

Epidemiology of Pathogens Listed as Potential Bioterrorism Agents, the Netherlands, 2009–2019

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Sarah Gregory] Hello, I'm Sarah Gregory, and today I'm talking with Dr. Jorrit Broertjes, a physician and resident in clinical microbiology at the Amsterdam University Medical Centers. We'll be discussing pathogens listed as potential bioterrorism agents in the Netherlands.

Welcome, Dr. Broertjes.

[Jorrit Broertjes] Thanks, Sarah. Thanks for having me on the podcast.

[Sarah Gregory] Bioterrorism agents are used as the plots in plenty of fictional books, and obviously they're great for scaring people. But what are bioterrorism agents in real life?

[Jorrit Broertjes] Bioterrorism agents are pathogens classified as potential bioterrorism agents based on characteristics such as route of transmission, pathogenicity, infectious dose, and also stability in the environment. These characteristics would allow ill-meaning individuals to use them as a bioweapon.

[Sarah Gregory] And how does something get classified as a bioterrorism agent?

[Jorrit Broertjes] There are several lists drawn up by, for example, the CDC (the American Centers for Disease Control and Prevention) which classifies these agents based on their potential to be used—or misused, I should say—as a bioweapon.

[Sarah Gregory] Okay. So there's people that make these lists. Are they...who are they that keep track of these agents? What are these agencies? You mentioned CDC. Are there some others?

[Jorrit Broertjes] Yes. There is also a European list, but this is currently maintained by the European Medicines Agency. So these are just government agencies which make prioritization which pathogens should be taken extra care of.

[Sarah Gregory] So how did these agents become part of the lists? What makes them classified?

[Jorrit Broertjes] There are several pathogens, for example bacteria, which can be dangerous because they are easily transmitted to persons and also have a high mortality rate, so that makes them a potential bioweapon. So they should be taken extra care of.

[Sarah Gregory] And, okay, so how are bioterrorism agents actually used or how could they be used for bioterrorism? Warfare, obviously, or killing people, but how?

[Jorrit Broertjes] Fortunately, the number of cases where these pathogens have been used as a bioweapon are very limited. But there are several ways possible for which we can prepare, and one way is the release of aerosols. So if people make a bacteria into very small droplets—and that could be released on a crowd of people, for instance—that could be a potential risk.

[Sarah Gregory] Okay. So these are not always just theoretical concerns. There are actually events that have occurred?

[Jorrit Broertjes] Fortunately, it is very difficult to perform a successful—if you even can call it that—bio attack. There have been attempts. For example, in Japan in 1993, the Aum Shinrikyo cult tried to release anthrax. However, they failed because they used a vaccine strain, which is the wrong strain. But it had been a serious attempt. And also in 2001, there had been anthrax

spores which were sent in the mail (a lot of people may know) which caused a lot of concern and panic. So these are concerns. But fortunately, it is rather difficult for people to do this.

[Sarah Gregory] Are there levels or degrees of dangers for the different agents? Are some worse than others?

[Jorrit Broertjes] Yes. There are many pathogens which could be misused. But there is a classification based on how easily they are transmitted, the mortality rate. So that influences the risk involved and following the classification as a potential bioweapon.

[Sarah Gregory] Your study looked at bioterrorism agents in the Netherlands. Why did you want this information?

[Jorrit Broertjes] First of all, to be clear, these are natural occurrence or background incidence of these pathogens. They are not suspected of actual bioterrorism attacks. Many of these pathogens occur in nature and are either endemic or travel-related, but it's important to know how often they occur. And the aim of this study was to provide an overview of the incidence exemplified in the Netherlands. One major aim of this study was to raise awareness for biosafety laboratories, as many of these pathogens can also potentially be harmful to employees of clinical microbiology laboratories. Another important factor is to underscore the relevance of biosecurity measures to prevent unauthorized access to these pathogens.

[Sarah Gregory] What period of time did you look at and why then?

[Jorrit Broertjes] We set observation time for 2009 to 2019. We started in 2009 because in 2008, a new law was implemented in the Netherlands (a public health act) which classified certain diseases as notifiable diseases, and many of the potential bioterrorism agents are also notifiable diseases. So that's the starting point. The end point was 2019 because, as we all know, after 2019 the COVID-19 pandemic occurred, which very much restricted air travel and travel in general. So since we want to have a normal incidence of these pathogens, that's not a good period to check. So we took 2009 to 2019.

[Sarah Gregory] And what did you find? What were the pathogens, number of cases, and incidences?

[Jorrit Broertjes] The pathogen with the highest incidence was *Coxiella burnetii* (Q fever), but this was because from 2007 to 2010 there was a Q fever endemic (epidemic) in the Netherlands, actually the largest epidemic recorded. So in 2009, there were over 2,000 cases, which is quite a lot for a small country. But after that, the cases decreased to 10 cases per 10 million persons per year. So that's still relatively a lot, especially compared to other cases. So for example, the incidence with more than one case per 10 million persons per year were *Brucella*, *Francisella*, and also *Burkholderia pseudomallei*. Pathogens with an incidence of less than one per 10 million persons per year were hemorrhagic fever viruses, *Clostridium botulinum*, and anthrax. Finally, as expected, smallpox did not occur in the Netherlands since it had been globally eradicated, and also *Yersinia pestis* was not found because the last case of *Yersinia pestis* was almost 100 years ago in the Netherlands. So that was also expected that we did not find any cases.

[Sarah Gregory] *Yersinia pestis* is plague, right?

[Jorrit Broertjes] Exactly. So we fortunately do not have any cases anymore for quite some time.

[Sarah Gregory] That is fortunate. We've had several in the United States.

Could these findings be similar to other countries globally or would different countries have different pathogens, agents, and events?

[Jorrit Broertjes] Yeah. There are a lot of differences between countries globally (climate related), and in certain countries some of the pathogens are endemic, for example *Brucella* can be found in the Middle East and also the plague, as we discussed earlier, is found in Madagascar and it can also be found in North America as well.

[Sarah Gregory] Apparently, you excluded some agents from your study. Why was this?

[Jorrit Broertjes] As we discussed before, there are a lot of pathogens which could be misused. However, prioritization was made so the less dangerous pathogens were excluded, and we focused on the most harmful pathogens.

[Sarah Gregory] You also mention in your study that it might make more sense for the EU to keep these lists instead of some of the agencies keeping them now. Why is that?

[Jorrit Broertjes] That's not actually correct. I think the US should keep their own list by the CDC. However, the current list in Europe is maintained by the European Medicines Agency, which is mainly tasked with approving medicine. It would be more logical to give the task to the European Centre for Disease Control and Prevention (ECDC), as in a similar situation with CDC in the United States.

[Sarah Gregory] I see, okay. So how are bioterrorism acts prevented, the rare times they actually occur? Does the prevention differ for the type of agent, say a virus versus ricin, which comes from castor beans?

[Jorrit Broertjes] Well, in general, these pathogens have very low incidences. This makes them very unlikely for ill-meaning individuals to isolate them from natural sources in the Netherlands. However, these pathogens do cause infections in limited cases, but these pathogens are then stored in clinical microbiology laboratories. So that means that these locations should be...have good security. So this underscores the need for biosecurity measures as a means to prevent bioterrorism attacks.

[Sarah Gregory] Okay. So tell us a little bit more about what kinds of preparedness do you see as essential for preventing these kinds of attacks?

[Jorrit Broertjes] Preventing means that you've got to prevent in the first place that anyone can get these pathogens. That's done by controlling and restricting the development, production, stockpiling, and other ways of acquiring these biological and toxin weapons, and as well ways of delivering them. And preparedness means being able to respond in case that an act of bioterrorism is suspected. This requires securing the site where the agent is released (if there is a site known), and also safely identifying the pathogen to guide further actions.

[Sarah Gregory] What do you consider the most important public health takeaways from your study?

[Jorrit Broertjes] Some consider bioterrorism a high-impact but a low-probability event. That means that the probability that it happens is low, but it could cause a lot of panic and could have a lot of impact. So I think the main thing is to be prepared. And also, the low incidence really underscores, like I said before, the need for good biosecurity measures at laboratories.

[Sarah Gregory] Is there a personal public health nightmare scenario that worries you the most?

[Jorrit Broertjes] There are many potential scenarios which could be...which could cause a lot of panic and chaos. I think the most important thing is to be prepared, for different organizations—involve law enforcement, CDC—to know what to do. So in that case, the biggest nightmare for me would be to have an unprepared public health center.

[Sarah Gregory] Dr. Broertjes, tell us about where you work and what you do there.

[Jorrit Broertjes] I am currently training to become a clinical microbiologist at Amsterdam University Medical Center. And our main task is, at the hospital laboratory, we identify the pathogens causing infection in patients and advise on their treatments, suggesting antibiotics and other measures to improve patient health and recovery.

[Sarah Gregory] Well, thank you so much for taking the time to talk with me today.

[Jorrit Broertjes] Thank you very much for having me on the show.

[Sarah Gregory] And thanks for joining me out there. You can read the July 2023 article, *Epidemiology of Pathogens Listed as Potential Bioterrorism Agents, the Netherlands, 2009–2019*, online at [cdc.gov/eid](https://www.cdc.gov/eid).

I'm Sarah Gregory for *Emerging Infectious Diseases*.

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