



SHORT COMMUNICATION

Impact of the Pesticides in the Environment and Public Health: The Case of Yucatan, Mexico

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Actually, it is important the water conservation to prevent high impact on the public health, as well as the application of the environmental regulations, especially when there is a high fragility for water pollution in the ecosystem, particularly in developing countries. Throughout the world, there are rules and regulations that indicate the Maximum Permitted Limits of organochlorine pesticides (OCP) residues in water, which must be monitored so that the water quality does not exceed these limits, however, in Mexico and developing countries it is not met, and have high impacts on the human health and the environment. Li and Jennings [1] conducted the worldwide pesticide regulation study including Mexico and demonstrated that many current pesticide standard values in the environmental cannot protect human health. Thus to help improve public and environmental health, local government and regulatory agency should review and revise current pesticide regulations.

The 25% of the world population of Europe, Asia and America, have karstic aquifers that are highly vulnerable to contamination. Karst landscapes are recognized by the presence of bedrock in the surface, sinkholes, conduits, and caves with high facility of filtration of pollutants to the aquifer. The rainwater generally percolates through the bedrock contact to the karst aquifer [2]. The karstic nature of the Yucatan, Mexico, causes that the underground water is very vulnerable to the pollution by pesticides. The agricultural and livestock activities use banned organochlorine pesticides as DDT, heptachlore, lindane, aldrin, endrin, dieldrin, endosulfan [3].

These pesticides are endocrine disruptors that contaminate the water and can bioaccumulate in the human being, and cause diverse disease in the neurological and reproductive system, included diverse cancer [4-7]. Diverse studies have reported that the organochlorine pesticides have potential toxic effects such as immunotoxicity, neurotoxicity, developmental toxicity, carcinogenicity and mutagenicity [8-10].

Materials and Methods

These multidisciplinary studies use methodologies that included a territorial characterization in 32 municipalities of Yucatan, an analysis of natural and social vulnerabilities, which contribute to the water pollution, Geographic Information System (GIS) and Gas Chromatography for determination of organochlorine pesticides in water in rain and dry seasons, such as well in blood and breast milk of Maya women. To know if there is bioaccumulation of pesticides in the Maya women with cervix uterine cancer, they were analyzed 70 blood samples, and 25 samples in Maya healthy women were realized a study for the detection of pesticides in breast milk. For qualitative study was used the software SPSS and the Exact Test of Fisher to the analysis of interviews.

Results

The results show that there is a high level of pesticide contamination in the water, as well as high bioaccumulation in samples of blood and breast milk of Maya women.

The highest concentrations of 13.61 and 12.54 ppm



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of heptachlor and levels above of 10 ppm of lindane founded in the water in the dry period are of high impact to the human being because 30% of the communities in the rural zone use the sinkholes and well to drinking water [3].

The results of bioaccumulation in blood showed that the highest organochlorine pesticides (OCP) levels were endosulfan I (7.35 mg/mL), aldrin (3.69 mg/mL), 4, 40 DDD (2.33 mg/mL), 1.39 and 1.46 mg/mL of d-HCH. Women from the agricultural area had high concentrations of OCP in their blood, particularly dieldrin (1.19 mg/mL), and 1.26 mg/mL of 4, 40 DDE. In the metropolitan area, 0.080 mg/mL of g-HCH and 0.064 mg/mL of heptachlore were detected. This monitoring study was also based on epidemiological data of uterine cervical cancer [11]. For the levels of pesticides in breast milk study, high levels of OCP residues was detected, 18.43 mg/kg of heptachlor epoxide and 1.92 mg/kg of endrin in the metropolitan zone; 2.10 mg/kg of dieldrin, 0.117 mg/kg of endosulfan II, 0.103 mg/kg of heptachlor, 0.178 mg/kg of endrin, and 0.127 mg/kg of endrin aldehyde in the main agricultural zone and on the west coast. Both, levels in blood and breast milk in Maya women is the resulting of a chronic exposure to organochlorine pesticides. The qualitative study on risk perceptions to the health by the use and management of agrochemicals in the communities, showed a very low risk perception due to the very low educational levels and lack of government support programs in agriculture [3,11-13].

In the other hand, scientific literature about the effect of the climate change such as the increment of the temperature can have indirect effects to the human health due to their physicochemical behavior in the environment [14].

Recommendations

In accord to the result, it is necessary to implement official monitoring programs in the aquifer, the water drinking can have residues of organochlorine pesticides due to the karst system and lack of regulations for pesticides; blood and breast milk of Maya women also needs monitoring programs to determine pesticides. Official programs of health promotion and cancer prevention, such as well agroecological alternatives for agriculture are necessary.

Developing countries needs care the environment and human health, applying the official norms and regulations in each country, channeling resources for water sanitation, avoiding the high level of corruption that mainly affects the rural communities and the societies in poverty. These studies can be a reference to the determination of natural risk factors on the landscape to the karst aquifers, and the impact of the bioaccumulation of levels of pollutants in the human being in developing countries.

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