UPDATES SESSION

Nitrite Issue

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I visualize that a "reciprocation synopsis," in order to be useful or effective, must include a brief statement of background, a discussion of data or methods having direct relevance to the problem, and a mention of other information impacting indirectly on the area. So this presentation will focus on recent new findings about residual nitrite in cured meat.

Nitrite has been used as a food preservative for decades; it is the key ingredient in cured meat and not only produces the typical color, flavor and texture but also acts as an antioxidant and protects against botulism. The use of nitrite in cured meat has been regulated by USDA since the early 1900s, and in a broad generalization the industry is allowed to add a maximum of one-quarter ounce of sodium nitrite to one hundred pounds of meat. Obviously, this means that they may add less if desired. When nitrite is added to meat, it reacts with various components. These reactions are speeded up by heating and continue to occur as time passes. The result is that when the manufacturing process is complete, only about 10—20% of the originally added nitrite is analytically detectable. This nitrite remaining in the product is called residual nitrite. Of importance, is the fact that use of a reducing agent such as ascorbates is now generally allowed, in practice in the cured meat industry. These substances speed up the curing process and inhibit formation of nitrosamines.

During the 1970s, the use of nitrite was questioned because of concern about the possible occurrence of preformed nitrosamines, which are carcinogens, and the presence of residual nitrite, which added to the total body burden of nitrite in consumers. These concerns were largely laid aside by the end of the decade, on the basis of research, debate and regulation. But, the concern resurfaced in the mid-1990s, when results from some epidemiological studies were interpreted to show a link between consumption of hot dogs and some forms of cancer. The background about curing meat and the concerns expressed about health related effects is an enormous topic, and the reader may find an entrance to the literature in the publications of Cassens (1990, 1995).

During the past twenty years, an enormous change has occurred in cured meat products. In fact, there is a new generation of "convenient and healthful" cured meat products which are low in fat and contain many other ingredients not previously used. Attention had not been given to the residual nitrite content of the products, so investigations were begun to establish it (Cassens, 1997).

The basic design of the three separate trials was as follows. Bacon, bologna, ham and weiner samples, representative of the major manufacturers in the USA, were picked up in retail stores in Los Angeles, Denver, St. Louis and Tampa, and examined analytically. A total of 164 samples were analyzed. The only provision was that the products be within the "sell-by" date when selected, and all label information was recorded for future study and comparisons when they were logged in.

The original paper should be consulted for exact results, but the important findings can be summarized. The residual nitrite content was approximately 10 ppm (with a range of 0—48). This compares to a residual nitrite in cured meats of approximately 50 ppm during the mid—1970s, or a reduction of about 80%. Several other points are of interest. Residual nitrate was not detectable, and a relatively high (209 ppm) level of residual ascorbates was found. The majority of samples contained phosphates, which resulted in a trend for higher residual nitrite. Approximately half of the bologna and weiner samples contained poultry, and the presence of poultry resulted in higher residual nitrite.

Sen and Baddoo (1997) have reported recently on residual nitrite in Canadian cured meat products. In summary they found that the residual nitrite in Canadian products is about double compared to those in the USA. They also concluded that the amount has not changed appreciably in the past 25 years. The differences may be explained by the fact that Canadian regulations permit 200 ppm ingoing nitrite (compared to 156 ppm in the USA), and the use of ascorbates has increased faster in the USA than in Canada.

Possibly impacting on the use of nitrite in foods is the strong biological research interest now focused on nitrite (and/or its reaction products) in human physiology. It is known that nitric oxide is formed in the human body

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(nitric oxide synthase catalyzes the stepwise oxidation of the amino acid l-arginine to nitric oxide and L-citrulline), and nitric oxide is a biological messenger important in the functions of neurotransmission, blood clotting, blood pressure control and immune system function. Other evidence (Dykhuizen et al, 1996), for example, suggests the generation of salivary nitrite from dietry nitrate may provide protection against gut pathogens in humans.

To conclude, recent evidence about residual nitrite level in modern cured meat, and emerging results about the biological role of nitric oxide in humans, should alleviate concern about health implication possibly associated with cured meat consumption.

References

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