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Detection of the Antibiotic Residues in Broiler Chickens by Microbiological Screening Test in Algeria

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Abstract: Nowadays, in Algeria, the use of antibiotics is common in poultry farming. Failure to comply with the waiting period, the use of these molecules as a preventive growth promoter and improper use without precise diagnosis lead to the presence of antibiotic residues in broiler chickens (boilers). In order to preserve food safety, a study was conducted the presence of antibiotic residues in boiler chickens at the department of veterinary medicine at Souk Ahras university (Algeria). A total of 50 samples were analyzed by a qualitative microbiological method (agar diffusion method) allowing the detection of residues of antimicrobial substances. On the basis of this analysis, 34% of the samples were positive for antibiotics, with a higher contamination rate in liver (70.58%) than in wishbone (29.41%). All the detected residues were present in hepatocytes. There were positive liver samples to two types of antibiotic residues (tetracycline and erythromycin). In 34% of the positive samples, colistin was dominate in the wishbones (19%) and in livers (25%), followed by the tetracycline with a light abundance in the wishbone (12.50%) comparing with the livers (25%); The Erythromycin presents only in the samples of liver with a percentage of 25%.The study is a wake-up call, especially in light of the adverse impact of antibiotic residues for human consumer health, including the selection of antibiotic-resistant on the one hand and allergic risks and carcinogenic substances on the other hand. This is why measures must be taken at various levels by the sector (public authorities, veterinary doctors, technicians and breeders) to guarantee the safety of foodstuffs of avian origin.

Key words: Antibiotic Residues · Boiler Chickens · Microbiological Test

INTRODUCTION

Meat is a very good source of animal protein that consists of essential amino acids, minerals, vitamins and essential fatty acids [1, 2].

The white meat production knew a major progression in Algeria during the last years what returns the price of this reasonable and very gravitational product for the consumer [3, 4].

Among these products, the antibiotics occupy a place of choice. Since fifties, the antibiotics continue to be used to prevent and treat infectious diseases being able to involve a significant morbidity and mortality .The use of antibiotics (like any veterinary medicinal product) aims to maintain the animals in good health and to contribute to their well- being, these drugs make it possible to control the medical level and to ensure quality and the productivity in the bleedings [5].

The diagnosis of diseases in the east of Algeria is based simply on the success or the failure of the therapeutic methods (therapeutic diagnosis) as a result the use of these antibiotics, must be carried out in a rational way ; However, their use without control, can lead to the formation of the residues in the products resulting from these animals, especially when the withdrawal periods are not respected by the users [6-9].

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The potential risks related to the presence of the residues in broiler chicken are several orders: carcinogenic risks (Nitrofuranes), allergic risks (Penicillins, Streptomycin), toxic risks (Chloramphenicol), modification of the intestinal flora (Tetracyclines). Adding to that, the bad practices based on the use of antibiotics can select stocks of multi-resistant pathogenic bacteria, which can be transmitted to human by the food [10]. On the other hand, there is an indirect risk for the meat consumers as a zoonotic disease.

In April 2010, the European Authority of safety of food (EFSA) devoted a file on these diseases which easily transmit animal to the human and their bond with the use of antibiotics.

The use in mass or inappropriate of antibiotics is indeed a major cause of the emergence of resistances of certain bacteria to certain antibiotic classes. The resistant bacteria, which develop in the animals, can be transmitted to the man mainly by the means of the meat. Bacteria such as *Escherichia coli*, *Salmonell*a, *Campylobacter*, *Enterococcus* and *Staphylococcus aureus*, can causes gastrointestinal infectious diseases which can be difficult to look after.

In Algeria curative and preventive using of antibiotics in the breeding is not regulated it consists of maximum limits of residues (LMR), which poses a potential risk for the consumers. Few scientific studies and data on this subject are available in Algeria. This is why we undertook the present study in order to detect the antibiotic residues in broiler chickens by microbiological screening test in veterinary department of Souk Ahras University.

MATERIALS AND METHODS

Study Area and Sampling Conditions: The study was conducted at the institute of veterinary medicine, university of Souk Ahras (Algeria). A total of 50 broiler chickens (Ross 308) at 60 days of age were selected according to their average body weight (2700 g) from broiler chicken flock. Chickens were divided in 2 groups. Wishbones were collected from the first group (25 broilers). Livers were collected carefully from the second group (25 broilers).

Analysis Methods: The present method had for aim the detection of antibiotics residues, using sensitive micro-organisms. It consists in making diffuse an antibiotic in agar medium containing a bacterial stock sensitive to this antibiotic. For this reason, one deposits identical volumes representing several dilutions of the solution containing antibiotic on blotting paper discs. These discs are put in contact of agar surface containing 10^6 to 10^7 cells indicating stocks or spores. During incubation (37°C /24h), the antibiotic diffuses in the gel by radiate way starting from its point of application. After 15 to 48 hours at the optimal temperature of growth of the micro-organism, one measures the diameters of inhibition which appear as a clear zone [11]

Data Analysis: *Descriptive statistics* are *used* to describe the basic features of the data in a study.

RESULTS

Sensitivity of Reference Strain to the Studied Antibiotics: The diameters corresponding to the zones of inhibitions obtained for the strain of reference tested are reported in Table 1.

From the tabulated data, it could be noticed that the reference strain: *Staphylococcus aureus* is sensitive to the tetracycline and the Erythromycin, *Pseudomonas aeruginosa* is sensitive to the colistin and: *Escherichia coli and Klebsiella pneumoniae* were sensitive to the colistin and to the tetracycline.

Detection of the Antibiotic Residues in Broiler Chickens by Agar Diffusion Method: After analysis of the samples, got from chicken meat and offal, by agar diffusion method, the results obtained show the presence of inhibitions zones of which testify the presence of antibiotics residues.

The study showed that on the 50 samples of analyzed chickens, 17 were tainted by antibiotic residues. The global contamination rate was 34% (Figure 1).

There were a positives samples corresponding to the liver in two types of residues at the same time (the tetracycline and the erythromycin).

Comparison Between the Antibiotics Presents in Wishbone and in Liver of Broiler: The results show that on the 17 positive samples: 5 wishbone (29.41%) and 12 livers (70.58%) contained antibiotic residues. The rate of contamination was higher in liver than in the wishbone.

Colistin was dominate in the wishbones (17.64%) and in livers (23.52%), followed by the tetracycline with a light abundance in the wishbone (1.76%) comparing with the livers (23.52%); The Erythromycin presents only in the

Table 1: Diameters of the inhibitions zone (mm) for tested antibiotics with the reference and standard strains

	Antibiotics tested					
	Colistin		Tetracycline		Erythromycin	
Reference strain	Diameter obtained (mm)	Norms (mm)	Diameter obtained (mm)	Norms (mm)	Diameter obtained (mm)	Norms (mm)
Staphylococcus Aureus	-	-	20.76	24-30	23.38	22-30
Pseudomonas Aeruginosa	24 .32	20-22	-	-	-	-
Escherichia coli	16.54	20-40	24.16	18-25	-	-
Klebsiella pneumonia	16.68	15-24	19.43	14-22	-	-

Table 2: Comparison between the antibiotics presents in the wishbone and in liver

	Antibiotics			
Samples	Colistin	Tetracycline	Erythromycin	Total
Wishbone (n=25)	3 (19%)	2 (12.50%)	0 (0%)	5 (31.5%)
Liver (n=25)	4 (25%)	4 (25%)	4 (25%)	12 (75%)

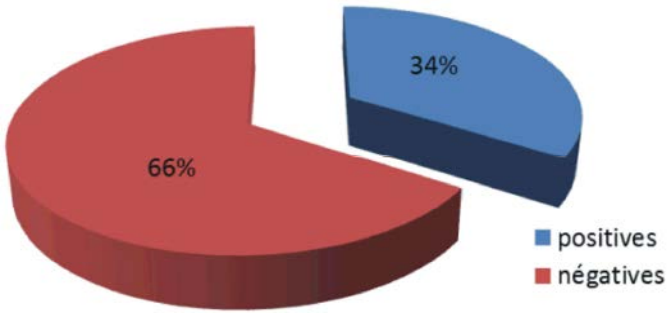

Fig. 1: Detection of the antibiotic residues in broiler chickens

samples of liver with a percentage of 23.52%; we also notice that the three antibiotics (colistin, tetracycline and the Erythromycin) were presented in the liver with the same percentage 23.52% (Table 2).

DISCUSSION

Our study showed that the detection of the antibiotic residues in broiler chickens in Souk Ahras are a revealed a prevalence of 34% (17 samples present antibiotic residues). This may be explained by the abusive use of antimicrobial, false diagnosis, anarchic drug use or related to a treatment of the animals followed by an insufficient withdrawal period [8, 9, 12-14].

It should be also noted that the self-medication of the animals by the stockbreeders played a primordial role. This is consolidated by Dosso, [15] who find that self-medication was practiced in 79% of farms in Ivory Coast. Moreover addition of antibiotics as food additive (growth promoter) remained strongly suspected in spite of the prohibition of this practice [13].

In the present study, the rate of negativity was 66 %, probably does not mean the absence of residues in the analyzed samples, because the latter can contain antibiotic molecules to a lower concentration than the CMI. This situation could be explained by the use of antibiotics with low dose and for prolonged periods [16].

The comparisons of the percentages obtained in broiler wishbone and the liver; showed that our results (75%) in liver and (31.50%) in wishbone are close with Shareef *et al.*[17] in Iraq which underline a percentage of 56 % in the wishbone and 56% in liver antibiotic residues. This difference also could be related to the kinetics of the drugs through the vessels. These kinetics lead to congestion and edema similar to the results reported by Khenenou *et al.* [2]

According to Kantati *et al* .[18], the lack of sensitivity and specificity; as not to determine the exact nature of the molecule present, or the contents and must thus often be followed tests of confirmations.

Concerning the distribution of the families of antibiotics, the percentage of tetracycline obtained in our experience was 35.28%. These results were close with thus mentioned by Albayoumi and Elmanama [19] in Gaza, who reported a rate of 43.15% of tetracycline residues. However, the study carried out in Congo by

Okombe *et al.* [20] underlined a percentage of 100% of tetracycline. Another study performed in Senegal by Abiola *et al.* [21] found 14% of the residues of tetracycline; in Saudi Arabia, Al-Ghamdi *et al.* [22] revealed a significant rate of Tetracycline with 65%.

Polypeptide (colistin) residues recorded in our study with a percentage of 41.16%, were lower than that found in Congo by Okombe *et al.*[20] (71.42 % of colistin).

A percentage of 25% of the Erythromycin residues recorded in this study is higher than those obtained by Ben Mohand [23] in Algeria who found 6.66% of β-lactamin (penicillin G) and macrolides (Erythromycin).

According to Messaï [6] the most significant rate of positivity is that obtained by the polypeptide (colistin) with a rate of 43.75%; antibiotic which used in the treatment of the digestive affections with short withdrawal period (7 days).

Our results showed a percentage of 34% of positive samples, this result was in agreement with those reported by Ben Mohand [23] and Chaiba *et al.* [24]. However Mansouri [25] found that on 120 analyzed samples 65.7 % contained the antibiotic residues. Mohamed said [13] and Hakem *et al.* [26] revealed respectively a percentage of 60 % and 86.2 % of positive samples.

According to Mohamed said [13] the negative rate could be explained by the management of breeding by the official sector seems to be correct and respectful of the regulation and the use in a careful and rational way of the antibiotics.

CONCLUSION

The presence of the antibiotic residues in broiler chickens in Algeria area (Souk Ahras), is a reality that our study has revealed. The overall antibiotics residues rate was 34% with a higher rate in liver (75%) than in the wishbone (31.50%). The antibiotics residues obtained in this study can be explained by the excessive use of antibiotics by the stockbreeders as well as noncompliance of the withdrawal period between the administration of antibiotic in animal and its slaughter.

The polypeptide (colistin) and tetracyclines residues with a percentage of (41.16%) and (35.28%) respectively were most dominant in the region of the study. The results obtained are enough alarming, especially when we know the impact of these residues, in particular the appearance of antibioresistance, on the public health.

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