

## Pesticides and Your Food

Fact Sheet 652

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Pesticides are chemicals used to control insects, diseases, rodents, and weeds that destroy or damage crops. So many organisms feed on our food crops and the crops we feed our livestock that even with extensive use of pesticides a substantial amount of damaged is caused by pests each year. In addition, many species of insects have become pesticide-resistant. Although pesticides often fail to kill their targeted pests, many experts maintain that without pesticides, our yield of usable food would be much lower.

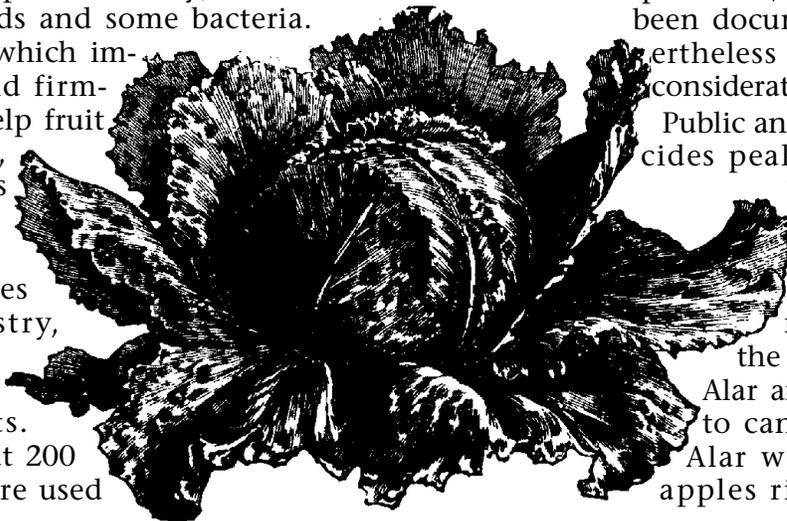
There are many classes of pesticides: insecticides kill insects, rodenticides control rodents, herbicides keep weeds at bay, and fungicides inhibit molds and some bacteria. Growth regulators, which improve the color and firmness of fruit and help fruit mature uniformly, also are classified as pesticides.

Since 1945, scientists, using advances in organic chemistry, have developed more than 45,000 pesticide products. However, only about 200 active ingredients are used

widely. Pesticides are applied to crops as sprays, gases, or dry formulations. In some cases, the chemicals are applied directly into the soil and are taken up by plant roots.

Recently, concern has grown about the possible effects of pesticides on our food, health, and environment. Exposure to some pesticides causes immediate health problems. The United Nations World Health Organization estimates that pesticides injure 1 million people and kill 20,000 people each year. (Most of them are poorly protected farm workers in developing nations.) Exposure to some pesticides also may contribute to long-term or chronic health problems, which have not been documented but nevertheless are a disturbing consideration.

Public anxiety about pesticides peaked in February 1989 when a national television broadcast highlighted a report linking the growth regulator Alar and its byproduct to cancer in children. Alar was used to help apples ripen uniformly



and prevent them from falling off trees too early. It was used on a few other fruits as well, but now it is banned for food crops.

Other reports linking some pesticides with cancer in laboratory animals have further heightened public concern, causing many environmental and consumer advocates to voice growing apprehension about the safety of our food and water. According to a poll conducted in January 1992 by the Food Marketing Institute (a trade association representing food retailers and wholesalers), 18 percent of consumers voluntarily mentioned pesticide residues when asked what they perceived to be the greatest threat to food safety. When specifically asked if they thought pesticides in food were a hazard, 76 percent of respondents said they were a “serious hazard,” and 19 percent thought pesticides were “something of a hazard.” However, many scientists maintain that the United States has one of the safest food supplies in the world.

The fate of a pesticide after it is applied to a crop depends on its chemical makeup, the crops on which it is used, and the geography and climate of the area to which it is applied. After application, a certain amount of a pesticide is broken down by sunlight, water, and micro-organisms. Usually, the breakdown products are inactive, but a few are more toxic than the original chemical.

The amount of pesticide that remains on raw food is called a residue. Processing procedures, storage conditions, and cooking can reduce the amount of pesticide residue in food. Scientists express residue concentration as parts per some large number, such as parts per million. To gain an understanding of the size of these concentrations, consider the following:

- One part per million is 1 inch in 16 miles; 1 minute in 2 years; or 1 cent in \$10,000
- One part per billion is 1 inch in 16,000 miles; 1 second in 32 years; or 1 cent in \$10 million.

- One part per trillion is 1 inch in 16 million miles; 1 second in 32,000 years; or 1 cent in \$10 billion

Table 1 shows how residues of the commonly used pesticide benomyl are affected by processing. Notice that some parts of a product contain more pesticide residue than other parts. For example, benomyl has a tendency to accumulate in the oil of oranges but not in the juice.

For more than half a century, the United States has relied on several important laws for regulating the use of pesticides. The Federal Food, Drug, and Cosmetic Act of 1938, our basic food law, stipulates that pesticide residues in food must not endanger public health. This law was amended in 1954 with the passing of the Miller Pesticide Amendment, which sets limits on the amount of pesticide residues allowed in food.

Another major piece of legislation is the Delaney Clause. Passed in 1958, the Delaney Clause prohibits the use of carcinogenic synthetic chemicals, including carcinogenic pesticides, in processed food (not raw agricultural commodities).

Pesticides originally were regulated by the U.S. Department of Agriculture (USDA) under

**Table 1. Effect of processing on benomyl residues on three different fruits**

Food form	Benomyl residues (parts per million)		
	Tomatoes	Oranges	Apples
Raw	1.76	3.28	1.06
Raw, washed	.31	.75	.89
Juice, canned	.25	.07	.31
Puree	.02	—	—
Paste	.57	—	—
Catsup	.03	—	—
Oil	—	2.51*	—
Sliced	—	—	.10
Sauce	—	—	.18

— Not analyzed.

\* Contained primarily in the peel.

the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947. In 1970, the newly established U.S. Environmental Protection Agency (EPA) took control of regulating pesticides under FIFRA. An amendment in 1972 acknowledged the possibility that pesticides could have adverse environmental and health consequences, so a new registration process was implemented requiring pesticide manufacturers to submit extensive data to EPA concerning the safety of all new pesticides. These data must include both the health and environmental effects of the pesticide.

According to the Delaney Clause, no new pesticide can be registered if it is carcinogenic and concentrates in processed food. All new pesticides are tested stringently for safety using the most recent scientific techniques. However, the Delaney Clause does not apply to pesticides registered for use before 1972.

EPA now has the task of reevaluating pesticides approved before 1972, but it has been criticized for proceeding too slowly. Because of this, additional amendments to FIFRA were passed in 1988 to accelerate the reregistration process, with the goal of completing the task by the year 2000. Pesticide manufacturers now are required to pay for the cost of this testing. While these evaluations continue, many older pesticides still are being used legally. Evaluation of laboratory data during the reregistration process sometimes identifies a potential for a pesticide to cause adverse health or environmental effects. Such pesticides are subjected to a special review process to determine the likelihood of adverse effects from the actual use of the pesticide in the field.

Today, three Federal agencies share responsibility for regulating agricultural pesticides

used in food production. State governments also play a role in the regulatory process.

**Environmental Protection Agency (EPA).** All pesticides sold or used in the United States must be registered with EPA. It is through the registration process that EPA decides whether a pesticide is safe for food. EPA mainly is concerned with how much of a pesticide remains in a raw or processed food—both on the surface and within the food—before the food is sold.

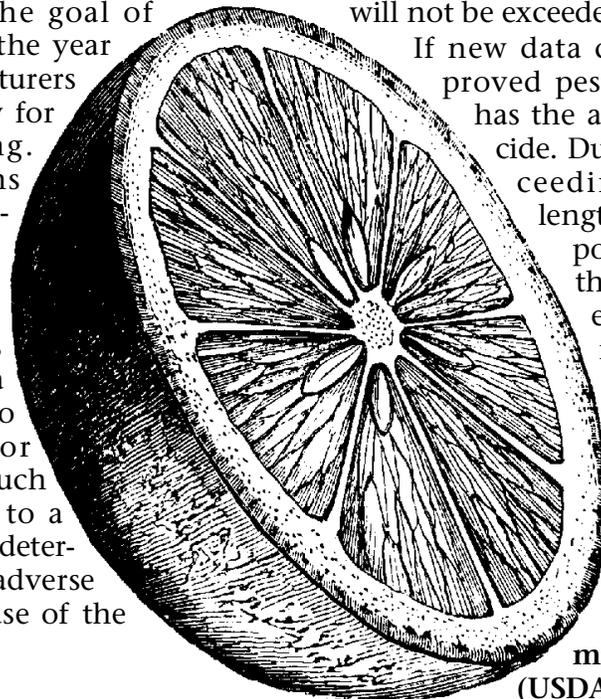
The maximum residue level legally allowed in or on a food is called a tolerance. EPA sets what it considers to be safe tolerance levels for pesticides in both raw and processed food products. These tolerances apply not only to foods produced in the United States but also to all imported food commodities.

EPA also requires safety information on pesticide labels. The labels provide directions for pesticide use, including on which crops the pesticide can be used and how many days, if any, must elapse between treatment and harvest. The preharvest interval ensures adequate time for the pesticide to be broken down by the plant so that the tolerance level will not be exceeded.

If new data demonstrate that an approved pesticide is dangerous, EPA has the authority to ban the pesticide. During the cancellation proceedings—which may be a lengthy process—EPA can temporarily suspend the use of the pesticide if EPA considers the chemical to be an imminent hazard. Other options are lowering the application rate, restricting the number of applications that can be made, and increasing the length of the preharvest interval.

**United States Department of Agriculture (USDA).** The Food Safety and

Inspection Service (FSIS) of USDA ensures that pesticide residues in meat, poultry, and eggs do not exceed the tolerances set by EPA. USDA monitors domestic and imported meat and poultry products

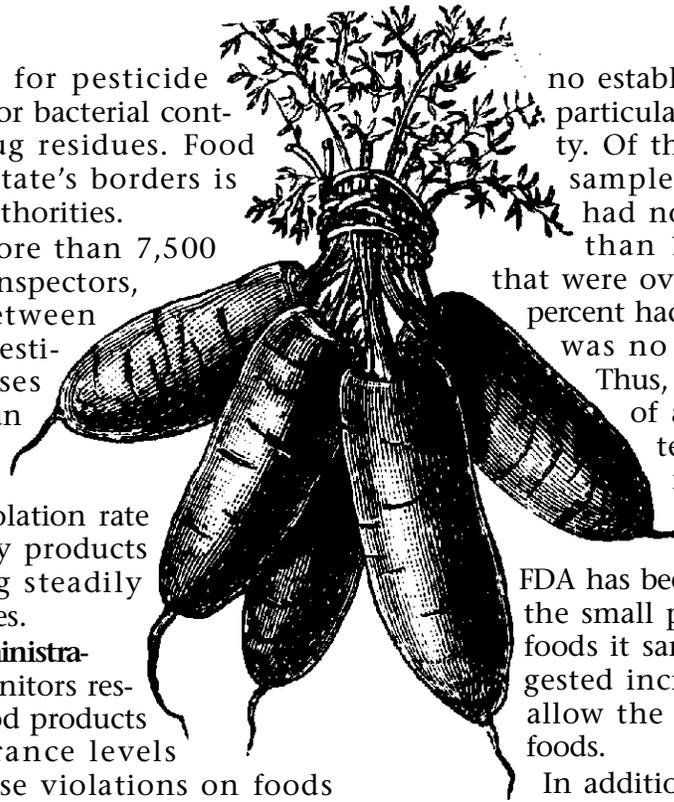


shipped interstate for pesticide residues, as well as for bacterial contamination and drug residues. Food shipped within a state's borders is regulated by state authorities.

USDA employs more than 7,500 meat and poultry inspectors, who conduct between 10,000 to 20,000 pesticide residue analyses each year. Fewer than 1 percent of these tests show illegal residues, and the violation rate in meat and poultry products has been declining steadily over the last 2 decades.

**Food and Drug Administration (FDA).** FDA monitors residues in all other food products and enforces tolerance levels and unregistered-use violations on foods shipped between states. FDA also inspects imported foods at border crossings, airports, and seaports. Unregistered use is the application of a pesticide on a food crop for which an approval has not been granted and is the most common violation. However, a pesticide that is registered for use on other food products may not pose a health threat through unregistered use. FDA can sample any food shipment to test for a violation of tolerance levels or an impermissible use of a pesticide. If a tolerance level is exceeded or an unapproved pesticide used, the food is considered to be contaminated and cannot be sold. EPA can then seize and destroy the food shipment. Contaminated food, however, is sometimes sold before the samples are analyzed and the producer notified.

In 1992, FDA analyzed over 16,000 food samples, about half of which were imports. Ninety-four percent of the samples were surveillance samples, samples collected when there is no evidence that a shipment might contain illegal pesticide residues. FDA found no pesticide residues in 65 percent of the domestic surveillance samples. Less than 1 percent of the domestic samples had residues that were over EPA tolerances, and less than 1 percent had residues for which there was



no established tolerance for that particular pesticide or commodity. Of the imported surveillance samples analyzed, 66 percent had no residues detected, less than 1 percent had residues that were over the tolerances, and 3 percent had residues for which there was no established tolerance.

Thus, approximately 97 percent of all surveillance samples tested in 1991 either had no pesticide residues detected or had levels below the tolerances.

FDA has been criticized, however, for the small percentage (4 percent) of foods it samples. Congress has suggested increasing FDA's budget to allow the agency to sample more foods.

In addition to its monitoring programs, FDA collects samples of domestic and imported foods and analyzes them for pesticide residues. This survey, performed about four times each year, is known as the Total Diet Study or the Market Basket Study. FDA personnel go to 12 cities across the United States, including Puerto Rico, and fill shopping carts with more than 200 different foods, as if they were shopping for a family. The items include a variety of meats, vegetables, soft drinks, snacks, baby food, and infant formula. Each market basket can cost up to \$1,200. The items can come from roadside stands and small retailers as well as supermarkets.

After each shopping spree, perishable items are packed in ice. All the food is then rushed to an FDA laboratory where it is cooked and prepared as it would be at home. Then, samples of the food are analyzed for pesticide residues using extremely sensitive instruments capable of detecting residues at a level of one part per billion. Although each market basket may contain trace amounts of 70 or 80 pesticides, the levels of these substances are usually so low that they pose no significant health risks.

The market basket approach has been criticized for omitting the concerns of consumers

who eat a lot of a particular food that does not make up a sizable proportion of the market basket. People who consume certain foods in significantly greater amounts than the general public may be assuming a greater risk.

A few banned pesticides—such as DDT, dieldrin, and heptachlor—continue to show up at extremely low levels in some foods, not because they are still being used, but because they break down in the environment very slowly. But the amount of these pesticides in nature and in foods is declining steadily.

The United States food supply is regarded by many experts as the safest in the world. FDA monitoring for more than 25 years has rarely found above-tolerance residue levels. But with three independent government agencies, a fragmented system of regulations and controls, and a swirl of conflicting scientific studies, the pesticide picture is too complex to assure complete safety.

Take the Alar controversy, for example. According to a February 1989 EPA report, the estimated lifetime risk from eating Alar-treated apples is 45 cases of cancer for every 1 million adults—45 times more than the acceptable limit. But according to the National Resources Defense Council, based on government data, as many as 910 people per million will develop cancer from consuming Alar-treated apples, apple juice, and applesauce during the first 6 years of life.

During the past several years, Congress repeatedly has voiced concerns that FDA's resources are stretched too thin to adequately inspect foods and safeguard America's health. There also have been complaints that not all pesticide residues are detected by FDA testing methods.

Some consumer advocacy groups state that even if every law were enforced flawlessly, 6 billion pounds of pesticides used worldwide annually may be too much for this planet. Chemicals sprayed on crops or applied to the soil sometimes end up in the water and air. Although most break down or dissipate with time, a few keep recycling through the

food chain. Also, the possible synergism of pesticides, in which the total effect of several different pesticides is greater than the sum of the individual effects, cannot be explored adequately.

Most people debating the safety of pesticide residues in our foods agree that more scientific study is needed to provide a better understanding of the true risks and benefits of pesticides.

This topic is especially complex because we are comparing the risk of potential health effects with the economic benefit of preventing crop loss and the advantage of having a diverse and abundant food supply.

Experts who review the available data agree that our biggest dietary health risks come not from pesticide residues but from not eating enough fruits and vegetables and from eating a diet too high in fat and cholesterol. Thus, it is far more dangerous to eliminate fruits and vegetables from one's diet than it is to eat foods that may contain small amounts of pesticide residues.

Some people believe the world would be much better off with fewer or even no pesticides; others say our economic and nutritional well-being depends on continued chemical protection against pests that, if left unchecked, would devour or destroy our food.

According to a study by Texas A&M University economist Ronald D. Knutson, eliminating the farm use of agricultural chemicals would inflate food prices, reduce food exports, and increase soil erosion. He estimates that a typical household would pay \$228 more per year on food if pesticides were abolished. Moreover, the average consumer would spend 12 percent more of their income on food each week.

While experts continue to study and debate the impact of pesticides, scientists are developing other ways to combat pests. One of the best ways to limit your exposure to pesticides is to landscape and garden without them or with minimal use of them. Home gardeners and professional farmers can practice integrated pest management (IPM), a strategy for controlling pests through a combination of biological, cultural, and chemical methods. IPM techniques include using insect predators and other natural enemies of pests, bacteria that attack insects, companion planting, plants bred for insect resistance, crop rotation, physical barriers, timing harvests to avoid infestations, and applications of carefully timed and often reduced amounts of pesticides when needed.

Another option is entirely organic farming, which avoids synthetic fertilizers and pesticides altogether. But this is difficult to do using modern farming practices. Also, some natural chemicals used in organic farming can be just as toxic as synthetic ones.

There are several easy ways to lower your exposure to pesticide residues without giving up good nutrition.

- Thoroughly rinse fruits and vegetables under cold running water. Vegetable scrub brushes can be used to remove most of the surface residues. Do not use soaps or detergents.
- Discard the outer layers of leafy vegetables, such as lettuce and cabbage.
- Peel some fruits and vegetables when appropriate to remove residues that do not wash off, especially when the skin has been waxed (on cucumbers, for example). Unfortunately, peeling the skin removes some fiber and nutrients. Cooking also may remove residues. Other foods commonly waxed are eggplants and apples. Peeling is a choice that consumers have, but it does not mean they will actually lower their residue intake.

- Buy produce in season. Locally grown produce, when available, may contain less pesticide residues than imported foods and those shipped long distances, which may need postharvest treatments to keep them from spoiling.
- Trim and discard visible fat before eating food because some pesticides and other chemicals tend to concentrate in the fat of meat, poultry, and fish.
- Buy low-fat milk products. FDA samples raw, whole milk before it is processed. Very few pesticides concentrate in milk. If pesticides are present, low-fat and skim milk will have less residues than raw milk.
- Consider buying organically grown produce, but be sure to go to a reputable dealer. Look for an official label, stamp, or logo that certifies that the food has been organically grown. A food marked organically grown, however, does not always mean that the food has been produced without any pesticides. Currently, Maryland's guidelines allow certain pesticides to be used on produce considered organically grown.
- Grow your own fruits and vegetables using integrated pest management techniques.
- Eat a variety of fresh fruits and vegetables to limit your exposure, however minimal, to any one pesticide.

Americans enjoy a plentiful, inexpensive, and varied food supply. This would not be possible without pesticides. The health effects of pesticide residues are a legitimate concern; however, pesticides are an added expense to the farmer, so it is in the grower's financial interest to use the minimum amount possible. By following the simple precautions outlined in this fact sheet, consumers can further reduce the already minute amounts of pesticide residues in food.

Authorities from EPA, FDA, the American Cancer Society, the National Cancer Institute, and other health organizations agree

that giving up fruits and vegetables, which may help protect against cancer and other chronic diseases caused by pesticide residues, is more of a health hazard than eating the trace amounts of pesticide residues that may be on produce.

For more information about pesticides and food safety, contact any of the following organizations:

American Council of Agriculture Education  
Foundation  
P.O. Box 27723  
Washington, DC 20077-1614  
(202) 682-9200

American Council on Science and Health  
47 Maple St.  
Summit, NJ 07901  
(201) 277-0024

American Farm Bureau  
600 Maryland Ave., SW, Suite 800  
Washington, DC 20024  
(202) 484-3600

Americans for Safe Food  
Center for Science in the Public Interest  
1501 16th St., NW  
Washington, DC 20036  
(202) 232-9110

Greenpeace Action/Toxics Campaign  
1436 U St., NW  
Washington, DC 20009  
(202) 462-8817

U.S. Department of Agriculture  
14th St. and Independence Ave., SW  
Washington, DC 20250  
(202) 447-2791

U.S. Environmental Protection Agency  
401 M St., NW  
Washington, DC 20460  
(202) 557-2805

U.S. Food and Drug Administration  
HFE88/Room 16-63  
5600 Fishers Lane  
Rockville, MD 20857  
(301) 443-3170

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