

# **FSIS Comparative Risk Assessment for *Listeria monocytogenes* in Ready-to-eat Meat and Poultry Deli Meats Report**

## **Executive Summary**

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**May 2010**

## **BACKGROUND**

*Listeria monocytogenes* (*L. monocytogenes*) is an important foodborne pathogen, estimated to cause approximately 2,500 illnesses, 2,300 hospitalizations, and 500 deaths each year in the United States. In an effort to understand better the sources of foodborne *L. monocytogenes* infection, the Food and Drug Administration (FDA) and the Food Safety and Inspection Service (FSIS), working collaboratively, developed a quantitative microbial risk assessment for *L. monocytogenes* that compared the risk of listeriosis among twenty-three categories of ready-to-eat (RTE) foods. The results of the risk assessment, completed in 2003, indicated that deli meats pose the greatest risk for listeriosis, accounting for approximately 1,600 illnesses per year.

Based on these findings, FDA and FSIS conducted a preliminary analysis using the 2003 FDA-FSIS *L. monocytogenes* risk assessment model to evaluate the relative risk of illness from *L. monocytogenes* on deli meat sliced and packaged at federally-inspected processing establishments (prepackaged deli meat) compared to deli meat sliced at retail facilities. This risk assessment contained industry data for *L. monocytogenes* on retail deli meat from delicatessens in California and Maryland (Gombas *et al.*, 2003). The results of this risk assessment indicated a high percentage of listeriosis cases related to deli meats were associated with those sliced at retail. Because these results, however, were based on limited retail *L. monocytogenes* contamination data for deli meats, FSIS sought to gather additional data specifically to examine the relative risk of illness from prepackaged deli meat compared to deli meat sliced at retail facilities more closely. Therefore, the U.S. Department of Agriculture, Agricultural Research Service funded the National Alliance for Food Safety and Security (NAFSS) – a consortium of twenty-five research universities – to conduct a four-state study in which prepackaged deli meat and deli meat sliced and packaged at retail were analyzed for the prevalence and level of *L. monocytogenes* (Draughon, 2006).

## **METHODS**

Data from the NAFSS study, described in Appendix A of this risk assessment report, were used as inputs to the deli meat exposure pathway developed by modifying the above-mentioned 2003 FDA-FSIS *L. monocytogenes* risk assessment model for RTE foods. The pathway consists of four distinct stages. The Retail Stage determines the level of *L. monocytogenes* in prepackaged deli meats and in deli meats sliced at retail. The Growth Stage uses an exponential growth rate function to model growth of *L. monocytogenes* in deli meat between purchase at retail and consumption. The Consumption Stage uses information about deli meat serving sizes and the number of servings consumed to estimate consumer exposure to *L. monocytogenes* in deli meat. Lastly, by integrating the predicted exposure with a dose-response relationship, the Dose-

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Response Stage predicts the probability of death from consuming *L. monocytogenes* on deli meat.

The modified model considered four categories of deli meats: retail-sliced versus prepackaged and with or without growth inhibitor. Consumer storage times were based on a consumer survey conducted by RTI International, Tennessee State University, and Kansas State University (Cates *et al.* 2006). The results of the survey indicated prepackaged deli meat was stored for statistically significant longer periods than deli meat sliced at retail. The survey did not find any difference for storage temperature.

## **RESULTS**

This risk assessment, using current retail contamination data for deli meat (Draughon, 2006) and current consumer behavior data for deli meats (Cates *et al.*, 2006) indicates that of those listeriosis cases and deaths attributed to deli meats, approximately 83% are associated with deli meats sliced at retail. The estimated mean number of deaths per year from *L. monocytogenes* in retail-sliced deli meats was 166.9 (95% CI: 164.5 – 169.3). In contrast, the estimated mean number of deaths from prepackaged product was 34.1 (95% CI: 33.4 – 34.9). Similarly, 919.6 (906.8-932.4) illnesses were attributed to retail-sliced product while 188.6 (184.7-192.4) illnesses were attributed to prepackaged product.

Of the four categories of RTE deli meat, most of the predicted deaths were attributed to retail-sliced product (which had a higher starting concentration) without growth inhibitor (which allowed for greater growth rates). Almost 70% of all predicted deaths fell into this category. The results illustrate the significant interaction between slicing location and use of growth inhibitor.

Sensitivity analyses indicated that the percentage of deaths attributed to retail-sliced deli meats was not appreciably affected by consumer storage time, product shelf life, or total number of deaths.

## **CONCLUSIONS**

Of those illnesses and deaths from *L. monocytogenes* from deli meat consumption, approximately 83% are attributed to deli meat sliced and packaged at retail facilities (Endrikat *et al.*, 2010). The remainder is from prepackaged deli meat. Similar results were obtained by Pradhan *et al.* (2010) in a study that compared the risk of listeriosis in both retail-sliced and prepackaged ham and turkey. Studies are needed to determine how contamination of deli meat at retail occurs and to design effective interventions for reducing listeriosis associated with the consumption of deli meat sliced at retail.