

NITRATES AND NITRITES

IN PRESERVED MEATS – AN EVOLVING PROCESS

By Tanya Brouwers

The ancient practice of meat preservation has culminated in the convenient, plastic-wrapped deli meat we see today in the supermarket.

Once a time-honoured tradition of ensuring the butchered pig lasted through lean times, the process of preservation has evolved into an industry surrounded by controversy, especially as it pertains to the addition of nitrates and nitrites.

Sodium or potassium nitrates, in either the chemically produced or mined (saltpeter) form, have been added to cured meat for centuries to:

- prevent the growth of bacteria;
- minimize lipid (fat) oxidation;
- add a distinctive cured flavour, and
- give the meat a rosy colour.

It sounds like a simple scenario but the reactions are so complex that scientists have been scrambling for years to quantify the chemistry.

Excess nitrites can result in the formation of nitrosamines with possible carcinogenic side effects.

In simplest terms, the nitrates added to bacon, bologna or ham react with certain bacteria present in the meat and are reduced to nitrites. In the 1800s, it was discovered that nitrites were the true curing agents and, from that point forward, producers used industrially produced nitrites to more easily control and speed up the curing process.

By the late 1960s, scientists discovered that during these chemical reactions, not all nitrites went to work,

so to speak. The nitrites left behind could, under certain conditions, react in the stomach to form carcinogenic nitrosamines. Processing practices and government regulations on nitrite limits were rapidly changed to minimize the amount of nitrite used. Consumer and scientific concerns continue to linger.

Organic and natural processors looked for alternatives to conventional nitrites. The answer came in the form of vegetables.

Vegetables are an excellent source of nitrates. High concentrations are found in celery, lettuce, spinach and beets. A powder or juice from these vegetables can be fermented with a nitrate-reducing bacterial culture. The resulting nitrites perform the same tasks as their industrial cousins. Or do they?

As noted above, the reactions of conventional nitrates with the compounds in meat are complex. Those reactions involving plant-based nitrates are even harder to quantify. Food scientists continue to grapple with the optimal fermentation conditions to ensure adequate nitrite formation. In these respects, industry results are often variable. For 'natural' and organic cured products, the shelf life, colour and taste are frequently inconsistent from one batch to the next.

These inconsistencies raise concerns of safety. In meat cured with natural nitrates, it is impossible to measure the actual amount of nitrite formed when it reacts with the meat. The level of residual nitrates is often much lower than that found in conventionally

Celery juice and celery powder are natural sources of nitrates. They work well with processed meats as they impart little pigment and do not detract from the final flavour.

Nitrates and/or nitrites are added to cured meat products like bologna, ham, frankfurters and bacon. As well as adding colour and flavour, the nitrites help control pathogens and keep the fat from becoming rancid.

cured products. This leaves scientists questioning whether nitrite levels are high enough to inhibit the growth of potentially fatal bacteria.

On the other hand, some studies have found that if celery powder is fermented for an extended period, excessive residual nitrites can result. As noted above, excess nitrites can result in the formation of nitrosamines with possible carcinogenic side effects.

It's clear from the accelerated pace of our society that convenience foods like deli meat will not disappear anytime soon. It's also obvious from the rising demand for organic processed food items that people like their convenience

Simply smoking meat is not considered safe; smoking usually follows a curing process.

in what they perceive to be a healthy and sustainable package. Recognizing this, researchers from l'Université Laval and Agriculture and Agri-Food Canada participating in Canada's Organic Science Cluster are working hard to develop a naturally cured meat product that meets consumer demands.

Over three years, the researchers and scientists involved in this project will attempt to develop a naturally sourced curing product in which each ingredient is responsible for one aspect of nitrite curing—specifically, the pleasing colour and familiar taste of cured meats. They also aim to create a product that will effectively eliminate pathogen and nitrosamine formation. The result for us, as consumers, will be the ability to sit down and eat our organic bologna sandwiches in a welcome, albeit brief, moment of peace.

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Source:

Sebranek, JG & JN Bacus. 2007. Cured meat products without direct addition of nitrate or nitrite: What are the issues? *Meat Science*. 77:136–147.

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