

## *Pesticides in the Food Supply*

### **1. What is a pesticide?**

It is any agent used to control or kill undesired insects, diseases, weeds, rodents, mold and other organisms, such as bacteria. Falling under the term “pesticide” are herbicides, insecticides, fungicides, rodenticides and disinfectants. Government regulations usually include in this category growth regulators, such as Alar.

### **2. Why are pesticides used on food?**

They protect crops and increase yields by controlling insects, diseases, weeds and other pests. They also protect livestock and poultry from insects and other pests. Crops may be vulnerable to 10,000 different insects, 1,800 weeds, 160 bacteria, 250 viruses and 8,000 fungi — which together destroy 30 percent of the nation’s crops each year, worth \$20 billion. Pests destroy up to 45 percent of the crops in countries where pesticides are not as widely used.

### **3. How are they used?**

Pesticides are injected into the soil or applied directly to crops as a spray, fog or dust.

### **4. What are the major uses?**

Agriculture accounts for 71 percent of pesticide use; home and garden applications (including golf courses), 15 percent; forestry, industry and government, the remaining 14 percent.

### **5. How many pesticides are used on foods?**

Thousands of pesticide products have been registered in the United States, containing 865 active ingredients, according to the Environmental Protection Agency. EPA has approved 350 ingredients for food uses — 200 of which account for 98 percent of the pesticides currently applied to agricultural products. The balance are used in nonfood applications, such as lawn care and termite and rodent control.

### **6. How would food be affected if farmers didn’t use pesticides?**

Food can be produced without pesticides, but the quality and quantity may decline — thus affecting the availability, variety and cost. The major achievements in farm productivity and crop quality in the 20th century were due, in part, to pesticides. There is a consensus among consumer, environmental and industry groups, along with scientists and government officials that pesticide use should be reduced because of the safety concerns and because nonchemical alternatives for many pesticides are available.

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The Food Marketing Institute (FMI) is a nonprofit association conducting programs in research, education, industry relations and public affairs on behalf of its 1,500 members including their subsidiaries — food retailers and wholesalers and their customers in the United States and around the world. FMI’s domestic member companies operate approximately 26,000 retail food stores with a combined annual sales volume of \$340 billion — three-quarters of all retail food store sales in the United States. FMI’s retail membership is composed of large multi-store chains, small regional firms and independent supermarkets. Its international membership includes 200 members from 50 countries.



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### 7. Why is there concern over the safety of pesticides?

- Scientists have found that laboratory animals contract cancers and other illnesses when exposed to large doses of many of the chemicals used in pesticides.
- As chemical detection methods grow more sensitive, scientists discover residues in foods once thought to be pesticide-free.
- Some pesticides damage the environment, polluting water and killing plants and wildlife — an effect that prompted in part the passage of the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) of 1947.
- Farm workers who mix, load or apply certain pesticides have contracted serious illnesses and in some cases died from direct exposure, according to health officials.

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### 8. Do pesticides cause cancer?

Pesticides appear to pose some cancer risk. Some compounds are carcinogenic to laboratory animals and to farm workers exposed directly to pesticides. Most chemicals are toxic when applied at high enough levels. The key issue when assessing the dietary risk is the extent of exposure — the dose — needed to bring the onset of cancer.

Until scientists fully understand the biochemistry of cancer, they must rely on less precise methods of risk analysis. Laboratory animal tests provide an indication of risk, but they are not fully projectable to humans owing to significant differences in the organisms. In order to simulate a lifetime of exposure in humans, scientists often must expose animals to massive amounts of the pesticides under study. This raises the possibility that any illness or death could just as easily have resulted from the shock of the large dose as the long-term toxicity of the chemical.

Since cancers take many years to develop, it is difficult to isolate a particular pesticide as the cause among so many other dietary, environmental and lifestyle factors. In addition, humans are exposed to natural carcinogens in food, including pesticides that plants themselves produce to ward off predators.

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### 9. What are the positions of consumer and environmental groups?

Some groups are unwilling to accept any risk, calling for the elimination of all pesticides. Others — along with much of the food industry — would like to see greater use of farming methods that reduce or eliminate pesticides. These include organic methods that rely on crop rotation, and biological controls such as using natural predators to eliminate various pests (e.g., parasitic wasps that prey on alfalfa weevils), along with integrated pest management practices.

At the other end of the spectrum are advocates of “high-yield” agriculture on a global basis, relying heavily on pesticides, fertilizers and other growth aids. By maximizing the productivity of farm land, they contend that this strategy puts less stress on the environment and allows more of

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nature to be undeveloped or put to other uses.

In the 2000 report *The Future Role of Pesticides in U.S. Agriculture*, the National Research Council (NRC) concluded that no justification currently exists for completely abandoning chemical pesticides. “Chemical pesticides should remain part of a larger toolbox of diverse pest-management tactics in the foreseeable future,” said May Berenbaum, professor of entomology at the University of Illinois, Urbana, who chaired the committee that wrote the report. “No single pest-management strategy will work in all ecosystems, so chemicals need to be part of an ecologically based framework that can safely increase crop yields.” The NRC is the principal research arm of the National Academy of Sciences.

### **10. How are farmers responding to these concerns?**

Driven by economic and safety concerns, they are abandoning highly toxic, broad-use pesticides in favor of ones that target specific pests and can be applied in smaller quantities. Many are adopting integrated pest management techniques, which combine natural methods with selective pesticide use, such as spraying only when pests are most active. The natural methods include insect vacuuming, disrupting reproduction with pheromones (insect hormones), and the use of natural predators, including insects, bacteria and fungi, that harm the pests and not the crops.

Also gaining popularity are botanical pesticides made from plant sources, which are likely to break down more quickly in the environment than compounds synthesized with petrochemicals.

Agronomists are applying gene-splicing techniques from the science of biotechnology. They are synthesizing new, safer compounds from organic sources and bolstering plants’ own defenses with genes that produce natural pesticides such as the bacterium *Bacillus thuringiensis* (BT). The resulting plants can then be grown with little or no pesticides.

About 5 percent of all crops are now grown without pesticides or with reduced application levels, according to the U.S. Department of Agriculture (USDA).

### **11. Are there safety concerns associated with naturally occurring pesticides and toxins?**

In the debate over pesticide safety, scientists note that naturally occurring chemicals may pose some of the same hazards as synthetic ones. Some may act as natural pesticides to protect plants, for example, from fungi, bacteria, molds, insects and animal predators. Almost all foods contain at least some natural toxins, whose role scientists are just beginning to understand.

As with synthetic chemicals, natural toxins appear to be hazardous only when consumed in large quantities; most foods carry only trace amounts. Examples include arsenic, which is found in many fruits, vegetables, meats and seafood at levels of less than 0.5 parts per million (ppm). The average adult consumes about 0.9 milligrams per day with no apparent ill effect. The human body produces nitrosamines — carcinogenic to laboratory animals — when nitrate in foods react with bacteria in the mouth and digestive system. Nitrates are common components of vegetables such

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as beets, celery, lettuce, spinach, radishes, rhubarb, turnips and cabbage. The amount of dietary nitrate that ends up in the body to produce nitrosamines is believed to be insignificant.

One natural substance that poses a clear health hazard is the aflatoxin produced by molds that grow on peanuts, corn and other grains, usually under hot, humid conditions. Excessive consumption of aflatoxins has been linked to liver cancer. Typically, however, they are found at nonhazardous levels of one to three parts per billion (ppb). The Food and Drug Administration (FDA) has ruled that no more than 20 ppb of aflatoxins may be present in food (0.5 ppb in milk). USDA routinely inspects foods for these compounds, which can be visually identified in the molds that produce them. Aflatoxin growth can also be controlled with chemicals.

## **12. Can pesticide residues be washed off fruits or vegetables?**

Surface residues on raw agricultural commodities can be reduced by washing them thoroughly with water, throwing away the outer leaves of leafy vegetables (e.g., cabbage, lettuce), peeling the food or, in some cases, by cooking it. This may not eliminate all the residues, nor will it reduce those from pesticides that work by entering the fruit or vegetable. Residues of these systemic pesticides can generally be reduced by cooking. Naturally occurring pesticides and toxins can seldom be removed.

As consumers assess any health risks from pesticides, they should also bear in mind that government inspectors detect no residues whatsoever in well over half the items sampled each year, and very few samples have residues exceeding the tolerance levels. As for natural chemicals, consumers can take some comfort in the fact they have been consuming small amounts for years with no apparent health consequences.

## **13. How are pesticides regulated to safeguard consumers?**

The state and federal governments regulate pesticides, looking to the scientific community for guidance on health and safety concerns. The federal government takes the lead, registering pesticides and setting standards for their use. States have the option of regulating them more rigorously. Essentially, federal agencies regulate pesticides in three steps:

1. Review scientific data on the safety of pesticides, looking at how exposure to residues may affect health. For individual pesticides, they set legal residue levels called tolerances for each commodity to which the pesticide is applied.
2. Monitor both domestic and imported food products, testing for pesticide residues that exceed the tolerance levels or are not permitted.
3. Take action to remove from the market food products with illegal residue levels and penalize the parties responsible.

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#### 14. How does the government determine or evaluate pesticide safety?

EPA is responsible for registering pesticides. It reviews health data submitted by pesticide manufacturers and independent labs. EPA examines the potential effects of pesticide residues on consumer and worker health and on the environment. It examines the impact of short-term or acute exposure, along with exposure over a lifetime of 70 years. If the data show that exposure would pose unreasonable risks, it denies registration. Otherwise, EPA sets maximum residue tolerance levels that serve as standards when foods are tested for pesticides by USDA and the Food and Drug Administration (FDA).

Up until 1996, EPA observed different safety standards for raw and processed foods. For the latter, it used the zero-risk standard established by the Delaney Clause, a 1958 amendment to the Food, Drug, and Cosmetics Act. That standard, however, had proved to be impractical and even counterproductive. It prohibited foods from carrying minute traces of carcinogenic compounds, while exempting many toxic chemicals that were registered before the clause was enacted. As a result, regulators were forced to allow the use of toxic chemicals while barring safer alternatives.

Congress repealed the Delaney Clause in the Food Quality Protection Act of 1996, substituting the negligible risk standard that had long been used to set tolerances for raw foods. This standard allows residues of potentially carcinogenic pesticides as long as there is a “reasonable certainty of no harm” to consumers. In practice, regulators will approve a pesticide application only if it will cause no more than one additional cancer case per million people who consume it over a lifetime.

The tolerances tend to err on the side of safety. They are set and enforced as residues appear on foods at the farm. Residue levels tend to decline during transport, storage, mixing with untreated crops, processing and cooking.

EPA also restricts when pesticides may be applied during the growing season, along with the amounts and the crops on which they may be used. These measures are designed to control the residues. EPA may revoke a pesticide’s tolerance and cancel its registration for particular crops or all crops if new scientific data reveal health hazards. For example, new data prompted the agency to ban EDB as a pesticide in 1983. In 1989, suppliers voluntarily withdrew from the market most applications of an entire class of fungicides known as EBDCs.

More recently, EPA has reduced pesticide risks through negotiated agreements with suppliers. In 1996 suppliers agreed to eliminate the use of the miticide propargite on 10 fruit and vegetable crops. Cancer concerns and high residue levels led to this action. Cancer risks are also prompting the industry to restrict and phase out the use of cyanazine by 1999.

The Food Quality Protection Act requires EPA to reevaluate more than 9,000 existing pesticide tolerances by 2006. As of 2003, the agency has completed the effort for two-thirds. The law also charges EPA to establish a renewal program for reregistering pesticides on a 15-year cycle to

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ensure that tolerance levels and application controls are up to date with the most current scientific research.

### **15. Why have consumer and environmental groups criticized the registration process?**

They note that many pesticides were registered long before the extensive research on cancer and other diseases in recent years. EPA has been investigating the safety of all the older pesticides as part of the reregistration effort underway.

Some environmental groups also take issue with some of the established tolerance levels, saying they are too high for safety. They believe that any pesticide residue on food is hazardous. EPA's regulatory programs, they note, also fail to consider the effect of interaction among pesticides, how health may suffer from consuming residues from many compounds over a lifetime, and the special vulnerability of infants and children. The government is now taking action to address these concerns as it implements the Food Quality Protection Act.

### **16. Are infants and children more sensitive to pesticide residues?**

The findings to date are inconclusive. Several factors suggest that infants and children are more sensitive. Their vital organs are less developed and thus more susceptible to harm from toxic chemicals. In addition, their higher metabolic rate speeds the absorption of some chemicals. This characteristic, however, may provide some protection since it would speed the breakdown of some harmful chemicals.

Adding to the concern is the fact children eat more food in relation to body weight than adults to meet their rapid demand for growth. And they consume large amounts of produce, which may carry more pesticide residues than other foods. Produce also provides significant health benefits, which could outweigh any harmful effects.

From the limited research performed, it appears that children may be more sensitive to some pesticides and less sensitive to others, according to a 1993 report by the National Academy of Sciences (NAS) — *Pesticides in the Diets of Infants and Children*. The report calls for more research and regulatory measures that take into account the distinctive diets and physiology of infants and children.

### **17. How does the government consider the increased risk to infants and children in its regulation of pesticides?**

When setting tolerances, EPA takes into account the special diets of 22 sensitive subgroups, including infants, children, and pregnant and nursing women. This is done under its Dietary Risk Evaluation System, which was first used in 1986.

In 1994 FDA increased its monitoring of foods eaten by infants and children. In its domestic monitoring, for example, the agency analyzed twice as many carrot samples and 10 times as many fruit juice samples as in 1993. It also increased sampling of green beans, peaches and oranges — both domestic and imported — as well as imported bananas.

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The agency has denied tolerances for pesticides over concern for the adverse effects on children. In 1985, for example, it barred the use of pydrin on alfalfa and sorghum, fearing the secondary residues in milk from cows eating the grains posed a hazard to children.

The 1993 NAS report recommended that regulators:

- Use more immature animals in their tests to determine how young organisms react to chemicals.
- Conduct annual food consumption surveys of children aged 0–5 years, 6–10 and 11–18.
- Consider nondietary sources of exposure to pesticides, such as the air, soil, lawns and pets.
- Apply new statistical methods to estimate the risk to infants and children.

The Food Quality Protection Act of 1996 requires the government to upgrade its testing and risk assessment methods to better protect children. As a result, the agencies that regulate pesticides have adopted many of the NAS recommendations.

### **18. How does the government monitor the market for unsafe residues?**

FDA monitors food for pesticide residues as part of its responsibility to protect consumers. USDA monitors the commodities in its domain: meat, poultry and egg products. Many farm states, including California and Florida, complement federal efforts with their own monitoring.

FDA tests about 6,500 domestic and imported food items each year for pesticide residues. It samples domestic food at or near the production source, such as a wholesale distribution center, and imported food from about 100 nations at the point of entry into the U.S. This helps authorities trace the food to its source in order to correct a problem. Sampling at the early stages in the food marketing chain helps prevent the distribution of food with illegal residues.

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FDA gives emphasis to food commodities of major dietary importance, along with foods most likely to contain residues at the time of consumption. If illegal residues are detected or suspected in a region — foreign or domestic — the agency gives special attention to food products coming from that area.

The monitoring efforts show that pesticides seldom appear in food at unsafe levels. Of the 7,234 samples tested in FDA's 2003 general surveillance program, it found:<sup>1</sup>

<b>Source</b>	<b>Samples Tested</b>	<b>No Illegal Residues</b>	<b>No Residues Detected</b>
Domestic	2,344	97.6 percent	62.7 percent
Imported	4,890	93.9 percent	71.8 percent

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<sup>1</sup> *Food and Drug Administration Pesticide Program Residue Monitoring 2003.*

USDA's 2003 Pesticide Data Program revealed few residue violations in 12,316 samples of produce, beef, poultry and drinking water. Only 0.3 percent of the samples carried illegal residues; another 1.5 percent had low levels of residues for which no tolerance has been established.<sup>2</sup>

FDA also performs a Total Diet Study at the retail level. Inspectors visit supermarkets and other outlets and purchase 200 different items, including fresh, frozen and packaged foods, fast foods and wine. Four times a year, they make identical purchases in three cities in a particular region. The foods are prepared as they would be at home and analyzed by an FDA laboratory for pesticide residues. This program has found that the residue levels are consistently below the safe limits of exposure recommended by the World Health Organization (WHO), the United Nations agency that oversees food safety worldwide.

FDA monitors pesticide residues in animal feed as well. According to the most current data, from 2003: of the 438 domestic samples, 69.2 contained no detectable residues and only 98.2 percent had no illegal residues; of the 60 import samples, 83.3 percent had no residues and 95.0 percent had no illegal residues.<sup>3</sup>

FDA has been monitoring pesticides since 1965 and has found that the residues in the foods that Americans eat fall well below the daily levels recommended by WHO.

### **19. How does the government enforce the pesticide laws?**

State and federal agencies work with the food industry to remove from the market any food contaminated with illegal residues. Food that is deemed adulterated must be recalled. FDA has the authority to seize adulterated foods, prevent further shipments and initiate criminal actions against those responsible. FDA also is authorized to refuse entry to imported foods that are adulterated. When FDA identifies a contaminated product, the food industry responds immediately to remove it from the market.

A producer that fails to follow the directions on the pesticide label is violating the pesticide laws and is subject to civil or criminal penalties. The label on a pesticide specifies exactly how it is to be used, when, the rate of application and the interval between the last application and harvesting of the food product.

For example, improper pesticide use led to recalls of milk contaminated with the pesticide heptachlor (from animal feed consumed by cows) and watermelons contaminated with aldicarb. The application of these two pesticides was illegal since they were not registered for use on animal feed or watermelons.

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<sup>2</sup> Pesticide Data Program — Annual Summary, Calendar Year 2003.

<sup>3</sup> Food and Drug Administration Pesticide Program Residue Monitoring 2003.

**20. What if state and federal pesticide regulations disagree?**

States are required by law to observe EPA tolerance levels and application restrictions.<sup>4</sup> They may, however, adopt lower tolerance levels and stricter use restrictions. Food manufacturers object to this state authority because it promotes inconsistent regulations from state to state, which interferes with an orderly flow of commerce.

On the other side, environmentalists, consumer groups and many governors want to strengthen states' rights. They argue that states should have the right to protect consumers and workers. They also would like states to have more staff and funds to regulate pesticides more extensively.

*Imports comprise well over half the produce tested by FDA each year. Government monitoring programs show no significant differences in residue levels in domestic and imported foods.*

**21. How are pesticides regulated in imported foods?**

FDA monitors all imported foods to ensure that they do not contain residues in violation of U.S. tolerances. Imports comprise well over half the produce tested by FDA each year. Imported foods are not allowed to enter the country if they contain illegal residues. Such adulterated food is usually destroyed.

**22. Do imported foods contain more residues than domestic foods?**

Government monitoring programs show no significant differences in residue levels. As indicated in the answer to Question 18, FDA testing in 2003 found that slightly fewer imports carried no illegal residues (97.6 percent vs. 93.9 percent), while more carried no detectable residues at all (71.8 percent vs. 62.7 percent).

**23. Why are some pesticides used in other countries but not in the U.S.?**

Due to differences in climate and pest problems, among other factors, some pesticides used overseas are not used in the U.S. For those not used here, EPA sets an "import tolerance" if health data show that the pesticides are safe to consume under certain residue levels.

**24. Where can consumers find more information?**

Local or regional representatives of FDA, EPA, USDA, state and county departments of agriculture or local extension services. The following offices can provide information on local and regional federal government branches:

General Information  
U.S. Department of Agriculture  
1400 Independence  
Avenue, S.W.  
Washington, DC 20250  
202-720-2791  
Web site: [www.usda.gov](http://www.usda.gov)

Office of Pesticide Programs  
Environmental Protection Agency  
401 M Street, S.W.  
Washington, DC 20460  
703-305-5805  
800-858-7378 — National Pesticide  
Information Center  
Web site: [www.epa.gov/opp](http://www.epa.gov/opp)

Center for Food Safety  
and Applied Nutrition  
Food and Drug Administration  
200 C Street, N.W.  
Washington, DC 20204  
888-723-3266  
Web site: [www.fda.gov](http://www.fda.gov)

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<sup>4</sup> EPA may exempt a state or federal agency if emergency pest conditions warrant it. EPA carefully scrutinizes emergency exemption requests to ensure that the process is not used to circumvent the registration requirements.