Overview of Agricultural Health and Safety Problems: The Federal Environmental View

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Many Americans, particularly those in our larger cities who are a generation or more removed from an agricultural existence, have forgotten their past and imagine that the farmer lives an idyllic pollution-free existence. However, one has only to glance over some of the topics in this conference to realize that the concept of agriculture as an industry free of environmental hazards is a myth.

The Environmental Protection Agency and other Federal agencies are well aware of some of the health problems associated with agriculture and are working along with State and local government, universities, and industry in an attempt to solve these problems. However, to my knowledge these agencies have not integrated their concerns into a logical program addressing environmental health in agriculture.

RESPONSIBILITIES OF FEDERAL AGENCIES

I would like to briefly review with you some of the Federal activities in the area of agricultural health and safety. I will doubtless talk more about EPA than about the other agencies involved, since that is the program with which I am most familiar.

The most significant impact of EPA on agricultural health and safety is in registration and regulation of pesticides. As a prerequisite to effective discharge of this responsibility, our agency also carries on a

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research program on the human health effects of pesticides. You will be hearing later in this conference from Dr. William Murray about the epidemiological studies on the health effects of pesticides being carried out by EPA under the Community Pesticide Studies Program. Our agency is also working with the states to assure that pesticide applicators are properly qualified. One should not forget that EPA also has legal responsibilities to assure reasonably clean air and water supplies in an environment free from excessive noise for the farm family as well as the urban resident.

The U.S. Department of Agriculture, in its multifaceted effort to improve the lot of the farmer and the consumer, has a number of programs which have health aspects. Foremost among these USDA programs are studies to develop safer and more effective means of pest control, including various types of biological control. The Agricultural Extension Service also serves an important role in informing the farmer about necessary safety precautions for using pesticides.

The Department of Health, Education and Welfare is concerned with the health and safety of agricultural products and farm workers. For example, a major program of the Food and Drug Administration monitors pesticide residues in food crops and assures wholesome food supplies for the consumer. The National Center for Toxicological Research, a joint effort of FDA and EPA, is assessing the safety of long term, low level exposures to a variety of agricultural chemicals. Units of the National Institutes of Health such as the National Cancer Institute and the National Institutes of Environmental Health Sciences are conducting research to determine whether or not certain agricultural chemicals add to our health risks. The Center for Disease Control also plays an important role through its links to state health departments and through the research and scientific efforts of the National Institutes of Occupational Safety and Health.

The Department of Labor, under OSHA (The Occupational Safety and Health Act), has responsibility for issuing guidelines to protect agricultural workers. Among Federal agencies, the Department of Labor has taken the lead

in protecting migrant workers, for example, by setting standards for farm housing used by migrants.

The Department of Transportation issues guidelines for safe transportation of pesticides and sets safety standards for certain farm vehicles, such as trucks and tractors.

EXPOSURE AND/OR HEALTH DIFFERENCES BETWEEN RURAL AND URBAN POPULATIONS

Rural and urban populations have been shown to differ with regard to exposure to a number of potentially toxic chemicals. These and other environmental differences may be at least partly responsible for some of the observed variations in morbidity and mortality statistics which distinguish city dweller from farm populations. However, the links between exposure and human disease, especially chronic disease, have not usually been established.

1. Urban-rural studies of exposure or residues - A number of studies have shown that levels of DDT, its metabolite DDE and a number of other chlorinated hydrocarbon residues in both blood and adipose tissue are correlated with exposure.[1] Agricultural workers using pesticides have significantly higher DDT and DDE concentrations in both blood and adipose tissue than does the general population. The actual level for an individual worker depends on the degree of his work exposure to the pesticide. Applicators and other agricultural workers using organic phosphorus pesticides may have lower blood cholinesterase activity levels than the general population.[2] Whether or not this effect occurs depends on the amount of contact with the chemical and also on the protective measures observed. While most of these compounds affect both plasma and erythrocyte enzyme levels, some others, such as fenthion and Dursban, seem to have a disproportionate effect on the plasma cholinesterase.

In a study carried out in Charleston County, South Carolina, polychlorinated biphenyl (PCB) levels in plasma were more frequent and higher in urban than in rural residents.[3] Suspected urban exposure sources of PCB included polluted air and contaminated water.

2. Urban-rural differences in morbidity and mortality - A number of studies have demonstrated striking urban-rural differences in several specific categories of morbidity and mortality in the United States. In general, death rates for all causes and many individual causes are higher in urban than in rural areas.[4] Deaths due to arteriosclerotic heart disease, cancer (all sites), tuberculosis, and cirrhosis of the liver are all more common in urban areas. Although attention is often focused on the negative correlation between heart disease death rates and water hardness, most studies reporting this observation ignored population density which is in fact, a much stronger predictor.[5] Cancer of the lung occurs much more frequently among urban dwellers of this country and Great Britain.[6] Deaths due to accidents are more frequent in rural areas whereas those for homicide tend to be higher in urban areas.[7] Urban death rates for suicide almost universally exceeded rural rates during the 19th and early 20th century although today there is no difference or a slight rural excess.[8]

A recent monograph on "Infectious Diseases" summarizes incidence and mortality data for several specific disorders.[9] The incidence and death rates for amebic dysentery, diphtheria, whooping cough, tetanus, poliomyelitis, influenza and diarrhea of the newborn all were higher in non-metropolitan areas. The incidence of bacillary dysentery and measles was higher in metropolitan areas, but the death rates were higher in non-metropolitan areas. Pneumonia and meningococcal infections did not vary by urban-rural locations, but death rates due to puerperal sepsis, bronchitis, and emphysema all were more frequent in metropolitan areas.

Urban-rural differences in both disease incidence and prevalence have been documented by the U.S. National Health Survey. Age-sex adjusted rates

of acute conditions, days of restricted activity, and bed disability all were lowest in the non-SMSA farm areas. Likewise, the incidence of infective and parasitic disease, upper respiratory conditons, and "all other acute conditions," was lowest in farm areas.[10] With regard to the prevalence of selected chronic respiratory conditions, chronic bronchitis, asthma, and hay fever were lowest in rural areas whereas chronic sinusitis was reported most frequently in farm areas.[11]

Of course the reasons for these observed differences are both multiple and complex. Certainly differences in diagnostic custom, in availability of medical care, and in patterns of selective migration are involved. Nevertheless, after these aspects are accounted for, it is clear that part of the difference in morbidity and mortality patterns can be attributed to differences in the urban-rural environment. Furthermore, the environmental differences encompass both the non-occupational as well as the occupational factors.

UNSOLVED PROBLEMS

From my viewpoint in a Federal regulatory and research agency, there appear to be a number of unsolved or continuing problems in agricultural health and safety, including:

1. Availability of health care - The urban-rural differences in morbidity and mortality recounted earlier point out the problems of the availability and utilization of health care in rural areas as well as hazards peculiar to agricultural occupations. Medical care availability is generally better in urban areas. Several speakers in this Conference will address the specific problems of rural emergency medical care, rural general medical care and the delivery of health care in rural areas. Suffice it to say that although these problems still exist, efforts toward innovative solutions have begun.

2. Health of migrant workers - The special health problems of migrant workers were long neglected but are now beginning to receive consideration in various public health programs. I am pleased to see that the health of migrant workers is one of the topics to be discussed here.

3. Hazard of new and substitute pesticides - The recent limitations placed on the use of persistent chlorinated hydrocarbon pesticides have resulted in an increased usage of non-persistent, but acutely toxic organic phosphorus and carbamate-type pesticides. That is, we have exchanged an environmentally toxic group of compounds for chemicals which are less persistent and safer for the environment but on the average present a greater health hazard to the farmer-applicator and others directly exposed. The fact that acute occupational pesticide poisonings have not noticeably increased with this change in usage pattern may be credited, at least partly, to the joint USDA-EPA program "Operation Safeguard", which was designed to warn farmers of this hazard. It seems reasonable to continue this warning program until farmers generally are aware of the hazard of these newer pesticides.

4. Need for improved indices of exposure - The increased usage of organic phosphorus and carbamate pesticides referred to earlier has pointed up the need for improved methods of providing an early warning of possible over-exposure. Chemists at our Center have developed a urine test for exposure to organic phosphorus pesticides, based on excretion of the alkyl phosphate or thiophosphate moiety of the molecule. This procedure is more sensitive than blood cholinesterase as a measure of exposure. The method needs further testing to determine its correlation with poisoning.

5. Reentry problem - The reentry question will be discussed in detail by Mr. Harold Alford, Office of Pesticide Programs, EPA, later in this meeting and I will not go into it further here except to say that this is a matter on which we need more research to clarify the cause of these delayed poisoning incidents. The etiology of these poisoning outbreaks, which may occur 30 days or longer after spraying has puzzled our scientists for a number of years.

6. Disposal of unused pesticides - Farmers and others who use pesticides are often faced with the question of how to dispose of unused pesticides. In desert areas these materials may be safely buried with no threat of contamination to ground water. The only truly safe method of disposal is by burning. However, incineration must be accomplished in special high temperature ovens to assure complete combustion of the pesticide. Simpler disposal methods are needed which are more accessible to the individual farmer.

7. Changes in methods of pesticide application - One factor which may affect the hazard of pesticide usage for the farmer is change in the method of application. For example, the recent introduction of ultra-low volume (ULV) spraying techniques with the attendant smaller size of the spray droplets has brought about an increased suspendability of these particles in air. Studies carried out by our Center have shown an increased respiratory as well as dermal exposure for applicators using ULV applications in comparison with conventional dilute spray procedures.

8. Accidental injury - The greater hazard of accidental injury, both chemical and traumatic, for the rural as compared to the urban resident was considered above. Accident prevention is certainly a complex problem but equipment safety standards should prove helpful. Furthermore, improvements in the availability of emergency rural health care will surely reduce the associated morbidity and mortality.

SUMMARY

In summary, the environmental health and safety problems of agricultural workers and the rural family tend to be different in many respects from those of urban residents, even though many of their overall health problems are very similar. The rural environmental problems are no less real than the urban. These pollution problems need and deserve continued and increasing scrutiny by research workers to more clearly

define the important problem areas and to suggest feasible solutions. The Federal government is pursuing a number of research and regulatory activities to help solve agricultural health and safety problems. Among agencies involved in these activities are EPA, USDA, DHEW, Transportation and Labor. The conference here assembled provides a good mechanism for integrating our health and safety concerns; for highlighting continuing problem areas that require additional research, and for discussing progress toward solutions of other health questions relating to the most basic of American industries.

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