



# Chemical Preservatives and their Effects on Human Body

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## ABSTRACT

Chemical food preservatives are substances which, under certain conditions, either delay the growth of microorganisms without necessarily destroying them or prevent deterioration of quality during manufacture and distribution. The former group includes some natural food constituents which, when added to foods, retard or prevent the growth of microorganisms. Sugar is used partly for this purpose in making jams, jellies, and marmalades and in candying fruit. The use of vinegar and salt in pickling and of alcohol in brandying also falls in this category. Some chemicals foreign to foods are added to prevent the growth of microorganisms. The latter group includes some natural food constituents such as ascorbic acid (vitamin C), which is added to frozen peaches to prevent browning, and a long list of chemical compounds foreign to foods and classified as antioxidants, bleaching agents, acidulants, neutralizers, stabilizers, firming agents, and humectants.

**KEYWORDS:** chemical, preservatives, effects, human, constituents, food, microbes

## 1. INTRODUCTION

Food preservation is one of the methods to protect food from unwanted microbial growth. After the food is produced, product is store and protect by covering the rice and curry with lids to keep away flies and other insects. By this, we are protecting it from any infection caused by them. This is a short-term condition. Chemical food preservation, on the other hand, is done to preserve food for a longer time.[i,ii]

According to FSSAI- "Preservative" means a substance which when added to food, is capable of inhibiting, retarding, or arresting the process of fermentation, acidification, or other decomposition of food.

### Objective of food preservation

1. Prevention of food by damaging agents like microbes, insect etc.
2. Delay of enzymatic spoilage.
3. Hinder or prevention of the growth of microorganism.[xxviii]

The above-mentioned objectives can be achieved by various techniques like drying, freezing, using preservatives etc.[iii,iv]

### Why chemical preservation

1. To preserve the natural characteristics of food.
2. To preserve the way natural food looks.

- To increase the shelf life of foods for storage.[xxvii]

Types of Chemical Preservatives:

According to the Canadian Food Inspection Agency (CFIA), preservatives are grouped into classes (I-IV), with each class having similar microbiological or chemical activity[xxix]

Class I: Curing preservatives in cheeses and meats

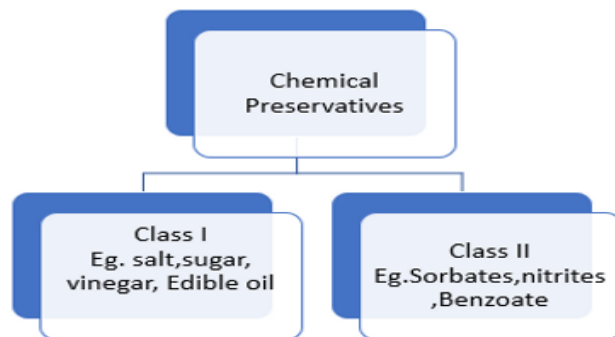
Class II: Antimicrobials (which inhibit the activity or growth of microorganisms)

Class III: Antifungals (which inhibit the activity or growth of yeast and mold) and

Class IV: Antioxidants and its synergists (which are used to prevent the oxidation of vitamins, minerals and lipids of foods and ant browning agents which prevent both enzymatic and non-enzymatic browning of foodstuffs).[v,vi]

However, according to FSSAI Chemical preservatives are divided into two categories, namely:

- Class I Preservatives: Those which are obtained from natural sources.
- Class II Preservatives: Those that are obtained synthetically.[xxx]



Chemical preservation works either by interfering with cell membranes, enzyme activity, or alteration in the microorganism's genetic mechanism. Chemical Preservatives should be added just after the processing of food and before its packaging. A suitable method of food preservation is one that slows down or prevents the action of the agents of spoilage altogether. Also, during the process of food preservation, the food should not be damaged. To achieve this, certain basic preservatives can be used. Nowadays Mostly all food products have food preservatives. Chemicals are used as food preservatives as they are the most effective for longer shelf life and stop or delay bacteria's growth and suppress the reaction when food meets oxygen. Some Chelating agents and

antioxidants (Vitamin E, Vitamin C) work as preservatives, for example, Disodium ethylene diamine tetra-acetic acid (EDTA), Polyphosphates, Citric acid, and Ascorbic acid.[vii,viii]

## 2. DISCUSSION

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. [xxvi]

Using a lot of preservatives has a negative impact on your health. Listed below are some of the health problems that you may suffer from if you eat foods loaded with preservatives.

### 1) Heart Diseases

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 InChem 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.[ix,x]

### 2) Breathing Problems

Preservatives and chemicals present in 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.

### 3) Cancer

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.

### 3. IMPLICATIONS

Preservatives prolong the shelf-life of food, cosmetics and pharmaceuticals by preventing their spoilage. Antimicrobials such as nitrites, nitrates, benzoates and sulfur dioxide destroy or delay the growth of bacteria, yeast and molds. Anti-oxidants such as butylated hydroxy toluene (BHT), butylated hydroxy anisole (BHA), [xxv] and propyl gallate slow or stop the breakdown of fats and oils. Anti-enzymatic preservatives such as citric and erythorbic acids block the enzymatic processes such as ripening occurring in foodstuffs even after harvest. Natural substances like salt, sugar, vinegar and spices have been used as preservatives since time immemorial. The majority of preservatives used today are artificial rather than natural. Several of them are toxic and several others have potentially life-threatening side effects.[xi,xii] Researchers have reported that artificial preservatives such as nitrates, benzoates, sulfites, sorbates, parabens, formaldehyde, BHT, BHA and several others can cause serious health hazards such as hypersensitivity, allergy, asthma, hyperactivity, neurological damage and cancer. Research has proven that several natural preservatives obtained from plants, animals, microbes and minerals contain antioxidant, antimicrobial and antienzymatic properties. Extracts of basil, clove, neem and rosemary are promising alternatives to their artificial counterparts. There should be increasing awareness about the harmful effects of artificial preservatives and recommends the usage of natural preservatives for better therapeutic efficacy, safety and preservation of substances along with improved general health.

These preservatives are also used to delay spoilage and contamination in foods, but these are artificially produced or synthetic in nature. Often these are also called 'additives' on food labels – so read the label carefully before you make the purchase. Ketchups, packed juices, baked goodies and spreads and jams could contain artificial preservatives. One of the possible harmful effects of preservatives could be a trigger for breathing problems asthma, bronchitis.<sup>2</sup> Preservatives can cause problem within young children like hyperactive behaviour. This problem is also measured by parental and objective

reporting.<sup>3</sup> Sustained and excessive consumption of artificial preservatives can weaken heart tissues which is dangerous especially for the aged people.<sup>4</sup> They could contain BHA and BHT food additives which could be cancer causing. BHT is used in cereals and fats while BHA could be present in potatoes, meats and other baked goods.<sup>5</sup> Preservatives could cause obesity in some as it contains fatty acids especially in processed foods[xiii,xiv]

Cutting preservatives completely from your diet is difficult but reducing isn't. One should try to intake less preservatives as it causes chronic health conditions. One can incorporate fresh fruits, vegetables, juices, fresh lean meats and low fat dairy in your diet rather than switching to too many packaged food items. Lastly, read the labels on the products carefully before buying food items for you and your family. More often than not, a quick glance should help you figure out if the item is fit for consumption by your family or not.

The three main categories of artificial preservatives are antimicrobials, antioxidants, and chelating agents. [xiv]

- Antimicrobials: They help to prevent the overgrowth of bacteria and molds. And include: 1) Benzoates (found in many beverages). 2) Sorbates (help to prevent mold, yeast and fungi growth in foods and beverages). 3) Propionates (mold inhibitors used in baked goods). 5) Nitrates and nitrites (help to prevent bacterial overgrowth, most notably Clostridium botulinum).
- Synthetic Antioxidants: They help to prevent discoloration and include sulfites, synthetic vitamin E, C, butylated hydroxyanisole (BHA), and butylated hydroxytoluene (BHT).
- Chelating agents: They include EDTA and polyphosphates. And help to bind metals, usually copper and iron to prevent the metals from oxidizing and speeding up spoilage.

### 4. RESULTS

The American Academy of Pediatrics warns about the harmful side effects of food preservatives and food additives in their policy statement.[xv] So as per this statement, preservatives are all the way more harmful for children. Children are smaller, so their "dose" of any given chemical ends up being higher. Moreover, they put their hands in their mouths more often than adults do, so

they are likely to ingest more. Since their bodies are still developing, they can be at more risk.

### **1. Breathing Problems:**

One of the most harmful side effects of food preservatives is that they increase the chances of breathing problems like asthma. Some of the preservatives present in food items such as aspartame, sulfites, and benzoates aggravate breathing problems. Therefore, removing foods with preservatives from the diet can help in reducing the symptoms as well as the severity of breathing problems. [xxiii]

### **2. Obesity:**

Preservatives could be the reason for excessive weight gain and obesity in kids who are mostly consuming processed foods. Also, artificial preservatives used in many processed foods could increase the risk of inflammatory bowel diseases and metabolic disorders. (How to prevent obesity in kids?)[xvi,xvii]

### **3. Hyperactivity:**

Most of the packaged food companies are adding artificial preservatives to delay spoilage and contamination in foods. Artificial preservatives such as nitrates, benzoates, sulfites, sorbates, parabens, formaldehyde, BHT, BHA and several others can cause serious health hazards such as hyperactivity, neurological damage and hypersensitivity.

### **4. Serious Diseases:**

Recently, cardiovascular diseases have become quite common and the presence of preservatives on food items is one of the main causes of increasing heart problems. Studies also suggest that food preservatives can weaken the heart tissues over time. Another harmful side effects of food preservatives is that they can result in forming cancer cells. For example, some food items consist of nitrosamines, a preservative which has nitrites and nitrates. When this is mixed with the gastric acids, it forms cancer-causing agents. That is primarily why it is best to avoid snacks or meals that are loaded with nitrites and nitrates. [xxii]

### **5. Hormones:**

Another side effect of food preservatives are that they can affect your child's neurological development and the endocrine system, which regulates hormones. The endocrine system is involved in growth and hormones, so if additives affect estrogen or testosterone, it can also affect development during puberty. Since food choices have a direct effect on hormone levels in the body, it

becomes extremely important to make sure that each and every bite that goes into your kid's mouth is adding nutrition and not causing any harm in any way. Moreover, hormonal imbalance is very common nowadays amongst the teenagers and one of the major reason for this is excessive consumption of processed foods, ready to eat and packaged foods. [viii,xix]

## **Conclusions**

### **(1) Tips To Avoid Food Preservatives:**

- Buy and serve more fresh fruits and vegetables, and fewer processed meats, especially during pregnancy.
- Wash hands thoroughly before and after touching food, and clean all fruits and vegetables well.
- Cut back on canned foods and beverages in general.
- Cut back on fast food and processed foods.
- Read labels.[xx,xxi] Get familiar with each and every ingredient of the products you use.

## **Conflict of interest statement**

Authors declare that they do not have any conflict of interest.

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