What Can We Do to Prevent Listeriosis in 2006?

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(See the article by Varma et al. on pages 521--8)

Investigations of outbreaks of listeriosis during the 1980s demonstrated that listeriosis is a foodborne disease. With the exception of 4 large outbreaks occurring in the United States, the United Kingdom, and France, each of which involved >100 cases, most listeriosis outbreaks have involved few cases (usually <20 cases). Throughout Europe and the United States, the majority of cases of listeriosis reported to public health officials are apparently not linked to a common source and are, therefore, considered to be sporadic.

The role of foodborne transmission in sporadic listeriosis was demonstrated in the 1990s in the United States by 2 case-control studies that associated the consumption of undercooked poultry, non-reheated hot dogs, soft cheeses, and delicatessen counter foods with sporadic listeriosis. The ability of Listeria monocytogenes to grow at refrigeration temperatures, coupled with the ubiquitous presence of the bacterium (e.g., in unpasteurized milk, in dairy products, and in raw and processed meats, as well as in poultry, vegetables, and seafood), makes this bacterium a serious threat to susceptible consumers.

In outbreaks, the vehicle of transmission is usually a highly contaminated, ready-to-eat food. However, in sporadic cases, different foods could be implicated, and factors such as the duration and conditions of storage, food handling, and modes of food preparation can influence the frequency and level of contamination.

In this issue of Clinical Infectious Diseases, Varma et al. [1] studied the food preferences associated with 169 cases of sporadic listeriosis. Their study shows that the disease is associated with the consumption of hummus prepared in a commercial establishment and with eating melon at a commercial establishment. However, contamination by these foods would explain <20% of the cases. Patients may have been contaminated by many different products that this study did not identify because of the lack of power or the biases inherent in the design of the study. Case-control studies for listeriosis are a challenge, because several conditions inherent to this illness can bias the study. Listeriosis occurs mostly in elderly patients who have an underlying disease that can interfere with their food habits, so matching case patients and control subjects with the same underlying disease (e.g., cancer of the same organ and the same type of diabetes) is crucial but is not always possible. The combination of listeriosis, underlying disease, and, often, older age makes the interview difficult or impossible. The investigators will, then, have to rely on surrogates who are not always fully aware of the food habits of the case patient. Also, the interviews have to focus on food consumption during a period of several weeks, because the incubation period of listeriosis can be quite long (up to 6–8 weeks).

Because L. monocytogenes is ubiquitous and has been isolated from a large variety of foods, it is likely that there are many vehicles of sporadic L. monocytogenes infection. Case-control studies of sporadic listeriosis may fail to incriminate foods to which exposure is either very rare or very common. Indeed, because of the limited power of these studies, only foods associated with markedly elevated relative risk can be identified as associated with the illness. On the other hand, multiple testing is likely to find an association simply by chance. The plausibility of such a statistical association must, therefore, be analyzed carefully before issuing recommendations. The properties of foods associated with a high risk for causing listeriosis have been stated recently by the International Life Science Institute Expert Panel; such foods have the potential for contamination with L. monocytogenes, support the growth of high numbers of L. monocytogenes, are ready to eat, require refrigeration, and are stored for an extended period of time [2]. Looking at these criteria, it seems much more reasonable to consider hummus a high-risk product than melon.

If case-control studies do not success-

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fully identify all of the products potentially associated with a high risk of *L. monocytogenes* infection, what additional evidence is needed to determine which recommendations should be made to prevent listeriosis? Sampling and microbiological analysis of foods at the retail level provide important information, identifying high-risk, ready-to-eat foods. Relevant information includes not only the prevalence of contamination but the concentration of this pathogen in the food. In the study of ready-to-eat foods by Combas et al. [3], the prevalence of *L. monocytogenes* was lower in fresh luncheon meat than in deli salads, but the level of contamination was higher. Consequently, luncheon meat has been shown to be associated with a higher risk than deli salad, in which the growth of *L. monocytogenes* can be inhibited by the dressing. Products associated with the origin of outbreaks are also to be considered with special attention. Outbreak strains seem to be more virulent than other strains. The contamination of manufactured food products by outbreak strains indicates that more-virulent strains can be part of the environment of the production of this kind of product and that *L. monocytogenes* has the ability to grow on this product.

Prevention of listeriosis must not be restricted to sporadic cases. Outbreaks can occur even after protracted periods that are free of outbreaks. In the United States, 2 outbreaks were reported between 1985 and 1997 and 12 outbreaks have been detected from 1998 through 2003, 1 of which involved 101 cases [4]. A similar increase in detected outbreaks has been observed in England and Wales: the Health Protection Agency detected no outbreak between 1993 and 1998, 1 outbreak in 1999, 4 outbreaks in 2003, and 2 outbreaks in 2004 [5]. For surveillance and control purposes, it is essential to have the capacity to detect clusters of listeriosis at an early stage. Routine subtyping of *L. monocytogenes* strains isolated from patients, coupled with the analysis of surveillance data and combined with thorough epidemiological and microbiological investigations, allows the early detection of common-source foodborne outbreaks. Investigation of clusters aims to control an ongoing source of contamination and to prevent the development of outbreaks involving numerous cases. To obtain a full picture of foods involved as vehicles for listeriosis, we need to combine the information from retail food studies, data from outbreak investigations, and the results of case-control studies of risk factors associated with sporadic listeriosis and not rely on only 1 of these approaches.

Because the high-risk population (including individuals with immunosuppression and elderly individuals) is going to increase during the next decades, priority must be given, at both the production and the retail level, to the reduction of contamination level and the inhibition of the growth of *L. monocytogenes* in high-risk foods. Another priority is to not only advise individuals at high risk for illness to avoid high-risk foods but also to inform them of how to reduce the risks by thorough cooking, avoidance of cross-contamination, and short-term refrigerated storage of cooked perishable foods.

Evaluation of the recommendations and of their acceptability should also be a priority. Recommendations should be delivered using, when appropriate, newly developed communication tools, such as the Internet, computers, compact discs, and/or digital video discs, as part of an education program targeted at high-risk populations. The recommendations should be understandable by all, and they should not be overly restrictive, so as to maintain a variety of foods that is sufficiently large to avoid the undernourishment frequently associated with older age and certain immunosuppressive conditions, such as cancer.

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### References