

# Legionnaires' Disease and Compost

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

[Sarah Gregory] Today, I'm talking with Dr. Brian Raphael, a CDC research microbiologist, about Legionella bacteria in compost. Welcome, Dr. Raphael.

[Brian Raphael] Hi. Thank you for having me.

[Sarah Gregory] Let's start with defining Legionnaire's disease. What is it and how does a person get it?

[Brian Raphael] So legionnaires' disease is a serious type of pneumonia that's caused by various species of *Legionella* bacteria. The most commonly detected species is *Legionella pneumophila* which causes about 90 percent of reported infections in the United States and in most other countries. People who smoke, have underlying respiratory disease, are immunosuppressed, or the elderly are at increased risk for Legionnaires' disease. The disease is characterized by cough, shortness of breath, and fever. Legionnaires' disease can be treated with antibiotics but it is still deadly for about one in every 10 people who get it. Typically, people can be exposed to *Legionella* by inhaling aerosols or water droplets containing the bacteria from various man-made systems, such as cooling towers associated with large building air conditioning systems, showers, decorative fountains, and whirlpool spas. Keeping systems like these clean and maintaining appropriate disinfectant levels are some of the best ways to prevent Legionnaires' disease.

[Sarah Gregory] Are their different types of legionella bacteria and how are they detected?

[Brian Raphael] There are about 60 known species of *Legionella* and nearly half of these have been linked to human disease. Other than *Legionella pneumophila*, only a few of these species are linked with disease in a sizeable number of people; most have only been reported to cause disease in one or two people. The best way to detect *Legionella* is by culture of lower respiratory tract secretions, like sputum or aspirates, taken when patients undergo bronchoscopy. However, culture is not always successful and can take several days. Our laboratory also tests respiratory secretions using PCR to detect *Legionella* DNA, which is indicative of infection. Infection with the most common serogroup of *Legionella pneumophila*, serogroup 1, can be detected by urinary antigen test, which is the most frequent way that Legionnaires' disease is diagnosed.

[Sarah Gregory] While you're not an author on this study, I know you have extensive knowledge of Legionnaires' disease. Would you tell us about this study?

[Brian Raphael] This was a case-controlled study conducted in the Canterbury region of New Zealand to assess risk factors for Legionnaires' disease caused by *Legionella longbeachae*. This species of *Legionella* causes a significant number of infections in places like Australia and New

Zealand but is not frequently found to be the cause of Legionnaires' disease in places like North America or Europe. Previous studies have shown that the route of exposure appears to be different for *Legionella longbeachae*, which has been linked with the use of compost or potting soil. This study took a closer look at the differences in underlying health conditions and behaviors of people who became sick, compared to a random sample of healthy people. An interesting side note is that the species gets its name from the first recognized case of Legionnaires' disease caused by *Legionella longbeachae*, which occurred in 1980 in Long Beach, California.

[Sarah Gregory] And so how was the study conducted?

[Brian Raphael] Over the course of two summers, which is when Legionnaires' disease cases typically peak, the authors followed up on all notified cases in face-to-face interviews. Case patients whose infection was determined to be caused by *Legionella longbeachae* by culture, PCR, or by an increase in their titer of specific antibodies were given a questionnaire. For comparison, healthy individuals of about the same age as the case patients were contacted by telephone. Questions included preexisting health conditions, garden activities, and potential exposures to potting soil or compost. Statistical analysis was performed to determine what conditions or exposures were more likely to be associated with Legionnaires' disease patients.

[Sarah Gregory] What behaviors or health conditions were shown to increase the risk of getting Legionnaires' disease in this study?

[Brian Raphael] Chronic obstructive pulmonary disease, or COPD, was the health condition most strongly associated with Legionnaires' disease in this study. Smoking was also associated with an increased risk of disease. While nearly everyone who participated in this study maintained an outdoor garden, case patients were more likely to have an indoor garden, for instance, one housed within a glass structure. Use of purchased compost products was highly associated with the Legionnaires' disease patients. The authors also looked at certain behaviors potentially associated with increased risk. Moving hands near the face to smoke, eat, drink, or touch one's face after using compost was highly associated with disease. Tipping and troweling the compost also increased risk.

[Sarah Gregory] Gardening is a favorite past time. While this study was done in New Zealand, should people everywhere be worried about legionella bacteria in their compost and potting soil?

[Brian Raphael] It is not clear why *Legionella longbeachae* infections are more prevalent in Australia and New Zealand. Some studies have looked at differences in compost or potting soil content in different countries and the presence of *Legionella longbeachae*. People in North America and Europe should not discount the possible risk of infection. Several cases of *Legionella longbeachae* have occurred in Scotland and samples of potting mix from some patients who gardened before getting sick contained the bacteria. In the United States, a few

cases have occurred among people who used potting soil prior to getting sick and at least some of those soil samples also tested positive for *Legionella longbeachae*.

[Sarah Gregory] Are there any precautions people should be taking while they garden then?

[Brian Raphael] People with certain underlying illnesses, immunosuppression, the elderly, and smokers should be aware that they may be at increased risk for Legionnaires' disease from various sources, such as aerosolized water, which is more commonly associated with *Legionella pneumophila*, as well as compost and potting soils. While the authors of this study did not find that wearing a mask or gloves while using compost had a significant protective effect, they were reluctant to advise against such practices on the basis of this single study. However, the authors did suggest that people should consider minimizing aerosolization of the soil by opening bags away from one's face and keeping hands away from the face until washing.

[Sarah Gregory] An interesting side note is that the founding editor-in-chief of the *Emerging Infectious Diseases* journal, Joe McDade, is the person who discovered *Legionella pneumophila*. Can you tell us a little bit about his discovery?

[Brian Raphael] The first recognized outbreak of Legionnaires' disease occurred in Philadelphia during the summer of 1976. Samples taken from patients were tested for all types of known pathogens and toxins but everything came up negative. McDade was a microbiologist at the time in the CDC laboratory back in Atlanta and he was using techniques to grow a type of bacteria called "rickettsia" from some of these samples. McDade attempted to grow the Legionnaires' disease organism in the same way that he grew rickettsia and by the end of 1976 and early 1977, he noticed a bacterium on some of the microscope slides and conducted some follow up studies. By growing these bacteria in eggs and inoculating guinea pigs, McDade eventually showed that the bacterium he recovered was responsible for causing the disease and that antibodies from Legionnaires' disease patients reacted with these bacteria showing that the patients were exposed to the same antigens. Incidentally, another *Legionella* species was named after McDade. After the identification of *Legionella* in the late 1970s, scientists tested previously unidentified bacteria, which had been stored from a patient with fever in the 1940s and realized it was actually new species of *Legionella*, which they named *Legionella micdadei*.

[Sarah Gregory] You work in the labs at CDC. I know a lot of people, when they think of CDC, consider lab work to be really exciting. Can you tell us a little bit about your job?

[Brian Raphael] As a research microbiologist, I agree that working in the lab is very rewarding. Our team works exclusively on *Legionella*. We conduct testing of isolates and specimens to detect *Legionella*. During outbreak investigations, we may obtain potential environmental source samples, like water and swabs, to look for *Legionella*. More recently, we have developed genome sequencing techniques to compare strains from clinical and environmental samples. These techniques allow us to determine how similar strains are related at the genetic level and can help us confirm the source of an outbreak. Ultimately, knowing the source of an outbreak

can help us stop more people from getting sick and institute changes to prevent outbreaks in the future. One of the best parts of my job is helping other public health labs conduct investigations by providing training, consultation, and developing new tools, such as a *Legionella* genomic sequence database that can be used by our partners to better understand the distribution of *Legionella* in the environment.

[Sarah Gregory] Thank you, Dr. Raphael. I've been talking with Dr. Brian Raphael about the July 2017 article, Risk Factors for *Legionella longbeachae* Legionnaires' Disease, New Zealand. Listeners can read the entire article online at [CDC.gov/EID](http://CDC.gov/EID).

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

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