Reducing Uncertainty About the Public Health Implications of Escherichia coli Serogroup O104:H4

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(See the major article by Abu Sin et al, on pages 432–8.)

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The dramatic outbreak of hemolytic uremic syndrome (HUS) that occurred in Germany from May through June 2011 heralded the emergence of a Shiga toxin–producing Escherichia coli (STEC) strain with a novel combination of virulence factors [1]. The outbreak was remarkable for its size (2987 gastroenteritis cases), the proportion of cases resulting in HUS (29%), the age distribution of cases (median age, 42 years), and the predominance of cases among women (68%). Many of the unusual epidemiologic features of the outbreak can be explained by the vehicle (fenugreek sprouts) that is primarily eaten by adults, more often by women. However, important questions bearing on the public health implications of the novel STEC serogroup O104:H4 were not answered by the initial outbreak investigation [1]. In this issue of the Journal, Abu Sin et al from the Robert Koch Institute present the results of a follow-up study that reduce some of the uncertainty about carrier prevalence, secondary household transmission, and duration of shedding associated with the outbreak [2]. Their findings shed additional light on severity of illness observations made during the outbreak and provide a framework for developing public health recommendations to control future outbreaks.

To determine carrier prevalence and to identify previously unrecognized cases, Abu Sin et al recruited 57 households with known cases and 36 control households with no known cases from geographic regions in the heart of the outbreak [2]. They identified only 1 previously unconfirmed case in a known case household and no cases in the control households. Although the number of households participating in the study was small, the results were clear: there was no evidence for substantial asymptomatic infection, and cases were strongly associated with consumption of sprouts. Diarrheal illnesses were reported from both case and control households. Approximately 10% of case household contacts and 16% of control household participants reported a diarrheal illness during the reference period. Since these illnesses were mild and accompanied by negative stool cultures, they most likely reflected background rates of diarrheal illness in the community, rather than extensions of the outbreak.

The second part of the study sought to determine the duration of shedding among cases. Of 20 carriers followed prospectively, 3 showed patterns of intermittent shedding, and 1 shed for 237 days. However, the estimated median shedding time for all 57 cases studied was 10–14 days [2]. These estimates are consistent with patterns of shedding associated with other STEC strains among adults [3].

The outbreak strain of STEC O104:H4 included a novel combination of enterogaggregative adherence (EAEC) factors with Stx2 Shiga toxin. The high proportion of HUS cases associated with the outbreak suggested that this organism was highly virulent, perhaps uniquely so. However, conclusions about the virulence of the agent depend in part on our understanding of the sensitivity of the outbreak surveillance. If exposure to the implicated vehicle was widespread and a high proportion of mild infections were not detected, the outbreak as recognized would be biased to appear more severe than it actually was. The results of the study by Abu Sin et al suggest that bias in case detection was not a likely explanation for the observed severity of the outbreak.

The other concern with the STEC O104:H4 being EAEC was for the enhanced potential for person-to-person spread of the organism. Results of this study also provide some reassurance on that count. The limited household transmission that was documented in this
outbreak suggests that STEC O104:H4 is not more likely than other STEC strains to be transmitted from person to person. This is also encouraging because it suggests that secondary spread by infected food workers is not likely to be a greater problem with STEC O104:H4 than with other STEC strains. The consistent association with sprout consumption suggests that infected food workers did not contaminate multiple other food items served at restaurants involved in the outbreak. Although this outbreak involved primarily adults, the results suggest that managing household transmission does not require exceptional measures beyond what would be recommended in other STEC settings. In this regard, Abu Sin et al also reported a relatively high proportion of cases and household contacts who washed their hands, with over half of participants washing their hands more frequently after STEC diagnosis in themselves or a household member [2]. While we cannot conclude that good hygiene practices prevented transmission in these households, the self-reported behavior change in case households is encouraging. It serves as an important reminder of the importance of an individual’s actions in mitigating the impact of outbreaks that were not otherwise preventable by the individual.

Note

Potential conflicts of interest. Author certifies no potential conflicts of interest.

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References