

## Strategies to Reduce Person-to-Person Transmission During Widespread Escherichia coli O157:H7 Outbreak

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[Dan Rutz] I'm Dan Rutz, here with Dr. Martin Meltzer, Senior Health Economist and Distinguished Consultant in the Division of Emerging Infections and Surveillance Systems here at CDC. We're here to talk about an article in the June 2007 issue of *Emerging Infectious Diseases* about the *E. coli* outbreak in 2006 in the United States that was traced to contaminated spinach. Now, this made big news at the time, Martin, but give us a short recap of the extent of the outbreak.

[Martin Meltzer] Well, Dan, the outbreak was first detected in mid-August of last year, 2006, in Wisconsin and Oregon. By September 26, there were 183 cases in 26 states, resulting in 95 patients being hospitalized and, unfortunately, 1 death. The outbreak was caused by a toxic strain of the bacteria *E. coli* known as O157:H7. There are hundreds of strains of *E. coli*, most thankfully harmless, but this strain produces a powerful toxin that can cause severe illness.

The outbreak was first detected by "DNA fingerprinting" that indicated a number of patients in Wisconsin and Oregon had been infected with the same strains of *E. coli* O157:H7. However, what DNA fingerprinting doesn't tell us is how the patients became infected. To determine that, we have to interview as many patients as possible, asking each a long list of questions to determine what they ate. Those answers were then compiled and analyzed to see if the patients reported eating the same food. And in the end, about 123 patients, out of 130 interviewed, reported consuming uncooked fresh spinach sometime in the 10 days before they became ill.

[Dan Rutz] Obviously, very important for the public to know about this. How did people find out about it?

[Martin Meltzer] The first warning to the public was issued on September 14th by the Food and Drug Administration—the FDA—and they told consumers not to eat bagged fresh spinach. The next day, September the 15th, a California company started a voluntary recall of all of their products containing fresh spinach. The following day, the FDA expanded its warning, advising all consumers to not eat fresh spinach or products containing fresh spinach. By September the 21st, the FDA told consumers that only spinach grown in three California counties were implicated in the outbreak.

These efforts had a significant effect. Most stores and restaurants stopped selling fresh spinach almost straightaway, in any form, within days of the initial warning, and the general public was made aware of the contamination in a very short period of time. However, as the article which we're discussing notes, no warnings were issued about how to prevent person-to-person transmission of the bacteria.

[Dan Rutz] Now why, Martin, is that so important?

[Martin Meltzer] As this article says, reports from previous outbreaks indicate that somewhere between 12% and 75% of all cases are actually due to human-to-human transmission, not the consumption of the infected material, like the spinach. A person can transmit *E. coli* to another person in many different ways, such as not washing their hands after handling raw, contaminated food.

In this article, the authors built a mathematical model to help them estimate the number of *E. coli* infections that might have been avoided if they had used interventions designed to reduce secondary transmissions. These interventions included recommendations for hand washing, avoiding contact with anybody who had diarrhea, making sure that kitchen surfaces and utensils are properly cleaned after preparing food, and staying home from work or school for any gastrointestinal illnesses, such as diarrhea.

The authors found, for this particular outbreak, that even if those interventions prevented only 2 to 3 percent of the illnesses caused by human-to-human transmission, then the total number of illnesses would have decreased by 5 to 11 percent, which is pretty impressive. Assuming higher levels of person-to-person transmission and/or more effective interventions would naturally increase the number of cases potentially averted.

[Dan Rutz] You said that the results were produced by a complicated mathematical model. Does this mean that public health authorities and the public have to be experts in mathematical modeling to use the results of such models?

[Martin Meltzer] Oh, absolutely not, Dan. You know, for scientific research and results to be trusted and used by health officials and the public, scientists must write in a manner that non-scientists can understand. This is not a recommendation to “dumb down” the writing. Rather, the authors must write without using jargon, and explain all the methods used. Nobody, but nobody should trust the results from a paper in which the authors merely state that they built a model without giving the adequate details. I believe that the authors of this paper that we’re discussing succeeded in sufficiently explaining their methods and their results to a non-mathematical audience.

[Dan Rutz] Even if we “get it,” if we do understand the methods and those results, how accurate and trustworthy are such results from this or any mathematical model?

[Martin Meltzer] Dan, there’s a saying in modeling: “Garbage in, garbage out.” That is, the results can only be as good, or as trustworthy, as the accuracy of the data used in the model. In public health models like this one, there’s always a need for the authors to do a lot of sensitivity analysis—that is, asking “what if?” questions. In this paper, the authors asked what would happen if the probability of human-to-human transmission was altered, or if interventions to reduce human-to-human transmission started earlier or later in the outbreak. For each of these questions, there should be an alteration in the estimates of the possible effects and the value of conducting interventions. Readers should then be able to easily see how strong or weak the results are and to judge for themselves whether the interventions are worthwhile in reducing numbers of cases. I believe that the authors of this paper presented a number of results from sensitivity analyses, which help support the validity of their findings.

[Dan Rutz] Martin, thank you for your comments, and we appreciate your perspective on the methods and the findings.

Our discussion with Dr. Meltzer was prompted by an article on strategies to reduce person-to-person transmission during *E. coli* outbreaks. It's published in the June 2007 issue of *Emerging Infectious Diseases*. This article, and others on emerging bacterial and viral diseases, can be read online at [www.cdc.gov/eid](http://www.cdc.gov/eid).

You can submit your comments on this interview to [eideditor@cdc.gov](mailto:eideditor@cdc.gov). That's eideditor, one word, at cdc.gov.

For *Emerging Infectious Diseases*, I'm Dan Rutz.

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