Save Your Bacon! Sizzling Bits about Nitrites, Dirty Little Secrets about Celery Salt, and Other Aporkalyptic News

January 03, 2013 |

By Dr. Mercola

Just to be clear, although I have cautioned against the consumption of pork, *I am NOT anti-pork (or anti-bacon)*. My concern about pork is that you are cautious about *the source* of the pork you consume—just as you should be cautious about the source of your beef, eggs and poultry. If your pork is pasture-raised and the pigs live in their natural setting eating pig-appropriate food, then pork can be a nutritious part of your diet.

Pork is arguably a "healthful" meat from a biochemical perspective, and if consumed from a humanely raised pastured hog like those on Polyface Farm and prepared properly, there is likely minimal risk of infection. However, virtually all of the pork you're likely to consume will not fit these criteria—it is extremely difficult to find. If you can find a source that does it right, then by all means, enjoy!

Joel Salatin of Polyface Farm provides an exceptional example of how hogs should be raised. I visited his farm and talked with him extensively about sustainable farming practices, which you can view in the video below.

By Kaayla T. Daniel, PhD, CCN

Neal Barnard MD, head of the Physicians Committee for (Ir) Responsible Medicine, tried to round up an army of vegans to protest a Bacon Festival in Iowa last Spring, but succeeded in recruiting only six volunteers.[1]

Why so few? Probably fear of bacon!

Not fear of death by bacon, which is what Dr. Barnard hoped to fuel with anti-meat rhetoric and billboards of skulls and crossbones, but vegan fears of succumbing to the lure of bacon itself! Bacon's smell and taste are so seductive that many vegetarians fear it as "the gateway meat."

But what of those health risks? What about all that fat, cholesterol and sodium? And what about nitrites?

It's not just vegans after all who warn us against bacon. Recently, the Harvard School of Public Health announced with great fanfare that just a small daily serving of red meat would increase our likelihood of death by 13 percent, while a little bacon, hot dogs, sausage or other processed red meats every day would kill us off 20 percent faster. [2-3]

In fact, the study was pseudo science at its best — an observational study using notoriously fallible food-frequency questionnaires, with researchers drawing unwarranted conclusions based on mere associations. Much ado about nothing, in other words. A careful look at the data suggests a 0.2-fold increased risk at most. And that's for people eating supermarket meat from factory farms who also happen to smoke, don't exercise, and eat their red meat wrapped up in white bread and buns. [4-6]

Is it Safe to Eat Bacon?

Sadly lots of people assume Harvard's warnings must be valid. Red meat, bacon and other tasty high-fat foods, after all, have long enjoyed reputations as being both delicious and dangerous.

Indeed, the bacon question has been argued for years, now with most non-vegan internet bloggers concluding that bacon's "not so bad" if used to add a bit of flavor and crunchiness to "healthy" foods such as salads and vegetables. Comedian Jim Gaffigan spoofed this on *Late Night with Conan O'Brien* when he described bits of bacon as "the fairy dust of the foodcommunity" and eating a salad sprinkled with bacon as "panning for gold."

A bit more bacon – even a few strips – sometimes even gets the Food-Police stamp of approval, provided it's a special treat, of course, and not a daily indulgence. But such recommendations usually come complete with a warning to stick with lean bacon, and then cook it so it's firm but not soft. While that last sounds a bit naughty, it's actually anti-fat puritanism — the goal being to render the soft parts into fat that can be poured or patted off.

But what if bacon is actually good for us? What if it actually supports good health and is not a mortal dietary sin after all? What if we can eat all we'd like? Naughty propositions to be sure, but ones the Naughty Nutritionist™ is prepared to argue. And that promise is not just a strip tease!

What You Need to Know about Healthy Fats

Bacon's primary asset is its fat, and that fat— surprise! – is primarily monounsaturated. Fifty percent of the fat in bacon is monounsaturated, mostly consisting of oleic acid, the type so valued in olive oil. About three percent of that is palmitoleic acid, a monounsaturate with valuable antimicrobial properties. About 40 percent of bacon fat is saturated, a level that worries fat phobics, but is the reason why bacon fat is relatively stable and unlikely to go rancid under normal storage and cooking conditions. That's important, given the fact that the remaining 10 percent is in the valuable but unstable form of polyunsaturates.[7]

Pork fat also contains a novel form of phosphatidylcholine that possesses antioxidant activity superior to Vitamin E. This may be one reason why lard and bacon fat are relatively stable and not prone to rancidity from free radicals.[8]

Bacon fat from pastured pigs also comes replete with fat-soluble vitamin D, provided it's bacon from foraging pigs that romp outdoors in the sun for most of year. Factory-farmed pigs kept indoors and fed rations from soy, casein, corn meal, and other grains, are likely to show low levels of Vitamin D.

It's a Numbers Game...

How much Vitamin D is the question. Most databases suggest 100 to 250 IU per 100 grams, with some of the higher numbers coming from Italy, where even commercial pigs are more likely to see the great outdoors.[9-10] However, far higher numbers have been reported, especially for pastured pigs.

According to Dr. Mary Enig, USDA laboratories in the 1980s came up with the figure of 2,800 IUs per 100 grams though that data was never officially reported by the government agency.[11] According to her source at the USDA, the agency chose to suppress this information because it wanted the public to think its vitamin D must come from fortified milk and other BigAg products. Whether the 2,800 IUs figure is valid and represents sophisticated laboratory testing still not in common use, or a typographical error for 280 IUs is not known. USDA databases from that period do not even include Vitamin D.

Other unanswered questions involve the Vitamin A content of bacon fat or lard. USDA tables — both the official tables and the unpublished 1980 findings discovered by Dr. Enig – report levels of zero.[12-13] Yet a 1948 study showed that Vitamin A deficiency in rats can be corrected with lard. Indeed Vitamin A-deficient rats reversed the deficiency when provided fats that replaced the sucrose in their chow. Even more interesting, those

animals fared better than those on the same diet with added Vitamin A palmitate, a synthetic form of A.

Although any fats seemed to help, the effect was most pronounced with lard.[14] This makes little sense given the seeming lack of Vitamin A in lard, but a series of studies from the early 1950s identified the presence of a "vitamin A replacing factor" in lard even when Vitamin A itself was not detected.[15-19]

As we would expect, the good fat in bacon comes accompanied by cholesterol, a "no no" according to the Food Police, and yet another reason for bacon's dangerous reputation.

The evidence against cholesterol causing or contributing to heart disease, of course, is inconsistent, contradictory, misinterpreted and sparse. It's oxidized cholesterol — as found in the powdered milk and powdered egg ingredients used for processed, packaged and fast foods, including low-fat and non-fat milks — that contributes to heart disease. What's more, as biochemical textbooks make clear, cholesterol is the mother of all hormones, including our reproductive and mood hormones.[20] Thus bacon's cholesterol content may be part of the reason it enjoys such a reputation as a "feel good" food.

The Heart of the Matter

Even so, "everyone knows" bacon's bad for us, and Dr. Barnard would have us think it's a veritable risk factor for heart disease. In fact, bacon might be good for the heart. And not just because it makes us happy, though that's surely a plus! Monounsaturated fat — the primary fat in bacon — is widely lauded for reducing inflammation and lowering blood pressure, while the antimicrobial palmitoleic content in bacon fat can keep plaque at bay. Triglycerides too may improve because bacon fat is especially good at helping us achieve satiety and stable blood sugar. Bacon can thus be useful for diabetics and prediabetics as well as everyone else coping with sugar cravings and carbohydrate addictions.

Promoting bacon as a red hot ticket to weight loss might seem over the top, but eggs and bacon do add up to a high-fat, high-protein and low-carb breakfast. They not only help people start their day feeling happy, but can reduce hunger pains and rev the metabolism. For many people, bacon's signature salty and savory sweetness is a treat that reduces feelings of deprivation and lack. It can help people transition away from high carb diets and overcome carb addictions. And by stabilizing blood sugar, bacon helps prevent mood swings, reduce anxiety, improve focus and enhance coping skills.

Salt of the Earth

Those not worried about bacon's fat and cholesterol content often fret about the salt. Sodium restriction, of course, is the latest goal of the Food Police despite underwhelming evidence that salt contributes to high blood pressure and heart disease. In fact, Americans today eat about half the salt they consumed during the good old days prior to refrigeration when meat and fish were preserved by salting and curing, and vegetables by culturing and pickling.

Animals seek out salt licks, paleo people eat and drink salty blood and other animal parts, and biochemists point out we need sodium and chloride for blood, sweat, tears, mucus and semen. Textbooks "worth their salt" make all of this abundantly clear, yet U.S. government guidelines recommend drastic reductions in salt intake.

Sadly, low-salt diets increase the likelihood of heart disease, hypertension, cognitive decline, osteoporosis, insulin resistance and erectile dysfunction.[21-22] Given today's epidemic of chronic illness, that's pouring salt on a gaping healthcare wound! And it's a poor reason indeed to avoid bacon.

Fear of Nitrites

For members of the Weston A. Price Foundation, the big issue is not fear of fat, cholesterol or salt, but fear of nitrites, which have been associated with cancer and many other ills. Indeed studies — such as the recent one out of Harvard – make the headlines so often that nearly all educated, health conscious consumers think they should either avoid processed meats altogether or choose "uncured bacons" that are advertised as "nitrite free." Popular brands assumed to be healthy include Niman, Bieler, Applegate, Coleman's and nearly every other bacon brand found at Whole Foods Market or other health food stores. The question is, are these "uncured" bacons healthier?

Deceiving the Public

The short answer is no. Nathan S. Bryan, PhD, University of Texas Houston Biomedical Research Center, pulls no punches when he states, "This notion of 'nitrite-free' or 'organically cured' meats is a public deception."[23] Traditionally bacon was cured by adding sodium nitrite salts directly to the meat. Today most manufacturers of "nitrite free" brands add celery salt, which is about 50 percent nitrate, plus a starter culture of

bacteria. This transforms the nitrate found naturally in the celery salt into nitrite, which cures the meat.

Although manufacturers label this bacon "nitrite free," this method actually generates more nitrite from the celery salt than would ever be added as a salt. Indeed, "nitrite free" bacon can have twice the nitrite content of bacons cured directly with nitrite salts. "Some convert 40 percent, some convert 90 percent, so the consistency of the residual nitrite is highly variable," Dr. Bryan says. Yet his biggest concern is not nitrite content but the possibility of bacterial contamination. "I think it is probably less healthy than regular cured meats because of the bacteria load and the unknown efficacy of conversion by the bacteria," he says.[24]

Nitrites were used traditionally to preserve food safely, including cured meat and fish, as well as some cheeses. Although improved hygiene and availability of refrigeration diminishes the need for nitrite, it remains useful for its antioxidant properties, antimicrobial activity, flavor enhancement and color development.[25-31]

Modern alternatives such as biological acidulants, parabens and sorbates are FDA approved and generally considered safe. Yet biological acidulants such as sodium and potassium bisulfates have been linked to respiratory problems, including lung irritation and coughing,[32] and parabens are significant endocrine disrupters, with the potential to adversely affect the fertility and sex lives of both men and women.[33] As for sorbates, the mainstream media only warns us about an association with contact dermatitis[34]

Older studies, however, suggested mutagenic sorbate and nitrite reactions.[35-36] Biochemist Galen D. Knight, PhD, is sufficiently concerned to exclude them from his diet: "The sorbates and parasorbates are essentially polyunsaturated fats capable of forming both epoxides and enols, which are carcinogens. The 'bates should not be in our food supply if we want to remain healthy." [37]

The Bacon Cure

Could it be our ancestors were right after all? That today's new, improved and supposedly healthy versions of bacon are not? The traditional way to make bacon is dry cured through hand rubbing with a mixture of herbs, sugars, salt, and the sodium nitrite curing salts. Vitamin C in the mix helps form the nitrosylheme pigment that gives cured meats their wonderful red color, and, as will be explained shortly, helps ensure nitrites convert to healthy nitric oxide and not carcinogenic nitrosamines.

Traditional producers leave the bacon to cure for anywhere from a day to a month before slow-smoking it over applewood, hickory or other wood fires, generally from one to three days. The extended curing time intensifies the pork flavor and shrinks the meat so that the bacon doesn't shrivel and splatter as it cooks.

Flavor can vary quite a bit from producer to producer, and is determined by the ingredients of the cure, the method of smoking, and the timing. The age, gender, and breed of the pig, as well as its time outdoors, forage and feed all influence the final flavor of the bacon as well as its potential for health benefits or risks.

Dirty Little Secrets

Supermarket bacon may also use sodium nitrite, but not in a traditional way. Instead, manufacturers opt for fast and cheap methods by which inferior quality factory-farmed meat is pumped and plumped with a liquid cure solution that includes sodium erythorbate and sodium nitrite, along with "liquid smoke," spices and flavorings heavy in MSG. After "curing" for a few hours, the pork is sprayed with more "liquid smoke" and heated until a smoke-like flavor permeates the meat. The pork is then quickly chilled, machine-pressed into a uniform shape, sliced, and packaged for sale. Pumped and plumped bacon may look big in the package, but shrinks, shrivels and splatters when cooked.

"Liquid smoke," a product heavily favored by big food manufacturers, is produced by burning wood chips or sawdust, then condensing the smoke into solids or liquids and dissolving it in water. It is being investigated by the European Food Safety Authority for safety as a food flavoring because of evidence of genotoxicity and cytotoxicity. Indeed, one study suggests liquid smoke is more carcinogenic than cigarette smoke concentrate.[38-41]

Concerns about Nitrite

Concerns about the safety of nitrite first surfaced in the 1960s when studies showed the presence of carcinogenic nitrosamines in bacon and other cured meat products. In the early 1970s, researchers at the Massachusetts Institute of Technology implicated nitrite itself as a carcinogen. The MIT study involved direct feeding of nitrite to laboratory rats, and later studies did not support the headline-making conclusion that nitrite induces cancer. The USDA's concern then shifted to the formation of nitrosamines from nitrite combining with the amines available in meat, with regulators weighing the possible risk

of cancer against nitrite's traditional and well-proven role protecting us from botulism and other forms of food poisoning. [42]

Since then commercial bacon has been heavily studied and subject to regulatory monitoring of nitrosamine levels. Although nitrosamines have been found in many cured meats, they are most consistently found in fried bacon.[43-50] A look at the research, however, shows it to be inconsistent, contradictory and confusing.

Over the years, most scientists have blamed the nitrosamines on frying although some data suggest nitrosamines can be produced as an artifact during the analytical procedure whenever residual nitrite is present.[51]. Wood smoke has also been blamed though the culprit might actually be "liquid smoke."[52]

In 1973 the Canadian Department of Agriculture found preformed nitrosamines in the readymade spice mixes favored by Big Ag bacon processors as well as many of the smaller producers. After the USDA confirmed the Canadian findings, regulators made these spice mixes illegal.[53] The USDA also soon required the use of sodium erythorbates and/ or ascorbates in bacon processing after consistent research findings indicated these substances pushed nitrosamine levels way down.[54]

Obviously some of the nitrosamine problem stems from industrial processing. The USDA may have outlawed certain spice mixes back in the 1970s, but preformed nitrosamines might well exist in the latest generation of artificial and "natural" flavorings and "liquid smokes." Also worrisome are references to "meat batters" and to high pressure, high temperature processing methods known to produce nitrosamines and routinely used to produce commercial bacon.

Choosing dry cured or "country style" bacon made by small producers would seem to be a safer option, but in some instances might generate even higher levels of N-nitrosopyrrolidine (NPYR) after frying compared to pump-cured bacon.[55] The problem is processing methods vary widely, with different choices and concentrations of spices, sodium nitrite and sometimes sodium nitrate. The USDA now recommends that processors not add sodium nitrate because it is not necessary and the conversion of nitrate to nitrite is variable and somewhat unpredictable.

Fat in the Feeds

From the WAPF point of view, the most interesting and helpful findings concern the effect of fatty acid composition on nitrosamine formation. After all, factory-farmed pigs

routinely eat feeds that include soy, corn and other inferior oils while pastured pigs should not.

In 1984, researchers discovered that bacon from pigs fed corn oil-supplemented diets contains significantly higher levels of the nitrosamines n-nitrosopyrrolidine and n-nitrosodimethylamine compared to controls. They also reported that bacon from pigs fed a coconut fat-supplemented diet contains significantly lower levels of n-nitrosopyrrolidine but no significant difference in n-nitrosodimethylamine levels compared to controls.

Given that the controls were fed a standard commercial corn and soy-based diet supplemented with vitamins and minerals, we can only wonder what might be found with bacon sourced from optimally nourished, pastured pigs. Be that as it may, one of the researchers' conclusions is telling: "Fatty acid analyses of the adipose tissue of the bacon samples indicated that n-nitrosopyrrolidine levels in bacon correlated well with the degree of unsaturation of the adipose tissue."[56] Other research supports the connection between nitrosamine formation and the fatty acid profiles of animal feed and meat. Nitrosamines, show up more frequently in the fat than in the lean.[57-59]

The takeaway is clear: choose bacon from pastured pigs.

That said, finding genuine, traditionally cured artisanal bacon is just about impossible. The anti-nitrite message has penetrated so deeply that most artesanal farmers produce their bacon using the dry salt way but without added nitrites, relying on salt, good sanitary practices and refrigeration to prevent contamination. In the days prior to refrigeration, of course, the sodium nitrite step was not an option. This type of "no added nitrate or nitrates" products are honest compared to the newfangled celery salt "uncured" bacons, and are obviously far healthier than supermarket pumped and plumped bacon-like products, or the fakin' bacons from turkey or soy.

That said, there is probably nothing wrong with a good old-fashioned bacon cured with a precise amount of sodium nitrite curing salts. If the idea of nitrite still seems scary, consider this: Ascorbic acid is routinely added to cured meats along with the nitrite in order to promote beneficial nitric oxide formation from nitrite, and to inhibit nitrosation reactions in the stomach that can lead to carcinogenic nitrosamines. Bringing alpha tocopherol (Vitamin E) into the mix as well seems to further prevent occurrence of nitrosamine formation.[60-63] Old-fashioned processing, involving leisurely time for curing and smoking, further enhances the conversion of nitrite to the beneficial nitric oxide molecule.

Just Say "NO"

In 1998 Robert F. Furchgott, Louis J. Ignarro and Ferid Murad won the Nobel prize in physiology and medicine for their discovery of nitric oxide (NO) as a signaling molecule in the cardiovascular system. As the first molecule discovered that can literally communicate with other molecules, nitric oxide revolutionized conventional scientific thinking.[64]

In terms of preventing heart disease, nitric oxide produced by the cells in our blood vessels signals the surrounding arterial tissues to tell them to relax. That lowers blood pressure, expands narrow blood vessels, eliminates dangerous clots, and reduces the formation of plaque. Interestingly enough, NO lowers triglyceride levels, but not cholesterol, and researchers even report that NO even seems to protect those with high cholesterol. WAPF thinking, of course, holds that NO's failure to lower cholesterol is a point in its favor, as cholesterol has many benies and no protection against high cholesterol is needed.

By optimizing circulation, NO affects every part of the body. More blood flow means better oxygen transfer and more energy. More blood flow means better brain function and better attention. And more blood flow means a better sex life.

Accordingly, NO is a key ingredient in many well-known erectile dysfunction products. Nitric oxide also benefits the immune system, where it helps us fight off infections, and the nervous system where it helps our brain cells communicate properly. NO's myriad health benefits are summed up in the popular book *The Nitric Oxide (NO) Solution* by Nathan S.Bryan, PhD and Janet Zand, OMD.[65] Although the book does not contain citations, a quick PubMed search reveals Dr. Bryan's contribution to at least 88 journal articles, many establishing the NO benefits described above.

NO for Life

The message is NO is vital for a long, healthy and vital life. Unfortunately, few people today produce enough NO for optimal health, and NO deficiencies have been identified in many chronic diseases. Although NO supplements have been developed and marketed, and might well be helpful for people on plant-based, low-fat, low-cholesterol diets, such products might not be needed with a return to traditional foods. Traditionally cured bacon, sausage and other meats cured with sodium nitrite might be just the ticket to increasing NO production in the body.

Another big NO producing food is beets, suggesting yet another reason why so many WAPFers thrive on beet kvaas. Although foods rich in the amino acids citrulline and arginine are often recommended to increase NO production, most people are not young enough or healthy enough to turn that trick. Perhaps the more direct route from nitrite to NO is the way to go.

Nitrites and the Nitrogen Cycle

But aren't nitrates and nitrites dangerous? Yes, and no. Nitrates are natural products of the nitrogen cycle and found in water, plants and animals. Approximately 80 percent of dietary nitrates are derived from vegetable consumption, and nitrites are naturally present in saliva, in the gut and indeed in all mammalian tissue.[66] Clearly, we cannot be pro plant based diet and anti nitrates!

Levels of nitrite naturally increase in the body to help boost oxygen when people live at high altitudes, and such people are often considered among the healthiest in the world.[67] In short, nitrites are not a problem, provided our diets are rich enough in antioxidants to facilitate the conversion of nitrites to NO and to prevent nitrosation reactions that convert nitrites into carcinogenic nitrosamines.

It's obviously important to avoid eating readymade sources of nitrosamines, such as those that occur in soy protein isolates, non-fat dry milk and other products that have undergone acid washes, flame drying or high temperature spray-drying processes.[68-70] People are also exposed to nitrosamines from some types of beer, cigarettes, nipples of baby bottles and the rubber used with braces in orthodontics.[71-72]

In other words, nitrosamines don't just come from cured meats. Furthermore, the nitrosamine content in cured meats has gone way down over the past few decades.[72] As for environmental damage from nitrates, this problem comes from the land use abuses of factory farming.

Bring Home the Bacon

Then why do so many health experts condemn bacon and other cured meats because of their nitrite content? Well, why do fats and cholesterol still get a bum rap?

The reason is bad studies and worse publicity, with the latest shoddy work out of Harvard a prime example. According to Dr. Bryan, the body of studies show only a "weak association" with evidence that is "inconclusive." As he and his colleagues wrote in the *American Journal of Clinical Nutrition,* "This paradigm needs revisiting in the face

of undisputed health benefits of nitrite- and nitrate-enriched diets."[73] So what's the last word on America's favorite meat? Indulge bacon lust freely, know that the science is catching up, the media lags behind, and, our ancestors most likely got it right.

Weston Price Organization

Without a doubt the premiere organization in the United States connecting individuals to the farmers that are producing the healthiest food is Weston Price. They have hundreds of chapters throughout the country that are likely not to far from where you live. You can contact a chapter leader near you, and they can help you identify local resources to provide you and your family with health food that is grown locally.

About the Author

Kaayla T. Daniel, PhD, CCN, is the Naughty Nutritionist™ because of her ability to outrageously and humorously debunk nutritional myths. A popular guest on radio and television, she has been on The Dr Oz Show, NPR's People's Pharmacy and PBS Healing Quest. Dr Daniel is the author of The Whole Soy Story: The Dark Side of America's Favorite Health Food, a popular speaker at Wise Traditions, Biosignature, National Association of Nutritional Professionals and other conferences, Vice President of the Weston A. Price Foundation and recipient of its 2005 Integrity in Science Award. Her websites are www.naughtynutritionist.com and www.wholesoystory.com.