Food-Borne Toxic Microorganisms

The Toxic Microorganisms Panel of the United States–Japan Cooperation on Development and Utilization of Natural Resources met in Tokyo, Japan, 17–20 November 1969, for governmental interagency exchanges of information for insuring the development of the highest hygienic standards for the food supplies of the two nations. Japan as a net food importing nation and the United States as a net food exporting nation have humanitarian and economic incentives for mutual concern with the maintenance of desirable hygienic and nutritive qualities of food commodities moving in international commerce. Attention was focused on botulism, mycotoxins, and *Vibrio parahaemolyticus* contamination. The panel agreed it would be desirable in the future to also consider the question of staphylococcal food poisoning. The Japanese expressed great interest in how the Food and Drug Administration of the U.S. Department of Health, Education, and Welfare exercises its authority in insuring safe food supplies.

The first outbreak of type B botulism in Japan occurred in 1969 and was traced to imported caviar. Thus, type E botulism traceable to marine food products remains as the only indigenous form of clinical botulism in Japan. This fact contrasts with the condition in the United States where human botulism is traceable to types A, B, and E bacilli. A group led by Genji Sakaguchi has been successful in purifying and characterizing the type E toxin. In laboratory culture and in contaminated foods, this toxin occurs as a 350,000 dalton molecular weight ($S_{20,w}11.6$) simple protein. This protein can be separated into a 150,000 molecular weight ($S_{20,w}7.3$) toxic component and similar weight nontoxic component. Only antibody against the toxic component is effective in neutralizing the toxicity. Both the $S_{20,w}11.6$ and 7.3 toxins can have their toxic potency increased by short-term exposure to trypsin. This activation is not accompanied by an identifiable change in sedimentation coefficient. None of the Japanese work with type E toxin supports the claims of Canadian workers that activation by trypsin is accompanied by a loss of amino acid residues from the toxic protein, or that toxicity exists in molecules smaller than $S_{20,w}7.3$. Carl Lamanna of the U.S. panel and Sakaguchi prepared a paper on the nomenclature of toxins. It was

suggested that the naturally occurring toxin be called progenitor toxin and that toxic components that can be prepared in the laboratory from a progenitor toxin be labeled derivative toxins. Adoption of these suggestions would limit the use of the terms protoxin and prototoxin to nontoxic protein that can be activated to a toxic state by any kind of manipulation such as exposure of proteolytic enzyme.

Japanese investigations of antitoxin treatment of type E poisoning under the leadership of Hiroo Iida continue to demonstrate curative value for antitoxin employed in the earliest phases of intoxication. The absence of reports of serum sickness in patients treated with type E antitoxin derived by Japanese methods of manufacture at Chiba Serum Institute has stimulated the panel to sponsor a comparative study of the allergenic properties of horse botulinal antitoxin manufactured in Japan and the United States. Consistent with Japanese clinical experience, L. L. Layton (Western Regional Laboratory, U.S. Department of Agriculture), employing biophysical and serological characterization techniques, has found the Japanese antitoxin to be freer of extraneous protein than the American product.

Very little work is in progress on studies of mechanisms of action of botulinal toxin. In following up a report of W. I. Jensen that malathion offers some protection against poisoning by the type C toxin, E. M. Sporn has had negative results in attempts to demonstrate protective effects in rats against type A poisoning by using the anticholinesterases malathion and parathion.

J. T. Graikoski reviewed U.S. studies in preparation of smoked fishes which show that proper combinations of salting, dehydration, and smoking will prevent the growth of *Clostridium botulinum* type E. Thus, knowledge is now available for the preparation of fish products safe from botulism during packaging.

Japanese investigators have been the world leaders in studies of *Vibrio parahaemolyticus* and the severe acute gastroenteritis caused by growth of this organism in naturally contaminated fish products. J. C. Olson, Jr. (U.S. Food and Drug Administration) reviewed studies of the organism in the United States. He agreed with Riichi Sakazaki, the leading expert on this organism, that formidable problems of specific identification exist, and that the role of this organism in causing food poisoning in the United States is still obscure. The panel agreed it would be of great practical benefit to both countries to exchange laboratory personnel concerned with *V. parahaemolyticus* investigations.

H. W. Schroeder, C. W. Hesseltine, and P. B. Marsh of the U.S. panel and H. Kurata and S. Matsuura of the Japanese panel reviewed recent studies of mycotoxins in the United States and Japan. While in both countries fungi that contaminate agricultural commodities are found which produce mycotoxins, and while progress is evident in elucidating the conditions under which growth of the fungus is accompanied by mycotoxin production, no definitive answer can be given to the question at what level of aflatoxin production can the organisms be considered harmless. It is obvious that analytic techniques can enhance capabilities for precise accurate detection of smaller and smaller quantities of the mycotoxins.

As a net importer of grains and other food products subject to contamination with mycotoxin-producing fungi, Japan is greatly interested in conditions of storage and shipment that eliminate development of mycotoxin-producing fungi. The panel agreed it would be of both scientific and practical value to

initiate a cooperative research program between the two nations for systematic surveillance of food products moving between Japan and the United States at storage, shipment, transit, and receiving points. Only in this way can practical suggestions be evolved for the control of harmful fungal growth by identification of the points of initial contamination and those environmental situations in commerce conducive to fungal growth and mycotoxin production. Such investigations remain to be done.

The Toxic Microorganisms Panel sponsored a conference on toxic microorganisms in Hawaii in October 1968. Over 60 papers presented at this meeting will be published as a book entitled "Proceedings of the First U.S.–Japan Conference on Toxic Microorganisms" (U.S. Department of the Interior and UJNR Panels on Toxic Microorganisms, Washington, D.C.). Publication is scheduled for March of this year.

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Courses

Tropical Botany, Coral Gables, Fla., 15 June–31 July. The University of Miami, Fairchild Tropical Garden, and U.S. Plant Introduction Station will offer an NSF-sponsored advanced seminar for graduate students in plant science. Stipends and travel allowances are available. (Dr. Howard J. Teas, Coordinator, Tropical Botany Seminar, Department of Biology, University of Miami, Coral Gables, Fla. 33124).

Physics of Quantum Electronics, Prescott, Ariz., 22 June–3 July. The course will be similar to the ones held in 1968 and 1969 but with additional emphasis on superconductivity phenomena. Other subjects will include atomic coherence effects (light scattering, self-induced transparency, theory of the laser), nonlinear phenomena (pico-second pulses, parametric optics), and statistical properties of radiation. (Prof. S. F. Jacobs or Prof. M. O. Scully, Optical Science Center, University of Arizona, Tucson 85721).

Marine Sciences, Cape Henlopen, Del. Marine Biology, biological oceanography, algal ecology, and special problems will be presented 15 June–21 July; and benthic invertebrates, engineering in coastal environment, nearshore geotechnique, and special problems will be presented 27 July–28 August. A short course on field methods in marine geophysics will be offered 13–18 July. These courses will be appropriate for graduate students, undergraduates, and teachers. (Dr. Victor A. Lotrich, Marine Laboratories, 114 Wolf Hall, University of Delaware, Newark 19711).