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Validating the Inhibition of Staphylococcus aureus in Shelf-Stable, Ready-to-Eat Snack Sausages with Varying Combinations of pH and Water Activity. Tilkens BL[1], King AM[2], Glass KA[1], Sindelar JJ[3]

Shelf-stable, ready-to-eat meat and poultry products represent a large sector of the meat snack category in the meat and poultry industry. Determining the physiochemical conditions that prevent the growth of foodborne pathogens, namely, Staphylococcus aureus postprocessing, is not entirely clear. Until recently, pH and water activity (aw) criteria for shelf stability has been supported from the U.S. Department of Agriculture training materials. However, concern about the source and scientific validity of these critical parameters has brought their use into question. Therefore, the objective of this study was to evaluate different combinations of pH and aw that could be used for establishing scientifically supported shelf stability criteria defined as preventing S. aureus growth postprocessing. Snack sausages were manufactured with varying pH (5.6, 5.1, and 4.7) and aw (0.96, 0.92, and 0.88) to achieve a total of nine treatments. The treatments were inoculated with a three-strain mixture of S. aureus, with populations measured at days 0, 7, 14, and 28 during 21°C storage. Results revealed treatments with a pH ≤ 5.1 and aw ≤ 0.96 did not support the growth of S. aureus and thus could be considered shelf stable for this pathogen. The results provide validated shelf stability parameters to inhibit growth of S. aureus in meat and poultry products.

Effect of Acidified Sorbate Solutions on the Lag-Phase Durations and Growth Rates of Listeria monocytogenes on Meat Surfaces. Alexander DD[1], Weed DL, Miller PE, Mohamed MA.

The surfaces of ready-to-eat meats are susceptible to postprocessing contamination by Listeria monocytogenes. This study quantified the lag-phase durations (LPD) and growth rates (GR) of L. monocytogenes on the surfaces of cooked ham as affected by sorbate solutions of different concentrations and pH levels. Slices of cooked ham inoculated with a four-strain mixture of L. monocytogenes (ca. 10(3) CFU/g) were surface treated with sorbate solutions of 0 to 4% (wt/vol) at pH 4.0 to 6.5, vacuum packaged, and stored at 4 to 12°C for up to 45 days. The LPD and GR of L. monocytogenes were used to develop response surface models. The models estimated that the LPD of L. monocytogenes in samples treated with solutions of pH 4.0 to 5.5 (no sorbate) were 0 to 11 days and the GR were 0.25 to 0.36 log CFU/day, respectively, at 4°C. With the treatments of 2 and 4% (wt/vol) sorbate solutions, the LPD were estimated to be extended to 2 to 26 days and 34 to >45 days, and the GR were reduced to 0.15 to 0.30 and 0 to 0.19 log CFU/day, respectively. At 4°C, increasing sorbate concentrations by 1% (wt/vol) to 2, 3, and 4% (wt/vol) at pH 5.5 to 4.0 led to an extension of LPD by 2 to 11, 10 to 19, and 18 to 27 days, whereas the GR were reduced by 0.037 to 0.055, 0.048 to 0.066, and 0.060 to 0.078 log CFU/day, respectively. Sorbate also extended the LPD and reduced the GR of L. monocytogenes at 8 and 12°C. Results indicated that sorbate concentration and pH level were significant factors affecting the LPD and GR of L. monocytogenes and that the combination of sorbate and low pH has potential for use as a surface treatment to control L. monocytogenes on meat surfaces.

Red Meat and Colorectal Cancer: A Quantitative Update on the State of the Epidemiologic Science.

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The potential relationship between red meat consumption and colorectal cancer (CRC) has been the subject of scientific debate. Given the high degree of resulting uncertainty, our objective was to update the state of the science by conducting a systematic quantitative assessment of the epidemiologic literature. Specifically, we updated and expanded our previous meta-analysis by integrating data from new prospective cohort studies and conducting a broader evaluation of the relative risk estimates by specific intake categories. Data from 27 independent prospective cohort studies were meta-analyzed using random-effects models, and sources of potential heterogeneity were examined through subgroup and sensitivity analyses. In addition, a comprehensive evaluation of potential dose-response patterns was conducted. In the meta-analysis of all cohorts, a weakly elevated summary relative risk was observed (1.11, 95% CI: 1.03-1.19); however, statistically significant heterogeneity was present. In general, summary associations were attenuated (closer to the null and less heterogeneous) in models that isolated fresh red meat (from processed meat), adjusted for more relevant factors, analyzed women only, and were conducted in countries outside of the United States. Furthermore, no clear patterns of dose-response were apparent. In conclusion, the state of the epidemiologic science on red meat consumption and CRC is best described in terms of weak associations, heterogeneity, an inability to disentangle effects from other dietary and lifestyle factors, lack of a clear dose-response effect, and weakening evidence over time. Key Teaching Points: The role of red meat consumption in colorectal cancer risk has been widely contested among the scientific community. In the current meta-analysis of red meat intake and colorectal cancer, we comprehensively examined associations by creating numerous sub-group stratifications, conducting extensive sensitivity analyses, and evaluating dose-response using several different methods. Overall, all summary associations were weak in magnitude with no clear dose-response patterns. Interpretation of findings from epidemiologic studies investigating diet and health outcomes involves numerous methodological considerations, such as accurately measuring food intake, dietary pattern differences across populations, food definitions, outcome classifications, bias and confounding, multicollinearity, biological mechanisms, genetic variation in metabolizing enzymes, and differences in analytical metrics and statistical testing parameters.