



Perspective

Perspective vs. Caprice in Evaluating Toxicity

MAURICE H. SEEVERS, Department of Pharmacology, University of Michigan

LIFE IN THESE UNITED STATES in mid-twentieth century is so dependent upon the products of chemical technology that no field of human thought or endeavor can ignore its dominating influence. Developments in this field have moved forward so rapidly in the last two decades that the toxicologist is swamped with the multitude of agricultural, industrial, and household chemicals which are flooding the market.

Many of these compounds are highly toxic by any standard. Others are potentially capable of effecting long range biological actions about which little is presently known. The public, ignorant of these effects, deserves and expects protection against unlimited exploitation of these new substances. The question is, "Just how much protection can a government be expected to guarantee to its members and how shall it be accomplished?"

Although I believe that any philosophy based essentially on prohibition is impossible of scientific defense, my concern does not stem primarily from this fact. I am much concerned, however, as a scientist about the methods used in the name of science to support an indefensible policy. These methods are essentially based on a studied attempt to confuse and mislead the public. My remarks are not intended to be an exercise in semantics, but I wish to make my point by relating what has happened to the terms, "toxicity" and "poisonous." These terms have become so misused and so abused by pseudo-scientists, politicians, etc., that they now connote almost any type of action, or reaction, whether biologic, sociologic, economic, or whatnot which is reported to be inimical to the public interest. The shifting of these terms from a scientific to a lay connotation places the pharmacologist, toxicologist, as well as the clinician, on the horns of a dilemma. They are asked and expected to do the impossible. The principal task of the pharmacologist and toxicologist is to supply sufficient basic information concerning the biological action and potential toxicity of chemical substances on animals to warrant its preliminary clinical study in man as "a calculated risk." To what purpose, if their application to man is denied? The *a priori* determination of calculated risk is an exceedingly complicated problem and in many instances must involve the considered judgment of a large number of fully competent specialists in a variety of fields,

including nonbiological areas, especially where prolonged and extensive exposure of a whole population is involved.

There is a tendency to believe, or to lead the public to believe, that the chemical agents which are appearing on the horizon now are fundamentally different from those old chemicals with which we have long been in contact. The inference is even made that some new principles need to be evolved to handle the problems of toxicity which arise in this advanced chemical age.

To the contrary, these new chemicals do not differ in any respect except possibly in potency from those with which we are more familiar, since almost without exception, every known chemical substance is capable of producing a toxic action on man if the exposure is adequate. In fact, "selective toxicity" is the basic principle which governs the activity of that very large segment of the chemical industry which deals with the actions of chemicals on biological systems, whether this involves the search for a cure for cancer or tuberculosis or any other human or animal disease, an insecticide, a soil fumigant, a food preservative, or whatnot.

The real defect in our thinking at the national level has been that whereas we have created the mechanism for determining accurately toxicity in animals, and we know how to determine toxicity in man with a minimal risk, the most difficult facet of this problem—the determination of justification for use—has not been kept in proper focus. Nor does it seem likely that perspective can be gained easily when any individual may assume competence and get a respected hearing even in our law-making tribunals without regard to his training, experience, or judgment in these difficult areas.

The public should be informed as to the facts. In the final analysis it is the citizen who would like to assess for himself his calculated risk.

(Excerpts from an address presented before the Section of Experimental Medicine and Therapeutics, American Medical Association, New York, June 3, 1953. Reprinted with permission of the Journal of the American Medical Association, Chicago, Ill.)