

# Sodium Nitrite: Essential to Food Safety

Sodium nitrite, a salt, is a USDA-approved food additive that gives cured meats such as ham, bacon and hot dogs their characteristic color, contributes to their flavor, and prevents rancidity by inhibiting fat oxidation.<sup>1</sup>

**Most importantly, sodium nitrite plays an essential role in protecting the food safety of cured meats.<sup>1</sup>**

Sodium nitrite added to cured meats inhibits the growth of microorganisms, specifically *Clostridium botulinum* and the development of the botulism toxin. In 1906, the USDA approved sodium nitrite as a food additive, and the meat industry began using it in cured meats starting in 1925.<sup>1</sup>

## Sodium Nitrite is a Safe and Regulated Food Additive

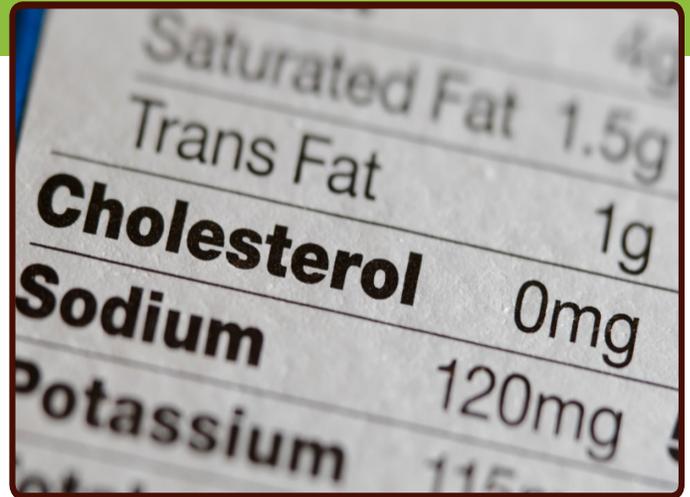
Numerous scientific studies and expert organizations have concluded for decades that sodium nitrite is a safe food additive.<sup>1</sup> In addition, the Food Safety and Inspection Service of the USDA strictly regulates the level of nitrite in foods to ensure it remains at very low levels.<sup>1</sup>

Periodically, controversy has emerged concerning the proposed link between sodium nitrite in cured meats and the endogenous formation of carcinogenic nitrosamines under certain conditions.<sup>1</sup> However, studies by the U.S. Food and Drug Administration, the National Academy of Sciences, the Joint Food and Agriculture Organization/World Health Organization (FAO/WHO) Expert Committee on Food Additives, and the American Medical Association (AMA) conclude that the use of sodium nitrite in cured meats is safe and not associated with cancer risk in humans.<sup>1-4</sup> In 2003, the FAO/WHO Expert Committee, based on its review of the scientific literature, concluded that the findings “do not provide evidence that nitrite is carcinogenic to humans.”<sup>3</sup> In 2004, the AMA concluded that the risk of “developing cancer as a result of consumption of nitrites-containing foods is negligible.”<sup>4</sup>

Earlier, both the U.S. Department of Health and Human Services' National Toxicology Program, the world's leading authority on the toxicological safety of chemicals, and California's Office of Environmental Health and Hazard Assessment's Developmental and Reproductive Toxicity Identification Committee concluded that nitrites are safe at the levels used and do not cause developmental or reproductive toxicity.<sup>1</sup>

A 2012 scientific review of human safety controversies surrounding nitrite and nitrate in the diet by University of Wisconsin researchers affirms the general safety of nitrite and nitrate in human health.<sup>1</sup> If nitrite caused cancer, people would be advised to avoid swallowing since saliva accounts for approximately 93% of the total daily intake of nitrite.<sup>1,5</sup>

Not only is sodium nitrite a safe and regulated food additive, but



“today, the regulatory controls, and more stringent plant production practices have essentially eliminated all regulatory nitrosamine concerns in meat,” state the authors of the above scientific review.<sup>1</sup> Industry efforts have lowered residual nitrite levels in cured meat products in the United States by approximately 80 percent since the mid-1970s.<sup>1,5,6</sup> Residual nitrite levels in cured meats conventionally cured with sodium nitrite continue to be minimal, and are not different from nitrite concentrations in meats not manufactured with sodium nitrite (i.e., cured using alternative methods), according to a recent national survey of cured meat products available at retail.<sup>7</sup> The overall nitrite level from all cured meats was  $\leq$  10 ppm (1 mg/100 g),<sup>7</sup> a level similar to that found in a similar survey reported in 1997.<sup>6</sup>

A recent article identifies “nitrites in cured meats cause cancer” as one of five health scares you can ignore, and adds that “you’d have to eat about 100 hot dogs just to take in the same amount of nitrite that your body naturally produces each day.”<sup>8</sup>

## Emerging Research Suggests Nitrites May Have Health Benefits

Evidence is mounting that nitrite may have several health benefits. Through normal metabolism, the human body generates nitrite and converts it to nitric oxide. Called the “Molecule of the Year” by *Science Magazine* in 1992, nitric oxide may help heal wounds, promote blood clotting, control blood pressure, enhance brain function, and boost immunity. Research has shown that nitrite may guard heart, lung

and brain tissue against cellular death when they become starved for oxygen.<sup>9</sup>

Scientists at the National Institutes of Health have concluded that nitrite is a potential new treatment for organ transplantation, heart attacks, sickle cell disease, brain aneurysms, leg vascular problems and even pulmonary hypertension, an illness that suffocates babies.<sup>10</sup>

## Most Nitrites in the Diet Come from Vegetables

Nitrites come from a variety of sources. Nitrates, which the body converts to nitrites when they come in contact with saliva in the mouth, are found mainly in vegetables. The nitrates in vegetables account for 80% to > 90% of nitrates consumed.<sup>1,5</sup> Cured meats and drinking water make a small contribution to total nitrate intake.



- Most (93%) nitrite comes from saliva, with only a very small amount directly contributed by foods.<sup>1</sup> Less than 5% of the intake of nitrite and nitrate comes from cured meat; the rest is derived from saliva and vegetables.<sup>7</sup>

The amount of nitrate (a precursor of nitrite in the body) in some vegetables can be very high:<sup>5</sup>

- Spinach contains 740 mg per 100 g of food
- Collard greens contain 320 mg per 100 g of food; and,
- Broccoli contains 40 mg per 100 g of food.

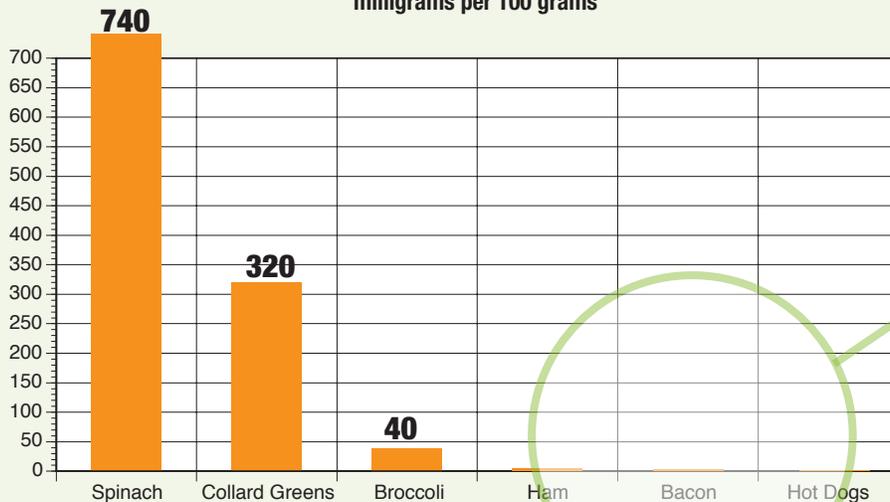


The amount of nitrite in cured meats is much lower:<sup>5</sup>

- Ham contains .89 mg per 100 g of food;
- Bacon contains .38 mg per 100 g of food; and,
- Hot dogs contain .05 mg per 100 g of food.



**Nitrates**  
milligrams per 100 grams



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<sup>1</sup> Sindelar JJ, Milkowski AL. Human safety controversies surrounding nitrate and nitrite in the diet. *Nitric Oxide* 2012; 26: 259-66.

<sup>2</sup> Assembly of Life Sciences (U.S.) Committee on Nitrite and Curing Agents in Food. *The Health Effects of Nitrate, Nitrite, and N-Nitroso Compounds*. Washington DC: National Academies, 1981.

<sup>3</sup> Food and Agriculture Organization, World Health Organization (FAO/WHO). Nitrite (and potential endogenous formation of N-nitroso compounds). In: *Safety Evaluation of Certain Food Additives and Contaminants*. Geneva: World Health Organization, Joint FAO/WHO Expert Committee on Food Additives, WHO Food Additives Series No. 50, 2003. <http://inchem.org/documents/jecfa/jecmono/v50je05.htm>. Accessed June 17, 2012.

<sup>4</sup> American Medical Association. Report 9 of the Council on Scientific Affairs (A-04). Labeling of Nitrite Content of Processed Foods. 2004. <http://www.ama-assn.org/resources/doc/csaph/a04csa9-fulltext.pdf>. Accessed June 17, 2012.

<sup>5</sup> Hord NG, Tang Y, Bryan NS. Food sources of nitrates and nitrites: the physiologic context for potential health benefits. *Am J Clin Nutr* 2009; 90: 1-10.

<sup>6</sup> Cassens RG. Residual nitrite in cured meat. *Food Technol*. 1997; 51: 53-5.

<sup>7</sup> Nunez De Gonzalez MT, Osburn WN, Hardin MD, et al. Survey of residual nitrite and nitrate in conventional and organic/natural/uncured/indirectly cured meats available at retail in the United States. *J Agric. Food Chem* 2012; 60: 3981-90.

<sup>8</sup> Clark L. 5 Health Scares You Can Ignore. July 5, 2012. <http://abcnews.go.com/Health/Wellness/health-scares-ignore/story?id=16712712>. Accessed July 5, 2012.

<sup>9</sup> Cosby K, Partovi KS, Crawford JH, et al. Nitrite reduction to nitric oxide by deoxyhemoglobin vasodilates the human circulation. *Nature Med*. 2003; 9: 1498-1505.

<sup>10</sup> Webb AJ, Patel N, Loukogeorgakis S, et al. Acute blood pressure lowering, vasoprotective, and antiplatelet properties of dietary nitrate via bioconversion to nitrite. *Hypertension* 2008; 51: 784-90.