

Detection of antibiotic residues in stored poultry products

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Abstract

A total of 75 samples stored poultry products; liver, breast and thigh muscle samples, were tested for the presence of four antibiotics residue; oxytetracycline, sulfadiazine, neomycin, and gentamycin using thin layer chromatography. The results revealed 39 (52%) positive samples. From 25 samples of each of liver, breast and thigh muscle samples tested, 7 (28%) of liver and breast muscle were positive for sulfadiazine and oxytetracycline while 7 (28%) of thigh muscle were positive for oxytetracycline and 4 (16%) samples were positive for sulfadiazine. No neomycin or gentamycin residues were detected on TLC plates in all samples tested. Oxytetracycline was the most predominant antibiotic detected (28%), among the four studied antibiotics and followed by Sulfadiazine (24%). Liver and breast muscle had the highest percentage of antibiotic detected (56%), followed by for thigh muscle (44%).

Keywords: Antibiotics, Residues, Poultry.

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الكشف عن بقايا المضادات الحيوية في منتجات الدواجن المخزونة

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الخلاصة

أخذت 75 عينة من منتجات الدواجن المخزونه، والتي شملت كل من عينات الكبد وعضلات الصدر والفخذ للدجاج، حيث تم اختيارها لمعرفة امكانية احتوائها على بقايا أربعة مضادات حيوية وهي gentamycin باستخدام مشراب الطبقة الرقيقة. كشفت النتائج عن وجود 39 عينة موجبة (52%). من 25 عينة للكبد ولعضلة الصدر والفخذ، كانت 7 عينات للكبد وعضلات الصدر ايجابية (28%) لكل من sulfadiazine و oxytetracycline بينما كان هناك 7 عينات ايجابية (28%) لـ oxytetracycline و 4 عينات موجبة لـ sulfadiazine (16%). لم يسجل بقايا لكل من neomycin أو بقايا gentamycin على لوحات طبقة المشراب الرقيقة. في كل العينات التي اختبرت Oxytetracycline كان المضاد الحيوي السائد (28%) بين الأربعة المدروسة يليها sulfadiazine (24%). عضلة الصدر والكبد سجلا النسبة المئوية الأعلى للمضاد الحيوي (56%)، تلتها نسبة (44%) لعضلة الفخذ.

Introduction

Antibiotic are substances that kill or inhibit the growth of bacteria (1). Antibiotics can be applied in veterinary sector in three ways; at sub therapeutic concentrations; in a rotating classes of multiple antibiotics at low, sub therapeutic concentrations; in a gradient sub therapeutic regimen (2). In poultry, antibiotic usage had facilitated their

efficient production, and also enhanced the health and well-being of poultry by reducing the incidence of disease, but unfortunately, edible poultry tissues may be contaminated with harmful concentrations of drug residues (3). Antibiotic residues in foods of animal origin are one of the sources of concern among the public and medical health professionals (4). Many of the antibiotics used to treat bacterial infections in humans also have veterinary applications; they are used

to treat infections in sick and injured animals and as prophylactics and growth promoters. In the latter two cases, the antibiotics are used at concentrations lower than those used for treatment; a potentially dangerous practice since it can encourage the production of antibiotic resistant strains of bacteria (6,7), potential allergic reactions and technological problems of fermented meat products (8). Some antibiotics are directly toxic, e.g. chloramphenicol which cause fatal a plastic anemia, while allergic reactions and toxic side effects may have fatal consequences (9). The availability of simply and reliable screening systems for the detection of antibiotics is an essential tool in assuring the safety of food products. In this study a simple and fast method was surveyed for detection of antibiotics residue in chicken meat tissues. Thin layer chromatography is a sensitive and exact- reliable method for monitoring low amounts of different biological and chemicals. Illumination of antibiotics against UV light helps as a simple detector for this mean (10).

Materials and methods

Sampling

Seventy five samples of stored poultry products (25 livers, 25 thigh muscle, 25 breast muscle samples were selected from different markets in Ninevah city, Mosul, Iraq.

Antibiotics extraction

10 grams of each sample of stored poultry products were mixed with 10 ml ethanol (96o) (GCC Laboratory reagents), crashed and squeezed fine in a Chinese mortar. The solution transferred to 15 ml falcon centrifuge tubes and centrifuged at 7000 rpm for 10 minutes. The clear supernatant transferred to fresh glass test tubes and evaporated in contact with nitrogen stream. After full drying the deposits dissolved in 0.2 ml methanol (GCC Laboratory reagents). The samples were ready to point on silica plates (10).

Silica plates

TLC Silica plates with 0.25 mm. thickness (Merck, Germany), were activated in 120°C for two hours before use (11).

Standard preparation

For comparison of extracted residues with routinely used four raw antibiotics (oxytetracyclin, Sulfadiazine, Neomycin, and Gentamycin) were prepared by dissolving of 0.1 gm of each powder in 4 ml methanol (12).

Pointing, running and detection

About 50 µl of methanol dissolved deposits were

pointed on silica plates. Treated plates transferred to TLC tank containing acetone-methanol (1:1) as mobile phase. After reaching of solution front to end of plates, chromatograms observed on UV light at 256 nm (12).

Results

The number of tests performed for four antibiotics and for each type of stored poultry product, liver, breast and thigh muscle samples are shown in Figure 1 and 2. A total of 75 samples of stored poultry products were tested, 39 (52%) results samples were positive. The details of the positive results, number, percentage of positives for antibiotic type and sample type were given in Table 1. From 25 breast muscle samples tested, 7 (28%) were positive for sulfadiazine and oxytetracycline. From 25 thigh muscle samples tested, 7 (28%) samples were positive for oxytetracycline, and 4 (16%) samples were positive for sulfadiazine. From 25 liver samples tested, 7 (28%) were positives for oxytetracycline and for sulfadiazine. No neomycin or gentamycin residues were detected on TLC plates in all samples tested. Oxytetracycline was the mot predominant antibiotic detected (28%), among four studied antibiotics. It was followed by sulfadiazine (47%), Figure (3). Liver and breast muscle had the highest percentage (56%) of antibiotic detection, followed by (44%) for thigh muscle, Figure (4).

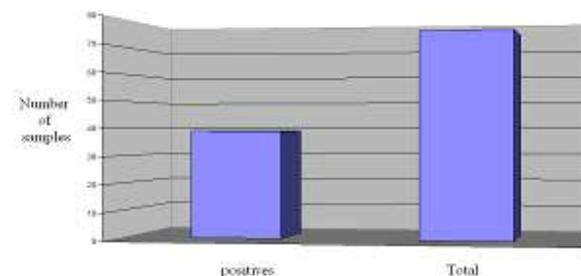


Figure 1: Total and positives samples of stored poultry products.

Table 1: Number (%) of positive samples for four antibiotics.

Antibiotic	Poultry products			Total samples (N=75)
	Breast muscles (N=25)	Thigh muscles (N=25)	Liver (N=25)	
Gentamycin	0	0	0	0
Neomycin	0	0	0	0
Sulfadiazine	7 (28)	4 (16)	7 (28)	18 (24)
Oxytetracycline	7 (28)	4 (16%)	7 (28)	18 (24)
Total	14 (56)	11 (44)	14 (56)	39 (52)

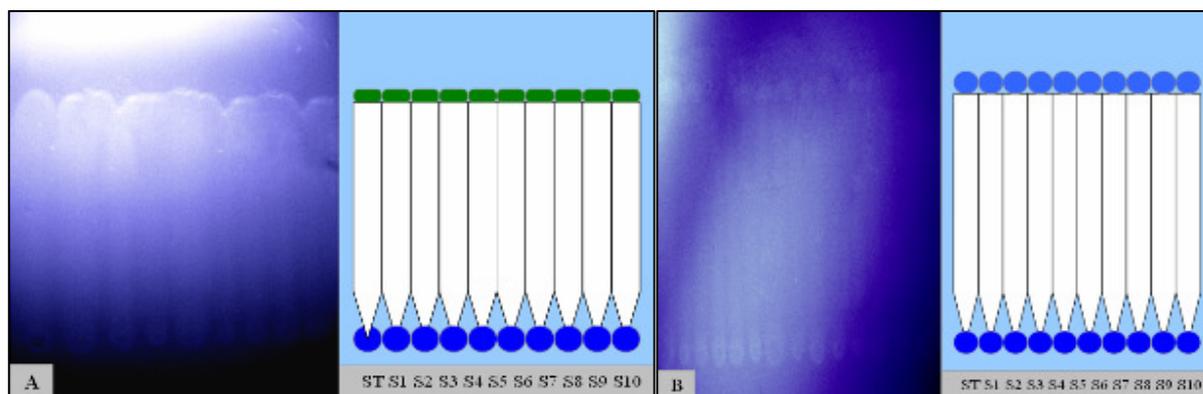


Figure 2: Positive samples for tetracycline (A) and Sulfadiazine, (B) on thin layer chromatography plates, ST= Standard S1, S2, S3.....= Samples.

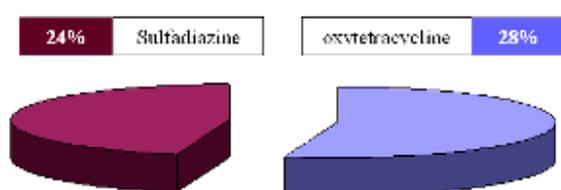


Figure 3: Percentages of antibiotic residues detected in stored poultry products.

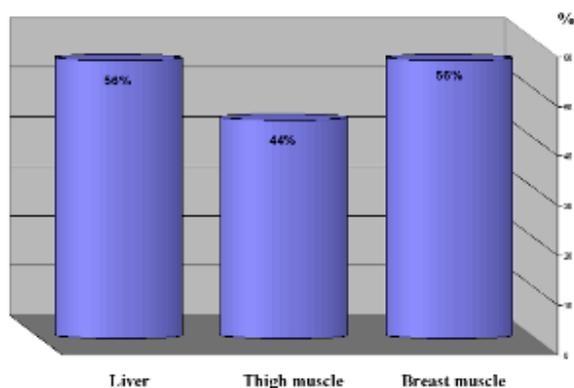


Figure 4: Percentage of antibiotic detection in different samples of stored poultry products.

Discussion

It is known that drugs residue on animal products specially meat is an important problem in most countries (13-15). Analytical thin layer chromatography which employed in our study was not tasked for measuring concentration of antibiotic residues, but for detection their presence in stored chicken products. This technique is simple, exact and non expensive which can execute easily

in most laboratories, but with less accuracy than HPLC (16). However, our results showed that more than half of the tested samples were positive (52%). This result may be interpretative with difficulty, since we have no information about the exact time of slaughtering and processing these products, nor the length of time elapsed in which these samples were stored in freezing condition, which may affect their presence in stored products. In any case, these findings were similar to those obtained by (10) in Iran, who found that more than 50% of poultry meat samples had noticeable antibiotic residue. Higher percentage (69%), was however reported (17), through examining 33 broiler farms, with 87% and 100% positivists for Oxytetracycline in muscle and liver respectively. More higher percentage (96%) was recorded in Canada during 1991-1992 through examination 961 poultry samples (18) oxytetracycline was the predominant antibiotic residue detected in our study, followed by Salfadiazine, while neomycin and gentamycin were not detected. Anyhow, Sulfadiazine and oxytertracycline were the antibiotics recovered (19), through examining 7600 meat samples including poultry. Again sulfonamide was also recorded to be fully in compliance in Canada during 1991-1992, by examining 216 poultry meat samples (18). The high percentage of sulfonamides detected may be largely due to their using in poultry sector for reducing mortalities due to fowl typhoid, fowl cholera and coccidiosis (20). The detection of Sulfadiazine and oxytetracyclines in our study may be due to their absorption and their distribution, since they are systemic antibiotics and absorbed from the intestines in substantial amount, while neomycin and gentamycin were not detected due to their poor absorption from gastrointestinal tract or are absorbed in trace amounts. The presence of sulfonamide in higher concentration may impose health threat due to the toxicity of the sulfonamides in thyroid gland stimulation and phenotypically variable

detoxification rates in the liver, which require restrictions in food-animal use and continuation of residue monitoring. Sulfonamides have been used widely at sub therapeutic and therapeutic concentrations in food-animal production, but increasing concern over their carcinogenic and mutagenic potential and their thyroid toxicity has led to decreased use, longer withdrawal times, and tighter residue monitoring (21).

The inappropriate use and accountability of antibiotics in human and veterinary medicine and in agriculture are; a shortened lifespan of an antibiotic's usefulness; additional complications in surveillance; the ability to predict resistance patterns, and the consequences for human health.

From above it is important to say that antibiotic residues can be prevented from entering the food chain at the producer level if farmers and processors are educated about the potential hazards associated with antibiotic residues in foods of animal origin. Producers and processors should also be made aware of the financial losses they may incur as a direct result of having product dumped, or not being able to trade as a result of contamination, which has happened to farmers.

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