feet. The whole group consisted of 20 travelers involved in amateur beach volleyball in Poland. The main purpose of the trip were volleyball games on local beaches and all travelers spent a significant amount of time barefoot on the beach every day. The first skin lesions appeared either at the end of the trip or within few days after return. The initial presentation, as reported by all patients, were small reddish vesicular lesions on their feet, which progressed to intensely pruritic, serpiginous tracks within a few days.
All affected persons sought medical help in the next 2 weeks, however they did not receive proper diagnosis despite several appointments, typical cutaneous manifestations and travel history. The wrong diagnoses list included: urticaria, contact dermatitis, dermatomycosis and atopic dermatitis. Finally, CLM was diagnosed in all 12 patients based on the presence of the characteristic lesions and exposure history. In addition, dermoscopy was performed. All patients were treated with albendazole orally and topical ivermectin. Pruritus resolved in 1-3 days, while skin lesions disappeared in 15-21 days in all patients.
Conclusions: Travel medicine providers, family physicians and dermatologists should be familiarized with CLM manifestations. Exposure history assessment is essential to prevent diagnostic delay in post-travel clinical care.

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The Mosaic of Malaria Presenting in Europe (1998-2018): A EuroTravNet Retrospective Analysis

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Background: Malaria is no longer endemic in Europe but thousands of cases, mainly travel-related, are reported annually.
Objectives: To describe the epidemiology of malaria presenting in Europe (1998-2018).
Methods: We analysed data on malaria cases recorded at EuroTravNet sites focusing on species, area of acquisition, traveller type- age -and sex, migration waves, colonial ties, disease severity, mortality, screening and unusual circumstance acquisition. We evaluated the impact of a pre-travel consultation on the acquisition of various species of malaria in several categories of travellers.
Results: From a total of 103,739 persons presenting at EuroTravNet sites in 13 different European countries, 7,195 individuals (6.9%) had a malaria diagnosis with 87 likely countries of exposure. The causative species in most cases (5171, 71.9%) was *Plasmodium falciparum,* followed by *P. vivax* (789, 10.9%), *P.ovale* (352,4.9 %),*P. malariae* (164, 2.3%), *P. knowlesi* (5, 0.1%) with 95 cases of mixed species and 619 cases of unknown species. Male sex dominated for all species with more than 74% of *P.vivax* cases presenting in men. There were 7 malaria-related deaths - all *P. falciparum* (6 men) mainly business travellers. Most cases of malaria were in VFR travellers (47%) accounting for 55% of *P. falciparum* malaria and 21% of *P. vivax* cases. Tourists acquired 16% of all cases, business travellers 13% and 24% of cases were associated with migrant and other traveller categories. The top countries of *P. falciparum* acquisition were: Cote d'Ivoire, Cameroon, Ghana, Nigeria, Comoros, Burkina Faso, Senegal and Mali. For *P. vivax*, main acquisition countries were: Pakistan, French Guiana, India, Eritrea, Ethiopia, Afghanistan and Indonesia. Some 31% of *P. vivax* cases were acquired in Sub-Saharan Africa. From a total of 636 malaria cases with migration travel only, 72(11.3%) had no symptoms and were identified by screening. Pre-travel encounters were associated with significantly fewer malaria cases, particularly *P. falciparum* cases, but this protective effect did not apply to business or military travellers.
Conclusions: The epidemiology of malaria presenting in Europe is complex with colonial ties and migration wave impact. These findings will highlight risk groups and have implications for pre-travel malaria prevention guidelines and for screening protocols.

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Hair Concentrations of Anti-malarials in Returned-travellers - The HAIR Study: Proof of Principle Analysis

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Background: Hair analysis to identify substance use is an established methodology. This could also be a method to determine use of antimalarial drugs.
Objectives: We aimed to establish a methodology to determine hair concentrations of atovaquone, proguanil and mefloquine in returned travellers who used chemoprophylaxis as a method to monitor adherence.
Methods: Travellers were prospectively recruited for the HAIR study at the Zürich WHO Collaborating Centre for Travellers' Health. A strand of hair was collected from the posterior vertex region. The name of the anti-malarial drug taken, the start and end dates of drug intake as well as the sampling date was recorded.A liquid chromatography-tandem mass spectrometry (LC-MS/MS) method was developed and validated for simultaneous analysis of the antimalarial drugs -atovaquone (ATQ), proguanil (PRO) and mefloquine (MQ), in human hair. The hair samples from five volunteers were used for this proof-of-concept analysis. Three volunteers were taking daily atovaquone / proguanil (ATQ/PRO) chemoprophylaxis and two volunteers were using weekly mefloquine (MQ) chemoprophylaxis.
Results: With this proof-of-principle analysis, we could show that ATQ/PRO and MQ are integrated into the hair matrix and that chemoprophylaxis use could be quantified. In hair segments, maximal concentrations of 3.0 ng/mL/20mg hair proguanil, 1.3 ng/mL/20mg hair atovaquone and 78.3 ng/mL/20mg hair mefloquine were measured. Moreover, malaria drug concentration changes correlated with the time interval since finishing the chemoprophylaxis regimen.
Conclusions: Our proof of principle analysis successfully validated a methodology to determine concentrations of anti-malarials in hair samples with a lower limit of quantification (LLOQ) of 0.25

ng/mL for all substances, with inter- and intraday precision values <10% and accuracy within 85-115% of the nominal values for all analytes. The method was demonstrated to be free of matrix effects and met acceptance criteria for selectivity, linearity and carry-over. The validated method was used successfully for analysis of antimalarial-positive hair samples containing ATQ / PRO or MQ. This research shows that antimalarial medications are detectable in hair matrix and can be measured semi-quantitatively for adherence monitoring and paves the way for larger studies and optimized procedures.

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Pioneering Safe and Sustainable Caribbean Travel and Tourism through CARPHA's Regional Tourism and Health Program

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Background: As the most tourism-dependent region, travel and tourism are extensively embedded in Caribbean countries' operations, propelling employment, revenue generation and economic sustainability . The emergence and re-emergence of diseases imperil regional health security, debilitate tourism and adversely affect livelihoods and economies, as evidenced by the COVID-19 pandemic.
Objectives: With the unveiled necessity of integrating health in tourism, the Caribbean Public Health Agency developed the Regional Tourism and Health Program (THP). Our objective is to emphasize THP's fundamental role in enhancing the health and safety of visitors and locals, strengthening regional health security, sustainability, and resiliency of Caribbean travel/ tourism.
Methods: The THP supports Caribbean countries and endorses sustainable travel by addressing the health, safety, and environmental sanitation (HSE) threats to tourism . A multifaceted set of regional public goods (RPGs) of early warning and response surveillance systems and guidelines, capacity building, policy, standards, advocacy, partnerships, travellers' health award and mobile app are developed to bolster national and regional health systems and enhance the health of transient and resident populations. Consequentially, THP propels the integration of tourism into the traditional health systems, aimed at driving long-term sustainability.
Results: As of January 5, 2023, various elements of THP have been implemented in 21 Caribbean countries. A total of 834 tourism business utilize the land-based surveillance system whilst 1583 cruise-ship surveillance alerts were issued, resulting in rapid responses by CARPHA MS and reduction of spread of public health threats. Regional travellers' health policy, HSE standards (approved by health, tourism and trade ministers), guidelines for response to health threats in land and sea tourism settings and numerous technical guidelines were developed, 8000 persons were trained in healthier safer tourism practices, 110 travellers' healthier safer tourism awards were issued, and 20 collaborating health and tourism partners are amassed.
Conclusions: As Caribbean countries continue to rebuild and reinvigorate Caribbean tourism post-COVID-19, THP plays a crucial role in countries' preparation and response to public health threats now more than ever. With the utilization of these RPGs, THP is elevating Caribbean tourism through sustainable initiatives geared toward a healthier, safer, more resilient Caribbean tourism product.
Conflict of Interest: I confirm there are no conflicts of interest

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Implementing Effective Care in a University Population Based on National Routine and Travel Vaccination Recommendations

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Background: Vaccines are a cost-effective, successful medical intervention, saving 2-3 million lives worldwide. Unfortunately, vaccination coverage for adults remains low, leading to unnecessary and costly health consequences. Local Problem: A chart review revealed 95% (N = 20) of students were

not current with vaccines. In a patient survey, 100% (N = 21) could not recall receiving useful vaccine information, but 66.7% felt it would be helpful (≥ 4 out of 5 on a Likert scale).
Objectives: Strategies supporting effective care, an Institute of Medicine quality domain, were used to address these gaps. The aim was to increase effective vaccine care in university students by 30% over 90 days.
Methods: Plan-Do-Study-Act cycles were used to evaluate iterative tests of change (TOC). Examining contextual elements, team and patient feedback, aggregate data, and run charts informed TOC over four cycles.
Results: Greater than 83% (N = 152) of students screened were not current with vaccines per national guidelines. Over eight weeks, the team effectively referred students for 265 of 274 vaccines for which they were eligible with 95.3% accuracy. The aim score increased from 49% to 95%.
Conclusions: Effective care for vaccine uptake increased by 83.8%, exceeding the goal. Campus health centers and other primary care settings could benefit from adopting a similar strategy, providing clear benefits to patients and the broader community while decreasing health care costs.

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Improper Post-exposure Rabies Prophylaxis Could Associate with No Previous Vaccination and Non-dog Mammals Exposure: A 7-year-Retrospective Study of Travelers at an Emergency Center in Thailand

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Background: There are still reports of human rabies cases in Thailand. Delay or lack of patient compliance to the rabies vaccination schedule may contribute to subsequent death. Although mentioned by travelers as a common country of mammal bites, data on post-exposure rabies management among international travelers in Thailand are limited.
Objectives: We assessed factors associated with post-exposure (PEP) rabies prophylaxis of travelers at a university hospital emergency center in Thailand.
Methods: All international patients who came for PEP following mammal exposure during 2016-2022 were analyzed. The collected data consisted of demographics, mammal exposure and related immunization history. Delayed PEP was defined if the patient received treatment > 24 hours after exposure. We also evaluated if the patient had completed PEP, according to the WHO guideline, at our hospital. A logistic regression model was used to identify the possible factors associated with delayed or uncompleted PEP.
Results: A total of 518 mammal-exposed travelers (53% males; 73% were from Southeast Asia with a mean age of 24.30 years) were included. The majority (87%) were category 3 exposure. There were 51 cases (10%) of delayed PEP with a median interval between exposure to the treatment of 46.50 hours (range 24.20-185.25). There were 280 cases (54%) who did not complete PEP at the hospital. In a regression analysis, no previous tetanus vaccination (adjusted odds ratio (AOR) 2.51, 95% confidence interval (CI) 1.16-5.45) was associated with delayed rabies PEP. Male patients (AOR 1.52, 95% CI 1.03-2.25), Non-dog mammal exposure (AOR 2.27, 95% CI 1.39-3.72), no previous rabies vaccination (AOR 5.38, 95% CI 2.64-10.95) and received PEP intramuscularly (AOR 2.21, 95% CI 1.45-3.35) were associated with uncompleted PEP.

Table 1. Comparison of the characteristics of international travelers (N=518) who came for post-exposure rabies prophylaxis (PEP) following mammal exposure during 2016-2022 at the Burapha University Hospital emergency center, classified by the interval from exposure to treatment.

	Received PEP < 24 hours n = 467 (%)	Received PEP ≥ 24 hours n = 51 (%)	P-Value
Demographic			
- Male sex	245 (52.5)	31 (60.8)	0.258
- Age, mean years (range)	27.85 (0-93)	29.76 (2-69)	0.417
- Non-Southeast Asian	124 (26.6)	13 (25.5)	0.870
Exposure history			
- Non-dog exposure	109 (23.3)	12 (23.5)	0.976
- Expose to head	20 (4.3)	2 (3.9)	0.816
- Expose to trunk	11 (2.4)	2 (3.9)	
- Expose to multiple sites	18 (3.9)	1 (2.0)	
- Exposure category 3	410 (87.8)	42 (82.4)	0.268
Medical history			
- Previous rabies vaccination	57 (12.2)	5 (9.8)	0.616
- Previous tetanus vaccination	191 (41.1)	12 (23.5)	**0.015**

Table 2. Comparison of the characteristics of international travelers (N=518) who came for post-exposure rabies prophylaxis (PEP) following mammal exposure during 2016-2022 at the Burapha University Hospital emergency center, classified by completion of PEP, according to WHO guideline.

	Completed PEP n = 238 (45.9%)	Uncompleted PEP n = 280 (54.1%)	P-Value
Demographic			
- Male sex	116 (48.7)	160 (57.1)	0.056
- Age, mean years (range)	27.53 (0-93)	28.46 (0-89)	0.508
- Non-Southeast Asian	63 (26.5)	74 (26.4)	0.991
Exposure history			
- Non-dog exposure	44 (18.5)	77 (27.5)	**0.016**
- Expose to head	11 (4.6)	11 (3.9)	0.633
- Expose to trunk	7 (2.9)	6 (2.1)	
- Expose to multiple sites	11 (4.6)	8 (2.9)	
- Exposure category 3	207 (87.0)	245 (87.5)	0.858
Medical history			
- Previous rabies vaccination	49 (20.6)	13 (4.6)	**<0.001**
- Previous tetanus vaccination	111 (47.0)	92 (32.9)	**0.001**
- Intramuscular rabies vaccination	63 (26.5)	118 (42.1)	**<0.001**

Conclusions: One-tenth of mammal-exposed travelers delayed PEP. We suspected that lack of awareness and preparation, represented by no prior tetanus vaccination, might delay rabies immunization. More than half of travelers, especially males, did not complete PEP. Raising awareness of rabies risk associated with non-dog mammals, preexposure preparation, and reduced vaccination schedule might increase compliance to the rabies PEP among international travelers.

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Yellow Fever Vaccine Fractional Dosing - A South African Experience

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Background: In July 2022 South Africa experienced a severe, indefinite yellow fever vaccine shortage. The South Society of Travel Medicine (SASTM) issued a directive for the use of fractional yellow fever vaccine. Our travel clinic primarily provides comprehensive corporate travel health risk management to employees who travel for work. In addition we see a large number of leisure travellers. In the wake of the COVID-19 pandemic South Africans were desperate to find employment abroad, often in countries requiring yellow fever vaccination.
Objectives: Our study documents the provision of fractional yellow fever vaccine, and the outcome in terms of possible side effects and practical complications related to border crossings with an ICVP indicating a validity of only one year.
Methods: At the time of the shortage we calculated that using fractional dosing would allow vaccinating 4-5 times more travellers than standard dose. We took stock of our yellow fever vaccine supply and instituted fractional dosing. We documented demographic data for clients receiving fractional doses and the destination country. All clients were provided with the option of seeking a full dose elsewhere or postponing travel. Clients who chose to receive fractional dosing signed informed consent. All requests for yellow fever vaccine were screened to determine the actual need for vaccination. We administered 525 fractional doses over a three month period. We did follow up calls to all fractional dose recipients and recorded possible side effects in five clients.
Results: Of the 525 vaccines administered 59% were male and 41% were female. 87% were between the ages of 21 and 60 years of age. Sub-Saharan Africa was the most common destination, followed by South America. 428 clients travelled for work, of which 27 were seafarers. We recorded and investigated one possible severe adverse event. We did not receive reports of any problems with border crossings. Our follow up campaign reinforced the importance of accurate contact details.

Conclusions: Fractional yellow fever vaccine dosing is safe and effective in the event of short term vaccine shortage. Further studies are needed to establish the long term immunity of fractional dosing in the face of global yellow fever vaccine shortages.
Conflict of Interest: N/A

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CoronaCheck: Rapid Development of a Self-assessment and Triage Tool for Managing the Early Stages of the COVID-19 Pandemic in Switzerland

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Background: Several digital interventions were deployed worldwide in response to the COVID-19 pandemic achieving mixed results.
Objectives: We describe the development of CoronaCheck, a self-screening and triage system deployed by the University Centre for Primary Care and Public Health (Unisanté) from March 2020 to November 2021 in up to 5 cantons of Switzerland.
Methods: The first working prototype was programmed overnight as a Telegram Chatbot on 27/02/2020 (Figure 1). The user could self-screen for testing criteria and, speculatively, receive a self-test kit at home and be assisted by telemedicine. The idea and prototype were pitched the following day to the Crisis Unit of Vaud Canton's Public Health Department. Following the multi-layered framework described by Boxwala et al. (Figure 2) a medical doctor translated the unstructured narrative guidelines (L1) into a structured decision tree (L2) and data dictionary. Combinations of variables trigger a "flag". A flag or a combination of flags then triggers a piece of information. The sum of all pieces of information is then built into a final message shown to the user (Figure 3).
After validation, a mixed team of medical doctors and IT specialists developed the tool as a web app. CoronaCheck.ch went live on the 02/03/2020. It comprised two sections: i) a self-screening tool for the general public to know what to do if sick and if testing criteria were met, to book a slot in a testing facility; ii) a triage and decision support tool for healthcare professionals to manage clinical cases.
Results: CoronaCheck was adopted by the Public Health authorities of 5 Cantons serving up to 2.7 million people. It responded to three needs: to inform the general public, to help healthcare professionals with case management, and to regulate and streamline access to testing. After the first two months, CoronaCheck had received 2 million unique visitors. Outreach was facilitated by its translation into 11 languages.
Conclusions: CoronaCheck answered simple, yet important needs while playing a key role in the coordination and management of the massive influx of patients during the COVID-19 pandemic.
previously_presented: Submitted also to ECCMID 2023, not yet received response

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SARS-CoV-2 Disease Severity in Language Minorities

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Background: There have been many reports of unequal distribution of covid-19 related adverse outcomes among ethnic minorities in many countries.
Objectives: We studied whether hospitalized patients with a foreign first language had more severe Covid-19 disease presentation upon admission to specialized health care and if they presented with a similar course of disease once in care.
Methods: We did a retrospective observational population-based quality registry study including all patients with a confirmed COVID-19 infection who were admitted to specialized healthcare and the intensive care unit (ICU) between 27th February and 3rd August 2020 in the capital province of Finland. We studied laboratory results upon admission to care and maximum values recorded during hospitalization in different language groups. Included biomarkers were C-reactive protein (CRP), platelets (PLT), white blood cells (WBC) and serum creatinine (sCr).

Results: Altogether 647 patients were admitted to specialist care of whom 614 (94.9%) had a registered first language. Of those with a determined first language 131 (21.3%) had a foreign first language i.e. other than Finnish or Swedish. Those with a foreign first language were younger (median 49 versus 62 years) and had milder laboratory findings. The age gap persisted but narrowed and the biomarker profiles attenuated when delimiting to under 70 year olds. Men were slightly more likely to end up in the ICU and had lower WBCs at start. More abnormal laboratory results were more common in the ICU and the trends were similar in both language groups. CRP was the earliest indicator for ICU admission.
Conclusions: CRP was the most significant early predictor for severe disease presentation and ICU admission. No significant differences in laboratory findings were found between the language groups, suggesting that disease severity when admitted to hospital did not differ between language minorities and the rest of the population.

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University COVID-testing Center as a Sentinel for Institutional and Regional Guidelines

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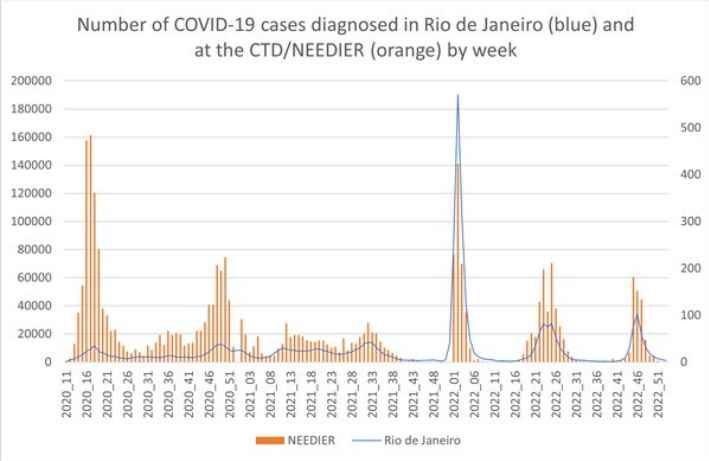
Background: The Universidade Federal do Rio de Janeiro (UFRJ) is Brazil's most prominent federal university. At the beginning of the pandemic, when testing was locally lacking, a COVID-19 testing centre was founded (CTD) at its campus. It started testing a target population of professionals from public health/security services in Rio de Janeiro. As in-person activities restarted, its target extended to all university personnel, aiming to control disease within the campus. Recently, based on the success of CTD activities and incorporating it, a unit dedicated to the prevention and preparedness of emerging infectious diseases was established at UFRJ, the Núcleo de Enfrentamento e Estudos de Doenças Infecciosas Emergentes e Reemergentes (NEEDIER - Carlos Chagas).
Objectives: To predict the surge of COVID-19 cases in Rio de Janeiro, using data from the CTD, and promoting up-to-date institutional and regional guidelines.
Methods: From March 2020 to December 2022, public healthcare/security professionals and university personnel sought diagnostic testing at CTD presenting COVID-19-related symptoms or being in close contact with confirmed cases. Diagnostic tests were performed by qRT-PCR for SARS-CoV-2 using nasopharyngeal samples. All participants responded to a questionnaire and accepted participation in the current study, which was approved by the ethics committee (CAAE 30161620.0.1001.5257). Periodic reports were sent to authorities.
Results: From March 16th, 2020 to December 22nd, 2022, 32,516 diagnostic tests were performed at CTD, with 8,621 positive tests (26,5%). The cases appeared in 7 peaks, reflecting Rio de Janeiro's surges. On week 16/2020, patients diagnosed at this centre came to represent 6,3% of the total cases in the city.



Conclusions: Despite current immunization protocols, the emergence of new variants and fluctuations in antibody levels have allowed the circulation of SARS-CoV-2. Thus, new surges of cases still occur.

The establishment of a testing centre in an important institution allowed the rapid notification of variations in COVID-19 cases to university and sanitary authorities, as well as the public, which conducted changes (either reinforcement or relaxation) of COVID-19 prevention measures. Also, the creation of CTD allowed the study of other diseases throughout this period (e.g. Influenza).

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Challenges in Pre-travel Consultations at Switzerland's Largest Travel Clinic Just Prior to the COVID-19 Pandemic: 2011-2019 — A Retrospective Analysis

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Background: Travel-related health risks depend on the destination, travel characteristics, travel behavior, and pre-existing medical conditions. Pre-travel consultations offer a unique opportunity to best prepare travelers for their journey, and to reduce the risk of disease by applying preventative measures.
Objectives: We aim to better understand traveler's risks and needs to improve individualized pre-travel consultations. Potential challenges faced during pre-travel consultations in a large travelers' population captured in a large database will be identified.
Methods: We performed a retrospective, descriptive analysis of pre-travel visits to Switzerland's largest travel clinic, the Center of Travel Medicine of the University of Zurich, from 2011 to 2019. Data were analyzed over time and by reason for travel and destination. Data are presented as mean and percentages, where appropriate.
Results: Overall, 103,708 travelers visited the clinic from 2011 to 2019. Tourism was the main reason for traveling (*n* = 83,158; 80.2%) followed by visiting friends and relatives (VFR) travelers (*n* = 7,998; 7.7%). VFRs travelled significantly more to medical high-risk areas ($p < 0.05$), however nearly one-sixth of VFRs (n = 1,203; 16.1%) did not receive any vaccinations.
The main travel destinations were Tanzania (*n* = 7,501; 7.2%) and Brazil (*n* = 7,087; 6.8%). The most common vaccinations were against hepatitis A (*n* = 36,957; 37.5%) and yellow fever (*n* = 31,776; 32.3%). One-fifth of travelers presented with at least one pre-existing chronic disease (*n* = 22,650; 21.8%). Psychiatric (*n* = 6,160; 5.9%) and cardiovascular diseases (*n* = 4,908; 4.7%) were among the most common, whereas 1,191 (1.1%) travelers were immunocompromised.
Conclusions: The challenges during a pre-travel consultation are multi-faceted, where a "one size fits all" approach might not be expedient. For example, the percentage of travelers with a chronic disease increased over time; to date, one-fifth of travelers presents with a chronic disease. Furthermore, VFRs are travelling to high medical risk areas, of which one-sixth does not receive any vaccinations. Knowledge of the characteristics of the traveling population seems critical to meeting the special needs of travelers. Especially, the growing proportion of patients traveling with pre-existing medical conditions strongly necessitate further individualized pre-travel advice.

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Side-by-Side Comparative Study of the Immunogenicity of the Intramuscular and Intradermal Rabies Post-exposure Prophylaxis Regimens in a Cohort of Suspected RABV Exposed Individuals

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Background: All WHO pre-qualified rabies vaccines for human use are inactivated tissue culture rabies virus (RABV) formulations that are produced for intramuscular (IM) administration. However, due to costs and shortage of these vaccines, rabies post-exposure prophylaxis (PEP) dose-saving intradermal (ID) administration is encouraged by WHO.
Objectives: This study aimed to assess the immunogenicity of the intradermal 2-site, 3-dose rabies PEP vaccination scheme (2-2-2-0, IPC regimen) compared to the intramuscular 1-site, 4-dose vaccination protocol (1-1-1-1, Essen regimen) for Sanofi's purified Vero cell rabies vaccine in PEP recipients with category II and III exposure (including children <15 years).
Methods: We analyzed the development of neutralizing antibodies (nAbs) by fluorescent antibody virus neutralization test (FAVNT) and rapid fluorescent focus inhibition test (RFFIT), and the T cell response to a glycoprotein-derived peptide pool at baseline and 28 days after first injection of the post-exposure prophylaxis (PEP) in 210 patients with a category II or III animal exposure in a rabies-endemic country receiving either ID (n=112) or IM (n=98) PEP regimen, and equine rabies immunoglobulin (ERIG) was co-administered whenever appropriate.
Results: The mean age of the study participants was 21 years (range 3-50 years) with a female:male ratio was 1:1.02. At the date of presentation at the PEP center and initial vaccination, 29 study participants (13.8%) received additionally ERIG treatment (14 in ID group, and 15 in IM group). None of the vaccinated individuals reported any side effects. At day 28, all study participants seroconverted for rabies nAbs (≥0.5 IU/mL), irrespective of PEP scheme, age, or administration of equine rabies immunoglobulin (ERIG) and nAb titers did not differ for the two PEP schemes. Both PEP schemes induced a RABV-specific T cell response (measured 28 days after the first dose), which was polyfunctional and did not differ by PEP scheme.
Conclusions: We demonstrated under real-life PEP conditions in a direct comparative trial that the 3-dose, 1-week ID IPC regimen course is as sufficient in inducing an anti-rabies immune response as a 4-dose, 2-week IM Essen regimen.
Conflict of Interest: V. Bosch-Castells, C. Augard, C. Petit are employees of Sanofi and may hold shares and/or stock options in the company. All the other authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Effect of Change in Health and Hygiene on International Tourist Arrivals: An Analysis of Global Data 2007-2019

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Background: Tourism contributes a significant share to gross domestic product globally. Health and hygiene standards (HHS) of a country seem to affect its number of international tourist arrivals (NITA), however, its quantitative evaluation is unavailable. Our study assessed the association between HHS and NITA over time globally.
Objectives: To examine whether changes in health and hygiene standards of destination countries are associated with the change in international tourist arrivals globally.
Methods: We utilised Travel and tourism competitiveness index (TTCI) data from 2007 to 2019. The HHS (a composite score of physician density, proportion of populations having access to improved sanitation and improved drinking water, number of hospital beds, HIV prevalence, and malaria incidence) and the NITA of the destination countries were considered as the exposure and outcome variables, respectively. We modelled the log transferred NITA (logNITA) associated with the HHS over time adjusting for a range of covariates over two assessment periods (2007-2013 and 2015-2019) using the hierarchical mixed model with random intercept as the country and the random slope as the year. A total of 600 data points from 129 countries were used for the analysis. We presented the

results segregated across different time points as we observed a significant interaction between HHS and time (year).
Results: The mean change in logNITA for unit increase in HHS was -0.16 (-0.28, -0.05; p=0.005) in 2007 after adjusting other covariates. However, the effect gradually decreased over the years and was statistically significant only till 2010 (adjusted mean change in logNITA= -0.12, 95% CI: -0.23, -0.01; p=0.04). Further, a statistically significant interaction between HHS and human, cultural, and natural resources (HCNR) scores were found for the assessment period. For the assessment period of 2015-2019, the adjusted mean increase in the logNITA associated with unit increase in the HHS was -0.51 (95% CI: -0.96, -0.07; p=0.02). No significant interaction between the HHS, and the HCNR scores was found for this assessment period.
Conclusions: Overall, our study showed a strong association between country's HHS and international tourist arrivals. Therefore, HHS of destination countries could have implication in terms of their travel and tourism industry.
Conflict of Interest: No conflict of interest

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Risk Factors and Detection Rates of Coronavirus Disease 2019 among International Travelers, Taiwan, 2020-2021

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Background: Testing on international travelers at borders prevents Coronavirus Disease 2019 (COVID-19) infections from entering communities. In Taiwan, the effects of the intervention remained unclear.
Objectives: To investigate the positivity rates and associated factors of COVID-19 among international air travelers, and compare the detection rates in different testing strategies at airports.
Methods: In this retrospective cohort study we defined case patients as travelers positive for COVID-19 PCR tests, and imported cases as case patients diagnosed within 21 days after arrival. Participants were passengers arriving in Taiwan on international flights during 2020-2021. The study period was divided into two phases based on testing strategies. In phase 1 (before 1 July 2021), only symptomatic passengers were tested. In phase 2 (after 2 July 2021), all passengers were tested. We compared test positivity rates, numbers needed to test (NNT) to detect one case, and detection rates (number of case patients detected on arrival divided by the total number of imported cases) between phases. We assessed associations between test positivity and traveler characteristics using multivariate logistic regression.
Results: 1.9% (243/12,514) of symptomatic travelers tested in phase 1 and 0.2% (462/231,010) of travelers tested in phase 2 were test-positive on arrival. The NNT was 52 in phase 1 and 500 in phase 2. The detection rate on arrival was 22.8% in phase 1 and 39.4% in phase 2 (Table 1). Of 733,320 travelers, 1,914 (0.3%) were confirmed as imported cases. Females (adjusted odds ratio [aOR]: 1.2, 95% confidence interval [CI]: 1.1-1.3), travelers aged 10-19 years (aOR: 1.4, 95% CI: 1.3-1.6), foreign nationals (aOR: 2.2, 95% CI: 2.0-2.4), symptomatic travelers (aOR: 13.4, 95% CI: 11.5-15.6), and those traveled to 2 countries (aOR: 2.5, 95% CI: 2.3-2.8) or more (aOR: 2.9, 95% CI: 2.1-3.9) in the past 14 days were more likely to be an imported case.

	Phase 1	Phase 2
Target groups	Symptomatic travelers	All travelers
Tested for COVID-19	12,514	231,010
Test-positive for COVID-19	243	462
Test positivity rate	1.9%	0.2%

Numbers needed to test (NNT)	52	500
Imported cases	1,068	1,172
Detection rate	22.8%	39.4%

Conclusions: Testing on all travelers yielded higher detection rates, identifying nearly 40% of imported cases on arrival. However, lower positivity rates with high NNT made such a testing strategy highly resource-intensive. Countries should adjust testing strategies focusing on high-risk populations according to updated national policies, pandemic situations, and disease burdens.

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A PfSPZ Vaccine to Prevent Malaria in Travelers

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Background: There are ~1,500 hospitalizations and 11 deaths in the US and ~8,000 cases in the EU caused by malaria each year; >80-85% due to *Plasmodium falciparum* (Pf) acquired in Africa. We have focused on developing a vaccine to prevent Pf malaria in travelers to Africa using attenuated, aseptic, purified, cryopreserved Pf sporozoites (SPZ).
Objectives: Our goal is a PfSPZ vaccine regimen that is >90% protective against African variant Pf strains for at least 12 weeks and demonstration of feasibility of immunizing at travel and military medicine clinics.
Methods: We assessed Sanaria® PfSPZ Vaccine (radiation-attenuated) in 23 clinical trials in the US, Europe, Africa, and Indonesia and PfSPZ-CVac (chemo-attenuated) in 11 trials in the same regions. We assessed efficacy in the field and by controlled human malaria infection (CHMI) using a Brazilian Pf strain (7G8) more variant from the West African vaccine strain than any of >700 African strains. We modeled delivery, storage, and administration of PfSPZ vaccines in the US at travel clinics in New York and Maryland and military clinics in Washington (state) and Maryland.
Results: PfSPZ Vaccine achieved 79% vaccine efficacy (VE) at 9-10 weeks after last vaccine dose against 7G8 CHMI in Germany, not meeting our VE target. PfSPZ-CVac, a more potent approach, achieved 100% VE at 12 weeks (*Nature* 2021), meeting our target. Both vaccines are currently being assessed head-to-head in malaria-naive Indonesian soldiers deployed to Indonesian West New Guinea (Papua), where highly variant Pf and *P. vivax* are intensely transmitted. In parallel, we successfully demonstrated the capacity to deliver, store, and administer PfSPZ vaccines at travel and military medicine clinics. Concurrently, we have developed a new, genetically attenuated vaccine PfSPZ-LARC2 that is simpler and safer than PfSPZ-CVac and should have equivalent VE, with clinical testing starting in 2023.
Conclusions: PfSPZ-CVac can provide the VE needed for travelers to Africa and it is feasible to deploy such a vaccine in travel clinics. We will report on plans for development and rapid licensure of a PfSPZ vaccine, now likely to be PfSPZ-LARC2 Vaccine, and on the prospect of using monoclonal antibodies for preventing malaria in travelers.
Conflict of Interest: LW Preston Church, Thomas L Richie, Peter F. Billingsley, Eric R. James and Stephen L. Hoffman are all salaried employees of Sanaria Inc. Eric R. James and Stephen L. Hoffman hold patents pertaining to the vaccines, manufacturing and cryopreservation processes. Stephen L. Hoffman is an owner and CEO of Sanaria.

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Challenges to the Practice of Travel Medicine Nursing during the COVID-19 Pandemic at the Thai Travel Clinic, Bangkok, Thailand

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Background: The COVID-19 pandemic disrupted air travel due to the need for public health measures to contain the spread of the virus, which resulted in dramatic decreases in international arrivals to Thailand. Several areas of medical service, especially travel medicine practice, have been impacted, with a shift to a COVID-19 -related focus rather than traditional travel clinic services. The arrival of the new normal is a good time to reevaluate challenges to travel medicine nursing, and roles and responsibilities for the next pandemic.
Objectives: To describe challenges to travel-medicine nursing practice during the COVID-19 pandemic and to propose the role of the travel medicine nurse with the resumption of tourism.
Methods: The researchers interviewed travel medicine nurses at the Thai Travel Clinic and analyzed challenges in their careers.
Results: Before the COVID-19 pandemic, nurses in the Thai Travel Clinic provided nursing care, including administering vaccines as prescribed, educating travelers with specific information, e.g. vaccine side effects and travel health risks. Nurses in the Travel Clinic were involved in administrative work, managing online appointments, and acting as an information center via phone or email. Nurses also play co-investigator and research-site coordinator roles in research studies conducted in the Clinic.
With the COVID-19 pandemic, Travel Clinic services changed rapidly from traditional travel-medicine services to COVID-19 -related procedures. Nurses, with other stakeholders, played important roles in designing, determining, and organizing new services during the pandemic; for example, COVID-19 testing before international travel was initiated in May 2020. People traveling under these circumstances were provided with additional counseling in person or via tele-consultation. Our travel-medicine nurses have also been involved in the COVID-19 vaccine roll-out, provided COVID-19 vaccination certificates for international travel, and initiated tele-consultations in travel medicine.
Conclusions: Travel medicine practitioners, including physicians and nurses, have learnt from the COVID-19 pandemic that we must be resilient when dealing with such a challenging situation. Travel-medicine practitioners should prepare and adapt for the next pandemic now.
Conflict of Interest: No conflict of interest to be declared

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A Systematic Review of Scorpion Envenomation Therapeutics and Antivenom Accessibility

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Background: Scorpions (Scorpiones) are eight-legged arthropods of the class Arachnida. With increased human migration and transcontinental shipment of produce from the tropics, the incidence of scorpion envenomation may increase in non-endemic areas.
Objectives: We aim to synthesize existing evidence around prevention and treatment of scorpion envenomation into a clinical resource including provision of information on access to, and indications for, antivenom usage.
Methods: PubMed (NCBI), MEDLINE (OVID), EMBASE (OVID), Cochrane Database of Systematic Reviews (CIDR) and TOXLINE (TOXNET) were searched from inception to March 2022 using combinations of the search terms "scorpion" and "envenomation". Iterative inclusion and exclusion of search terms was employed to maximize article extraction. The GRADE approach was used to assess quality of studies reporting therapeutic interventions. Evidence will be summarized using descriptive measures for each intervention type as well as a qualitative synthesis. Meta-analysis will be planned if sufficient efficacy measures exist.
Results: 961 MEDLINE articles, 1053 PubMed, 1486 EMBASE, 0 CIDR and 149 TOXLINE records were retrieved for title and abstract screening; after a multi-step deduplication pipeline 1928 remained. After title and abstract screening, 422 studies were eligible for inclusion, of which 87 were ultimately included and GRADE classified. 55 studies were classified as low quality, 20 as very low, 10 as moderate and 2 as high. Clinically relevant data from 529,469 scorpion envenomation encounters were captured. Most data were acquired from high-volume hospital and poison control centres located

in endemic locations for stings.
Children are at a higher risk of experiencing severe manifestations of scorpion envenomation. Antivenom is widely used in envenomed patients, although controversy exists as to when patients should receive it. Antivenin access varies across geographical regions, with a noted disparity between rural and urban centres. Prazosin is more effective than other supportive treatments, helping to alleviate cardiovascular manifestations.
Conclusions: Our analysis suggests that antivenom is effective in accelerating the recovery process and reducing mortality in moderate and severely envenomated patients. Synthesizing current evidence around therapeutic strategies for envenomation can inform the development of appropriate treatment and prevention protocols in non-endemic regions where clinicians lack familiarity with envenomation syndromes and appropriate therapeutics.

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Influence of Host Nutriome on Immunological Control of *Trypanosoma cruzi* Infection

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Background: Host nutritional status may impact humoral and cellular mechanisms, modulating the immunologic control of parasitic infections. Insufficient or surplus micronutrients can weaken the immune systems' function, resulting in poor immunologic control of protozoal infections.
Objectives: To further understand this, we intend to study the relationship between *Trypanosoma cruzi* infection and host micronutrient status. This will be done by analyzing how the immune response and defense mechanisms are impacted by nutrient deficiencies and perturbations in Chagas disease. The severity of Chagas disease is heavily influenced by the host's immune response to infection, while the current landscape of literature suggests that the host's nutritional status plays an integral role in this relationship.
Methods: Combinations of search terms from database inception to March 2022 were searched in five electronic databases. A total of 9.814 articles were retrieved; after deduplication 7,828 articles remained. Screening remains ongoing and has been performed independently by two reviewers with discrepancies arbitrated by a tertiary reviewer. Presently, 206 articles have been full-text screened, leaving 5 eligible for inclusion. A thorough bias assessment will be carried out using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach following screening.
Results: Interim findings suggest that poor micronutrient status is associated with greater Chagas disease severity. Deficiencies reported to impact Chagas disease clinically and parasitologically include vitamin D (n=2), selenium (n=2), vitamin A (n=1), vitamin E (n=1), magnesium (n=1), and omega-3 polyunsaturated fatty acids (n=1).
Conclusions: The data collected will be concisely reported to illustrate the findings of published literature regarding the various ways that the function of the immune system in people with Chagas disease alters and deteriorates due to nutrient deficiencies or irregular micronutrient status. This combined body of information will potentially improve the prognosis of patients with Chagas disease, by informing the development of possible adjunctive therapies include nutrient repletion.

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The Treatment of Multibacillary Leprosy Utilizing Rifampin-Ofloxacin-Minocycline (ROM): A Systematic Review

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Background: From a diagnostic and management perspective, leprosy is a complex tropical infection. Patients who are affected by leprosy are at risk of several complications associated with the disease

itself and its treatment. Standard WHO multi-drug treatment (MDT) is comprised of medications that are potentially harmful and can induce a variety of adverse systemic effects.
Objectives: Alternative options for potential treatment have emerged such as monthly dosing of rifampin-ofloxacin-minocycline (ROM) combination therapy, however, there is limited synthesized evidence of efficacy. Multibacillary leprosy, characterized by numerous skin lesions and a high bacillary load, requires more prolonged daily treatment compared to paucibacillary disease. Monthly ROM-based protocols may enable reduced pill burden and translate to fewer adverse effects associated with the clofazimine and dapsone components of standard MDT, in particular.
Methods: To assess the safety and efficacy of monthly ROM treatment in a multibacillary population, and to determine how this may be affected by determinants of health, we conducted a systematic review of relevant literature. Various databases were searched from inception to May 2022. 1,201 records were retrieved for screening however after a de- duplication process 625 articles remained. Thus far, 8 articles have been identified for ultimate inclusion, however screening remains ongoing.
Results: Interim findings suggest that treatment failure and side effect frequency is greater in the comparator group (+2.29% and +52% respectively), and that relapse is more frequent in the ROM group (+0.94%). This suggests that ROM may be comparable to gold standard therapeutics, however a more robust analysis is necessary. Additionally, major determinants of health to be considered include social environments, education level of the patient, access to health services, gender, and income.
Conclusions: By synthesizing the current evidence discussing the efficacy of monthly ROM in treating multibacillary leprosy, we will map the current body of knowledge that exists with the ultimate goal of enabling more simplified standardized treatment protocols.

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Rifampin-Ofloxacin-Minocycline (ROM) for the Treatment of Paucibacillary Leprosy: A Systematic Review

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Background: Leprosy is a complex tropical infection from a diagnostic and management perspective, as patients with leprosy are at risk of numerous related complications from the disease itself and its treatment. Standard WHO multi-drug treatment (MDT) consists of medications that are potentially harmful and cause a range of adverse systemic effects.
Objectives: Monthly- or single dosing of combined rifampicin, ofloxacin, and minocycline (ROM) has emerged as a potential treatment option for leprosy, however, a recent synthesis of the evidence supporting ROM does not exist. Paucibacillary leprosy, characterized by limited skin lesions and a low bacillary load, may be most amenable to a fluoroquinolone-based treatment protocol.
Methods: We performed a systematic review of relevant literature to evaluate the safety and efficacy of ROM-based treatment for paucibacillary leprosy. Various databases were searched from inception to May 2022, using a combination of search accounting for alternative disease and chemical identifiers. The systematic review will focus on assessing and reporting on the efficacy, and safety of monthly ROM in the treatment of paucibacillary leprosy within a human population. 1,201 records were retrieved for title and abstract screening, however, after a multi-step de-duplication pipeline, 625 articles remained. Thus far, 28 articles have been identified for final inclusion, however screening remains ongoing.
Results: Interim findings suggest that patient lesion clearance and treatment failure is greater in the comparator group (+4.69% and +2% respectively), and that relapse, side effects, and reversal reactions are more frequent in the ROM group (+0.39%, +0.42%, and +8.15% respectively). This suggests that ROM may be slightly less efficacious than its comparator, however, a more robust analysis is necessary. Determinants of health identified in the treatment of leprosy include social environments, patient education, health services, gender, and income.
Conclusions: Synthesizing the current evidence discussing the efficacy of monthly ROM, will strengthen the current body of knowledge surrounding the treatment of paucibacillary leprosy, and may allow for the development of standardized fluoroquinolone-based treatment protocols.

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An Update on the Role of Imaging in the Care of Patients with Intestinal Schistosomiasis

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Background: Schistosomiasis leads to significant morbidity and mortality worldwide, including severe hepatic disease with peri-portal liver fibrosis, portal hypertension and subsequent esophageal varices. Previous studies recommended the use of abdominal imaging to detect early hepatic changes, thereby improving disease outcome. However, there are no recently published or authoritative resources to guide the utilization of imaging in the initial diagnosis of schistosomiasis.
Objectives: We aim to synthesize available literature regarding the role of imaging in the evaluation of patients with schistosomiasis and synthesize clinical recommendations for risk stratification of this disease.
Methods: Eight electronic databases were searched: Ovid Medline, EMBASE, Cochrane Library of Systematic Reviews, Epistemonikos, Global Health, NICE, TRIP and LILACS with the following search terms: [Schistosomiasis OR (Schisto* AND (mansoni OR japonicum))] AND [CT OR (computed AND tomography) OR Ultraso* OR Sonogr* OR MRI OR (Magnetic AND resonance AND Imaging) OR Echo OR Imaging] AND [Liver OR periportal OR peri-portal OR fibrosis OR hepat* OR echogenic* OR (portal AND hypertension)] from database inception to February 28, 2019.
Results: A total of 2977 articles were identified; 1838 articles remained after deduplication. After title, abstract and full text screening by two independent reviewers and a tertiary arbitrator, 603 articles remained for full text assessment for eligibility, and after full text screening there are 404 articles for data extraction. Preliminary qualitative analyses were performed on 11 observational studies, with 9 being cross-sectional studies and 2 case control studies. There were 7 studies from Brazil and one study from Senegal, Madagascar, Zimbabwe and Tanzania, respectively. *Schistosoma mansoni* were diagnosed in patients from these settings and abdominal ultrasound was performed on the liver. Of the 4,172 participants examined, the prevalence of periportal fibrosis was between 19 to 100% across the studies.
Conclusions: Synthesizing the current literature on abdominal imaging in the evaluation of schistosomiasis can translate into clinical recommendations for improved risk stratification and management of schistosomiasis.

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Reactivation of Old World Tegumentary Leishmaniasis Following Iatrogenic Immunosuppression: Occurrence and Role for Secondary Prophylaxis

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Background: Old world cutaneous leishmaniasis (OWCL) is a neglected tropical disease caused mainly by the species *L. donovani, L. aethiopica, L. tropica, L. major* and *L. infantum.* Recent increases in global migration, travel, and climate change have contributed to the growing burden of OWCL. Moreover, the widespread availability of iatrogenic immunosuppression (IS) can increase the risk of reactivation and severe disease manifestations due to weakened immunological control. Currently, the role for secondary prophylaxis in preventing such outcomes is unknown.
Objectives: We synthesized the available data surrounding OWCL reactivation and corresponding IS regimens. We also investigated the role of secondary prophylaxis in preventing the reactivation of OWCL leishmaniasis for patients requiring immunosuppressive therapy to reduce the knowledge gap in disease management.
Methods: PubMed, Medline, Embase, Web of Science, and LILACS were searched between inception to December 12, 2022, with combinations of the search terms "*Leishmania* reactivation",

“Leishmaniasis” and “Immunotherapy”. Quality assessment of studies reporting therapeutic interventions will be conducted using the GRADE approach.
Results: 1297 full texts have been assessed for eligibility, 55 of which progressed to data extraction. Visceral and cutaneous leishmaniasis were shown to be the most common forms of reactivation in transplant recipients and inflammatory disease patients receiving IS regimens, respectively. Moreover, three case studies report the use of secondary prophylaxis to prevent OWCL reactivation. Two of those cases presented successful prevention while one case resulted in failure as three subsequent recurrences ensued.
Conclusions: The role of secondary prophylaxis in the context of OWCL remains inconclusive due to the dearth of data around this topic. Thus, this systematic review aims to further investigate the role of secondary prophylaxis to provide the necessary information required by healthcare providers in guiding the clinical management of this patient population.

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Where Do Travellers Go? Using Digital Geolocation Data to Understand the Risks of Travel to Remote Places in Common Tourist Destinations

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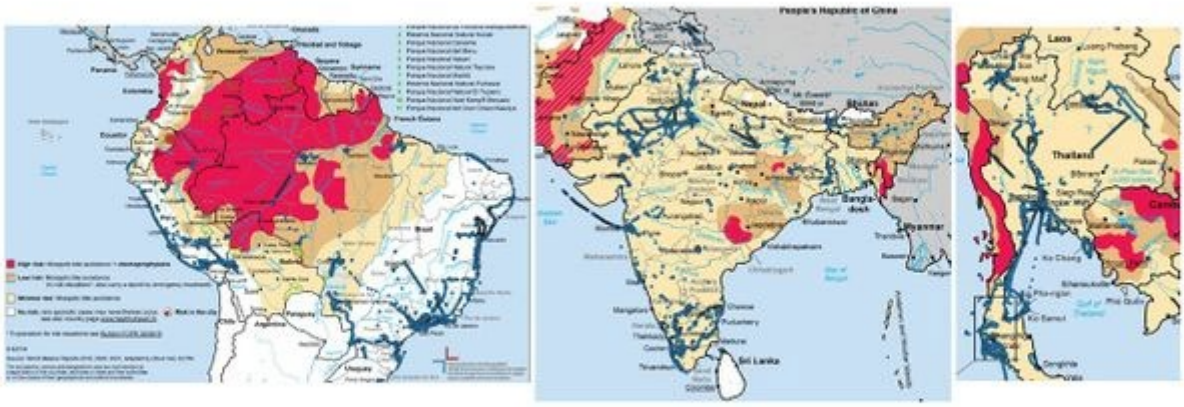
Background: The degree to which travellers visit disease endemic and remote regions in common tourist destinations remains unknown. The ability to geo-locate traveler itineraries in real-time using smartphone applications offers new opportunities to link health and environmental exposures.
Objectives: To (i) identify and describe the travellers that actually visit malaria endemic regions in six common tourist destinations, and (ii) determine whether travellers that visit remote areas have increased incidence of adverse health outcomes during their trips.
Methods: We recruited a prospective cohort of 1,000 travellers ≥ 18 years planning travel to Thailand, India, China, Tanzania, Brazil, or Peru for <5 weeks from the travel clinics in Zurich and Basel (Switzerland). Participants answered demographic, clinical, and risk behavior questionnaires pre-travel, and a daily health questionnaire each day during travel using a smartphone application. Environmental, social media, and location data were collected passively by GPS. To define high risk malaria areas, we used the malaria maps from the Swiss Expert Committee for Travel Medicine (www.healthytravel.ch). Rural areas were defined according to the Global Human Settlement Model Grid.
Results: Of the 793 travellers that completed the study, 242 (31%) visited a region defined as high risk for malaria. In Tanzania, 100% (n=225) visited a high-risk malaria area; in Peru, 6% (n=6); in Brazil, 4% (n=8); in Thailand, 2% (n=3); in India and China, 0%. None were clinically diagnosed with malaria during the study period. Among travellers visiting high-risk malaria areas, incidence of subsequent symptoms was lower than that of travellers that did not visit a high-risk malaria area (11% reported fever vs. 19%, 52% headache vs. 68%, and 27% muscle pain vs. 41%). Among the 396 travellers (50%) that visited rural areas, the incidence of fever (RR: 2.2, 95% CI: 1.5, 3.0) and diarrhea (RR: 1.3, 95% CI: 1.1, 1.4) was significantly elevated compared to travellers that remained at urban

destinations. 71 (9%) visited an altitude above 2,800m, mainly in Peru (n=47) and Tanzania (n=19).



Conclusions: Travellers often visited malaria endemic and remote areas, but malaria risk remained low. Infectious disease-related symptoms were significantly elevated in those visiting rural areas.
Conflict of Interest: I confirm that there are no potential conflicts of interest for any of the authors.

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Cardiorespiratory Test Performance in Young Adults post SARS-CoV-2 Infection Compared to Negative Controls

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Background: Several reports suggest that SARS-CoV-2 infection sequelae persist months after the acute stage of the infection even in previously healthy young persons.
Objectives: We sought to evaluate cardiorespiratory function in young personnel from the Swiss Armed Forces using a cardiopulmonary exercise test (CPET) and to compare test results in study participants who had a previous confirmed SARS-CoV-2 infection with non-exposed controls.
Methods: A standardized cardiopulmonary exercise test was done on a treadmill to evaluate fitness, heart rate, blood pressure, inspiratory and expiratory CO_2 and O_2 concentrations.
Results: We evaluated 177 participants who had a SARS-CoV-2 infection more than 6 months previously, 251 controls with negative serology, 19 participants with a recent infection, and 46 asymptomatically infected individuals. Baseline characteristics were balanced in all groups. Less than 10% of participants in each group reported having asthma, and more than 75% were physically active at least once a week. No significant differences were found in spirometric measurements, but there was strong evidence of differences in the CPET measures of percent oxygen consumption (p-value: 0.013) and work rate (p-value: 0.014) at the anaerobic threshold (AT1) between the control and the SARS-CoV-2 infected groups.
Conclusions: The study found that young persons infected with SARS-CoV-2 even > 6 months previously had significant differences in cardiovascular fitness and endurance compared to healthy controls. More research is needed to evaluate the trajectory of symptom persistence beyond one year.

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Trends among Travelers Visiting the Thai Travel Clinic in 2022, after COVID-19 Travel Restrictions Lifted

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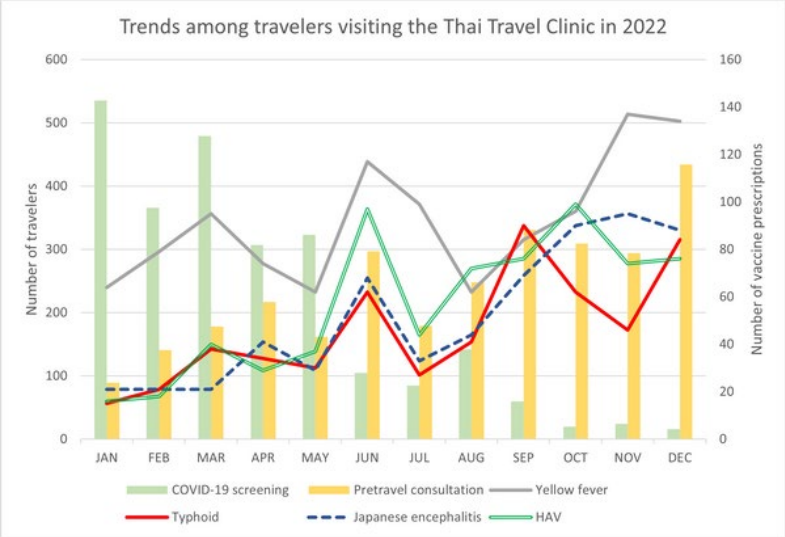
Background: The Thai Travel Clinic, at the Hospital for Tropical Diseases, Mahidol University, provides comprehensive pre- and post-travel consultations, including vaccinations, malaria prevention and other preventive measures, and COVID-19 screening tests before travel. The emergence of COVID-19 limited travel activities and impacted the Clinic's services. However, in 2022, many travel restrictions imposed at the onset of the pandemic were lifted, restoring travel to nearly pre-pandemic levels.
Objectives: To describe the trend of travelers and the medical services provided at the Thai Travel Clinic in 2022, as COVID-19 travel restrictions were eased.
Methods: The Clinic's electronic database and the Hospital Information System (HIS) were used to determine trends among travelers visiting the Thai Travel Clinic for travel-related purposes during 2022.
Results: The total number of Clinic visits decreased from 13,254 in 2021 to 10,259 in 2022 (22.6%). The higher number in 2021 was largely due to travelers seeking COVID-19 pre-departure tests, which were required by many countries for arriving passengers. During the first half of 2022, these travel requirements were still enforced, accounting for 39.9% of Clinic visits. The most common destinations for COVID-19 screening were the USA (21.3%), Japan (8.3%), and Singapore (8.0%). A significant shift occurred in June after the US CDC lifted all COVID-19 screening requirements, resulting in a dramatic decrease in the use of COVID-19 testing services.
In the latter half of the year, the main purpose of visits shifted to pre-travel consultations (36.3%), which correlated with an increase in the number of prescriptions for travel-related vaccines. The use of vaccines against yellow fever, typhoid, and Japanese encephalitis increased significantly, at 24.6%, 75%, and 108.5%, respectively. In addition to vaccinations, increasing trends in high-altitude travel consultations and prescriptions for malaria chemoprophylaxis were observed.

Characteristics of travelers and services at Thai Travel Clinic in 2022	**Total in 2022 No. (%)**	**Jan - Jun 22 No. (%)**	**Jul - Dec 22 No. (%)**
Total visit	10,259	5,313	4,946
Thai	6,689	3,213	3,476
Non-Thai	3,570	2,100	1,470
- USA	826 (23.1%)	548 (26.1%)	278 (18.9%)
- United Kingdom	330 (9.2%)	173 (8.2%	157 (10.7%)
- China	196 (5.5%)	48 (2.3%)	132 (9.0%)
- Canada	191 (5.4%)	108 (5.1%)	83 (5.6%)
- Germany	166 (4.6%)	88 (4.2%)	78 (5.3%)
Purpose of visit			
- General vaccination			
- Pre-travel consultation	2,829 (27.6%)	1,226 (23.1%)	1,603 (32.4%)
- COVID-19 pre-departure test	2,880 (28.1)	1,085 (20.4%)	1,795 (36.3%)
- Other	2,465 (24.0%)	2,118 (39.9%)	347 (7.0%)
	2,085 (20.3%)	884 (16.6%)	1,201 (24.3%)
Common destinations for COVID-19 Testing			
- USA	524 (21.3%)	514 (24.3%)	10 (2.9%)
- Japan	205 (8.3%)	114 (5.4%)	91 (26.2%)
- Singapore	197 (8.0%)	194 (9.2%)	3 (<1%)
- South Korea	135 (5.5%)	59 (2.8%)	76 (21.9%)
- Vietnam	89 (3.65)	88 (4.2%)	1 (<1%)
Common destinations for pre-travel	513 (16.3%) 250 (8.7%)	107 (9.9%) 113 (10.0%)	257 (19.8%) 137 (7.6%)

Characteristics of travelers and services at Thai Travel Clinic in 2022	Total in 2022 No. (%)	Jan - Jun 22 No. (%)	Jul - Dec 22 No. (%)
consultations - Thailand - USA - India - Brazil - South Africa	181 (6.3%) 157 (5.5%) 94 (3.3%)	56 (5.2%) 103 (9.5%) 28 (2.6%)	125 (7.0%) 54 (3.0%) 66 (3.7%)
Vaccine Usage (doses) - Yellow fever - Japanese encephalitis - Typhoid - Hepatitis A (HAV)	 1,103 620 550 678	 491 201 200 237	 612 419 350 441
High-altitude consultations	169	44	125
Malaria chemoprophylaxis prescriptions	283	91	192



Trends among travelers visiting the Thai Travel Clinic in 2022

Conclusions: COVID-19 regulations inevitably impacted travel-medicine service providers, affecting both the overall number of travelers and the types of services offered by clinics. This highlights the importance of travel-medicine practitioners being able to adapt to changes in the global health situation and being prepared for the eventual resumption of travel.

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Delaying the Third Dose of Japanese Aluminum-free Hepatitis A Vaccine Aimmugen Elicits Effective Immune Responses against Hepatitis A in Adults

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Background: Inactivated aluminum-adsorbed hepatitis A vaccines such as Havrix, Vaqta, and Avaxim are commonly used worldwide. These vaccines are typically administered in a two-dose series (at 0 and 6–12 months). However, a lyophilized inactivated aluminum-free hepatitis A vaccine, Aimmugen, which is approved in Japan, is typically administered in a three-dose series (at 0, 2–4, and 24 weeks).

Hence, individuals visiting endemic hepatitis A areas receive the primary two doses of Aimmugen prior to travelling and the third booster dose much later. It is currently uncertain whether boosting with a delayed third dose of Aimmugen is effective, or whether a new vaccination schedule should instead be initiated.
Objectives: We investigated the anti-hepatitis-A-viral immune response of adult travelers who received the third dose of Aimmugen more than 24 weeks after the first dose.
Methods: Participants were vaccinated with the third dose of Aimmugen > 24 weeks after their initial vaccination. Antibody titers were measured at Day 0 (pre-vaccination) and at 28–42 days after the third dose of Aimmugen.
Results: Twenty-nine adult participants were enrolled in the study (14 men and 15 women; mean age ± standard deviation age, 36.2 ± 8.1 years). Interval between the primary two doses and the third dose was 3-14 years. The seroprotection rate (i.e., the percentage of participants with anti-hepatitis A virus antibody titers ≥ 10 mIU/mL) was 96.6% (28/29) at Day 0 and increased to 100% (29/29) at Days 28–42. Geometric mean titers increased from 105 mIU/mL to 4,013 mIU/mL.
Conclusions: We showed that delaying the third dose of Aimmugen still elicited effective immune responses after priming with two doses of the vaccine.
previously_presented: Poster presentation in The 25th Annual meeting of the Japanese society for vaccinology

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Monitoring Changes in Respiratory Pathogen Carriage in Swiss Armed Forces Personnel Deployed in Kosovo Using Pre- and Post-deployment Nasal Swabs

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Background: Airborne transmission of pathogens can be a major cause of morbidity in deployed military and the airway route may also be a conduit for agents of bioterrorism.
Objectives: In this study, conducted prior to the COVID-19 pandemic, we sought to monitor changes in respiratory pathogen carriage in Swiss military personnel deployed in Kosovo
Methods: The study was designed as a prospective evaluation using paired nasal swabs. The swabs were taken immediately prior to departure and on the return flight from Kosovo. Short questionnaires were administered at the time of swabbing to capture data on the occurrence of respiratory symptoms and influenza like illness. The paired swabs were tested for 34 respiratory viruses and bacteria using Real Time PCR. Differences in proportions were tested by McNemar's chi-square which takes into account the pair structure of questionnaires and PCR results.
Results: We evaluated 204 participants. The PCR results showed changes in colonization and pathogen carriage pre- and post-deployment particularly with respect to rhinovirus, common coronavirus and the bacteria *Staphylococcus aureus* and *Klebsiella pneumoniae*. We found concordance between symptom questionnaires and PCR results.
Conclusions: The study showed that nasal swabs can be successfully used for deployed military to monitor circulating respiratory pathogens and to may be effective in recognising regional emergence of new pathogens. This will be of added value for military surveillance and preparedness and allow for tailored planning of medication needs and vaccines.

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Corsican Deadlicacies

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Background: Hepatitis E is the most common cause for acute hepatitis with approximately 3.3 million symptomatic cases out of the 20 million estimated Hepatitis E Virus (HEV) infections worldwide. It has a global distribution with two separate epidemiological patterns: endemic and sporadic. In France, Occitania, Corsica, and the South-East region have the highest annual incidence rates. It is a mainly foodborne disease occurring after consumption of contaminated water or raw or undercooked pork, boar or deer meat. Other routes of transmission include: contact with infected persons or animals, mother-to-infant transmission, and parenteral route. Incubation period after oral contamination is 14 days-10 weeks. Pregnancy, immunosuppression, and pre-existing chronic liver disease represent risk factors of severe HEV infection with liver failure and death.
Objectives: Increase hepatitis E awareness among travelers to Occitania, Corsica, and South-East France.
Methods: We report a case of symptomatic hepatitis E in a French military traveler.
Results: On February 1, 2022, a 46 year-old French military, up-to-date on all his routine vaccines (especially Hepatitis A and B), with unremarkable past medical history, presented with recent fatigue, anorexia, nausea, dark urine, light jaundice, and pruritus. He reported the consumption of figatellu and fitone (Corsican specialities made of pork meat) while visiting his wife's family in Corsica, during the Christmas holidays, in December 2021. Blood work showed a 130-fold, 50-fold, and 5-fold increase of ALT, AST, and conjugated bilirubin respectively. Free bilirubin, hemoglobin, and haptoglobin rates were normal as well as prothrombin time. Ultrasound imaging of the liver and bile ducts was unremarkable. HEV IgM antibodies were 34-fold the normal level. HIV, HCV, CMV, and HHV6 serologies were negative. He was immune to toxoplasmosis, EBV, HAV, and HBV. Treatment was based on rest and avoiding hepatotoxic products (alcohol, acetaminophen, etc). Outcome was favorable with complete recovery 6 weeks later. His wife was HEV IgG positive.
Conclusions: Hepatitis E is an underestimated and underdiagnosed disease with potential lethal outcome (particularly in case of pregnancy, immunosuppression, and pre-existing chronic liver disease). Prevention in travelers is based on drinking only purified water and avoiding raw or undercooked pork, venison, and wild boar meat in endemic countries.
Conflict of Interest: None

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An Update on the Role of Imaging in the Care of Patients with Genitourinary Schistosomiasis: A Systematic Review

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Background: Schistosomiasis is a parasitic trematodiasis caused by worms of the genus *Schistosoma*. In areas that are endemic to *Schistosoma haematobium* - Africa and the Middle East - genitourinary schistosomiasis causes significant mortality and morbidity. Infection with *Schistosoma haematobium* can lead to severe fibrosis and calcification in the urinary and reproductive organs such as the bladder, ureter, and genitalia. Infection is also highly correlated to infertility.
Objectives: There have been no recent authoritative resources to guide the use of imaging in the initial risk stratification and management of genitourinary schistosomiasis, therefore, our work aims to fill this gap in clinical care guidance by performing a systematic review of existing evidence.
Methods: Five databases were searched using the following search terms: [Schistosomiasis OR (Schisto* AND haematobium)] AND [CT OR (computed AND tomography) OR Ultraso* OR sonogr* OR MRI OR (Magnetic AND resonance AND Imaging) OR Echo OR Imaging] AND [Bladder OR ureter OR ureter* OR genital OR prostate OR seminal vesicle OR vas deferen* or urinary] from database inception to December 2020. After de-duplication 769 articles remained for title/abstract screening. Articles were systematically double screened by two reviewers and a tertiary arbitrator. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) was employed. Data were summarized using qualitative measures.
Results: Imaging was able to demonstrate abnormalities in the bladder, caused by infection including changes in shape, size, and the presence of calcifications. In a study done in an established endemic area of Madagascar, ultrasound showed bladder abnormalities in 47% of participants infected with *Schistosoma haematobium*. Likewise, ultrasounds performed on Zimbabwean primary school children revealed bladder masses and thickenings in 27% of those who were infected with the parasite.

Conclusions: In countries endemic to the disease, the use of imaging was able to diagnose and provide key information about disease progression and management. Imaging is an important tool for risk stratification and management caused by schistosomiasis. This systematic review on imaging evaluation on genitourinary schistosomiasis will strengthen the current body of knowledge. Findings can be translated into clinical recommendations that can improve risk stratification and management of this genitourinary disease.

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Dientamoeba fragilis Infection; Clinical and Treatment Evaluation

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Background: *Dientamoeba fragilis* (DF), a gastrointestinal protozoa, has been an emerging pathogen since the introduction of new Multiplex PCR stool tests. This parasite is associated with gastrointestinal symptoms, yet its pathogenicity is still controversial.
Objectives: To assess the clinical aspects, and treatment response, of all patients positive for DF by PCR who were seen in our center.
Methods: All symptomatic patients with stool PCR positive for DF alone (or co-infected with *Blastocystis* spp) during 2017 - 2022 were included.
Clinical data are presented for all. Treatment regimen was given according to the treating physician decisions. Response to treatment was evaluated in patients who repeated post-treatment second molecular stool test. Clinical cure was defined as resolution of symptoms following treatment course. Molecular response was defined as PCR result for DF following any of the treatment courses. Clinical and molecular response was evaluated about one month following treatment course
Results: During the study period 106 patients were eligible, 52.8% were female. In 47.2% the infection was acquired in relation to international travel. Adult population (83%) has a median age 39 years old, while pediatric population has a median age of 8.5 years old. 98.1% had gastro-intestinal (GI) symptoms, 72.6% loose stools , 72.6% abdominal pain and 45.3% bloating.
Extra-intestinal complains were observed including fatigue (46.2%), eosinophilia (14.2%), pruritus-ani (8.5%), and perianal rash (5.7)%,
122 treatment courses with clinical responses and 95 with molecular responses were recorded. Clinical cure with nitroimidazoles-based regimen achieved in 22.1% vs. 78.2% by paromomycin treatment ($p<0.0001$). Molecular cure rate was 14.6% in nitroimidazoles-based regimen vs. 90.5% after paromomycin-treatment ($p<0.0001$). Clinical cure was strongly associated with molecular eradication of the parasite, occurred in 97.6%. , while only occurred in 9.1% with molecular failure ($p<0.0001$).
Conclusions: Our results support DF as being pathogenic protozoa since there was a correlation between DF eradication and clinical cure. DF should be considered in cases of persistent abdominal symptoms, and in addition is causing extra-intestinal symptoms, unusual in other GI protozoa infection. Paromomycin should be the preferred treatment option.

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Influence of Host Nutriome on Immunological Control of *Leishmania* Infection

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Background: Immunologic control of parasitic infections arises from a combination of humoral and cellular mechanisms, both of which may be influenced by host nutritional status. Micronutrient depletion or over-repletion impairs the functioning of the immune system, potentially resulting in increased susceptibility to and poor immunologic control of protozoal infections.
Objectives: We aim to synthesize the knowledge surrounding the interplay between host micronutrient status and *Leishmania* infections. Leishmaniasis is a tissue-dwelling parasitic infection in which disease severity is determined by the host's immune system. Research suggests that acquired

factors such as nutritional inadequacies play a significant role in immunosuppression and enhanced pathogenicity.
Methods: Five electronic databases were searched with combinations of search terms from database inception to March 2022. A total of 9,814 articles were retrieved; after a deduplication step 7,828 articles remained. Screening remains ongoing and has been performed independently by two reviewers with discrepancies arbitrated by a tertiary reviewer. Currently, 206 articles have been full text screened leaving 12 eligible for final inclusion. Following screening, a comprehensive bias assessment will be carried out using the GRADE approach.
Results: Interim findings suggest that malnourished individuals are at greater risk of acquiring a significant leishmanial infection. Deficiencies reported to impact the disease severity and parasitologic parameters include malnourishment in general, as well as deficiencies in vitamin A, zinc (n=3 each), iron (n=2), fiber, vitamin E, potassium, selenium, and copper (n=1 each). Disruptions to white blood cell count (n=3), and antibody levels (n=1) were also noted.
Conclusions: The data will be summarized to systematically map published literature that will illuminate several ways in which nutrient deficiencies or abnormal micronutrient status alter and impair immune function in persons with leishmaniasis. This synthesized body of information will ultimately inform adjunctive therapeutic decisions in the context of leishmaniasis, which has the potential to improve patient prognosis.

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Knowledge of Travel Medicine among Medicals Students and Lecturers who Attended the Hubert Kairuki Memorial University 2022 Convocation

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Background: Travel medicine is an evolving field of medicine due to globalization and increased movement of people across the globe, from developed to developing and vice versa for varying reasons. It is dynamic and multidisciplinary. Tanzania attracts travellers but there is insufficient data on the knowledge of travel medicine especially in the medical field. We aimed to assess the awareness of medical students and lecturers about travel medicine among the attendees of the Hubert Kairuki Memorial University convocation where there was a talk about travel medicine.
Objectives: This study aimed to assess the awareness of Travel medicine among medical students and lecturers at Hubert Kairuki Memorial University.
Methods: We conducted a cross sectional study at Hubert Kairuki Memorial University, among the attendees of the 2022 convocation; lecturers and medical students. We used a google form sent via mail. We collected the data from 26th December 2022 to the 4th January 2023. All participants of Hubert Kairuki Memorial University convocation who agreed to voluntarily submit to the questionnaire. We excluded a second form filled by the same participant.
Results: 39 persons replied to the google form, one form was excluded because filled by the same participant.
30 participants were medical students (76.9%) and 9 lecturers (23.1%).
The age group was between 19 and 52 years.
21 participants (53.8%) only heard about it at convocation and 36 participants (87.2%) have never been to a travel clinic.
There is a huge interest in learning more of which 38 participants (97.4%) were interested in learning more about travel medicine.
Conclusions: There is low awareness of travel medicine but majority are interested to learn more about it.

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Investigation of a Cluster of Autochthonous Malaria at Frankfurt International Airport, Summer 2022

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Background: Occasionally, malaria is acquired in non-endemic areas. In absence of a relevant travel history, delayed diagnosis may lead to adverse clinical outcomes. Genomic analysis of *Plasmodium* DNA can assist in establishing the geographical origin of malaria parasites.
Objectives: We describe the epidemiological and molecular investigations of a cluster of odyssean malaria cases in Frankfurt International Airport employees in Germany, during the summer of 2022.
Methods: Three airport employees without a history of travel to malaria-endemic areas or blood transfusions were diagnosed with malaria tropica. Co-workers were screened for febrile illnesses in the 42 days preceding the case diagnoses. We conducted entomological investigations to find the source of the outbreak. We performed whole genome sequencing (WGS) of the *Plasmodium falciparum* genomes to investigate parasite genetic relatedness between the cases and predicted parasite origin, using principal component analysis, a discriminant analysis of principal components, and identity-by-descent (IBD) analysis respectively.
Results: On July 12th, 2022, a bus driver was diagnosed with malaria tropica (parasitaemia 0.15%) and the following night, a forklift driver presented with severe malaria (parasitaemia 7%). A third case of severe malaria (parasitaemia 15%) was reported in Hannover, Germany, on September 14th with symptoms since July 6th. All were Frankfurt International Airport employees, but had neither worked in the same area of the airport nor handled the same aircraft, goods or travellers. There had been no direct flights from Ghana, Togo, Ivory coast or Burkina Faso in June and July. Screening of airport employees did not identify additional malaria cases. No mosquitoes were trapped at the airport. All three patients have recovered.
Genomic analysis of the *P. falciparum* isolates obtained from the 3 patients showed that the parasites were highly related (IBD > 95 %). The geographical origin of the isolates from three cases was positioned closest to Ghana (figure 1).
Conclusions: We described three (two severe) airport malaria cases. The infecting *Plasmodium falciparum* strains were highly related and likely originated from Ghana. Awareness of airport malaria should prompt appropriate diagnostics and comprehensive outbreak investigations when unexplained fever cases present near international airports to avoid late diagnosis and severe morbidity.

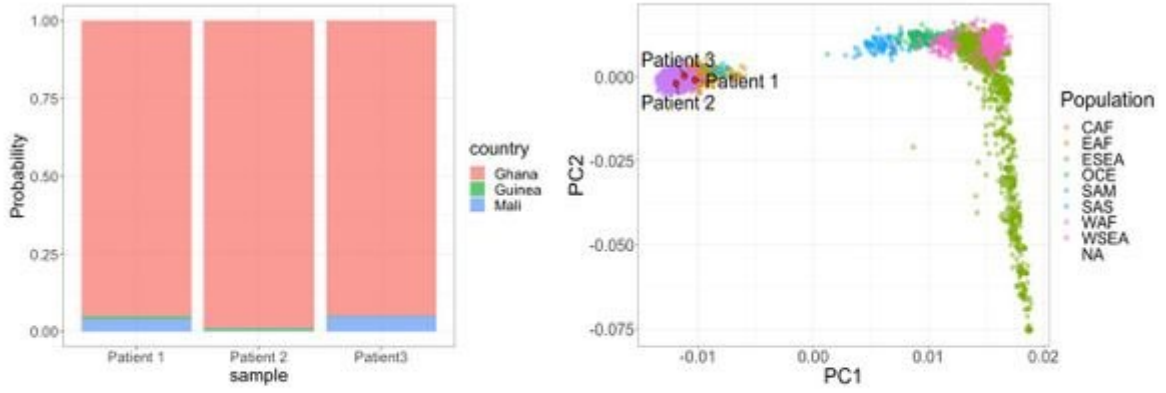

Figure 1. Probability of the country of origin of the *P. falciparum* strains detected in the three patients based on discriminant analysis of principal components (DAPC, top) and a principal component analysis of all samples included in the MalariaGen database together with the three patient samples. (PCA, bottom) of the three specimens (patient 1, 2 and 3).

Code	Region
CAF	Central Africa
EAF	East Africa
ESEA	East Southeast Asia
OCE	Oceania
SAM	South America
SAS	South Asia
WAF	West Africa
WSEA	West Southeast Asia

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Data Science Methods to Increase Detection of Emerging Infections Using the GeoSentinel Core Surveillance Data

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Background: GeoSentinel, a network of 71 clinics worldwide, has been conducting sentinel surveillance for travel-related infections since 1996. The Network identified many sentinel events by analyzing clusters of cases reported to the GeoSentinel database, but timely detection of emerging infections has been hampered by various biases, such as the lack of denominator data and selective data entry.
Objectives: To investigate data science methods that can be applied to GeoSentinel data to increase the likelihood of signaling outbreaks by detecting patterns, clusters, trends, and outliers.
Methods: We conducted a literature search to identify data science methods that could be adapted and implemented to obtain a self-learning, automated system that can conduct real-time surveillance of travel-related infections using GeoSentinel core surveillance data (demographics, travel and clinical data).
Results: We identified two classes of data science methods for the surveillance of disease events. The class of model-based surveillance methods includes (1) traditional *control charts* that are capable of detecting small temporal shifts and drifts (*e.g.*, cumulative sum control charts, exponentially weighted moving average), (2) *regression-based monitoring* that detect clinically significant trends in time-ordered patient data by eliminating for instance seasonal trends, and (3) *scan statistics* that can identify unusual clusters of events in sparse spatial-temporal data in the absence of denominator data. The class of data-driven surveillance methods includes (1) *spatial clustering techniques* that could retrospectively find global and local disease clusters, (2) *hotspot analysis methods* that use vectors or grids to identify statistically significant local geographic extreme events, and (3) *machine and deep learning techniques* (e.g., support vector machines, neural networks) that could identify anomalies in heterogeneous data and self-learn when more data is added.
Conclusions: Two main classes of data science methods can be used for automated surveillance of travel-related infections and outbreak detection. Based on our results, we will adapt and implement the most promising methods for automation of core surveillance activities. We will retrospectively validate these data science methods for their ability to detect independently identified past outbreaks in the GeoSentinel database. Early identification of travel-related illnesses and detection of emerging infections may assist with global public health responses and prevention of travel-related morbidity.

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An Average Cost of Pre-travel Counselling for a Traveler Spending Per Visit at Thai Travel Clinic in 2022

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Background: A budget prepared for a trip is usually planned according to a trip itinerary. However, pre-travel consultation expenses may be overlooked and considered unnecessary or overpriced for some individuals. Some might be at risk of exposure to health threats during their journey and end up spending more on medical bills.
Objectives: This study aims to demonstrate an average price of pre-travel counselling per visit at the Thai Travel Clinic in 2022.
Methods: Data was retrieved from the Thai Travel Clinic's electronic logbook and medical records of travelers who visited the Clinic in 2022 for pre-travel consultation. All expenses on laboratory

investigations, medication, and vaccination were recorded and analyzed. Hospital and doctor fees were excluded.
Results: In 2022, a total of 10,259 travelers visited the Thai Travel Clinic, of which 2,880 were pre-travel consultation. Only 2,718 visits were included in this study due to the completeness of data. The majority of visitors were from Asia (74.79%). The most common destination was Asia (1,177 visits, 43.30%), followed by Africa (762 visits, 28.04%). Thailand was a destination for 17.67% (480) of visits by foreigners. The average cost per visit of all travelers was 52.60 USD. The highest average spent per visit was from travelers planning to visit Africa (75.60 USD), which yellow fever, hepatitis A and meningococcal vaccines were the most frequently prescribed. The lowest spending was among travelers visiting Asia (42.72 USD) in which rabies pre-exposure prophylaxis and Japanese encephalitis vaccines were commonly prescribed. Foreigners visiting Thailand spent an average of 36.23 USD on the counselling. The data also showed that 142 travelers (5.22%) only received health education without any vaccine or medication prescription.

Table 1: Average cost per visit of pre-travel counselling at the Thai Travel Clinic in 2022.

Population		n	%	Average spent (USD)[1]	Minimum (USD)[1]	Maximum (USD)[1]
Total visit		2718	100	52.60	0	551.67
Region of residence						
	Africa					
	Asia	12	0.44	69.34	14.88	240.30
	Australia	2033	74.80	56.00	0	551.67
	Europe	50	1.84	35.18	0	81.15
	North America	360	13.25	40.86	0	303.64
	South America	254	9.35	45.21	0	237.45
	Thai	9	0.33	37.03	10.58	66.27
		1815	66.78	56.35	0	551.67
Destination						
	Africa					
	Asia	762	28.04	74.57	0	551.67
	Australia	1177	43.30	42.72	0	296.30
	Europe	35	1.29	59.63	0	190.82
	North America	91	3.35	46.99	0	246.88
	South America	318	11.70	46.35	0	316.73
	Worldwide	322	11.85	43.63	0	260.91
	Domestic[2]	13	0.48	55.80	0	144.85
	Thailand[3]	25	0.92	42.95	0	192.97
		480	17.66	36.23	0	248.55
Advice only		142	5.22	-	-	-
Pre-travel counselling exclude advice-only group		2576	95.78	55.50	0.23	551.67

[1] Exchange rate 1 USD = 33 THB
[2]Thai travelers traveling in Thailand
[3]Foreign travelers traveling in Thailand

Conclusions: The expense for pre-travel counselling can be varied due to destination and vaccines required. The average cost of pre-travel counseling at the Thai Travel Clinic in 2022 was less than 60 USD which can be beneficial to save up the medical bills caused by illness during the journey. Thus, we encourage travelers to consider pre-travel counseling as a necessary expense.

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Comparison of Clinical and Laboratory Manifestations of Primary vs. Secondary Dengue Fever in Travelers

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Background: Dengue fever (DF), caused by the Dengue virus (DenV), is the most common arboviral disease in travelers worldwide. It is hypothesized that compared with primary DF, secondary DF may result in antibody-dependent enhancement of the immune response, resulting in more severe disease.
Objectives: We aimed to compare clinical and laboratory parameters in travelers with primary and secondary DF to determine whether secondary DF is associated with markers of severe disease.
Methods: We conducted a retrospective cohort study, which included all patients diagnosed with DF at the Central Virology Laboratory of the Israeli Ministry of Health during 2008-2019. Clinical, laboratory and virological data were extracted from laboratory and patient records. A Diagnosis of DenV infection was based on positive nonstructural protein 1 or serology. Primary and secondary infections were based on accepted definitions. Severe DF was defined according to WHO classification.
Results: We identified 245 DF cases: 210 (85%) primary and 35 (14%) secondary. While fever duration was significantly longer in secondary compared with primary infections (6.4 vs. 5.3 days, p=0.02), Aspartate aminotransferase levels were significantly higher in primary compared with secondary cases (146 vs. 64 U/L, p<0.001), and no other clinical or laboratory parameter differed significantly between the groups. Of note, only 4 patients had severe DF, all were primary infections, and none died.
Conclusions: In a cohort of returning travelers with DF, secondary infection, compared with primary infection, was not associated with markers of severe disease.

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Pre-travel Health Services: Development of a Hub and Spoke Model

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Background: In 2017, the Scottish Government and the Scottish General Practitioners Committee agreed that publicly funded vaccinations would move away from a model based on General Practitioner (GP) delivery to one based on National Health Board delivery through dedicated teams. The UK has a mixture of public and private delivery of travel vaccination provision. Here we describe the development of a new large travel health service in NHS Lothian, Scotland.
Objectives: Hub and spoke models have been used across industries to augment peripheral services by centralising key resources. The Vaccine Transformation Programme came into action in April 2022 with NHS Lothian (population 916k) opting to roll out a hub-and-spoke model of travel health care to a) replace previous travel vaccination provision by GPs and b) deliver comprehensive, holistic and accessible travel health assessments.
Methods: A GP survey estimated a need for a capacity of 18k appointments/y. The pre-existing travel clinic at Western General Hospital in Edinburgh serves as a hub of expertise being located within a large tertiary infectious diseases unit. To absorb the work previously undertaken by GPs, spoke clinics were set up throughout the wider Lothian area. Staffing includes travel health nurses, doctors, a pharmacist, and administrators. The clinical service is led by an infectious disease consultant.
Results: The hub-and-spoke organisation design is a model which offers a full array of services via the hub, complemented by secondary spokes which can route highly complex travellers needing more intensive services to the hub for assessment. The start of the new service in April 2022 coincided with the world reopening to travel post pandemic. Since then, it has grown exponentially and is on track to deliver its planned targets.
Conclusions: This model allows for consistency across operations by virtue of policies and procedure being issued offering uniformity throughout the network. This increases efficiencies, enhances quality of care for patients, and staff satisfaction. The decentralised care provision improves access for travellers. Furthermore, the hub-and-spoke model is a highly scalable design, with spokes being added as needed in response to demand.

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Co-circulation of Dengue Virus Serotypes 1, 2, and 3 in the 2022 Massive Dengue Outbreak in Nepal

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Background: Largest dengue outbreak in the history with significant number of causalities occurred in 2022, affecting all 77 districts of Nepal with the hardest hit being nation's capital city, Kathmandu (altitude 1300 m). However, molecular epidemiology including dengue virus (DENV) serotypes responsible for this unusual epidemic remained unknown.
Objectives: To understand the epidemic trend, clinico-laboratory features, and identify responsible DENV serotypes and their viral load profiles during 2022 outbreak in Nepal.
Methods: This was a hospital based cross-sectional study conducted at Sukraraj Tropical and Infectious Disease Hospital (STIDH) in Kathmandu, Nepal. Dengue suspected febrile patients were investigated by routine-laboratory assays, serological and molecular tools including real-time quantitative polymerase reaction (qRT-PCR). Additionally, publicly available data from Epidemiology and Disease Control Division (EDCD) were also analyzed to understand the national scenario of this epidemic.
Results: Of the 538 dengue suspected patients enrolled at STIDH, 401 (74.5%) were diagnosed as dengue. Among these dengue cases, 129 (32.2%) patients who required hospital admission had significant association with myalgia, rash, diarrhea, retro-orbital pain, bleeding, and abdominal pain. DENV-1, -2 and -3 were identified during 2022 epidemic with a predominance of DENV-1 (57.1%) and DENV-3 (32.1 %) reflecting a new serotype addition. Other adjoining districts of Kathmandu also reported more than one serotypes. No statistically significant difference was observed in the levels of genome copy numbers between outpatients and admitted dengue patients and among infecting serotypes. Nepal reported 53,951 dengue cases and 62 deaths (fatality rate, 0.11%) with 58.8% cases reported in September (epidemic peak) while 55.3% of total cases were from Kathmandu valley alone.
Conclusions: We found multiple serotypes circulated in 2022 with more frequencies of hospitalizations, more severe dengue and deaths. Therefore, precise mapping of dengue and other related infections through integrated disease surveillance, assessing the travel-impacts, dynamics of population level immunity and virus evolution should be urgent plan of actions for evidence-based policy making for dengue control and prevention in the country.
Conflict of Interest: None.

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Multidisciplinary Consensus Recommendations for Management of Imported Schistosomiasis Coordinated by the Italian Society of Tropical Medicine and Global Health (SIMET)

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Background: Human schistosomiasis is a Neglected Tropical Disease that affects people living in tropical and subtropical regions. Receiving a constant flow of migrants and travelers from endemic countries, non-endemic regions need to implement practical guidelines to quickly identify and manage acute and chronic schistosomiasis.
Objectives: Develop handy and clinically relevant recommendations on schistosomiasis screening, diagnosis and treatment useful for a broad range of health care providers in non endemic setting.
Methods: A multidisciplinary panel was selected among the members of the Italian Society of Tropical Medicine and Global Health (SIMET) to identify key clinical questions, perform the literature search, develop and validate a set of recommendations through a Delphi consensus-seeking procedure involving internal and external experts.
Experts form ten additional Scientific Societies were involved to discuss, refine, endorse and promote the recommendations, namely the Italian Society of Infectious and Tropical Diseases (SIMIT), the Italian Association of Microbiologists (AMCLI), the Italian Association of Parasitology (SoIPa), the Italian Society of Urology (SIU), the Italian Society of Pediatric Infectious Diseases (SITIP), the Italian Pediatric Society of (SIP), the Italian Society of Gastroenterology and Digestive Endoscopy (SIGE), the Italian Society of General Medicine and Primary Care (SIMG), the Italian Society of Gynecology (SIGO) and Italian Society of Colposcopy and Cervico-Vaginal Pathology (SICPVC).
Results: A set of multidisciplinary recommendations to cover screening, laboratory and imaging diagnosis, treatment and follow-up both for chronic and acute schistosomiasis were developed and listed in the Figure.

CHRONIC SCHISTOSOMIASIS

SCREENING

Population to screen
- Screening for schistosomiasis is recommended in all subjects, even if asymptomatic, who were born or have lived for at least 6 months in endemic countries;
- Screening is also recommended in all subjects, independently by their country of origin, who have visited endemic countries even for short periods (e.g., tourists) and who may not exclude freshwater exposure

Screening tools
- Serological tests are the recommended screening tools considering their high sensitivity for detection of schistosomiasis in low-endemicity settings

DIAGNOSIS

Clinical suspicion of chronic schistosomiasis
The diagnosis of schistosomiasis should be considered in subjects who present the epidemiological criterion (travel or origin from endemic area) and at least one among the followings:
a) eosinophilia,
b) signs and/or symptoms, even if non-specific, affecting the gastrointestinal system (abdominalgia, hepato- and / or splenomegaly),
c) signs and or symptoms, even if non-specific, affecting urogenital system (e.g., hematuria, dysuria, lower back pain, hemospermia etc.).

Laboratory tools
It is recommended to use a combination of direct and indirect tools to diagnose chronic schistosomiasis:
- one serological test with high sensitivity and specificity at least
- parasitological examination of at least 3 stool/urine samples and possibly of a tissue biopsy in case of high diagnostic suspicion but when diagnosis may not be confirmed by less invasive methods
In case of availability, you may consider using:
- DNA detection tests on stool, urine and serum;

Coinfection to screen
The following screening tests are recommended in the subject with a possible, probable and established diagnosis of schistosomiasis to rule out other epidemiologically related infections:
- HIV- Ab;
- HCV-Ab, HbsAg, HBs Ab, HBc Ab, HAV-Ab (particularly recommended in subject with hepato-intestinal schistosomiasis);
- Strongyloides-Ab.
Patients potentially eligible for latent tuberculosis infection (LTBI) treatment according to local guidelines may benefit from LTBI screening when signs or symptoms of active tuberculosis are excluded. IGRA (Interferon-Gamma Release Assays) or Mantoux test may be used.

Imaging in patients with chronic schistosomiasis
Ultrasound of the abdomen is recommended in the following situations:
- symptoms of chronic schistosomiasis;
- signs of organ damage (e.g., haematuria, microhaematuria, splenomegaly, history of hematemesis) or other signs of chronic schistosomiasis;
- other comorbidities (e.g., HBV or HCV infection);
- positive parasitological examination of stool or urine or other direct methods of diagnosis such as CAA or DNA detection tools.

Cystoscopy in patients with urogenital Schistosomiasis
- Cystoscopy ± biopsy is recommended in patients with urogenital schistosomiasis in case of bladder lesions that do not regress at 3-6 months after praziquantel therapy;
Cystoscopy ± biopsy is not recommended in patients with a clinical suspicion of urogenital schistosomiasis since the diagnosis can be obtained through non-invasive tests (such as serology and parasitological test).

Colposcopy in patients with genital schistosomiasis
Colposcopy is recommended in patients diagnosed with or suspected of FGS in the following situations:
- signs and symptoms of genital involvement in order to verify any differential diagnoses.
Colposcopy is recommended in women who complain genital discomfort even before the diagnosis of schistosomiasis is formulated. A serology test is suggested in case of a suggestive clinical picture

TREATMENT

Patients to treat
- all patients with probable or proved schistosomiasis must be treated with praziquantel
- empiric treatment with praziquantel may be considered in i) migrants from countries with high prevalence of schistosomiasis in context of public health initiatives; ii) patients with high clinical suspicion of schistosomiasis but without a microbiology confirmation.

Recommended antiparasitic drugs
-Praziquantel is the first line treatment for schistosomiasis;
-Praziquantel dosage for chronic schistosomiasis: 40 mg/kg/die po in 1 or 2 doses the same day for S. haematobium e S. mansoni, 60 mg/kg/die in 3 doses the same day for S. japonicum e S. mekongi.
-calculate the final dose on patient's weight and administer divided doses 4-6 hours apart. It is recommended to take it with or immediately after a meal to enhance its absorption;
-in non-endemic areas it is suggested to repeat the daily dosage for three consecutive days for subjects ≥ 4 years old with chronic schistosomiasis;
Investigate past history of seizures or skin nodules and clinically rule out neurocysticercosis or ocular cysticercosis before prescribing praziquantel.

Praziquantel use in special population
- pregnant and lactation: praziquantel may be used during pregnancy and lactation with standard dosage (over 1 day). In non-endemic settings, the benefit of treating a pregnant woman must always be balanced with the risk of disease progression in the absence of adequate treatment.
- children aged less than 4 years old: praziquantel is recommended at standard dosage (over 1 day, off label use of praziquantel). It is possible to crush the tablets and give them together with a soft food or drink.
- HIV co-infection: evaluation of drug interactions required.
Patient with active TB or ITL: administer praziquantel prior to initiation of rifampicin therapy in order to avoid sub-optimal treatment for schistosomiasis

Principles of management in patients with complicated chronic schistosomiasis
After praziquantel treatment, subjects with urogenital or hepato-intestinal schistosomiasis with organ complications should be managed with an individualized and multidisciplinary approach and possibly at a referral centre.

Follow up of patients with chronic schistosomiasis
- in asymptomatic subjects with probable infection in which only serologic data supports the diagnosis, no follow-up is recommended.
- in subjects with eggs of Schistosoma spp. on stool or urine, parasitological monitoring is recommended 2-3 months after treatment with praziquantel and, if viable eggs are still detected, a new antiparasitic treatment is requested.
- in subjects with hepato-intestinal schistosomiasis and pathological findings at imaging, ultrasound monitoring is recommended 6 months after the end of treatment. The frequency of ultrasound follow up may be modified depending on the severity of the picture.
- in subjects with urogenital schistosomiasis with bladder wall lesions, ultrasound monitoring is recommended at 1, 3 and 6 months until lesions disappearance. The persistence of bladder lesions at 6 months after treatment should lead to histological investigation through biopsy to rule out carcinomatous evolution and differential diagnoses.

ACUTE SCHISTOSOMIASIS

DIAGNOSIS

Clinical suspicion of acute schistosomiasis (Katayama syndrome)
The diagnosis of schistosomiasis should be considered in subjects with the epidemiological criterion (travel in endemic area in the last 3 months and history of direct contact with fresh water) and at least one among the following:
a) onset of symptoms such as nocturnal fever, headache, myalgia, non-productive cough, sweating, gastro-intestinal symptoms, hepatomegaly, urticarial rash, neck pain.
b) eosinophilia

Laboratory tools for diagnosis of acute schistosomiasis
It is recommended to use a combination of direct and indirect tools to diagnose Katayama syndrome:
- one serological test with high sensitivity and specificity. If serology is initially negative repeat the test after 3-4 weeks from the onset of symptoms and approximately 4-8 weeks after contact with contaminated water to check a possible seroconversion
- parasitological examination of at least 3 stool/urine samples. If initially negative repeat the test after 4-8 weeks from the exposition.
In case of availability, you may consider using:
- nucleic acid amplification tests by DNA detection tool on serum.

TREATMENT AND FOLLOW UP

Management and follow up of Katayama syndrome
- all patients with probable or proved acute schistosomiasis must be treated with an antiparasitic drug associated with steroids administration;
- empiric treatment with praziquantel may be considered before the microbiology confirmation in travellers or entry migrants from endemic countries who presents with possible acute schistosomiasis;
- Praziquantel dosage for acute schistosomiasis: 40mg/kg/die for S. mansoni and S. haematobium and 60 mg/kg/die for S. japonicum, both in 2 doses the same day for 1-3 days associated with steroids administration (prednisone 25 mg/die or equivalent for 3-6 days with progressive de-escalation during 2-3 weeks). Repeat praziquantel in 6-8 weeks when all worms are mature.

Conclusions: Even considering the limitations due to the use of expert opinion-based method, those recommendations are intended to allow a multidisciplinary and forward-looking approach to identify and manage schistosomiasis in Italy and could be useful also in other non-endemic setting. The involvement of several Scientific Societies form different fields of medical science aim to broadly disseminate good practices for the management of this Neglected Tropical Disease.

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Health Literacy and Need Assessment of Migrants-construction Workers and Homeless in Delhi

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Background: Migrant and homeless population seeks less outpatient services and more emergency services and require hospitalization even for preventable conditions. In India health profile of homeless is not well documented. Their health needs and literacy for healthy lifestyle is known, however no published report is available on it specific nature and extent. This study enables the task of documenting this information.
Objectives: Updation of status of migrant marginalized community in Delhi.

Methods: This cross sectional door to door surveys carries out the assessment of health status and needs in nonsystematic approach. The survey was designed to describe health problems of migrating homeless marginalized community and to identify inequalities It was conducted by volunteers group and Government funded NGOs working for improvement of the health of this set of community from November, 2012 to January, 2013.
A non-probability mode sample of 877 persons was interviewed from the following sites-Kalakaji flyover, JNU campus construction site, Hauz Khas village slum dweller, Munirka night shelter, Kusum Pahari slum.
Results: 24% morbidity (n=210) was recorded. In children, upper respiratory infections (34%) were commonest of morbidities followed by pain in abdomen (28%) and malnutrition /anemia (20%). Other morbidities like tuberculosis, eye & ear infections and congenital defects comprised 18% of the morbidities. In adults, joint pain & nonspecific body aches (30%), indigestion & acidity restlessness, irritation anxiety
(34%), loss of vision (8%) headache (7%), anemia (6%) ruled the chart. Most of the mental problems like stress, anxiety, restlessness, irritation were present and 67% of the participants were alcoholics. At each of the sites, there were 2-3 young alcoholic males
(20-30 years old) who presented with severe jaundice and liver failure. At all the sites we observed that liquor, ganja, tobacco chewing, bidi smoking were common addictions among male members and widely practiced.
Conclusions: A huge gap in knowledge attitude and practices in health literacy and health services was identified in migrant construction sites workers and homeless. Availability of Alcohol and other addictive agents needs to be restricted at such sites. There is a need for
regular mobile health services, education and counseling help for better health of such migratory population.
Conflict of Interest: None

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Ethnopharmaceuticals for the Treatment of Old World Cutaneous Leishmaniasis: A Systematic Review

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Background: Toxicity, expense, and accessibility limit treatment success in Old World genus Leishmania found in the Middle East, Mediterranean basin, Arabian Peninsula, Africa as well as the Indian Subcontinent. Better drugs are urgently needed, however, drug discovery is hampered by limited funding given burden of highly endemic OWCL mostly to LMICs. Plant-based compounds with potential anti-leishmanial effects found in and around local endemic communities present an opportunity to overcome the aforementioned therapeutic challenges, and many such interventions are supported by anecdotal evidence of efficacy.
Objectives: We aim to synthesize existing evidence around available ethnopharmaceuticals to promote drug discovery for the prevention and treatment of OWCL.
Methods: Five electronic databases were searched. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) will be implemented. Further data extraction will be performed by two reviewers and the quality of the articles will be critically evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach. A total of 7662 articles were retrieved. Titles, abstracts, and full-text articles are in the process of being systematically double screened by two reviewers with a tertiary arbitrator. As of right now, 828 studies have been assessed for full-text eligibility and statistical analysis has been performed on 5 papers.
Results: 13 studies were included evaluating a number of topical applications of ethnopharmaceuticals including: Buca (Mat lippie), *Cassia fistula*, Z-HE, *Juniperus excelsa*, honey, *Achilles millefolium*, ozonated olive oil, *Sambucus ebulus*, garlic, *Azadrachta indica*, *Acacia nilotica*, *Physalis minima* and *Morinda citrifolia*. Eight (62%) studies were RCTs, 3 (23%) studies were cohorts and 2 (16%) studies were from patents. *C. fistula* gel was the most studied extract, evaluated in addition to Glucantime therapy, where topical gel resulted in complete cure [RR = 1.62 (1.17-2.24)].

Conclusions: Synthesizing the current evidence surrounding ethnopharmaceuticals for the treatment of OWCL may contribute to drug discovery pipelines and potentially lead to novel therapeutics in a field that has not seen any new drug development for over half a century.

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A Systematic Review of Kidney Solid Organ Transplantation in Acute Presentations of Tropical Infectious Diseases

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Background: Fulminant life-threatening presentations of acute tropical infections may occur, and the degree of end-organ impairment may qualify patients for kidney solid-organ transplantation (SOT). However, there is a knowledge gap around indications for and outcomes in kidney SOT for severe acute tropical infectious diseases.
Objectives: We aim to synthesize such knowledge, focusing on patient outcomes.
Methods: Five electronic databases were searched. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) will be implemented. Further data extraction will be performed by two reviewers and the quality of the articles will be critically evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach. A total of 7662 articles were retrieved. Titles, abstracts, and full-text articles are in the process of being systematically double screened by two reviewers with a tertiary arbitrator. As of right now, 828 studies have been assessed for full-text eligibility and statistical analysis has been performed on 5 papers.
Results: All 5 papers diagnosed malaria in patients. Statistical analysis demonstrates that the most common etiologic pathogens in synthesized papers of patients undergoing kidney SOT are *Plasmodium falciparum* and *Plasmodium vivax*. An analysis of patient outcomes shows that 60% of patients survived after kidney SOT.
Conclusions: Malaria due to P. falciparum or P. vivax are the most well represented pathogens causing acute tropical infections requiring kidney SOT. The full data set will be summarized to systematically map published literature that will illuminate the frequency, indications for, and health outcomes of kidney SOT recipients in the treatment of acute tropical infectious diseases. Where kidney SOT capacity exists, alongside the occurrence of endemic or imported tropical infectious diseases, such synthesized information is essential for resource allocation and informed clinical decision-making.

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Treatment of Schistosomiasis in Pregnancy: A Systematic Review of Fetal and Infant Outcomes

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Background: Parasitic infections in pregnancy necessitate considerations of numerous factors, including the potential developmental outcomes for the fetus and newborn. For these considerations, a substantial knowledge gap exists in schistosomiasis, with few published and authoritative resources to guide clinical decision-making.
Objectives: We aimed to map the available literature regarding the safety of intestinal schistosomiasis treatments during pregnancy for fetal and infant development.

Methods: Five electronic databases were searched and titles, abstracts, and full texts of included studies and reviews were screened from database inception to July 2021 without language restriction. Systematic reviews randomized controlled trials, cohort studies, smaller observational studies, case-control studies, case series, and case reports were screened. Two independent reviewers extracted the data and assessed trial quality using the GRADE approach. Data were summarized using qualitative and quantitative measures for the safety of praziquantel treatment on fetal and infant outcomes. The risk of bias for each study was determined.
Results: A total of 3013 articles were retrieved from literature databases and other sources. After title and abstract screening, 658 full-text articles were assessed for eligibility. Of the sixteen studies included in qualitative synthesis, three were also included in the meta-analysis. Data showed praziquantel treatment of mothers infected with *S. mansoni* during pregnancy increased the incidence of infantile eczema [RR 2.65 (95% CI 1.16 - 6.08)] but did not increase the incidence of stillbirth, neonatal deaths, congenital anomalies, unhealthy newborns, or serious infant adverse events. No associations were identified between praziquantel and birth weight, infant weight and height, Apgar score, or being small for gestational; nor were any associations found between praziquantel and infant cytokine levels, newborn and infant hemoglobin levels, or newborn and infant anemia.
Conclusions: With increased international travel and the migration of vulnerable populations, health practitioners are bound to encounter schistosomiasis infections in pregnant patients. Currently, quality evidence supporting specific management strategies with a fetal and neonatal lens is limited. Synthesizing the current literature on the treatment of schistosomiasis may improve the effects of pregnancy care.

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Are Travellers Interested in Receiving, during the Pre-travel Consultation, An Information on Measures to Reduce their Carbon Footprint?

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Background: The carbon footprint of the tourism industry represents approximately 8% of global greenhouse gas emissions. Reducing it inevitably involves changing travel arrangements. The pre-travel consultation is a privileged moment to make travellers aware of the risks associated with travel, whether infectious or non-infectious (traffic accidents, food hygiene, sexual behaviour). This preventive dimension could include information on the negative environmental impact of travel and ways to mitigate it.
Objectives: We assessed the acceptability by travellers of receiving, during the pre-travel consultation, an information on the ways of reducing their carbon footprint while traveling.
Methods: A question was added to the medical questionnaire usually completed by travellers before the pre-travel consultation. This question was as follows: Do you think that our centre should provide information on measures that can reduce the ecological impact linked to travel? The pilot study was conducted from 1st May to 15th May 2022. The second phase started in January 2023 and is ongoing.
Results: In the pilot study, out of 88 travellers questioned, 44, meaning 50%, were in favour of receiving this type of information, 23 (i.e., 26%) were against it and 21 (i.e., 24%) had no opinion. The study is still ongoing. The final results will be available in April 2023.
Conclusions: The travellers questioned during the pre-travel consultation are mostly in favour of obtaining information in connection with the measures that can reduce the carbon impact of their journey. Information of this nature could be offered systematically to the traveller, in the same way as individual prevention measures.

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Comparing Pre and Post Post Pandemic Travel Patterns in a Travel Clinic

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Background: The spread of covid 19 virus has led to significant and sudden changes in travel patterns, resulting in a virtual shutdown of travel medicine activity. At the same time, many questions have been raised about the negative impact of global travel on the environment.
Objectives: To describe the effects of the covid pandemic on travel behaviors by comparing pre- and post-pandemic data from a travel clinic
Methods: We compared the profile of pre covid travellers (between January 01, 2019 to December 31, 2019) and post covid travellers (January 01, 2022 to December 31, 2022) in a travel clinic in Lausanne. The following data were compared from the database: destination, length of stay, type of travel, number of continents visited, average flight carbon emission (using my climate calculator) and average distance travelled.
Results: We included 9202 travellers in 2019 and 5998 in 2022. The five most visited destinations in 2019 were Tanzania (12%), Brazil (7.89%), Senegal (5.58%), Thailand (4.26%) and India (4.14%). In 2022, the five most visited destinations were Tanzania (18.9%), Senegal (6.97%), Brazil (4.95%), DRC (4.79%), Kenya (4 %). In 2019, 48.8% travelled less than 15 days (48.45% in 2022), 42.47% between 15 days and 3 months (42.24% in 2022), 4.16% between 3 and 6 months (4% in 2022) and 4.56% more than 6 months (5.4% in 2022). In 2019, 96.4% of travellers visited one continent (96.8% in 2022), 2.98% visited two continents (2.53% in 2022), 0.48% visited three continents (0.57% in 2022), 0.13% visited 4 continents (0.1% in 2022). In 2019, 74% were tourists (70.4% in 2022), 9% were business travellers (9.90% in 2022) and 10,19% were VFR (15.4 % in 2022). The average distance travelled by plane (travellers visiting one country) was 13,000 km in 2019 and 12,430 km in 2022. The average flight emission was 2.15t in 2019 and 2.06t in 2022. The statistical analysis is ongoing.
Conclusions: The post covid characteristics of travellers are similar to those pre covid in this travel clinic. The pandemic didn't induce lasting changes in travel patterns.

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HIV Traveler - Are Vaccines Safe?

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Background: As countries reopen post-COVID, international travel is increasing. Providers need to have a sound knowledge base of understanding the intricacies of prescribing vaccines for the person living with human immunodeficiency virus (HIV) (PLWH) and acquired immunodeficiency syndrome (AIDS). With the increased use of pre-exposure prophylaxis (PrEP), HIV/AIDS detection levels are decreasing. This can impact which vaccines are offered A reviews population.
Objectives: This presentation aims to identify the benefits, risks, and barriers of vaccinating PLWH.
Methods: A review of current evidence and guidelines will be presented, highlighting the significant risks associated with vaccinating the PLWH traveler. Review current anti-retroviral therapy (ART) and understand diagnostic evidence to provide safe outcomes. Additional evidence will describe the point brought forward in peer-reviewed and gray literature.
Results: This presentation will offer the provider information regarding the safety and efficacy of prescribing, vaccinating, and appropriately protecting the PLWH traveler. Provide visual algorithms based on current guidelines for vaccination of a PLWH with live vaccines.
Conclusions: Guidance will be provided regarding the approach during the pretravel consult. We will identify behaviors, risks, and benefits of vaccines. A review of lab value consideration for the PLWH includes vaccine titers, CD4 count, viral load, and any change to their immune status, which may change eligibility to receive a live vaccine. We will discuss the risk of adverse events with vaccination, seroconversion, and seropositivity in the PLWH to determine additional levels of protection that may be warranted. Discuss the need for additional guidelines for this population of travelers. In conclusion, a review of resources facilitates confidence in prescribing.

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A Systematic Review of Liver Solid Organ Transplantation in Acute Presentations of Tropical Infectious Diseases

S. Bhasker[1], E. Hagopian[1], M. Klowak[1,2], T. Shahid[1], R. Ahmed[1], S. Igboanugo[1], J. Hewitt[1], O. Jamal[1], C. Madakadze[1], C. Lecce[1], A. K Boggild[1,2,3]

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Background: Fulminant life-threatening presentations of acute tropical infections may occur, and the degree of end-organ impairment may qualify patients for liver solid-organ transplantation (SOT). However, there is a knowledge gap around indications for and outcomes in SOT of the liver for severe acute tropical infectious diseases.
Objectives: We aim to synthesize such knowledge, focusing on patient outcomes.
Methods: Five electronic databases were searched. A total of 7662 articles were retrieved. Titles, abstracts, and full-text articles are in the process of being systematically double screened by two reviewers with a tertiary arbitrator. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) will be implemented. As of right now, 828 studies have been assessed for full-text eligibility and 10 full-text articles have been included in statistical analysis. Further data extraction will be performed by two reviewers and the quality of the articles will be evaluated using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach.
Results: An analysis of the type of tropical infectious diseases assessed shows that the majority of diagnoses are acute hepatitis and viral hepatitis E infection. 80% of the articles assess the hepatitis E virus pathogen. An analysis of patient outcomes shows that 70% of patients survived following SOT.
Conclusions: The data will be summarized to systematically map published literature that will illuminate the frequency, indications for, and health outcomes of SOT of the liver recipients in the treatment of acute tropical infectious diseases. Such synthesized information is essential for appropriate resource allocation and informed clinical decision-making.

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Impact, Health Care Utilization and Costs of Travel-associated Mosquito-borne Diseases in International Travelers: A Prospective Study

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Background: International travelers frequently acquire diseases while traveling in endemic areas, yet relatively little is known about the impact and economic burden of these diseases on travelers.
Objectives: We conducted a prospective exploratory costing study on adult returning travelers with falciparum malaria, dengue, chikungunya, or Zika virus.
Methods: Patients were recruited in eight Travel and Tropical Medicine clinics between June 2016 and March 2020 upon travelers' first contact with the health system in their country of residence. The patients were presented with a structured 52-question self-administered questionnaire after full recovery to collect information on patients' healthcare utilization and out-of-pocket costs both in the destination and home country, and about income and other financial losses due to the illness.
Results: A total of 134 patients participated in the study (malaria, 66; dengue, 51; chikungunya, 8; Zika virus, 9; all fully recovered; median age 40; range 18-72 years). Only 7% of patients were hospitalized abroad though 61% were hospitalized upon returning home. Similarly, while 15% sought

ambulatory services while abroad, 61% utilized outpatient services at home. Each dengue episode resulted in a median loss of 10 (IQR 6 – 15) work or school days, each malaria episode a median loss of 5 (IQR 3 – 7) days, each chikungunya episode a median loss of 7 (IQR 6 – 9) days, and each Zika virus episode a median loss of 7 (IQR 4 – 9) days. The average direct out-of-pocket hospitalization cost in the destination country (US$2,236; range: $108-$5,160) was significantly higher than the direct out-of-pocket ambulatory cost in the destination country (US$327; range: $0-$1,560), the direct out-of-pocket hospitalization cost in the home country (US$35; range: $0-$120), and the direct out-of-pocket ambulatory costs in the home country (US$45; range: $0-$192). Respondents with dengue or malaria lost a median of USD $570 (IQR 240 – 1140) and USD $240 (IQR 0 – 600), respectively, due to their illness, while those with chikungunya and Zika virus lost a median of USD $2,400 (IQR 1200 – 3600) and USD $1,500 (IQR 510 – 2625), respectively.
Conclusions: Travelers often incur significant costs due to travel-acquired diseases. Further research into the economic impact of these diseases on travelers should be conducted.
Conflict of Interest: None
previously_presented: ASTMH 2022 in Seattle, USA (Poster ppt)

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Trials and Tribulations of Conducting RCTs in Mass Gatherings

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Background: Limited number of randomised controlled trials (RCTs) have been conducted in the field of travel medicine. Mass gatherings (MGs) such as Hajj pilgrimage provide a unique opportunity to conduct RCTs that require a large sample size but are often fraught with various challenges. Here we describe the challenges we faced while conducting RCTs at MGs.
Objectives: To present the challenges we faced while conducting RCTs at MGs.
Methods: This is a qualitative description of various challenges we encountered during the execution of six RCTs (including pilot trials) at Hajj and Umrah MGs conducted from 2011 to 2021. We focus on the challenges or setbacks experienced by investigators, data collectors and participants, and discuss the difficulties experienced during logistic operation and field work.
Results: From 2011 to 2021, we conducted six RCTs including two pilot RCTs, all but one involving Hajj pilgrims from Australia, Saudi Arabia and Qatar, and the other involved Umrah pilgrims from Saudi Arabia. These RCTs explored the effect of facemask or hand hygiene against respiratory viral infections, immunological interactions of vaccines, and the effect of conjugate vaccines on pharyngeal bacterial carriage. The challenges experienced are related to: a) collaboration, b) logistics, c) trial execution, d) data quality, and e) funding. Challenges of collaboration include poor cooperation, not meeting deadlines and changing mind at the last minute. Logistic issues include unavailability or delay in the supply of study tools, products, diagnostics and maintenance of cold chain. Issues with the execution of RCTs include randomisation, blinding, inadequate follow-up, and importantly poor compliance of the trial participants. Issues with data quality include submission of incomplete questionnaires, loss to follow up, suboptimal training or performance of the data collectors. Funding issues include non-release of grant money before the start of field work, and withdrawal of funding due to regional political crises.
Conclusions: There are preventable challenges in conducting RCTs in MGs.
Conflict of Interest: Nil.

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A Systematic Review of Treatment Strategies for Percutaneously Introduced Marine Toxins and Venom

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Background: Marine envenomation's are common worldwide, and can range from mild to severe, the latter causing a multitude of symptoms including paralysis, cardiac depression and neurological toxicity. Without appropriate medical intervention, marine envenomation's can be fatal. With the rising prevalence of travel and ecotourism, potential exists for increased exposure to marine stings and penetrating marine injuries.
Objectives: We aim to synthesize existing evidence around diagnosis, treatment and prevention of marine envenomation's into a clinical resource.
Methods: Four electronic databases were searched from inception to August 2019 using combinations of the search terms "marine", and "envenomation." Iterative inclusion and exclusion of search terms were employed to maximize article extraction. The search was refined to humans only, without language restriction. For the systematic review, we will include observational studies, case reports, case series, and cohort studies, as well as clinical trials, and therapeutics tolerability and efficacy. The GRADE approach will be employed to assess quality of studies reporting therapeutic interventions. Evidence will be summarized using descriptive measures for each intervention type. Meta-analysis will be planned if sufficient efficacy measures exist.
Results: 299 MEDLINE articles, 1060 PubMed, 937 EMBASE, and 1785 BioSIS records were retrieved for title and abstract screening. Of those, 1152 duplicates were removed, with 2926 remaining and 266 from LILACS. Data will be grouped and summarized for ease of clinician use by marine organism, syndrome, prevention and therapeutic strategies, and according to geographic location and species. Thus far in our search, *jellyfish* (47), *scorpaenidae* (24), and *stingrays* (21) are the leading etiological agents for marine envenomation's. Also, the geographical areas of interest for the envenomation's included North America (30 total envenomation's), Europe (22 total envenomation's), and Australia (13 total envenomation's).
Conclusions: With increased globalization, as well as the rising numbers of clinicians electing to train or work in areas where marine envenomation's are common, it is important to synthesize the current evidence around clinical epidemiology, presentation and management for marine envenomation's. This synthesis will subsequently help to develop updated public health protocols to ensure timely and effective medical intervention for marine envenomation's.

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Safety and Immunogenicity of an Investigational Yellow Fever Vaccine in Adults

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Background: The re-emergence of yellow fever (YF) as a global threat to public health and the recent shortages of licensed vaccines in the face of multiple regional outbreaks has underscored the need for newer YF vaccines that match currently available products in safety and effectiveness, but improve upon ease of manufacturing. vYF is a next-generation live-attenuated YF vaccine grown in serum-free Vero cells, developed to ensure more sustainable and robust supply. Preclinical testing of vYF demonstrated equivalence to licensed YF vaccines. In a Phase I clinical trial in adults (UTN: U1111-1217-1958), vYF was shown to be safe at all tested doses and to elicit a protective immune response.
Objectives: We conducted a Phase II randomized, observer-blind, active-controlled (YF-VAX), non-inferiority multicenter study of vYF, 5Log $CCID_{50}$/dose, in 18–60-year-old adults, in the USA (BB-IND: IND #: 019167; WHO UTN: U1111-1261-5612).
Methods: 565 adults were randomized 2:1 to receive vYF or YF-VAX. Solicited and unsolicited adverse events (AE) were collected in all participants, hematologic and biochemical parameters

assessed in a subset of subjects. Primary immunogenicity endpoints included YF neutralizing antibody (Nab) titers, seroconversion, and seroprotection. An interim analysis through Day 29 (D29) was performed.

Results: 486 participants were YF-naive at baseline (329 in vYF, 157 in YF-VAX groups).

No vaccine related death or serious AEs occurred. No fever ≥ 39.0°C was reported in any group. Most injection site or systemic reactions were mild to moderate and resolved spontaneously within 1-3 days. The most commonly reported solicited reactions were injection site pain, headache, malaise and myalgia.

Four weeks post-vaccination, participants had YF Nab titers above the protective threshold (micro-neutralization assay, 10, 1/dil). Almost all (>99%) YF-naïve participants seroconverted and achieved seroprotective Nab titer by D29, irrespective of the vaccine group (Table 1). vYF met the non-inferiority criterion for immunogenicity compared to YF-VAX.

Table 1: Immune responses against YF on D29

	vYF	YF-VAX
Seroconversion (% - 95%CI)	99.7 (98.3; 100)	99.4 (96.5; 100)
Seroprotection (% -95%CI)	99.7 (98.3; 100)	99.4 (96.5; 100)
GMT (10, 1/dil – 95%CI)	2705 (2355; 3107)	3225 (2629; 3955)

Conclusions: A single dose of vYF is safe, well tolerated, and immunogenic in 18 to 60 years old individuals 28 days post-vaccination, similar to YF-VAX.

Conflict of Interest: EF, AMM, CF, AR, TM, HA and LD are Sanofi employees and may hold company shares/stock options

Funding: The study was funded by Sanofi