Quantitative microbial risk assessment of Salmonella in dry fermented sausage (salami) in Southern Brazil

Dry fermented sausage (salami) is a very popular ready-to-eat product in Southern Brazil, of which the raw materials can be contaminated with pathogens such as Salmonella. This product can put consumers at risk if a failure occurs during the manufacturing process. To investigate this risk, a quantitative microbiological risk assessment was performed. The objective was to assess the impact of Salmonella inactivation during the process of fermenting and drying and the distribution of the bacteria in minced pork used in Italian-Style salami on the consumer health risk, using a modular process risk model (MPRM) approach. A total of 405 scenarios were tested combining five scenarios for sausage fermentation, three maturation times (12, 15, and 24 days), nine scenarios for prevalence and concentrations of Salmonella on pork carcasses, and three scenarios for clustering of cells (homogeneous and heterogeneous). In general, it was observed that the mean exposure to Salmonella due to ingestion of a portion of contaminated salami was very low; “zero risks” (with no cases of salmonellosis among 100,000 consumed portions of salami) were found in 65% of the scenarios (265/405) assessed and low risks were found in the other 35% of the scenarios (140/405). Low risks were observed in all scenarios that included 24 days of maturation (0 to 9.8 × 10⁻⁹; n = 135 scenarios) or ≥2.2 log reduction at any stage of the process (0 to 3 Å— 10⁻⁹; n = 189 scenarios). According to the model, 134 of the 135 scenarios presenting log reduction greater than 3.3 during maturation reduced the mean risk to zero. The most important variables, increasing the risk, were lack of fermentation, short maturation period (12 days), and high concentration of Salmonella on the carcass. On the contrary, a negative association (indicating a decreased risk) was observed when 24 days of maturation is applied and or with good fermentation process. If a realistic heterogeneous distribution of bacteria over the sausages is assumed instead of homogeneous distribution, the estimated risk is larger. Although in general the mean risks found here were low, selling dry fermented sausage before complete maturation of the product and failure in fermentation can pose a risk to the consumers from the studied region. It was found that a maturation period of 24 days can be considered safe, even in a situation with high initial levels of contamination.