

# ***Salmonella* in Thanksgiving Turkey, 1998-2018**

[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. Farrell Tobolowsky, a CDC FLIGHT fellow in Atlanta. We'll be discussing *Salmonella* serotypes associated with illness after the Thanksgiving holiday.

Welcome, Dr. Tobolowsky.

[Farrell Tobolowsky] Thank you.

[Sarah Gregory] We've talked a lot about *Salmonella* on our podcasts, but can you briefly describe what it is for those who are listening in for the first time?

[Farrell Tobolowsky] Sure Sarah, I'm happy to. *Salmonella* are bacteria that make people sick, and we divide *Salmonella* into two groups based on the types of illness they cause. So typhoidal *Salmonella* can cause typhoid and paratyphoid fever, and the CDC estimates that this group of *Salmonella* causes about 400 infections among people in the US each year. And most people with typhoid traveled abroad to a place with poor sanitation and hygiene.

Then nontyphoidal *Salmonella* causes a diarrheal illness called salmonellosis. And the CDC estimates that this group of *Salmonella* are far more common in the US, causing about one million infections each year. And most people in the US with a nontyphoidal *Salmonella* infection got it after eating contaminated food. So our paper, today's talk, focuses on the second group (nontyphoidal *Salmonella*).

[Sarah Gregory] Okay. So what are the symptoms of nontyphoidal *Salmonella*?

[Farrell Tobolowsky] Symptoms can vary among people, but usually include diarrhea, fever, and stomach cramps. Some people might have nausea, vomiting, or a headache as well. The symptoms usually last four to seven days.

[Sarah Gregory] And is there any treatment for it?

[Farrell Tobolowsky] That's a bit of a trick question. The good news is that most people recover without doing more than just drinking extra fluids to stay hydrated while they have diarrhea. However, antibiotic treatment is available when needed, for example for people with or at risk for severe illness.

[Sarah Gregory] Okay. So how severe can it get?

[Farrell Tobolowsky] Even though it rarely happens, these illnesses can be rather severe, leading to hospitalization and even death. This can happen when people become extremely dehydrated or when the bacteria spread beyond the digestive tract into the bloodstream and to other parts of the body. Infants, older adults, and people with weakened immune systems are more likely than others to get a severe illness. Unfortunately, CDC estimates that these infections are responsible for about 400 deaths in the US each year.

[Sarah Gregory] So as many deaths from nontyphoidal version as total typhoidal version, it sounds like.

[Farrell Tobolowsky] Exactly, exactly.

[Sarah Gregory] How is it diagnosed?

[Farrell Tobolowsky] First, the person with symptoms has to go to their healthcare provider, which doesn't usually happen. But if the person does seek care, they can provide a sample that's usually stool for laboratory testing. And the infection is diagnosed when a lab test detects *Salmonella* bacteria in the patient's sample. The test could be a culture that isolates the bacteria or a test that detects the bacteria's genetic material. And then further lab testing, including DNA fingerprinting on bacteria isolated from the patient sample, can provide additional information, answering important public health questions such as: is it a particular strain of *Salmonella* that makes people severely ill?; is it likely to respond to antibiotics?; and has it recently been found in others who are sick, suggesting an outbreak?

[Sarah Gregory] Your study focused on *Salmonella* infections related to eating turkey during Thanksgiving. How much turkey is eaten during that time?

[Farrell Tobolowsky] The short answer is a lot. More than any other time of the year. We know that 90% of families eat turkey during the Thanksgiving holiday. And would it surprise you to learn that about 20% of all turkey produced in the US is for Thanksgiving alone?

[Sarah Gregory] No. It would not surprise me.

So how common is it for people to get sick from eating turkey?

[Farrell Tobolowsky] That's a tough question to answer. We know that turkey is one of the most common food categories associated with *Salmonella* infection. We also know that turkey can be contaminated with other germs that cause diarrheal illness, such as *Campylobacter*. The fact is, we don't always have information needed to identify the source of diarrheal illness. And in the case of an outbreak, when we usually have more information, disease detectives look for the source but they're not always successful in identifying it. However, turkey has been identified as the cause of several outbreaks.

[Sarah Gregory] And how do people get *Salmonella* from eating turkey in the first place? What happens to cause this?

[Farrell Tobolowsky] So turkey and other poultry, most especially chicken, can be contaminated with *Salmonella* and other harmful germs. Then these germs can multiply in poultry that's not properly thawed or cooked to a safe internal temperature. And then sometimes these germs spread from raw poultry and its juices to utensils, surfaces, food that's already cooked or eaten raw, and the hands of people who are preparing it, leading to people becoming infected. But the most common way people become infected is by eating raw or undercooked poultry.

[Sarah Gregory] So you mentioned a lot of cases are not detected, but you also briefly commented earlier about outbreaks. So how are *Salmonella* outbreaks detected if most people don't even go to the doctor?

[Farrell Tobolowsky] Well, let's start by reminding listeners what an outbreak is. So an outbreak is when two or more people get the same illness from the same source. And a foodborne disease outbreak is when the source is a contaminated food or drink. And remember when I mentioned that laboratories performed DNA fingerprinting on patient samples? Well, PulseNet, a national laboratory network, compares these DNA fingerprints to find clusters of disease that represent unrecognized outbreaks. Then finding a cluster triggers an investigation, and if epidemiologists then find links among patients, the cluster is classified as an outbreak.

[Sarah Gregory] Okay. So once an outbreak is detected, what steps are taken to control it?

[Farrell Tobolowsky] The number one goal is to bring a quick end to the outbreak and prevent additional infection. And if contaminated food stays on store shelves and restaurant kitchens or in home pantries, more people can get sick. That's why public health and regulatory officials work quickly to collect as much information as possible to identify the source of the outbreak. Not every outbreak is solved, but when clear and convincing information links illnesses to a contaminated food, health officials take action, such as issuing a recall or warning the public. And we're always considering new ways to identify, investigate, and solve outbreaks faster.

[Sarah Gregory] In your study, you mention *Salmonella* serotypes. What are they and how many are there?

[Farrell Tobolowsky] Serotypes are a fancy term to describe distinct kinds of *Salmonella*. We identify a bacteria serotype by examining its surface structures. Would you believe that we've identified more than 2,500 serotypes of *Salmonella*? Fortunately, only about 100 of them make people sick.

[Sarah Gregory] Yeah, that's a lot of serotypes. I would have had no idea, and it's interesting that so few of them actually cause infections.

So tell us a little bit more about your study. What specifically were you looking for?

[Farrell Tobolowsky] Well, I mentioned earlier that we often do not know as much about germs and food linked to sporadic or non-outbreak infections. And this study provided a chance for us to fill in some of these gaps. We wanted to find out which *Salmonella* serotypes are specifically associated with the Thanksgiving holiday and foods disproportionately consumed during the holiday.

[Sarah Gregory] And what did you find?

[Farrell Tobolowsky] We found that some serotypes are more strongly associated with *Salmonella* infection directly after the Thanksgiving holiday. The one with the strongest association is Reading, and we also found that Reading and some other *Salmonella* serotypes are associated with typical Thanksgiving food, such as turkey.

[Sarah Gregory] How did you go about conducting this study? It seems like there's a lot of illness related to all of it.

[Farrell Tobolowsky] Absolutely. We wanted to design a study that could identify the *Salmonella* serotype associated with Thanksgiving foods. But after considering several options, we chose a case-crossover design which measures the effect of short-term exposures, such as eating a particular food item, on the risk for sudden illness. And in our case, we were measuring the effect of eating Thanksgiving foods on risk of getting a *Salmonella* infection immediately after the holiday versus other times of the year.

[Sarah Gregory] What do you think is causing this emergence of different *Salmonella* serotypes in turkeys?

[Farrell Tobolowsky] We know from previous sampling of poultry in outbreaks that we've investigated over the years that these serotypes aren't really emerging. They've been associated with turkey for a while now. But if you're referring to why it is that we're seeing these specific serotypes showing up in turkey, Reading caused a large outbreak linked to raw turkey a couple years ago and a new clone of this serotype recently emerged in a commercial turkey industry. Some of the serotypes that significantly increased after Thanksgiving are rare and not linked to

recent outbreaks, and although our study didn't identify why these serotypes increased after Thanksgiving, we pointed out that particular attention probably should be paid to evidence of these serotypes emerging in Turkey production.

[Sarah Gregory] Alright. So ultimately, why does it matter what serotype it is?

[Farrell Tobolowsky] The different serotypes can behave differently and how often they sicken people, when and where people get sick, and what foods or other sources they contaminate. Some serotypes are only found in one kind of animal or food or in a single place. Knowing which serotypes are more likely to contaminate certain sources can inform efforts to mitigate contamination and prevent illnesses.

[Sarah Gregory] Do you suspect that we will be seeing more *Salmonella* outbreaks around Thanksgiving in the future, based on your findings?

[Farrell Tobolowsky] Of course we hope not, and instead hope our study will help to reduce that likelihood. If a *Salmonella* outbreak does happen after Thanksgiving, our study's findings can be used to help investigators more quickly identify a possible source. And the study and our conversation today will also hopefully increase awareness about importance of food safety not only during Thanksgiving, but year-round. But relying on the last step of the food production chain to prevent illnesses and outbreaks is not the best practice. Ultimately, we hope that our study helps to inform measures to prevent illnesses and outbreaks from occurring in the first place.

[Sarah Gregory] Is there anything farmers can do to help reduce the chance of their poultry carrying *Salmonella*?

[Farrell Tobolowsky] Well, *Salmonella* naturally colonizes or likes to live on poultry, which makes getting rid of all *Salmonella* in poultry a daunting task. However, poultry establishments can take steps to prevent or reduce this colonization. These steps include vaccinating birds, helping them establish a healthy gut flora, and implementing biosecurity and hygiene measures. Taking measures like this on the farm help to reduce the chances of contamination further along the food production chain, such as during slaughter and processing.

[Sarah Gregory] How can individuals reduce their risk for getting sick with *Salmonella*? Handling? Cooking? Leftovers? What?

[Farrell Tobolowsky] Glad you asked. We might not be able to completely get rid of *Salmonella* in food as we said before, but people can take steps to reduce the risk of infection. Listeners can visit the CDC website to learn more about the four steps to food safety, which are clean, separate, cook, and chill. When it comes to turkey, special care should be taken whether you're cooking a whole bird or a part of it. This includes properly storing your turkey, thawing it, handling it, cooking it to the minimum safe temperature of 165 degrees Fahrenheit (as measured by a food thermometer), and taking care of leftovers. The food safety site also contains guidance on safely preparing turkey and other tips to prevent foodborne infections during holidays.

[Sarah Gregory] And you mentioned safely dealing with leftovers. How is that done? What's the best way to deal with your leftovers? Let them sit out until they cool or pop them into the refrigerator immediately?

[Farrell Tobolowsky] Yeah. I think the most important part of taking care of leftovers and making sure that they're stored properly at the right temperature and not letting them sit out for hours.

[Sarah Gregory] Okay. And what is the exact website that we're talking about? Can you give us that URL?

[Farrell Tobolowsky] Yeah, thanks for asking. It's [www.cdc.gov/foodsafety](http://www.cdc.gov/foodsafety).

[Sarah Gregory] Okay, back to the *Salmonella* and the turkeys and all of that. What about stuffing a turkey versus putting the dressing on the side?

[Farrell Tobolowsky] The safest way to prepare this holiday dish is as dressing on the side. Cooking it in a casserole dish instead of inside your turkey makes it easy to be sure it is thoroughly cooked. If you cook your stuffing in the turkey, put it in the bird right before it goes in the oven. And after your turkey is finished cooking, wait about 20 minutes before you remove the stuffing so it has more time to cook. And no matter which way you prepare the dish, remember to use a food thermometer to check that it reaches 165 degrees Fahrenheit. Remember that's also the minimum safe internal temperature for turkey.

[Sarah Gregory] Okay. So the turkey 165, and the stuffing 165. And measure them separately.

[Farrell Tobolowsky] Yes. The preference is to prepare the dish on the side, if possible.

[Sarah Gregory] Right, right, right. But just for those who are diehards with stuffing.

What are the main public health implications of your study?

[Farrell Tobolowsky] When we look at the big picture, knowing which *Salmonella* serotypes are most associated with turkey and other sources can inform efforts to prevent contamination and the resulting illnesses, hospitalizations, and deaths. Industry and public health officials can use our specific analysis to guide the monitoring of illnesses, inform prevention efforts, and time interventions to prevent illnesses and deaths associated with specific types of *Salmonella*.

[Sarah Gregory] And going forward, how do you hope these findings will be used? More studies or more information on the website?

[Farrell Tobolowsky] We hope that public health and industry will continue to work together to get *Salmonella* out of turkey flocks and therefore out of the turkey we eat. But in the meantime, cooking turkey well and preventing turkey and its juices from contaminated surfaces and other foods help to reduce illnesses.

[Sarah Gregory] You were an EIS officer at CDC, and now you're a FLIGHT fellow (F-L-I-G-H-T). Tell us about being an EID officer and tell us about being a FLIGHT fellow.

[Farrell Tobolowsky] EIS stands for Epidemic Intelligence Service officer, and it's a fancy term for a disease detective. So we're usually assigned to CDC headquarters or a local or state health department for two years. When disease outbreaks or other public health threats emerge, we investigate, identify the cause, try to stop the outbreak, and collect evidence to prevent outbreaks in the future. It's tough to choose what I enjoyed most during my time as an EIS officer. I really liked working with many public health professionals from different training backgrounds and I enjoyed the types of work we carried out, including field investigation, epidemiologic research, and surveillance.

Between foodborne disease and COVID-19 outbreaks, I worked on about 10 investigations both in the US and abroad. And I recently in July started a new fellowship at CDC called FLIGHT, which is a three-year global leadership training program. And my work now focuses on eradicating polio.

[Sarah Gregory] Well good for you.

[Farrell Tobolowsky] Thank you.

[Sarah Gregory] That's really interesting and fabulous and important work.

Okay. Finally, what's your favorite food to eat during the Thanksgiving holiday?

[Farrell Tobolowsky] Luckily, it's definitely not turkey. My favorite dishes are the vegetable casseroles and this special chocolate pudding dessert with cream cheese and graham crackers, and we call it Judy's Chocolate Pudding. Before the pandemic, around 40 family members and I would get together for thanksgiving every year and eat the exact same dishes every year. So I look forward to them.

[Sarah Gregory] That's really nice to hear.

Well, thank you for taking the time to talk with me today, Dr. Tobolowsky.

[Farrell Tobolowsky] Of course. Thanks for having me.

[Sarah Gregory] And thanks for joining me out there. You can read the January 2022 article, *Salmonella* Serotypes Associated with Illnesses after Thanksgiving Holiday, United States, 1998–2018, online at [cdc.gov/eid](https://www.cdc.gov/eid).

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

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