FOOD SAFETY—AN OVERVIEW©

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For decades officials of the FDA and USDA have publicly agreed with industry scientists that microbial hazards to the food supply far outweigh any of the risks that might be traced to food additives. The U.S. and other industrialized countries are experiencing an unprecedented increase in foodborne disease. This may be partially a result of better detection techniques and diagnosis of previously unreported cases. However, a number of changes in food patterns and processing may also serve to increase the risk of foodborne illness. Salad bars, "natural" foods, rare meat, and raw seafood; the microbes in fresh or minimally heat-processed foods pose greater health risks than the nutrient loss that occurs in cooking or the chemical additives and pesticide residues many people fear.

The FDA and CDC estimate that each year as many as 33 million Americans (14% of the population) suffer from various foodborne illnesses. If unreported, untreated or misdiagnosed cases are added, the number may exceed 80 million (USDA, FSIS). Nearly 9,000 cases per year prove fatal. It is likely that these figures estimate only about 75% of the whole possible spectrum of disease in which food is a vector. Foodborne illness costs the U.S. between $5 billion and $17 billion annually in medical care and lost productivity. Salmonella, Campylobacter spp., Yersinia spp., and Esherichia coli account for as many as 10 million cases of enteric disease annually.

The food industry uses a variety of effective control measures to limit potential hazards; destruction or inactivation of bacteria or spores through the use of heat treatments (pasteurization, canning), dehydration, freezing, refrigeration, specialized packaging, and/or approved antimicrobial preservatives. Food processors have achieved a high level of product safety; however, the trends towards increased dining out (nearly 1 out of every 2 meals) and the use of fresh, refrigerated foods (containing little or no salt and other preservatives) has offset the strides made by processors. The food industry is very concentrated--if something microbiological goes wrong, thousands of people may be affected (eg. 16,000 cases of Salmonella due to a problem in the Chicago Hillfarm Dairy in 1985).

Mishandling of food resulting in foodborne illness occurs primarily in food service establishments and in the home.

Food service establishments--65%
Home----------31%
Food processing facilities-------4%.

The four factors that most often contribute to outbreaks of food borne illness are (1) holding food at the wrong temperature including inadequate cooling, (2) inadequate cooking, (3) use of contaminated equipment in handling food and (4) poor personal hygiene by the food handler.
Foods can serve as vehicles of many pathogenic and toxigenic agents of disease including bacteria, rickettsia, viruses, molds, and parasites. Microorganisms grow by increasing in number rather than increasing in size. Unlike spoilage microorganisms, pathogens may not produce any off-odors, off-

flavors or discoloration. Some of these agents produce their effects through toxic metabolites resulting from growth of the agent in the food prior to ingestion (Staphylococcus aureus, Clostridium botulinum)--this is food poisoning or food intoxication. Others produce illness through ingestion of living organisms (Salmonella)--this is food infection. Some work via combination of the two--Clostridium perfringens grow to high levels in the food, sporulate in the digestive tract and release a toxin which causes illness.

Several factors affect whether or not foods become important vehicles of foodborne pathogens:

1. The nature of the food in regard to attributes that affect microbial contamination, survival and growth.
2. The likelihood of contamination at its source, in transit, and during processing and preparation, and the point at which contamination occurs.
3. Containers and/or packaging used for the food.
4. Processing time/temperature exposures (survival vs inactivation).
5. Nutrients, pH, water activity, redox potential, time and temperature affect whether microbes grow and at what rate.
6. Whether foods are eaten raw, partially cooked or fully cooked.
7. Conditions under which foods are held prior to serving.

Microbial hazards must be addressed on the farm (animal health, antibiotic use), during processing, sanitary facilities, preventing cross-contamination, and temperature control throughout the chain. Chemical hazards include antibiotics and pesticides. They should be used as directed--only as necessary, and withdrawal periods must be observed. Pesticides on animal feed and human food crops should be handled likewise. Another groups of potentially hazardous chemicals is food additive. Their safety is regulated by the FDA under the Food Additives Amendment. The Delaney Clause in this amendment states that "no additive shall be deemed to be safe if it is found to induce cancer when ingested by man or animals….."

Additives are evaluated based on risk vs benefit. Risk is the likelihood that harm will result from using this substance daily. "Acceptable Risk" is defined as use that will increase the type of harm by no more than 1 than already occurs for every 1 million people. BUT for Carcinogens--"0" risk is acceptable. The risks are weighed against the potential benefits: protect nutrients, maintain safety, maintain color / flavor (other qualities), or provide functions (emulsifiers, free-flow agents, pan-release agents, etc.). However, some natural carcinogens occur in food. Some occur in foods. If they are "natural", are they OK? How can we compare the risk of these substances to the CONTROLLED use of regulated additives?? For example, ethylene dibromide was banned as a fumigant (pesticide) because it is carcinogenic at 1.5 mg / kg of body weight. It prevents mold growth on peanuts. Those molds produce aflatoxin, a powerful carcinogen at 0.003 mg / kg of body weight. It takes 5000 times more EDB to cause cancer than aflatoxin. Which is the worse "evil"??

Everything that becomes food once walked on or grew in the ground, flew in the air or swam in the sea / lakes / rivers. All of these environments contain substances which can make us sick. The food material itself can contain substances that make us sick. Choosing "safe" food materials, then handling them safely are both required to produce safe food products. Ultimately, producers, processors, and food handlers take responsibility for the safety of the products that they produce: regulatory responsibility, legal responsibility, and responsibility to the public.