permitted for household use. The difference is not necessarily related to technological advancement. Here again, is an example that the way in which a compound is used may be more important than its toxicity in determining danger.

In Japan, Namba (17) found that there were over 3,000 deaths from parathion alone during the 6-year period 1953 to 1958. There is some reason to suspect that the record may be even worse in certain developing countries where vital statistics are collected in only a fragmentary way or not at all. Certainly, there have been isolated reports of hundreds of cases of human poisoning in single outbreaks (6). Good labeling appears to be the most important single measure for promoting safe use by a literate population.

### *The Contribution of Pesticides to Health*

DDT has contributed to the control of at least 27 diseases of man (21). An aggressive campaign against malaria in Greece reduced the number of cases each year from a million in 1938 to twelve hundred in 1958 (2). Many tropical countries with similar needs lack vigorous programs. This is unfortunate, because prevention of disease has not only saved lives, but also permitted economic development and achievement of a higher standard of living (21).

It is a tragic possibility that the safety record of pesticides may be poorest where the need to increase the use of these compounds is greatest. DDT is credited with eradication of malaria in the United States and Italy. But, the greatest threat of malaria has always been in the tropics. Leading agriculturalists agree, as pointed out by Decker (5), that people of the United States could not be so well fed without the use of agricultural chemicals, and parathion is credited with eliminating starvation in Japan (17). But the need is more dramatically apparent in some developing countries where partial starvation is a present fact.

When other methods of controling vector-borne diseases are developed—as they undoubtedly will be—care must be taken to test their safety, as well as their efficacy.

### *Methods of Improving the Safety Record*

If the safety record of pesticides is to be improved, both in the developed and the developing countries, attention must be focused on real problems as determined by official vital statistics, by the reports of poison control centers, and by epidemiological studies. As we have seen, problems may not be identical in different countries. Furthermore, there must be variation in the ability of different countries to divert technically trained personnel to these studies and related regulatory activities. Therefore, each country must examine its technical resources critically before charting its course.

There are three kinds of laws designed to minimize injury by pesticides: (a) labeling laws, (b) laws regulating residues on food, and (c) laws regulating use. I have given examples of these kinds of laws and reviewed them in a comprehensive paper already cited (8). To be effective, all these laws must be based on research showing that a practice is safe before it can be permitted. Most of the toxicological information required under these laws is based on animal experiments. Often somewhat greater account is taken of use experience in connection with laws that regulate use directly than in connection with the other two kinds of laws.

Without doubt, good labeling is the most important single step to the safe use of chemicals. Good labeling, in itself, will go a long way to promote proper use. If education does not suffice, direct regulation can restrict use of specified