

Organochlorine Pesticidal Residues in Broiler Chicken Fat in Markets of Eastern Region of Saudi Arabia

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Abstract:

This survey was conducted to investigate the presence of organochlorine compounds in chicken fat collected from supermarkets of cities of Eastern Region of Saudi Arabia during May-June, 2005. Few samples of chicken fat collected from Qatif, Dammam and Al-Ahsa were found to contain residues of endosulfan and heptachlor below the maximum residue limits for fat tissues. Close monitoring of residues is suggested to minimize ingestion of these compounds.

Introduction:

Organochlorine compounds are categorized by the Agency of Toxic Substances and Disease Registry (ATSDR, 1994) as probably carcinogenic to human. The presence of these pollutants in the environment (Fraser *et al.*, 1998; Buehler *et al.*, 2001) leads to their presence in foods (Frank *et al.*, 1985). Biomonitoring procedures have been developed to assess human exposure to organochlorine and other pesticides to ensure that residues are kept at low level so that health risk posed by their ingestion is minimized. This survey was carried out to obtain information on the occurrence of organochlorine compounds in chicken meat collected from markets of Eastern Region of Saudi Arabia.

Materials and Methods:

Sampling Procedures:

Samples of frozen broiler chicken were collected from supermarkets in Jubail, Qatif, Dammam, Khobar, Abqaiq and Al-Ahsa in a single trip during May-June, 2005. Additional samples were collected from 5 broiler farms and 10 chicken pluck shops (Natafa) in Al-Ahsa region.

After dissection, chicken fat tissues were packed separately in plastic bags. Fat tissues was then homogenized and melted at 80°C. An aliquot was stored in a fridge at 4°C until analysis.

Analytical method:

Samples of fat were extracted and assayed according to the method of Frank *et al.* (1985). The compounds detected were hexachlorocyclohexane (HCH), endosulfan, lindane, heptachlor, methoxychlor, dieldrin, endrin and total DDT.

Insecticides residues were measured by electron capture (^{63}Ni source) Gas chromatography (Hitachi, Japan) using a 15 m x 0.25 mm capillary column coated with an 0.25 μm thickness of SE-30. Chromatographic conditions were as follows: injector temperature, 225°C; detector temperature, 300°C; column oven, programmed for an initial 1-min hold at 90°C followed by 15°C/min to 20°C and then 5°C/min to 25°C; carrier gas, helium at 30 cm/s (105 kPa head pressure) and 30 ml argonmethane (95 + 5)/min make-up gas to the detector. The injection was auto injection of 1.5 μl with capillary inlet system configured in the splitless mode with the by-pass valve held open for 0.5 min.

Recoveries were determined by direct fortification of fat with known concentration of compounds in acetone and analyzed as described above. Results were corrected for extraction losses. Detection limits of the assay and the recovery values are shown in Table 1.

Table (1)
Average recoveries and detection limits in fat

Analyte	Recovery (%)	Detection limit ($\mu\text{g/kg}$)
Total DDT	87	0.4
HCH	88	0.1
Methoxychlor	81	1.0
Heptachlor epoxide	91	0.1
Dieldrin	83	0.1
Endrin	80	0.2
Endosulfan	88	0.1
Lindane	94	0.1

Results and Discussion:

Residues of organochlorine compounds in chicken fat collected from supermarkets, poultry farms and chicken pluck shops (Natafa) of Eastern Region are shown in Table 2. Few samples of chicken fats collected from Qatif, Dammam and Al-Ahsa were found to contain residues of endosulfan and heptachlor.

The residues detected were well below the maximum residue limits for fat tissues according to European regulations (EEC/CD 1986). Occurrence of pesticides and herbicides in soil and sand dust from Riyadh city has been confirmed (Al-Mutlaq *et al.*, 2002; Rushdi *et al.*, 2004). Local agriculture and gardening application of these pesticides may be the main source of compounds in the dust of city of Riyadh and elsewhere in the Kingdom. Uses of these pesticides and insecticides in poultry premises, however, could not be ruled out. Evidence of organochlorine pesticides contaminating poultry tissue in different parts of the world has been reported (Watson *et al.*, 1993; Doganoc, 1999; Cerkvénik and Komar, 1999; Jevsrick *et al.*, 2004). In this study, the sample size was rather small. A wider scale study including survey of eggs may yield more informative data. It is noteworthy to conclude that endosulfan was detected in major cities of Eastern Region of Saudi Arabia. Endosulfan is registered as hazardous materials causing acute and chronic toxicities (Khare *et al.*, 2002) among which is reduction of oxygen uptake in blood (Bhalchandra and Lemote, 2003).

In conclusion, the presence of hazardous pollutants in chicken fat is mainly due to environmental contamination. This needs continuous close monitoring and corrective action.

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Table (2) Organochlorine residues^a in chicken fat collected from market of Eastern Region of Saudi Arabia

Source	Number of samples	Positive samples			
		Hepatochlor (MRL ^b = 200 µg/Kg)	Range (µg/Kg)	Endosulfan (MRL= 200 µg/Kg)	Range (µg/Kg)
Jubail	25	-	-	-	-
Qatif	20	-	-	1	20
Dammam	25	-	-	1	15
Khobar	20	-	-	-	-
Abqaiq	20	-	-	-	-
Al-Ahsa supermarket	30	-	-	2	10-20
Al-Ahsa poultry farms	100	1	15	2	10-20
Al-Ahsa chicken pluck shops (Natafa)	100	3	10-20	3	10-20

a) Other organochlorine compounds were not detected.

b) MRL= Maximum residue limit.

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بقايا المبيدات الكلورينية العضوية في دهون الدجاج اللاحم في أسواق المنطقة الشرقية - المملكة العربية السعودية

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الملخص:

لقد تم مسح بقايا المركبات الكلورينية العضوية في دهون الدجاج اللاحم في الأسواق المركزية في المنطقة الشرقية بالمملكة العربية السعودية وكذلك في مزارع الدجاج اللاحم والنتافات بالأحساء خلال شهري مايو ويونيو ٢٠٠٥ م وقد أوضحت الدراسة أن العينات التي جمعت من أسواق القطيف والدمام والأحساء قد احتوت على بقايا مركب الاندوسولفان ومركب الهيباتوكلور ولكن بتركيز يقل كثيرا عن الحد الأقصى المسموح به في دهون الدجاج حسب التشريعات الأوروبية (EEC/DC 1986). كما خلصت الدراسة إلى ضرورة الاستمرار في إجراء مسح دوري مستمر للكشف عن هذه المركبات حتى يمكن تفادي بقايا المبيدات الحشرية في لحوم الدجاج حفاظا على صحة المستهلك.