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***Project Title : Chemical Pesticides and Human Health: The
Urgent Need for a New Concept in Agriculture***

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Introduction

Pesticides are substances or mixtures of substances that are mainly used in agriculture or in public health protection programs in order to protect plants from pests, weeds or diseases, and humans from vector-borne diseases, such as malaria, dengue fever, and schistosomiasis. Insecticides, fungicides, herbicides, rodenticides, and plant growth regulators are typical examples . These products are also used for other purposes, such as the improvement and maintenance of non-agricultural areas like public urban green areas and sport fields . Furthermore, there are other less known applications of these chemical substances, such as in pet shampoos , building materials, and boat bottoms in order to eliminate or prevent the presence of unwanted species .

Residues of pesticides can be found in a great variety of everyday foods and beverages, including for instance cooked meals, water, wine, fruit juices, refreshments, and animal feeds . Furthermore, it should be noted that washing and peeling cannot completely remove the residues . In the majority of cases, the concentrations do not exceed the legislatively determined safe levels. However, these “safe limits” may underestimate the real health risk as in the case of simultaneous exposure to two or more chemical substances, which occurs in real-life conditions and may have synergistic effects. Pesticides residues have also been detected in human breast milk samples, and there are concerns about prenatal exposure and health effects in children.

Organochlorine Pesticides

The most widely known organochlorine pesticide is dichlorodiphenyltrichloroethane, i.e., the insecticide DDT, the uncontrolled use of which raised many environmental and human health issues. Dieldrin, endosulfan, heptachlor, dicofol, and methoxychlor are some other organochlorines used as pesticides.

There are a few countries that still use DDT or plan to reintroduce it for public health purposes. Furthermore, DDT is also used as a solvent in certain solvents. It is a ubiquitous chemical substance, and it is believed that every living organism on Earth has a DDT body burden, mainly stored in the fat. There is also evidence that DDT and its metabolite p,p'-dichlorodiphenyldichloroethylene (DDE) may have endocrine-disrupting potential and carcinogenic action. *In utero* exposure to both DDT and DDE has been associated with neurodevelopmental effects in children. Moreover, a recent study related DDE to hepatic lipid dysfunction in rats.

Organophosphorus Pesticides

Organophosphates, which were promoted as a more ecological alternative to organochlorines , include a great variety of pesticides, the most common of which is glyphosate. This class also includes other known pesticides, such as malathion, parathion, and dimethoate; some are known for their endocrine-disrupting potential . This class of pesticides has been associated with effects on the function of cholinesterase enzymes , decrease in insulin secretion, disruption of normal cellular metabolism of proteins, carbohydrates and fats , and also with genotoxic effects and effects on mitochondrial function, causing cellular oxidative stress and problems to the nervous and endocrine systems .

Population-based studies have revealed possible relations between the exposure to organophosphorus pesticides and serious health effects including cardiovascular diseases , negative effects on the male reproductive system and on the nervous system, dementia , and also a possible increased risk for non-Hodgkin's lymphoma . Furthermore, prenatal exposure to organophosphates has been correlated with decreased gestational duration and neurological problems occurring in children .

Other Classes of Chemical Pesticides

Triazines, such as atrazine, simazine, and ametryn, are another class of chemical pesticides that have been related to endocrine-disrupting effects and reproductive toxicity

Moreover, it was found that there is a possible statistical relationship between triazine herbicides and breast cancer incidence Atrazine is the most known of the triazines, and it is a very widely used herbicide that has been associated with oxidative stress cytotoxicity and dopaminergic effects

Furthermore, the exposure of experimental animals to atrazine has been associated with reproductive toxicity and delays in sexual maturation.

Urgent Need toward Cleaner and Safer Agricultural Practices

Current agricultural practices include the wide production and extensive use of chemicals known for their ability to cause negative health effects in humans and wildlife and to degrade the natural environment. Therefore, an urgent strategic approach is needed for a reduction in the use of agrochemicals and for the implementation of sustainable practices. Furthermore, current agriculture has to implement environmentally friendlier practices that pose fewer public health risks. Reforming agricultural practices aligned to fulfill these criteria is a step toward the sustainability of the agricultural sector in contrast to precision agriculture



Thank You !