Food Safety: Problems of the Past and Perspectives of the Future

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ABSTRACT

Historically, most bacterial food poisoning in the United States is associated with mishandling, either in the home or in the food service establishment. Outbreaks traceable to errors in processing plants are rare. When they do occur they are often associated with changes in processing or packaging technology whose effect is not determined before the product is on the market. Areas of future concern that need research include (1) a better understanding of the mycotoxins; (2) how to minimize Salmonella contamination in animal products; (3) how to prevent, or at least predict, red tides; (4) better bactericidal agents that can be applied to foods; (5) an understanding of the nature and significance of mutagenic agents that are produced in foods during cooking.

Thirty years ago, the food industry was booming along with its war-born technology making all kinds of convenient and toothsome goodies to tempt the palates and the pocketbooks of America’s consumers. Make it and peddle it was the main idea. Nobody thought much about food safety. It was just assumed.

But every now and then the system failed, and when it did we learned all over again that Mother Nature is still in business. More often than not the failure was the direct result of a technological or marketing advance whose impact was not anticipated.

Sometimes the failure was the result of ignorance and indifference. The responsible party simply neglected to use appropriate quality control measures that would have warned him of danger.

At still other times the failure was simply the result of environmental changes and natural phenomena that we could not anticipate or control. We still don’t know why we have red tides at some times and not at others. We still don’t know why the Cholera bacillus appeared in Gulf Coast waters a few years ago. We still don’t know for sure where the virus of infectious hepatitis may be lurking in our oyster beds. There is much that we don’t know, but we know enough to do a lot better than we have done.

The trouble is, we have dissipated so much of our energy on nonproblems and ignored those of real health significance.

Let us look at some of the system failures of the past two decades that could have been prevented by simply applying the knowledge that we already had:

(1) Some time after World War II vacuum packaging was introduced to the Great Lakes smoked fish industry. This innovation greatly increased the keeping time and market area of smoked chubs and similar fresh water delicacies. Then in the early 1960s two outbreaks of Type E botulism with seven deaths were attributed to vacuum-packaged smoked fish from Lake Michigan and Lake Superior. In both cases the products had suffered temperature abuse without obvious signs of spoilage. Vacuum packaging in itself did not cause botulinum toxin to form, but it did help to hide the signs of temperature abuse. Without that there would have been no toxin.

(2) Nonfat dry milk has long been used as an ingredient of cooked foods, but its poor dispersibility limited its use as a beverage until the instantizing process was developed. Then in 1965 an outbreak of Salmonella new brunswick infection involving several infants was traced to instant nonfat dry milk from a single source. There is no reason to believe that the instantizing process per se affected the presence of salmonellae in the product. However, in accelerating and simplifying the rehydration process, instantizing did encourage the consumption of nonfat dry milk as a beverage and thus exposed more people to whatever microbial hazard existed in the original milk powder.

(3) Growth of the pizza business in recent years greatly increased the demand for sliced mushrooms. To
meet this demand with the equipment then available, some processors would shake the cans vigorously to pack more mushrooms into each container. This changed the heating characteristics of the product and frequently resulted in under-processing. Several lots of product containing botulinum spores or toxin were discovered and solved all of the safety problems relating to technological change and microbiological contamination.

(4) Fast food restaurants specializing in roast beef sandwiches have sprung up all over the United States in recent years. Suppliers of the roast beef tended to undercook the meat so it would be rare when it reached the customer. Several large outbreaks of *Salmonella* gastroenteritis called attention to the need for better control of the cooking process.

(5) In 1965, a cheesemaker in a midwestern state had trouble with slow acid production by his starter culture; yet he continued to operate as he tried to solve the problem. Several weeks later some of the cheese made during this period caused staphylococcal food poisoning in consumers. As it turned out, the milk became recontaminated with staphylococci after pasteurization and the slow acid production allowed the contaminants to grow and produce enterotoxin.

Those things actually happened. Some of them had enormous economic impact on the companies involved and all endangered the health of American consumers. Every one of them could have been prevented by simply applying our knowledge of bacteriology and proper food handling techniques.

Yet our system did not require any kind of safety appraisal. It left everything to the manufacturer, including the opportunity to use the consumer to find out if his products were safe.

We should not consider for one minute that we have discovered and solved all of the safety problems relating to technological change and microbiological contamination of food. Here are some others that we must think about.

(1) Is there a botulinum hazard in holding foil-wrapped baked potatoes at room temperature and then using them to make potato salad?

(2) What is the significance of the "Yersinia-like" organisms often found in vacuum-packaged boned-beef?

(3) What is the source of *Vibrio cholerae* and of the noncholera vibrios in Gulf Coast seafood? What can we do about them?

(4) What is the significance of Anisakine nematodes in marine seafood?

(5) Are viruses important as food-borne disease agents?

(6) What is the significance of *Campylobacter* spp. in food and water?

(7) How can we identify the truly enteropathogenic *E. coli* in foods?

(8) Is food (e.g., honey) a contributing factor in infant botulism?

(9) Does crowding in broiler houses and feed lots exacerbate the public health problems associated with foods of animal origin?

What can we do to protect the public against food-borne disease? We all know that errors in preparing and serving food are responsible for the vast majority of food poisoning outbreaks. These occur in the home, in commercial feeding establishments and wherever food is prepared or served.

Commercially processed foods are rarely involved, but there are exceptions and those exceptions should be guarded against. A consumer who buys a branded product deserves a safe and wholesome food. How can we insure that he will get it?

There is no absolute assurance, of course, but we could attempt to make the hazards known to manufacturers and to persuade--or force--them to take protective steps necessary to assure a safe food product on the market.

We are a long way from doing that today. FDA has issued a general Good Manufacturing Practice regulation that applies to all foods produced under the agency's jurisdiction. In addition, FDA has issued specific GMP regulations for low-acid canned foods, acidified foods, cacao products, confections, smoked fish, frozen raw breaded shrimp and bottled drinking water. This leaves vast areas without specific regulation and, in effect, means that precautions are largely up to the manufacturer and distributor.

I should emphasize that no manufacturer wants to have his product involved in a food poisoning incident. The cost of such a mishap can be enormous, and some incidents have proved fatal to the companies involved. Thus a knowledgeable company executive will go to almost any length to keep his product from harming a consumer. The problems arise with the unknowing executive who does not appreciate the hazards that can be associated with foods.

Given the present mood of the country, I think it inevitable that we shall see more regulation of the food industry aimed at preventing food-borne disease. In all likelihood this will include requirements for better and more meaningful quality assurance systems. It will probably include more specific definitions of acceptable processing methods, and it could even go so far as requiring pre-market clearance of any new or unusual product.

That all sounds good if you say it fast, but think for a minute about pre-market clearance. Are we or our regulators wise enough to write the regulations and make the judgments on which to base go or no-go decisions on each new product idea? This is a very difficult and complicated business with enormous potential for harm.

Take the low-acid canned food regulation as an example. The objective was laudable--to protect the consumer against botulism. Clearly the regulation was intended to make our canned foods safer. Then look
what happened. As the regulation was written, it would require that most process cheese products, and certainly all cheese spreads in glass jars, must be given a heat treatment that will kill botulinum spores.

Such a heat treatment will ruin the product. Now what do we do?

It is a fact that we know a great deal about the cause and control of most food-borne diseases, but I must admit that we still have much to learn. Here are a few of the research needs that exist today.

(1) We badly need a better understanding of the nature, occurrence and importance of mycotoxins in foods and feeds.

(2) We must learn how to minimize or prevent *Salmonella* contamination on foods of animal origin.

(3) We need to know how to predict and hopefully how to prevent red tides.

(4) We need better and quicker tests for toxins and infectious organisms in foods.

(5) We need bactericidal agents other than heat that can be applied to food and packaging materials. Radiation is not approved, ethylene oxide is in jeopardy, chlorine and iodine are not suitable for many uses.

(6) We need to know how to recognize and control new and unusual food-borne disease agents before they manifest themselves by massive and disastrous outbreaks of disease.

(7) We need to know if the mutagenic substances produced in heated foods have any significance to health and, if they do, how to prevent their formation.

We have gone a long way toward an understanding of the common food-borne diseases and how to prevent them. The major problems arise through failure to observe the essentials of safe food handling practices. This deficiency can be remedied only through education.

Meanwhile, new problems continue to surface. Only a little over two decades ago we first learned that common storage fungi can produce toxins in foods. Aflatoxin, the first described, has had enormous impact on peanuts, corn and cottonseed. At least a dozen other mycotoxins have potential health significance as food contaminants.

Cholera bacteria are new to our Gulf Coast waters. Food microbiologists recently added the names of *Yersinia*, *Campylobacter* and enteropathogenic *E. coli* to their vocabulary. Infant botulism has again raised questions about the significance of botulinum spores in various foods.

It should be obvious that we still have a great deal to learn before we can achieve the degree of safety that everyone would like our foods to have.