Application of a Safety Monitoring and Assurance System (SMAS) for minimizing the risk of listeriosis of cooked ham

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ABSTRACT

A Safety Monitoring and Assurance System (SMAS) for minimizing risk of listeriosis of cooked ham at the time of consumption is presented. In this system, instead of the conventional first in first out (FIFO) method a new approach based on actual risk evaluation at important points of the chill chain is used in order to promote products to the next stage of distribution. This evaluation is based on continuous product temperature monitoring and the use of predictive models for the growth of *L. monocytogenes*. The applicability of SMAS is demonstrated and evaluated based on *L. monocytogenes* kinetics and chill chain data employing the Monte Carlo simulation method. Furthermore, the effectiveness of SMAS on the spoilage status of cooked ham at the time of consumption was evaluated based on the growth of *Lactobacillus sake*, chosen as the specific spoilage organism.

In order to simulate the results of the application of the SMAS system a chilled chain scenario is used consists of production, transportation to the main distribution center, transportation to the local market (2- 24h) or export market, (24-72), 6, 24 or 36 h at the retail storage and various time periods at the consumer's refrigerator. Two decision points are used to apply the SMAS approach. At the first decision point, the main distribution center, products are appropriately split and sent to the close local market or the distant export market based on *L. monocytogenes* growth. At the second decision point, units are classified into 3 groups for successive stocking of the retail cabinets every 6 h with the products with higher growth of *L. monocytogenes* promoted first. Without the use of SMAS, product split at the above two points with the common FIFO approach is random, since time in the chill chain for all products in consideration is the same.

For the local market the risk distribution of products distributed based on SMAS and FIFO approach was found to be similar. For the export market however, SMAS application led to a substantial shift of the central tendency of the risk distribution to lower risk probabilities (from 10^{-7} with FIFO to 10^{-8} with SMAS) and a significant decrease of products with high risk. Furthermore, for the export market with the FIFO system 12.54% of products were spoiled at the time of consumption, whereas with SMAS unacceptable products reduced to 4.32%.