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CHLORINATED HYDROCARBON PESTICIDE RESIDUES IN SMALL RUMINANTS AND CAMEL FAT IN ASSIUT, EGYPT

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ABSTRACT :

A total of 80 fat samples (40 goats, 20 sheep and 20 camels) were collected from Assiut Governorate slaughter houses and analyzed for determination of chlorinated hydrocarbon pesticides residue levels (α, β, γ, and δ-hexachlorocyclohexane (HCH), p,p′-DDT and some analogues (p,p′-DDE, p,p′-DDD and o,p′-DDT), aldrin and dieldrin, heptachlor and heptachlor epoxide, endrin and hexachlorobenzene (HCB) by using GC-ECD.

The main chlorinated hydrocarbon contaminants found in all analyzed samples of goat and sheep were β-HCH, p,p′-DDE and p,p′-DDT and p,p′-DDE in camel followed by p,p′-DDD, α-HCH, HCB and endrin. Heptachlor and aldrin could not be detected in sheep and camel fat but recorded in few goat samples. Total HCH isomers averages were 0.01 ± 0.007, 0.006 ± 0.007 and 0.004 ± 0.003 ppm in goat, sheep and camel fat, respectively, while the mean values of total DDTs were 0.0116 ± 0.008, 0.0122 ± 0.008 and 0.0024 ± 0.0011 ppm .

The obtained results showed a decrease in the levels of the investigated pesticides. The changes were related to the prohibitions and restrictions applied on the usage of these compounds. The detected residue levels were compared to Extraneous Residue Limits (ERL's) released by the Codex Committee on Pesticide Residue (CCPR) of FAO/WHO in 1994. Health hazards were also discussed.

INTRODUCTION :

A number of chemicals are used in modern agriculture for producing food commodities as cheaply and efficiently as possible to meet world-wide food demands. Despite obvious benefits, occasional misuse of such chemicals has resulted in over intoxication of animals and accumulation of residues in feeds and foods. Introduction of chlorinated hydrocarbon insecticides in the 1940s created the potential for serious residue problems. All these synthetic pesticides are fat soluble, rapidly absorbed, stored in fatty tissues and slowly secreted (Hansen and Lambert, 1987). These compounds represented by hexachlorocyclohexane (HCH), chlorocyclodienes (aldrin, dieldrin, endrin, heptachlor and heptachlor epoxide), DDTs, and the fungicide hexachlorobenzene (HCB) accumulate in the body fat of animals continuously exposed to them through spraying of the environment or feed contamination. However, the toxic implications of such residues in humans are not completely understood, since they may be unsafe even at low daily intakes as they accumulate in the fat tissue and may induce changes in biotransformation of the endogenous and exogenous compounds (Concon, 1988).

Chlorinated hydrocarbons have been used extensively as pesticides and insecticides in Egypt since 1950a as in the other parts of the world . Although their use was officially benned in 1980s (Dogheim et., 1996b) , surveys carried out in Assiut and other Egyptian Governorates (El-Shafei, 1988; Dogheim et al., 1988; and Salem et al., 1990, 1991,1995, 1996a and 1996b) showed a widespread contamination of chlorinated hydrocarbon residues (HCH, DDTs, HCB) in buffaloes and cattle tissues, raw milk, mother's milk and fresh water fish .

Since meat is an important source of pesticide residues in the human diet, this paper reports the results of analyses of goat, sheep and camel carcasses fat generally consumed by human beings in Assiut Governorate.

MATERIALS AND METHODS :

Eighty perinephric fat samples (40 goats, 20 sheep and 20 camels) were collected randomly during January-June 1995. Adipose tissue samples were obtained from carcasses prepared for human consumption in Assiut Governorate slaughter houses. The samples were placed in aluminium foil, transferred to the laboratory, minced and frozen until analysis.

Apparatus :

* Gas chromatograph- Carlo Erba MEGA HRGC 5330 with ^{63}Ni ECD and split-splitless injector and column, HP ULTRA1 50m X 0.2mmX0.33um was used. Temperature programming: start at 80°C hold 1 min., increase to 200°C at 30°C/min., hold 3 min., increase to 220°C at 1°C/min., hold 10 min., increase to 250°C at 25°C/min., hold 15 min. Conditions: injector 250°C; detector 320°C; carrier gas (helium) 250 kPa; makeup-gas nitrogen 300 kPa.

Reagents:

* All the reagents used were for pesticide residue's analysis:- Dichlormethane, iso-Octane and Petroleum ether.
* Sodium sulphate anhydrous (heated for one night at 500 °C before use).
* Florisil (grain size 0.15-0.25 mm; 60-100 mesh) Merck 12518: was heated for one night at 550°C and cooled in a desiccator and mixed with distilled water (3%): i.e. 97 gm florisil +3 gm distilled water. The flask was closed and shaked immediately by hands for 5 minutes. Finally, it was shaked for 20 min. by a shaking machine and left for 10-12 hours before use. It must be used within 3 days.

NB: Florisil stayed more than 48 hours without use, must be heated at least for 5 hours or one night at 130 °C, then prepared as mentioned above before further use.

Pesticide reference standards:

Alpha-HCH (Supelco Nr. 4-8493), Beta-HCH (Supelco Nr. 4-8494), Gamma-HCH (Supelco Nr. 4-9049) and delta-HCH (Supelco Nr. 4-8495), p,p'-DDE (Supelco Nr. 4-9017), p,p'-DDD (Supelco Nr. 4-9009), o,p'-DDT (Ehrenstorfer P1111), p,p'-DDT (Supelco Nr. 4-9019), Heptachlor and heptachlor epoxide (Supelco Nr. 4-9041 and 4-9042), Aldrin and dieldrin (Supelco Nr. 4-9000 and 4-9024), Hexachlorobenzene (Supelco Nr. 4-8508) and endrin (Supelco Nr. 4-9032). Standard solution of reference materials were prepared in petroleum ether.

Extraction of adipose tissue samples:-

Tissue extraction and clean-up was performed according to Anonymous, (1988) and Stijve and Cardinale, (1974) that previously used by Salem, (1993).

A 10 gm sample was mixed with 30 gm granular sodium sulphate anhydrous in a porcelain mortar until formation of a homogeneous mass. The homogenate was transferred into a wide mouth Erlenmeyer flask and petroleum ether was added to the mixture in the flask until 2 cm above its surface, the mortar was rinsed with it and , transferred into the flask. The flask with its contents was kept for one night. Petroleum ether was filtered into a round evaporatory flask that was previously weighed. The first flask, insoluble material and filter paper was rinsed with petroleum ether 3 times. Petroleum ether was evaporated by rotatory evaporator at maximum 40 °C. The flask with fat was weighed again, and the fat content of adipose tissue was calculated. One gram of this pure fat was used for clean-up (florisil column).

A chromatographic column 300×22 mm was filled with nearly 70 ml petroleum ether. 25 gm deactivated florisil were added, topped with 15 gm sodium sulphate anhydrous. All petroleum ether was withdrawn until 1 cm above the column packing. The fat sample (1 gm) was dissolved and transferred into the column with nearly 10 ml petroleum ether. Pesticide residues were eluted with 300 ml pet. ether/dichioromethane (8:2 , v:v) . The elute was collected in a 500 ml evaporator flask and evaporated by rotatory evaporator at 40°C, transferred quantitatively into another 50 ml special round flask and evaporated again until 1 ml remained, which was evaporated under stream of nitrogen. Residues were transferred into a 5 ml volumetric flask by iso-octane for GC. All residue levels were not corrected with its recoveries (table 4).

RESULTS :

The levels and the frequencies of various chlorinated hydrocarbon residues found in each animal are shown in tables 1, 2 and 3. Results presented are expressed as ppm on a fat basis (mg/kg of extractable fat).

DISCUSSION :

β-BHC, p,p'-DDE and p,p'-DDT were the only chlorinated hydrocarbon pesticides determined in all goat and sheep samples analyzed plus p,p'-DDE in camel fat. Overall, the frequency of detection of chlorinated hydrocarbon residues in our samples was high since all samples contained at least more than two different pesticides. In general, camel appeared to be less contaminated. This study indicated also that the concentrations of all pesticides were dramatically decreased more than thirty folds; in some pesticides (HCH) reached one hundred folds in comparison with previous studies (El-Shafei, 1988 and Salem, 1993).

Table(1) : Mean, range values (ppm) and frequency of chlorinated hydrocarbon pesticide residues detected in goat fat collected from Assiut. (Number of analyzed samples= 40) .

Pesticide	mean	min.	max.	median	90th percentil	frequency	F%
α-HCH	0.0003 ± 0.0002	0.0001	0.0007	0.0003	0.006	36	90
β-HCH	0.008 ± 0.006	0.002	0.029	0.0061	0.016	40	100
γ-HCH	0.001 ± 0.0015	0.0001	0.0053	0.0002	0.0034	36	90
δ-HCH	0.0006 ± 0.0007	0.0001	0.0028	0.0003	0.0015	30	75
Total HCH	0.010 ± 0.007	0.0021	0.0311	0.0075	0.0198	40	100
p,p'-DDE	0.010 ± 0.0123	0.0021	0.0621	0.0057	0.0162	40	100
p,p'-DDD	0.0014 ± 0.0011	0.0004	0.0036	0.0009	0.003	37	92.5
o,p'-DDT	0.0011 ± 0.0008	0.0005	0.003	0.001	0.0019	21	52.5
p,p'-DDT	0.002 ± 0.0017	0.0003	0.006	0.0016	0.004	40	100
Total DDTs	0.0116 ± 0.008	0.0041	0.0661	0.0086	0.0204	40	100
Heptachlor	0.0004 ± 0.0001	0.0002	0.0005	0.0003	----*	8	20
H. epoxide	0.0017 ± 0.0017	0.0003	0.0062	0.0012	0.0041	30	75
T. heptachlors	0.0017 ± 0.0017	0.0003	0.0062	0.0012	0.0041	30	75
Aldrin	0.0003 ± 0.0004	0.0001	0.0012	0.0004	----*	6	15
Dieldrin	0.0005 ± 0.0004	0.0003	0.0011	0.0006	0.0011	25	62.5
Ald. & Dield.	0.0006 ± 0.0004	0.0004	0.0015	0.0008	0.0012	25	62.5
Endrin	0.001 ± 0.0006	0.0003	0.0024	0.0009	0.0016	26	65
HCB	0.0005 ± 0.0003	0.0001	0.0011	0.0003	0.001	36	90

* Number of positive samples less than 10

Table(2) : Mean, range values (ppm) and frequency of chlorinated hydrocarbon pesticide residues detected in sheep fat collected from Assiut. (Number of analyzed samples= 20) .

Pesticide	mean	min.	max.	median	90th percentil	frequency	F%
α-HCH	0.0012 ± 0.002	0.0001	0.007	0.0002	0.0023	19	95
β-HCH	0.0035 ± 0.003	0.0015	0.013	0.0029	0.0042	20	100
γ-HCH	0.0002 ± 0.0001	0.0001	0.0003	0.0001	0.0003	12	60
δ-HCH	0.0014 ± 0.0014	0.0002	0.003	0.0011	----*	8	40
Total HCH	0.006 ± 0.007	0.0016	0.024	0.0032	0.0078	20	100
p,p'-DDE	0.009 ± 0.007	0.0025	0.0232	0.0065	0.0159	20	100
p,p'-DDD	0.0009 ± 0.0005	0.0005	0.0017	0.001	0.0015	20	100
o,p'-DDT	0.0007 ± 0.0007	0.0003	0.002	0.0005	0.0008	12	60
p,p'-DDT	0.0022 ± 0.0021	0.0003	0.0074	0.0013	0.004	20	100
Total DDTs	0.0122 ± 0.008	0.0068	0.0321	0.0093	0.017	20	100
Heptachlor	ND	ND	ND	ND	ND	0	0
H. epoxide	0.0004 ± 0.0001	0.0003	0.0006	0.0004	0.0005	10	50
T. heptachlors	0.0004 ± 0.0001	0.0003	0.0006	0.0004	0.0005	10	50
Aldrin	ND	ND	ND	ND	ND	0	0
Dieldrin	0.001 ± 0.001	0.0004	0.0026	0.0006	0.0016	12	60
Ald. & Dield.	0.001 ± 0.001	0.0004	0.0026	0.0006	0.0016	12	60
Endrin	0.0006 ± 0.0004	0.0003	0.0014	0.0007	0.0013	14	70
HCB	0.0007 ± 0.0014	0.0001	0.0043	0.00024	0.001	18	90

* Number of positive samples less than 10 , ND = not detected.

Table(3) : Mean, range values (ppm) and frequency of chlorinated hydrocarbon pesticide residues detected in camel fat collected from Assiut. (Number of analyzed samples= 20) .

Pesticide	mean	min.	max.	median	90th percentil	frequency	F%
α-HCH	0.0004 ± 0.00036	0.0001	0.0011	0.0002	0.0005	16	80
β-HCH	0.0043 ± 0.0024	0.0012	0.0083	0.0035	0.0062	18	90
γ-HCH	0.0002 ± 0.0001	0.0001	0.0003	0.0002	0.0003	14	70
δ-HCH	0.0003 ± 0.0	0.0003	0.0003	0.0003	----*	4	20
Total HCH	0.004 ± 0.003	0.0013	0.0088	0.0038	0.0063	20	100
p,p'-DDE	0.001 ± 0.0004	0.0005	0.0016	0.0008	0.0014	20	100
p,p'-DDD	0.001 ± 0.0006	0.0003	0.0021	0.001	0.0012	14	70
o,p'-DDD	0.0005 ± 0.00	0.0005	0.0005	0.0005	----*	2	10
p,p'-DDT	0.0008 ± 0.0005	0.0004	0.0015	0.0006	0.001	14	70
Total DDTs	0.0024 ± 0.0011	0.0005	0.004	0.0023	0.0035	20	100
Heptachlor	ND	ND	ND	ND	ND	0	0
H. epoxide	0.0004 ± 0.0001	0.0003	0.0006	0.0004	----*	8	40
T. heptachlors	0.0004 ± 0.0001	0.0003	0.0006	0.0004	----*	8	40
Aldrin	ND	ND	ND	ND	ND	0	0
Dieldrin	0.0006 ± 0.0004	0.0005	0.0012	0.0005	0.001	10	50
Ald. & Dield.	0.0006 ± 0.0004	0.0005	0.0012	0.0005	0.001	10	50
Endrin	0.0005 ± 0.0003	0.0003	0.0011	0.0006	0.0008	10	50
HCB	0.0001 ± 0.00015	0.0001	0.0004	0.0002	0.0003	14	70

* Number of positive samples less than 10 , ND = not detected.

Table (4) : Recovery percent and limit of quantitation.

Pesticides	Spiked conc. (mg/kg)	Recovery percent	Limit of quantitation (mg/kg)
HCH alpha	0.02	90	0.0001
HCH beta	0.1	86	0.001
HCH gamma	0.02	89	0.0001
HCH delta	0.02	76	0.0001
DDE p,p	0.1	83	0.0002
DDD p,p	0.1	85	0.0003
DDT o,p	0.1	80	0.0004
DDT p,p	0.1	91	0.0002
Heptachlor	0.01	100	0.0001
Hep. epoxid	0.1	84	0.0003
Aldrin	0.01	83	0.0001
Dieldrin	0.1	85	0.0003
Endrin	0.1	84	0.0003
HCB	0.01	97	0.0001

According to studies carried out in many countries, i.e., Egypt (El-Shafei, 1988 and Salem, 1993), Iran (Hashemy-Tonkabony, 1981); Iraq (Al-Omar et al., 1985); Ireland (Harper, 1980) and Spain (Herrera et al., 1994), the pesticides most commonly found in the ruminants were lindane, the isomers of HCH, DDT and its metabolites (DDE and DDD), dieldrin and heptachlor epoxide. HCB and HCH gamma and alpha isomers were the most frequently detected pesticides in Germany (Knoeppler, 1976) and in Austria (Jarc, 1980).

Total hexachlorocyclohexane isomers (alpha-, beta-, gamma- and delta-HCH) were found in all analyzed fat samples. Its mean values were 0.01±0.007, 0.006±0.007 and 0.004±0.003 ppm in goat, sheep and camel fat, respectively. Goat fat contained the highest levels of total HCH isomers. This may be attributed to the body fat condition. Spence et al., (1990) recorded that the reduction in HCH residue levels occurred by redistribution and dilution throughout the increased body fat. β-HCH was most frequently detected isomer of the four HCH isomers (α, β, γ and δ), 100% in goat and sheep and 90% in camel fat, followed by α-HCH and γ-HCH (lindane), then delta isomer.

As shown in tables 1, 2 and 3, the mean values of total HCH isomers found in all fat samples were mainly due to the beta isomers, which might correspond to the concept of possible isomerization of alpha and gamma isomers to the beta isomer (IPCS, 1991 and 1992). β-HCH showed levels distinctly higher than those reported for the other three isomers, (α, γ and δ-HCH) in the investigated animals. Such findings were reported by Salem (1993), Salem et al. (1995) and Dogheim et al. (1988, 1990, 1991 and 1996a). β-HCH may occur in meat at higher levels because of its great persistence, which far exceeds that of the other isomers (Hecht, 1988). This isomer is the most persistent and slowly eliminated from the body (Pfeilsticker, 1973) and has the ability to accumulate in fat tissues 10-30 times than lindane (Heeschen, 1980), but not the most hazardous (Scholz et al., 1985).

Lindane (gamma isomer of HCH) which is used alone as a pesticide and also is the most toxic isomer of this group is always detected in insignificant amounts. Almost no differences in the residual amounts of lindane were observed between the different animal sorts.

α-HCH was also more frequent in fat samples as β-HCH but with very low values except in some samples of sheep. This may be attributed to the possible use of technical HCH that contained a large proportion of α-HCH or the external treatment of animals with HCH based veterinary preparations, which could be ingested or absorbed through skin (Harper, 1980). Gamma-HCH isomerizes to the alpha and delta isomers, respectively 4 and 50 times less insecticidal (Newland et al., 1969).

Animal exposure to HCH can occur through the use of lindane or technical HCH as a dipping chemical to control scab mostly in sheep (Sumner, 1984). The distribution pattern of HCH isomers indicates that such residues might result from previous exposure to lindane (>90% γ-isomer) and to Gamaxan, the HCH mixture of isomers (< 70% α-isomer, 15% γ- isomer and 10% β-isomer) sold in Cairo (Dogheim et al., 1996a).

All the detected levels were below the ERL (2 ppm) for total HCH isomers and lindane released by the Codex Committee on Pesticide Residue (CCPR) of FAO/WHO in 1994. Also all the investigated samples were found to contain residues far below the EC level of safety (1 ppm) for total HCH, (100 ppb) for β-HCH and 0.2 ppm for α-HCH (Herrera, et al., 1994).

The overall pollution of goat, sheep and camel with DDT and its metabolites, especially of the p,p' form, was found to be very low, averaging 0.0116, 0.0122 and 0.0024 ppm, with a maximum of 0.0661, 0.0321 and 0.004 ppm, respectively. Total DDTs were presented in all adipose tissue samples with p,p'-DDE. This could be attributed to the high solubility and tendency of DDT and its metabolites to accumulate and stored in fatty tissues (WHO, 1979 and 1989).

The metabolite p,p'-DDE made up the greatest fraction (0.01, 0.009, and 0.001 ppm) in goat, sheep and camel fat, respectively, followed by p,p'-DDT (0.002, 0.0022 and 0.0008), indicating the continuous degradation of DDT to the less toxic and more persistent derivative. This was shown by Fries et al., (1972) and Hayes, (1975); who reported that DDE is more resistant to metabolic degradation than DDT in animals and man. Also, DDE is found in almost all the living organisms because of its strong affinity with body fat (Jensen and Jansson, 1976).

In spite of the known information about the prohibited use of DDT in Egypt at the last

15 years according to the authorities report, the continued use of the dicofol (Kelthane®) replaced DDT as the primary source of environmental DDE and contains as much as 0.6 % p,p´ and o,p´-DDT (Camoni et al., 1983). This indicates the continuous contamination of the environment by DDT and DDE.

On basis of ERL of 5 mg/kg total DDTs (CCPR, 1994) residues in animal tissues, all the analyzed samples were below the limit.

Contamination with cyclodienes was quit low, except for a high frequency of some pesticides. Heptachlor and aldrin could not be detected in sheep and camel. The residue averages of this group were very low as shown in tables 1, 2 and 3. This group as a whole shows levels in samples usually below 0.020 ppm on a fat basis as reviewed by Ruiter, (1985). This limited extent of contamination by the cyclodiene group is in accordance with the figures given by El-Shafei, (1988) and Salem, (1993) in meat of various species and Dogheim et al., (1996b) and Salem et al., (1995) in fish as a result of their use being banned in Egypt.

Wilkinson et al., (1964) indicated that toxic residues mostly heptachlor epoxide, will persist in the soil for as long as 9 years, the possibility thus exists for contamination of crops from these fields. However, it was translocated from the soil into certain crops (Bruce and Decker, 1966), subsequently stored in the fat of dairy cows (Rusoff et al., 1963). Referring to the ERL´s of the (CCPR, 1994) of 0.2 mg/kg of heptachlor and its epoxide in animal tissue, it could be revealed that all detected residues were found below the permissible limit.

Aldrin residue definition includes dieldrin residues as well. Inspite of dieldrin being an insecticide by itself it is also resulting as a degradation product from aldrin application. A statement that was mentioned by Bann et al., (1956) that dieldrin is the form of which aldrin usually being stored in fats. The magnitude of aldrin and dieldrin residues revealed low levels and few frequencies in adipose tissue samples of all animals. Aldrin residues were absent in all sheep and camel samples as the total residues resulted mainly from dieldrin (tables 2 and 3). All the analyzed samples contained aldrin and dieldrin residues below the extraneous residue limit.

As far as human safety is concerned, endrin is the most hazardous pesticide from the cyclodiene group. Its average was very low in comparison with the previous data recorded by Salem, (1993) The extraneous residue limit of endrin in animal tissues is 0.1 mg/kg (CCPR, 1994). All fat samples never exceeded the permissible limit.

Hexachlorobenzene has been used as a seed treatment fungicide. It is a by-product of some chemical processes, and has been known to cause human poisoning (Cam and Nigogosyan, 1963). It was translocated in foods and human tissues from non-agricultural sources such as industrial high-temperature processes involving chlorine and production of organic solvents (Heinish, 1985 and Vogelgesang, 1986). Recently, Salem, (1993) and Salem et al., (1995) detected HCB with frequencies more than 90% in buffaloe and cattle fat and fresh water fish samples collected from Assiut with low values. Thus, the rate of contamination with HCB in the food-chain is possibly extraordinarily high. Therefore, it was not surprising to find such widespread HCB contamination (90%) of goat and sheep samples and (70%) of camel samples.

HCB, has since the early 1970s been recognized as an environmental contaminant comparable to DDT and PCBs in industrialized countries (Acker and Schulte, 1970 and Stijve, 1971). On the other hand, HCB contamination does not seem to be a serious problem in Egypt, since only very low residue levels were found in all analyzed samples (tables 1, 2 and 3), far below the current EC-MRL (maximum residue limit) of 0.2 ppm. Ruiter, (1985) reviewed that accumulation ratios (tissue level to feed level) for this fungicide are 10 to 30 in beef and poultry, and ratios of 8 to 11 were observed in adipose tissue of swine. The increase in its frequency in this study may indicate a new exposure of our environment to this compound.

From the summary of the data obtained, it was shown that, among the various chlorinated hydrocarbon pesticides, total HCH and total DDTs were the most abundant in all type of meat considered. This probably the consequence of their persistence and could also indicate a fraudulent use. It is worth nothing that the mean levels of these pesticides in different meat were well below the extraneous residue limits set up by CCPR of FAO/WHO and EC authorities.

The persistence of these pesticides and their metabolites in the environment means that much of the materials used for control of insect-borne diseases and elimination of agricultural pests still contaminates soil and water. In this respect, it should be mentioned here that Macklad et al., 1990 and Dogheim et al., 1992 detected organochlorine pesticide residues in water samples collected from the River Nile and its branches. Dogheim et al., (1996a) detected also higher levels of HCH isomers, DDTs, Dieldrin and heptachlor in ground water, followed by River Nile water and tap water. They found also that soil contained higher levels than water, especially for DDTs in appreciable amounts that could be an important source of contamination.

It is advisable to continuously monitor the degree of chlorinated hydrocarbon pesticides contamination in meat and meat products. This is due to their high levels of consumption. The presence of chlorinated hydrocarbon pesticides contamination is still real, although very moderate in extent.

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متبقيات المبيدات الكلورينية العضوية في دهن المجترات الصغيرة والجمال بأسيوط – جمهورية مصر العربية

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يعد الفحص الدورى المستمر للأغذية واحداً من الأهداف القومية الهامة التى تقوم بها الجامعة كمؤشر وقائى لحماية البيئة والمستهلكين من أخطار التلوث ، وبما أن لمتبقيات المبيدات باللحوم وما يتخللها من دهون خطورة على المستهلكين ، فقد تم تحليل ثمانين عينة دهن (٤٠ ماعز و ٢٠ أغنام و ٢٠ جمال) والتى تم جمعها بصورة عشوائية من مجازر أسيوط خلال الفترة من يناير إلي يونيه ١٩٩٥ ؛ لاستبيان مدي إحتوائها علي متبقيات المبيدات الكلورينية العضوية بواسطة جهاز كروماتوجرافيا الغاز (GC-ECD) . تم الكشف عن مشتقات مبيد الهكساكلوروسيكلو–هكسان (الفا ، بيتا ، جاما ودلتا) ومركبات الدي دي تي (بارا بارا وأورثو بارا دي دي تي ، دي دي إي و دي دي دي) والهبتاكلور والهبتاكلور إيبوكسيد والألدرين والديلدرين والإندرين وكذلك الهكساكلوروبنزين.

أوضحت نتائج التحليل إحتواء جميع العينات علي أكثر من مبيد ، حيث احتوت عينات الماعز والأغنام علي مشتق بيتا لمبيد الهكساكلوروسيكلوهكسان والدي دي تي والدي دي إي وكذلك عينات الجمال علي الدي دي إي . كما كان تواجد مبيد الهكساكلوروبنزين ومشتقي الفا وجاما لمبيد الهكساكلوروسيكلوهكسان ملحوظاً في جميع الحيوانات.

وكانت مستويات المبيدات المتواجدة بالعينات منخفضة بالمقارنة مع الدراسات التي تمت علي الجاموس والأبقار في المنطقة ذاتها أو في المحافظات الأخري . وقد كان مستوي مجموع مركبات الدي دي تي ٠,٠١١٦ ، ٠,٠١٢٢ و ٠,٠٠٢٤ جزء في المليون ، بينما كان مجموع مشتقات مبيد الهكساكلوروسيكلوهكسان ٠,٠١ ، ٠,٠٠٦ و ٠,٠٠٤ جزء في المليون في دهن الماعز والأغنام والجمال علي التوالي وتمثلت هذه المبيدات في جميع العينات بالمبيد ذاته أو أحد مشتقاته.

ويتبين من النتائج المتحصل عليها أنه لم يتعد أي من المبيدات المتواجدة بالعينات الحدود المسموحة والمقررة من الهيئات العالمية مثل لجنة الكودكس التابعة لمنظمة الصحة العالمية والأغذية والزراعة التابعة لهيئة الأمم المتحدة وكذلك الاتحاد الأوروبى بما يفسر ظاهرة ارتفاع الوعى الثقافى البيئى وقلة تعرض المجترات الصغيرة والجمال لمثل هذه المبيدات .