



CHEMICAL CUISINE ~ COMMONLY USED FOOD ADDITIVES *from A-Z*

Have you ever wondered why peanut butter doesn't separate?
Why baking mixes rise in the oven? Why ice cream is smooth and creamy?
Most likely, you take food appearances and quality for granted.
But desirable qualities in processed foods can often be attributed to food additives.

People have been using food additives for thousands of years. Today nearly 3,000 substances are used as food additives. Salt, sugar, and corn syrup are the most widely used food additives in the United States. Another 12,000 find their way into our food supply indirectly, including pesticides.

Americans want to know...are additives safe, or do they increase our risk for cancer and other diseases? Intentional food additives pose little health hazard because so much is known about food additives, and their use is well regulated. The exception lies with a small number of individuals with specific allergies, who may actually experience reactions to food additives.

History of Food Additives

The Food and Drug Administration (FDA) defines food additive as any substance used to provide a technical effect in foods. The use of food additives has increased in recent years because of the popularity of using prepared, processed, and convenience foods.

☞ **The Food and Drug Act** of 1906 prevented the manufacture of adulterated, misbranded or poisonous foods and drugs.

☞ In 1938, **The Food, Drug and Cosmetic Act** gave government the authority to remove adulterated and obviously poisonous foods from the market. But it did not specifically regulate food additives.

☞ **The Food Additives Amendment** of 1958, (also known as the Delaney Clause), states that "no additive shall be deemed to be safe if it is found to produce cancer in man or animal."

There are two categories of additives that are exempt from the testing and approval process.

Almost 700 substances are on the **Generally Recognized as Safe (GRAS)** list. These substances are already considered harmless because of extensive use in the past with no known harmful effects.

Prior Sanctioned Substances are also exempt and include those additives approved before 1958 for use in food. The safety of approved additives is continually under review. Additives never have permanent approval.

Monitoring the Safety of Food Additives

Before any substance can be added to food, its safety must be assessed. FDA evaluates the safety of all food additives. The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) is responsible for the safety of food additives used in meat, poultry, and egg products. When an additive is proposed for use, its safety, technical function, and conditions of use are also evaluated by the Labeling and Compounds Review Division of FSIS. FDA has overriding authority regarding additive safety, but FSIS may apply even stricter standards that take into account the unique characteristics of meat, poultry, and egg products.

Why Additives Are Used

Food additives are no secret. The ingredient list on food labels can help you identify specific additives in any food. Additives are used for a variety of reasons:

to maintain or improve nutritional quality; to preserve quality and/or freshness; to assist in processing or preparation; and to make food more appealing.

To Maintain or Improve Nutritional Quality

Nutritional additives either enrich or fortify a food. The enrichment process replaces vitamins and minerals lost in processing, such as adding B-vitamins to breads and cereals. The fortification process adds *nutrients* to food that may be lacking in the diet. Examples include vitamin D in milk, vitamin A in margarine, folic acid in breads and cereals, and iodine in table salt.

To Preserve Quality and/or Freshness

PRESERVATIVES (antimicrobials) extend shelf life by preventing food spoilage from bacteria, molds, fungi, and yeast. An example includes sodium nitrite in cured meats, fish, and poultry. An *antioxidant* such as ascorbic acid (vitamin C) helps prevent changes in color, flavor, or texture, that occur when foods are exposed to air.

To Assist in Processing or Preparation

Food additives in this category fulfill a wide variety of tasks, allowing food manufacturers to achieve many food qualities that consumers expect.

ANTI-CAKING AGENTS prevent lumping by keeping foods from absorbing moisture. Silicon dioxide is an anti-caking agent used in granular products that flow freely.

EMULSIFIERS improve the homogeneity, consistency, stability or texture of a product. By evenly distributing tiny particles of one liquid into another, salad dressings don't separate.

HUMECTANTS allow food to retain moisture and soft texture. Shredded coconut stays moist and marshmallows stay soft because of an added humectant, such as glycerin.

LEAVENING AGENTS improve the texture and volume of baked goods. Baking soda (sodium bicarbonate), and baking powder (sodium bicarbonate and acid salts), as well as yeast, produce carbon dioxide that makes dough rise.

MATURING AND BLEACHING AGENTS improve the baking qualities of food made with wheat flour. Calcium bromate is a common dough conditioner, helping produce a more uniform grain and greater volume in bread.

PH CONTROL AGENTS adjust the acidity or alkalinity of a food and influence the texture, taste, and safety of foods. An acid such as lactic acid, balances the acidity in cheesemaking and adds tartness to carbonated fruit-flavored drinks.

THICKENERS AND STABILIZERS improve the consistency or texture of food. Gelatin from animal bones and carrageenan obtained from seaweed are

commonly used in ice cream and chocolate milk as stabilizing agents.

To Make Food More Appealing

These additives include colors, flavors, flavor enhancers, and sweeteners. Of this group, the most widely used are sugar, salt, and corn syrup.

COLORS make food more appealing to eat. Only seven of the thirty-three colors that are approved for use in food are synthetic. Foods colored with beet juice, paprika, carrot oil, or saffron are quite common. Cheese and margarine often get their uniform, yellow color from the natural substance, annatto.

FLAVORS heighten natural flavor or restore flavors lost in processing. Flavors make up about 1,700 of the additives approved for use in food and are both natural and synthetic. They include spices, herbs, extracts, salt, caffeine, and other seasonings.

FLAVOR ENHANCERS do not add any flavor of their own, but heighten the natural flavors already present in food. Monosodium glutamate (MSG) is the best known.

SWEETENERS make the aroma or taste of food better, work as browning agents, and may be used as a preservative. Sucrose (table sugar), fructose, dextrose, and mannitol are nutritive sweeteners, meaning they can be used by the body for energy. Non-nutritive sweeteners, such as saccharin and aspartame, do not contribute energy.

The following chart, **FOOD ADDITIVES FROM A-Z**, will explain the purpose and possible effects of the sometimes mysterious-sounding chemical substances found in the ingredient list on food labels.

FOOD ADDITIVES FROM A-Z is divided into three parts that are each in alphabetical order. The three parts include:

Additives considered safe because of reliable studies and long-term use with only a few individuals experiencing allergic reactions. Non-toxic additives, but large amounts may cause unpleasant effects or lead to less than optimal nutrition.

Additives that may pose a risk for some individuals.

Because an additive is not on this list is not an indication of safety or non-safety.

These common food additives are considered safe because of reliable studies and long-term use. Only a few individuals experience allergic reactions.

Additive	Use	Found In
Alginate (propylene glycol alginate)	thickener, foam stabilizer	ice cream, cheese, candy, yogurt, soft drinks, salad dressing, canned frosting
Alpha Tocopherol (vitamin E)	antioxidant, nutrient	vegetable oil
Ascorbic Acid (vitamin C, sodium ascorbate)	antioxidant, nutrient, color stabilizer, preservative	cereals, fruit drinks, cured meats, frozen fruit, candy
Calcium or Sodium Propionate	preservative	bread, rolls, pies, cakes
Carrageenan	thickener, stabilizer, emulsifier	ice cream, jelly, chocolate milk, infant formula
Casein (sodium caseinate)	thickener and whitening agent	ice cream, ice milk, sherbet, coffee creamers
Citric Acid (sodium citrate)	controls acidity, flavoring, antioxidant	ice cream, sherbet, fruit drinks, soft drinks, instant potatoes, gelatin desserts, jam, candy, canned & frozen fruits & vegetables, cereals, cheese
Erythorbic Acid	antioxidant, color stabilizer	cured meats
Folic Acid	nutrient	bread, cereals, pastas
Gelatin	nutrient, thickener	powdered dessert mixes, yogurt, ice cream, cheese spread, beverages
Glycerin (glycerol)	humectant, sweetener	candy, beverages, baked goods, chewing gum, marshmallows, edible coating for meat & cheese
Gums (arabic, furcelleran, ghatti, guar, karaya, locust bean, xanthan)	thickener, stabilizer, bulking, firming & binding agent	bottled sauces, salad dressings, soft drinks, ice cream, yogurt, cheese spread, cream cheese, frozen fruit, fruit drinks
Lactic Acid	controls acidity	Spanish olives, cheese, frozen desserts, fruit drinks
Lecithin	emulsifier, antioxidant, humectant, leavening agent	chocolate, baked goods, margarine, powdered milk, popcorn
Modified Food Starch	thickener	soup, gravy, baby food
Mono & Diglycerides (glyceryl monostearate distearate)	emulsifier	baked goods, margarine, shortenings, beverages, ice cream, ice milk, whipped toppings, chocolate candy, peanut butter

These food additives are considered non-toxic but large amounts may cause unpleasant affects or lead to less than optimal nutrition.

Additive	Use	Found In
Corn Syrup (high fructose corn syrup)	sweetener	soft drinks, candy, toppings, snack foods, imitation dairy foods, other processed foods
Dextrose (corn sugar, glucose)	sweetener, color agent	bread, caramel, soft drinks, cookies
Hydrogenated Vegetable Oil	fat, oil, shortening (tenderizer)	margarine, crackers, baked goods
Mannitol	sweetener, anticaking agent, stabilizer, thickener	chewing gum, candy, low calorie foods
Phosphates (phosphoric acid, calcium, iron ammonium, phosphates)	acidifier, emulsifier, nutrient, stabilizer, flavoring, leavening agent	baked goods, cheese, powdered foods, cured meats, soft drinks, cereals, dehydrated potatoes
Plant Sterol Esters	cholesterol-lowering	margarine, salad dressing
Polysorbate 60, 65 80	emulsifier, humectant, foam stabilizer	baked goods, frozen and gelatin desserts, imitation dairy products, shortening, vitamin and mineral supplements
Salt (sodium chloride)	flavoring	processed foods, soup, chips, crackers
Sorbic Acid (potassium, calcium sodium sorbate)	preservative	cheese, syrup, jelly, jams, fruit pies, juices, yogurt, cakes, dried fruits, pickles, sauces
Sucralose	artificial sweetener	diet foods, soft drinks, baked goods, ice cream, sweetener packets
Sorbitol	sweetener, humectant, thickener, stabilizer	chocolate cakes, cookies, pastries, candy, ice cream, bacon & sausage, dietetic drinks and foods, chewing gum
Sugar (sucrose)	sweetener	table sugar, sweetened foods

These food additives may pose a risk for some individuals

Additive	Use	Found In
Artificial Colors	coloring: yellow, blue, green, red, citrus red	wide variety of foods including: candy, soft drinks, gelatin desserts, fruit snacks
Artificial Flavorings	flavoring	wide variety of foods including: soft drinks, candy, cereal, gelatin desserts, fruit snacks
Acesulfame-Potassium (acesulfame-K)	artificial sweetener	baked goods, chewing gum, gelatin desserts, soft drinks
Aspartame (NutraSweet)	artificial sweetener	diet foods/beverages, frozen desserts, sweetener packets
BHA/BHT	antioxidant	cereals, chewing gum, chips, oils
Caffeine	stimulant	soft drinks, chewing gum, waters
Cyclamate	artificial sweetener	diet foods & beverages
Monosodium Glutamate (MSG)	flavor enhancer	soup, salad dressing, chips, frozen entrees, restaurant foods
Olestra (Olean)	fat substitute	chips, crackers
Saccharin	artificial sweetener	diet food & beverages, sweetener packets
Sodium Nitrate (potassium nitrate or nitrite, sodium nitrite)	preservative, color fixatives, flavoring	processed meat (bacon, ham, hot dogs, luncheon meats, smoked fish, corned beef)
Sulfites (sulfur dioxide, sodium bisulfite)	preservative, bleach	dried fruit, wine, processed potatoes

**Sandra Bastin, Ph.D., R.D.,
Food & Nutrition Extension Specialist**

References

- American Institute for Cancer Research, *Adding Up the Facts on Food Additives*, AIC Research Newsletter, Winter, 1987.
- CSPI, *Chemical Cuisine: CSPI's Guide to Food Additives*, 1999.
- CSPI, *Guide to Food Additives*, 1999.

- Duyff, R. *American Dietetic Association Complete Food and Nutrition Guide*, Chronimed Publishing, 1996.
- FDA/CFSAN, *Food Additives: Toxicology, Regulation and Properties CD-ROM*, CRC Press, 1999.
- FSIS/USDA, *Additives in Meat and Poultry Products*, May, 1998.



ANTIMICROBIAL ACTION ACTIVITY

Preservatives work as antimicrobial agents, preventing or slowing down the growth of molds and bacteria. Through the course of history, the first substances used to preserve food were salt and sugar. Demonstrate the action of preservatives by trying this simple experiment.

Ingredients

- table salt
- white vinegar
- 3 small clear glasses or plastic cups
- 1 chicken bouillon cube
- liquid measuring cup
- measuring teaspoon
- tape for labeling
- marking pen

1. Label 3 containers with *salt*, *vinegar* **and** *control*.
2. To 1 cup of hot tap water, add 1 bouillon cube.
3. Pour 1 cup of the bouillon into each labeled container.
4. Add 1 teaspoon of salt to the container labeled *salt*.

Add 1 teaspoon of vinegar to the container labeled *vinegar*.

Do not add anything to the container labeled *control*.

The reaction of the ingredients in all cups will be compared to the *control* container.

5. Place the 3 cups in a warm place for 2 days. Then compare what you see.

Questions

1. When was a change first noticed in each of the three containers?
2. Which container became the cloudiest?
3. Why did the containers become cloudy?
4. Why did the containers of vinegar and salt never become as cloudy as the control container?



ADDITIVE INGREDIENT LIST ACTIVITY

Additives in food are no secret to consumers. Just by reading the ingredient lists on food labels, you can identify specific additives in any food.

Can you find the additives in this pizza label?

What does each additive do to improve the quality of the pizza?

INGREDIENTS: Crust: wheat flour with malted barley flour, water, partially hydrogenated vegetable oil (soybean and/or cottonseed oil) with soy lecithin, artificial flavor and artificial color (beta carotene), soybean oil, yeast, high fructose corn syrup, salt, calcium propionate added to retard spoilage of crust, l-cysteine monohydrochloride.

Sauce: tomato puree (water, tomato paste), water, green peppers, salt, lactose and flavoring, spices, food starch– modified, sugar, corn oil, xanthan gum, garlic powder.

Topping: low moisture part skim mozzarella cheese (pasteurized milk, cheese cultures, salt, enzymes).

Answer:
Soy Lecithin = Emulsifier - to keep ingredients blended
High Fructose Corn Syrup = Flavoring - to add sweetness
Calcium Propionate = Preservative - to retard spoilage
Xanthan Gum = Thickener - to give a uniform texture

Educational programs of the Kentucky Cooperative Extension Service serve all people regardless of race, color, age, sex, religion, disability, or national origin.

Selected publications are available on the World Wide Web at <http://www.ca.uky.edu>. Issued 01-2000

AGRICULTURE & NATURAL RESOURCES • FAMILY & CONSUMER SCIENCES
4-H/YOUTH DEVELOPMENT • RURAL & ECONOMIC DEVELOPMENT