

Michigan State University " Cooperative Extension Service



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Michigan State " Cooperative Extension Service

Understanding and Dealing with Risk

When you lie in the sun and don't use a sunscreen, you take a risk. You have chosen not to protect your skin, and you know that doing so may result in a painful burn, and maybe even skin cancer. The risk has definite consequences of which you are aware. And besides, you have the option to apply the sunscreen, move to the shade, or put on protective clothing.

But what about harmful substances in your food? Do you have the same freedom of choice or are you forced to take risks from which you have no protection?

Exposure to potentially toxic, or poisonous, substances in our environment and in our food supply happens every day, usually without our notice. Residues from chemicals applied to crops, additives in processed foods, antibiotics and hormones in animal products, naturally occurring toxins, bacteria and other environmental contaminants all have toxic potential and may pose short-or long-term health risks if they end up on our dinner tables.

"Risk, in general, includes biological, microbiological and environmental contaminants,"

explained Mike Kamrin, professor of environmental toxicology at MSU. Kamrin said categories of contaminants include man made, or synthetic, chemicals such as pesticides and some food additives, as well as nature's own versions of these chemicals

Scientists define risk as the probability that damage will be caused under particular circumstances. Food safety risk is the probability that discomfort, illness or even death will occur if food containing toxicants is eaten. The risk can be immediate, such as diarrhea or vomiting, or long term, such as cancer.

"There is no such thing as absolute safety," said Robert Hollingworth, director of the Pesticide Research Center at Michigan State University. "We would like to tell everyone 'there is no risk and don't worry because we are looking after it,' when in truth that isn't entirely correct. Toxic materials in the diet are unavoidable. That we can ever completely avoid them is a naive view. There is no way to have a risk free diet. Simply by being human we expose ourselves to these materials every day."

Unknowns are something that make most people uncomfortable, and often angry.

"There is an outrage factor when people think risks are being imposed on them and they have no control or voice," Hollingworth said. "This context makes setting acceptable levels of risk very difficult."

Hollingworth said risk assessment through typical toxicology tests is a "fuzzy business."

"At the very best, estimates of risks to humans can only be approximate," he said. "At times, pressure groups act as though a hard estimate has been made through the scientific method and use this for political purposes, when in reality there is a significant uncertainty and the real risk is probably much lower than the publicized figures.

"But to say we are uncertain doesn't mean we can't set reasonable estimates on where the risks may lie," Hollingworth added. "Then we allow for the uncertainty by building in safety factors."

Those safety factors are built in when determining the exposure which is probably safe for humans over a lifetime.

"There is good

reason to be conservative in how we develop our risk assessment, because there are unknowns," he said.

"We can only try to increase precision and reliability through studies of basic mechanisms of toxicology to get a better understanding of how to extrapolate the studies we do with animals to human beings."

Kamrin said consumers often latch onto fads and "miracle Cures" in their attempt to sort out and find order amidst the uncertainty. He advised consumers to be wary of sensational headlines and isolated instances of food hazards, and to pay more attention to well tested scientific findings.

"The best advice I can give is to worry less about every media-driven crisis and claim, and make sure you and your children are eating a diet of varied foods that includes a good amount of fruits and vegetables, because there is strong evidence that such a diet is beneficial," Hollingworth said. "That may not be the answer people want to hear but it is the best one I can give."

IF IT'S RISKY, ARE YOU OUTRAGED?

When the average person tries to understand a scientific report, he or she can get easily confused or misunderstand the information. One of the problems is that scientists and non-scientists use the word "risk" differently.

To scientists, risk means probability expected annual mortality - and they try to quantify any danger in objective, statistical terms. To the average person, who is looking for a simple, cut-and-dried answer, risk means the actual threat plus what is called the "outrage factor."

The outrage factor explains why some people persist in fearing risks they really don't need to worry about and ignore risks that are likely to kill them, according to Peter Sandman, director of the Environmental Communication Research Program at Rutgers University. If outrage is high, they tend to overestimate a hazard.

Here are some of the factors that contribute to public outrage and influence perceptions of scientific reports:

Involuntary risk. People are much more likely to accept a risk that they voluntarily choose. Most environmental risks are involuntary and, therefore, extremely objectionable.

Artificial risk. A risk such as radon found naturally in the soil

is regarded with less fear and Outrage than radon linked to a landfill contamination. Part of the difference is that natural radon provides no enemy to get angry at. Memorable incidents. When the news media make an incident memorable, the perception of risk increases.

Dread. Some risks, such as AIDS and cancer, create more dread than others. The greater the dread, the greater the perception of risk.

Exotic sources. If the source of a risk seems exotic, it will also seem more dangerous.

Unknowable risks. The more uncertain the risk, the greater the outrage. For instance, any risk linked to cancer will have a high outrage quotient because of cancer's untraceable origins.

Control by the individual. Eighty five percent of the American public consider themselves better-than-average

drivers. As long as they control the car, they feel safer. This is true of all risks. If people have some control over a situation, they feel safer.

Unfairness. People are Outraged when they suffer the risks but do not receive the benefits. If you live close to a waste facility and the profits from that facility leave the community, you feel outrage.

Moral relevance. Certain risks are perceived as more than risks - they are evils. When a risk is considered morally wrong, using the cost-benefit argument will backfire. For example, police do not always catch child molesters, but they never argue that an occasional molested child is an acceptable risk.

Impact on the weak. Outrage increases when the weak - such as children - are the most vulnerable to a particular risk.

Untrustworthy sources. Most people accept the risk of vaccinations because they trust the doctor who explains the benefits. In fact, they may not even ask about the risks. On the other hand, people may have such strong distrust of large companies that they will expect total certainty and zero risk from them.

Poor interaction.



Outrage increases when industries are secretive and defensive, ignore past problems and indulge in technobabble.

From all of this, Sandman concludes that the public responds more to Outrage than to actual hazard. He notes that chemicals in food, for example, have the potential for high outrage because they trigger many of the 12 Outrage factors.

When a hazard is genuinely low, companies can do more to reduce outrage by keeping people honestly informed, being less secretive, acknowledging problems, making sure that those who accept the risks also receive benefits and giving people control through local oversight.

(Adapted from "Food Safety Today," University of Illinois at Urbana Champaign, Cooperative Extension Service, 1991.)

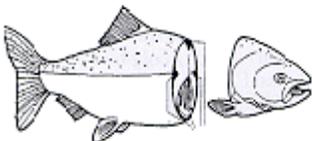
Sorting Out Scientific Language

When it says:
contributes to
suggests
indicates
is associated with
some scientists believe
at least in some people
animal studies show
in people with high Y
elevates blood cholesterol
high intakes elevate X

It does not mean:
causes
means
proves
is causally related
all scientists agree
probably in all people
human studies would show
if people with normal Y
increases heart disease
low intakes decrease X

GREAT LAKES FISH: Why the Concern?**CLEANING GREAT LAKES FISH**

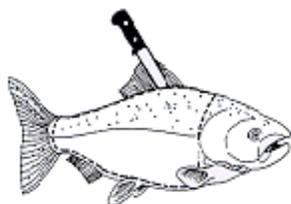
1. Low levels of halogenated hydrocarbons tend to accumulate in fatty parts of the fish and should be removed.



4. Trim fat along top center of the fillet.



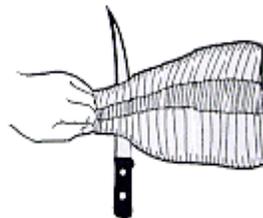
2. Carefully fillet the fish with a sharp, long-bladed knife.



5. Trim fat along edges of fillet.



3. Skin the filets, holding the tail section firmly. Run the blade between the skin and the meat along the table surface.



6. Bake, broil or barbecue fish on a rack to allow fat to drip off.



tissues of aquatic organisms. Fish also absorb toxic compounds directly from the water through their gills.

The concentrations of contaminants in fish vary greatly among and within species primarily because of differences in their size, age, feeding areas and habits, behavioral patterns and amount of body fat, as well as the amount of pollution in the geographic area where the fish spend most of their time. Although the levels of most toxic substances in Great Lakes fish have declined dramatically over the past 20 years, some organic chemical compounds are still found in certain species of Great Lake fish and continue to cause concern.

Whether people buy fish at the market or enjoy fishing and eating their catch, many are concerned about toxic substances in fish. Although contaminants have been found in fish from various bodies of water, including rivers, streams and oceans, Great Lakes fish have received much of the publicity in the past two decades.

Are Great Lakes fish safe to eat? It's a deceptively simple question, but there is no simple answer-yet. For now, each would-be fish consumer must make his/her own decisions, taking into account the following: information about contaminants in the Great Lakes; various factors about the fish, including its overall nutritional value, the species, the size and where it spends most of its time; how much fish the person eats and how often; the individual's susceptibility to

potential toxic substances, e.g., a pregnant woman or a small child; and his/her perception of risk.

Michigan Sea Grant Extension, in cooperation with the Michigan Agricultural Experiment Station, the MSU Pesticide Research Center and the Institute for Environmental Toxicology, is developing information to help Michigan residents make their decisions.

Toxic Substances in Fish

At least 400 synthetic organic chemical compounds have been identified in the Great Lakes ecosystem. Many of these chemicals have been banned or severely restricted because of their persistence in the environment and their potential impact on the health of aquatic organisms and human beings.

Most species of Great Lakes fish do not have aminant problems. However, certain organic chemical compounds accumulate in the fatty

FOOD SAFETY NEWS

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Contaminants and Human Health

It is impossible to tell by looking at fish whether it contains chemical

on human health are likewise hard to predict. They depend on the following factors, each of which is difficult to measure: how toxic the chemical is; the total amount ingested; and the diet, state of health, lifestyle, age and genetic makeup of the consumer.

The most important factor is the amount eaten. Toxic substances are often measured in parts per million (ppm). One ppm is the equivalent of one penny in \$10,000 or 1 second in 12 days.

People who eat large quantities of the fish with the greatest concentrations of contaminants or eat such fish throughout their lifetime are possibly at greatest risk. Also, certain groups of people may be at greater risk than others. Pregnant women, nursing mothers and women who may have children someday are at risk primarily because of their offspring, who are more sensitive to exposure to even the smallest amounts of chemicals. (At least one study, however, has shown that children born to fish-eating mothers suffered no observable adverse consequences.) The growth and development of children under age 16 may also be affected.

Fish Consumption Advisories

Because so many people like to eat Great Lakes fish and because of the presence of contaminants in some species, federal and state agencies responsible for protecting the food supply and public health have been charged with assessing the impact of Great Lakes fish on human health and taking appropriate precautions.

Public officials analyze contaminants in skin-on fillet samples of Great Lakes fish, study the health of people who eat fish and issue advisories on consuming sport-caught fish. The

Great Lakes states try to coordinate their fish analysis techniques and advisories to minimize public confusion that might result

from hearing differing announcements from the various jurisdictions.

The advisories are designed to provide a large margin of safety, not to draw an exact borderline between "safe" and "unsafe." They describe the locations where the fish are caught, the species and sizes of fish and appropriate consumption precautions.

In addition, Michigan applies federal guidelines to Great Lakes fish caught commercially and sold in the state.

Even with the precautions exercised by federal and state agencies, controversy over the long-term consumption of Great Lakes fish continues. Some people feel that no amount of toxic substances in Great Lakes fish should be tolerated and that people should eat little or no Great Lakes fish. Others believe that the long-term consumption of Great Lakes fish produces neither proven acute, immediate harm nor demonstrable long-term problems and that no consumption advisories are necessary. Still others believe that any potential risk is far surpassed by the known benefits of eating fish. And some people are still puzzled and confused.

The Research Based Approach

Through the years, various scientists have worked to discover the true impact on human health from eating Great Lakes fish and to learn what factors are most important in reducing human exposure to contaminants in Great Lakes fish.

One recent study of chinook salmon from Lake Michigan showed the following:

- (1) Skinned, trimmed fillets contained an average of less than 1 part per million (ppm) of PCBs, considerably below 2 ppm, the amount considered safe and used by federal and state authorities in developing fish consumption advisories.
- (2) The larger and heavier the chinook salmon, the greater the

concentration of PCBs. Of the 81 fish collected, only one very large fish exceeded the 2 ppm level.

(3) When length and height factors were taken into consideration, there were no significant differences in the PCB levels in fillets from chinook caught during the various seasons.

Earlier New York state studies also showed that filleting and trimming as much fat as possible before cooking reduces the concentration of contaminants as much as 50 percent.

Other studies performed on salmon species in the late 1970s showed that deep-frying in corn oil or baking, broiling or barbecuing fish on a rack where fat can drip off will reduce the levels of contaminants even further an additional 30 to 70 percent.

MSU researchers are now analyzing samples of several fish species from all of the Great Lakes cooked by a variety of methods to determine more precisely which methods are most effective in reducing whatever concentrations of contaminants are present in the raw fish.

The Personal Decision

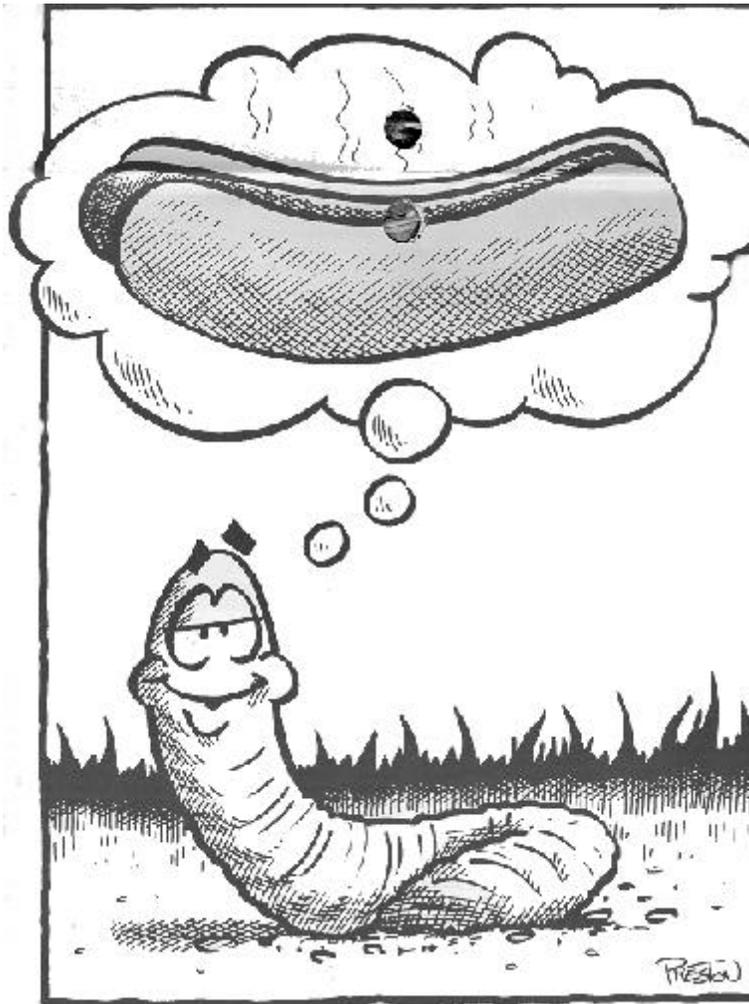
The answer to the question "Are Great Lakes fish safe to eat?" involves both public policy and personal perspective and choices.

Beyond the public health advisories mentioned earlier, it's up to individuals to determine the significance of this risk in their lives. The risk is far less than that of some personal habits and daily activities, and demonstrably less than that of eating some other foods. It can also be balanced against the epidemiological evidence that suggests that Omega-3 fatty acids found in some fish species may help prevent heart diseases, and the fact that many fish species contain little fat and are excellent sources of protein.

A Final Answer

The question "Are Great Lakes fish safe to eat?" may never be answered once and for all with a simple "yes" or "no." As long as the question and concern remain, Extension will help people deal with it. #

HOME ECONOMISTS ANSWER FOOD SAFETY QUESTIONS



Where can consumers get answers to questions about food or food safety? They can call the local Extension home economist.

In a normal day, a county Extension home economist may field questions on everything from food additives ("What is sodium erythorbate? does it come from earthworms? why is it in hotdogs to food storage and handling ("I

left the leftover lasagna out on the counter last night and didn't find it until this morning; is it safe to eat?") and food preservation ("Can I can tomatoes without adding acid?") to the safety of toasting the holidays with homemade eggnog drunk from lead crystal.

One of the most commonly asked questions is one that at first appears

the most outlandish: does the sodium erythorbate used in hot dogs come from earthworms? And what is it doing in hotdogs? (See "Answers" below.)

This question represents the "what is it and why is it in there" category of questions. Food storage and handling questions are another major group. Like the person who left the lasagna

out all night, people asking these "damage control" kinds of questions have usually failed to follow recommended procedure - or the freezer came unplugged or long forgotten food was discovered - and they have come looking for assurance that the mishandled food can somehow be saved.

A variation on that theme is the consumer who gets a

bargain by buying some product in bulk or in an institutional or catering size container and then wants to know how to break it down into more manageable size packages and store it. For some reason, the food that people ask most about in this context is olives.

Home canning season, predictably, turns phone lines into hotlines.

"People know they should follow updated canning recommendations, but they may have used the old ways successfully for years," observes Ingham County home economist Pat Lamison. "With tomatoes, for instance, the USDA recommendations for tomatoes now call for adding acid to tomatoes canned in a water bath canner. People who have canned tomatoes for years without adding acid want to know if they really have to add citric acid or lemon juice. Others want to know if they can skip the acidifying step if they use a pressure canner instead of a boiling water bath canner. The variations on this question alone could keep the phone busy in late summer."

Hunting season invariably brings questions about the safety and/or desirability of eating venison that has spent many hours draped across the roof rack of a pickup truck, or many days - or even weeks - hanging from the rafters in the garage.

Thanksgiving and "every possible question about thawing and cooking turkey" provide a break

from wild game questions. Then comes Christmas, with its focus on raw eggs in eggnog, frosting and other products. Unexpected color changes in foods such as potatoes that turn black when cooked - cookware safety, Mexican vanilla and the use of non-food items with food (using trash bags for food storage, for example) are other frequently asked questions.

Issue-oriented questions can pop up any time, usually in response to a prominent news story on television or in the newspaper. Recently, salmonella in eggs, tomatoes and canteloupe has been a popular topic.

ANSWERS

1. Sodium erythorbate is an antioxidant used in hot dogs to control color and flavor changes caused by reactions with oxygen. It does not come from earthworms. The rumor probably started because the first syllable of the second word sounds like "earth" and the last syllable sounds like "bait." The fact that hot dogs are long, skinny and red doesn't help matters, either!

2. Lasagna left out all night should be discarded. The rule of thumb is 2 hours at room temperature for highly perishable protein foods.

3. Acidifying tomatoes by adding lemon juice or citric acid is strongly recommended to make sure that the finished product is acidic enough to prevent the growth of the organism that causes

botulism. No tests have been done to establish a safe time for pressure canning unacidified tomatoes. Any processing times for unacidified tomatoes that would be established would probably be very lengthy, resulting in a poor quality product.

4. Lead in crystal could be especially hazardous to pregnant women or children. They should avoid even occasional use. The greatest danger exists when acidic or alcoholic foods or beverages are stored in lead crystal. Significant quantities of lead can migrate from the glass into the food.

5. The Extension Service does not recommend using recycled products or products not intended for use with food in direct contact with food.

6. If you're going to buy a gallon of olives, you'd better have plans for using them up within a couple weeks of opening the jar. They don't freeze well and can't be recanned, so plan on splitting a container with friends. Olives completely submerged in their brine will keep for up to two weeks in the refrigerator, so decide how many olives you can eat in that time and work back to figure out how many friends you are going to need to share with.

7. Venison and other wild game should be handled as carefully as you handle fresh meat from the grocery store. More information on wild game and safe handling of the holiday turkey is available turkey at your

county extension agent office.

8. Eating raw or slightly cooked eggs is not recommended, especially for high risk groups - infants and pregnant women, in ill health and elderly persons. Avoid recipes for uncooked frostings that include fresh eggs; try making eggnog with a pasteurized egg substitute.

9. To keep potatoes from turning black during cooking, try adding a little cream of tartar to the cooking water.

10. Aluminum cookware is cheap and cooks well, and suspicion of a possible connection with Alzheimer's disease has now been discounted. Storing acidic foods such as fruits, pickles and fermented foods in aluminum containers, however, is not recommended because aluminum could leach into the food.

11. Cheap vanilla extract bought in Mexico may be contaminated with coumarin, a substance related to certain blood thinning agents. Extension advises against bringing back or using bargain vanilla from Mexico.

12. Salmonella in eggs and produce is a bigger issue than we have space to handle here. Your local Cooperative Extension Service home economist has information. Extension is listed under "county government" in your telephone book .

BUY, COOK & EAT FISH SAFELY

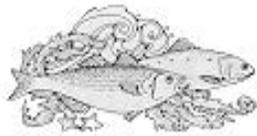
To ensure that the fish you buy and eat is as safe as possible, follow these recommended guidelines:

Think twice before you eat raw fish. You can never be absolutely sure the fish doesn't harbor parasites or high levels of bacteria.

Cook fish thoroughly until it is opaque and flakes easily with a fork. Overcooking makes it dry. The best way to learn the technique is to practice.

When buying whole fish, look for bright, clear, bulging eyes. Cloudy, sunken, discolored or slime-covered eyes often signal fish that is beginning to spoil. The skin of freshly caught fish is covered with a translucent mucus that looks a bit like varnish. The color is vivid and bright. Avoid fish whose skin has begun to discolor, shows depressions, tears or blemishes, or is covered with sticky yellowish brown mucus.

When buying steaks or fillets, look for moist flesh that still has a translucent sheen. Watch out for flesh that is dried out or gaping - the muscle fibers are beginning to pull apart.



That's a sign of over-the-hill fish.

Note how the fish is displayed and look for clues that the temperature may be too high. Fish that are piled high, displayed in open cases or sitting under hot lights are perfect places for bacteria to grow. If fish fillets are displayed inside separate pans surrounded by ice, that's usually a sign the retailer is paying some attention to quality. Whole fish should be displayed under ice.

Keep an eye out for displays featuring cooked and raw fish or seafood next to each other. There's a potential health hazard from cross-contamination - the transfer of bacteria from raw to cooked products. Buying anything from this kind of display can be risky.

Use your nose. Fresh

fish smell like the sea but have no strong odor. Freshwater fish in good condition sometimes smell like cucumbers. Strong odors usually indicate spoilage.

Once you buy fish, refrigerate it quickly. At home, store it in the coldest part of your refrigerator, keep it in the original wrapper and use it fast within a day.

If you're concerned about quality, look for evidence that fish has been frozen and then thawed. Look for chunks of ice floating in the fish liquid - a clue that the fish had been frozen. There's nothing wrong with frozen fish that's been thawed, but if you unknowingly refreeze it, its texture and flavor will suffer. It's probably better to buy frozen fish instead.

TEACHING KIDS THE ABCS OF SAFE FOOD HANDLING

As family lifestyles change, more children are assuming responsibility for preparing their own food. Between 24 million and 81 million cases of food-borne illness are estimated annually, so it's obviously important to educate children on simple ways to prevent these illnesses. (More than 85 percent of these illnesses could be prevented if people handled and prepared their foods properly.)

For kids, the basics include washing their hands before they handle food, before they eat and after using the bathroom. Beyond that, there are other food safety risks associated with handling, storage and preparation of food that kids and their families should be aware of.

Michigan State University recently launched a safe food handling and preparation project that project coordinators hope will improve the health status of children and their families by improving their knowledge of and skills in safe food handling. The project studied food handling attitudes, knowledge and practices of approximately 10,800 third-grade children, some of their families, teachers, food service workers in schools, and medical and health care support personnel, said Sandra Andrews, Extension specialist and assistant professor in the Department of Food Science and Human Nutrition.

Andrews termed some of the findings surprising. For example, 18 percent of children who took their lunches to school packed the lunches themselves. Many children today are responsible for preparing their own

snacks, yet few get proper instruction on food-borne illnesses and how to avoid them.

The survey showed some contrasts between the way that kids handle food and the perceptions that parents had.

"One example is that about 20 percent of children brought lunch leftovers home. What happens to the leftovers? Do they get refrigerated? Do they sit on the kitchen counter? In contrast to what the children said, almost 99 percent of the parents thought that their children didn't bring leftovers home at all," Andrews said.

The survey also showed that 85 percent of Michigan third-grade children operated microwave ovens by themselves. The parents' survey showed that a smaller portion of the adults used a microwave to prepare food. But most children - and probably many adults - don't understand how a microwave works. Food heated in a microwave cooks from the outside in. The outer portion of the food holds heat and continues to cook the food for several minutes after it is removed from the appliance. This period of time is referred to as "standing time" in the cooking directions. If standing time is not observed, undercooked food, which is potentially unsafe, may be consumed.

There's also a concern about injury from hot food and steam when microwaving. Andrews recommends teaching children to follow the instructions on the food packaging and explaining microwave basics to them to

prevent injury.

Another discrepancy the survey found was in hand washing practices, which are key to safe food handling. A large number of children in the study said that they never washed their hands before meals. About 98 percent of parents said that they always washed their hands and assumed that their children did, too.

Many kids learn about basic food safety in fourth grade, yet they aren't provided much information on the issues surrounding food handling and tips for handling food safely, Andrews said.

The survey data will be used to develop a hypermedia software package for use in third-grade classrooms to help children improve their food handling skills. This education component will provide innovative and interesting ways for children to learn about proper food handling. In addition to the software program that will be piloted with 300 students in May, packets of information will be distributed to the students, with exercises in food handling that they will practice at home with their parents. The same information will be relayed to parents through Cooperative Extension Service bulletins. Although the pilot program will reach a limited number of children, the program's goal is to reach culturally diverse children across the state and to become a part of the Michigan Model for Comprehensive School Health Education, said June Youatt, associate professor

of family and child ecology. Andrews believes that the program will not only reach the children, but make an impact on their families as well.

Another similar project is focusing on the food handling practices of MSU student families who come to the United States from other countries and cultures. Carol Ann Sawyer, associate professor of food systems management, said that this project is designed to assist international student families with their food handling practices while in the United States.

The project will not only teach these families how to make the adaptation to safe food practices here, but it will also provide the researchers the opportunity to better understand safe food handling practices of many cultures.

"There are some cultures that are not familiar with typical American food buying, handling, storage and cooking techniques. If someone has never operated an electric oven before, he or she may not know how to safely cook food in it," she said. "We'll try to learn about their customs and teach them what they need to know about safe food handling here."

The project will use persons from the same culture to provide in-home assistance and recommendations.

Some of the findings from the research will also become part of the educational materials developed for the children's program.

FOR SOME, FOOD POISONING IS A SPECIAL CONCERN

Are you pregnant? Do you have AIDS? Are you over 55? Do you have children less than a year old? Are you diabetic? Do you suffer from chronic liver or kidney disease, or cancer? Are you an alcoholic?

If you answered "yes" to any of these questions, you may need to be particularly concerned about the risk of illness or infection caused by bacteria in food.

Most food safety experts would agree that health hazards associated with chemical toxins in food are miniscule when compared with the potential harm from bacterial food-borne illnesses.

"The Centers for Disease Control estimates that 9,000 people a year die from microbial food poisoning of one type or another," said Robert Hollingworth, director of the Pesticide Research Center at MSU. "Everyone in the U.S. population has had some reaction to some microbial agent at some time or another, whether they know it or not. Usually it causes only discomfort for a few hours, but there can be lethal consequences as well."

For those individuals who are "immunocompromised" -meaning they have weakened immune system the sequences of microbial



food poisoning should be of particular concern.

Food-borne infection is caused by bacteria in food Salmonella, Campylobacter, and shigella bacteria, if eaten they continue to grow in the intestines and cause illness. Immunocompromised individuals may also be at a heightened risk of poisoning by toxins that some bacteria can produce in food that is carelessly handled, cooked or stored. Examples of toxin-producing bacteria are Staphylococcus aureus and Clostridium botulinum.

How severely the toxins or bacteria affect various individuals depends on a number of factors, including the nature of the organism, the amount of the organism or toxin ingested, and a person's age, physical condition and genetic makeup. Severe illness and death tend to visit those individuals whose immune systems are weak.

People infected with HIV, the human immunodeficiency virus that causes AIDS, need to be

especially careful when selecting, preparing, storing and eating food because their immune systems are hindered by viral siege and cannot provide adequate defense against harmful bacteria.

Older individuals may also be especially vulnerable to food-borne illness because most people's immune systems begin to weaken around age 55. The stomach's acidity also decreases with age. Acid helps control bacteria, so less acid means greater risk of illness.

Women who are trying to conceive, or are pregnant or lactating, and very young children are also particularly vulnerable to bacteria and other harmful substances in their food.

"Many of the toxins found in food are involved in developmental processes, such as nerve processes," said Sandra Andrews, Extension specialist and assistant professor of food science and human nutrition at MSU. "The toxins can have a teratogenic effect, meaning they will interfere with early fetal development. Alcohol is probably the biggest teratogenic of all. High doses or abuse can endanger anyone, but people in these highly vulnerable situations need to take special care."

Children under the age of 1 have immature immune

systems and cannot fight harmful bacteria with the same vigor as older children and adults.

In addition, anyone with diabetes, chronic liver or kidney disease, or cancer, people taking steroids or undergoing chemotherapy, and alcoholics are at greater risk of severe illness or death from a food-borne illness because of their weakened immune systems.

Most food-borne illness results from eating raw, mishandled or improperly prepared food. About 1 in 10,000 raw eggs, for example, carries the Salmonella enteritidis organism, which could lead to salmonellosis.

Therefore, if you are in a particularly vulnerable group, choose well-cooked scrambled eggs over sunny-side up, and avoid foods made with raw eggs, such as hollandaise sauce and homemade holiday eggnog. Other foods commonly associated with food-borne illness are fish, shellfish, poultry, meat and egg salads, pork, processed meats, meat pies, cream desserts and fillings, sandwich filling, and raw milk products.

These foods may be contaminated anywhere between the time they are slaughtered or harvested and the time they reach the dinner table. Poor handling

of food by shippers, restaurateurs, grocery stores or consumers all may introduce bacteria and other organisms into the food supply that endanger the lives of those at high risk of food-borne illness.

Fortunately, thoroughly cooking food readily destroys most bacteria that survive at refrigerator and freezer temperatures.

Tips for safe food handling:

Make sure you and your family members wash their hands after using the toilet or touching pets, before handling food and before eating. Bacteria are spread through contact with waste of animals, including humans.

Other bacteria are found on the skin and in the nose and throat, so people with colds, sinus infections or infected skin lesions may contaminate food that they handle.

Keep cooking surfaces and utensils clean.

Refrigerate foods promptly after meals or cooking.

Thaw frozen foods in the refrigerator or under cold running water.

Discard discolored or foul smelling leftovers.

Use only pasteurized milk and ilk products.

"Another thing people can do is break their leftovers into small portions and store

them in shallow containers," Andrews said. "If you Put a lot of hot food into a big, bulky container, the heat can't get out quick enough so the food remains too long at temperatures where bacteria can quickly reproduce."

Dining out can be risky for immunocompromised individuals if they don't know what precautions to take.

"In restaurants, food should be served piping hot," Andrews said. "Send it back if it isn't. All meat, poultry fish and egg products should be well cooked. Eggs should not be runny, meat should not be pink and fish should flake easily."

Avoid raw meat, poultry and seafood (especially oysters and clams), raw milk and raw milk products in restaurants, Andrews advised.

Most people have the defense mechanisms that help protect them against food-borne diseases. Though they may experience occasional illness or discomfort from eating contaminated food, the illness is usually short-lived. But for those individuals who have weak or underdeveloped immune systems, bacteria in food could mean severe illness or even death.

"These people are not different from other people in terms of the food-borne diseases they can get," Andrews said. "They are different because the odds are higher that they'll become severely ill. So while you and I can be

HOTLINES

Meat and Poultry Hotline

The Meat and Poultry Hotline handles questions about food storage, holiday and meal safety, egg safety, mail-order foods, product recalls, meat and poultry inspection, meat and poultry labeling, and other issues.

1-800-353-4555
8 a.m. to 2 p.m. EST

The National Pesticide Telecommunications Network

The National Pesticide Telecommunications Network deals with a wide range of pesticide information, including the effect of pesticides on food safety.

1-800-858-7378
Operates 24 hours a day
Every day of the year

Michigan Poison Control Center
Blodgett Regional Poison Center
Grand Rapids, Mich.
1-800-632-2727

pretty careful most of the time, these people need to be very careful all of the time."#

Remember the widespread fear about Alar on apples and then, a few months later, the emotional charges about the use of certain fungicides (EBDCs) on agricultural crops?

Despite the widespread fear, scientific evidence shows little, if any, evidence that any pesticide residue that might show up on food is a potential cancer threat to humans.

According to the Environmental Protection Agency (EPA), the World Health Organization and the United Nations Food and Agricultural Organization, Alar (now off the market) did not pose a meaningful risk of cancer in animals, let alone humans.

After two years of

special review, the EPA is also giving the green light to the expanded use of EDBC, based on evidence from actual farm use and the absence of pesticide residues on produce. The fungicides are used to protect potatoes, tomatoes, apples and other fruits and vegetables against diseases and molds.

The Food and Drug Administration has repeatedly stated that health risks from legal use of pesticides are insignificant. The National Cancer Institute recently stated that it is "unaware of evidence that suggests that regulated and approved pesticides in foods contribute to the toll of human cancer in the United States."

Those assessments backstop earlier statements by Robert Hollingworth about the use of pesticides in agricultural production. Hollingworth is the director of the MSU Pesticide Research Center.

"We have no direct knowledge that pesticide residues in produce have cost even one human life or ever caused a single case of cancer." Hollingworth said.

Pesticides are used to



curtail damage by insects and diseases on food crops and also to prevent food spoilage by organisms that produce powerful toxins. Eliminating pesticides would eliminate that protection. Even worse, eliminating pesticides might actually increase your overall risk from toxic chemicals that occur naturally in food, Hol Hollingworth said.

He-and many other scientists point out that Mother Nature is chock-full of carcinogens, many of them significantly more potent than anything properly used for agricultural crop protection. (See related story on environmental and natural toxins, p. 8.)

Nonetheless, the agricultural community is acutely aware of its responsibility to help assure the safety and quality of the products going through the farm gate by using pesticides prudently.

Larry Olsen, MSU Extension pesticide education coordinator, said there are three areas of education and practice that guide farmers in their crop production -integrated pest management (ICM) and pesticide application certification (PAC).

PAC has been a Michigan law since 1976. All farmers who

apply restricted-use pesticides for any kind of crop production must have passed a stringent examination administered through the Michigan Department of Agriculture. Farmers must also be recertified every three years, and they are strongly encouraged to participate in pesticide update education programs held around the state each winter.

"Passing the examination requires a thorough knowledge of the effects of the pesticide, proper application, handling, storage, worker safety and prevention of environmental contamination," Olsen said. "Upon certification, the applicator is given a card that must be presented each time a pesticide is purchased. Overall, it's a pretty thorough process that helps assure safe use of the chemical."

Olsen says that approximately 6,000 people are certified or recertified each year, including farmers, crop dusters, lawn care representatives - anyone who applies pesticides.

These exams are an integral part of IPM. MSU entomologists pioneered the development of the IPM concept in the mid-1960s. A key component of IPM is judicious use of pesticides

only as needed to supplement other control approaches, and only after assessing the environmental health and economic costs and benefits.

"Successfully implemented IPM provided economic benefits to farmers and more environmentally acceptable crop and animal protection practices," Olsen said. "The system and programs are being continually refined and improved, based upon continuing research and experience."

He estimates that fruit growers using IPM and other practices have been able to reduce their use of pesticides by more than 40 percent during the past decade. Emerging technology in pesticide application equipment suggests that the current volume of pesticides can be trimmed by another 50 percent.

"These revised practices are based on many years of hard, field-tested research," Olsen said. "In many areas, these practices require farm use of computer systems to maintain the safety and quality of the crop."

A number of software programs have been developed at MSU and by industry to help farmers calculate how to use pesticides and fertilizer and animal manure in the best manner possible.

For instance, computer-based systems such as the MSU-developed Envirocaster can be used in the field to forecast when insects and disease organisms will begin to

threaten fruit and vegetable crops.

Similar programs help farmers calculate how much animal manure and fertilizer can be applied to land so that nutrients are absorbed by the crop rather than carried away into surface or groundwater.

Some computer systems are even built into tractors, planters and harvesters to enable the farmer to tell exactly how necessary crop production inputs are being used.

"We are very close to prescription farming-tailoring every input to actual need, much as a doctor would prescribe a specific drug for an illness," Olsen said. "Agriculture is a complex business, far more than most people understand. Today's farmer is very much a professional, a skilled producer and a good steward of the environment."

HOW SAFE IS MY FOOD?



Is the food you buy for your family safe? If you listen to the reports in the news, you might wonder. Studies show that a large number of consumers do not think that meat and dairy products are safe, and their greatest concerns are about the drugs used to treat food-producing animals and the pesticides they are exposed to.

It is true that beef, pork

and dairy producers use antibiotics to treat their livestock. It is also true that on-going testing and research and quality assurance programs help to provide safe and healthy food-producing animals. There are several federal testing programs. The United States Department of Agriculture's Food Safety Inspection Service (FSIS) conducts

meat inspection on a national level. There is no state testing program, but the Michigan Department of Agriculture has a contract with the Food and Drug Administration (FDA) to provide an educational program to farmers who are found to be in violation of FDA accepted levels of drugs, to help ensure that it won't happen again. Under this program, the

department makes about 175 farm visits a year.

The U.S. Department of Agriculture has also implemented a regulatory program that measures animal drug and pesticide residues in domestic meat and poultry products.

The FSIS found that the majority of the 125 million meat animals and the 6.3 million poultry that enter federal inspected plants each year are healthy and

virtually free from infection. The FSIS program also checks for residues from more than 133 drugs and pesticides

The FSIS also tracks violations on a computer system called the Residue Violation Inspection System, which provides 24-hour, 365-day access to data.

Violations occur when a carcass is tested and found to contain illegal levels of chemicals, pesticides, environmental contaminants or drugs. Levels are set by the FDA, which regulates drugs and food additives, or the Environmental Protection Agency, which regulates pesticides used in food production and establishes tolerance levels.

Bill McCarthy, director of the dairy products division of the Michigan Department of Agriculture, said that the FDA requires studies to be done on food-producing animals. For instance, a program is being implemented to test each tank of milk produced for beta lactam, a penicillin residue. There is also periodic testing for other drugs and drug residues, such as the antibiotics tetracycline and gentamicin, McCarthy said.

As time goes by, more screening tests for more drugs will become available, McCarthy added.

According to James Lloyd, D.V.M., MSU assistant professor of large animal clinical sciences, animal drugs can potentially affect human health if residues occur in sufficient quantity. Effects, which are rare, usually involve allergic

reactions.

"Actual, documented cases of reactions to specific antibiotics used in residue occurrence, he noted.

There have always been questions over the safety of drugs used in animals. Even with the comprehensive testing and research that the FDA requires, the agency still comes under fire to do a better job of ensuring animal drug safety.

On-going research and monitoring of drugs, their uses and the amounts of the products used continues. One drug to come under such scrutiny was DES, a hormone once used in both humans and livestock. After health problems were discovered in women who had been exposed to DES as a part of their prenatal care, the drug was banned in humans and in livestock. The newest animal drug controversy is over the risks to consumers from a genetically engineered growth hormone, bovine somatotropin, or BST. BST is a protein hormone that all cows and calves naturally produce for normal physiological function, including growth and milk production.

To prolong and increase milk production, scientists have produced a synthetic form of BST that is estimated to increase production by 8 to 15 percent. But what effect does synthetic BST have on the milk you get at home?

According to Lloyd, BST has not been found to have

any affect on growth or health in humans.

Lloyd said the risks perceived by the public associated with animal drug residue are far greater than the actual risks.

McCarthy agreed.

"The consumer should feel very comfortable with the testing that is being done for drug residues," he said.



FOOD SAFETY

ON THOSE SPECIAL OCCASIONS

Picnics, potlucks, office parties, graduations, showers, church functions - the list of social occasions that involve food is endless.

Whether you're taking food to an event or serving it to people who come to your home, safe food handling will reduce the possibility that someone will contract a food-borne illness.

Keeping foods safe and wholesome is not difficult, but it does require some planning. Remember to keep hot foods hot - 140 degrees F or higher. And keep cold foods cold 40 deg lower. Limit the possibility of contamination of foods - transfer of bacteria from raw food to cooked food or raw food that won't be cooked - by washing Cutting boards, utensils and hands frequently. Raw meat, poultry and egg products and their juices should never come into contact with cooked foods or raw foods to be eaten raw.

When serving perishable foods such as meat, fish,

shellfish, poultry, milk and eggs, prepare several small serving trays or dishes and replace perishables and serving dishes, trays and utensils frequently.

Keep perishables in the refrigerator until serving time and use a clean tray, dish or spoon with each fresh batch.

Dips for vegetables, fruits and snacks often contain sour cream, milk or cheese. Prepare several small containers of dips ahead of time and store in the refrigerator until use. Replace the dip, the container and any serving utensils each time to minimize cross contamination from one batch of dip to the next.

If raw foods need to be cooked prior to party time, make sure they are thoroughly cooked before serving and held at 140 degrees or higher. If food must be prepared ahead of time, cook hot foods and store them in the refrigerator or, for longer

storage, in the freezer. Foods cool quicker in several small portions rather than in one large batch. Use a food thermometer to check the temperature of food. Reheat cooked foods thoroughly - to 160 degrees F or higher - before serving and hold at 140 degrees F or higher.

Don't demand too much of your refrigerator. If your refrigerator is too small to keep your party foods cold, ask a neighbor if you could borrow some refrigerator space for a few hours. Perishables will be safe and wholesome if they

an ideal environment for the growth of food pathogens (organisms that cause food-borne illness). Steak tartare, oysters on the half-shell and sushi (raw fish) may be popular, but they are also raw perishable foods that may contain food pathogens. Foods that contain uncooked eggs, such as Caesar salad or uncooked homemade ice cream or eggnog, may contain salmonella bacteria. (Commercial eggnog and ice cream have been pasteurized and are safe.) Recipes that contain lightly



are not held two room temperature for more than 1 hours including the time it takes to prepare and serve them.

Avoid serving raw meat, fish, she fish or eggs. Raw foods, especially those that are low in acid and high protein, provide

cooked eggs -such as stirred Custard, chilled chocolate mousse or meringue - may also support salmonella. Because these foods are minimally heated, salmonella and other food pathogens may survive and multiply in the warm temperatures. Cook whole eggs until the yolk is not runny and the white is firm.

WAYS TO CUT YOUR RISK OF FOOD-BORNE ILLNESS

In food safety, the big risks may be in the kitchen. People are far more likely to get sick from food-borne illness because food was contaminated or mishandled after it was purchased than because of an additive or pesticide residue.

The FDA reports that the risk of illness because of food additives or pesticide residues is very low. Monitoring results show almost no pesticide residues present in fresh foods. On the other hand, it's estimated that between 24 million and 81 million cases of food-borne illness occur in the U.S. every year. Here are some tips to cut your risk of food-borne illness:

SHOP CAREFULLY

- # Shop for meat, poultry, fish, shellfish and refrigerated and frozen foods last in the grocery store. In hot weather, take along a cooler if it will take you more than an hour to get home. In hot weather, keep groceries in the car, not the trunk, on the way home.
- # Make sure meat, poultry and fish products are placed in a plastic bag that will keep raw juices from dripping on other foods.
- # Buy products marked "Keep Refrigerated" only if they are in a refrigerated case. Frozen foods should be solidly frozen.
- # Don't buy fresh, prestuffed poultry. If stuffed poultry is purchased hot, buy

it only if you can serve it within 2 hours.

- # Report problems with packaging, product condition or in-store sanitation to the management. If the problem is not corrected, notify the local public health department.

DELI FOODS NEED SPECIAL CARE:

- # Buy only the amount of shaved deli meats that you can use in 1 or 2 days.
- # If you buy a hot food item, take it right home and eat it or hold it no longer than two hours at 140 degrees F or hotter.
- # Discard any deli foods if they go unrefrigerated for more than 2 hours.

REFRIGERATOR STORAGE

- # Keep the refrigerator clean and the temperature at 40 degrees F or colder.
- # Use warm soapy water to clean refrigerator shelves and surfaces. Rinse with a dilute bleach solution (1 tsp. per quart of water) to sanitize shelves or drawers where raw meats, poultry or fish is stored.
- # Store raw meat, poultry, fish or shellfish separate from other foods. Use plates, plastic bags or trays to keep meat and poultry juices from dripping on other foods or refrigerator surfaces.
- # Refrigerate products with "Keep Refrigerated" labels.
- # Don't taste foods that may have

been stored too long. Check appearance and odor for clues about condition. Most perishable foods should be kept no more than 5 days in a refrigerator. Adopt the restaurant industry motto "When in doubt, throw it out!"

- # If the power off, keep the refrigerator door closed except to add ice. Cook perishable foods within a few hours or, if the power outage was only in your home, move the food to a neighbor's refrigerator.

FREEZER FACTS

- # Keep the freezer at 0 degrees F or colder.
- # Label and date all frozen foods so you can use them while the quality is good. Foods that are stored for longer than recommended times will be safe but may not be palatable.
- # If the power goes off, keep the freezer closed except to add dry ice. Foods that still contain ice crystals can be safely refrozen. Thawed but still cold meats, poultry, fish or shellfish should be checked for off-odors. If none are present, cook the foods and eat them or refreeze the cooked food.

STAY CLEAN, STAY WELL

- # Wash hands with soap and hot water for at least 20 seconds before beginning food preparation, after

handling raw meat, poultry, fish or shellfish, and after touching animals, using the bathroom or changing diapers.

- # Wash hands, counters, equipment and utensils after handling raw meat, poultry, fish or shellfish. Rinse with a dilute chlorine bleach solution (1 tsp. per quart of water).
- # If you have a diarrheal illness, don't prepare foods at home/work.

- # Wear disposable plastic gloves while preparing foods if you have an infected cut or burn on your hand.

GET READY TO COOK

- # Don't taste raw or partially cooked meat or poultry, eggs, fish or shellfish.
- # Wash all fresh produce with cool water (no detergent) before eating.
- # Thaw or marinate raw meats, poultry, fish or shellfish in the refrigerator, not on the counter. Discard leftover marinade. Do not reuse it.

MICROWAVE SAFETY

- # The microwave oven is not a "magic bullet" for bacteria. Bacteria are not as easily destroyed by microwave heating as by other heating methods because of the shorter heating times and uneven heating patterns.
- # Use roasting bags or

covered containers to cook fresh meat, poultry, fish or shellfish in the microwave. This keeps steam in contact with the meat.

Allow standing time after cooking. Use a temperature probe to assure correct internal temperature. Rotate or stir foods while heating.

Do not use microwave ovens for home canning.

PREPARING FOOD WITH CARE

Cook meat, poultry, fish, shellfish and eggs

completely -to an internal temperature of 160 degrees F for meat and eggs and 180 degrees F or higher for poultry. For cuts more than 2 inches thick, use a meat thermometer to check the temperature. For thinner cuts, clear juices without a pink appearance are signs of doneness. Fish will flake easily with a fork when done.

Roast meats or poultry at oven temperatures of 300 degrees F or above. Don't cook without a constant heat source.

Stuff meat or poultry just before cooking and cook in one continuous time period. Don't partially cook a food and then finish cooking it several hours later.

To save cooking time on a grill, partially cook the meat in a regular oven or microwave, then immediately transfer it to a hot grill.

if you are cooking food ahead to serve later, chill the food rapidly as soon as it is cooked by refrigerating it or placing the container of food in ice water until it cools down. Don't let hot

foods cool off at room temperature. It's a myth that hot food will spoil if it's put in the refrigerator.

Freeze sandwiches if they can't be kept cold until lunchtime. Omit lettuce, tomatoes or other fresh vegetables when you, freeze them.

If you like mustard, salad dressing or mayonnaise on a sandwich, spread it directly on both sides of the meat.

Acid in these dressings helps slow down bacterial growth.

COME AND GET IT

Serve cooked foods on clean plates with clean utensils. For example, don't put grilled chicken back on the plate that held raw chicken, and don't eat with a fork or knife that was used on raw food.

If outdoor temperatures are above 90 degrees F, hold cooked foods no more than an hour without heat or refrigeration. At cooler temperatures, hold no longer than two hours.

Hold hot foods at 140 degrees F or higher.

Chill leftover foods quickly and immediately after the meal. Separate meat from stuffing or gravy to cool.

Use shallow containers for quick cooling.

#Don't taste old leftovers to determine safety.

Discard outdated, unsafe or questionable leftovers in the garbage disposal or in tightly wrapped packages that will not attract animals.#

NEW PACKAGING AND FOOD SAFETY

Today's consumer can buy food items packaged in cans, boxes, plastic tubs, microwavable containers, plastic bags, vacuum-packed containers - the choices are almost endless.

One of the most well received new types of packaging is the plastic shelf-stable container, according to T. Downes, MSU packaging professor. Small plastic tubs of pasta, stews and soups, for example, are increasingly finding their way into American lunch bags. Pop the container into a microwave at school or at work and you have a hot lunch with no storage, preparation or clean-up problems.

Shelf-stable plastic bags offer soups and entrees with the same convenience. The bags are heated in the microwave or boiled in water. Unlike their frozen counterparts, these plastic bags come in paperboard containers that can be stored on the pantry shelf until needed.

"Food shipped and heated in similar kinds of shelf-stable containers formed until the basis for much of the menu served to our service men and women in Operation Desert Storm," Downes noted.

How safe are these new packaging alternatives? "These products are safe," Downes

said. "They're as safe as canned food," and the same precautions should be followed for them as for canned food. In other words, don't consume the food if the package is bulging or has been punctured or torn, he advised. (Once the seal has been broken, the product becomes vulnerable to

bacterial contamination, just like a canned product.

What about the storage life of these products? Downes recommended eating canned and packaged food within a year of purchase, though it's likely these products could be stored longer than that.

"The issue here isn't food safety," said Downes, who admitted that in 1961 he ate hamburger packaged in 1944 for the armed forces, with no adverse effects. "The product remains safe if the seal is intact, but the quality can deteriorate."

Many of these new packaging processes use cooking methods that give you a product closer to fresh than the traditional canning process does, Downes pointed out. So even if color, flavor or texture does deteriorate over time, the quality may still be better than that of some canned products.

Though plastic shelf-stable packaging has been well received, some other new packaging methods haven't been as widely accepted in the United States. Aseptic packaging - vacuum sealed, sterilized liquids in small cardboard boxes - has been well accepted for juices and juice-flavored drinks but not for milk, Downes said.

Because the United States has a very efficient cold chain, the cost of transporting, storing and displaying cold or frozen products is not as high here as in some other countries. Americans also usually have ample refrigerator space and can indulge their preference for cold, pasteurized milk rather than sterilized milk, which has a cooked flavor to some

palates.

Downes maintained that aseptically packaged milks still have a place. You can't beat the convenience of the product when camping or for a backup when you suddenly run out of milk for your breakfast cereal, he said.

With aseptic packaging, the safety issues are the same: don't drink the product if the package is swollen or punctured. And once you've opened it, you have to consume it, as with fresh milk, refrigerate it will spoil.

A third type of new, package can be found in the refrigerator section of your grocery store. Meats and various entrees - either raw or cooked - are packaged in a modified - a different mixture of oxygen, nitrogen and carbon dioxide. In some European countries, this type of packaging has become very popular, but it has had lower acceptance in the United States.

The key to food safety is to make sure the product is held at refrigerator temperature.

Another type of packaging that didn't catch on with American consumers is vacuum-packed fresh meat,

Downes said. Though vacuum packing - no oxygen/nitrogen-flushed is probably the best way to package meat, consumers rejected the packaging, possibly because vacuum-packed meat is purple. Americans prefer seeing and buying meat that is red.

"As meat is exposed to oxygen, it begins to turn first red, then brown," Downes said. Because of our preference for red, we are buying meat that is packaged in a wrap that allows oxygen in (and spoilage microorganisms to grow).



Environmental, Natural Toxins Occur in the Food Supply



Toxins are everywhere in our environment. Often they can't be seen, touched or tasted, and they rarely interrupt our routine, though we are exposed to them all day long. But what are toxins, and where are they, and why have they generated so much concern in recent years?

By definition, a toxin is a poisonous substance produced by a living organism—usually a bacterium, fungus or plant—that can be harmful to other organisms, including humans. These poisons have always existed in nature, as well as in our food supply.

Another category of toxins is those introduced into the environment through some other means, perhaps through application of pesticides to crops or as chemical byproducts of industry. For example, most of the industrialized world has been exposed to toxic compounds such as PBBs

and PCBs since the 1940s, when chemical companies began producing and using them for everything from fire retardants to pesticides.

"Naturally occurring toxins are typically a natural part of the plant and have always been there," said Sandra Andrews, Extension specialist and assistant professor of food science and human nutrition at MSU. "Other environmental contaminants such as PCBs have gotten into the environment through some other mechanism and we don't want them to be there. There are similar concerns about both types of toxins, but how and why they are in the environment are different and should not be confused."

It was the inert, long-lasting qualities of some highly chlorinated chemical compounds that first made them attractive industrially. But when they and the byproducts from their synthesis were found

to be life-threatening to biological systems that could not break them down, the government halted their use and production. But their effects still linger, and they remain among the major environmental pollutants in the world and continue to plague the food supply.

"PCB use is no longer legal, but they are still in the environment because they are so stable," Andrews said. "Their concentration in our environment is decreasing, but they still exist."

"Persistent pesticides that are no longer legal in the U.S., such as DDT, are still in the environment as well," Andrews said. "Some of the metabolites are still out there, and they still get into our food. But the substances are present in very small quantities and have declined greatly in the past 20 years."

Because the environment is made up of air, water and land, contamination can be

introduced to the food supply through a variety of systems.

"Air, water and land issues eventually become food issues," Andrews said. "Environmental contaminants in food is just one aspect, one route to our exposure."

"Burning materials releases substances into the air that mix with water and make acid rain, which can cause the indigenous mercury in rocks to dissolve into the system and it gets into the inland lakes. Then we have, mercury in our fish."

"Air and land contamination from past use of leaded gasoline can also begin a progression that puts lead in our food," Andrews said.

Toxic substances can enter the body through ingestion, or eating, or they may penetrate the skin or be inhaled into the lungs.

When a toxic substance is

eaten, it may or may not be absorbed into the bloodstream. If it is, the toxin will be distributed throughout the body's organs and tissues, and then either stored, metabolized or excreted (or a little of each). Depending on the amount and concentration of the substance ingested, its chemical structure, and the individual's health, lifestyle, age and genetic makeup, the toxin may cause immediate illness, have no effect at all, or go unnoticed for many years before its effects are seen.

Both types of toxins—those occurring naturally and those that are synthetic—can be harmful and even deadly to someone who ingests a large enough dose over a long enough time.

"The only difference between natural and manmade is a philosophical point," said Robert Hollingworth, director of the Pesticide Research Center at MSU. "Some people believe that natural means safer, but to the toxicologists it doesn't make any difference. We often make in a factory exactly the same thing that a plant or bacterium makes. A field of crop plants is a chemical factory run by nature."

When shopping for food, Hollingworth advised consumers to remember that "natural" doesn't always mean better.

"The word 'natural' has marketing magic, but it is exceedingly dangerous if it is misused," Hollingworth explained. "There is a true cachet and value in saying something is natural, but it may have nothing to do with

minimizing the risk that comes from the toxic materials.

"Many scientists believe that naturally occurring toxins are likely to be greater contributing factors to long term illness in humans than manmade contaminants," Hollingworth said. "Some natural chemicals are exceedingly toxic and have the ability to cause such things as birth defects and cancer."

Hollingworth said some natural pesticides occur in higher concentrations than would ever be allowed in a synthetic pesticide. If duplicated in the lab and submitted for commercial approval, the substances would never pass inspection by regulatory agencies.

These natural toxins often serve as models, however, on which toxicologists formulate synthetic pesticides and herbicides.

"We get some of our best ideas from naturally occurring materials," he said. "For example, pyrethroids are commonly used synthetic insecticides based on naturally occurring pyrethrins, a toxic material with insecticidal properties found in certain types of chrysanthemums."

Natural toxins are present in plants as a defense mechanism, Andrews explained.

"A plant can't get up and run," she said. "By making itself toxic, a plant can wage its own chemical warfare against fungi, insects, weeds and grazing animals."

Andrews said consumers can protect themselves and minimize their exposure to

natural and environmental toxins by simply being aware and making informed, logical food choices.

"Eating a wide variety of foods will reduce the chance of consuming a high concentration of some contaminant in the diet," she said. "If you eat a single food with a particular toxin regularly, you might be setting yourself up for a problem."

Andrews said some foods with known natural toxic potential should be of particular concern to consumers.



Michigan State University " Cooperative Extension Service Spring 1992

Americans have discovered that a microwave oven is great to prepare food quickly. Currently, 75 percent of American households own and use microwaves.

Microwaves heat food more quickly than conventional methods, but that doesn't mean basic food safety rules don't apply. As a matter of fact, you must be even more careful when using a microwave.

The heat generated when food is microwaved can cause the container or packaging to get very hot, cautioned Bruce Harte, MSU packaging professor. A glass container can get hot enough to cause a burn. Cardboard or plastic packaging may get hot enough to soften it, causing it to twist or turn when you pick it up, spilling hot food on your hand. And popcorn bags and other sealed containers may release dangerously hot steam when opened.

It's critical to teach family members how to handle and open containers that have been heated in the microwave if you want to avoid nasty scalds or burns, Harte said.

Follow the cooking instructions on the package. Many products need to sit for a couple of minutes after cooking time is completed. This serves two purposes, Harte said. It allows the heat to dissipate from the product and, in many cases, it also completes cooking times, preventing possible food-borne illness.

On the horizon is new microwave packaging with

self-venting films or tops that will allow the release of steam during cooking.

Some consumer concerns about packaging materials relate to food safety.

"A couple of years ago, consumers were raising the issue of residuals in the migrating into the cooked product," Harte said.

"Susceptors were under special scrutiny." Susceptors -are the thin metallic-like layers in microwave packages that absorb energy and heat up to between 350 and degrees F, allowing foods to brown crisp. There was some concern that chemical changes at such high temperatures could create new substances that could migrate into foods.

The FDA requested data from industry and academic institutions regarding research in this area. To date, no report has been released, but Harte said it's important to note that technology in this area is moving fast and it's likely that earlier problems were corrected.

The increasing consumer demand for recycled materials is leading to the availability of more and more consumer goods made from recycled materials. The FDA regulates the use of products that come into contact with food, and the only recycled packaging products FDA allows for food use are egg (in the shell) cartons, berry baskets, harvesting crates and soda bottles. A regeneration process used to make recycled plastic soda bottles with PET (polyethylene

terephthalate) is the only FDA-reviewed process for recycling plastic containers for food use.

Paper towels and paper plates made from recycled products should not be used when cooking food in the microwave because the heat from microwaving might cause migration of materials in the recycled product to the food.

In addition to safety concerns about the containers we cook with, there are also some potential food safety problems related to the cooking method.

For all its good points, a microwave cooks food unevenly. This creates hot and cold spots in foods being heated or cooked. The cook must take steps to ensure thorough cooking of perishable foods such as meat, poultry, fish and eggs. Food that is not completely cooked may harbor bacteria that could cause food poisoning.

Here are some common questions asked about microwaving:

Q: How do you cook meat long enough in the microwave to prevent potential food-borne illness without drying it out?

A. Because microwaving can leave cold spots in food, it is very important to cook meat and poultry thoroughly. However, cooking too long will cause the meat to get dry and tough. To ensure safe, tender meat and poultry, try the following:
Arrange pieces of meat uniformly and cover the dish. Steam that builds up

under the cover will help kill the bacteria and cook the meat uniformly. You can use a glass or microwave ware cover or plastic wrap.

Interrupt the cooking several times to move the food around in the dish. If your microwave does not have a turntable, interrupt the cooking several times to rotate the entire dish a quarter turn.

Ground meat should be stirred frequently during cooking.

Use a thermometer to be Sure the meat has reached the desired temperature.

Q: Can baby food be heated in a microwave?

A: Because microwaves heat unevenly, some portions of the baby food may be tepid while others are scalding hot, and the baby's mouth could be burned. For this reason, it is not advisable to heat baby food in the microwave. If you're in a situation where you have to use a microwave, use the following precautions:

Stir food and shake liquids thoroughly before testing for temperature.

Always test the temperature for formula and food before offering it to the baby.

If you heat bottles in the microwave, remove the caps and nipples. Do not heat too long - plastic liners may burst.

Don't use the same jar for heating, serving and storing the uneaten portion. Heat the amount of food you know the baby will eat in a separate dish. When

you use the jar as an eating and leftover storage container, you run the risk of contaminating the leftover food with the bacteria in the baby's saliva that gets carried on the spoon.

with normal heating.#

Q: If you thaw a large bag of frozen chicken parts in the microwave and decide not to use all of the parts, can you refreeze the extra pieces?

A: This practice is not advisable because foods thawed in the microwave are subjected to temperatures that can cause parts of the food to begin to cook..

It's best to cook food immediately after thawing it in the microwave.

You could cook all of the chicken and then freeze some of the cooked chicken. If you don't want to do that, thaw the chicken in the refrigerator, remove the desired number of pieces as soon as you can, and then refreeze the extra pieces.

Q: A casserole was completely thawed and then left at room temperature for several hours. Is it safe to eat if it's reheated in the microwave?

A: If the casserole was left at room temperature for more than two hours, it is not advisable to eat it. Bacteria multiply rapidly at room temperature. Reheating it in the microwave will kill some but not all bacteria responsible for causing food-borne illness. Some bacteria produce heat-stable toxins that cannot be destroyed

IS IT SAFE TO BARBECUE?

We used to slap steaks and chicken on the grill without giving a thought to the safety of the cooking procedure, but those days may be gone forever.

Today's consumers are questioning the safety aspects of everything related to the foods they eat, from growing and packaging to cooking. Many people are questioning past grilling practices and wondering if grilling is safe.

There may be some cause for concern. Grilled fatty meats are suspected of increasing the risk of cancer. When the meat is cooked over high heat, fat drips onto the heating element-coal wood, gas flames or electric coils-and forms potentially carcinogenic chemicals that are deposited on the meat by the rising smoke. Such substances form whenever the meat is cooked until charred-even to some extent when meat is broiled or pan-fried, especially if it's cooked until well done. This doesn't mean that you should never eat barbecued meat. just don't eat it every day, and take the following steps to reduce the risks:

Q Pick low-fat meats, or at least trim all visible fat before grilling.

Q Wrap meat in foil to protect it from the smoke.

Don't place the heat source directly beneath the meat. For instance, put the coals slightly to the side so that fat doesn't drip on them.

Q To reduce grilling time, particularly for thick cuts, partially precook the meat first (by microwaving or boiling), then finish it on the grill.

Q Place aluminum foil or a metal pan between the meat and the coals to catch the dripping fat.

Q If dripping fat creates a lot of smoke, briefly remove the meat or reduce the heat.

Q Scrape off charred parts of meat.

Q Don't use mesquite -this soft wood burns very hot.

FOOD SENSITIVITIES ARE COMMON; TRUE FOOD ALLERGIES ARE NOT

Fred develops an upset stomach, gas and diarrhea if he consumes dairy products.

Dorothy can't eat fish or other foods cooked in the same oil with fish, or even he around where fish is being cooked.

She becomes deathly ill - her throat swells shut and she can't breathe.

Dorothy has a true food allergy an adverse reaction to food caused by an overreaction of the immune system.

from mildly uncomfortable to life threatening.

Food sensitivities are defined as any abnormal or noticeable response to food. They are commonly caused by metabolic deficiencies, toxins or disease.. Some people, for example, experience mild to severe problems because they cannot metabolize tyramine, which is an amino acid. Lactose intolerance is probably the most common food sensitivity, Others

food, such as milk, eggs or peanut butter. After that, it takes only a small amount of the food to set off an allergic reaction.

Reactions may include itching, rashes or hives, abdominal pain, nausea, vomiting or diarrhea. More severe reactions may include asthma attacks, swelling of the throat or a sudden drop in blood pressure. If blood pressure falls, the person can go into a potentially fatal shock

action.

Because true food allergies can be life threatening, anyone who suspects he or she has a food allergy should consult with a physician. Medical attention is important to distinguish possible allergies from other conditions that may cause similar symptoms.

If you find you have a food

lobster, for instance, avoidance is a fairly simple process. An allergy to dairy products, wheat or eggs, however, can be a bit trickier.

It will definitely mean much careful reading of labels to avoid allergenic ingredients in prepared foods, as well as less eating out and more cooking at home "from scratch" using cookbooks and recipes developed specifically for allergy sufferers.

Fortunately for most people, foods such as wheat, milk and fish are highly nutritious foods that are integral parts of a balanced diet.

For people with life-threatening allergies to these foods, however, the risks outweigh the benefits.



Fred has a food sensitivity, probably lactose intolerance, the inability to digest milk sugar.

Dorothy is among the 1 to 2 percent of the population who suffer from true food allergies. Fish and shellfish, milk, eggs, tree nuts, peanuts, soybeans and wheat are the foods that most often set off allergic reactions. These may range

include excess bloating or gas from beans or tofu, and mild to severe reactions to sulfites. Though true food allergies can develop at any time, they most commonly develop during infancy and childhood. Some 4 to 6 percent of infants have some form of food allergy, but many outgrow them later in childhood. An allergy develops after exposure to a

allergy, the treatment involves removing the culprit from the diet. Trying to diagnose yourself may result in failure to eliminate the allergenic food and progressively more severe allergic reactions with each exposure. The reverse can be true, too: you may needlessly eliminate a perfectly good food from your diet.

If you're allergic to

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