

Chemical Preservatives and their Effects on Human Beings

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ABSTRACT

The levels of food contamination have reached an all-new level. To preserve the taste, freshness, and color of the foods, even fresh fruits and vegetables are loaded with chemicals and preservatives. Taking into consideration the increased use of chemicals and preservatives, it is extremely important to avoid junk food. However, when it comes to fresh fruits and vegetables, it is impossible to avoid them considering their dietary significance. This is the reason why it is extremely important to wash fruits and vegetables in the right way using a vegetable and fruit cleaner. Artificial or Chemical preservatives which are used to delay the contamination of foods are the ones that lead to health problems. These preservatives are artificially produced and synthetic in nature. These are often labeled as preservatives on food labels.

KEYWORDS: chemical, preservatives, contamination, toxins, preservatives, diet, health, synthetic, junk, artificial

INTRODUCTION

Cardiovascular diseases have become quite common and the presence of preservatives on food items is one of the main causes of increasing heart problems. Research conducted by In Chem suggested that food preservatives can weaken the heart tissues. When you consume food items that have a residue of the preservative on the surface, it can increase the chances of heart damage. Preservatives and chemicals present in the food items also increase the chances of breathing problems. According to research by MayoClinic, removing foods with preservatives from the diet can help in reducing the symptoms as well as the severity of breathing problems and asthma. Some of the preservatives present in food items such as aspartame, sulfites, and benzoates aggravate breathing problems. One of the most harmful effects of preservatives on food items is their ability to transform into carcinogen agents. Some of the food items consist of nitrosamines, a preservative that has nitrites and nitrates, which mix with the gastric acids and form cancer-causing agents. To ensure that you avoid eating this preservative, you need to avoid snacks or meals that are loaded with nitrites and nitrates. Those were some of the harmful effects of preservatives on your health. Considering

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these harmful effects, it is advisable to pay special attention to what you eat. Avoid junk as much as possible and make sure you wash the fruits and vegetables with care. Instead of washing the food items with plain water, you can use the vegetable and fruit cleaner.[1,2]

The Codex Alimentarius Commission also establishes standards and guidelines on food labelling. These standards are implemented in most countries, and food manufacturers are obliged to indicate which preservatives are in their products. In the European Union, for example, there is legislation governing labelling of food preservatives according to a set of pre-defined "E-numbers". People who have allergies or sensitivities to certain food preservatives should check labels carefully. WHO encourages national authorities to monitor and ensure that food preservatives in food and drinks produced in their countries comply with permitted uses, conditions and legislation. National authorities should oversee the food business, which carries the primary responsibility for ensuring that the use of a food additive is safe and complies with legislation.

Various common chemicals may harm the immune system, causing it to malfunction. This is known as immunotoxicity Trusted Source. These harmful effects may be temporary or permanent.

Possible immunotoxic effects include:

- hypersensitivity
- chronic inflammation
- immunosuppression, or an impairment of the body's ability to fight off infections
- immunostimulation, which can cause tissue damage through immune responses
- autoimmunity

In particular, if an immunotoxic substance causes the body to produce fewer antibodies, it can have an effect on the fight against active infections and the protection against future ones.

The FDA currently require immunotoxicity testing for food preservatives. However, most food preservatives received approval decades ago, and the FDA do not mandate updated testing on previously approved preservatives. What do a can of corn, a take-out pizza, a reusable water bottle, a bright green yogurt, and an inflatable pool toy have in common? They all contain food preservatives or chemicals that can be dangerous for children. Over the last few decades, the number of chemicals added to foods and other products has skyrocketed. We have created all sorts of plastics that are used in innumerable ways. We add preservatives to foods to keep them fresh. We add chemicals to foods to make them look more appealing. We have made food packaging to keep food fresh. We add chemicals to lotions and beauty products to make them feel, look, and smell nice... the list goes on and on of the ways we have invented and used chemicals. We did all of it for what seemed like good reasons at the time, but we are learning that many of those chemicals can cause real harm.[3,4]

Discussion

In a policy statement entitled Food Preservatives and Child Health, the American Academy of Pediatrics warns about these harms — and points out that they often are worse for children. Children are smaller, so their "dose" of any given chemical ends up being higher. They put their hands in their mouths more than adults do, so they are likely to ingest more. Their bodies are still developing, so they can be more at risk of harm — and they are young, so the chemicals have more time to do more damage.

In particular, the policy statement warns about: Bisphenols, such as BPA. They can act like the hormone estrogen and interfere with puberty and fertility. Bisphenols can also increase body fat, and

cause problems with the immune system and nervous system. They are found in the lining of food and soda cans, plastics with the number 3 or 7, and cash register receipts, among other places. They used to be found in plastic baby bottles and sippy cups; while this has been banned, older bottles and cups may still contain them.

Phthalates. These can also act like hormones, interfering with male genital development, and can increase the risk of obesity and cardiovascular disease. They are ubiquitous, found not just in plastic packaging, garden hoses, and inflatable toys, but also in things like nail polish, hairsprays, lotions, and fragrances.

Perfluoroalkyl chemicals (PFCs). They can lead to low-birth weight babies, as well as problems with the immune system, the thyroid, and fertility. They are commonly found in grease-proof paper, cardboard packaging, and commercial household products such as water-repellent fabric and nonstick pans, among other places.[5,6]

Perchlorate. This chemical also interferes with thyroid function, and can disrupt early brain development. It's found in some dry food packaging — it's used to decrease static electricity — and sometimes in drinking water.

Artificial food colors. These have been found to increase symptoms in children who have attention deficit hyperactivity disorder, or ADHD. They are found in all sorts of food products, but especially those marketed for children.

Nitrates and nitrites. These can interfere with the thyroid, as well as with the blood's ability to deliver oxygen to the body. They can also increase the risk of certain cancers. They are used to preserve food and enhance its color. They are commonly found in processed foods, especially meats.

These chemicals are truly everywhere, and impossible to avoid completely. Here is what the AAP suggests:

Buy and serve more fresh or frozen fruits and vegetables, and fewer processed meats, especially during pregnancy.

Since heat can cause plastics to leak BPA and phthalates into food, avoid microwaving food or beverages in plastic containers. Also: wash plastics by hand rather than putting them in the dishwasher.[7,8]

Use more glass and stainless steel instead of plastic.

Avoid plastics with the numbers 3, 6, and 7 on them.

Wash hands thoroughly before and after touching food, and clean all fruits and vegetables well.

And here are a few more ideas:

Cut back on canned foods and beverages in general.

Cut back on fast food and processed foods.

Read labels. Get to know what is in the products you use.

Look for lotions, soaps, and other products that are made naturally — and are fragrance-free.

Consider making your own home cleaning products. You'd be amazed what a little baking soda or vinegar can do.[9,10]

Results

The increasing demand for ready-to-eat fresh food products has led to challenges for food distributors regarding the safety and quality of their foods. Artificial preservatives meet some of these challenges by preserving freshness for longer periods of time, but these preservatives can cause negative side-effects as well. Sodium nitrite is a preservative used in lunch meats, hams, sausages, hot dogs, and bacon to prevent botulism. It serves the important function of controlling the bacteria that cause botulism, but sodium nitrite can react with proteins, or during cooking at high heats, to form carcinogenic N-nitrosamines. It has also been linked to cancer in lab animals. The commonly used sodium benzoate has been found to extend the shelf life of bottled tomato paste to 40 weeks without loss of quality. However, it can form the carcinogen benzene when combined with vitamin C. Many food manufacturers have reformed their products to eliminate this combination, but a risk still exists. Consumption of sodium benzoate may also cause hyperactivity. For over 30 years, there has been a debate about whether or not preservatives and other food preservatives can cause hyperactivity. Studies have found that there may be increases in hyperactivity amongst children who consume artificial colorings and benzoate preservatives and who are already genetically predisposed to hyperactivity, but these studies were not entirely conclusive. Hyperactivity only increased moderately, and it was not determined if the preservatives, colorings, or a combination of the two were responsible for the increase.

Every day people are exposed to a cocktail of chemicals in food that interact with each other in ways that are far beyond our understanding. This “chemical soup” is particularly dangerous when we include food chemicals in our diets. Pre-packaged food must have a long enough shelf life to make it from the processing plant, to the store, to the consumer. Chemical preservatives keep the food fresh longer, and over 14,000 lab-made preservatives

enhance its shelf appeal. Research estimates that the United States consumes 453,6 billion kilograms of chemical preservatives each year. While the use of these chemicals is kept as quiet as possible, for obvious reasons, they have been associated with a number of negative health and behavioral conditions.

Food preservatives are any of various chemical substances added to foods to produce specific desirable effects. Preservatives such as salt, spices, and sulfite have been used since ancient times to preserve foods and make them more palatable. With the increased processing of foods in the 20th century, there came a need for both the greater use of and new types of food preservatives. Many modern products, such as low-calorie, snack, and ready-to-eat convenience foods, would not be possible without food preservatives.[11,12]

Chemicals can end up in our food in various ways:

Some substances may be used during production, transport, or storage of food products. This includes pesticides, preservatives and colouring agents, veterinary drugs and substances in packaging materials.

Sometimes chemicals are used illegally in the food production process.

Some substances may occur naturally in the basic ingredients used in a food product, or in the food itself. Examples include heavy metals, such as lead and cadmium, which are present in the soil. Or mycotoxins, a group of toxins that are produced by fungi.

Some substances are produced during the course of food production or preparation. For instance, acrylamide is produced when baking starchy foods at high temperatures, while polycyclic aromatic hydrocarbons (PAHs) are released when cooking meat on a barbecue.

A list of hazardous chemicals we can nowadays find in processed food and preferably be avoided when buying packaged food;

Artificial Flavoring: is a blanket term that refers to man-made chemicals created to taste the same as natural flavors, such as vanilla, strawberry, or lemon. Because it's cheaper to use in most products, it's very common. Studies suggest it may result in behavioral changes.[13,14]

High Fructose Corn Syrup: this sweetener, made from corn, is popular with food manufacturers because it's cheaper and sweeter than cane sugar, and it maintains moisture, while preserving freshness. This additive is extremely common in processed food and is believed

to contribute to heart disease, increases your LDL (“bad”) cholesterol levels, and contributes to the development of diabetes and tissue damage. In addition to accelerating the aging process.

Monosodium Glutamate (MSG): is made of components naturally found in our bodies of water, sodium and glutamate, but that doesn’t mean it's meant to be ingested. MSG is a flavor enhancer often used in seasonings, condiments, bouillons, and snack chips. Studies show that regular consumption of MSG may result in adverse side effects which include depression, disorientation, eye damage, fatigue, headaches, and obesity. MSG effects the neurological pathways of the brain and disengaged the "I'm full" function which explains the effects of weight gain. MSG may also be listed as “hydrolyzed soy protein” or “autolyzed yeast.”

Sodium Benzoate: is used as a preservative in both drinks and food products. When used in conjunction with food color, sodium benzoate may increase hyperactivity in children. It may also react with vitamin C to create a cancer-causing substance called benzene.

Aspartame: is an artificial sweetener commonly used in diet drinks and some food products. Aspartame has been controversial for years and has been reported to cause seizures, headaches, mood disturbances, and even cancer. It may be listed as a brand name such as Equal or NutraSweet.

Benzoic Acid: is an additive used in everything from chewing gum and ice cream to pickles and salad dressing. Benzoic Acid can contribute to asthma attacks and hyperactivity, as well as headaches and digestive issues.

Potassium Bromate: An additive banned in Europe, Canada, Asia, and Brazil, Potassium Bromate is an oxidizing agent that chemically ages flour, strengthening its elasticity. It has caused cancer in some animals, and even small amounts create a risk for humans. Consumers might also see it listed on a food label as bromated flour.

Sodium Caseinate: is a biochemical found in many dairy products. It's suspected to contribute to or cause many milk-based allergies, which result in reactions such as skin rashes, stomach upset, or respiratory arrest. Ingesting large quantities of Sodium Caseinate can also harm your kidneys.

BHA (Butylated Hydroxyanisol): is a preservative frequently found in many foods such as butter, cereal, beer, baked goods, dessert mixes, and chewing gum. While it is “generally recognized as safe” by the Food and Drug Administration, the National Institute of

Health categorizes it as “reasonably anticipated to be a human carcinogen.”[15,16]

Canthaxanthin: is a color additive used in foods that need a boost of yellow or red, like eggs or salmon. Studies have found that great quantities of Canthaxanthin can result in retinal damage.

Nitrates/Nitrites: are a synthetic food preservative often added to cured meat. When nitrates are exposed to high heat during the cooking process, they convert to nitrites. Nitrites combine with amines to form cancer causing nitrosamines.

Maltodextrin: is added to a number of foods like pudding, salad dressing, and sauces as a thickening agent. The side effects of Maltodextrin include unexplained weight gain, bloating, and allergic reactions such as asthma, rash, itching, and respiratory distress.

Conclusions

Chemistry has helped the modern world in various ways. One such important contribution has been the advent of chemicals in our day to day food. Actually, there are three main functions that chemicals perform when they are added to food, these are:

- They help preserve the food. Most of the processed food we find in the market have a shelf life varying between a few months to even a few years. This is only possible because we add chemicals to these foods as preservatives.
- Sometimes chemicals can be added to food to improve their physical appearance. Certain chemicals will help the producers boost the appeal and make them more attractive to consumers. They serve a purely cosmetic purpose.[17]
- And of course, chemicals can also add nutritional value to foods.

Chemicals in food are known as preservatives. There are many types of preservatives we use currently that are considered safe for human consumption. But not all of these are considered healthy. Here are a few chemicals we use in food:

- Food Colors
- Artificial Sweeteners
- Artificial Flavors
- Stabilizing agents
- Preservatives
- Supplements
- Trans Fats

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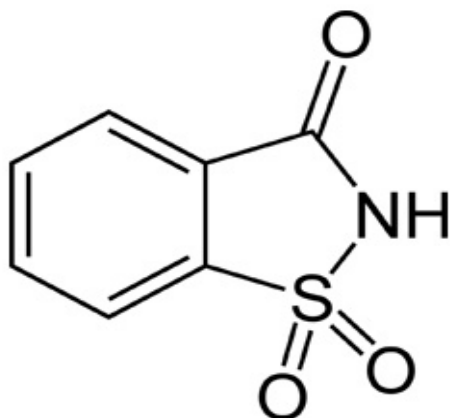
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Artificial Sweeteners

Normally we add sugar to sweeten any food or drink. Sugar, as we know, is sucrose i.e. $C_{12}H_{22}O_{11}$. Sucrose is a natural sweetener we obtain from natural resources like cane sugar. However, sucrose has a high caloric value and is considered unhealthy in high doses.

Thus we used chemistry to come up with alternatives, i.e. artificial sweeteners. There are actually a few chemicals we use as artificial sweeteners. Let us take a look.

Saccharine



This was the first sweetener that was ever invented. Saccharine's chemical name is O-Sulfobenzimide, and the chemical formula is $C_7H_5NO_3S$. This is a very strong artificial sweetener. It has zero nutritional value, and no calories as well. Saccharine is five hundred times sweeter than cane sugar.

It was initially considered harmless to humans, and diabetics were encouraged to consume it in place of sucrose. However, in the 1970s there were studies that indicated that saccharine may cause cancerous tumours. The studies were later discredited, but the debate still continues.

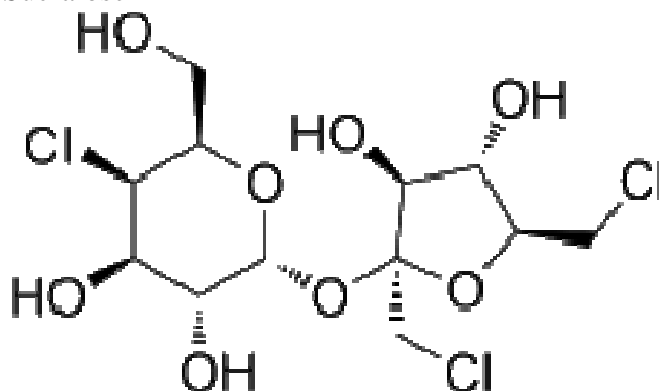
Aspartame

Another type of artificial sweetener is aspartame with the chemical formula $C_{14}H_{18}N_2O_5$. It is a methyl ester of phenylalanine dipeptide or aspartic acid. It is roughly two hundred times sweeter than sugar. So we use it in very small quantities, making its calorie count almost zero.

One problem with aspartame is that it is not a stable compound. Hence it cannot be heated or used for

cooking purposes. So it is mainly used in drinks and cold foods. The health effects of aspartame are also still up for debate.

Sucralose



Sucralose is the most recent sugar substitute invented by us. It is a trichloro derivative of sugar, i.e. sucrose. The chemical formula is $C_{12}H_{19}Cl_3O_8$. Sucralose is almost twice as sweet as saccharides and about 320-1000 times sweeter than cane sugar.

One property of sucralose is that it does not break down in our bloodstream. This means it is noncaloric. Also since it is a stable compound, it can be used in cooking, baking and in products that need a longer shelf life.

Sucralose is generally mixed with some bulking agents. The ones most commonly used are maltodextrin and/or dextrose. The major advantage sucralose has over the other substitutes is that its appearance, as well as its taste, is very similar to natural sugar.

245 Food will get spoilt after a time due to the growth of microbes and other microorganisms. This spoilage of food can be controlled and delayed by using food preservatives. There are some natural preservatives such as salt (NaCl), sugar and some oils (like vegetable oil).

However, sometimes chemical food preservatives must be used to increase the shelf life of the food. Especially packaged food that is sometimes consumed weeks and months after it is prepared. In fact, one of the largest uses of chemicals in food is that as a food preservative.

The most common chemical is sodium benzoate. The molecular formula of sodium benzoate is $C_7H_5NaO_2$. It is a salt of benzoic acid and the resulting product of the reaction between sodium hydroxide and benzoic acid. Sodium benzoate is a particularly effective preservative for acidic foods. It inhibits the growth of microbes that cause food spoilage.

Other nitrates (for example sodium nitrate) and sulphites (like sodium sulphite) are also effective food preservatives. Like all chemicals in food, in small quantities they are harmless. But in large quantities, they can have ill effects on human health.[18]

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