

Mysterious Illness May Be Carried by the Wind

By Tim Wogan | May. 19, 2014



Mystery illness. Kawasaki disease can cause redness and swelling in various part of the body.

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One of the world's most baffling diseases may be spread by the wind. A new study has found that Kawasaki disease, which sickens 12,000 children a year in Japan and occurs in other countries including the United States and South Korea, is at its deadliest when the wind blows from northeastern China. The findings suggest that the illness may be caused by an airborne toxin from that region, but just which one remains unclear.

Kawasaki disease typically strikes children between 6 months and 5 years old. Common symptoms include fever, a blotchy red rash, and redness and sometimes peeling of the hands and feet. It can be treated with antibodies; untreated, it often leads to inflammation of the coronary arteries, sometimes causing aneurysms that can lead to internal bleeding or heart attacks. Some researchers believe Kawasaki to be an infection, but they have never identified the microbe responsible; others suggest it's an immune response to an unidentified toxin.

In previous research, mathematical ecologist Xavier Rodó and colleagues at the Catalan Institute for Climate Sciences in Barcelona, Spain, had suggested that seasons with large numbers of Kawasaki

cases in both Japan and the United States coincide with times when the prevailing winds come from Central Asia. In the new work, they investigated that idea further.

The researchers examined health records from 1970 to 2010 in each of Japan's 47 administrative divisions. They looked at the days on which the most cases were identified in Tokyo and other major cities, and used computer models of airflow to find out where the air had come from in the previous few days. Because the incubation period for Kawasaki disease is unknown, the team looked at various lag times.

On the days most children became ill, **the air blowing into the cities had spent large amounts of time in the same region in northeastern China**, usually about 2 days before reaching Japan and 2.5 days before the children came down with symptoms, the team reports online today in the *Proceedings of the National Academy of Sciences*. This suggests, the researchers say, that the disease is borne on the wind and that it has an incubation period of only about a half-day.

They also looked at the possibility that the disease could be an infection spreading between children. However, in all the major cities, most children fell ill on the same days, and the infection peak in all cities died away as soon as the wind changed direction, which would be hard to explain if the children were infecting each other. "It must be in the form of a toxin or some other environmental agent," Rodó says. His team also found no relationship with days of high levels of pollen or common pollutants such as sulfur and nitrogen oxides.

The region implicated, the Northeast China Plain, is highly agricultural, so the researchers suggest that a toxin produced by a fungus living on the crops is a likely culprit. They conducted several flights from Japan to northeastern China—the opposite direction of the prevailing winds—and filtered the air they collected. They found many species of *Candida*, a fungus genus responsible for common human infections and also for symptoms similar to Kawasaki disease in some strains of mice. However, the researchers do not claim to have identified the exact cause of Kawasaki disease, and they are hoping to conduct more flights. They also plan to look in more detail at the cause of the disease in the United States.

“I think these authors have presented a dataset that is pretty conclusive that this is most likely a microbial toxin of some type,” says environmental microbiologist Dale Griffin of the U.S. Geological Survey in St. Petersburg, Florida. He notes that the techniques of tracking airflow back to a common origin are well established in environmental sciences.

Anne Rowley, a pediatric infectious disease specialist at Northwestern University’s Feinberg School of Medicine in Chicago, Illinois, says the work is “very interesting” but she remains skeptical about the windborne toxin hypothesis, which, she says, would be unprecedented for a human disease. She notes that a number of diseases, including AIDS and polio, were attributed to unidentified toxins shortly before infectious agents were identified.

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