

Unique Measles Virus in Canada

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

[Sarah Gregory] Today, I'm talking with Dr. Shelley Deeks, chief of communicable diseases at Public Health Ontario, about a unique measles virus in Canada. Welcome, Dr. Deeks.

[Shelley Deeks] I'm happy to be here.

[Sarah Gregory] When this outbreak hit, it was believed that measles had been eliminated in Canada. Can you explain what that means?

[Shelley Deeks] Sure. Well measles is one of the most contagious infectious diseases known. Before vaccines against measles became widely available, the disease was a significant cause of death and disability worldwide, leading to approximately two and a half million deaths every year. In 2015, though, the WHO estimated that there were about 134,000 measles deaths in that year around the world.

So the elimination of measles is defined as the absence of endemic measles transmission in a defined geographic area for 12 months or more, in the presence of a well-performing surveillance system. Following the implementation of a two-dose routine vaccination program against measles, Canada reported its last endemic case of measles in 1997, and had eliminated it in 1998. In 2016, The International Expert Committee of PAHO determined that the entire Region of the Americas had eliminated endemic transmission of measles.

However, measles is still relatively common in other regions of the world, including Africa, India, and parts of Europe. As such, countries within the Americas are still at risk for measles importations. As a result, measles cases reported in Canada in recent years have been largely due to importation of the disease from such regions, and then limited spread within the country. These importations have resulted in outbreaks of the illness, particularly among populations or groups who aren't fully protected against measles through vaccination. As long as importations into an area where measles is eliminated are contained and do not turn into endemic or ongoing transmission again, then that area retains its elimination status.

[Sarah Gregory] Tell us about the outbreak of measles that prompted your study.

[Shelley Deeks] In the province of Ontario, we continue to experience measles virus transmissions, despite the elimination of measles in the country. In early 2015, we saw an unusual outbreak of measles in the province that involved cases that predominantly didn't appear to be linked to each other; although, there was a family cluster of cases in one city. A total of 18 cases of measles were reported from four public health units in the province during a two month-long outbreak period. We also noted that none of these cases occurred in people who had recently traveled. Intriguingly, all cases that were laboratory confirmed had a unique genotype, or DNA fingerprints, of the virus, which strongly suggested that they were all linked.

[Sarah Gregory] What made this outbreak unusual?

[Shelley Deeks] What made this outbreak unusual is the lack of travel history in the cases and the lack of association between the individual cases. When cases of measles occur in Ontario, it's

generally due to an imported travel case from a region of the world where measles is still endemic, or circulating. A person who typically is not fully vaccinated against measles contracts the virus while travelling and brings it back into the country. With this outbreak, despite intensive investigation by the health units involved, no common exposure settings or linkages with other cases were noted among the individual cases, and yet the laboratory evidence strongly suggested that all cases formed the same chain of transmission, meaning that they were linked. Extended genotyping suggested that all were identical or very similar and had a previously unreported pattern.

[Sarah Gregory] And do you know how this happened?

[Shelley Deeks] We don't know for certain how this happened. This outbreak occurred in an area of the province where there is a large population and a high volume of international travelers. Measles can be spread easily to others through coughing and sneezing; it's very infectious. There may have been an exposure that involved a casual interaction with an unknown source case that was not noted by subsequent cases but that was actually quite critical, given the highly infectious nature of the measles virus. Alternatively, a source case may have exposed other cases in several locations while moving through the city while the person was infectious. The absence of a source case indicates that not all cases were reported to public health.

This outbreak is an example of why it's important that everybody ensures that their vaccinations are up to date. Vaccination with two doses of the measles-mumps-rubella, or MMR, vaccine provides the best protection against getting ill with measles. We live in a global and interconnected world and need to ensure that we're protected from infectious diseases, not only when we travel, but even if we're staying at home. We're continually exposed to other people in our everyday lives. For a disease such as measles, that is extremely contagious and transmitted through the air, an individual can be exposed to an infected person and be at risk of disease with limited interaction with that person. Sitting near an infectious person on a plane or walking into a room an hour after an infectious person has left can infect someone who's not protected against the disease.

[Sarah Gregory] How did you conduct your study?

[Shelley Deeks] Measles is a reportable disease in Ontario, requiring physicians and laboratories to notify local public health units immediately of all suspected and confirmed cases. As part of this investigation by public health, a detailed travel history from measles cases is crucial to determine the probable source of infection. Laboratory investigation, including virus identification and genotyping, is also critical since molecular epidemiologic analysis can provide information about transmission patterns of circulating virus strains and help identify potential sources of infection. Seventeen outbreak-related measles cases were genotyped using the WHO-recommended targets. Extended genotyping was performed to seek additional evidence about possible chains of transmission and the results showed that all the cases were linked and part of the same outbreak.

When we were looking into potential epidemiological links in the outbreak, the case investigators also used social media and Instagram posts for outbreak source identification. They asked patients to use it as a reference tool to help them recall their whereabouts, activities, or events they attended.

[Sarah Gregory] And what did you find?

[Shelley Deeks] Well, despite enhanced interview methods and epidemiologic analyses, a source patient was never identified in this outbreak. None of the cases had a pertinent travel history and, aside from a family cluster, had no relationship to each other. However the closely clustered timing of the first cases and the laboratory analysis strongly suggested that all of the cases we knew about arose from an exposure to a single importation of the measles virus by an unidentified source. The public health action that resulted from this outbreak was immense and included extensive contact tracing, media releases, public health information hotlines, and vaccination clinics. This outbreak was controlled relatively quickly and there was limited spread. The majority of cases—89 percent—were not up to date with their measles vaccinations.

[Sarah Gregory] Until measles are eradicated globally, are there particular actions that Canada is taking to contain these kinds of outbreaks?

[Shelley Deeks] Yes, definitely. Despite the mystery surrounding this outbreak, it was really a success story for public health, considering that the outbreak was limited to 18 cases. We were fortunate that we only had 18 cases, given the size of the population where the cases occurred and the numerous exposure settings. We are also lucky that we have an effective and safe vaccine to protect against measles, a responsive public health system to investigate these types of outbreaks, and that we have quite high measles vaccine coverage in Ontario.

This outbreak highlights the need for physicians to be aware that measles still circulates in many parts of the world and that they should consider it in the differential diagnosis in a person who has travelled and then who develops a fever and a rash. They also need to do appropriate laboratory testing.

It also highlights the need for everyone to remain vigilant and ensure that they're protected against measles. The MMR vaccine is extremely safe and highly effective. In order to get this message across, there has been a lot of general communication aimed at the public to ensure that they are aware that the best way to protect themselves, their loved ones, and the community against diseases like measles is to ensure their vaccinations are up-to-date in general and especially before they travel.

Finally, it's important to note that the genetic diversity of measles virus will likely decrease as progress is made towards elimination in other regions of the world. As a result, extended genotyping beyond the WHO standard targets, as was required in this particular outbreak, will probably be needed more often to define the molecular epidemiology of measles outbreaks.

[Sarah Gregory] Dr. Deeks, would tell us a little bit about your job and your interest in measles?

[Shelley Deeks] Sure, I'm the chief of communicable diseases, Emergency Preparedness and Response at Public Health Ontario and an Associate Professor at the Dalla Lana School of Public Health, at the University of Toronto. Our purpose at PHO is to protect and promote the health and safety of the people of Ontario. For me personally, my interest in measles and other vaccine-preventable disease was sparked over 20 years ago after witnessing the devastation of some of these diseases during the course of my work, especially during time spent in Asia and Africa. No

matter how many times I'm involved in an outbreak investigation, each one is its own puzzle and brings its own challenges, which is always really interesting and rewarding.

[Sarah Gregory] Thank you Dr. Deeks. I've been talking with Dr. Shelley Deeks about her July 2017 article, Measles Outbreak with Unique Virus Genotyping, Ontario, Canada, 2015. Listeners can read the entire article online at [CDC.gov/eid](https://www.cdc.gov/eid).

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

[Announcer] For the most accurate health information, visit [cdc.gov](https://www.cdc.gov) or call 1-800-CDC-INFO.