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Meat and Muscle Biology™

Supplemental Nitrate in Cured Meats as a Means to Potentially Increase Dietary Nitric Oxide

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Objectives

Numerous human clinical studies have demonstrated that dietary nitrate is a significant contributor to physiological nitric oxide and associated human health benefits. Consequently, cured meats could provide a vehicle for delivery of supplemental nitrate (SN) in human diets, but information on effects of high nitrate concentrations on product properties is needed. The objectives were to evaluate physical, chemical and microbial effects of SN in products with 220 mg nitrate per 112 g serving, similar to consumption of vegetables by combining conventional sodium nitrate with celery juice powder (CJP) containing additional nitrate.

Materials and Methods

Effects of SN from CJP on residual nitrite, residual nitrate, rancidity (TBARS), microbial growth, color, sensory properties, and proximate composition of frankfurters, cotto salami and boneless ham during storage (1°C) were investigated. The products were assigned one of two replicated treatments: control (156 ppm sodium nitrite) or SN (156 ppm sodium nitrite, 1718 ppm sodium nitrate and 2% CJP). Trained 9-member sensory panel parameters and proximate composition were measured once for each replication. All other analytical measurements were conducted at regular intervals for 98 d. Statistical analysis was by SAS mixed procedure.

Results

Residual nitrite did not differ ($P > 0.05$) between treatments for salami and hams; however, frankfurter control (15.8 ppm) and SN (11.9 ppm) were different ($P < 0.05$). In all 3 products, SN treatment did not increase residual nitrite when compared to the controls. No changes ($P > 0.05$) in residual nitrate levels for any products were observed during storage. There was no effect ($P > 0.05$) on microbial growth. TBARS differed ($P < 0.05$) for salami control (0.47) and SN (0.37), and for frankfurter control (0.38) and SN (0.49), but not ($P > 0.05$) for hams. Hunter L-values for salami control (49.65) and SN (46.94) were different ($P < 0.05$), and Hunter a-values for ham control (8.59) and SN (7.92) also differed ($P < 0.05$). In addition, internal Hunter a-values for control frankfurters (10.62) differed ($P < 0.05$) from SN (10.11). None of the other physical, chemical or microbial measurements conducted were affected as a result of SN treatment. Sensory evaluations (15-cm line scale) were similar to instrumental color results for salami, frankfurters, and ham treatments in that frankfurter (9.33) and ham (9.86) controls received greater intensity of pink color scores than frankfurter (6.93) and ham (6.56) SN treatments. Panelists also determined that control salami (6.65) had a lighter visual appearance than SN (9.87). Frankfurters showed no differences for sensory panel odors or flavors; salami treatments resulted in some differences in aromas and flavors, while the greatest effect on aroma and flavor occurred with hams.

Conclusion

The results showed that addition of SN did not alter most physical, chemical or microbial properties of cured meat products during refrigerated storage, but product-dependent sensory effects were observed. Therefore, cured meat products could serve as a viable dietary source of nitrate, but use of CJP to achieve nitrate concentration above that allowed for conventional nitrate will be product-dependent and determined by the products sensory profile.

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