

Righting a Wrong, or What You Don't Know Can't Hurt You

For a number of years I have been concerned about so-called “uncured” meat products that proclaim “no nitrate or nitrite added” on the label. These include an assortment of ham products, bacon, salami, and frankfurters. They are becoming very popular, with many small, medium, and even very large corporations producing these products for consumers concerned about nitrite in their food. Going back as far as the early 1970’s studies showed that nitrite in cured meat products could be a source of carcinogenic nitrosamines. But nitrite continues to be permitted for use in processed meat products by the United States Department of Agriculture because of the concern for possible contamination of these products with *Clostridium botulinum*, *Clostridium perfringens*, and *Listeria monocytogenes*. Used in very small amounts (parts per million), nitrites (usually added as sodium or potassium nitrite, and collectively referred to as “nitrites”) are one of the most effective ingredients for preventing the growth of these harmful organisms. This is an example of the benefit outweighing the risk. Plus, curing meat with nitrites has a very long history of use dating back to the late 1800’s.

The reason for my concern is that a close inspection of the ingredients in “uncured” meat products usually finds seemingly innocuous ingredients such as celery juice, celery juice powder, or vegetable juice, but no added nitrate or nitrite. I knew from reading an early edition of one of my favorite food chemistry books, “*Food: The Chemistry of its Components*”, by Tom Coultate, that celery contains high levels of nitrates. Certain other vegetables such as Swiss chard, spinach and arugula also contain high levels of natural nitrates (see table at end for a short list of vegetables containing high levels of nitrate). In fact, more than 90% of the nitrates we ingest come from fresh vegetables, rather than processed foods. Nitrate (NO_3^{-1}) is a close chemical cousin of nitrite (NO_2^{-1}). In plants nitrates exist as sodium, potassium, or calcium salts, and may be referred to in the singular or plural. Nitrates can be readily converted by enzymes in bacteria, saliva and food to nitrites, which in turn may be converted to nitrosamines following ingestion. It appeared to me the practice of adding celery powder to “uncured” meat products labeled “no nitrate or nitrite added” was a deliberate way of deceiving the consumer into thinking these products were nitrate-free.

I am sure many consumers bought these products assuming they did not contain any nitrates or nitrites, when in fact they did! In issue number 105 of *Cook’s Illustrated* magazine we published (July 1, 2010, page 2) the results of independent laboratory tests of “uncured” bacon for the presence of both nitrates and nitrites. The laboratory found levels of nitrates ranging from 10.3 to 44.3 parts per million (ppm), and levels of nitrites ranging from 16.3 to 35.0 ppm. Although these uncured “no nitrate or nitrite added” products were well within the USDA use level of 120 ppm of added nitrites in cured bacon, they clearly contained both nitrates and nitrites at levels similar to aged cured meat products that openly declare them in the list of ingredients on the label.

What consumer wouldn't be confused and concerned by these results. Following our report various websites started publicizing the issue. On May 11, 2011 Mark Ruhlman called "no nitrites added" a "hoax" (<http://ruhlman.com/2011/05/the-no-nitrites-added-hoax/>). I believed this too, until I read a petition submitted on November 3, 2011 to the Food Safety and Inspection Service (FSIS, a branch of the USDA) by Applegate Farms requesting a change in the federal regulations governing cured meat products. The petition stated "*Many of those same consumers feel deceived that our products, which are cured with vegetable juice and sea salt, actually do contain nitrites.*" The petition even included the article published in *Cooks Illustrated* magazine as confirmation that consumers feel confused and deceived. Some of the manufacturers may have taken advantage of the regulations to avoid listing nitrites in their ingredients, but at least one wanted the regulation changed so consumers would not be deceived.

Maybe I was wrong! Perhaps I was blaming the wrong party. The petition stated that "Any product cured without the addition of sodium nitrite or nitrate has to follow 9CFR317.17 (a), (b), (c)", which is the federal regulation that requires these products must be labeled as "uncured", and shall contain the qualifier "no nitrate or nitrite added". CFR stands for the *Code of Federal Regulations*, which spells out the requirements for the standards of composition and labeling of a vast number of products, including many food products sold to consumers. It turns out the real culprit for consumer confusion regarding "uncured" meat products may be the United States Government, and not the manufacturers who are following federal regulations. These guidelines state that if a manufacturer is not deliberately adding the processed ingredients sodium nitrite or sodium nitrate for the purpose of curing the processed meat, then the product must be labeled as "uncured" and must include the words "no nitrate or nitrite added", even if the manufacturer is adding celery powder as a natural source of curing nitrates. In fact, the Food Safety and Inspection Service (FSIS) has recently issued a statement that celery powder and other natural sources of nitrite are NOT approved for use as curing agents (updated July 9, 2014). Instead, these substances are currently regulated as flavorings! Figure that one out.

Is the United States Government enabling manufacturers to deceive the consumer? I thought the purpose of federal regulations was to protect the consumer. According to professor Joe Sebranek (Iowa State University), the original federal regulation regarding uncured meat products goes back to 1972, when the Code of Federal Regulation first required the use of the word "uncured" on the label of processed meat products that did not contain nitrate or nitrite added as a preservative. This regulation was intended to make products without nitrate or nitrite available to the consumer, but did require refrigeration as a minimum safeguard. Then in 1979 the CFR was amended to require "no nitrate or nitrite added" on the label. Finally, in 1990 the Organic Foods Production Act (OFPA) specifically prohibited the addition of nitrate or nitrite to organic products, and required that organic processed meats be labeled "uncured". Surprisingly, the OFPA does not prohibit the use of natural sources of nitrate, such as celery

powder, as long as they are added as flavorings. As a chemist I know that nitrate is nitrate no matter the source or intended use. Ah, the sanctity of organic foods.

The term “naturally cured” is not recognized by the U. S. regulatory agencies, and cannot be used on labels. According to professor Sebranek, the first natural curing process was developed in the late 1990’s after all of the early regulations for uncured products had been passed. This led to the production of concentrated vegetable juices and powders that contained as much as 3% by weight of natural nitrates (30,000 ppm), combined with nitrate reducing bacteria to convert the nitrates to nitrites. Manufacturers soon began to adopt this process because they could label their uncured products as containing no added nitrates or nitrites, with full support of the regulatory agencies. Technology is now available to produce vegetable juice powders containing as much as 4% nitrates and 2.5% nitrites incorporated at 0.3% of the weight of meat. According to professor Amanda Gipe McKeith (Western Kentucky University) the USDA has not reached a conclusion regarding the Applegate Farms’ petition to alter the regulations because they are waiting for more research on the safety of natural curing ingredients to prevent the growth of harmful microorganisms. Talk about a sense of urgency (almost 20 years since the confusion started)! Meanwhile, the consumer is left in the dark! I guess what you don’t know really can’t hurt you.

I wrote this science note in the hopes that regulations will change sooner rather than later once people understand the issues. But I have to admit, what really got me writing this note was a recent statement in *Food and Wine* magazine (January 2015, page 106) in regards to a delicious recipe for Naomi Pomeroy’s celery soup with bacon croutons. The statement, presumably written by one of the editors, was “*Did You Know? Because celery is naturally rich in sodium, celery juice or powder is often used to cure nitrate-free bacon.*” **Nitrate-free bacon!!** Are you kidding me!! First of all, celery stalks contain only about 80 milligrams of sodium per 100 grams of stalks, which is far below the USDA guideline for the level of salt (not sodium) required to preserve processed meat. But most importantly, here is another statement in a respected food magazine that continues to promote the belief that adding celery powder or juice is NOT adding nitrate to bacon. Another example of why the myth lives on!!

Fresh Vegetable	Nitrate (mean, mg/kg)*
Arugula	2597
Beetroot	1727
Broccoli rabe	905
Celery	1678
Lettuce (Romain)	1241
Spinach	1845
Swiss chard	2363

Mean values reported in milligrams per kilogram (parts per million) of fresh vegetables from P. Santamaria, A. Elia, F. Serio, and E. Todako, *J. Sci. Food Agric.* 1999; 79: 1882-1888.

Primary Information Sources

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