



QUANTITATIVE ASSESMENT OF ANTIBIOTIC AND ANABOLIC AGENTS IN BROILER CHICKEN MEAT

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Background

Antibiotics and anabolic agents are widely used for treatment of bacterial diseases or as growth promoters in intensive poultry production. Although most of the countries around the world banned a wide range of antibiotics and growth promoters, many of those are still being indiscriminately used (Weirup, 2001). Administration of antibiotics or anabolic agents to broiler may lead to deposition of residual material in meat and consequently presents a potential human health hazard. Over-use of antibiotics in poultry feeding and /or treatments and its contribution to the generation of antibiotic-resistant strains of bacteria has become a worldwide problem in the treatment of human infectious diseases (Millar et al., 1998; Neely and Holder, 1999).

Objectives

The objectives of this study were to detect and quantify residue levels of some widely used antibiotics (streptomycin and tetracycline) and anabolic agents (oestradiol and testosterone) in broiler chicken meat.

Materials and methods

Thirty-four fresh and frozen broiler chicken carcasses representing 16 local and imported products collected between April and May 2003 were used. Four samples (10 to 20 grams) from the breast muscles including meat and skin were homogenized then stored in sealed plastic bags at -80°C . The samples were randomly allocated to one of four residual assays; streptomycin, tetracycline, oestradiol and testosterone. The Enzyme Linked Immunosorbent Assay (ELISA) technique was used to detect residues in the samples. For each assay, a specific kit was used to provide quantitative negative or positive detecting results after extracting and preparing samples according to the type of the residue. The sample was mixed thoroughly and then kept in a sealed plastic bag at -80°C . Frozen samples were left at room temperature (20°C) for two hours before starting extraction. Five to ten grams from each sample were mixed with 10-25 ml of special buffer (organic solvent), which has been prepared specifically for each analysis, for 30 minutes using a shaker, and then it was homogenized. The homogenized sample was transferred to screw cap glass test tube and centrifuged at 3000 to 4000 rpm for 10 minutes at 15°C . The supernatant was decanted into another flask, then the buffer was dried using rotary evaporator. The residue was redissolved in the solvent. Finally, 5 ml of the filtrate were purified with RIDA C18 column and stored at -20°C . The concentration of the hormone or antibiotic in ppb/ppt corresponding to the absorbance of each sample was read from the calibration curve.

Results and discussion

The results of oestradiol-17- β , testosterone, streptomycin, and tetracycline concentration levels in broiler chicken meat samples are presented in Table 1. Fifteen out of 16 samples (94%) contained oestradiol-17 β but of these only four samples (24%) contained residues that exceeded tolerance levels of 100 nanogram/kg specified by the National Residue Control Plan. Salem, et al. (2003) found that feeding 100 $\mu\text{g}/\text{bird}/\text{day}$ of ethynyl oestradiol to chickens resulted in the highest residue levels of 81.9 $\mu\text{g}/\text{kg}$ in the skin rather than in the muscle (22.9 $\mu\text{g}/\text{kg}$). They concluded that the use of oestradiol resulted in its accumulation in different tissues and organs, even if the treatment was stopped for 4 weeks and even when the chicks meat was boiled for one and a half hours. In the present study, seven samples contained 52.4 micrograms/kg of oestradiol-17- β , which were above the average level in muscle and skin chicken sample reported by Salem (2003). Although, most of oestrogenic compounds have been now banned in most countries because of their apparent carcinogenic (cancer-causing) activity (McCutcheon, 1989), this study revealed that residues of oestradiol-17- β were present in broiler meat. The naturally occurring androgen testosterone, and its synthetic analogues such as trenbolon acetates (Finaplix®), are effective growth-promoting agents in



domestic animals. Fifteen (94%) out of 16 samples contained testosterone residues, but all were less than the tolerance level of 100 nanogram/kg. These values were less than the limit specified for meat samples by the German Residue Control Plan (100 nanogram/kg).

All meat samples (100%) tested in the present study showed residues of streptomycin (75-155 ppb), but these were below tolerance levels of 500 microgram/kg as specified by the maximum residue limit-European Union regulation. Tetracyclines are also extensively used throughout the world for treatment of bacterial infections in poultry. They act by modifying metabolism of bacteria in the intestine and consequently suppress sub-clinical disease and improving digestive efficiency. All the samples tested in the present study contained showed various levels of tetracycline concentrations. All samples contained tetracycline that ranged between 46.2- 47.2 micrograms/kg, which was lower than the maximum residue limit specified for meat samples by European union (100 micrograms/kg). This indicates that tetracycline was used at least once during chicken lifetime as treatment against bacterial infections or as growth promoters.

Conclusions

This study indicated that broiler chicken meat products contained various amounts of residues of antibiotic and anabolic agents. Although, levels of some of these did not exceed the maximum residue limit in most cases, they still pose human health hazard. Residues of antibiotics may cause development of resistant pathogenic strains.

References

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Table 1. Levels of accumulated testosterone (ppt)¹, oestradiol (ppt), streptomycin (ppb)² and tetracycline (ppb) residues in broiler chicken meat.

Sample #	Testosterone	Oestradiol-17β	Streptomycin	Tetracycline
1	29.5	5	125	46.8
2	30	28	135	47.2
3	24	45	135	46.8
4	5	95	115	47.2
5	70	95	105	46.4
6	40	90	105	46.4
7	0	6	125	46.8
8	27	100*	150	47.2
9	5	45	135	46.8
1	25	28	75	47.2
11	30	200*	145	46.4
12	38	44	125	46.4
13	15	100*	105	46.4
14	12	0	85	46.4
15	24	200*	155	47.2
16	40	28	155	47.2

* Above the detection limit

¹ ppt: nonaogram/kg

² ppb: microgram/kg.