Risk management of chilled meat products with Time Temperature Integrators

P. S. Taoukis, M.C. Giannakourou, K. Koutsoumanis, G.J. Nychas

In the last decade, the increased incidence of foodborne disease and the stricter quality requirements, stress the need for more effective food quality and safety assurance systems. Especially, meat products are highly perishable foods, which are potential hazards, unless correctly stored, processed, packaged and distributed. The actual chill chain is the weakest link of chilled foods stock rotation system, with temperature frequently deviating from specifications.

The objective of this work was to develop a Safety Monitoring and Assurance System (SMAS) for minimizing the risk of foodborne disease, expected to lead to an optimized handling, in terms of safety and quality. The goal is to replace the conventional First In First Out (FIFO) approach with a new system, based on actual risk evaluation at important points of the chill chain, through continuous product temperature monitoring with TTI.

The building blocks of SMAS are the predictive models of the relevant food pathogens and the kinetics of response of the appropriate TTI. The applicability of SMAS is demonstrated and evaluated based on *Listeria monocytogenes* mathematical models, on ground pork and real food chain data, using the Monte Carlo simulation.

In order to prove the effectiveness of SMAS, a realistic distribution scenario is assumed, including all stages of transport and storage. Two decision points were selected, namely the product split at the distribution center to the export or local market, and the stocking of the retail cabinets. In both cases, products with the higher microbial load and risk were promoted first, instead of random rotation.

The results suggest SMAS policy substantially reduced risk probability and minimization of products of high risk. At the same time, quality distribution was also optimized, minimizing “tails”, i.e. products of unacceptable quality.