

More Than You Ever Thought You Would Know About Food Additives

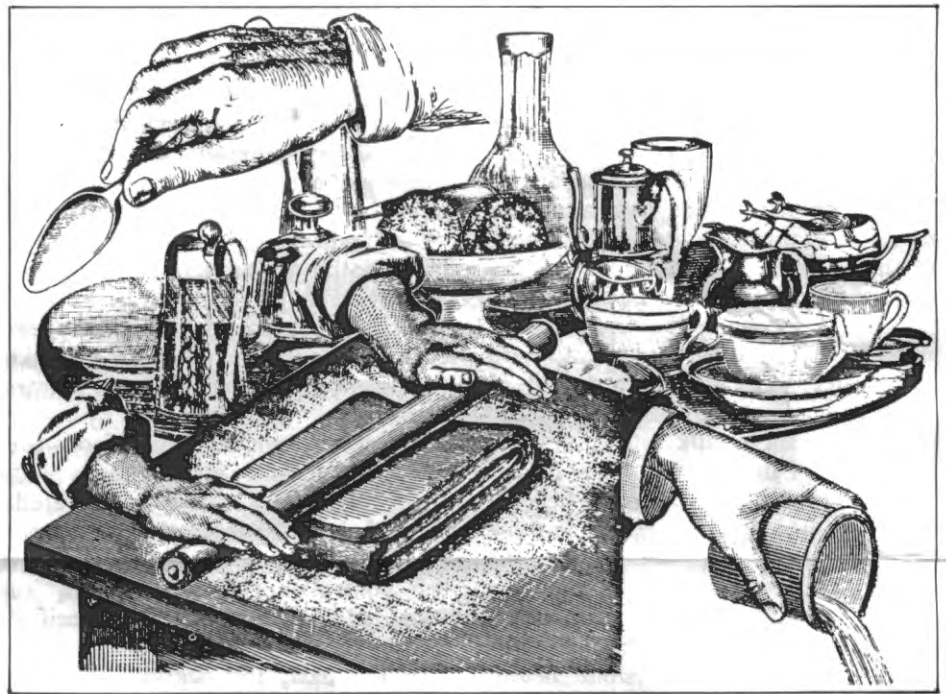
by Phyllis Lehmann

Food additives are so much a part of the American way of eating today that most of us would find it difficult to put together a meal that did not include them.

Take a typical lunch, for example: sandwich, instant soup, gelatin dessert and a cola drink. The bread has been fortified with vitamins and also contains an additive to keep it fresh. The margarine has been colored pale yellow—or, if you use salad dressing, it has been made with emulsifiers to keep it from “separating.” The luncheon meat contains nitrite; the soup, an additive to keep it from becoming rancid; the gelatin, red coloring to make it pretty. Finally, the cola to wash it all down; without coloring, flavoring, sweeteners or artificial carbonation, the pause that refreshes is nothing more than plain water!

Changing lifestyles in this century have resulted in more additives than former generations could have imagined. As Americans moved from farms to cities, there was a need for foods that could be mass produced, distributed over considerable distances and stored for long periods. The exodus of women from the home into the outside work place created a demand for more pre-prepared convenience foods. Greater sophistication increased demand for year-round supplies of seasonal products. Greater buying power gave industry a bigger market to please. So today we have a wider variety of foods available—and more additives in all foods.

By broadest definition, a food additive is any substance that becomes part of a food product when added either directly or indirectly. Today, some 2,800 substances are intentionally added to foods to produce a desired effect. As many as 10,000 other



compounds or combinations of compounds find their way into various foods during processing, packaging or storage.

An additive is intentionally used in foods for one or more of these four purposes:

- To maintain or improve nutritional value. Many foods are fortified with vitamins and minerals that might otherwise be lacking in a person's diet or that have been destroyed or lost in processing.

- To maintain freshness. Foods last as long as they do on the shelf or in the refrigerator because of additives that retard spoilage, preserve natural color and flavor, and keep fats and oils from turning rancid.

- To make food more appealing. The most widely used additives are those intended to make food look and taste better. These include coloring agents, natural and synthetic flavors, flavor enhancers such as MSG

(monosodium glutamate), and sweeteners.

- To help in processing or preparation. A wide variety of compounds are used to give body and texture to foods, evenly distribute particles of one liquid in another, affect cooking or baking results, control acidity or alkalinity, retain moisture, and prevent caking or lumping.

By far the most predominant additives are sugar, salt and corn syrup. These three, plus citric acid, baking soda, vegetable colors, mustard and pepper, account for more than 98 percent, by weight, of all food additives used in this country.

Additives for Nutritional Purposes

Goiter, rickets, pellagra, beriberi. Most Americans have barely heard of these diseases, much less suffered them. Their disappearance in the United States over the past 50 years is in large measure the result of adding essential

vitamins and minerals to such everyday foods as milk, flour, cereals and margarine.

Nutritional fortification began in 1924 when iodine was first added to table salt to prevent goiter, enlargement of the thyroid gland caused by iodine deficiency. The disease had been especially prevalent in the Great Lakes region and the Pacific Northwest where soil, water and crops were devoid of iodine.

Fortification of milk with vitamin D, which began in the 1930s, has helped prevent rickets, a childhood deficiency disease in which the bones fail to grow properly. Later, it became standard practice to add iron and B vitamins—niacin, thiamine and riboflavin—to flour, breads and cereals. Such enrichment was made as a public health measure to prevent development of deficiency diseases such as iron deficiency, anemia; pellagra, a niacin-deficiency disease that causes skin eruptions, digestive and nervous disturbances, and mental deterioration; and beriberi, a thiamine deficiency that results in partial paralysis of the extremities.

Today, many additional foods are enriched or fortified with vitamin and mineral compounds. Nutrients may be added to supplement the vitamins and minerals already present in the food, such as the B vitamins into flour and bread, or they may be truly "added" to the food. Some breakfast cereals, for example, are fortified with virtually all the vitamins and minerals for which the government has established U.S. Recommended Daily Allowances.

Amino acids, nutrients much needed by the body, also may be added to foods under certain conditions. While some of these compounds can be manufactured by the body, others, known as "essential

amino acids," must come from foods. Animal products such as meat, poultry, eggs and milk generally contain the approximate balance of amino acids required by man. Most plant foods, on the other hand, are low in one or more of the essential amino acids. This means that vegetable protein must be fortified with such compounds as tryptophan, leucine, lysine and methionine to make it equivalent to protein from animal sources.

Consumers can tell which foods are fortified, because all products with nutrients added must be labeled. Through labeling regulations the types and amounts of nutrients in foods are also controlled. "Enriched flour" or "fortified milk" must contain specified levels of specified nutrients.

In the past, fortification has been made in staple foods to combat deficiency diseases and to restore nutrients destroyed during processing and storage.

A misconception among some consumers is that addition of vitamins and minerals always makes a food superior to unfortified foods. In fact, adding nutrients already abundant in the diet provides no extra benefit, because the body uses only what it needs. There also can be too much of a good thing. Excessive amounts of some nutrients, such as vitamins A and D, or of trace elements, such as copper, zinc, molybdenum and selenium, can be toxic.

Is fortifying food tampering with nature? Some critics say it is. They maintain that nutrients synthesized in the laboratory and added during processing are inferior to those present naturally in food. Actually, each vitamin, mineral or amino acid has a specific molecular structure that is the same whatever the origin of the compound. The body cannot distinguish be-

tween a vitamin that occurs naturally in a plant or animal product and the same compound created in a laboratory.

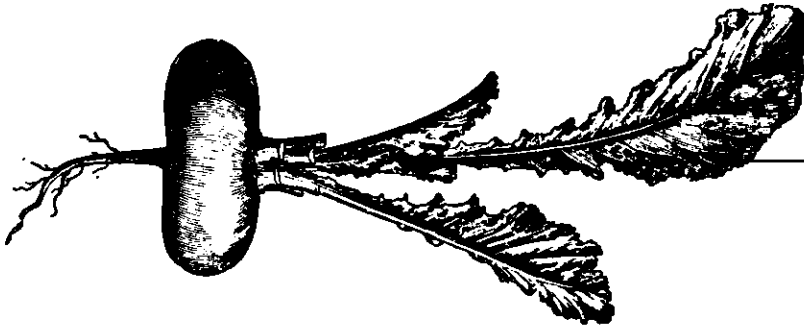
Additives That Maintain Freshness

Basically, there are two ways that foods can "go bad." The first, and potentially most serious, is spoilage caused by molds, bacteria, fungi and yeasts. Bacterial contamination of food can cause distressing digestive disorder, as well as deadly botulism.

Over the years, a number of common substances have been used to protect foods from microbial action. The oldest is salt, probably used before recorded history, to preserve meat and fish. Sugar has long been used in jams and jellies and to help preserve canned and frozen fruits. Today, such chemicals as sodium propionate and potassium sorbate are used to extend the shelf life of breads, cheeses, syrups, cakes, beverages, mayonnaise and margarine.

The second, and less serious, way that food can "go bad" is the undesirable change in color and flavor that occurs with the exposure of foods to oxygen. The resulting oxidation is what causes fresh sliced apples or peaches to turn brown or butter to turn rancid after being exposed to air for varying lengths of time. A group of preservatives known as anti-oxidants retard oxidation by scavenging oxygen on the surface of the food. These preservatives are not necessarily exotic chemicals. Vitamin C and vitamin E are among the 27 compounds added to foods as anti-oxidants. Even the lemon juice that Mom squeezes on sliced apples to keep them from turning dark is technically an anti-oxidant.

Commercially, two of the most widely used anti-oxidants are BHT (butylated hydroxytoluene) and BHA (butylated hydroxyanisole), which pre-



vent rancidity in such foods as baked goods, cereals, snack foods and instant potatoes. These chemicals may be used singly or in combination.

Additives To Make Food Appealing

Some additives are put into foods simply to make them more appealing.

Coloring agents, for instance, contribute nothing to nutrition, taste, safety or ease of processing. And some consumer advocates argue that food is often made to look more appetizing at the risk of increasing health hazards.

Today food colors are used in virtually all processed foods. While their use is not restricted, per se, they cannot be used in unnecessary amounts or to cover up unwholesome products. Artificial colors must be listed as ingredients in all foods except butter, ice cream and cheese.

There are 33 colors currently permitted for use in food. Nearly half of them are synthetic colors, which are created in laboratories. The man-made colors find the widest use because they are stronger than natural colors and thus can be used by manufacturers in smaller quantities and at less cost.

The two most widely used food colors now are Red No. 40 and Yellow No. 5, and both are under fire because of reports of possible health risks. Red No. 40 is suspected of causing premature malignant lymph tumors when fed in large amounts to mice. In 1977, the Health Research Group petitioned FDA to prohibit its use along with several other colors. FDA denied the petition, but tabled a final decision on Red No. 40 pending further study. A scientific group reported to FDA in October of 1981 that the color is safe for use in food and drugs.

The problem with Yellow No. 5 is that it causes allergic reactions—mainly

rashes and sniffles—in an estimated 50,000 to 90,000 Americans. The reactions are usually minor but in some instances can be life threatening. Because of its relatively narrow effect, FDA has required manufacturers to list Yellow No. 5 on the labels of any food products containing it.

Some 1,700 natural and synthetic substances are used to flavor foods, making flavors the largest single category of food additives.

Flavors are listed on food labels in general terms, such as "artificial flavoring" or "spices." If a product contains any added flavoring, either natural or synthetic, that fact must be noted on the label. For example, a label that says "strawberry yogurt" means that the product contains all natural strawberry flavor. "Strawberry-flavored yogurt" indicates that it contains natural strawberry flavor plus other natural flavorings. "Artificially flavored strawberry yogurt" means that it contains only artificial flavorings or a combination of artificial and natural flavors.

Flavors have come under less criticism than colors, perhaps because they serve a more direct purpose in foods. Still, some consumer groups question the necessity of using artificial flavors. FDA scientists maintain that anyone sensitive to artificial flavors would be likely to react to natural ones as well because of the chemical similarities.

Flavor enhancers magnify or modify the flavor of foods and yet do not contribute any flavor of their own. Some of them work by temporarily deadening certain nerves—those responsible for perception of bitterness, for example—thereby increasing the perception of other tastes.

The best known flavor enhancer is the amino acid, monosodium glutamate

(MSG), widely used in restaurants and in prepared foods. Scientists are not sure exactly how it works, but suspect that it increases the nerve impulses responsible for perception of flavors. Several years ago, public pressure persuaded manufacturers to stop using MSG in baby foods after studies showed that large amounts had destroyed brain cells in young mice.

MSG also produces the so-called "Chinese restaurant syndrome," which causes some people to have a burning sensation in the neck and forearms, tightness in the chest, and headache after they consume the relatively large amounts of MSG often used in food served in Chinese-style restaurants.

Though technically flavors, sweeteners are among the most commonly known food additives. Who has not heard of saccharin?

Sweeteners are classified as nutritive and non-nutritive. The nutritive ones, metabolized by the body to produce energy, include the natural sugars such as sucrose (common table sugar), glucose and fructose, as well as sugar alcohols, such as sorbitol and mannitol. Non-nutritive sweeteners, which are not metabolized and therefore contribute no calories to the diet, include cyclamate, which is currently prohibited from use in food, and saccharin.

The sugar alcohols, chemical variants of natural sugars, have been around for decades but have been promoted in recent years as "low-cal" alternatives to sugar and as less likely to cause tooth decay. Foods containing these sweeteners are not truly low-calorie. Nor can they be considered completely "free" foods for diabetics, as they can and do lead to the production of some blood sugar. An FDA regulation effective July 1, 1980, requires manufacturers to state on labels that because

they are using these non-sugar sweeteners it does not mean the product is "low-cal" or "reduced calorie."

Additives Used in Preparing and Processing Foods

The final category of food additives consists of those used in the preparation and processing of foods. These additives are used by manufacturers to get desired effects during processing and beyond. To the consumer, the additives give the food some of the characteristics that are associated with the products.

The functions of these additives are many. Some cause baked goods to rise. Others prevent ice crystals from forming in ice cream and keep peanut butter from separating into oily and dry layers. Because of such additives, shredded coconut stays fresh and moist in the can.

There are seven major groups of additives that are considered aids in processing or preparation of foods.

Emulsifiers (*Mixers*)

Some liquids don't mix unless there is an emulsifier around. In salad dressing, for example, oil and vinegar normally separate as soon as mixing stops. When an emulsifier is added, the ingredients stay mixed longer.

Many emulsifiers come from natural sources. Lecithin, naturally present in milk, keeps fat and water together. Egg yolks, which also contain lecithin, improve the texture of ice cream and mayonnaise. The mono- and diglycerides come from vegetables or animal tallow and make bread soft, improve the stability of margarine, and

prevent the oil and peanuts in peanut butter from separating.

Stabilizers and Thickeners

These compounds "improve" the appearance of foods and the way it feels in the mouth by producing a uniform texture. They work by absorbing water. Without stabilizers and thickeners, ice crystals would form in ice cream and other frozen desserts and particles of chocolate would settle out of chocolate milk.

Stabilizers also are used to prevent evaporation and deterioration of the volatile flavor oils used in cakes, pudding and gelatin mixes.

Most stabilizers and thickeners are natural carbohydrates. Gelatin—made from animal bones, hooves and other parts—and pectin—from citrus rind—are used in home and commercial food processing. Extra pectin, for example, is added to thicken jams and jellies.

pH Control Agents

These affect the texture, taste and safety of foods by controlling acidity or alkalinity. Acids, for example, give a tart taste to such foods as soft drinks, sherbets and cheese spreads. A more important use is to insure the safety of low-acid canned foods, such as beets.

Alkalizers alter the texture and flavor of many foods, including chocolate. After cocoa beans are picked, they are allowed to dry and ferment before they are made into chocolate. During processing, alkalizers are sometimes added to neutralize the acids produced during fermentation and to provide a

darker, richer color and milder flavor in the finished product.

Leavening Agents

Although air and steam help create a light texture in bread and cake, carbon dioxide is the key to making baked goods rise properly. Without leavening agents that produce or stimulate production of carbon dioxide, we would not have light, soft baked goods.

Maturing and Bleaching Agents

Maturing and bleaching agents are used primarily to get flour ready for baking because natural pigments give freshly milled flour a yellowish color. Flour also lacks the qualities necessary to make a stable, elastic dough. When aged for several months, it gradually whitens and matures to become useful for baking.

Anti-caking Agents

Compounds such as calcium silicate, iron ammonium citrate and silicon dioxide are used to keep table salt, baking powder, confectioner's sugar and other powdered food ingredients free flowing. By absorbing moisture, these chemicals prevent caking, lumping and clustering that would make powdered or crystalline products inconvenient to use.

Humectants

Humectants are substances that retain moisture in shredded coconut, marshmallows, soft candies and other confections. One of the most common is glycerine. The sweetener sorbitol also is used for this purpose.

REVISED FEBRUARY 1982

HHS Publication No. (FDA) 82-2160

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HUMAN SERVICES
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