REVIEW OF LITERATURE
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The large number of epidemiological studies on cancer risk in farmers has produced conflicting results, meta-analyses and review of the risks associated with the use of agricultural pesticides like organophosphates, carbamates and pyrethroids report increased risk for specific cancer such as leukemia and multiple myeloma.

The undesirable health effects caused by pesticides in humans are of special concern, among these are the genotoxic effects including cancers and several other genetic diseases. Genotoxicity tests form an important part of risk assessment of potential mutagens and carcinogens.

Many reports have shown the use of cytogenetic biomonitoring in populations exposed to pesticides. Factors such as age, sex, lifestyle, smoking habits, alcohol consumption and history of recent illnesses can influence the frequency of genotoxic effects.

Many approaches and techniques have been developed for monitoring human population exposed to environmental genotoxins. Human biomonitoring can be performed using different genetic markers. Biomarkers such as chromosomal aberrations (CAs) and DNA damage (SCGE) are among the most extensively used markers of genotoxicity of pesticides. Evaluation of AChE levels complements cytogenic analysis, which is the traditional monitoring method to establish a relation between genetic damage and the critical events leading to carcinogenesis.

Increased levels of cytogenetic damage have been detected in some populations exposed to organophosphates, pyrethroids and carbamate pesticides but not in others previously most biomonitoring studies were reported without determination of pesticide quantity from the exposed population.

Organophosphates (OP) are used as insecticides in agricultural and domestic settings throughout the world. As nerve agents they have also been used in warfare and terrorist attacks. The mechanism of action is through the inhibition of the enzyme acetyl cholinesterase, leading to the accumulation of acetylcholine at cholinergic synapses. The excess acetylcholine causes constant acetylcholine receptor triggering, resulting in malfunction of the autonomic, somatic and central nervous system.
Clinical manifestations of OP poisoning lead to acute cholinergic crisis. Although parasympathetic overstimulation tends to predominate the over stimulation of nicotinic receptors due to excess acetylcholine can lead to sympathetic over stimulation as well\(^{20}\).

A second manifestation is the intermediate neurotoxic syndrome characterized by cranial nerves palsies, weakness of the neck and proximal limbs and respiratory paralysis \(^{21, 22}\). Organ phosphorous pesticides are highly reactive chemicals and their toxicity is limited to acetylcholinesterase binding. Through the binding to other enzymes delayed neurological symptoms can occur as well\(^{23,24}\).

Children and spouses of farmers are potentially exposed to pesticides indirectly by take-home contamination; pesticide can be tracked in to farm homes on the clothing and shoes of farmers. The previous report that the majority of farmers changed their work clothes and shoes inside the home\(^{25}\). Pesticide track-in has been clearly demonstrated after residential application of herbicides to lawns\(^{26,27}\). The measured distribution of herbicides 2,4 D in homes within a week of a lawn application and showed that transport mechanisms were dominated by track-in from active dogs, the home owner’s contaminated shoes and the children shoes when worn indoors. They found that cholorpyrifos\(^{28}\) residues in indoor air and in carpet dust were higher within a few days after an exterior residential application and suggested that track in was the principal source of these residues.

Several studies have found that farm homes have a greater frequency of detectable residues of pesticides and higher concentrations of pesticides in dust than in references homes, potentially leading to greater exposure to pesticides among family members\(^{29-34}\).

Pesticide urine concentrations among the children of farmers and farm workers have been shown to be elevated when compared with children of non-farm families\(^{35}\) and pesticide levels in house dust have been correlated with urinary pesticide levels in children and adults living in the home.

Pesticide exposure is thought to be associated with a variety of health effects including cancer, reproductive disorders, neurotoxicity and endocrine disruption \(^{36-41}\). More specifically phenoxy herbicides (e.g 2,4-D) have been associated with a number of cancers including soft tissue sarcomas, non-hodgkin’s lymphoma (NHL), cancer of stomach, colon and prostate; triazine herbicides (e.g atrazine) have been associated with ovarian cancer; organophosphates insecticides neuropathy, chromosome aberrations, central nervous system alterations and NHL \(^{36}\) metolachlor has been associated with lung cancer \(^{42}\) and interuterine growth retardation \(^{43}\) and glyphosate has...
been associated with adverse neurobehavioral development. Further parental occupation involving pesticide application has been associated with childhood cancers and household pesticide use has been associated with childhood leukemia.

Differences in children's physiology, behavior patterns, and hygiene may result to environmental contaminants than adults. Small children spend much of their time on the floor or ground and are very likely to come into contact with pesticide residues on carpets or uncovered floors when playing inside and yard dirt when playing outside. These factors can result in different sources and levels of pesticide exposure for children than adults. A study was initiated to investigate agricultural pesticide contamination inside farm homes and family exposure to agricultural pesticides. The goal of the study was to evaluate pesticide exposure among farm families and compare their exposure to non-farm controls. i) to measure urinary pesticide levels among farm and non-farm families in low and II) to ascertain what factors may influence these levels.

One study has shown that personal air levels of organophosphate (OP) pesticides were significantly higher among women who reported using exterminatory sprays, can sprays and pest bombs during pregnancy compared with those reporting number of OP pesticides use.

Another study demonstrated that children whose parents reported garden use of insecticides had higher levels of OP pesticide metabolites than did children whose parents did not use garden insecticides.

Studies of children of agricultural workers have focused on potential para occupational exposure, collecting data on the transmission of pesticide from the work place to the home by parents or other adult household members as well as data on residential proximity to pesticide application.
References


