factsheet
Pork Information Gateway

Safety of Cured Pork Products

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The process for curing meat is enormously important to the pork industry. While portions of the carcass are used fresh, such as in pork chops or fresh breakfast sausage, most of it is cured to make ham and bacon, or as an ingredient in wieners or other luncheon meats. In fact, about 70% of the carcass is utilized in cured, value-added products.

Methods & Results of Curing

The key ingredient used to cure meat is nitrite. In addition, salt, spices and flavorings, and other functional components such as reducing agents and phosphates are normally used. These ingredients are distributed uniformly in the meat by grinding, chopping and mixing or by injecting a water solution of them into whole pieces of meat. The meat is heat processed and often smoked.

The most recognizable result of curing is the production of a typical cured pink color. In addition cured meat has a characteristic flavor and texture. From a preservation standpoint cured meat is more stable than fresh meat. Not only is it essentially pasteurized during the heat processing, but ingredients such as the salt make it more resistant to spoilage. Nitrite is especially important in this regard because it has inhibitory action against microorganisms and specifically against spores of Clostridium botulinum should they be present. Nitrite is an antioxidant thereby maintaining an attractive appearance and fresh flavor throughout the distribution/refrigeration chain.

A Proven Historical Record

The salting and curing of meat can be traced into antiquity, but already by the close of the 19th Century scientists had discovered that nitrite was the required component and that it reacted with the meat pigment myoglobin to produce the characteristic cured color.

At the beginning of this Century there was a movement to have the Government ensure that our food supply be as safe as possible. One result was the Federal Meat Inspection Act in 1906. The regulations governing curing were issued in 1926, following a good deal of experimentation by

Cured Meat Crisis of the 1970s

A strong tide of concern by consumers developed during the 1960s, and it was directed at environmental issues, against technology and especially at food safety issues. A major crisis developed around the issue of safety of cured meat, and it reached the point that the use of nitrite for curing was almost banned during the 1970's.

Fear centered on the suggestion that there might be preformed nitrosamines, which are carcinogens, in cured meat. Additionally, the nitrite remaining in cured meat, known as residual nitrite, was suspected as also being a health risk.

USDA into the methods and results of curing ham. Basically, it was allowed to add one-quarter ounce (156ppm) of nitrite to one hundred pounds of meat.

Interestingly and with the exception of some changes in the bacon regulations, the same rules are in force today, some seventy years later. This fact alone substantiates the strong safety record for cured meat.

Recent Evidence Indicating Safety of Cured Meat

The epidemiological studies used a residual nitrite of about 50ppm to calculate the contribution of wiener consumption to total intake of nitrite. Recent work (Cassens, 1997) has shown that modern cured meats contain about 10ppm of nitrite, a substantial reduction from the previously quoted 50ppm. Also, considerable ascorbates remain in cured meats, and this offers strong protection against nitrosation reactions.

Definition of Residual Nitrite

When nitrite is added to meat in the curing process it is "used'. It reacts with or is bound to various constituents of the meat such as the protein pigment responsible for color. For example, if 156ppm is added only about 10-20% of it is analytically detectable following the heat processing. It continues to decline with time. During the 1970's the residual nitrite content of cured meat was determined to be about 50ppm, but there was a large range, for example, in wieners of 0 to 195ppm.

Resolution of the Problem

By the close of the decade of the 1970's the National Academy of Sciences issued two reports which in essence indicated that nitrite cured meat was safe for humans. The detection of nitrosamines was found to be extremely low, and the government started a monitoring program which is still ongoing today. The industry has the option of lowering the amount of ingoing nitrite, thereby decreasing the potential for formation of nitrosamines. The use of reducing agents such as ascorbates was also shown to greatly reduce the risk, and they were used to the maximum. Other work demonstrated that the residual nitrite in cured meat contributed only a fraction to the total body burden of nitrite in humans. It is discovered that nitrite is generated in human saliva, for example, and that nitrate, such as found in green or root vegetables, contributed to the nitrite burden. As a matter of fact it is now known that nitric oxide is generated in and important to the human body.

Cured Meat Implicated in Childhood Cancer

Epidemiological studies in 1994 and again in 1996 implicated wiener consumption with childhood cancer, and gave as the reason the residual nitrite content of the wieners. These studies have been criticized because they were based on recall data of what the individuals consumed.

Conclusion

The process of curing meat is an integral and important part of the pork industry. The use of nitrite for curing has been challenged as a potential health risk to humans, but changes made by the industry and research by scientists has led to the conclusion that consumption of cured meat does not pose a health risk. The new generation of cured meat has lower residual nitrite and higher ascorbates making them, in fact, safer.

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