

more about the pesticides in wide use today than we do about many chemicals that are naturally in the foods that we eat every day without question.

The most famous and notorious pesticide of all time is D.D.T. This insecticide fully deserves its fame but not its notoriety. It is really not very poisonous and it has not been shown to be a significant hazard to human health. Its bad reputation derives from its cumulative properties, both in the environment and in the body. It is commonly assumed by those not trained in toxicology that D.D.T. keeps on piling up in the body indefinitely as long as it continues to be ingested. This is not true. A general principle of toxicology is that with a given rate of intake of a chemical substance an equilibrium is reached between the rate of intake and the rate that the body gets rid of the substance. Thus a steady state of storage is reached and the amount in the body does not increase. This is what has happened in the case of D.D.T. Dr. Wayland Hayes, of the U.S. Public Health Service and an authority on such matters, has pointed out that human storage levels in the U.S. were no higher in 1962 than in 1950. The steady state phenomenon has also been well established experimentally in both animals and man for D.D.T. The principle applies also, of course, to the other chlorinated hydrocarbon insecticides which have cumulative properties.

Another matter on which there seems to be much one-sided thinking is the large number of different pesticides being used. It is commonly thought that this situation creates extra hazard. But on basic toxicologic considerations it can be argued that there is safety in numbers. The larger the number of different pesticides used the less likely it is that the population will be exposed to a dangerous amount of any one of them. But what about the additive small toxic effects of many pesticides taken together? To this it can be said that, though the body has a limited capacity to tolerate a single chemical substance it has an amazing capacity to adapt itself to the simultaneous intake of small amounts of many different ones. This is how the body takes care of the multitude of chemicals, many known but many more unknown, which are present in the food we eat as nature produces it. The small toxic effects of different chemicals in the body very frequently oppose each other. In relation to pesticides some very interesting and significant observations have been made recently in experimental animals. Both aldrin and chlordane, which are important chlorinated hydrocarbon insecticides, when administered in small doses for several days, provide a marked protection against the toxic action of several of the organophosphate insecticides. Furthermore, animals have been observed to develop an adaptation to a number of the organophosphate insecticides, and in the case of at least one such agent, adaptation imparts resistance to another organophosphate. Several similar protective interactions have been observed between drugs and insecticides, a matter of considerable significance in relation to the question of the possible effects of man's exposure to pesticides when he is at the same time under treatment by one or more drugs.

I have referred here to several points which support the contention that, as far as pesticide residues in foods are concerned, things appear to be under good control and we have reason to be optimistic about the future. However, we still have to contend with the uncertainties in the extrapolation of toxicologic data from experimental animals to man. We still have the unanswered, and at present unanswerable, questions of the type I enumerated earlier. Future research and experience may answer them. Or in the meantime some of these questions may become less urgent, or even disappear unanswered, as pesticides selectively more toxic to the pest and non-toxic to man and animals are discovered, or as non-chemical methods of pest control are developed and exploited. We can expect an evolution in methods of pest control, though what will evolve, and how soon, are two more unknowns. But as long as chemical pesticides are used in large quantities everything possible should be done to minimize, or better abolish, the known or suspected hazards.