WHY MEAT WITH ANTIBIOTICS IS HAZARDOUS?

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Abstract – Increasing resistance of microorganisms to antibiotics is conditioned by their uncontrolled use. About half of antibiotics produced in the world are used in agriculture to stimulate animal growth and protect from different diseases. One of the risks associated with the presence of antimicrobial residues in meat and products of animal slaughter is emergence of resistance to these antimicrobials in pathogenic and conditionally pathogenic microorganisms. The aim of this study was to assess a level of contamination with antimicrobial residues in meat and products of animal slaughter.

Key Words – risks, meat and products of animal slaughter, antibacterial agents, antimicrobial resistance.

I. INTRODUCTION

The motto of the World Consumer Rights Day in 2016 is "Exclude antibiotics from the menu". Consumer demand for meat and meat products has always been topical. Therefore, an increase in their production is necessary. Meat volumes can be raised due to a muscle weight increase in productive animals. Modern technologies for enhancing productivity are directed towards investigation of mechanisms underlying muscle liveweight gain and a search for new ways to improve slaughter yield.

The muscle liveweight gain can be achieved by using growth promoters including antibacterial agents (terramycin, biomycin, bacitracin and grisin as food additives).

Antimicrobials are chemical compounds that prevent or inhibit the growth of microorganisms. They can be produced in the natural conditions both by fungi (for, example, penicillin) and bacteria (for example, tetracycline) or can be synthetic or semi-synthetic substances (for example, fluoroquinolones and amoxicillin, respectively). According to the original definition of Nobel Prize Winner Selman Waksman, the term "antibiotics" refers only to the natural products of microbial origin. Nevertheless, this term is often used as a synonym of the term "antimicrobial agents" independent of their natural or synthetic origin.

To prevent infection of livestock with different infectious agents, most farmers use antibiotics. Antibiotics have a range of advantages over other chemotherapeutic substances: they have antimicrobial action in very low doses; broad spectrum of antimicrobial action, which is especially important when using antibiotics to treat infections caused by several infectious agents, and comparatively low toxicity.

In addition to growth promotion, antibiotics facilitate an improvement of appetite in animals and better use of nutrients in feed, which allows reducing feed expenditure.

Therefore, when adding antibiotics to feed, it becomes possible to significantly reduce the use of expensive vitamin additives or replace animal proteins in a ration with less deficient plant proteins.

However, one of the main problems when using antibiotics in animal husbandry is emergence of resistance in natural microflora. Moreover, the broader the spectrum of used antibiotics, the higher antibiotic resistance in microbial strains. The antibiotics used in treating humans and animals are the same in 75% of cases.

Upon contamination of meat processing products with antibiotic resistant strains with the subsequent entry into the human body, infection caused by these strains can develop. Treatment failure in this case is predetermined leading to an increase in morbidity and mortality due to infections, as well as to a need for developing new antibiotics, which, eventually, presents an additional burden for a society. Over 25,000 people die of infections caused by antibiotic resistant bacteria in the EU countries every year [1].

Spreading of antibiotic resistance is complicated by the transfer of genes coding for resistance from resistant bacteria to other sensitive microorganisms [2]. Resistance to, so-called, critically important antibiotics used in medicine is of special concern. Since it was shown that the use of antibiotics as growth promoters is associated with the threat to human health, the use of all antibiotics as growth promoters has been terminated in the EU countries since 2006.

An important part of the work on containment of antibiotic resistance is the normative regulation of the use of antibiotics in farm animals. It is proposed that veterinary, agricultural and pharmaceutical bodies consider the possibility to take the following measures: termination of the use of antibiotics as animal growth promoters; the use of antibiotics in animals only on the prescription of a veterinarian; the use of antibiotics of critical importance in healthcare (especially third- and fourth-generation cephalosporins and fluoroquinolones) in farm animals only on reasonable grounds.

The use of meat even with the residual amounts of antibacterial preparations in production of uncooked smoked products results in the failure to produce safe and quality products since the processes of natural and targeted fermentation and ageing will be inhibited [3].

II. MATERIALS AND METHODS

Cattle meat (sticking piece) and products of cattle slaughter (liver, kidneys and visceral fat) of 5 groups of animals were used as objects of research. The objects were tested on Kundrat solid medium with the spores of Bacillus stearothermophilus, which was used as a test-agar for determination of the antimicrobial residues.

Sampling was carried out by the destructive method. Sample preparation consisted in several stages: a test sample (50.0-100.0 g) was minced in a rotational homogenizer; 25.0 (± 0.5) g of the minced samples were homogenized using a blade homogenizer with 25 cm^3 of a diluent; the container with the initial suspension was held in a thermostat at a temperature of (37 ± 1) ºC for 90 min.; centrifugation at 3000 rpm for 10 min.; transfer of the obtained supernatant.

The method for analysis of antimicrobial residues provided that the supernatant was transferred into two wells with the test-medium in an amount of 0.05 cm^3 each. Then, these Petri dishes were kept at room temperature for at least 30 min. for diffusion of the supernatant liquid into agar with the following incubation in a thermostat at a temperature of (65 ± 1) ºC for (3.5 ± 0.5) h.

The results were assessed by the absence or the presence of test-culture growth in the zone of diffusion of the tested supernatant liquid. The presence of antimicrobials was detected by retention of the blue color in a zone with a width of 2.0 mm and more. The absence of antibiotics or other antimicrobial chemotherapeutic substances in a test sample was detected by a change in the medium color from blue to yellow or retention of the blue color in a zone with a width of less than 2.0 mm.

III. RESULTS AND DISCUSSION

When examining the samples of meat and products of cattle slaughter from five enterprises for the presence of antimicrobial residues, the results presented in Fig.1 were obtained.

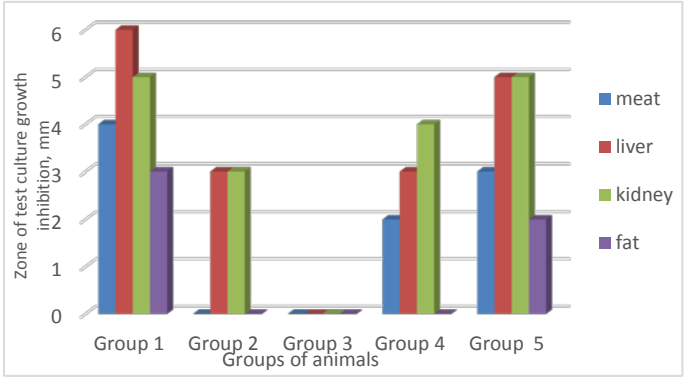

Fig. 1 Results of analysis of meat and cattle slaughter products for the presence of antimicrobial residues

The data presented in Fig. 1 demonstrate that there is a problem of lack of control regarding animal slaughter after using antimicrobials, i.e., the specified time period before slaughter is not maintained. Thus, considering the data presented in the diagram, up to 65% of the tested objects were contaminated with different degrees, which prevents using them in human nutrition as well as in production of fermented meat products [4].

When analyzing these data in terms of antimicrobial distribution in meat and slaughter products obtained from an individual animal, the following levels of contamination were established: 33 % in liver, 28-33 % in kidney, 20-22 % in meat, and the least amount (14-17 %) in fat (Fig. 2 and 3).

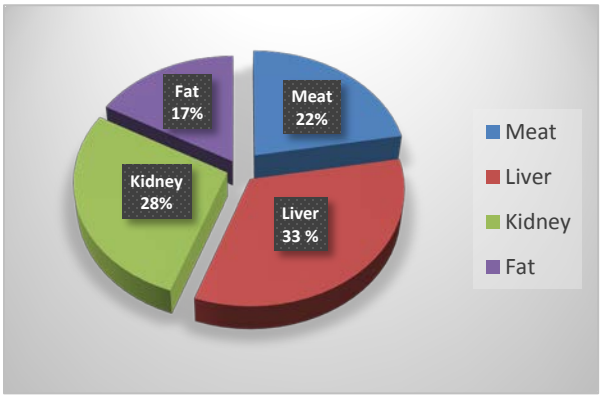

Figure 2 Diagram of antimicrobial residue distribution in meat and products of cattle slaughter from group 1

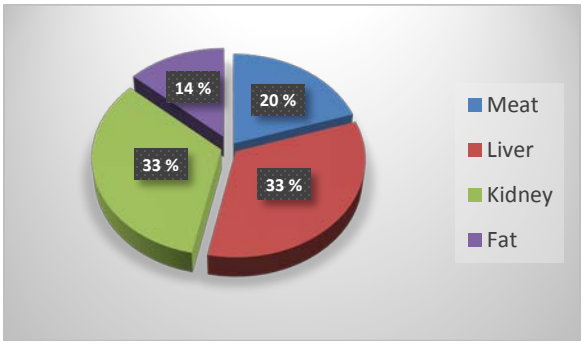

Figure 3 Diagram of antimicrobial residue distribution in meat and products of cattle slaughter from group 5

Zakrevsky V.V. and Leleko S.N., who assessed meat raw material delivered to meat processing enterprises of Saint Petersburg from different countries of the world, presented in their works the data on examination of beef produced in the RF for the presence of antibiotic residues (tetracycline, streptomycin and levomycetin). The authors established that 25% of the tested samples were contaminated [5].

In our investigations, we used the screening qualitative method, which made it possible to detect not only these antibiotics. Thus, we suppose that a higher percentage of the contaminated samples according to our results was conditioned by this fact.

Based on the foregoing, it can be said that meat and products of cattle slaughter are contaminated with antimicrobials and, therefore, they are not safe and can be allowed for processing and selling only after their examination for the content of residuals of antibiotics and other antimicrobial chemotherapeutic substances.

IV. CONCLUSION

1. Antimicrobial residues were found in meat and products of animal slaughter coming for processing.
2. Microorganisms isolated from meat and products of animal slaughter with antimicrobials can have antimicrobial resistance.
3. The most contaminated with antimicrobials were liver (33 %), kidney (28-33 %), then, meat (20-22 %), and, least of all, fat (14-17 %).
4. Many animal husbandry enterprises do not adhere to the terms of withdrawal periods before sending cattle for slaughter after using antimicrobials.

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