

Food Additives



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Suite 301
641 W. Lake Street
Chicago, IL 60661

800.634.4941
800.998.0854

info@learningseed.com

www.learningseed.com

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Food Additives

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The Video

Executive Producer: [Jeff Schrank](#)
Writer: [Jeff Schrank](#)
Producer: [Jeff Schrank](#)
Director: [Jeff Schrank](#)
Editor: [Jeff Schrank](#)
Narrator: [Anne Gallagher](#)

This Teaching Guide

Compilation: Gabriel Mckee
Copy Editor: Jennifer Smith

Learning Seed Catalog and ISBN Numbers

VHS LS-1206-08-VHS ISBN 1-55740-511-5
DVD LS-1206-08-DVD ISBN 1-55740-510-7

Closed Captioning

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Learning Seed
800.634.4941
info@learningseed.com

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Summary

Eating is a risky business. Do you know all the chemicals that are in that muffin you had for breakfast or that instant soup for lunch? Are some of these chemicals a threat to your health? Why do foods contain such long lists of unpronounceable chemical agents?

Food Additives sides neither with the poisons-in-your-pantry doomsayers nor those who proclaim the wonders of modern food technology. Instead, it presents an undistorted picture of our current food supply.

The 24-minute program explains food additives, why they are used, and how the intelligent eater should treat them.

Here are some questions explored in the video:

- What are the most common food additives?
- Why do foods contain so many additives?
- Which additives prevent disease and promote good health?
- What's the difference between natural and artificial colorings and flavorings?
- How is a cook like a chemist?
- Should we be worried about the health risks of preservatives?
- What is the best way to avoid needless additives in your daily diet?

Food And Chemicals

If you've ever looked at the list of ingredients on an everyday food item, you've probably noticed that our foods contain a large number of additives. A boxed rice dish may contain monosodium glutamate and lecithin. Your box of breakfast cereal may include calcium caseinate or BHT. Even staple items like milk and table salt can include additives. What do those chemical names mean, and why are they added to our food?

One key reason for food additives is convenience. Buying pre-made foods is far easier and less time-consuming than making your own meals from scratch. Making your own whipped cream takes time, patience, skill, and knowledge, and the result of the labor will spoil quickly. A survey in the 1960s showed that cooks wanted a topping that came already whipped, kept for weeks, had fewer calories, and could be frozen for re-use. Food technologists used a variety of chemicals to create whipped toppings to meet these demands. The result is a mixture made with elaborately-named ingredients and chemicals like polysorbate 60, sodium caseinate, and xanthan gum. Homemade whipped cream may taste better, but it can't match the convenience of ready-made topping that food additives make possible.

But why do we need additives in our food? In plain English, the basic ingredients in an artificial whipped topping are water, sweetener, oil, and gums. But a mix of just these ingredients wouldn't be whipped topping. Water and oil don't naturally mix—oil is lighter than water, so it separates to the top. Whipped topping is an emulsion, a substance in which oil and water remain mixed, so it needs an **emulsifier** to keep the oil from separating. That's where **polysorbate 60** comes in: it is a common emulsifier that's used in a wide variety of items, from shaving cream to insect repellent.

Other additives in an artificial topping help to give it a texture similar to that of real whipped cream. **Sodium caseinate** is added to the mixture to give it a better texture or "mouthfeel." It's used in a wide variety of foods from ice cream to lunch meat. Sodium caseinate has a technical-sounding name and is produced in factories, but it's derived from milk protein. The two gums in the whipped topping—**xanthan gum** and **guar gum**—are also added to improve the texture of the mixture, thickening it and giving it more body. Xanthan gum is made from the action of microorganisms on sugar, and guar gum comes from plants similar to soybeans.

Food additives may sound like the products of a chemical factory, but there's no reason to be afraid of chemicals in our food. Cooking is chemistry in action. Food is chemically complex, and a chef mixes ingredients in order to create chemical reactions between them, just like a scientist mixing polymers in a laboratory. Everything we eat is made of chemicals. The main difference between a chemist and a chef is the type of language they use: what a chef calls sugar, a chemist might call a disaccharide. In fact, of the 150 pounds the average person eats in a year, 147 pounds of them are varying forms of sugar and salt. Just because something has a chemical name doesn't mean it's harmful.

By the same token, just because a food additive has a simple name doesn't mean it's entirely risk-free. Too much salt can contribute to high blood pressure in some people. Nutrition experts recommend that we eat no more than 2,300 milligrams of sodium a day—about a teaspoon of salt. Most diets provide over four times that much, but the sources of that sodium can be surprising. Two slices of white bread have about 270 milligrams—about the same amount as in a one and a half ounce bag of potato chips. An ounce of corn flakes has more sodium than an ounce of salted peanuts, even though the nuts taste saltier.

The most common food additives are sugar and other sweeteners, which can contribute to obesity and tooth decay. Most sugar-related health problems stem from quantity. Nutritionists recommend that no more than 6% of our daily calories come from sugars, but the typical diet can have 12% or more, and the average North American eats 156 pounds of sugar a year. One third of those added sugars come from soft drinks. Some of the most common food additives can contribute to health problems, but many additives actually prevent disease.

Food Additives And Good Health

Food additives that prevent disease

What food additives promote good health? Iodine has been added to table salt since 1924. The mineral iodine is necessary to good health, and is normally present in our food. A lack of iodine can lead to a thyroid enlargement disease called goiter. The soil in some areas, especially around the Great Lakes, lacks natural iodine, and in the 1920s over a third of all children in some Great Lakes counties suffered from enlarged thyroids. A tiny amount of **potassium iodide** was added to table salt in 1924 in an effort to combat goiter. Within five years goiter dropped to 9%, and by 1952 to only 1.4%. Salt is still iodized today, and goiter has become rare.

Iodine isn't the only chemical added to food to prevent disease. Starting in the 1930s, vitamin D was added to milk to prevent the bone disease rickets. Vitamin A, which is essential for bone growth, prevention of disease, and eye and skin health, is added to margarine so that it has the same amount as butter.

Originally, flour was made by grinding grain between stones, but whole wheat ground in this manner spoils quickly. Modern white flour keeps for longer, and the mills of today can produce over a hundred tons of white flour a day. But the milling process loses parts of about 22 ingredients, including three B vitamins (thiamin, riboflavin, and niacin), iron, and **folic acid**. These ingredients are put back into white flour as additives, and the result is called "enriched flour." Flour enrichment began during World War II, which caused disruptions that decreased the quality of the average diet. The government chose to put these nutritious additives in flour because it is a staple food consumed by almost everyone. The additives prevent vitamin and mineral deficiency diseases like pellagra and beriberi. Most white flour is still enriched today, and as a result most people have never even heard of the diseases that enrichment prevents. Since 1998, folic acid (folate) has also been added to reduce the number of children born with neural tube defects like spina bifida.

Other foods have added vitamins that don't prevent specific diseases, but promote general good health. **Sterols** are a family of fat-like substances found naturally in vegetables, fruit, nuts, and grains that help lower cholesterol and reduce the risk of heart disease. Sterols are added to some margarines. Many breakfast cereals are enriched with vitamins and minerals—some cereals have the equivalent of a multi-vitamin pill in each serving. **Calcium**, which is essential for healthy bones, is added to some orange juices. Some cookies and candy bars have added vitamins and minerals. These are often called "energy" or "power" bars, but many are still basically candy with a new name.

Food additives that keep food fresh

All foods will eventually spoil if they aren't eaten. Historically, famines have often been caused by food spoiling between harvests or during transportation. In fact, many common foods were developed as ways to extend the life of fast-spoiling foods. Cheese was most likely invented as a way of preserving milk. Cured meats like ham, bacon, and sausage keep longer than uncured meat, enabling it to survive long journeys or last through the winter. Pickling keeps vegetables from going bad, and adding sugar to fruit keeps it fresh. In fact, we still call sugared fruit "preserves." Even alcoholic beverages are a form of preserved food—beer is basically fermented wheat, and wine is fermented grapes.

Today we still want our food to stay fresh for as long as possible. Bread used to become stale and moldy within a few days, but today bread contains **preservatives** such as **calcium propionate** to keep them fresh longer. Calcium propionate is a chemical, but it occurs naturally in many foods and dairy products. In lab tests, scientists fed rats the chemical at up to 4% of their total diet for a whole year with no ill effects. **BHA** and **BHT** are common preservatives in foods with fats and oils, like potato chips and crackers. They're **antioxidants**—chemicals that prevent damage from oxygen (oxidation). All of these chemicals have the same purpose—keeping our food from spoiling.

Food Additives For Convenience And Enjoyment

Making eating easier

In its simplest form, peanut butter is just ground peanuts. But over time the oil and solids in this ground mixture will separate, leaving a layer of oil on top and a gummy mess at the bottom. It must be stirred to mix the two back together before it can be used. **Partially hydrogenated palm oil** keeps the oil and butter from separating, making it far more convenient for the consumer. There's a cost to this convenience—the palm oil adds trans fats to the peanut butter. Consumers need to make a choice about what they eat: those who prefer convenience will have more additives, and those who put nutrition first may prefer an additive-free peanut butter that needs to be stirred.

Many foods have additives to make them easier to use in the kitchen. In humid weather, table salt and other powders will often clump together and won't pour. Additives like **calcium silicate** or **sodium silicoaluminate** prevent this clumping to keep the salt flowing. Other additives called **humectants** do the opposite, keeping foods from drying out too fast. **Propylene glycol** is used in shredded coconut, semi-moist dog food, and some skin creams and lotions to keep them from drying out, and some beers use it to produce a foamy head. This chemical is an antifreeze, and it's also used to create artificial smoke or fog. But it's not dangerous, and the FDA has deemed it safe to use in foods.

Improving food's flavor

Improving the taste of food is a major reason for including additives—there are over 1,700 additives that are used to improve or change our food's flavor. Your taste buds can only distinguish basic tastes (sweet, sour, bitter, and salty). Much of what we consider flavor is actually the smell of vapors released by chemicals in your mouth. Your nose is enormously sensitive to these chemical vapors—it can detect aromas in quantities of a few parts per trillion. By comparison, the best machines for detecting aromas, gas chromatographs, can detect aromas as low as one part per billion. Your nose is over a million times as sensitive as our best machines. If a single drop of the chemical that produces the flavor of a pepper were put into a triple-size Olympic swimming pool, you would be able to detect it.

Flavor additives can be either natural or artificial. **Natural flavors** come from plants or animals, but they're still highly processed and produced in factories. **Artificial flavors** are chemical mixtures that imitate flavors found in nature. They're synthetic, but they're cheaper to produce than natural flavorings and are more consistent in taste. Artificial flavors are especially useful in imitating the taste of fruit. Most frozen blueberry waffles don't contain any real blueberries; they'd be much more expensive if they did. Many children first learn the taste of strawberries, blueberries, and other fruits from their artificial imitators.

Artificial flavors are often the same chemicals as those found in nature, but produced by different techniques. The main chemical in banana flavor is **amyl acetate**. It can be distilled from actual bananas, but it can also be made by mixing vinegar with amyl alcohol and adding a catalyst. It's natural flavoring if it comes from real bananas and artificial flavoring if it's mixed from chemicals, but the amyl acetate itself has the same taste and smell. It might take tons of bananas to produce a few gallons of the flavoring, so it's much cheaper to create it artificially. Still, many consumers prefer food that's labeled as "all natural."

The smoked flavor in some meats and barbecue sauces is produced by capturing the smoke released by burning sawdust. The smoke is turned into a liquid using a solvent and then added to foods to reproduce the flavor of food cooked over a smoky fire.

Improving food's texture

Many of the foods listed above, including beer, ice cream, and diet soda, contain a boiled seaweed extract called **carrageenan**. This ingredient is a stabilizer and thickener that absorbs water and gives body to foods that might otherwise be watery and thin. This thickening improves what food technologists call “mouthfeel,” the overall interaction of a food with the mouth.

Gums like xanthan and guar gum are used to make liquids more syrupy. A good example of a food that benefits from gums is pancake syrup, which primarily consists of water and sugar. Without gums to make it more viscous, pancake syrup would pour like water. **Lecithin** is another texture-improving additive that's used in a wide variety of foods. The word comes from the Greek word for egg yolk—an egg yolk is about 9% lecithin—but today soy beans are the source of most of our lecithin. It helps foods that contain oils to stay fresh for longer, but it also works as an emulsifier, and is sometimes sold as a nutritional supplement.

Improving food's appearance

Consumers won't buy food that doesn't “look right.” Many additives are included in foods to make them more visually appealing. For instance, anything lime-flavored should be green, and margarine is expected to be yellow, like butter. The orange color of wild caught salmon comes from orange-colored algae in the fish's diet. Farm-raised salmon doesn't eat this algae, so their color remains white like other fish. Market research has shown that consumer's won't buy white salmon because they think that it won't taste right. Making foods the right color often means using natural or artificial colorings. Farmed salmon is colored with an orange food coloring called **carotene**—the same chemical that gives carrots their orange color. It's also sold in health food stores as a dietary supplement.

One common food coloring is **caramel color**, which is used to add brown coloring to sodas, bread, baked goods, and microwave entrees. This coloring is made by heating sugar or other carbs, and for years caramel color was known as “burnt sugar color.” It's even used to give a golden color to french fries, which are dipped in a sugar solution.

Consumers expect many foods to be bright white, including anything with the words “vanilla” or “cream” on the label. White cake frosting and whipped toppings often come from additives like the mineral **titanium dioxide**. In addition to light-colored foods, this coloring is used in house paint, toothpaste, cosmetics, pills, candies, and tattoo ink.

The bright red color of cherry or strawberry-flavored foods, especially yogurt and candies, often comes from **cochineal extract** or **carmine coloring**. This coloring comes from beetles that live on cactus plants in Peru and the Canary Islands. It takes as many as 70,000 beetles to make one pound of coloring.

Some food colorings are made from plants. **Annatto**, which is found in many kinds of margarine, is a reddish-orange dye made from the seeds of a tropical tree. **Chlorella** is a green color derived from algae, and **betanin**, a red coloring found in strawberry ice cream, is the pigment that makes beets red.

A century ago nearly 100 man-made colorings were used in foods, but today only nine artificial colors are allowed by the FDA. These synthetic colors are stronger than natural ones, so less volume of them is required. They're also more consistent, have no impact on the food's flavor, and cost less than natural colorings. Manufacturers of artificial colorings must submit samples from every batch to the FDA for testing.

Natural And Chemical: What's The Difference?

Industrial additives

A common misconception about food additives and chemicals in general is that there are a few good, natural ones that we can eat and lots of bad, toxic ones that are used in industry. But there are a surprising number of both chemicals and natural ingredients that are used in both food and industry. You probably wouldn't eat shoe polish, but you certainly would eat one of its major ingredients: corn. Corn isn't just a food - it's also an additive that's used in paint, kitchen flooring, textiles, plastics, cosmetics, and aspirin.

But some industrial ingredients turn up in food, too. **Shellac**, the shiny, sticky chemical that's used as a primer on wood, is also used as a glaze on pills and candy. It's the secretion of an insect found mainly in Thailand, and when used on food it's called confectioner's glaze. Shellac made for wood isn't a food, but the same chemical has applications in the kitchen. **Carnauba wax**, which is produced by the leaves of a tropical tree, is another item that's used in both food and industry. It's a major ingredient in car wax, but it's also sprayed on some fruits to give them an appealing shine. It's also an ingredient in lipstick and cosmetics and is used to coat pills.

To add or not to add?

There are many foods on the market that don't use additives. Compare, for example, two brands of ice cream. Brand A uses additives and Brand B does not. Brand A has some texture-enhancing ingredients that give it a smoother mouthfeel, and some artificial colorings that make it look more appealing. Brand A also has more air mixed in so that it weighs less by volume than Brand B. Brand B, the more "natural" ice cream, is more expensive.

For another example, compare two brands of bread. Brand A has stabilizers and dough softeners that give it a pleasing, uniform softness. Preservatives give it a longer shelf life, so the factory where it's baked can ship it by truck to your store and other stores hundreds or even thousands of miles away. This factory turns out thousands of loaves a minute. Brand B is made at a local bakery that makes only hundreds of loaves a day. It has no preservatives, so it needs to be eaten soon after baking. Its main ingredient is whole wheat flour rather than the processed white flour of Brand A. Brand A will stay fresher longer than Brand B. Like the "natural" ice cream, Brand B is more expensive.

In both of these cases, we see that the cheaper brand is also the more convenient. But both the lower price and the ease of use of foods made with additives come at a price. Additives are carefully tested, but they have some risks. Natural foods can be unhealthy too, but the additives in convenience foods may mean added sugar, salt, fat, and calories, all of which can have a negative impact on health. It's healthier to eat fresh fruits and vegetables, whole grains, and unprocessed meats. Convenience foods make sense, but sometimes that convenience may not be worth the price. Is slicing your own cheese such a burden?

At the same time, it's important not to assume that all chemicals and additives are toxic or dangerous. Those who argue against the use of any additives may just be appealing to fear to get consumers to buy alternative foods and supplements that are often more expensive. Convenience is important to many consumers, and the ability to keep foods for longer periods of time and to prepare foods quickly and easily is a valuable thing. As long as convenience is something that consumers look for in their food, additives will be necessary to make it possible.

Review

- We eat about 150 pounds of food additives every year on average, of which 147 pounds are salts and sweeteners.
- The main reasons that additives are used in food are keeping food fresh, making it more convenient, preventing disease, promoting good health, and improving food's flavor, texture, and appearance.
- Additives that prevent specific diseases include potassium iodide in salt, which helps prevent goiter.
- Foods like enriched white flour contain vitamins and minerals that promote general good health.
- Preservatives like calcium propionate and BHT help to keep food from spoiling quickly.
- Additives like partially hydrogenated palm oil in peanut butter or calcium silicate in salt make using those foods more convenient for the consumer.
- Natural flavorings come from plants or animals, but are still heavily processed in factories. Artificial colorings and flavors are mixed from chemicals, but in many cases the actual chemicals are the same, regardless of whether the source is natural or artificial.
- Stabilizers, thickeners, and emulsifiers improve food's texture or "mouthfeel."
- Consumers expect some products to be certain colors. Artificial and natural colorings give foods a more appealing appearance.
- Many chemicals, such as shellac and carnauba wax, have both industrial and culinary applications, and foods like corn can also be used in non-edible products such as paint and shoe polish.
- Some all-natural foods are healthier than their additive-heavy counterparts, but there's no reason to fear additives in general. All additives are carefully regulated and tested by the FDA.

Questions For Discussion

1. What are the main reasons for putting additives in our food?

The main reasons that additives are used in food are keeping food fresh, making it more convenient, preventing disease, promoting good health, and improving food's flavor, texture, and appearance.

2. Are food additives good or bad for your health? Why?

Some additives, like salt and sugar, can contribute to health problems. But additives are carefully regulated by the FDA, and many, like the vitamins in enriched flour, promote good health. Foods with additives are not always as healthy as all-natural foods, but there's no reason to fear additives in general.

3. One important reason for putting additives in food is increasing convenience. But how much convenience is necessary? (As the video says, is slicing your own cheese really that much of a burden?) Discuss the trade-off between convenience foods and natural foods.

Convenience is an important factor in many consumers' choice of what foods to buy. But health and nutrition are also a major factor. In many cases, like with peanut butter, there is a trade-off between convenience and health.

4. The video makes the claim that many artificial flavorings are no different from their natural counterparts. The amyl acetate that gives bananas their flavor is the same chemical as that produced from chemicals in a lab. Do you agree with this? Is there a difference between natural and artificial flavorings?

5. Discuss the ways in which cooking is a form of chemistry.

Cooks, like chemists, create chemical reactions by combining ingredients, raising or lowering temperatures, and mixing and blending different items together. Preparing food means creating chemical reactions, and we call these reactions "cooking."

6. Should we avoid foods that contain additives? Why or why not?

Suggested Activities

1. Have each student bring an ingredient list from a food to class. Each list should be for a single food, not a frozen meal or group of foods. Explore each item on your ingredient list. Explain why it is in the food and where it comes from. Use the online and print resources in this guide's bibliography to research additives not mentioned in the video.
2. Host a debate about the risks and benefits of food additives. Possible points to discuss in the debate include the dangers of food spoilage, the cancer risks of some additives, and the concept of "convenience food."
3. The video suggests that consumers who want to avoid needless additives should carefully read food labels and ingredient lists. It also suggests that a shorter ingredient list is sometimes a clue to quality. Pick a common food—ice cream, bread, waffles, soup, etc. Find two brands of the food—one with only the basic ingredients and the other with a long list of additives. Compare the two brands for nutritional value, price, and taste.
4. Have students volunteer to try a diet that avoids all additives for a week and report on their experience.
5. As an example of food preservation in action, use vinegar and spices to pickle cucumbers. Put a raw cucumber in a refrigerator and have students compare and contrast the texture and appearance of the pickled and raw cucumbers after a week. Try the same thing with strawberry or raspberry preserves.

Food Additives

Fill-In-The-Blank

Fill in the blanks with the correct words from the bank at the bottom of the page.

What are the main reasons that additives are used in our foods? One of the main purposes of additives is to keep food from _____. _____ keep our food fresh for longer periods of time, allowing us more time to eat it before it goes bad. Other additives prevent diseases. Potassium iodide is added to _____ to combat goiter, a condition in which the thyroid gland becomes enlarged. Some additives, like the vitamins and minerals in _____ white flour, don't combat specific health problems, but promote good health in general. Other additives make using foods more convenient. Without _____ palm oil, peanut butter would separate into oil and ground peanut meat, and would need to be stirred before use. Giving food a better texture or _____ is another main reason for using additives. _____, stabilizers, and thickeners give food more body, and _____ keep oil and water mixed together. Many additives improve food's flavor and appearance. _____ and _____ flavorings and colorings are often the same chemicals, but are produced in different ways. The main reason for all of these kinds of additives is to increase the overall _____ of eating.

Word Bank:

mouthfeel

natural

table salt

convenience

spoiling

artificial

emulsifiers

gums

preservatives

partially hydrogenated

enriched

Food Additives

Fill-In-The-Blank Answer Key

Fill in the blanks with the correct words from the bank at the bottom of the page.

What are the main reasons that additives are used in our foods? One of the main purposes of additives is to keep food from **spoiling**. **Preservatives** keep our food fresh for longer periods of time, allowing us more time to eat it before it goes bad. Other additives prevent diseases. Potassium iodide is added to **table salt** to combat goiter, a condition in which the thyroid gland becomes enlarged. Some additives, like the vitamins and minerals in **enriched** white flour, don't combat specific health problems, but promote good health in general. Other additives make using foods more convenient. Without **partially hydrogenated** palm oil, peanut butter would separate into oil and ground peanut meat, and would need to be stirred before use. Giving food a better texture or **mouthfeel** is another main reason for using additives. **Gums**, stabilizers, and thickeners give food more body, and **emulsifiers** keep oil and water mixed together. Many additives improve food's flavor and appearance. **Natural/artificial** and **artificial/natural** flavorings and colorings are often the same chemicals, but are produced in different ways. The main reason for all of these kinds of additives is to increase the overall **convenience** of eating.

Food Additives

Multiple Choice Worksheet

Circle the best available answer for each of the following:

- 1) An additive that keeps moist foods from drying out is called a:
 - a) preservative
 - b) stabilizer
 - c) humectant
 - d) emulsifier
- 2) Of the 150 pounds of food additives we eat every year, 147 pounds are:
 - a) salts and sweeteners
 - b) artificial colorings
 - c) emulsifiers
 - d) natural flavorings
- 3) White flour that has missing vitamins and minerals added back in is called _____ flour.
 - a) enriched
 - b) all-natural
 - c) fortified
 - d) whole wheat
- 4) Much of what we consider flavor is actually detected by:
 - a) the nose
 - b) the tongue
 - c) the eyes
 - d) the stomach
- 5) Ice cream with no additives is likely to _____ than ice cream with additives.
 - a) have more added colorings
 - b) weigh less
 - c) cost less
 - d) cost more
- 6) Emulsifiers are used to do what?
 - a) enhance "mouthfeel"
 - b) keep oil and water mixed
 - c) add brown or golden coloring
 - d) prevent food from spoiling
- 7) What additive in salt prevents the thyroid condition known as goiter?
 - a) sodium caseinate
 - b) titanium oxide
 - c) cochineal extract
 - d) potassium iodine
- 8) Natural flavorings are processed in:
 - a) farms
 - b) factories
 - c) India
 - d) laboratories
- 9) Which food item is used as an additive in shoe polish?
 - a) amyl acetate
 - b) shellac
 - c) corn
 - d) sugar
- 10) Which of the following is *not* a reason that additives are put into food?
 - a) promoting good health
 - b) increasing cost
 - c) improving texture and flavor
 - d) making food more convenient

Food Additives

Multiple Choice Worksheet Answer Key

Circle the best available answer for each of the following:

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 - c) cost less
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 - c) add brown or golden coloring
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- 7) What additive in salt prevents the thyroid condition known as goiter?
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 - c) cochineal extract
 - d) potassium iodide**

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 - a) farms
 - b) factories**
 - c) India
 - d) laboratories

- 9) Which food item is used as an additive in shoe polish?
 - a) amyl acetate
 - b) shellac
 - c) corn**
 - d) sugar

- 10) Which of the following is *not* a reason that additives are put into food?
 - a) promoting good health
 - b) increasing cost**
 - c) improving texture and flavor
 - d) making food more convenient

Food Additives Quiz

Match the words in the first column to the best available answer in the second column.

- | | | |
|-------|--|-----------------------|
| _____ | A family of fat-like substances that prevents heart disease. Often added to margarine. | 1) shellac |
| _____ | An additive in salt that prevents goiter, a thyroid enlargement disease. | 2) calcium silicate |
| _____ | The overall interaction of a food with the mouth. | 3) mouthfeel |
| _____ | Also known as confectioner's glaze, this material is often used as a shiny glaze on wood. | 4) sterols |
| _____ | "Preserves" are made by mixing fruit with this common household preservative. | 5) caramel coloring |
| _____ | These additives are derived from plants or animals, but are still produced in factories and heavily processed. | 6) potassium iodide |
| _____ | This brown coloring was once called "burnt sugar coloring." | 7) natural flavorings |
| _____ | This additive keeps salt from clumping in humid weather, making it more convenient for the consumer. | 8) sugar |

Food Additives

Quiz Answer Key

Match the words in the first column to the best available answer in the second column.

- | | |
|-----------------------|--|
| 4) sterols | A family of fat-like substances that prevents heart disease. Often added to margarine. |
| 6) potassium iodide | An additive in salt that prevents goiter, a thyroid enlargement disease. |
| 3) mouthfeel | The overall interaction of a food with the mouth. |
| 1) shellac | Also known as confectioner's glaze, this material is often used as a shiny glaze on wood. |
| 8) sugar | "Preserves" are made by mixing fruit with this common household preservative. |
| 7) natural flavorings | These additives are derived from plants or animals, but are still produced in factories and heavily processed. |
| 5) caramel coloring | This brown coloring was once called "burnt sugar coloring." |
| 2) calcium silicate | This additive keeps salt from clumping in humid weather, making it more convenient for the consumer. |

Glossary And Guide To Common Food Additives

Adipic acid	A chemical similar to one found naturally in beets. It resists humidity, so it is used to give a tart taste to beverages and candy.
Amyl acetate	One of the main chemicals that makes up the natural flavor of bananas. As a flavoring, the chemical can be distilled from bananas, but it can also be produced by mixing vinegar with amyl alcohol and adding a catalyst. However it's derived, the chemical itself is the same.
Annatto	A reddish-orange vegetable dye made from the seeds of the tropical "lipstick" tree. Commonly used to give butter and margarine the expected yellow color. Also used in meat casings, beverages, ice cream, cereals, and baked goods.
Antioxidants	Chemicals that prevents oxidation, or damage by oxygen. Preservatives like BHA and BHT are antioxidants, as are vitamins A, C, and E.
Artificial coloring, artificial flavoring	Colorings and flavorings that are mixed from chemicals in a factory or laboratory rather than produced from fruits, vegetables, or animals are called artificial. In many cases, the chemicals themselves are identical to their natural counterparts.
Ascorbic acid	This sounds like a scary chemical, but its everyday name is vitamin C. It is added as a nutrient or to preserve foods and prevent spoiling. One reason citrus fruits keep so long without spoiling is their natural ascorbic acid content.
Betanin	A red coloring derived from beets, betanin is commonly used in strawberry ice cream and fruit fillings.
Beta carotene	The natural coloring that makes carrots orange. The body converts beta carotene to vitamin A. Used as a food colorant and a nutritional supplement.
BHA/BHT	Abbreviations for Butylated Hydroxyanisole (BHA) and Butylated Hydroxytoluene (BHT), preservatives used to prevent oil from turning rancid. These common preservatives have a history of controversy. Most pre-1994 writing indicates some degree of caution because of a 1982 Japanese study showing it to cause cancer in lab animals. BHA/BHT are antioxidants like vitamins C and E. But to many people, the word "preservative" suggests junk food and chemical danger. Natural antioxidants like vitamins C and E are a common preservative in thousands of foods. Recent studies suggest that antioxidants such as BHA and BHT, in the amounts used in foods, may actually protect against cancer. The evidence is not conclusive, however, so don't assume these preservatives make your junk food healthier!
Caffeine	A drug that stimulates the central nervous system and increases heart rate. A 12 ounce can of cola typically has as much caffeine as two cups (six ounces each) of drip brewed coffee. As with many drugs, a smaller person is affected more than a larger person by the same dosage.
Calcium	An essential mineral for growth, calcium is often included as an additive in juices and breakfast cereals.
Calcium propionate	A chemical additive that's used as a preservative. Lab tests have shown it to be safe for use in foods—scientists fed it to rats at up to a 4% of their entire diet with no negative effects.

Calcium silicate	An additive that is used to keep salt from clumping in humid weather.
Calcium sulfate	Used as a dough conditioning and to help baked goods stay crispy. Found in baked goods, pudding, pretzels, chips, and snacks. Also known as plaster of paris.
Caramel color	A light brown or golden coloring made from toasted sugar. Caramel color used to be known as “burnt sugar color.”
Carmine coloring	(see Cochineal extract)
Carnauba wax	One of the main ingredients in car wax, carnauba wax is also used to give fruit an appealing shine. It also turns up in lipstick and other cosmetics, and is also used as a coating on pills.
Carotene	(see Beta carotene)
Carrageenan	A gel extracted from seaweed, Irish moss, and red algae. It absorbs water and prevents ice crystals from ruining the texture of ice cream and thickens many foods such as chocolate products. It is also an emulsifier, meaning it helps prevent fat and water mixtures from separating. Used in whipped toppings, salad dressings, syrup, puddings, and many milk products.
Caseinates	Casein is one of the proteins of milk. Caseinates are made from dried milk and improve thickness and texture in frozen desserts. Casein is milk solids, the liquid portion is whey. Common caseinates include sodium caseinate and calcium caseinate.
Cellulose	This is the main fiber in plants and trees. Used in foods to thicken, add bulk, stabilize, or add fiber. Most modern diets lack plant fiber.
Chlorella	A green coloring derived from algae.
Cochineal extract	Also known as carmine coloring, this red food coloring comes from beetles that live on cactus plants in Peru and the Canary Islands. It takes as many as 70,000 beetles to make one pound of coloring.
Corn syrup (corn sweetener, glucose, dextrose)	A simple sugar made from corn. As far as your body is concerned, sugar is sugar whether from cane, corn, or beets. Soft drinks were once sweetened with cane sugar, but today are more likely to contain high fructose corn sweetener.
Emulsifiers	Oil is lighter than water, so it normally floats to the top when the two are mixed together. An emulsion is a mixture in which oil and water stay mixed. Emulsifiers like polysorbate 60 and lecithin keeps the water and oil from separating in foods and other products that contain both water and oil, like whipped topping, baked goods, shaving cream and detergent.
Folic acid/folate	A type of B vitamin, folic acid is added to enriched white flour to promote good health. It's also believed to reduce the incidence of neural tube birth defects like spina bifida.
Guar gum	A vegetable gum made from the guar plant, often imported from India. It works as a stabilizer, emulsifier, and thickener.

- Gum Arabic** A sap like substance from the bark of the acacia tree, found mostly in Africa and the Middle East. We use millions of tons every year to thicken foods. It gives a pleasing mouthfeel to frozen desserts, prevents sugar crystals from forming in candy, and stabilizes the foam in beer.
- Humectants** Chemical additives that keep food from drying out too fast. Propylene glycol is one common humectant.
- Hydrogenated vegetable oil** Vegetable oil that has been hardened using hydrogen. A very common food additive in margarine and baked goods. The hardening makes the liquid oil more saturated. Most people eat too much saturated fat already and could benefit from avoiding this sometimes "hidden" fat. The hydrogenation produces what scientists call trans fatty acids.
- Lecithin/soy lecithin** Found naturally in most plants, animals and egg yolks. Most diets contain about an ounce of lecithin weekly. Lecithin is an antioxidant (it slows down spoilage). In some foods it's an emulsifier (helps keep oil and water mixed), and it's very common in chocolate products. The word comes from the Greek word for egg yolk—an egg yolk is about 9% lecithin.
- Modified food starch** Starch is a natural part of foods such as flour, potatoes, and corn. It is inexpensive and can absorb large amounts of water. Used to thicken foods such as soup or gravy. The starch is modified to keep an acceptable texture and prevent hardening.
- Mono- and diglycerides** A natural component of fat. Occurs in many foods and makes up about 1% of ordinary fat. Helps keep bread soft, prevents spoiling, keeps cake fluffy, prevents the oil in peanut butter from separating, and more.
- Monosodium glutamate (MSG)** Many people believe MSG is a laboratory concoction, but it occurs naturally in many living things from milk and meat to cheese. It occurs naturally in our bodies. It is a tasteless powder that magnifies existing flavors. It is sold in supermarkets as a flavor enhancer. MSG has a reputation for causing something called "Chinese restaurant syndrome." The syndrome includes headache, racing heart, tingling sensations, sweating and chest constriction. The so-called "hazardous" substance in MSG is glutamate, but it enters our system any time we eat meat, milk, corn, or whole wheat. There is more glutamic acid in fresh tomatoes and parmesan cheese than in any Chinese food sauce. The latest research finds this syndrome extremely rare and requiring about six times the amount of MSG normally consumed in food. The studies found MSG safe as a food additive and not linked to any other disease. Victims of severe, poorly controlled asthma might be susceptible to MSG.
- Natural coloring, natural flavoring** Colorings and flavorings that are derived from plants or animal products are called "natural." But don't take the name to mean more than it does—they're still produced in factories and highly processed.
- Partially Hydrogenated Vegetable Oil or Palm Oil** (see **Hydrogenated vegetable oil**)
- Pectin** A carbohydrate found in many fruits and vegetables. When fruit ripens, the pectin breaks down and causes the fruit to soften. Pectin is a gelling agent and helps thicken barbecue sauce, frosting, yogurt, and many other foods.

Polydextrose	Often used to substitute for sugar in diet foods, pudding, frozen desserts, baked goods, and more. Made from corn, it helps give "bulk" to food. It supplies only one calorie per gram instead of sugar's four and fat's nine.
Polysorbate 60 or 80	Emulsifiers that help keep oil dispersed in water. Polysorbate 60 helps keep flavor oils dissolved in candy, ice cream, and beverages. It acts to control foaming in some liquids. Made from corn, peanuts, or soy.
Potassium iodide	A mineral that is added to salt to prevent the development of goiter, a thyroid enlargement disease, in areas where the soil lacks natural iodine. Potassium iodide has been added to table salt since the 1920s, and the incidence of goiter has dropped dramatically as a result.
Preservatives	Any chemical that's added to food to keep it from spoiling is a preservative. This includes artificial chemicals, but many preservatives are naturally-occurring chemicals. Even common ingredients like sugar, salt, and vinegar can be preservatives—pickles and strawberry preserves are both examples of food that's been heavily treated with preservatives so that it lasts longer.
Propionic acid	Occurs naturally in apples, strawberries, and other foods, especially Swiss cheese. Prevents the growth of mold on baked goods and cheese. Also called calcium and sodium propionate.
Propylene glycol	A humectant used in shredded coconut and other foods to keep them from drying out. It's also used in some beers to give them a foamy head. Propylene glycol is an antifreeze that's also used to produce artificial smoke or fog, but don't be scared by those applications—the FDA has deemed it safe for use in foods.
Shellac	Best-known as a shiny, sticky substance used as a primer on wood, shellac can also be used as a glaze on pills and candies. In foods, it's often called confectioner's glaze.
Sodium caseinate	(see Caseinates)
Sodium nitrite/nitrate	Gives that pinkish color to hot dogs, ham, lunch meat, and other meats. Helps prevent botulism. Nitrite combines with stomach fluid to create nitrosamine, a cancer-causing agent. Reading labels can help you avoid nitrites and nitrates.
Sodium silicoaluminate	A chemical that prevents the formation of clumps in salt, detergents, and other powders.
Sterols	A family of fat-like substances found naturally in vegetables, fruit, nuts, and grains that help lower cholesterol and reduce the risk of heart disease. Sterols are commonly found in margarine.
Sucrose	Also known as table sugar. Sugar is found in all plants. Table sugar from sugar cane is made of fructose and glucose. The average person eats over 100 pounds a year of sucrose. Sucrose plays a role in tooth decay and adds calories without other nutrients.
Titanium dioxide	A mineral that is used as a food coloring. Titanium dioxide can make cake frostings and whipped toppings bright white, and it's also used in paints, toothpaste, and tattoo ink.
Xanthan gum	A gum commonly used as a thickener in foods from tomato sauce to ice cream. It's produced by the action of microorganisms on sugar.

For More Information...

Online resources

Center for Science in the Public Interest: CSPI's Food Safety: <http://www.cspinet.org/reports/chemcuisine.htm>

If you're concerned about the safety of additives in food, look at CSPI's page on the potential health risks of some additives.

NutritionData Food Additive Identifier: <http://www.nutritiondata.com/topics/food-additives>

NutritionData offers a simple list identifying the purpose of hundreds of food additives. It doesn't identify the sources of the additives listed, but it does offer a helpful glossary of food additive categories.

The Straightforward Food Additives Guide: http://www.straightforward.se/food_additives/Food_Additiveslist.asp

This searchable index of food additives offers brief descriptions of hundreds of common food additives, as well as giving synonyms and "E-numbers" used in Europe to identify additives.

U.S. Food and Drug Administration Center for Food Safety and Applied Nutrition (FDA/CFSAN):

<http://www.cfsan.fda.gov/~lrd/foodadd.html>

Includes a number of helpful resources on food additives, including the EAFUS list (Everything Added to Food in the United States).

Wikipedia. "List of food additives": http://en.wikipedia.org/wiki/List_of_food_additives

This helpful list provides links to Wikipedia's entries on a number of food additives. Some entries are quite lengthy and many use technical language.

Print resources

Farlow, Christine Hoza. *Food Additives: A Shopper's Guide to What's Safe & What's Not (2004 Revised Edition)*.

Escondido, Calif. : KISS for Health Pub., 2004

A handy pocket guide to additives that's perfectly sized to take on shopping trips.

Simontacchi, Carol N. *The Crazy Makers: How the Food Industry Is Destroying Our Brains and Harming Our Children*. New

York: Jeremy P. Tarcher/Putnam, 2000.

Simontacchi, an anti-additive activist, lays out the case for keeping additives out of our foods.

Winter, Ruth. *A Consumer's Dictionary of Food Additives: Descriptions in Plain English of More Than 12,000 Ingredients Both Harmful and Desirable Found in Foods*. New York: Three Rivers Press, 2004.

A comprehensive guide to food additives, their uses, and their impact on health.