

Alternative to Artificial Preservatives

PV Kamala Kumari*, S Akhila, Y Srinivasa Rao and B. Rama Devi

Vignan Institute of Pharmaceutical Technology, Duvvada, Visakhapatnam, Andhra Pradesh, INDIA.

ABSTRACT

Preservatives are the substances that 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 microorganisms. Anti-oxidants such as Butylated Hydroxy Toluene (BHT), Butylated Hydroxy Anisole (BHA), and propyl gallate act by preventing the oxidation of substances that slow or stop the breakdown of fats and oils. Anti-enzymatic preservatives such as citric acid block the enzymatic processes 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. Artificial preservatives 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 anti-enzymatic properties. Extracts of basil, clove, neem and rosemary are promising alternatives to their artificial counterparts. This article aims at 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.

Key words: preservatives, anti-microbial, antioxidant, anti-enzymatic, hypersensitivity, carcinogenic.

Correspondence:

P.V.Kamala Kumari, M.Pharm., Ph.D

Associate Professor, Vignan Institute of Pharmaceutical Technology, Duvvada, Visakhapatnam-530049, INDIA.

E-mail: kamalaparavastu@gmail.com

DOI : 10.5530/srp.2019.1.17

INTRODUCTION

Preservatives are natural or synthetic substances that are added to fruits, vegetables, prepared food items, cosmetics and pharmaceuticals in order to increase their shelf life and maintain their quality and safety by retarding their fermentation, acidification, microbial contamination and decomposition. Before the advent of preservatives, food was placed in containers such as clay jars to keep them away from spoiling. Drying food was a popular preserving method, as most bacteria and fungi require moisture to grow. Foods such as fruits, vegetables and meats were often dried for preservation. Jams and jellies are preserved as solutions of high sugar content, and many meats (e.g., hams) and fish are still preserved by salting¹⁻³.

CLASSIFICATION OF PRESERVATIVES

Preservatives are classified⁴⁻⁶ as:

1. Class I (natural preservatives):

Eg: Salt, sugar, vinegar, syrup, spices, honey and edible oil.

2. Class II (chemical or synthetic preservatives):

Eg: Benzoates, sorbates, nitrites and nitrates of sodium or potassium, sulfites, glutamates and glycerides.

Class II preservative should be used in one food item. People consuming or using items containing more than one preservative are at risk of exposure to multiple chemicals as shown in Table 1.

Both natural and synthetic preservatives are categorized as antimicrobial, antioxidant, anti-enzymatic. Antimicrobials destroy or delay the growth of bacteria, yeast, molds. Antioxidants slow or stop the breakdown of fats and oils in food that occurs in the presence of oxygen leading to rancidity.

Preservatives are commonly found in most oral, dental, dermal, nasal, parenteral products and including vaccines, rectal and ophthalmic products⁷⁻¹⁶ (Table 2 and Table 3).

HEALTH HAZARDS CAUSED BY ARTIFICIAL PRESERVATIVES

The artificial preservatives are mostly considered as to be safe, but several have negative and potentially life-threatening side effects such as¹⁷⁻²²:

Nitrates and nitrites

1. Upon ingestion, the nitrates are converted to nitrites that can react with hemoglobin to produce met hemoglobin that may cause the loss of consciousness and leads to death, especially in infants.
2. When the proteins are present in the stomach in which when they react with the nitrites and produce nitrosamines that leads to carcinogenic.
3. Researchers claim that there is a substantial link between increased levels of nitrates in food and increased deaths from Alzheimer's, Parkinson's and Type 2 diabetes.
4. Symptoms such as headache, sweating, redness of skin, nausea and weakness can occur following consumption of food containing monosodium glutamate (MSG).

Sulfites

Sulfite containing food preservatives may cause severe allergic reactions and asthma.

Parabens

1. The toxic paraben chemicals are often used along with the methyl chloro isothiazolinone and methyl isothiazoline.
2. By using these parabens they may cause neurological damage in rats and are potent irritants and allergens. The use of these toxic chemicals by pregnant women may adversely affect fetal brain development.

Formaldehyde

1. Formaldehyde such as hydantoin, diazolidinyl urea and imidazolidinyl urea are all potent skin, eye and lung irritants.

Table 1: Preservatives and their Applications.

S.No	Class	Preservatives	Applications
1.	Anti-microbial	Nitrites, Nitrates, sulfur dioxide, benzoates and sorbates.	Destroy or delay the growth of bacteria, yeast, molds.
2.	Anti-oxidants	Butylated Hydroxy Anisole(BHA), Butylated Hydroxy Toulene(BHT), ascorbic acid.	Slow or stop the breakdown of fats and oils to prevent rancidity.
3.	Anti-enzymatic	Erythorbic acid (iso-ascorbic acid) and citric acid	Block the process during ripening and harvesting.

Table 2: Foods products containing different types of preservatives.

Preservatives	Foods containing
Ascorbic acid (vitamin C)	Fruit products, acidic foods
Benzoic acid	Fruit products, acidic foods, margarine
BHA (butylated hydroxyanisole)	Bakery products, cereals, fats and oils.
BHT (butylated hydroxy toluene)	Bakery products, cereals, fats and oils
Calcium lactate	Dairy products, olives, frozen desserts, jams, jellies
Calcium propionate	Breads and other baked products
Calcium sorbate	Syrups, dairy products, cakes, mayonnaise, margarine
ETDA (ethylene diamine tetra acetic acid)	Dressings , margarine, canned vegetables
Methyl paraben	Beverages , dressings, relishes
Potassium propionate	Breads and other baked goods
Potassium sorbate	Dairy products, syrups cakes, processed meats
Propionic acid	Breads and other baked goods
Propyl paraben	Beverages, cakes, pastries, relishes
Propyl gallate	Cereals , snack foods , pastries
Sodium benzoate	Fruit products, margarine, acidic foods
Sodium nitrate and nitrite	Cured meats, fish, poultry
Sodium propionate	Breads and other baked products
Sodium sorbate	Dairy products, mayonnaise, processed meats, fermented products
Sorbic acid	Dairy products, fruit products, syrups, sweets, Beverages, fermented products
TBHQ(Tetra butyl hydroquinone)	Snack foods, fats and oils
Tocopherol (Vitamin E)	Oils and shortenings

Table 3: Preservatives used in various formulations.

Category	Products	Preservatives
Oral	Tablets, capsules, suspensions, syrups	Methyl, ethyl, propyl parabens and their combinations, sodium benzoate, benzoic acid, calcium lactate, sorbates of calcium, sodium and potassium, sorbic acid
Dermal	Creams, lotion, ointment, soap, bath gel, hair spray, shampoo, conditioner	Benzalkonium chloride, cetrimide, EDTA, benzoic acid, thiomersal, imidurea, chlorhexidine, chlorocresol, phenyl salicylate
Dental	Tooth paste, mouthwash, gargles	Sodium benzoate, benzoic acid, potassium sorbate, sodium phosphate, triclosan, cetyl pyridinium chloride, methyl and ethyl parabens
Ophthalmic	Eye drops, ointments, contact lens and solutions	Benzalkonium chloride, EDTA, benzoic acid, thiomersal, imidurea, chlorhexidine, poly amino propyl biguanide, sodium per borate, boric acid
Nasal	Nasal drops, sprays, aerosols	Benzalkonium chloride, phenylcarbinol, potassium sorbate, chlorobutanol, chlorocresol, EDTA
Rectal	Suppositories, enema	Benzyl alcohol, benzoic acid, sodium benzoate, methyl hydroxyl benzoate, chlorhexidine gluconate
Parenteral	Small and large volume parenterals including vaccines	Methyl, ethyl, propyl, butyl parabens and their combinations, benzyl alcohol, chlorobutanol, chlorhexidine, thiomersal, formaldehyde

2. High levels of exposure to toxins like these can cause DNA damage to sperm.

Research has shown that the food additives used in hundreds of children's foods and drinks can cause temper tantrums and disruptive behavior.

Some of the commonly used preservatives along with health hazards namely hypersensitivity, asthma and cancer, which they can cause as listed in the Table 4.

NATURAL PRESERVATIVES: ALTERNATIVES TO THE ARTIFICIAL PRESERVATIVES

Several excipients used today in foods, cosmetics and pharmaceuticals are of plant origin like acacia, tragacanth, guar gum, carrageenan, alginates, starch, agar, xanthum gum, gelatin, pectin and cellulose. These natural excipients are used as binding agents, disintegrants, sustaining agents, colloids, thickening agents, gelling agents, suppositories, stabilizers²⁵.

Natural plant-based excipients have several advantages such as low cost, free from side effects, biocompatible, better patient tolerance,

ecofriendly, locally available. Natural substances or extracts obtained from plants, animals or minerals, can serve as beneficial alternatives²⁶⁻³⁰ (Table 5). The days of benzoates, sorbates, metabisulphites, toxic gases and other synthetic chemical preservatives appear to be numbered. Manufacturers and retailers are responding to consumer resistance to chemical preservatives in food, beverages and cosmetics, and to research which has showed that artificial preservatives are causative agents of hyperactivity even in previously non hyper-active individuals.

CONCLUSION

Artificial preservatives are chemical substances that can cause health hazards. Awareness about the harmful effects of these chemicals in food, cosmetics and pharmaceuticals is increasing. Now- a- days parabens, benzoates, sorbates, metabisulphites, toxic gases and other synthetic chemical preservatives have appeared. Manufactures and retailers are responding to consumer resistance to chemical preservatives in food, beverages and cosmetics and to research which has been showed that artificial preservatives are causative agents of several health hazards such as hypersensitivity, asthma and cancer. Natural substances obtained from plants, animals and minerals can serve as beneficial alternatives.

Table 4: Health hazards of some commonly used preservatives.

Preservative	Dangerous food preservatives		
	Hypersensitivity (H)	Asthma (A)	Cancer (C)
Potassium and calcium sorbates, sorbic acid	H	A	-
Benzoic acid	H	A	-
Sodium benzoate	H	A	C
Propyl paraben	-	A	-
Sulphur dioxide	H	A	-
Sodium meta bisulphate	-	A	-
Potassium bisulphate	H	A	-
Hexamethylene tetra amine	-	-	C
Sodium nitrite	H	A	C
Sodium or potassium nitrite	H	-	C
Calcium or potassium or sodium propionates, propionic acid	H	A	-
Propyl gallate	-	A	C
Tetra Butyl Hydroquinone (TBHQ)	H	A	-
Butylated Hydroxyl Anisole (BHA)	H	A	C
Butylated Hydroxy Toulene (BHT)	H	A	C

Table 5: Some alternatives of artificial preservatives.

S.No	Natural preservatives	Source	Active constituents
1	Tulasi	Dried and fresh leaves of <i>Ocimum sanctum</i> Family: Labiatae	Volatile oil containing eugenol
2	Turmeric	Dried secondary rhizome of <i>Curcuma longa</i> Family: Zingiberaceae	Phenolic curcuminoids (curcumin), essential oils
3	Neem	Leaves and seeds of <i>Azadirachta indica</i> Family: Meliaceae	Limonoids, nimbin, nimbidin, margolone, margolonone, azadirachtin
4	Nisin	<i>Lactobacillus lactis</i>	Polypeptide
5	Ginger	Rhizome of <i>Zingiber officinale Roscoe</i> Family: Zingiberaceae	Essential oils, pungent phenolic compounds, gingerols
6	Garlic	Bulb of <i>Allium sativum</i> Family: Liliaceae	Alliin, allicin, ajoene
7	Clove	Dried flower buds of <i>Syzygium aromaticum</i> Family: Myrtaceae	Eugenol
8	Cinnamon	Dried inner bark of shoot or trunk of <i>Cinnamomum verum</i> Family: Lauraceae	Cinnamaldehyde, eugenol, carophyllene, 1,8 cineole
9	Lard	It is the purified internal fat obtained from the abdomen of hog <i>Sus scrofa Linn</i> Family: Suidae	Olein, stearin, palmitin
10	Rosemary	Fresh or dried leaf of <i>Rosmarinus officinalis</i> Family: Labiatae	Phenolic acids, flavonoids, diterpenoid bitter substances, carnosol, carnosic acid

Other than their use in food, cosmetics and pharmaceuticals as flavoring, binding, disintegrating, gelling, thickening or suspending agents, vehicles are used as Preservatives. Natural preservatives offer greater advantages over their artificial counterparts due to their non-toxic nature along with a wide range of health benefits.

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