

Issues of Microbiological Safety in Meat and Meat Products

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Five years ago, I served on an American Academy of Pediatrics Task Force to address the question of choking in children (Am. Acad. Ped. Report, 1983). Much of what transpired during those deliberations is similar to the concerns that relate to foodborne disease. Choking in toddlers, in addition to the aspiration of small toys and balloons, was ascribed to be from a variety of foods, i.e., popcorn, peanuts, hard candies, raw carrots, Spanish limes and the hot dog. Surveillance, or reporting of episodes of choking with near miss or death, was poor at best. There were geographic differences and socioeconomic-ethnic differences in the incidence of choking in children. Each of these areas of uncertainty is comparable to those associated with listeriosis where our understanding of the epidemiology, our methods of surveillance and reporting require considerable refining. Like choking in children, the population at risk for listeriosis can be defined. The child at risk for choking is a toddler, frequently cared for by a slightly older sibling with poor, or little, parental supervision. Lack of understanding of the risks associated with the type of food selected, method of preparation and the setting of the eating experience are key factors in choking. Listeriosis is most apt to occur during pregnancy, the newborn period, the elderly and other life situations where the immune system is compromised. Again, lack of understanding of food selection, methods of storage and preparation contribute to the epidemiologic pattern.

Education of parents, like education of food handlers, are major hurdles to overcome if we are to make progress in the control of accidental choking, or foodborne disease.

During the deliberations of the Task Force on Choking, meat products in the form of the hot dog received major attention. Several hours were spent by the experts redesigning the shape, size and consistency of the hot dog in an effort to minimize choking. One idea advanced during the conference was a hot dog with an open center core to allow the passage of air if the hot dog became lodged in the trachea. Some wag in the group dubbed this model the Hollow-Weenie.

Two pieces of information emerged during the conference that I found of value. Dr. George Wilson of the American Meat Institute reported that 13 billion hot dogs had been produced in the preceding calendar year. Dr. Roger Mittleman, Medical Examiner of Dade County, Florida (that area embracing

greater Miami), reported that there were 13 deaths in the preceding 12 months attributable to aspiration of a piece of hot dog. I took the position that the one death per billion units consumed were pretty good odds; however, a representative of the Division of Consumer Safety of the Food and Drug Administration registered a complaint concerning my simplistic analysis. In expressing relative risk for any event, it is necessary to index the event to some common denominator, much as airline safety is expressed in terms of deaths per passenger miles flown. The Consumer Safety representative suggested that a more appropriate model was a plane with a bomb aboard, i.e., a situation dangerous to your health. I doubt seriously that those of you who flew to these meetings entertained the latter model; however, all were concerned with airline safety.

With the analogy of the hot dog in mind, I would like to challenge the concept of "zero-tolerance" for *Listeria monocytogenes* in ready-to-eat or cooked meat and poultry products. While Engle and Adames (1988) have acknowledged that meat and poultry products may have been vectors for unreported cases of listeriosis, they note that, to date, such products have not been involved in any major outbreak of listeriosis. Zero-tolerance may well be like the experts who would redesign the hot dog, an unnecessary exercise.

Educating the Hispanic mother not to offer her infant a Spanish lime, with its succulent fruit and potentially obstructing pit, has its counterpart in education of specific ethnic groups at risk from eating raw meat products. Dr. Douglas Archer has recommended protection of the public against foodborne disease through education. He would increase physician awareness of the microbiological problems faced by at-risk populations, and introduce school-age children to the basic principles of food hygiene. Archer considers basic food hygiene practices as important in the school curriculum as information on substance abuse and AIDS.

The potential for post-processing microbial contamination of foods by food handlers within the fast-food and restaurant business is regarded by many as a greater threat than that imposed within plant processing where good manufacturing practices are carried out. We should all recall that the chain is no stronger than its weakest link and while Typhoid Mary may be an old story, the carrier state for *L. monocytogenes* or a resistant strain of *E. coli* continues to be real.

In order to set realistic microbiological standards for *L. monocytogenes* in foods, other than an unrealistic zero-tolerance, we need to develop information on the infectious dose for man. The potential for achieving this goal was recently challenged by experts within the Food and Drug Administration and academia. Uncertainties of immune system function within the spectrum of normal persons that make them as susceptible to bacteria as immune-compro-

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mised persons may preclude definition of the human infectious dose for *Listeria monocytogenes*. Dr. Michael Foster of the University of Wisconsin has extended this concept to include *Campylobacter*.

It is evident that much needs to be done by microbiologists, public health officials, epidemiologists, food technologists, process engineers, food manufacturers, food purveyors and educators to resolve the complex issues of foodborne disease.

In this vein, the recommendations made in February, 1988 by the World Health Organization's working group on Foodborne Listeriosis deserve comment. Thirteen specific recommendations were outlined for public health authorities. These ranged from increased research efforts to determine ways to eliminate *L. monocytogenes* from the raw food supply and elimination of post-processing contamination to education of health professionals and the public and the implementation of surveillance systems. Of particular concern was the maintenance of consumer confidence in the safety of a food supply which cannot be made totally *Listeria*-free.

A total of 8 recommendations were advanced to the food industry. These ranged from increased application of the Hazard Analysis Critical Control Point system (HACCP), to the support of research that would eliminate, or limit the growth of, *L. monocytogenes* in foods and improve hygienic design of food processing equipment.

Finally, I want to focus briefly on the activities that the International Life Sciences Institute (ILSI), has undertaken in the area of food microbiology under the aegis of the International Life Sciences Institute-Nutrition Foundation, or ILSI-NF. In April, 1987, ILSI-NF established a Committee on Food

Microbiology under the leadership of Dr. Paul Hopper of General Foods. The activities of this committee are supported by 30 U.S. food companies which have appropriated \$750,000 to support research in the area of food microbiology.

Working in conjunction with a scientific advisory panel that consists of Martin Blaser, University of Colorado; Claire Broome, Centers for Disease Control; Catherine Donnelly, University of Vermont; Michael Doyle and Michael Foster, University of Wisconsin; and Heinz Selliger, University of Wurzburg, the Committee elected to focus their initial effort on the research needs relative to identification and control of *Listeria*. Four areas of study emerged as the result of their assessment: (1) the development of important methods for rapid detection of *Listeria*, (2) the development of a better understanding of the pathogenicity-virulence relationships that lead to human disease, (3) additional studies on the growth and survival of the organism under a variety of conditions and, (4) better and more cost-effective ways for control of the organism within the plant environment. Requests for proposals for research studies in these four areas were solicited and 8 of 40 submissions were approached for funding. The Committee plans to move forward to study other organisms within the next year. Two specific organisms have been targeted, *E. coli* O157:H7 and *Salmonella*. The efforts of the Committee on Food Microbiology fulfill several of the recommendations made by the World Health Organization to the food industry and illustrate again the responsiveness of industry to a pressing public health problem. There is no question in my mind that our understanding of foodborne disease will be advanced by the activities of this Committee working in conjunction with industry, government and academia.

References

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