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Qualitative detection of antibiotic residues in the poultry livers consumed in the Eastern Algeria

LABIED Ibtissem^{1*}, BERGHICHE Amine², KHENENOU Tarek³, BATAH Rima⁴, MELOUAH Khalil⁵

¹Laboratory of Life Sciences and Techniques, The agro veterinary institute -Taoura-, Mohamed Cherrif Messaadia University, Souk Ahras, Algeria.

²Laboratory of Life Sciences and Techniques, The agro veterinary institute -Taoura-, Mohamed Cherrif Messaadia University, Souk Ahras, Algeria.

³Laboratory of Life Sciences and Techniques, The agro veterinary institute -Taoura-, Mohamed Cherrif Messaadia University, Souk Ahras, Algeria.

⁴Department of Biology, Faculty of Natural and Life Sciences, Mohamed Cherif Messadia University, Souk Ahras, Algeria

⁵Terrestrial and Aquatic Ecosystems Laboratory, Department of Biology, Faculty of Nature and Life Sciences, Mohamed Cherif Messadia University, Souk Ahras, Algeria

*Corresponding author's Email: i.labied@univ-soukahrass.dz

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Abstract:

Antibiotics used in breeding are susceptible of being found in meat and poultry products thus causing a risk to public health. The aim of this study is to investigate antimicrobial residues in poultry livers. A total of 82 samples (including 50 chicken livers and 32 turkey livers) were collected randomly from different butchers in Souk Ahras province and analyzed by the microbiological method of agar diffusion using three susceptible bacterial strains namely: *Staphylococcus aureus* ATCC 23, *Pseudomonas aeruginosa* ATCC 53 and *Escherichia coli* ATCC 22.

The study revealed that out of 82 samples of livers analyzed, 54 livers were contaminated with antibiotic residues, with an average contamination rate of 65.85%. For broiler chicken, the results showed that 90% containing Quinolones (enrofloxacin), 58% of Tetracyclines, 88% of Macrolides (erythromycin) and 33% of Polypeptide antibiotics (colistin). For turkey livers, the results showed that 28.13% contained Macrolides (erythromycin), 25% Quinolones (enrofloxacin), 12.5% Polypeptide antibiotic (colistin) and 6.25% Tetracycline. The results show that the contamination rate is higher for chicken livers than for turkey ones.

Key words : *Antibiotic residues, Liver, chicken, turkey, microbiological method, Souk Ahras*

I. Introduction

Livestock products, particularly poultry (meat, offal and eggs), had a very modest place in the structure of the Algerian's food intake [1]

Indeed, poultry offal and especially broiler liver is the most requested source of protein in our country because of its affordability and its nutritional value.

The liver is a red offal. It is part of the noble giblets but there are great differences in its quality and size depending on the origin of the animal. It comes from beef animals: cattle, sheep, and goats, but also from poultry: chicken, turkey. The most ordinary is that of the chicken, which is the largest gland of all the viscera; about 33 g in broilers [2-3].

In poultry farming, farmers use several varieties of veterinary drugs and in particular antibiotics. They are used either as growth promoters to increase production yields or therapeutically to treat and prevent against infectious diseases [4].

In fact, the abusive and uncontrolled use of these products could increase the appearance of antibiotic residues in tissues and the food chain, the rapid and worrying emergence of resistant bacterial strains and hypersensitivity reactions in the consumer, as well as a disruption of the normal intestinal flora, especially in the case of non-respect of the withdrawal delay and the absence of legislation regarding maximum authorized residue limits [5-6].

The presence of antibiotic residues in human foodstuffs from animal origin can have serious consequences on public health [7-8], harmful impacts on the environment and contribute to therapeutic failure as a result of the presence of antibiotic resistant pathogens in the food chain. These alerts have prompted warnings to the authorities and alarmed consumers [9].

The importance of this sanitary problem and the lack of scientific literature on experimental works dealing with antimicrobial residues in poultry livers and more specifically in turkey livers, show the urgency of doing this research, which main objective is the detection of antibiotic residues: oxytetracycline, colistin, enrofloxacin and erythromycin, in samples of poultry livers (broiler and turkey) collected from different butchereries at the level of Souk Ahras region.

1. Materials and methods

Biological material

A total of 82 samples of livers (50 broiler and 32 Turkey) were collected by random sampling from different butchereries in Souk Ahras region in order to detect antibiotic residues.

Sensitive bacterial strains

Three reference strains were used:

- *Staphylococcus aureus* ATCC23
- *Pseudomonas auruginosa* ATCC53
- *Escherichia coli* ATCC22.

3. Methods

The main objective of this method is the detection of antibiotic residues using sensitive microorganisms. "It consists in diffusing an antibiotic in an agar gel medium containing a bacterial strain sensitive to thi antibiotic. To do this, identical volumes representing several dilutions of the solution containing the antibiotic are placed on filter paper discs. These discs are placed in contact with an agar surface containing 10^6 to 10^7 indicator cells or spores.

During incubation, the antibiotic diffuses into the agar in a radial fashion from its point of application. After 15 to 48 hours at the optimal growth temperature of the microorganism, the inhibition diameters are measured and appear as clear zones "[10]

The residues researched correspond to the antibiotics; the most frequently used inpoultry farms, which are: quinolones(enrofloxacin), polypeptide antibiotic(colistin), erythromycin (macrolides) and tetracyclines.

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

4. Resultats

The study shows that from the 82 samples analyzed, 54 are contaminated by antibiotic residues with an overall contamination rate of 65.85% (Fig 1).

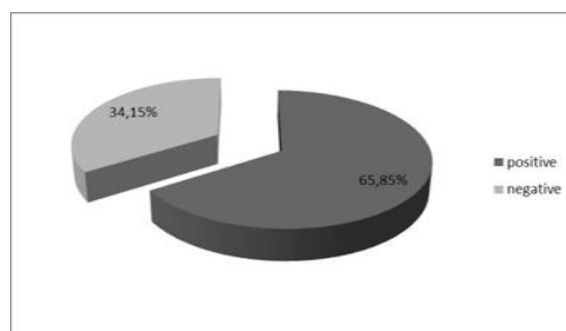


Figure 1: Contamination rate of liver samples by antibiotic residue

Among the 50 samples of chicken liver analyzed, 45 were contaminated, representing a rate of 90%. This contamination rate is higher than the one recorded in turkey liver which is 28.13% (Fig 2).

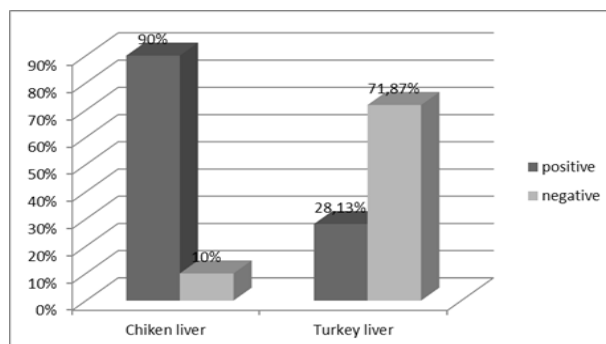


Figure 2: Contamination rate of chicken and turkey liver with antibiotic residues

The level of liver contamination in broilers varies from one antibiotic family to another. enrofloxacin represents the antibiotic family with the highest rate with 90%, followed by erythromycin and colistin with 88% and 66% respectively. Tetracycline represents the antibiotic family with the lowest rate with 58% (Fig 3).

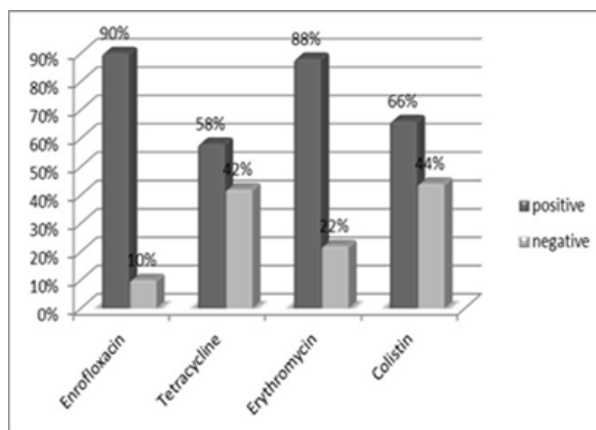


Figure 3: Comparison between the families of antibiotics present in broiler liver

Regarding turkey liver, tetracycline represents the antibiotic family with the highest rate with 94%, followed by erythromycin and enrofloxacin with 28% and 25% respectively. colistin represents the antibiotic family with the lowest rate with 13% (Fig 4).

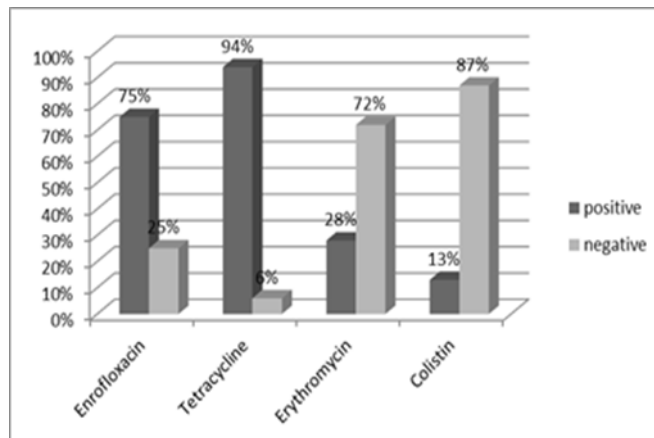


Figure 4: Comparison between the families of antibiotics present in the turkey liver

5. Discussion

The present study revealed the presence of antibiotic residues including enrofloxacin, tetracycline, erythromycin and colistin in the sampled products of avian origin (chicken and turkey liver) in Souk Ahras. The global contamination rate is 65.85% (Fig 1).

Furthermore, we found that broiler liver samples (90%) were much more contaminated than turkey (28.13%) (Fig 2). This could be explained by the abusive and uncontrolled use of antimicrobials in broiler farms probably related to the treatment of animals followed by an inadequate withdrawal delay [11-12].

Similar studies in other countries with the same or much more advanced methods show a

heterogeneity of results [13] works on chicken livers and gizzards in the regions of Dakar and Thiès (Senegal) revealed a contamination rate of 54%.

Another study conducted by [14] in Iraq highlighted a percentage of 56% of liver containing antibiotic residues.

Our results are very similar to those of [15] in Saudi Arabia who reported a percentage of 100% of liver containing antibiotic residues.

At the opposite, a low contamination of chicken liver samples was observed by several authors like [16] in Bulgaria, [17], [18] in Khertoum (Saudan) and [19] in Trinitade reported a contamination of 8.85%, 20%, 28.3% and 17.8% respectively.

A much lower rate of contamination (11.76%) was found in livers marketed in Lubumbashi [20]. In another study the results obtained for chicken liver samples were lower (8%) [21] compared to those we obtained.

However, our results stand out compared to those reported in the study conducted in Kinya, [22] reported that 34% of the samples contained residues of the substances with antimicrobial activity.

A similar study was also conducted in the same region of our study [23], who had found in broiler livers a rate of 70.58% of antibiotic residues, which is close to the proportion found in our study (90%).

Regarding turkey liver, our results are significantly lower than those obtained in a study conducted in Morocco where 63.63% of the samples are contaminated with antibiotic residues [24]

Among the factors responsible for this situation is the duration of breeding; More the duration of poultry farming is long, more the incidence of contamination by antibiotic residues is low.

In addition, many molecules have an affinity for richly vascularized organs, such as the liver, and some of the antibiotics studied (macrolides, colistin and tetracyclines) are metabolized by the liver and eliminated via the bile duct. This is a factor of persistence of the molecules in this organ [25].

These results do not represent the real rate of contamination. Nevertheless, they represent the maximum rate that it could have if there are no false positives in the batch. The agar diffusion method, being considered qualitative and sieving, these results could have been modified by the use of more specific quantitative methods, such as high-performance liquid chromatography and gas chromatography [26].

6. Conclusion

The presence of antibiotic residues in the livers of broilers and turkey commercialized in Souk Ahras region, is a reality that our study has just revealed. The level of contamination is 65.85% in total.

Antibiotic residues detected are present in all products sampled both in broiler and turkey. The contamination rate is higher for chicken liver than for turkey liver. This confirms a poor use of antibiotics in these farms and the lack of application of the recommended withdrawal delay after treatment.

The systematic monitoring of antibiotic residues in food products of animal source is therefore imperative and remains the only preventive way to ensure the safety of these products. However, to do so, more advanced quantitative methods should be used to clearly determine the nature and the exact amount of antibiotics present in these foods. It is also very important to raise awareness among poultry farmers about the dangers of the uncontrolled use of antibiotics for public health.

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