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INVESTIGATING AND MEASUREMENT OF RESIDUES OF D.D.T AND D.D.E IN FOUR SPECIES OF FISHES IN CASPIAN SEA, IRAN

M. Shokrzadeh[1] and A. G.Ebadi[2]

[1]*Department of Toxicology, Faculty of Pharmacy, Mazandaran University of Medical Sciences, Sari, Iran*
[2]*Department of Experimental Sciences, Islamic Azad University of Sari, Sari, Iran*

ABSRACT

Pesticides are compounds that used by human being, especially farmers for controlling biotic factors for a long time and bring a lot of environmental problems. Among these compounds chlorine incecticide sprays have high half-life, and high lipophilicity characteristic. Due to having chloronic consequences, it is necessary to evaluate and analyse in the environment especially in foods and also in fishes which have high fat and may carry this kind of insecticides . In the present study we have investigated the residues of chloride organoinsecticides such as D.D.T, D.D.E in the four kinds of fishes in the Caspian Sea. In this investigation we have selected four different kinds of fishes, which are highly used, and available in the Caspian Sea viz., Sefid - koli- kilca – kefal from four different hunting region viz., Chalous and Babolsar city and Khazar Abad and Miankaleh in 2004. After cleaning, we prepared hun muscle of the fished. Then, after the process of extraction, we distilled them in vacuum by means of organic solvent and determined the residues by Gas Chromatography (GC) with ECD detector. The results of insecticides analysis in four kinds of fishes been showed that the kafal in the Babolsar had the highest amount of D.D.T (0.031 ppm) followed by sefid in Babolsar (0.03ppm) ($P<0.05$).

Key words: D.D.T., D.D.E., organochlorine residues, Caspian sea, fish

INTRODUCTION

Synthetic organochlorines such as DDT and DDE are highly resistant to degradation by biological, photochemical or chemical means (Ware, 1986). These compounds are also typically characterized as having low water solubility and high lipid solubility. The organochlorines have been associated with significant environmental impact in a wide range of species and at virtually all tropic levels. Many organochlorines have been implicated in a broad range of adverse human health and environmental effects, including impaired reproduction, endocrine disruption, immunosuppression and cancer. Exposure to organochlorines has been correlated with population decline in a number of marine mammals such as fishes (Ware, 1986; Shereif and Mancy, 1995; Ingrid and Joan, 2002)

DDT came into use in the 1940s and was widely introduced into Iran agriculture in the 1950s. It was the first highly effective broad-spectrum insecticide which gave an extremely high level of control over many important insect pests. It has low acute toxicity to humans, and as such was widely acclaimed as a wonder chemical. There has been a total ban on the use of DDT in Iran since 1987 (Ingrid and Joan, 2002; Vidar and Anuchka, 1998).

The primary transport routes into marine and coastal environments include atmospheric deposition and surface run-off, the former being by far the greatest albeit dispersed over large areas. Because many organochlorines are relatively volatile, their re-mobilization and long-distance redistribution through atmospheric pathways often complicates the identification of specific sources. Nevertheless, those (the majority) used in agriculture are also washed off the land into rivers, thence to the sea or directly into the sea via outfalls or run-off. Many organohalogens follow quite complex biogeochemical pathways. Whilst there is substantial information concerning contamination of many industrialized countries and a number of studies have been conducted regarding organochlorine contamination in the Eastern Europe and Asia (Vidar *et al*., 1998; Stephenson *et al*., 1995; Hilbert *et al*., 1998).

The Caspian sea, the largest inland sea in the world, is bordered by five countries: Iran , Azerbaijan, Turkmenistan, Kazakhstan and Russia. It has no outlets and acts as a reservoir for water in the region. Environmental pollutants found in the sea probably arrive via the Mazandaran and Gillan rivers. Industrial complexes along the coast particularly in mazandaran and Gillan provinces, in Iran, also discharge waste directly into the Caspian sea (Hall, 1999)

It is evident that seafood, particularly marine and freshwater fish, is a major component of the local diet; it is estimated that an average Iranian person especially in Mazandaran province consumes fish or shellfish three or more times per week. The aim of this study was to survey levels of organochlorines (DDT and DDE) in the four species of most consumed fish available from the local market in order to estimate potential human exposure.

MATERIALS AND METHODS

Four commonly consumed fishes (Table 1) were purchased from a local fish market in February 2003 (n = 10).

Table 1. Four commonly consumed fish in this study .

Common name	Sciemtific name
Sefid fish	*Rutilus frisikutum*
Koli fish	*Clupeonell a delicatula*
Kafal fish	*Mugil auratns*
Kilca fish	*Vimba vimba*

All samples were collected from Caspian sea in July and August 2003. Five individuals of each fish were collected from four sites viz., Chalous and Babolsar city and Khazar Abad and Miankaleh region. Dorsal muscle of the samples were removed and frozen at -20°C and shipped to central laboratory, Sari city where concentrations of DDT and DDE were determined (Falandysz *et al.,* 1994).

Sample preparation and analysis

The sample preparation and analysis protocols are similar to those described in Vidar and Anuschka (1998). Approximately 5 g of dorsal muscle from samples fish was thawed and homogenized with 60 g of anhydrous sodium sulphate in a mortar until a free-flowing powder was obtained. The sample was extracted with 225 ml of 1: 1 methylene chloride/hexane. Extracted sample was injected to Gas chromatography in electron capture detector (ECD), OC levels (DDT and DDE) were measured using the internal standard method in conjunction with the corresponding external standards using selected ion monitoring mode (Vidar and Anuschka, 1998; Falandysz *et al.,* 1994).

RESULTS AND DISCUNSSION

Concentration of DDT and DDE contents in the four species of fishes in Caspian sea were Presented in Table 2. DDT and DDE measured in all samples that hunted from four fishery regions.

Table 2. The average quantities of of DDT and DDE Contents (ppm) in four species of fishes in Caspian Sea.

Region	Kind of fish	Mean of DDT (ppm)	Mean of DDE (ppm)
Chalus	Sefid	0.021	0.025
	Koli	0.022	0.025
	Kafal	0.031	0.029
	Kilca	0.014	0.015
Babolsar	Sefid	0.027	0.030
	Koli	0.023	0.023
	Kafal	0.021	0.021
	Kilca	0.019	0.018
Khazar abad	Sefid	0.018	0.020
	Koli	0.016	0.020
	Kafal	0.020	0.014
	Kilca	0.015	0.016
MianKaleh	Sefid	0.017	0.018
	Koli	0.017	0.018
	Kafal	0.019	0.019
	Kilca	0.016	0.018

DDT residues regarding Sefid fish has maximum amounts (0.027 ppm) in Babolsar. In Chalus and Babolsar regions, the amounts of DDT content in Koli fish were the greatest and close together (0.022 in Chalus and 0.023 in Babolsar). The Samples of Kafal fish in Chalus showed the maximum DDT content (0.031 ppm) and the Kilka fish in comparison to other fishes, showed the minimum DDT content in the above fishery regions.

Residues of DDE in the above fish species were found in the order of Sefid (Babolsar , 0.030) > Kafal (Chalus, 0.029) > Koli (Chalus, 0.025) wheras Kilka fish, showed the minimum DDE contents as compared to other fishes.

Statistical analysis (one–way ANOVA), indicated that there is no significant difference regarding DDT contents ($P< 0.05$) but DDE ($P< 0.05$) among fishery sites.

Other Study in North Atlantic indicated that means of DDT (0.002 ppm), DDE(0.002 ppm), Dieldrin (0.006 ppm) and Endosulphan (0.007 ppm) in liver samples (in Shirbit fish), lower than quantities proposed by WHO (0.05 ppm)(Falandysz *et al.*, 1994).

Quantities of DDT and DDE in Caspian sea (Table 2.) was lower than WHO Standard Levels (0.05ppm) But in comparison to all regions and other poisons, Presented higher quantities for great use by farmers in Northern Province in Iran (Southern coasts of Caspian sea) and great distribution by agriculture center in Mazandaran among Farmers (Ingrid and Joan, 2002; Shailaja, 1997; Juhler *et al.*, 1999; Dogheim *et al.*, 1996; Chan *et al.*, 1996).

There is evidence that the population of seals in the Caspian sea is declining and fertility rates are decreasing due to residues of chlorinated pesticides. Further studies on contaminants in live animals and biomarker responses that may indicate reproductive interference are needed before we can conclude that the high levels of DDT insecticides in this population are lexicologically important (Hall, 1999; Chan *et al.*, 1996; Morion, 1986, 1989; Muir *et al.*, 1990; Wolfe *et al.*, 1984).

The results revealed that the presence of poisonous residues in the most consumed fishes is very serious and important and there is need for a comprehensive survey in Caspian sea (Mazandaran Province) and southern coasts of Caspian sea.

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