

For example, vacuum-packed smoked whitefish from the Great Lakes area caused at least 17 cases of botulism and five deaths in Southeastern United States during 1963. This type of product had been made and used locally for a century without any previous indication of illness among consumers. In more recent years, consumers tended to prefer less smoking; plastic containers were introduced for vacuum packaging; and marketing was extended from the local area to include at least three Southeastern States. These changes, together with failure to maintain refrigeration in transit, produced conditions favorable for the growth of *Clostridium botulinum* from spores that were probably already in the fish when caught, and allowed eventual formation of type E toxin. If the original methods had been employed, the smoked fish would have been eaten or spoiled and discarded before the toxin was produced. Subsequent study has shown that a safe product can be prepared by controlled processing and distribution practices.

A host of engineering and technological problems are associated with the design, construction, and operation of sanitary food processing equipment and facilities. The importance of such items as pure air, easily cleanable machinery, and separation of raw materials from finished products has not been fully appreciated by some food industries. This aspect of processing has also been somewhat neglected by the Government agencies responsible for food protection, there is need to provide more assistance, especially to the smaller operators, in the improvement of their facilities.

Employee training and public education

The training and motivation of workers to employ sanitary practices is a major problem for the entire food industry and is especially acute in the food service industry. It involves reaching millions of workers, many of whom have relatively little formal education or special knowledge about their jobs. The turnover is rapid, amounting to about 300,000 food service employees per year, and pride in workmanship is often lacking. The techniques for creating awareness of good sanitary practices and a desire to apply them on the job are not well developed.

While a continuing effort on the part of industry and Government is necessary to protect the consumer from exposure to hazardous micro-organisms in his food supply, the consumer also has a responsibility not to abuse products used in the home, and he can also help by being more observant of sanitary practices in food service establishments. More effective consumer education along these lines seems necessary.

Development of microbiological standards

Neither the private citizen nor his local health department can, by themselves, determine the safety of foods made of ingredients from worldwide sources, processed in centralized factories, and distributed nationwide in prepackaged form. They are, in fact, dependent upon the integrity of the food industry and the watchfulness of the Federal Government. This situation has created the need for microbiological criteria and testing procedures that can be used by receiving areas to evaluate prepared foods without inspecting the sources or the processing and distribution chain through which they have passed before arriving in the local store or restaurant.

A number of national and international organizations are now attempting to develop uniform criteria and standard methodology for examination of manufactured food products. Among the groups most active in this field are the Association of Food and Drug Officials of the United States, the Food Protection Committee of the National Academy of Sciences, the Association of Official Analytical Chemists, the American Public Health Association, the World Health Organization, the International Association of Microbiological Societies, and the Codex Alimentarius Commission.

Progress has been substantial but slow, and no system of laboratory evaluation of finished products is likely to replace completely the more conventional sanitary inspections and quality control procedures in the near future.

The Public Health Service, together with other Federal agencies, university groups and industry associations, has taken part in these activities, but it has placed more emphasis on continuing to work with the States and industry to improve established sanitation procedures through research, training, technical assistance, and consultation. Serious difficulties have been encountered in responding to the array of new problems that have arisen in recent years, without an increase in operating resources, but in a few priority areas, such as the inter-