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Preservatives and the Link with Adverse Health Outcomes

Due to their ability to extend shelf life and prevent spoilage, synthetic and industrialized preservatives are common in U.S. processed foods and drinks—both on the grocers' shelves and at conventional and fast food restaurants. Unfortunately, despite their ability to retard spoilage a number of the most commonly used preservatives have been linked in clinical trials and empirical studies to potential adverse health outcomes for some consumers and several have been shown in scientific studies to be a potential health threat for the general population.

Sodium Benzoate

Empirical studies and *c*linical trials indicate sodium benzoate is linked in sensitive individuals to skin reactions including urticaria, pruritus and atopic dermatitis, and intestinal disturbances such as gastritis, nasal polyps, rhinitis, migraine headaches and arthralgia, shortness of breath, broncoconstriction, asthma, and with behavioral, mood and psychiatric disorders. Clinical and consumer reports indicate this additive may cause adverse reactions for people with chemical sensitivities (including people with asthma and other respiratory conditions) and allergies (including to

polyethylene glycol); symptoms may include skin reactions (including rash/urticaria), headaches, breathing problems, swelling of face, throat, tongue, hands, and feet, swollen/painful lymph nodes, earaches, sinus problems, edema and subsequent weight gain, digestive problems, rhinitis, difficulty concentrating, insomnia, anxiousness, hyperactivity, and depression, to name a few. This additive is commonly used as an antibacterial and antifungal preservative (as well as flavor enhancer) in a wide variety of processed foods including soft drinks, fruit juices, milk and milk products, cheeses, margarine, meat products, maple syrup, relishes, pickles, jarred peppers, bottled lemon juice, salad dressings, sauces, mixes, gravies, soups, condiments, flour, baked goods, confectionery and snacks. Sodium benzoate may also be present in conventional and fast food restaurants and can also be found in toothpastes, mouth washes, and other personal care products, as well as prescription and over the counter drugs. While food items containing sodium benzoate must list its presence, there are no required warnings for consumers.

Gallates (Propyl Gallate, Dodecyl Gallate, Octyl Gallate, and EGCG)

Gallates, like industrialized phosphates, have the distinction of not only being linked to adverse symptoms for sensitive groups, but also having the potential to harm well-being for the larger consumer population base as well. Propyl gallate is commonly used as a preservative in a variety of processed foods, and may be present with other preservatives such as BHT/BHA (two other food chemicals of concern) and has been linked with adverse reactions such as respiratory problems (especially for people with asthma), stomach irritation, swelling, weight gain, adverse skin reactions, insomnia/sleep disturbances, behavioral/mood disturbances, and more. Those people with chemical sensitivities (including to aspirin), people with asthma and other respiratory ailments, as well as those with liver and

kidney problems may be advised by health care professionals to avoid this additive. Additionally**,** **c**hellitis (dry, scaly, cracked lips) and stomatis (oral inflammation/inflammation of mucous lining of the mouth including cheeks, gums, tongue, lips, throat, etc.) have been reported by some consumers following exposure to propyl gallate. Diagnosis is frequently complicated by the fact that adverse reactions to gallates may be delayed for as long as 5 days. On an even more serious note**,** gallates have been linked in animal studies to anemia, as well as changes in the kidney and liver. Additionally, recent study findings have linked the food additive propyl gallate with hormonal disruptions in women. Propyl gallate is also a possible carcinogen. This additive can be found in a wide range of processed, packaged, commercially prepared meals, dried milk, dried meats, sauces, snacks (especially potato-based), sports drinks, vegetable oils and dressings, soups (especially chicken), condiments and chewing gum.

Dodecyl gallate is a synthetic antioxidant used as a preservative in processed foods and commonly found in salad dressings, margarine, oils, fats/lard, rice, bakery goods, cake mixes, dehydrated meats, soups, potatoes and broths, candy, cereals, processed nuts, spices, condiments, and a variety of snack foods, etc. Dodecyl gallate may cause allergic reactions in some people, especially swelling of the lips, dermatitis, chronic eczema or ulcerations**.** Chellitis (dry, scaly, cracked lips) and stomatis (oral inflammation/inflammation of mucous lining of the mouth including cheeks, gums, tongue, lips, throat, etc.) have been reported with exposure to dodecyl gallate.

Octyl gallate is commonly used as a preservative (and synergistic antioxidant with other preservatives, see: BHA/BHT) and can also be used as a bulking agent, thickener or emulsifier in processed foods such as peanut butter, margarine, bakery products, cake mixes, candy, cereals, processed nuts, processed and dehydrated meats, soups and broths, enriched rice, sauces, dips, seasonings, condiments, and snack foods. Octyl gallate may also be present in food packaging materials. This additive can cause allergic reactions in some people, sometimes severe. People with

asthma, or sensitivity to aspirin are frequently warned by health care professionals to avoid foods containing this additive. Octyl gallate may cause digestive/gastric problems in some people and can cause dermatitis in sensitive individuals. Reported adverse skin reactions to octyl gallate include redness, swelling, itching and fluid-filled blisters. Chellitis (dry, scaly, cracked lips) and stomatis (oral inflammation/inflammation of mucous lining of the mouth including cheeks, gums, tongue, lips, throat, etc.) have also been reported with exposure to octyl gallate. This additive is not recommended for infants or children.

Parabens

Parabens are highly controversial due to scientific study findings suggesting a link with possible carcinogenicity and estrogenic and reproductive effects. Because the majority of news reports on parabens have focused on their presence in personal care products many people are unaware that they are also used as food preservatives. The industrialized version of this naturally occurring chemical is widely used as a preservative in processed foods including soft drinks, juices, baked goods, jellies and jams, candies, salad dressings, mayonnaise, mustard, sauces, marinated fish products, foods containing processed vegetables, frozen dairy products, and snack food, to name a few. Though rare, some people may develop hypersensitivity or allergic reactions to this chemical when ingested as a food preservative. Symptoms may include swelling of lips, face, tongue and throat, difficulty swallowing, breathing difficulties, dermatitis, skin sensitivity, rash, itching, edema.

Other common food additives frequently used as preservatives such as EDTA (Ethylenediamine Tetraacetic Acid/Tetra-acetate) have been linked with allergic reactions in some people and TBHQ (Tert-Butylhydroquinone) has been linked with allergic reactions and possible toxicity. EDTA in particular may worsen conditions for people with asthma, heart rhythm problems, kidney disease, epilepsy, liver disease, hepatitis, tuberculosis, allergies, diabetes, and electrolyte imbalance, including hypomagnesemia (low magnesium levels), hypocalcemia (low calcium levels), hypokalemia (low potassium levels), and people with these health conditions or taking certain medications may be advised by health care professionals to avoid processed foods containing this additive. Reports of adverse reactions to this additive include allergic reactions, respiratory problems, skin reactions (including rash, redness, urticaria), weight gain, edema, swelling of face, hands, feet, tongue, excessive thirst, insomnia, and headaches, among others.

EDTA is a salt produced from synthesizing ethylenediamine, formaldehyde and sodium cyanide; it is used as a fortifier, texture enhancing agent, and food preservative and is commonly found in a wide variety of commercially-processed foods and restaurant foods. It can be found in breakfast cereals and breakfast bars, salad dressing, sauces, dips, toppings, canned fish and seafood (including shrimp, crab meat, etc.), canned beans, processed vegetables, including pickled cabbage and pickled cucumbers, canned potatoes (and products such as soups containing white potatoes), sandwich spreads, canned gravy, canned mushrooms, potato salad, processed fruit, bakery goods, margarine, some alcoholic/malt beverages, and soft drinks, among many other items.

Reported adverse effects associated with the additive TBHQ include headaches, stomach/digestive problems, allergic reactions, ringing in ears, edema/swelling of face, feet, hands, ADHD, skin reactions/dermatitis, urticaria, angioedema, sleepiness, rhinitis, sinus problems, breathing difficulties,

asthma, allergies, vasculitis, flushing, excessive sweating, vision/eye problems, and joint pain. Some researchers have argued that chronic exposure to this additive may induce carcinogenicity. TBHQ is a petroleum-based chemical used as a preservative for vegetable oils and animal fats. It is commonly found in packaged breads and baked goods products, breakfast cereals, frozen waffles, toaster pastries, snack crackers, conventional and fast food restaurant items, and baked goods in grocery store bakery sections, among others.

Nitrates/Nitrites

Nitrates/Nitrites is a possible carcinogen and has been linked with the formation of carcinogenic nitrosamines, bladder cancer, chronic liver disease, as well as respiratory, skin and intestinal disturbances, and Alzheimer's disease, diabetes mellitus and Parkinson's disease. Adverse reactions may include headaches, migraines, swelling, weight gain, and respiratory problems (including asthma problems). Research has linked nitrates/nitrites to bladder, colon and pancreatic cancers. It has also been linked to leukemia. Sensitive individuals (especially those with Alzheimer's disease, Diabetes, Blood Disorders, Parkinson's disease, and Thyroid Disease) and pregnant women may be advised by health care professionals to avoid or restrict consumption of processed foods containing nitrates/nitrites. Not to be confused with nitrates/nitrites which occur naturally in vegetables and fruits, industrialized versions of these preservatives are commonly added to processed lunch meats, hot dogs, sausages, bacon, ham, pork, jerky, deli meats, and other food items containing processed meat items (frequently listed on ingredients labels as "sodium nitrite", "potassium nitrite", etc.). As with many of

the food additives found in scientific studies and clinical trials to be potentially problematic for consumers, there are no required warnings on food ingredients labels.

Sulfites

Sulfites have been linked in scientific studies and clinical trials with several idiosyncratic and allergic reactions including respiratory tract irritation, bronchospasm, oculonasal symptoms, skin reactions including urticaria and angioedema, flushing, hypotension and intestinal disturbances, especially in sulfite-sensitive individuals and those with asthma. Reported reactions to this additive range from mild to severe and even life threatening, especially for those people with sulfite allergies or asthma (where it may provoke life-threatening asthmatic complications), bronchitis, or other respiratory illnesses, as well as for those individuals with certain medical conditions (such as liver enzyme deficiencies) or sensitivities to food chemicals. Reported symptoms include asthmatic reactions/lung irritation/difficulty breathing, swelling of face, throat, tongue, difficulty swallowing, excessive thirst, edema (and subsequent weight gain), swelling of hands, feet, legs, vision problems, headaches, earaches, elevated blood pressure, skin reactions such as urticaria/rash/hives, insomnia, nervousness, anxiousness, difficulty concentrating, painful, swollen lymph nodes, and anaphylaxis.

Sulfites are commonly used as a preservative against spoilage and color changes, and as a bleaching agent and dough conditioner, and may be present at varying levels in a variety of processed foods including dried/dehydrated fruits (such as raisins and apricots), dehydrated/dried and pickled vegetables, prepared toppings, dips (including processed avocado/guacamole), gravies and sauces, condiments, olives, pepperoncini, pickles, (including relish/pickled peppers/horseradish, etc.), salad

dressings and mixes, processed cheese mixtures and pastes, soy sauce, tomato paste and purée, molasses, maple syrup, brown sugar, tea, wine, beer, sparkling grape juice, wine vinegar, malt vinegar, fruit juices, soft drinks, cocktail mixes, cider/cider vinegar, canned vegetables and fruit (including potatoes, mushrooms, tomatoes, hominy grits), fruit pie filling, canned sauerkraut, corn starch (and processed foods containing corn starch, cornmeal, corn syrup (and processed foods containing corn syrup), baked goods (including pastries, cookies and crackers), frosting, dessert toppings, breading mixes, dried noodle and rice mixes, cereals, frozen pizza, frozen pizza dough/pie dough/cookie dough, high fructose corn syrup (and processed foods containing HFCS), trail mix, jams/jellies, bottled lemon juice/lime juice, vinegars and vinegar-based sauces and salad dressings, maraschino cherries, fresh and frozen shrimp, canned tuna, canned and dried seafood, canned clams/clam chowder, sausages/processed meats, foods containing pectin, beet sugars, or textured vegetable protein (TVP), gelatin, canned soups and dried soup mixes, coconut toppings/flavorings/dried coconut, instant drink mixes, cookie mixes, non-organic loose bulk foods, diet foods, baby formula, packaged salads (including fruit salads, lettuce-based salads and coleslaw), and conventional, "health food", and fast food restaurant foods (including dehydrated or precut potatoes such as those used for French fries, hash browns, and other dishes containing potatoes), as well as various salad bar items.

While prohibited on fresh, raw produce sold in U.S. grocery stores, restaurants are another matter. Sulfite agents—frequently sulfur dioxide—can be present on restaurant and catered salad bar offerings, sandwich sauces and toppings, as well as any number of food ingredients that arrive to the restaurant kitchen either packaged and/or partially or fully prepared. This additive may also be present in potato chips/snack food, hard candy/caramel candy, foods and drinks with caramel coloring, pet food, and some medications.

It is important to note that several forms of sulfites exist and are allowed for use in foods: sodium sulfite, sodium bisulfite, sodium metabisulfite, potassium sulfite, potassium bisulfite, potassium metabisulfite, and sulfur dioxide.

In 1986 the FDA banned the use of sulfites on fresh produce and began requiring that foods containing more than 10 parts per million (ppm) concentration of sulfites be declared on U.S. food labels. However, there remains no requirement for explicit warnings on processed or packaged food labels of the potential dangers from sulfites. Individuals who are highly sensitive to sulfites may experience adverse reactions to foods containing even low levels of sulfites. As lower levels of sulfites are not required to appear on U.S. food labels, individuals with the potential for severe reactions to sulfites may be advised by health care professionals to avoid such processed foods altogether.

Formaldehyde

While U.S. consumers may be hard pressed to find anything obvious about it on the label, the food additive formaldehyde is used in preserved foods, medicines and vitamins, sugar production, as a preservative for grain and seed dressings and as a disinfectant for seeds, as well as being present in the artificial sweetener Aspartame, and has been detected in sources that can leach or migrate into food such as food packaging, tableware and cooking utensils. The presence of formaldehyde in food is usually unlabeled. Studies have uncovered its presence in some sodas, packaged food, and beer. Formaldehyde often presents either as a byproduct of other synthetic food additives (such as EDTA/Disodium EDTA, etc.) or during digestive/metabolic processes as a byproduct of certain synthetic food additives such as the artificial sweetener Aspartame. Formaldehyde can occur naturally

and can be produced via metabolism of some amino acids and a variety of xenobiotics. Formaldehyde can also result from smoking/cooking foods (especially fish, seafood, and smoked ham), and it is also used/added as a preservative, biocide, disinfectant, or bacteriostatic agent in some processed food items.

Classified as a known human carcinogen (cancer-causing substance) by the International Agency for Research on Cancer (IARC) and the National Toxicology Program Report, U.S. Department of Health and Human Services, this chemical is long known to have mutagenic properties. According to a recent report from the National Toxicology Program, ingestion of food can be a significant source of exposure to formaldehyde—in addition to low levels of formaldehyde occurring naturally in a variety of foods such as fruit, food may contain small amounts of formaldehyde from its use as a fumigant, fertilizer and preservative.

It is important to note that much of the research on formaldehyde has centered on inhalation (scientific findings are based primarily on inhalation and oral exposure in experimental animal studies); epidemiological findings (from both cohort & nested case control studies) are based primarily on occupational exposure (humans working directly and indirectly with this chemical) and under these conditions it has been linked to a variety of adverse reactions including respiratory problems for people with asthma, migraine headaches, insomnia, memory loss, mood alterations, nausea, fatigue and leukemia/cancer. The FDA position on formaldehyde is that "The Food and Drug Administration (FDA) do not believe that the very low levels that are used in food and cosmetics present a significant safety concern," (Scheuplein 1985, 245).

"Although the FDA seeks to reassure us they are keeping a close watch over our food, the job of rigorously regulating thousands of food additives is simply too big for an underfunded agency. Brominated vegetable oil (BVO), for instance, the subject of a well-circulated petition by a 15-year-old in Alabama, was flagged for further study in the 1970s—testing that was never done. And BHA, a "probable carcinogen" according to the Department of Health and Human Services, is still allowed in food."
~Melanie Warner

BHT/BHA

The synthetic antioxidants and preservatives BHT (Butylated hydroxytoluene) and BHA (Butylated hydroxyanisole) are commonly found in breakfast cereals (where it is commonly used in packaging and leaches into the food—though two of the largest breakfast cereal producers have been working on alternatives for the past few years in an effort to phase out BHT), butter, margarine, vegetable oil, shortening, meats, grains, cake mixes, baked goods, beer, and numerous other processed foods and snacks (including potato chips and nuts), spices, and candy, as well as chewing gum, and various types of food packaging. BHT and BHA may also be present in pet food. The oxidative characteristics and/or metabolites of the commonly used preservatives BHA and BHT have been found in animal studies to contribute to carcinogenicity and tumorigenicity, as tumor promoters. It should be noted that there exist some evidence suggesting that under certain conditions these additives may also have the opposite effect in that they may be anti-carcinogenic.

Clinical reports suggest that BHT may complicate health conditions for those individuals with bladder problems such as interstitial cystitis ("painful bladder syndrome"), sensitive bladders, or who suffer from frequent bladder infections or irregularities. Other adverse effects associated with this

preservative include intestinal and digestive problems, headaches, allergic reactions, swelling of face, feet, hands, weight gain, skin reactions/dermatitis, urticaria, angioedema, sleep abnormalities, rhinitis, respiratory disturbances, asthma, allergies, vasculitis, flushing, diaphoresis (excessive sweating), vision/eye problems, and joint pain. Long-term exposure may create changes in lungs, liver, kidneys, and thyroid. Additionally, there is evidence that certain individuals may have difficulty metabolizing BHT, resulting in health and behavioral changes, respiratory, skin and intestinal disturbances. Also of note, in animal studies BHT has been linked to having a toxic effect on the lungs, having a significant adverse effect on body weight to developing fetuses and later during the lactation period, and adverse effects to adipose cells, as well as acting as a developmental neurobehavioral toxin, including triggering behavioral abnormalities in women during pregnancy, as well as to offspring (which can lead to severe deficits in learning, decreases in sleeping, as well as increases in aggression and social isolation), promoting liver abnormalities and toxicity, and promoting cancerous tumors.

BHA is now considered as "reasonably anticipated to be a human carcinogen" by the National Institutes of Health Report on Carcinogens, Public Health Service National Toxicology Program Report on Carcinogens and the U.S. Department of Health and Human Services' Report on Carcinogens (BHA), Eleventh Report on Carcinogens. BHA has been linked in animal studies as a developmental toxin, and as promoting decreases in sleeping, orientation reflex and learning. BHA has also be shown to potentially adversely affect liver and kidney functions. Additionally, like BHT, there is evidence that certain people may have difficulty metabolizing BHA, resulting in health and behavioral changes, respiratory, skin and intestinal disturbances. Clinical and consumer reports indicate other adverse effects associated with this preservative include intestinal and digestive problems, headaches, allergic reactions, swelling of face, feet, hands, skin reactions/dermatitis, urticaria, edema/angioedema, weight gain, sleep abnormalities, rhinitis, respiratory disturbances, asthma, allergies, sinus problems, vasculitis, flushing, excessive sweating, vision/eye problems, and joint pain. Citing numerous animal

studies linking BHA to serious adverse health consequences, Glenn Scott, M.D. filed a Citizens Regulatory Petition with the FDA back in 1990, asking the agency to prohibit the use of BHA in food. To date BHA continues to be used as a food additive/preservative in the U.S. While both BHA and BHT appear on the ingredients listings, there are no explicit warnings required on food products that contain these additives to alert consumers.

BVO

Brominated Vegetable Oil (BVO) contains bromine and is used in certain processed food items to maintain consistency and prevent separation. It is commonly found in processed citrus- and fruit-flavored drinks including juices, health drinks, sports drinks and soda. Bromine is a preservative used in certain processed foods to prevent them from going stale and to extend their shelf life. Bromine is a base element from which bromide and bromate are derived. Bromine and its derivatives Bromine, Bromate, Bromide: Potassium Bromate and Brominated Vegetable Oil (BVO) may cause nausea or diarrhea in some people. Other adverse reactions may include headaches, confusion, swelling, skin problems, fatigue, memory loss, ulcers, and loss of muscle coordination. In some cases excessive intake may lead to neurological or reproductive problems. Bromates have been linked in animal studies with the development of cancerous tumors. Potassium Bromate, for example, (most commonly present in commercial breads, bread products, including fast food breads and buns, and processed baked goods) is a known toxin and carcinogen and has been linked with thyroid and kidney cancers in animal studies. This additive competes with iodine in the body and may be a concern for people with iodine deficiencies and hypothyroidism. Brominated Vegetable Oil (BVO) contains bromine (a substance also

used as a flame retardant) which can build up in fatty tissues. Animal studies have linked bromine to the development of heart lesions. Bromine has also been linked with neurological impairment, reduced fertility, changes in thyroid hormones, and early onset puberty. Recent studies have linked excessive use of BVO to skin lesions, nerve disorders, depression, irritability, confusion, cognitive problems, slurred speech, and memory loss. This additive and its derivatives have been banned in some countries. In the U.S. the FDA maintains that BVO and other bromine derivatives are safe for consumers and it is legal for food manufacturers to use these additives, though pressure from recent consumer and activism efforts, including one particularly newsworthy campaign and petition spearheaded by a teenage girl, has led the two leading soda manufacturers to voluntarily remove BVO from their products.

Growing consumer skepticism as the ultimate agent of change

These commonly used preservatives can be found in hundreds and hundreds of packaged food and drink items in local grocery markets as well as in the food served at both conventional and fast food restaurants, catered food, hotel and hospital foods, school lunchrooms, and the list goes on. But food items are not the only place some of these preservatives make an appearance. They can also be found in many personal care products such as mouthwash and over the counter medications. With all the ways that consumers can be exposed to these preservatives they hold the potential for some real problems, especially in those groups of people who are the most vulnerable. Fortunately, there is finally a growing awareness among consumers about the potential adverse health effects of some of the

most commonly used food additives, preservatives among them. According to a recent study, the number of people in all age groups who are reading ingredients labels before choosing to purchase is at an all-time high.

"In a 2014 online survey about food safety…
88 percent of respondents were concerned about preservatives."
~University of Florida's Public Issues in Education Center (PIE) Survey

As a result of the growing consumer skepticism about synthetic and industrialized food additives such as preservatives, in order to remain competitive food industry corporations have had to shift their current models. Packaged food producers and fast food restaurants have begun the process of removing and replacing questionable food preservatives in some food items and are making obvious attempts through labeling and packaging, advertising and submitting press releases to the media to alert consumers of those changes. Likewise, the sale of organic, preservative-free foods and products are at an all-time high, with conventional Big Food corporations—the ones who have been putting all the preservatives in the processed foods for decades—owning substantial shares of the organic food market.

But are all these shifts enough to protect consumers from preservatives of concern in their food and personal care products? Not really. To begin with, there are large numbers of U.S. consumers who simply cannot afford to purchase organic or preservative-free foods each week. Additionally, there are over 10,000 additives in U.S. foods with more than a thousand new chemicals entering the food supply every month—some, and perhaps even many lacking proper safety testing to assure they will not pose problems to those who consume them. With all of these additives it is impossible to expect consumers

to become knowledgeable about all of the potentially problematic preservatives in the food they put into their carts and ultimately, their bodies. The only real power U.S. consumers currently have is to communicate with Big Food producers, to prepare as many meals as possible from scratch using fresh, whole ingredients, and to vote with their dollars by refusing to purchase brands that contain unwanted preservatives and choosing preservative-free options for themselves and their family. Fortunately, given enough time, that power will likely be enough to push the changes needed forward.

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