ASSESSMENT OF PROLACTIN AND SOME STEROIDAL HORMONE RESIDUES IN NATIVE AND IMPORTED Poultry MEAT

Khalaf A., Al-Mazien

Dept. of Physiology & Pharmacology, College of Veterinary Medicine, University of Baghdad

Abstract

The level of prolactin and some steroidal hormone residues level were assessed in imported and native poultry meat samples commercially available in local markets of Baghdad. The results clearly showed that there were significant differences (P<0.05) in steroidal hormone residues level between imported and native meat samples and the former were significantly higher.

Progestrone, testosteroone, cortisol and estradiol residues level in the aqueous extracts of imported meat samples were 0.187 μg/kg, 0.256 μg/kg, 0.451 μg/kg and 0.218 μg/kg respectively, corresponding levels for the native samples were 0.053 μg/kg, 0.048 μg/kg, 0.255 μg/kg and 0.084 μg/kg in the same order. Moreover, residue level in chloroform: methanol poultry homogenates extracts were 0.378 μg/kg, 0.471 μg/kg, 0.309 μg/kg and 0.317 μg/kg for the imported samples and 0.147 μg/kg, 0.177 μg/kg, 0.269 μg/kg and 0.218 μg/kg for the native poultry meat samples in the same order. Reverse results were record, concerning prolactin, the residual levels of prolactin in aqueous extracts of imported and native samples were 0.389 μL/U/kg and 0.412 μL/U/kg respectively. The corresponding prolactin values in the chloroform: methanol extracts were 0.338 and 0.199 μL/U/kg in the same order. The effect of traditional home-cooking methods showed that boiling with skin or roasting were participated in reducing hormone residue levels and the former was more effective.

Accepted on 6/5/2006, Received 11/6/2007
Introduction

Hormones play an integral role at different stages of human development including growth, reproduction and sexual/social behavior[1]. However, although steroid hormones or steroid-like compounds are permitted in some countries in order to increase weight gain and improve each of growth rate and efficiency of feed intake in livestock[2-5]; their use as growth promotant is prohibited in other countries[6]. That, because hormone residues in meat and meat products can disrupt the natural endocrine equilibrium[7,8]. Furthermore, any disruption of this equilibrium can result in multiple biological effects such as reduction in normal function of immunity system. Also, consumption of hormone treated meat may lead early puberty in girls, thus making them more susceptible to breast and other cancers[9]. Synthetic estrogen can also stimulate liver cell proliferation[10-10]. This study was conducted, to evaluate the level of prolactin and some steroid hormone residues in imported and native poultry meat sold in local markets, and, to assess the effect of some traditional home cooking methods on the level of these hormonal residues in cooked poultry meat.

Materials and Methods

Poultry Meat Samples

Ten commercially imported frozen poultry meat samples (legs) were purchased from private shops in Baghdad, whereas the native samples (local breed hens) were purchased from private growers, slaughtered and frozenness at –20°C.

Sample Preparation

Aqueous Extracts

Filleted (flesh and skin) imported and native poultry meat samples of 180-240 g were homogenized in a kitchen blender. Then a 10 g sample of homogenized meat was rehomogenized using Potter-Elvehjem-style homogenizer. The resulted homogenates were centrifuged for 15 min. at 6000 rpm and 5°C. The upper aqueous layer was collected by disposable Pasteur pipettes and reduced to 1 ml volume using a rotary evaporator at 45°C.

Organic Solvent Extracts

Two chloroform: methanol (v/v) crude poultry meat homogenate extract was prepared according to Maune et al. [11]; method with some modifications. To 10 g of rehomogenized imported or native poultry meat samples, 16 ml of chloroform and 8 ml of methanol of analytical grade quality were added and mixed for 30 min. at 5°C using magnetic stirers. The upper phase was collected and reduced to 1 ml volume using rotary evaporator at 40°C.

Method of Analysis

Quantitative determination of prolactin residues in poultry meat homogenate was carried out by using high performance liquid chromatography (HPLC), column 250X 4mm stationary phase CH-18 Super Merck was used[12]. On the other hand, steroid hormone residues level was measured using Radioimmunoassay kits supplied from CIS bio international, Filate de Schering S.A., France, using automatic Gamma counter Wallace model 1470 Swedish. Data was recorded, tabulated, and statistically analyzed on the basis of one-way analysis[13].

Results and Discussion

The levels of progesterone, testosterone, cortisol, estradiol and prolactin hormone residues in aqueous and chloroform: methanol crude poultry meat homogenate extracts of native and imported samples are listed in Table 1.

Table 1. Hormone residue levels in aqueous crude chicken meat homogenate extracts

<table>
<thead>
<tr>
<th>Hormones Source</th>
<th>Pregesterone μg/kg</th>
<th>Testosterone μg/kg</th>
<th>Cortisol μg/kg</th>
<th>Estradiol μg/kg</th>
<th>Prolactin μg/kg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native</td>
<td>a</td>
<td>A</td>
<td>A</td>
<td>a</td>
<td>a</td>
</tr>
<tr>
<td></td>
<td>0.053 ±0.018</td>
<td>0.098 ±0.018</td>
<td>0.255 ±0.04</td>
<td>0.084 ±0.01</td>
<td>0.412 ±0.07</td>
</tr>
<tr>
<td>Imported</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
<td>B</td>
</tr>
<tr>
<td></td>
<td>0.187 ±0.028</td>
<td>0.296 ±0.028</td>
<td>0.193 ±0.034</td>
<td>0.317 ±0.035</td>
<td>0.389 ±0.021</td>
</tr>
</tbody>
</table>

87
Greatly individual variations in steroid and prolactin residues level were recorded. The present data clearly demonstrated that the levels of steroid hormone residues were significantly higher (p<0.05) in chicken homogenate (aqueous and organic solvents extract) from imported samples in comparison to those obtained from the native samples, and the levels of prolactin were significantly lower (p<0.05) in the former extracts. Moreover, among the steroids, progesterone residue levels were the lowest in native and imported samples, while the estradiol and cortisol levels were the highest.

There is a difficulty in estimating the acceptable threshold level of steroids in the local poultry meat because of the limited works in Iraq in this regard, and the normal hormone concentration vary with the reproductive and physiological status of the animal[11], in addition to the absence of local legislation that restricts the maximum residues limit[12]. The related study done by Sadiq et al.[16] referred that feeding chickens with oral contraceptive steroids in Egypt lead to the formation of high estrogen residues in muscles and liver with a minimum level of 0.586 and 0.77 μg/kg, respectively. So, depending on the results of the previous study any value above 0.5 μg/kg will be considered as the action level of this investigation. However, although the mean hormone residues level in native and imported samples reported in this study were lower than the considered action level, the individual imported chicken meat shows an elevated value above the effective action level (particularly in organic solvent extracts, Table 3) and this may be attributed either to the higher fat content of meat, or to the possibility of enhancing anabolic promotants since the use of hormones ( Estradiol, progesterone, testosterone) and hormone-like agents (trenbolone acetate and zelanol) have been permitted in various countries[5, 7, 16]. Therefore, from the result of this study it can be concluded that some of the imported chicken meat sold in the local market may come from suppliers have used steroidal growth promotants in their production program. Therefore clear meat inspection system and restricted legislation should be considered for the protection of the consumers.

The results of this study also demonstrated that the mean prolactin residues level in the aqueous and organic solvents of native poultry meat extract were significantly higher than that recorded in the imported samples. This observation may explain the high frequency of the broodiness in the local breeds since a causative link between broodiness in laying hens and elevated prolactin levels has been postulated[13].

The effect of some traditional home cooking methods for chicken with skin intact (Table 3) revealed that boiling in water was more effective in reducing hormone residues level as compared to oven baking. This may be attributed to that boiling water worked as a diluents medium, in addition to hormone denaturation by cooking.
### Table 3. The effect of different traditional home cooking methods on the level of hormonal residues in imported chicken meat homogenate extract

<table>
<thead>
<tr>
<th>Hormones Source</th>
<th>Uncooked poultry meat</th>
<th>Boiled poultry meat with skin</th>
<th>% Hormone residues</th>
<th>Roasted poultry meat with skin</th>
<th>% Hormone residues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Progesterone µg/kg</td>
<td>0.591</td>
<td>0.278</td>
<td>47.05</td>
<td>0.396</td>
<td>66.99</td>
</tr>
<tr>
<td>Testosterone µg/kg</td>
<td>1.252</td>
<td>0.313</td>
<td>41.01</td>
<td>0.663</td>
<td>52.99</td>
</tr>
<tr>
<td>Cortisol ng/kg</td>
<td>0.640</td>
<td>0.364</td>
<td>56.89</td>
<td>0.466</td>
<td>72.79</td>
</tr>
<tr>
<td>Estradiol µg/kg</td>
<td>0.906</td>
<td>0.389</td>
<td>42.93</td>
<td>0.603</td>
<td>66.60</td>
</tr>
<tr>
<td>Prolactin µg/l</td>
<td>0.097</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

**Acknowledgement**

The authors wish to express their deep appreciation to the General Health Laboratory, Ministry of Health for helping in steroid hormone assay.

**References**


