

Review

Link between the occurrence of various forms of cancer and chronic exposure to pesticides

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Abstract

The occurrence of cancer in human is strongly associated with chronic exposure to various pesticides. Users may be exposed to pesticides through different ways, such as inhalation (absorption through the lungs) dermal contact (absorption through the skin or eyes) or ingestion (through the mouth). The pesticides such as, arsenic pesticides, dicamba, dieldrin, carbofuran, carbamate, organophosphate, phenoxyacetic acid, furans, dioxin, pendimethlin and metolachlor are associated with lung cancer. Chronic exposure of dioxin, herbicides, maneb/mancozeb, parathion and carbaryl are extensively associated with the development of melanoma. Similarly the occurrence of prostate cancer is linked with organochlorine, triazine and organophosphates. Pancreatic cancer can be caused by chronic exposure to DDT, DDD ethylan, pendimethalin and overall organochlorine pesticides while breast cancer is strongly linked with organochlorines. This mini review focuses some of the commonly used pesticides and its association with the development of various forms of cancers.

Keywords: Cancer, Arsenic, Pesticides

INTRODUCTION

Pesticides are a diverse group of chemicals used to control pests, counting plants, insects and molds. Pesticides are broadly used in agricultural. The National Health and Nutrition Survey found that mostly the United States population displayed measurable levels of various pesticide metabolites in their urine (Barr et al., 2004; Barr et al., 2005; Barr et al., 2010). Farmers are the main users of pesticides and extremely exposed group to pesticides. They can be exposed through loading, mixing, applying pesticides and during working in fields. Large selections of agricultural pesticides are used on farms counting livestock insecticides, herbicides, fungicides,

crop insecticides, and fumigants. Crop herbicides are used mainly about 50–93%, crop insecticides (48–59%), livestock insecticides (24–37%) and fungicides (11–14%) (Mandel et al., 1996; Alavanja et al., 1996; Reynolds et al., 1998). Pesticide contact can cause many harms for human health. These chemicals can contaminate the ecological environment through many ways including, improper disposal of unfilled pesticide containers (Abhilash and Singh, 2009; Karunamoorthi et al., 2012), spillage of pesticide residue into water canals and improper use of safety equipment (Salameh et al., 2004; Fu et al., 2001), great amounts of applied pesticide

residue stay in the environment, crops and derived foods (Dawson et al., 2010). Hence fruits, water, vegetables and food products are main sources of residual pesticides (Bradman et al., 2011) which can cause cancer, stomach diseases, kidney diseases, eye and skin irritations, and central nervous system related problems (Mejía-Aranguré et al., 2011). Based on existing studies, the probability of cancer and congenital deformities in children whose parents have been exposed to pesticides is high (Schreinemachers, 2003). Users may be exposed to pesticides through different ways, such as inhalation (absorption through the lungs) dermal contact (absorption through the skin or eyes) or ingestion (through the mouth) (Amoguis et al., 2012).

Lung cancer

About 85% of all lung cancer in Western countries is due to cigarette smoking (International Agency for Research on Cancer, 2004). Farmers are smokeless compare to the general population and usually have less lung cancer and other chronic disease compared with the general population (Alavanja et al., 2004a; Blair et al., 1985). For example, the respiratory cancer incidence among private applicators (mostly farmers) was only 47% of the broad-spectrum population of North Carolina and Iowa. Among the farmers' spouses the rate was only 41% and among marketable pesticide applicators only 61% (Alavanja et al., 2005). The strong influence of smoking on lung cancer rates can mask the effect of pesticides on lung cancer rates in Western agricultural populations, if smoking is not adequately controlled in the analysis. An excess threat of lung cancer was found amongst vineyard employees expose to arsenic pesticides (Luchtrath, 1983; Mabuchi et al., 1980; Mabuchi et al., 1979). Among approved pesticide applicators in Florida the threat of lung cancer increase with the number of years approved and a standardized mortality ratio larger than 2 was observed amongst applicators approved for 20 or more years (Pestori et al., 1994). This excess was endorsed to exposure to carbamate and organophosphate insecticides and phenoxyacetic acid herbicides. Exposure to Phenoxy herbicides or contaminants of phenoxy herbicides furans, dioxin, pendimethlin and metolachlor excess lung cancer death were observed in a cohort of employees from four manufacturing plants in Germany (Becher et al., 1996; Hou et al., 2006; Rusiecki et al., 2006). An association was also observed for dicamba, dieldrin and carbofuran exposure and occurrence of lung cancer (Samanic et al., 2006; Purdue et al., 2007; Bonner et al., 2005).

Melanoma

An Italian case-control study it was observed that

melanoma patients had a higher use of pesticides in a residential setting compared with controls (Fortes et al., 2007). Melanoma is connected to dioxin and herbicide exposure (Akhtar et al., 2004). An additional report of an elevated SIR for melanoma amongst Pan Britannica industry pesticide employees recommend that pesticides are connected to the improvement of melanoma (Wilkinson et al., 1997). In the AHS, specific pesticide exposures ascertained by survey prior to the onset of disease were found to be considerably associated with cutaneous melanoma. No significant associations were seen with overall, insecticide, herbicide or fumigant fungicide use or with chemical classes of pesticides including phenoxy herbicides, triazine herbicides, organophosphate insecticides or organochlorine insecticides however, melanoma was extensively associated with the fungicide maneb/mancozeb for those with more than 63 days of exposure. Similarly the insecticides parathion and carbaryl was also extensively associated with the development of melanoma for more than 56 days of exposure (Dennis et al., 2010; Mahajan et al., 2007).

Prostate cancer

Agricultural Health Study is the main probable cohort study to observe the connection of prostate cancer for both private marketable applicators and farmer with standardized incidence ratios = 1.19 and 1.28 at 95% CI, correspondingly evaluate with rates estimated in the 2 study states (Koutros et al., 2010). Some chemical classes or groups have been connected to prostate cancer include organochlorine insecticides, triazine herbicides and organophosphate insecticides (MacLennan et al., 2002; Mills and Yang, 2003; Alavanja et al., 2003). None of the relations is conclusive and it is ambiguous which exact pesticides might be motivating the group findings. Alteration of hormonal signal way or initiation of DNA injure is each postulate as a mechanism (Bagchi et al., 1995; Gammon et al., 2005; Kojima et al., 2004; Usmani et al., 2003; Usmani et al., 2006). Assessment on the role of pesticides in prostate cancer development is difficult because of the need to attain information on contact to specific individual pesticides to trail adjust in pesticide utilize pattern over time and because prostate cancer is common in adult men (Boers et al., 2005) a bigger amount of shortly phase tumors amongst men with broadly contact to pesticides contrast with men with no contact (Potti et al., 2003).

Pancreatic cancer

Pancreatic cancer is the fourth most important source of cancer death in the United States (American Cancer Society, 2008) and the sixth leading reason of cancer

death in Europe (Bray et al., 2002). Smoking is the only recognized modifiable risk factor but unlike lung cancer smoking only accounts for about 25% of pancreatic cancer cases in Western countries (Silverman et al., 1994; International Agency for Research on Cancer, 2004). Exposure to chlorinated hydrocarbon solvents (CHS) appears the mainly consistent occupational association with pancreatic cancer (Ojajarvi et al., 2001). It was found that statistically important pancreatic cancer incidence was observed among workers (28 exposed cases) exposed to DDT, DDD and ethylan (Garabrant et al., 1992). It was observed major excesses of pancreatic cancer among workers exposed to DDT, ethylan and overall organochlorine pesticides along with 66 exposed cases. Pancreatic cancer was associated with high serum levels of DDE, but the threat was retreating after the alteration for polychlorinated biphenyls (PCB) (Fryzek et al., 1997; Hoppin et al., 2000). Another study used a job-exposure matrix to guesstimate the level of professional exposure to pesticides among 484 cases and 2095 controls (Ji et al., 2001) and information on potential confounders was achieved by survey. Excess threat were found for professional exposure to fungicides and herbicides in the moderate/high level after modification for potential confounding factors but, particular chemicals were not recognized. An increased risk for insecticides exposure vanished after modification for herbicide and fungicides exposures. In the AHS, 93 incident pancreatic cancer cases were diagnose successive to finishing a detailed survey. Risk estimates were calculated controlling for age, diabetes and smoking. Two herbicides (pendimethalin and EPTC) of the 13 pesticides observe for intensity-weighted lifetime exposure use show a statistically extensive exposure response connected with pancreatic cancer. Applicators in the top half of lifetime, pendimethalin use had a threefold higher risk compared with never users, and those in the top half of lifetime EPTC use had a 2.56-fold threat evaluate with never users adjustment for age, smoking, and a history of diabetes. EPTC and Pendimethalin are capable to form N-nitroso-compounds. These conclusions are consistent with proof suggestive of a carcinogenic effect of nitosoamines on the pancreas (Andreotti et al., 2009). Because this was the first study to observe a connection between these two herbicides and pancreatic cancer, the possibility exists that this was a chance finding. Organochlorine pesticides were not linked with an excess threat of pancreatic cancer in the study but a real connection may have been missed in this cohort since DDT and many other chlorinated pesticides are banned in the 1970s and exposures were greatly diminished after that (Purdue et al., 2007).

Breast cancer

Breast cancer is one of the most common cancers in

women. Breast cancer affects one out of every 10 women in Europe and the USA (Miller and Sharpe, 1998). During the past decades increasing in the occurrence of cancer has been observed, particularly for prostate, testis and breast cancer. The relation among contact to oestrogenic compounds and threat of breast cancer was tainted by the facts of improvement of carcinoma of the vagina and cervix in daughters of women treated with pharmacological doses of diethylstilboestrol (DES) throughout pregnancy (Greenberg et al., 1984). The mothers themselves developed 35% additional breast cancers. Several pesticides especially organochlorines are known to stimulate biological responses corresponding to those of endogenous oestrogens (Adami et al., 1995). A number of experimental studies have publicized to promote activity of organochlorine compounds in the development of oestrogen correlated tumors in animals. Studies of human organochlorine contact has been frequently perform amongst populations through well-known or supposed professional or inadvertent exposure (Scribner and Mottet, 1981; Robinson et al., 1985; Blair et al., 1983). However approximately every single individual is daily exposed to much lower concentrations of ecological compounds through the dietary habit of food chain and water source. Numerous epidemiological studies have been accessible on the threat of breast cancer in relation with blood or fat concentrations of organochlorines (Wolff et al., 1993).

CONCLUSION

Chronic pesticides exposures are a source of various clinical disorders including cancer. Those pesticides which are highly carcinogenic should be banned by government. Some of the pesticides are banned by WHO such as mancozeb but they are still in use in developing countries such as Pakistan. The farmers should be aware about the hazardous effects of pesticides exposure. These farmers and industry workers should use protective clothes such as mask, gloves and other coverings to minimize direct contact with pesticides. Similarly the pesticides container should be disposed properly.

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