MICROBIOLOGICAL RESEARCH ON THE DETERMINATION OF ANTIBIOTICOSENSITIVITY OF PATHOGENS IN ABCESSES OF SLAUGHTERED PIGS

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Abstract

The scientific research reflected in this study aimed to study the behaviors of the sensitivity of some bacterial species highlighted by the abscesses of pigs slaughtered against antibiotics and the interpretation of the microbiological aspects that define them. The antibiogram results of microbial strains isolated from samples of Escherichia coli, Staphylococcus aureus and Streptococcus pyogenes abscesses were evaluated in antibiotic substances, determining various sizes of susceptibility areas.

Key words: Abscesses, Microbial species, Antibiotic sensitivity, Antibiotic substances.

It is scientifically known that microorganisms tend to resist any antibiotic and this vision is a global phenomenon that affects huge territories. For these reasons, the characteristics of the resistance phenomenon vary depending on the relationship with the affected bacterial species, the range of antibiotics used, the distribution of resistant strains in certain places where antibiotics were used and the antibiotic resistance phenotype established by comparing active antibiotics to strains. reference, belonging to bacterial species (which may have natural resistance to certain antibiotics), with antibiotic substances to which the tested strain is resistant [3,10].

Antimicrobial resistance is considered to be the ability of microorganisms of certain species to survive or increase in the presence of a given concentration of an antimicrobial agent that is usually sufficient to inhibit or kill microorganisms of the same species[1].

The Study of Monitoring Antimicrobial Resistance Trend (SMART) is a global antibiotic resistance surveillance program that is ongoing and monitoring the susceptibility of Gram-negative and Gram-positive bacteria from intra-abdominal infections since 2002 [2,4].

That is why epidemiologically the resistance of bacteria to antibiotics varies from one geographical region to another, from one specialty to another specialty, from one type of infection to another, from one year to another and therefore we considered that the study of the resistance of some bacteria, which are involved in infections of different origins is an important and actual issue [6,7,8].

Microbial abscesses are common in medical and veterinary clinical medicine. The microorganisms Escherichia coli, Staphylococcus aureus, Streptococcus pyogenes etc. are the most commonly isolated pathogenic microbial agents in these infections.

These aspects often have a cause or a factor that favors many mechanisms in the disorder of known physiological processes. When these mechanisms are affected by a condition, abnormality or trauma, they can no longer play this role of defense and bacterial infections can develop [5,9]

Therefore, the study of microbiological aspects in the case of these diseases is primarily due to research on antibiotic resistance in these bacterial infections and is motivated by the fact that such research is necessary to determine the level of resistance and the trend of this resistance.

MATERIAL AND METHOD

The scientific researches were performed in the Microbiology Laboratory of the Department of Food Safety and Public Health of the Faculty of Veterinary Medicine of the State Agrarian University of Moldova.

RESULTS AND DISCUSSIONS

The behaviors of 3 microbial strains identified from abscess samples were tested from

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pigs slaughtered against various antibiotics. To study the resistance to antibiotics, investigations were performed to determine the sensitivity of microorganism strains using the diffusimetric method.

Scientific research has determined the resistance of the following microbial strains identified from abscesses of slaughtered pigs: Escherichia coli, Staphylococcus aureus, Streptococcus pyogenes. The assessment of the resistance of microbial strains to antibiotics by the method of washers aimed at making passages on agar plates of microbial cultures from liquid media.

For this purpose, 6 washers soaked with various antibiotic substances were applied on the surface of the media. The plates were incubated in a thermostat for 16-17 hours at t -37 ^{o}C. After the expiration of the time on the examined plates, the zones of inhibition of the microorganisms of the bacterial strains around the washers were measured. The dimensions of the zones depended on the degree of sensitivity of the strains to the corresponding antibiotic: Intermediate (I); Resistant (R); Sensitive (S). The aspects of determining the resistance of microbial strains denote practical importance, noted by topicality and new pathogenicity criteria. The determination of the chemoresistance of germs thus acquires a wider significance than a simple analysis for the choice of a treatment and is therefore debatable, regarding the technique of execution and interpretation of the results from several points of view.

The results of the antibiogram of the microbial strain Escherichia coli shown in Table 1 show important results of the sensitivity of antibiotic substances demonstrating various areas of sensitivity. The most effective antibiotic substance turned out to be ceftazidime - 277mm, followed by amoxicillin - 26mm, cefaclor - 25mm, etc.

Some specialized sources confirm that E. coli is responsible for purulent infections manifested by abscess. Among E.coli strains there are considerable differences in the repertoire and expression levels of virulence factors that may affect bacterial growth and persistence in abscess pathology. Therefore, these interpretations confirm the mechanisms of Escherichia coli resistance and sensitivity to antibiotics, which translates into the ability of a microorganism to survive in the presence of antibiotics or antibacterial chemotherapeutics.

According to this study, bacterial resistance can be genetically genotypic or phenotypic and therefore chromosomal genetic resistance occurs as a result of mutations in the nucleotide sequence of the bacterial chromosome, which causes the synthesis of proteins or other macromolecules, different from the initial chemical structures, so the action antibiotic can no longer be achieved, representing 10% of the acquired bacterial resistance.

The most important transporters for the transfer of resistance genes from one bacterium to another are plasmids, transposons and integrators. Genes that confer resistance are transferred from one bacterium to another in a horizontal manner by conjugation, transduction, or transformation.

Important scientific evidence confirms the results of the antibiogram of the uropathogenic microbial strain Staphylococcus aureus to the antibiotic substances listed in Table 2, which determines aspects of the areas of sensitivity of the tested antibiotic substances.

Important data revealed the highest degrees of sensitivity to the following antibiotics: amoxicillin-28mm, followed by cefazolin-26mm, ampicillin-24mm.

Resistance to some antibiotics, however, is associated with changes in the enzymes that neutralize the antibiotic. It is the result of the expression of enzymes that covalently modify these antibiotics by acetylation using aminoglycoside-acetyltransferases, phosphorylation by aminoglycoside-phosphotransferases or adenylation by aminoglycoside-adenylyltransferases.

Table 1

The sensitivity of Escherichia coli to antibiotics

Antibiotic substances	Degree of sensitivity		
	Resistant (R)	Sensitive (S)	Intermediate (I)
Doxacycline	0	22	0
Cefoperazone	0	20	0
Ampicillin	0	21	0
Ceftazidime	0	27	0
Amoxicillin	0	26	0
Cefaclor	0	25	0

Table 2

Sensitivity of Staphylococcus aureus to antibiotics

Antibiotic substances	Degree of sensitivity		
	Resistant (R)	Sensitive (S)	Intermediate (I)
Ampicillin	0	24	0
Cefazolin	0	26	0
Amoxicillin	0	28	0
Doxacycline	0	22	0
Celosporine	0	20	0
Oxacillin	0	21	0

Table 3

Sensitivity of Streptococcus pyogenes to antibiotics

Antibiotic substances	Degree of sensitivity		
	Resistant (R)	Sensitive (S)	Intermediate (I)
Ampicillin	0	24	0
Cephalosporin	0	22	0
Ceftazidime	0	20	0
Ofloxacin	0	26	0
Cefeprim	0	28	0
Amikacin	0	21	0

These enzymes are usually plasmidically encoded, but transposable elements may also be involved. Different bacterial phenotypes from various species can also occur through plasmid exchange or facilitated dissemination of transposons.

As a result of assessing the results of the antibiogram of the microbial strain Streptococcus pyogenes in antibiotic substances - Table 3, significance shows the highest degrees of sensitivity to antibiotic substances: cefeprim -28mm, followed by ofloxacin -26mm, ampicillin-24mm, cephalosporin -22mm etc.

According to the scientific aspects subsequently reported, the initiation of this research led to the interpretation of some aspects of the mechanisms of virulence in infections with the microbial strains Escherichia coli, Staphylococcus aureus and Streptococcus pyogenes noted in this study. Therefore, the additional virulence-determining bacterial toxins found in the noted strains are imported molecules. These include hemolysins, cytotoxins, proteins that bind various aggressin compounds.

Based on these considerations, we note that the bacterial strains studied that induce pathological inflammation in the form of abscesses, have evolved persisting longer in the animal body, without causing clinically obvious symptoms. These bacteria exist in a host-like relationship with commensal bacteria, and in some cases appear to protect the animal's body from colonization by other pathogenic strains.

In this context, from the presented analyzes we mention that the results obtained show that the antibiotic resistance of the strains involved is an important problem in the laboratory microbial pathology of abscesses at slaughtered pigs, which must be taken into account in the treatment of different abscesses by different origin of the species tested above for sensitivity and must be considered an issue that needs to be addressed in this context as well and commitments need to be made at national and international level.

CONCLUSIONS

1. The study confirms the dominance of antibiotic sensitivity spectra of microbial strains tested in the foreground by

Streptococcus pyogenes, followed by Staphylococccus aureus and E.coli.

2. Early recognition of abscess infections caused by microorganisms is the pursuit of prescribing appropriate treatment, depending on the sensitivity to antibiotics, preventing the acceleration of the manifested infection.

3. It is recommended to avoid the trauma, peripheral vascular diseases, ulcers and other pre-existing conditions and the timely administration of anti-inflammatory drugs in order to prevent pathologies of abscesses.

REFERENCES

BRONZWAER, S., LONNROTH, A., HAIGH, R. 2004 - *The European Community strategy against antimicrobial resistance.Euro Surveill*. pp. 30-34.

CARP-CĂRARE, C. 2014 - *Microbiologie generală*. Iaşi: Ion Ionescu de la Brad, pp. 200-215. ISBN 978-973-147-153.

FIȚ, N.2015 - *Microbiologie generală.* Cluj-Napoca: Editura AcademicPres, 248 p.

GOLBAN, R.,2015 - *Microbiologie generală. Curs de prelegeri,* UASM, Chişinău: uasm.moodle.md, pp.125-128, 4,5 c.a.

GOLBAN,R.,2015 - *Microbiologie specială. Curs de prelegeri,* UASM., Chişinău: uasm.moodle.md, pp.80-84, 4,5 c.a.

GUGUIANU, E. 2002 - *Bacteriologie generală.* Iaşi: editura Jenus, pp.56-58.

JACOBSEN, S., STICKLER, D., MOBLEY, H. 2008 - *Complicated catheter-associated urinary tract infections due to Escherichia coli and Proteus mirabilis.*Clin Microbial. pp.26-50.

JOSAN, N. 2002 - *Microbiologie şi imunologie*. Chişinău: UASM, 512 p. ISBN 9975-62-081

PERIANU, T.2011 - *Tratat de boli infecțioase ale animalelor. Bacterioze, vol.I.* Iași:Universitas XXI,pp.48-57. ISBN 978-606-538-068-4.

RĂPUNTEAN, GH., RĂPUNTEAN, S. 2005. - *Bacteriologie veterinară specială*. Cluj- Napoca: Academic Pres, pp.325-345 ISBN 973-7950-95-X.