

Survey of hormonal levels in meat and poultry sold in Alexandria, Egypt

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استقصاء مستويات الهرمونات في اللحوم والدواجن التي تباع في الإسكندرية ، بجمهورية مصر العربية

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خلاصة : تم تحليل البقايا الشمالية لمستحضرات التسمين الابتنائية في اللحوم والدواجن التي تباع في الإسكندرية بجمهورية مصر العربية . وأظهرت الدراسة أن عينات اللحم البقري الذي يشتري من أسواق التعاونيات الحكومية تحوي مستويات من خلاصات الترينبولون ، وهو مستحضر تخليقي يستخدم للتسمين ، أعلى من المستويات الموجودة في اللحوم التي يبيعها القصابون في القطاع الخاص . غير أن مستويات الاستروجين كانت مرتفعة جداً في لحوم الدواجن التي ينتجها مربو القطاع الخاص . وأجريت مقارنة بين طرائق الطبخ المختلفة لعينات من لحوم الدواجن . ويوصي الباحثون بغلي الدواجن بعد نزع جلدها ، من أجل تخفيض ما يتناوله المستهلك من السمات الهرمونية .

ABSTRACT An analysis of residues from anabolic agents found in commercially available meat and poultry was undertaken in Alexandria, Egypt. This study shows that beef meat samples purchased from government cooperative supermarkets exhibit higher levels of the synthetic growth promoter, trenbolone acetate, than meat from private butchers; however, estrogen levels were much higher in chicken obtained from private growers. A comparison of different cooking methods was conducted on the chicken samples; boiling without skin is recommended to reduce the consumer's intake of hormonal residues.

Enquête sur les concentrations d'hormones dans la viande et les volailles vendues à Alexandrie (Egypte)

RESUME Une analyse des résidus de certains anabolisants trouvés dans la viande et les volailles commercialisées a été effectuée à Alexandrie (Egypte). Cette enquête a montré que les prélèvements de viande de boeuf achetée dans les coopératives gouvernementales contenaient des concentrations plus élevées d'acétate de trenbolone, substance de synthèse utilisée comme activateur de croissance, que la viande provenant des bouchers privés; toutefois, les concentrations d'oestrogènes étaient beaucoup plus élevées pour les poulets provenant d'éleveurs privés. Une comparaison des différentes méthodes de cuisson a été effectuée avec des échantillons de poulet; la cuisson à l'eau bouillante sans la peau est recommandée pour réduire l'absorption de résidus hormonaux pour le consommateur.

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Introduction

There are now several hormones and hormone-like agents with marked ability to improve the rate of growth and efficiency of feed intake for farm animals. The Joint (FAO/WHO) Codex Alimentarius Commission, in particular its Codex Committee for Veterinary Drug Residues in Food, has approved the use of a number of natural and synthetic growth promoters for use in food-producing animals, including the endogenous growth promoters estradiol-17 beta, progesterone and testosterone, and the synthetic growth promoters, trenbolone acetate and zeranol. In most countries the use of anabolic agents for these purposes is regulated to protect human and animal health. In addition, some countries like the United States of America feel that controlled use of certain compounds is safe; other countries strictly prohibit their application and, in particular, the use of "estrogens" [1,2]. The illegal use of these anabolic agents entails a special risk to the animals [3], and probably to the consumer.

The purposes of the present study were, first, to analyse the levels of anabolic agents in meat and poultry sold in Alexandria, Egypt; and, second, to determine the effect different types of home cooking might have on the level of hormonal residue in chicken previously fed with contraceptive pills as anabolic agent.

Materials and methods

Beef and liver samples

Beef and liver samples were purchased from government cooperative supermarkets and private butchers located in the El-Amria, El-Gomrok, West, Middle, East and Montaza districts of Alexandria, Egypt.

Chicken samples

Samples of non-free-range chicken found in government cooperative supermarkets and private shops, which slaughter their own battery chickens, were analysed during this survey. Chicken samples were collected from the same districts as above.

Processing experiment

Chicken samples of the breed Matrouh Pallet, 2 weeks of age, were used. The birds were fed broiler diet *ad libitum* and contraceptive pills in the same dose used by poultry growers in Egypt (four strips of Anovlar/100 kg diet) for 4 weeks as described in an earlier article [3]. Each strip contains 21 pills and each pill contains 21 mg norethisterone acetate + 1.05 mg of ethinyl estradiol. Three birds were subjected to each type of home cooking as follows:

- Boiling in water with skin
- Boiling in water without skin
- Oven roasting with skin
- Oven roasting without skin
- Grilling with skin
- Grilling without skin.

Sample preparation

Beef and chicken muscles were filleted and frozen prior to analysis. Also, livers of both beef and chicken samples were homogenized in a kitchen blender, then 80–100 g of the homogenate was sealed in a plastic bag prior to analysis.

Methods of analysis

Analysis was carried out by using high performance liquid chromatography (HPLC) as described before [1,4], column 250 × 4 mm stationary phase CH-18 Super Merck. The wavelength was 225 nm for 17-

estradiol and diethylstilbestrol; the wavelength was 240 nm for zeranol and 340 nm for trenbolone.

Results and discussion

The results show that beef samples from government cooperative supermarkets exhibit higher levels of trenbolone in comparison to meat from private butchers (Table 1). It is well known that free and conjugated 17 β -trenbolone have been determined in muscle, liver, kidney, fat and plasma [5,9].

Attempts have been made to determine zeranol residue in tissues of cattle [5,9]. The beef meat and liver collected from government cooperative supermarkets and private butchers were free from zeranol. The levels of diethylstilbestrol (DES) and estradiol were also very low; it should be noted that at present the use of DES in food animals for fattening purposes is prohibited

worldwide due to its mutagenic and carcinogenic activity [5]. Synthetic estrogens have also been shown to stimulate liver cell proliferation [6].

The present data clearly demonstrate that the level of estradiol is much higher in chicken from private growers in comparison to those obtained from government cooperative supermarkets (Table 2). It appears that some poultry growers in Egypt use hormones or hormone-like agents to improve the rate of growth. It is worth mentioning that feeding chickens with oral contraceptive steroids leads to the formation of high estrogen residues in muscle and liver in comparison to controls. It has been suggested that oral contraceptive steroids can act as promoters of growth [7]; however, the results of several studies have described the appearance of hepatocellular carcinoma in women using oral contraceptive steroids for prolonged periods of time [8].

Table 1 Hormonal residue ($\mu\text{g}/\text{kg}$) in beef

District	Group	Trenbolone acetate	Zeranol	Diethylstilbestrol	Estradiol
El-Amria	G1	0.875	0	0.006	0.000
	G2	0.013	0	0.006	0.000
El-Gomrok	G1	1.130	0	0.046	0.100
	G2	0.098	0	0.008	0.000
West	G1	0.710	0	0.040	0.100
	G2	0.060	0	0.006	0.000
Middle	G1	0.390	0	0.050	0.100
	G2	0.050	0	0.050	0.000
East	G1	0.900	0	0.050	0.100
	G2	0.070	0	0.006	0.000
Montaza	G1	1.210	0	0.040	0.100
	G2	0.000	0	0.040	0.100

G1 = collected from cooperative supermarkets; G2 = collected from private butchers

Table 2 Estradiol ($\mu\text{g}/\text{kg}$) levels in chicken muscle and liver

District	Specimen	Samples purchased from	
		Cooperative supermarket	Private outlet
El-Amria	Muscle	0.412	1.300
	Liver	1.462	1.821
El-Gomrok	Muscle	0.706	0.865
	Liver	1.180	4.216
West	Muscle	0.206	0.582
	Liver	0.912	1.500
Middle	Muscle	0.721	1.040
	Liver	0.312	1.170
East	Muscle	0.308	0.521
	Liver	0.602	2.461
Montaza	Muscle	0.312	0.708
	Liver	0.580	1.402

Mean = 15 samples from each region

The use of hormones was legally permitted for some time in various countries. The question which now arises is whether the type of home cooking might affect the level of hormonal residue in chicken. Table 3 shows that the best method for cooking is boiling without skin and hence removal of the skin, which contains fat, could con-

Table 3 Effect of processing on chicken muscle and liver when subjected to different methods of cooking

Processing method	Estradiol level ($\mu\text{g}/\text{kg}$)	
	in muscle	in liver
Uncooked	0.280	0.757
Boiling with skin	0.160	0.625
Boiling without skin	0.020	0.625
Roasting with skin	0.210	0.762
Roasting without skin	0.100	0.762
Grilling with skin	0.190	0.721
Grilling without skin	0.060	0.721

tribute considerably to the decrease of the level of estrogen intake by consumers. In general, the residues of estrogens found in fat exceed those found in the other tissues [9]. Data on residue levels obtained from these results clearly indicate that anabolic agents in beef and chicken entail a special risk to public health.

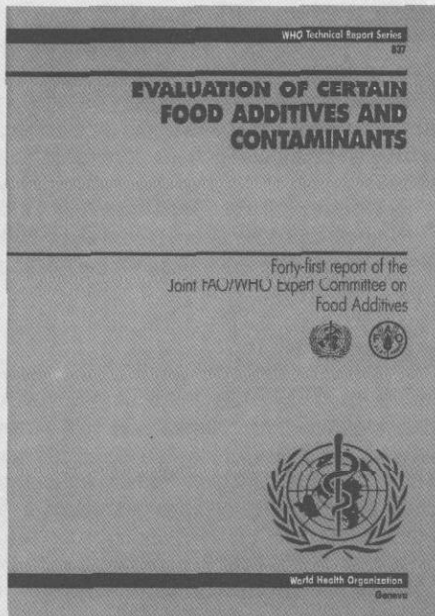
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This report presents the conclusions of a Joint FAO/WHO Expert Committee convened to evaluate the safety of various food additives and contaminants, with a view to recommending acceptable daily intakes for humans, and to prepare specifications for the identity and purity of food additives. The first part of the report contains a general discussion of principles governing the toxicological evaluation of food additives and contaminants. A summary follows of the Committee's evaluations of toxicological data on various antioxidants, flavouring agents, flavour enhancers, food colours, sweeteners, thickening agents, and other additives and contaminants.

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