

Chairman's Introduction to Session on Bioassay, Risk Assessment and Epidemiology

by David Ozonoff*

In introducing this third session of the Conference, let us pause for a moment to see where we have been in the first two sessions. The descriptive epidemiology of feral fish populations strongly suggests that enzootics of neoplasms are associated with contamination of their environment with carcinogens, procarcinogens, and cancer promoters. Detailed biochemical studies on fish and shellfish from contaminated and clean localities further implicate xenobiotics in these enzootics. Furthermore, the edible portions of fish and shellfish have been shown to contain residues of some xenobiotics and their metabolites.

To what extent, then, do these enzootics represent a public health warning to human populations that might consume fish or shellfish from these contaminated habitats? In this third session we begin to examine this question.

In assessing risks we need to know a number of things:

a) What are the conditions of exposure? Who is being exposed; to what; in what amounts and frequencies; in what way? We have already heard in previous sessions about some of the carcinogens found in habitats where fish suffer increased rates of neoplasms, but there is still a great deal about these environments that we do not know as yet. Moreover, there is much to learn about the prevalence and nature of carcinogens, procarcinogens, and promoters in the edible portions of fish and shellfish. Even if we were to fill in these gaps, we must still determine the extent to which human populations consume fish and shellfish in general, and from contaminated environments in particular.

b) Identify adverse effects and relate these effects quantitatively to dose (i.e., establish a dose-response relationship). As already noted, a number of known and putative carcinogens have been found in polluted habitats where feral fish populations show evidence of increased rates of neoplasms. However, the extent to which these or other carcinogens are passed up the food chain to humans and the possibility that they undergo transformation along the way to forms that may be more or less harmful than the original remains to be determined in most instances.

James Huff of NIEHS will discuss one standard method of identifying cancer risk in complex mixtures, the rodent chronic bioassay. Huff discusses the considerations involved in conducting such a test and the feasibility of doing so.

There is also controversy as to the mechanisms whereby some

xenobiotics might contribute to cancer. This problem is exemplified by PCBs, which are common contaminants in fish. If PCBs are promoters rather than initiators of cancer, there are some who feel that the dose-response curve will be quite different. In his paper, John Weisburger of the American Health Foundation discusses the distinctions between genotoxic and nongenotoxic chemicals and outlines some methods whereby these two classes of chemicals may be distinguished from each other.

In connection with the question of identifying adverse effects, I should note that this Conference has focused on the cancer risks to human populations. It is not at all obvious, however, that cancer is the most likely adverse outcome to result from consuming contaminated fish and shellfish. There is already some epidemiological evidence that infants born to mothers that consumed PCB-contaminated fish might suffer some slowing in their behavioral development. Noncancer risks, however, were not considered at this Conference.

c) Estimate the risks by applying information about dose-response relationships for an adverse effect to the conditions of exposure in the population. Clearly, there are significant uncertainties in the data on exposure, adverse effects, and dose-response relationships. However, it is still often desirable to make an estimate of the risk, even given these uncertainties. Such a detailed risk assessment has been carried out for Quincy Bay in Massachusetts, and is presented by Charles Cooper of Metcalf and Eddy. It is conventional practice in such exercises to make rather conservative assumptions when confronting the gaps in the data. Despite this, such assessments can be very valuable in indicating situations where, despite such assumptions, the risks seem to be small. Thus, at a minimum, risk assessments can suggest that there is unlikely to be a significant problem. In the case of Quincy Bay, the assessment did not result in a clean bill of health. It does, however, allow us to locate some boundaries on the risk problem and to identify important data gaps.

Ultimately, it is the experience of human populations that is the most persuasive to people. In my paper, written in collaboration with Matthew Longnecker of the University of California at Los Angeles, we discuss the potential of human epidemiological studies to ascertain the existence of a human cancer risk.

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