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Biochemical Changes due to Insecticide Exposure

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This study indicates that there is decrease in the levels of Protein and related parameters like Albumin, Globulin and A/G ratio to the people who exposed to insecticides and pesticides spray for longer duration.

Key words: A/G ratio (Albumin Globulin ratio), Organophosphorous compounds, Organochlorine compounds, malathion, Carbamate compounds, malathion, paraquot.

India is endemic to vector-borne diseases requiring spraying insecticides (Sharma, 1985). In terms of acute toxicity, the more recently introduced insecticides are certainly less toxic and persistant than the older organochlorine, organophosphorous and carbamate insecticides. Neverthless, there are still incidents of acute poisoning from a wide range of skin contamination following careless handling of pesticide concentrates. However a few people may suffer permanent damage of some kind (Proudfoot, 1988).

Chronic toxicity is present, where the effects are produced by long term intake of lower or intermittent doses (Sharp, 1986). The distribution of malathion is significant in lungs, liver, kidneys, spleen, brain, heart, blood, muscles, urine and gastric contents, (Jadhav *et al*, 1992).

The spraymen were not aware of the potential hazards of pesticides and did not try their best to personal hygiene (Parron *et al.*, 1996). The incidence of skin damage, nose bleeds and nail damage in the paraquot spraymen in Sri Lanka is reported higher than in the control group (Senanyake *et al.,* 1993). Exposure to organochlorine increases the risk of developing breast cancer (Hoffman, 1996). Organochlorine predominantly accumulates in the lipid fractions of the human food chain, by which animal fatty foods have become a major route of exposure for humans.

The most important aspect of pesticides is how they affect humans. There is increasing anxiety about the importance of small residues of pesticides, often suspected of being carcinogens or disrupting endocrine activities, in drinking water and food. In spite of stringent regulations by international and national regulatory agencies, reports of pesticide residues in human foods, both imported and home-produced, are numerous.

Over the last fifty years many human illnesses and deaths have occurred as a result of exposure to pesticides, with up to 20,000 deaths reported annually. Some of these are suicides, but most involve some form of accidental exposure to pesticides, particularly among farmers and spray operators in developing countries, who are careless in handling pesticides or wear insufficient protective clothing and equipment. Moreover, there have been major accidents involving pesticides that have led to the death or illness of many thousands. One instance occurred in Bhopal, India,

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where more than 5,000 deaths resulted from exposure to accidental emissions of methyl isocyanate from a pesticide factory. Hundreds of patients with chronic illness from chemical overexposure were found to have toxic encephalopathy, reactive airway disease, and other chemically induced organ system damage when the patients become ill from pesticide spraying, they usually do not head for an emergency room, where they typically experience long waits in an environment containing germicidal residue, scented products, carbonless copy paper, hospital linens with heavy fabric softener, and other exposures. The patients have experienced severe neurologic and respiratory exacerbations as well as other organ system damage, such as significant increase in liver enzymes, Persons who are at increased risk for symptom from pesticide spraying individuals with migraines, chronic sinus problems, asthma, reactive airway disease, autoimmune diseases (many of which are exacerbated by pesticide exposure), and conventional allergies (Kipen et al. 1994). There is increased respiratory inflammation with conventional allergies, and pesticides more readily enter the body because the barrier function of the respiratory tract is further compromised. In addition, Karpati et al. (2004) failed to take note of the U.S. Environmental Protection Agency (EPA) final report "Principles of Neurotoxicity Risk Assessment (U.S. EPA 1994). This document confirmed the lack of a blood–brain barrier between the nose and the brain, so that pesticides readily enter the body through the nose and pass directly to the brain. This report further confirmed the unusual vulnerability of the brain to neurotoxicants: pesticides are lipophilic and therefore seek out lipid tissue such as the brain, and because the brain has unusually long neurons, repair of damage in the neurons occurs much less readily than in other body cells.Other groups at increased risk of pesticides are those with chronic obstructive lung disease, toxic encephalopathy, and neural degenerative diseases. Pyrethroid pesticides are significant neurotoxins (Eells et al. 1992McDaniel and Moser 1993; Tippe 1993; Vijverberg and van den Bercken 1990), and because they are increasingly replacing organophosphates, they now account for a large proportion of the pesticide-induced chronic illness among my patients. In my experience, the use of nebulized glutathione, the major antioxidant and major detoxifying agent of the body (Klaassen et al. 1986), when combined with lipoic acid, helps to improve an individual's ability to detoxify (Packer et al. 1995); lipoic acid reactivates glutathione in lipid- and water-based tissues. Also, nebulized glutathione combined with adequate buffered vitamin C reactivates glutathione in water-based tissues.

MATERIAL AND METHODS

The study was carried out on the Spraymen engaged in spraying in the highly endemic areas with high density of vectors causing malaria, filaria and brain fever. Seasonable epidemics were a regular feature in these areas.

A total of 193 spraymen with an age ranging from 24-55years were included in this study.

Age and sex matched healthy subjects with similar socio-economic status and who were not involved in spraying operation in anytime formed the control group (n=120)

Total Protein and albumin in plasma were estimated by the method of Reinhold (1953)

RESULTS AND DISCUSSION

The levels of proteins, Albumin, Globulin and AG ratio are shown above. Total proteins and Albumin showed a significant decrease in the spraymen ($P<.001$) when compared with the controls. Globulin showed no alteration and A/G ratio decreased significantly ($P<0.001$).

Conjugated bilirubin and total bilirubin showed no significant variation suggesting no change in pigment metabolism.

A marked decrease in the levels of total proteins, albumin and A/G ratio is observed in the spraymen with the increase in the durations of exposure. The lowest values are seen in the spraymen exposed for more than ten years . Altered A/G ratio has been observed in 58 % of spraymen engaged in Allahabad, India (Joshi *et al*., 1996).

The membranotoxic effect of Malathion , an insecticide is associated with changes in protein fractions of the CSF by a fall of globulins and a rise in albumins, thus attesting to the predominance of pathological processes in the brain, especially in

Table 1. Plasma proteins and their distribution

Particulars	Controls	Spraymen
Proteins(g/dl)	7.27±1.21(120)	6.42±0.89***(193)
Albumin(g/dl)	3.96±0.72(120)	3.12±0.86***(193)
Globulin(g/dl)	3.31±0.77(120)	3.29±0.45(193)
Albumin/GlobulinRatio(g/dl)	1.27±0.38(120)	0.97±0.33***(193)
Bilirubin Conjugated(mg/dl)	0.28±0.11(120)	0.25±0.14(193)
Bilirubin Total(mg/dl)	1.02±0.88(120)	0.99±0.69(193)

Values are expressed as mean ± S.D. Figures in parentheses indicate number of samples.
*** - Statistical significance is shown at the level of P < 0.001.

the initial period of intoxication, and to the impairment of the blood-brain barrier.

Hypoalbuminia was observed with low total protein in the plasma of spraymen engaged for longer duration. A/G ratio was also significantly reduced.

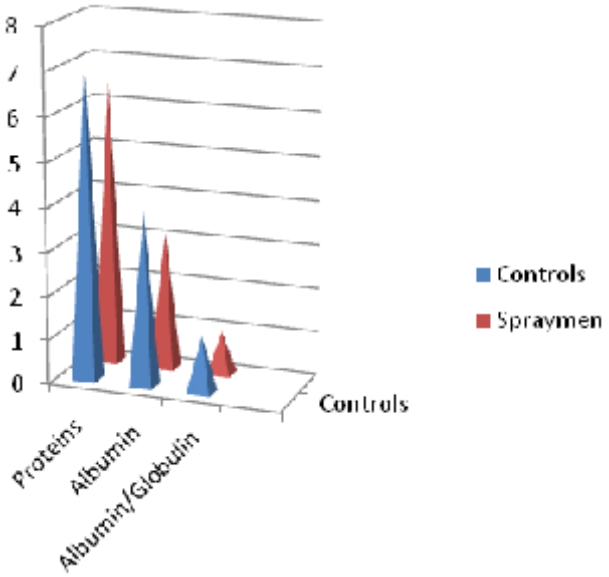

Fig. 1.

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