



# Preservation by drying and chemical preservatives



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- Preservatives are substances that limit, slow down or stop growth of microorganisms or present within the food and thus, prevent deterioration of goods or food poisoning.
- Used in cooked food, wine, cheese, fruit juices and margarines.
- Chemical preservatives prevent microbial growth without loss of nutrient.
- Chemical substances are artificial preservatives that stop or delay growth of bacteria, spoilage and its discoloration.
- □ Chemicals can be used for food preservation: propionic acid, sorbic acid, benzoic acid, and sulfur dioxide.
- Acceptable because they are metabolized by human body.



- Citric acid, acetic acid (vinegar) and ascorbic acid confer protection against product deterioration.
- pH of product is shifted to being low, that is, more acidic, where few molds, yeast and bacteria are able to grow and multiply.
  - Food additives (benzoate and sorbate) are commonly used in fruit drink industry to protect against microbial spoilage.



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Shaping Lives... Empowering Communities... Sorbic acid: preservation of syrups, salads jellies and some cakes.

Benzoic acid: beverages, margarine, apple cider Propionic acid is an ingredient of bread and bakery products.

- Sulphur dioxide, as gas or liquid is also used for dried fruits, molasses and juice concentrates.
- Ethylene oxide is used for spices, nuts and dried fruits.
- Tetracycline used to preserve meats.
- Antioxidants are chemical food preservatives that act as free radical scavengers: BHA (butylated hydroxyanisole).
- Sulfur dioxide causes irritation in bronchial tubes and nitrites are carcinogenic.



# Types of Artificial/Chemical Food Preservatives



Antioxidants include sulfites, Vitamin E, Vitamin C and butylated hydroxytoluene (BHT) and chelating agent (disodium ethylenediaminetetraacetic acid (EDTA), polyphosphates and citric acid).

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## Nitrates and nitrites:

Nitrates are converted to nitric acids which form stable red colour in meat.

Nitrites have inhibitory action against *Clostridium botulinum* in meat products but forms carcinogenic nitrosamine. Preserve sausage, ham, bacon, beef, etc.

- Side effects: allergy, asthma, nausea, vomiting and headache.
- Sodium nitrite can be converted to nitrous acid in body and cause cancer.

# Sulfites (sulfur dioxide and metabisulfite):

- Sulfites form sulphurous acid (active antimicrobial compound) that kill microbial cell by reduction of sulphide linkage, formation of carbonyl compounds and inhibiting respiratory mechanism.
- Prevent fungal spoilage and browning of peeled fruits and vegetables.
- Used level of sulphites is 0.005-0.2%.
- Side effects: allergy, asthma, nausea, vomiting, joint pain, palpitation, and headaches.



## Sodium benzoate or benzoic acid:

More effective against yeast and molds and used at conc. up to 0.2%. Inhibits enzymes necessary for oxidative phosphorylation, inhibiting membrane protein function and by destroying membrane potential

Added to carbonated drinks, margarine, flour, pickles, fruit purees, and fruit juices

Side effects: severe allergic reaction and cancer



### **Propionates**

Calcium and sodium propionate are effective against mold and bacteria at 0.1-0.2%

Inhibitory action is due to cytoplasm acidification and destabilization of membrane proton gradient.



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## Sorbate

- Sodium, calcium or potassium salt is used at conc. of 0.05-0.2%
  - Effective against yeast and mold
  - Sorbic acid and its salts are tasteless and odourless when used at levels below 0.3%
  - Used in non-alcoholic drinks, alcoholic drinks, processed vegetables and fruits and dairy desserts



Butylated Hydroxytoluene (BHT) and Butylated Hydroxyanisole (BHA):

Serve as antioxidants that prevent oxidation of fats (rancidity).

Used in preserving fresh meat, pork, sausages, potato chips & crackers, beer, baked goods, drink powder, dry cereals, and frozen pizza.

 These compounds have several side effects and can cause cancer and liver disease.



**Monoglycerides and Diglycerides:** 

- Used as preservatives for cookies, cakes, pies, bread, peanut butter, roasted nuts, shortening, and margarine.
- May cause cancer and birth defects.

## Salt and sugar:

- Effective means of extending shelf life of various products as these solutes bind water, leaving less water available for growth of microflora.
- Water activity (a<sub>w</sub>) of product is reduced.
- Since most microorganisms require high water activity, they are unable to survive.



Chemical Preservatives	Foods in Which they are used
Sorbic acid and sorbates	Cheeses, wines, dried fruits, fruit purees, trimmings
Benzoic acid and benzoates	Pickled vegetables, jams and jellies low in carbohydrates, fruits, semi-preserved fish products, sauces
Sulfur dioxide and sulphites	Inhibit bacterial growth in the dried fruit, canned fruit and wine. They also have antioxidant properties
Natamycin	Surface treatment of cheese and sausages
Nitrites and nitrates	Employees in the preparations of meat (ham, sausages etc.) To prevent the growth of <i>Clostridium botulinum</i> .

#### Examples of commonly used preservatives in different foods