

# Pesticide Exposure Among Migrant Workers in Southern New Jersey

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This paper attempts to delineate the deleterious effects which pesticide exposure may have on migrant farm workers in the southern part of New Jersey.

## I. BACKGROUND

Migrant labor represents a substantial part of the seasonal farm workers in the southern part of New Jersey. For example, it is estimated that over 70% (22,000) of the state's farm workers are located in four South Jersey counties: Atlantic, Cumberland, Gloucester and Salem. In addition, of the 1,129 agricultural camps located throughout the state, 79% are located in these four counties; these have the following ethnic breakdown: Puerto Rican, 69%; Black, 18%; Anglo White, 8%; Chinese, Philippino, Jamaican and Chicano, 5%. (NEW JERSEY BUREAU OF MIGRANT LABOR, 1970).

Essentially, farm workers in New Jersey are classified into four groups:

1. Day Hauls - residents of New Jersey and Pennsylvania
2. Contract Workers - residents of Puerto Rico
3. Migrant workers from the Eastern Stream of Florida and Texas
4. Resident Walk-Ins

Of considerable public health significance is the fact that over one-half of New Jersey's farm workers live as well as work in the state on a year round basis. At no time during the harvest season (April-November) do out-of-state (contract and southern migrant) farm workers number more than 42% of the total agricultural labor force. (GOTSCH, 1973)

## II. HEALTH SURVEY

During the summer of 1973 the Puerto Rican Congress of New Jersey, in cooperation with the College of Medicine and Dentistry of New Jersey (New Jersey Medical School and Rutgers Medical School) and the East Coast Migrant Health Council sponsored a mobile health screening program for rural poor farm workers in Atlantic, Cumberland, Salem and Gloucester counties, which was funded by the Robert Wood Johnson Foundation of New Jersey. (QUINONES, LOURIA, 1973)

Five hundred ninety-three persons (409 adults and 184 children) were screened at 30 migrant campsites for medical and dental problems by utilization of a mobile van. The medical screening included:

1) a socio-medical history and 2) a general physical examination. Farm workers were also selectively screened for vitamin deficiencies and pesticide exposure. A review of some of the findings shows that most of those screened resided in Salem and Cumberland Counties. The ratio of males to females at the campsites was 7 to 1, with an average of 8 farm workers per site.

The majority of workers were in the age range 20-29, had 7 years or less of schooling, and were born in Puerto Rico. One in 3 males was married and 2 out of 3 females were married. Spanish is the predominant language and 1 in 7 can converse in both Spanish and English.

Their medical history reveals that intestinal parasites are reported with frequency, particularly among younger family members, and females are more likely to suffer from allergies than males. Frequent or serious headaches are reported by a large segment of the respondents (38%). Trouble with eyesight (38%) and hearing are reported with surprising frequency.

Both sexes complain of shortness of breath, pains in calves of legs, circulation problems, and problems with indigestion, as well as significant weight changes.

Trouble with the skin on their feet (12%) is reported with a high degree of frequency, as are rheumatism and arthritis. Many complain about weak or painful feet and back trouble. One in four respondents (most under 40 years of age) complain of lack of general energy and pep.

It is of interest that some of the constellation of most prevalent complaints reported mimic the more subtle early manifestations of inordinate pesticide exposure, e.g. frequent headaches, dizziness, blurred vision, and a general feeling of weakness. (SHAKMAN, 1974)

### III. PESTICIDE EXPOSURE

The widespread use of pesticides in the agricultural industry provides considerable opportunity for migrant farm workers to be exposed to these toxic compounds. For example, in California there were approximately 1,000 cases of organophosphate pesticide poisoning reported during the years 1957-1962, of which 800 were agricultural workers. (NAMBA et al, 1971) Pesticides are, of course, toxic to insects, and all exhibit some degree of toxicity toward humans.

Pesticides are particularly hazardous for farm workers because oral ingestion is generally not necessary. Most cases of pesticide poisoning occur from inhalation of pesticide dust or vapors or accidental contact with clothing and skin, with subsequent absorption through the skin. In addition, migrant farm workers in New Jersey often live in the midst or on the fringe of vegetable fields. When

airplanes spray vegetables with toxic organophosphates, the planes almost unavoidably spray the farm workers and their homes as well.

There are four major categories of pesticides: (1) heavy metal containing substances, (2) chlorinated hydrocarbons, (3) carbamates, and (4) organophosphates.

The organophosphate group is perhaps the most important in relation to its effects on migrant farm workers. Decreasing use of the chlorinated hydrocarbons and heavy-metal containing compounds has led to an increased use of the organophosphates. This group includes such insecticides as parathion, methyl parathion, and malathion. The organophosphates are powerful inhibitors of carboxylic esterase enzymes, including acetylcholinesterase (true cholinesterase) and pseudocholinesterase. Inhibition of these enzymes by organophosphates is a result of firm binding of phosphate radicals of the organophosphates to the active sites of the enzymes. (NAMBA et al, 1971) The pharmacological and toxicological effects of organophosphates are primarily, if not entirely, due to the inhibition of acetylcholinesterase of the nervous system, resulting in the accumulation of acetylcholine at the synapses.

The effects of chronic exposure to phosphate ester pesticides may be cumulative in the sense that repeated exposures closely following each other can reduce cholinesterase activity faster than it can be regenerated. For this reason, in California, medical supervision is a legal requirement for agricultural workers who regularly apply the toxic phosphate ester group of pesticides. (AMERICAN PUBLIC HEALTH ASSOCIATION, 1967) This monitoring takes the form of an erythrocyte or serum cholinesterase activity test performed before the migrant workers enter the fields for the season. Then, decreases in activity can be monitored. In practice, this may be difficult since migrant workers move from one location to another during the season, making pre-exposure testing difficult, especially since they may first work in more southerly locations before working in New Jersey. A worker should be removed from any exposure when either plasma or red cell cholinesterase activity drops to below 50% of his normal value and returned to work when it returns to 75% or more of this value. (AMERICAN PUBLIC HEALTH ASSOCIATION, 1967)

#### IV. FINDINGS

In a preliminary investigation, we measured serum cholinesterase activities of a small group of migrants working in New Jersey, as well as those of appropriate controls, using a kinetic test kit (E.M. Laboratories, Inc., Elmsford, N.Y.) These were workers who were experiencing symptoms such as headaches, dizziness, and blurred vision, and had been exposed to organophosphates.

Whole blood samples were collected in heparinized vacutainers (Becton-Dickinson) from 12 migrant workers and 2 controls. The

controls were medical school personnel in good health and were included to make sure that if depressed cholinesterase activities were found, this was not due to sample deterioration. The control bloods and migrant worker bloods were collected at the same time, stored in the same refrigerator, centrifuged to separate the plasma, and analyzed 12 hours after collection. The results are given in Table I.

TABLE I  
CHOLINESTERASE ACTIVITIES OF MIGRANT  
WORKERS AND CONTROLS

(Normal Range 3.6-9.5 U/ml)

<u>Type of Sample</u>	<u>Plasma Cholinesterase Activity</u>
Migrant Worker:	(International Units/ml)
1	4.2
2	4.2
3	4.7
4	4.4
5	6.4
6	4.4
7	4.2
8	7.3
9	3.2
10	3.1
11	3.3
12	2.2
Control:	
1	8.4
2	6.8

All values in the table are the average of three determinations. The three determinations on the same sample agreed within 5% in all 14 cases. Generally depressed cholinesterase activities were found, with one-third of the migrants having activities below the lower limit of normal - 3.6 U/ml. However, since it was not possible to obtain pre-exposure laboratory data, a firm conclusion cannot be drawn from the study. Although only a small number of migrants and controls (14) were tested, the study does suggest, along with the concept of mandatory testing in California, that testing should also be required in New Jersey.

In addition, economic benefits should be provided for those migrants who could not work in the fields because of depressed cholinesterase activities, especially in light of their already inadequate incomes. Thus a program would have to be developed whereby farm workers and their families could receive a living subsistence during these periods of depressed cholinesterase activities. Another factor which requires serious attention is the diet of migrant farm workers. In view of the dietary

inadequacies of many of the migrant workers, it should be noted that decreased protein intake has been shown to enhance the toxicity of the organophosphate insecticides. (SHAKMAN, 1974)

#### V. CONCLUSIONS

Migrant workers represent a substantial percentage of farm workers in South New Jersey. Although the general health level for the migrants examined appears to be good, this finding must be interpreted with caution because of the relatively young age of the population studied. There is evidence that some of the health problems which were found (frequent headaches, blurred vision, dizziness, a general feeling of weakness, and depressed plasma cholinesterase activity) could be related to excessive exposure to pesticides. Further testing is needed to establish more precisely the extent of this problem in New Jersey.

Clearly, this "captive" group stands at risk from the chronic effects of pesticide exposure because of their general lack of awareness of dangers and symptoms, and the lack of availability of treatment. In particular, there may be little opportunity for the improvement of the health of the individual migrant worker because the mobility inherent in his occupation prevents him from receiving continuing medical care from the same sources.

To date there has been little effort towards remedying the specific health problems of our migrant population. In effect, they have been given the lowest priority in terms of health and social services. Obviously, programs to improve this situation are needed in New Jersey.

#### REFERENCES

- AMERICAN PUBLIC HEALTH ASSOCIATION: Safe use of pesticides. New York, American Public Health Association, Inc., 1967. Chapter 11.
- GOTSCH, J.: Farmworkers in New Jersey (unpublished manuscript). Puerto Rican Congress of New Jersey, Trenton, N.J., 1973.
- NAMBA, T., NOLTE, C.T., JACKREL, J., GROB, D.: Amer. J. Med., 50, 475, 1971.
- NEW JERSEY BUREAU OF MIGRANT LABOR: Annual Report. New Jersey State Department of Health, Trenton, N.J., 1970.
- QUINONES, M.A., LOURIA, D.B.: South New Jersey Rural Mobile Health Service Survey (unpublished manuscript). College of Medicine and Dentistry of New Jersey - New Jersey Medical School, Newark, N.J., 1973. Prepared for the Robert Wood Johnson Foundation.
- SHAKMAN, R.A.: Arch. Environ. Health, 28, 105 (1974).