

Nightshades

Garrett
Smith

March 30,
2010

Read this article in: [Dutch](#)

Problems from these Popular Foods Exposed to the Light of Day

The nightshades are members of an enormous family of plants called Solanaceae, represent a huge family of plants. The ones that concern us in the Western diet mainly include tomatoes, potatoes (not sweet potatoes or yams), eggplant and peppers—this means all peppers including chili peppers, habenero, cayenne pepper and paprika (not peppercorns, see sidebar). Paprika is a sneaky one, showing up in lots of flavoring mixes and often under “spices” on ingredient labels. Other nightshades include goji berries (the new darling of the antioxidant crowd), ashwagandha (an adaptogenic herb from Ayurvedic medicine), Cape gooseberries (not normal gooseberries), ground cherries and garden huckleberries (not blueberries).

I’m a licensed naturopathic physician in private practice, and I will admit right off the bat that I am biased against nightshades. I used to eat a ton of foods in the nightshade family, but now I avoid them as much as possible. I am one of those who is very sensitive to these foods. In my medical practice, I treat pain often. My goal in pain treatment is pain relief. In my opinion, pain management—that is, long-term painkillers, without a goal of true pain relief—is for suckers. For me and many of my patients, nightshade avoidance is the answer to long-term relief from pain.

Why should you care about this? It’s likely that you enjoy eating these foods and can’t imagine that they are bad for you in any way. Well, if you suffer from inflammation, joint pain and cracking, avoiding nightshades will lessen your pain, whether or not the nightshades are the true source of the pain. Are you sensitive to weather changes? This can be an indication of nightshade sensitivity. Muscle pain and tightness, morning stiffness, poor healing, arthritis, insomnia and gall bladder problems—these can all be caused by nightshades. Nightshades can also cause heart burn or GERD—a lot of people already know they react this way when they eat peppers or tomatoes.

Like soy, most nightshades are relative newcomers to European/Western diets. The tomato came to North America in the very early eighteenth century. It was termed the “love apple” and grown first as an ornamental. That means people grew it because it is pretty, yet they did not eat it. Why did they not eat it? They thought the tomato was poisonous. The leaves of the nightshade family are indeed overtly poisonous (livestock farmers know this well) and people avoided the fruit as well.

During a famine in 1782, Scottish highlanders complained of dropsy (an old term for edema or swelling, often associated with congestive heart failure) when they ate abundantly of potatoes.¹ Russian prisoners of World War II returned with advanced cases of dropsy, which was blamed on heavy potato consumption.² An old saying in New Hampshire in 1719 was that the white potato shortened men’s lives.

Eggplant was also first grown as an ornamental, a decorative plant. It was not eaten until relatively recent years in North America. According to Dr. Norman Childers, author of *The Arthritis Diet*, peoples of the Mediterranean area previously believed that the eggplant would cause insanity if it was eaten daily for a month, in fact, it had the nickname of “mad apple.”³ How many foods that you eat have a reputation like that?

It’s extremely easy to overdose on nightshades in Western culture, especially if you are a foodie. Let’s say you have

salsa on your eggs at breakfast, potato salad at lunch, and eggplant with peppers along with other spicy dishes at dinner. This is a large amount of nightshades, eaten three times per day, in multiple combinations. It's very hard to avoid the nightshades, believe me, it's a lot of work! This can be easily demonstrated by reading the menu at any restaurant— nightshades have become ubiquitous. Nightshade sensitivity, in terms of the vigilance needed to keep them out of the diet, is almost as bad as gluten sensitivity!

For those of you who think you have tried “everything” for your arthritis pain, tried this and tried that but haven't tried avoiding nightshades— in my opinion, it's something you do need to try. I can tell you as a naturopathic doctor that I have tried many different remedies for my middle back pain. Nightshade avoidance got rid of 90 percent of it. If you're one of those people whose pain treatments (be it chiropractic, acupuncture, laser, energy medicine, whatever!) provides only a day or two of relief, you're quite possibly nightshade sensitive.

A physical therapist once told me that if a patient isn't responding to treatment, one of the first things to consider is nightshade sensitivity— there is simply nothing else that anyone can do to help somebody in pain when nightshade sensitivity is the cause—because once they eat some nightshades again, their pain will return as it was before. Sad but true, as I have witnessed many times in my practice.

CALCITRIOL IN NIGHTSHADES

The nightshades are considered a “calcinogenic” plant; that is, they cause calcinosis, which is a toxic calcification of soft tissues when eaten by animals. This happens because they contain calcitriol (1,25-dihydroxy vitamin D), the most active form of vitamin D. Please note that calcitriol is not vitamin D₃ (cholecalciferol). This is an extremely important distinction, as you will see.

In humans, calcitriol is normally the end product of vitamin D metabolism, so let me start at the beginning. Cholecalciferol, or vitamin D₃, is produced in the skin by the action of sunlight or can be consumed in food or supplements. In the liver, vitamin D₃ is transformed into calcidiol (25-hydroxycholecalciferol, the compound that we test in the blood as a measure of vitamin D status); then the kidneys transform calcidiol into calcitriol (1,25-dihydroxy vitamin D).

Calcitriol is an extremely potent hormone, thousands of times more potent than vitamin D₃. It has been said that calcitriol is the most powerful hormone in the human body. Production of calcitriol is very tightly regulated by the kidney. Why is it so tightly regulated?

Calcitriol signals the intestines to absorb calcium from our diet. While we absolutely need calcitriol to maintain proper bone density, too much calcitriol, from any source, leads to hypercalcemia, also known as high blood calcium. The body does not like this situation and wants to get the calcium levels back down to normal as quickly as possible, as an imbalance of minerals in the blood particularly affects the heart. The quickest solution for the body is to deposit the extra calcium into the soft tissues. Each hypercalcemic episode likely lasts for only a short while, however, each episode leaves a small deposit behind. Over time, these deposits lead to the condition known as calcinosis.

Overconsumption of calcitriol from nightshade foods can circumvent the kidney's control and over time lead to calcium deposits in the soft tissues such as the tendons, ligaments, cartilage, cardiovascular tissues, kidneys and skin. Osteoarthritis is basically calcium deposits in the soft tissues of joints. Chronic hypercalcemia can lead to generalized vascular (blood vessel) calcification, which is coronary artery disease. Nephrocalcinosis is calcification of the kidneys.

We are not supposed to bypass the body's control mechanisms for calcitriol. Nightshades do this to our detriment. Many of us do not notice because it happens so slowly and gradually.

What causes arthritis? The conventional view is that arthritis is the result of the joint “wearing out.” If this were the case, then arthritis would always be accompanied by inflammation. Think of parts in a car. If they “wear out” due to friction, there is heat, which could be likened to inflammation in our bodies. However, osteoarthritis typically has no

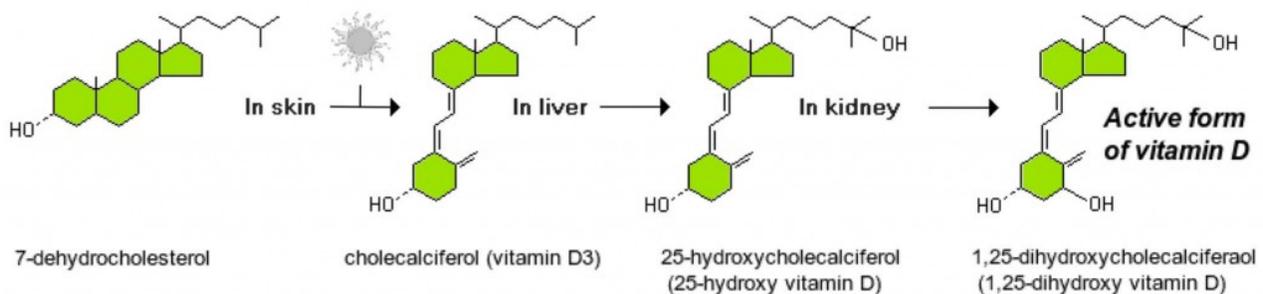
inflammation, so it really should be called osteoarthritis.

What if calcinosis could explain most, if not all these osteoarthritic changes? Instead of your joints wearing out, what if nightshades and their calcitriol content were causing the joints (cartilage, tendons, ligaments) to slowly calcify? Bone spurs are calcium deposits in tendons or ligaments. Many people are told that they have “no cartilage left” in their joints, but what if the truth was that the cartilage had slowly calcified? It would be nearly impossible to tell the difference between the two situations unless one knew exactly what to look for.

Scleroderma is a widespread connective tissue disease that involves changes or hardening in the skin, blood vessels, muscles and internal organs. The cause is said to be unknown. Could it be caused by nightshades, leading to calcinosis?

Some physicians are giving calcitriol or its analogs for simple vitamin D deficiency. This is overkill and not good for the system. In bypassing the body’s control systems we are creating the same situation I described above. If your doctor insists on using calcitriol, ergocalciferol (vitamin D₂, an unnatural form of vitamin D made by irradiating a fungus with ultraviolet light), or any other expensive analogue of vitamin D other than vitamin D₃ (cholecalciferol), you may want to find another doctor who is more educated in vitamin D supplementation. Please note that there are medical conditions where administering calcitriol is necessary, but simple vitamin D deficiency is not one of them.

According to Medline, common side-effects of calcitriol injections include weakness, headache, somnolence, nausea, vomiting, dry mouth, constipation, muscle pain, bone pain and metallic taste.⁴ Note the muscle and bone pain—do these sound like nightshade problems I’ve mentioned already? The liver and gall bladder can be affected, resulting in pale or fatty stools, an indication you are not digesting your fats well. Yellowing of skin or eyes (jaundice) is another symptom, indicative of liver issues. Hallucinations can happen, and a rare side effect is overt psychosis. Remember what was said to happen when one eats eggplant every day for a month?



Vitamin D Pathway

SOLANINE

Solanine is a glycoalkaloid, that is, a non-protein compound containing nitrogen. It is a potent poison found in species of the nightshade family, especially potatoes and eggplant. It can occur naturally in any part of the plant, including the leaves, fruit, and tubers.

Solanine poisoning is primarily displayed by gastrointestinal and neurological disorders. Symptoms include nausea, diarrhea, vomiting, stomach cramps, burning of the throat, cardiac dysrhythmia, headache and dizziness. Hallucinations, loss of sensation, paralysis, fever, jaundice, dilated pupils and hypothermia have been reported in more severe cases.⁵

Potatoes naturally produce solanine and chaconine, a related glycoalkaloid, as a defense mechanism against insects,

disease and predators (humans included). Potato leaves, stems and shoots are naturally high in these glycoalkaloids. When potato tubers are exposed to light, they turn green and increase glycoalkaloid production. This is a natural defense to help prevent the uncovered tuber from being eaten.

In potato tubers, 30–80 percent of the solanine develops in and close to the skin. If the potato looks green under the skin, throw it away; likewise if it has begun to sprout, just discard it.

How toxic are these compounds? The World Health Organization sets an upper limit of 20 mg per 100 grams of solanine per fresh weight of potato. Above that limit, they cannot be sold in stores, as they are considered too toxic for human consumption.⁶

Solanine and related glycoalkaloids are poisonous because they are acetylcholinesterase inhibitors—they inhibit the breakdown of acetylcholine, resulting in increased level and duration of action of this neurotransmitter. What does this mean? They cause prolonged muscle contractions. This is why people who are sensitive to nightshades or eat a lot of them often feel stiff when they wake up in the morning or sit for extended periods.

Studies with animals indicate that solanine causes cell membrane disruption in the digestive tract—exacerbated irritable bowel disorder in mice,⁷ gastrointestinal tissue destroyed in Syrian hamsters.⁸ It affects the gene expression of the human intestinal cell linings and also inhibits proteolytic enzyme activity.⁹ Solanines also destroy human liver cells in vitro.¹⁰

I have found fourteen research reviews linking potato blight in Ireland with birth defects in the following years.¹¹ Potato blight involves a particular fungus growing on potatoes, causing them to kick in their defense mechanisms and make high levels of solanine. In my opinion, it would be wise for pregnant women to avoid the nightshades.

NICOTINE

All nightshades contain nicotine, which is why they can be addictive. Is nicotine a problem when we eat it? A large body of research shows that nicotine consumption inhibits proper healing. In one study, nicotine delayed tendon-to-bone healing in a rat shoulder—the equivalent of our rotator cuff.¹² A follow-up study by the same authors showed that delayed healing in tendon-to-bone injuries resulted in inferior permanent healing of the area.¹³

CAPSAICIN

Capsaicin is an alkaloid found in hot peppers. We hear a lot about capsaicin supposedly having anti-inflammatory properties, but it actually is an irritant for mammals, including humans, and produces a sensation of burning in any tissue it comes in contact with.

Spicy peppers are the only plants that contain capsaicin, to my knowledge. The active ingredient in pepper spray is capsaicin. It can shut down the lungs—this is why some people have died from pepper spray. Asthmatics would do well to avoid capsaicin in general. They actually use capsaicin in animal studies to stimulate something very much like an asthma attack.

Substance P is released from the terminals of specific sensory nerves. It is found in the brain and spinal cord and is associated with inflammatory processes and pain—it acts as a neurotransmitter to carry pain signals to the nervous system. Capsaicin makes your nerves release almost all the substance P they have, and researchers have therefore suggested that drugs containing capsaicin can help reduce pain. For example, there is an over-the-counter cream containing capsaicin that is promoted to help deplete substance P from local nerve endings and relieve pain.

However, inducing massive releases of substance P on a regular basis is like taking speed until your adrenals run out of adrenaline; it leads to a chronic local or systemic depletion of substance P. Substance P is necessary for proper

healing. The brain gets a signal from substance P telling it that something is hurt and needs to be fixed. So when you have diabetics using capsaicin cream for their neuropathy, they feel better—the pain signal is gone—but they are inhibiting the healing process.

A recent study looked at the use of capsaicin in insulin-dependent diabetic rats.¹⁴ The standard explanation for type 1 diabetes is malfunction and death of the insulin-producing islet cells in the pancreas. Another theory holds that malfunction of the pain nerves surrounding cells in the pancreas can cause type 1 diabetes. Researchers have found that the islet cells in diabetics are surrounded by large numbers of pain nerves that signal to the brain that pancreatic tissue is damaged. When the researchers injected Substance P into the rats, the islet cells began producing insulin normally almost immediately. They also produced insulin for about a month when they were injected with capsaicin.

Capsaicin depletes substance P. Although this study was reported as showing a beneficial role for capsaicin, the proper conclusion is that capsaicin is likely horrible for diabetics and their blood sugar control. I have witnessed firsthand the negative impact of consuming peppers on blood sugar control in some of my diabetic patients (the ones who keep diet and blood glucose logs).

Capsaicin receptors have been found in arthritic joints. When they inject capsaicin into mouse knee joints, it reduces blood flow.¹⁵ That's a bad thing. Blood is what heals us. When neonatal rats were given capsaicin, their immune markers were depressed for ninety days.

In humans, increased consumption of peppers is associated with an increase risk of nasopharyngeal carcinoma and stomach cancer. Researchers found seventeen times (!) the risk of stomach cancer in people who self-rated themselves as high consumers of peppers.¹⁶ In people who had tissue biopsies of colon polyps, dysplasia and adenocarcinoma, researchers couldn't find any substance P in those biopsies. Where would it have gone? What they found was the presence of capsaicin receptors instead.¹⁷

TREATMENT

How do you find out whether nightshades are causing your medical problems? For many, no relief comes until the diet is totally clear of all these nightshades for at least six weeks. Many people notice an improvement in their pain; sometimes it goes away completely.

If the person has strictly avoided the nightshades for six weeks, yet still doesn't believe their pain has decreased, I suggest that they do a "nightshade party day": salsa and eggs for breakfast, tomato and eggplant for lunch, potatoes for dinner—just have it all, and have a lot. Eat as much as you can in one day and then watch for symptoms over the next two days. Often there is a delayed onset reaction—there is for me.

But the real question is, why are some people more sensitive than others? Nutrient deficiencies certainly come into play. For example, if you don't have enough magnesium, you will be more prone to calcinosis. Deficiency in vitamin D may exacerbate the problem. The speed at which one's liver and kidneys detoxify these compounds plays a huge role, and this is dependent both on genetics and nutrition.

A key nutrient is vitamin K₂—Dr. Price's famous Activator X. I love this study on vitamin K₂: The Effect of Vitamin K₂ on Experimental Calcinosis.¹⁸ They gave rats calcinosis by giving them way too much vitamin D₂. D₂ tends to cause calcinosis anyway. What did they find? A high dose of vitamin K₂ suppressed experimental calcification of soft tissues induced by vitamin D₂. So if you want to avoid problems with nightshades, be sure to eat goose liver, cheese, fatty grass-fed meats and pasture-fed butter—and take your butter oil.

If you suffer from osteoarthritis and you feel like you have some catching up to do in terms of resolving calcifications, you may want to take a vitamin K supplement. I use Allergy Research Full-Spectrum Vitamin K softgels, which combine vitamin K₁ (phytonadione) and vitamin K₂ (as both menaquinone-4 and menaquinone-7, known as MK-4

and MK-7, respectively).

MY EXPERIMENT

Recently after a power-lifting meet, I felt like cheating on my diet. I called it an “experiment.” My old favorite food was pizza—the nastiest combination of all the nastiest foods there are, at least for me. We had it with peppers, sausage containing paprika, tomato sauce, gluten and dairy, all of which I’m sensitive to. I felt that this was my chance to test my vitamin K hypothesis. I took two Allergy Research Full-Spectrum Vitamin K softgels with the meal, along with digestive enzymes and some buffered vitamin C. Normally the enzymes and the buffered vitamin C don’t help me much. However, this time, when I had loaded up on vitamin K₂, I had no day-after morning stiffness and none of my middle back pain returned. I’ve only done the experiment once at this point, but that’s what I found.

Even if you are one of those lucky people who don’t seem to have trouble with nightshades, in my opinion it’s a good idea not to overdo. Avoid having nightshades with every meal; we are far too reliant as a culture on potatoes, tomatoes and peppers. Vary your diet so you are not so dependent on these foods. Sweet potatoes, yams and parsnips are good substitutes for potatoes. You can steam cauliflower and mash it with butter and cream. As a substitute for chili pepper, use wasabi, horseradish, mustard powder, ginger, or freshly ground peppercorns. There’s no good substitute for tomatoes, so learn to use them sparingly.

Cooking does reduce the solanine levels in potatoes somewhat,¹⁹ and may even help reduce other toxins. So if you are eating nightshade foods, be sure to cook them, and cook them in butter or poultry fat—this is a synergistic combination because these fats provide vitamin K₂. And you’ll end up eating less of the nightshade foods because when you cook in good fats, you are more quickly satisfied and end up eating less.

For those who are sensitive to nightshades, the best strategy is to avoid them completely for a long time, until you can completely heal. That means no potatoes, pizza, tomato sauce or Mexican food—but to live pain-free makes it worth the sacrifice.

SIDEBARS

NIGHTSHADES IN MEDICINE

Many of the alkaloids in the nightshade plants are extremely toxic; yet they have many uses in medicine if administered in extremely small dosages. They can serve as an antidote to poisoning caused by pesticides and chemical warfare agents such as sarin and VX. They are also used to halt—but not cure—many types of allergic reactions. Scopolamine, a commonly used ophthalmological agent, dilates the pupils and thus facilitates examination of the interior of the eye. Nightshade compounds are also used as antiemetics in people prone to motion sickness or receiving chemotherapy.

Some of the most interesting uses of nightshades occur in homeopathy. Belladonna was one of the first homeopathic remedies, developed in 1799 by Samuel Hahnemann for scarlet fever, after he observed that symptoms of deadly nightshade poisoning closely matched those of scarlet fever. Belladonna now serves as a major homeopathy remedy for acute illnesses of sudden, violent onset. Other homeopathic remedies derived from the nightshade family include Stramonium, Hyoscamus, Tabacum, Dulcamara and Capsicum. Note that all of the “food nightshades” are used as homeopathic remedies as well. For those of you familiar with homeopathic theory and the “similimum,” it may start to make sense to you that eating significant amounts these foods could cause symptoms of disease in a healthy person.

WHAT ABOUT PEPPER?

Peppercorns are not the same as peppers; they are not members of the nightshade family. Peppercorns do not

contain poisonous alkaloids. Fresh ground pepper is the best; pre-ground pepper is not good for you. It doesn't taste very good and you'll notice you have to use a lot more of it. Once the peppercorns are cracked open, the protective and flavorful essential oils begin to evaporate. This allows a type of aspergillus mold to grow, which then produces aflatoxin. You may be familiar with aflatoxin already, as it is very toxic to the liver and is the same toxin that occurs with peanuts. If you don't eat peanuts for this reason, you would not want to use pre-ground pepper either. Freshly ground pepper helps with digestion—pre-ground pepper does not.

TOMATOES

Tomatoes contain lycopene, which is one of the first things people mention when I suggest avoiding nightshades. Lycopene is a carotenoid found in almost any red, orange or pink fruit or vegetable; it's simply highest in tomatoes. As with all of the fat-soluble carotenoids, to maximize absorption you'll need to eat it with fat. We hear a lot about lycopene supposedly preventing cancer. However, in a study on prostate cancer in rats, when rats were given lycopene by itself, there was no observed decrease in cancer mortality when compared to the controls.²⁰ However, when given tomato powder, there was a significant decrease in mortality rates from the induced prostate cancer. So there's something in the whole tomato that protects against cancer and it's not lycopene by itself.

The new theory in this reductionist way of thinking is that the anti-cancer substance in tomatoes is another glycoalkaloid called tomatine. While tomatine has been shown to inhibit and destroy cancer cells, it has also been shown to do the same to normal cells!²¹ This is the likely reason why many people get heartburn after eating tomatoes, not only because they are acidic (they are), but because the cells that line the stomach and esophagus are being destroyed. Can you really blame the stomach for sending you a signal that it isn't very happy?

By the way, epithelial cells are what line the urethra as it passes through the prostate. Eating tomatoes in the hopes of reducing prostate cancer is similar to friendly fire—it destroys the cancerous cells and normal cells at the same time. Does destroying your normal and healthy cells sound like a good idea? Not to me. Actually, it sounds very similar to chemotherapy and radiation—trying to kill cancer cells while hoping that the normal cells survive the process. While there is a time and place for that type of approach, I don't think I'd want to be eating such a potentially cell-destructive substance every day in my food.

Scientists are currently studying tomatine to use as an adjuvant in vaccines, in order to make the vaccine more effective by stimulating a massive immune reaction. The immune reaction happens because the body is reacting to the cell destruction that occurs when tomatine comes in contact with human cells.

Tomatoes also contain tomato lectin (another well-known lectin is gluten) which has been shown to agglutinate human, mouse and sheep erythrocytes—it can cause red blood cells to clump together. Combined together with tomatine, these compounds can cause leaky gut syndrome and potentially be a major issue in autoimmune diseases of all sorts.

For those of you have gone off gluten and you're wondering why you still have digestive problems, it may be because of tomatoes. Potatoes can be another culprit, as many gluten-free products are filled with potato starch.

REFERENCES

1. *Famine, Mortality, and Epidemic Disease in the Process of Modernization*, by John D. Post © 1976 Economic History Society, <http://www.jstor.org/pss/2594505>.
2. Childers NF. *Arthritis-Childer's Diet to Stop It. Nightshades, Aging, and Ill Health*, 4th ed. Florida: Horticultural Publications, 1993; 19-21.

3. *Ibid.*
4. <http://www.nlm.nih.gov/medlineplus/druginfo/meds/a682335.html>.
5. <http://www.inchem.org/documents/jecfa/jecmono/v30je19.htm>.
6. World Health Organization, *Toxicological Evaluation of Certain Food Additives and naturally Occuring Toxicants*, Thirty-ninth Meeting of the Joint FAO/ WHO Expert Committee on Food Additives (JECFA) WHO Food Additives Series, No 30; <http://apps.who.int/bookorders/anglais/detart1.jsp>
7. Patel B and others. Potato glycoalkaloids adversely affect intestinal permeability and aggravate inflammatory bowel disease. *Inflamm Bowel Dis*. 2002 Sep;8(5):340-6. PubMed ID: 124796498.
8. Baker D and others. Lesions of potato sprout and extracted potato sprout alkaloid toxicity in Syrian hamsters. *J Toxicol Clin Toxicol*. 1987;25(3):199-208. PubMed ID: 3612898.
9. Ruseler-van Embden JG and others. Potato tuber proteins efficiently inhibit human faecal proteolytic activity: implications for treatment of peri-anal dermatitis. *Eur J Clin Invest*. 2004 Apr;34(4):303-11. PubMed ID: 15086363.
10. Friedman M and others. Anticarcinogenic effects of glycoalkaloids from potatoes against human cervical, liver, lymphoma, and stomach cancer cells. *J Agric Food Chem*. 2005 Jul 27;53(15):6162-9. PubMed ID: 16029012.
11. Masterson JG and others. Anencephaly and potato blight in the Republic of Ireland. *Br J Prev Soc Med*. 1974 May;28(2):81-4. PubMed ID: 4604097.
12. Galatz LM and others. Nicotine delays tendon-to-bone healing in a rat shoulder model. *J Bone Joint Surg Am*. 2006 Sep;88(9):2027-34. PubMed ID: 16951120.
13. Galatz LM and others. Delayed repair of tendon to bone injuries leads to decreased biomechanical properties and bone loss. *J Orthop Res*. 2005 Nov;23(6):1441-7. PubMed ID: 16055296.
14. Razavi R and others. TRPV1+ sensory neurons control beta cell stress and islet inflammation in autoimmune diabetes. *Cell*. 2006 Dec 15;127(6):1123-35. PMID: 17174891.
15. Keeble J and others. Involvement of transient receptor potential vanilloid 1 in the vascular and hyperalgesic components of joint inflammation. *Arthritis Rheum*. 2005 Oct;52(10):3248-56. PubMed ID: 16200599.
16. López-Carrillo L and others. Chili pepper consumption and gastric cancer in Mexico: a case-control study. *Am J Epidemiol*. 1994 Feb 1;139(3):263-71. PubMed ID: 8116601.
17. Dömötör A and others. Immunohistochemical distribution of vanilloid receptor, calcitonin-gene related peptide and substance P in gastrointestinal mucosa of patients with different gastrointestinal disorders. *Inflammopharmacology*. 2005;13(1-3):161-77. PubMed ID: 16259736.
18. Seyama Y and others. Effect of vitamin K2 on experimental calcinosis induced by vitamin D2 in rat soft tissue. *Int J Vitam Nutr Res*. 1996;66(1):36-8. PubMed ID: 8698544.
19. Tajner-Czopek A and others. Changes in glycoalkaloids content of potatoes destined for consumption (2008) *Food Chemistry*, 106 (2), pp. 706-711.
20. Boileau TW and others. Prostate carcinogenesis in N-methyl-N-nitrosourea (NMU)- testosterone-treated rats fed tomato powder, lycopene, or energy-restricted diets. *J Natl Cancer Inst*. 2003 Nov 5;95(21):1578-86. PubMed ID: 14600090.
21. Friedman M and others. Tomatine-containing green tomato extracts inhibit growth of human breast, colon, liver,

and stomach cancer cells. *J Agric Food Chem.* 2009 Jul 8;57(13):5727-33. PubMed ID: 19514731.

This article appeared in *Wise Traditions in Food, Farming and the Healing Arts*, the quarterly journal of the Weston A. Price Foundation, [Spring 2010](#).