

Resistance to antimicrobial agents of *Enterococcus* spp. isolated at low and normal temperatures from water bodies of Vladivostok with anthropogenic load

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ABSTRACT. This research was mainly aimed to study the antimicrobial sensitivity of the *Enterococcus* strains isolated at low and normal temperatures from anthropogenically loaded water of the Vtoraya Rechka River located in Vladivostok. The presence of enterococci in water can confirm anthropogenic pollution. For this reason, we conducted a study of antimicrobial agents resistance, which revealed that the bulk of the isolated strains was sensitive to tetracycline and vancomycin, intermediately sensitive to erythromycin and resistant to streptomycin.

Keywords: *Enterococcus*, antimicrobial resistance, tetracycline, streptomycin, erythromycin, rifampicin, vancomycin.

Introduction

The *Enterococci* are the conditionally pathogenic microorganisms, which are part of the normal human and animal microbiome. They have the natural resistance some antimicrobial agents and, getting into sewage waters, they can acquire an additional resistance to antimicrobial agents (Muto et al., 2003). Due to this fact, it is necessary to monitor the sensitivity of *Enterococcus* microorganisms to antimicrobial agents. For instance, a tetracycline possesses bacteriostatic activity, inhibits bacterial cell synthesis in ribosomes as well as binds metals (Ca, Fe, Mg, and Mn), forming chelate complexes with them and inhibiting the enzyme systems (Egorov, 2004; Klez and Minakina, 2013). Such macrolide as erythromycin has bacteriostatic activity and suppresses protein synthesis of the microbial cell at the level of ribosomes, which is associated with the suppression of the peptidyl translocase enzyme. It is also important to study such substance as vancomycin, a glycopeptide with bactericidal effect destroying the synthesis of the cell wall (Egorov, 2004). Streptomycin refers to aminoglycosides that affect a bacterial cell, binding to the specific bacterial ribosome receptors, and inhibit protein synthesis. Rifampicin has a bactericidal effect and it suppresses RNA synthesis by complexing with DNA-dependent RNA polymerase (Egorov, 2004; Klez and Minakina, 2013).

Materials and methods

We studied 27 strains of *Enterococcus* isolated from the Vtoraya Rechka River at temperatures

from 0 °C to 8 °C with a volume of 10 µl and 20 µl. Antimicrobial resistance was studied by disc diffusion test (MUK 4.2.1890-04).

Results

Among 27 studied strains, 63% were sensitive to tetracycline, 6% had the intermediate sensibility to this drug, and 31% were resistant to this class of antimicrobials. 100% of the strains were resistant to streptomycin. Additionally, 60% of strains were intermediately sensitive to erythromycin, 40% were resistant to rifampicin, 27% had intermediate sensitivity, and 73% were resistant to rifampicin. Moreover, 87% were sensitive to vancomycin and 13% had intermediate sensitivity.

Conclusions

One of the main features of anthropogenic activity in the environment is the antimicrobial resistance in microbes isolated outside of a human microorganism. Furthermore, it can be a significant factor in the infection spread (McArthur and Tuckfield, 2000). At the same time, this problem is also important for ecologists, because co-existence of allochthonous and autochthonous microorganisms may cause the horizontal spread of genes, e.g. of genes of antimicrobial resistance from autochthonous microbes to allochthonous ones and vice versa (Lobova et al., 2002).

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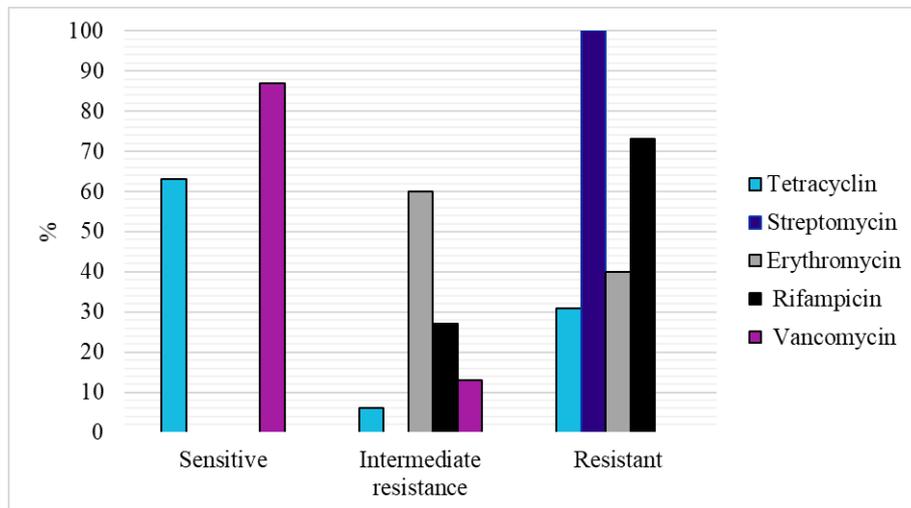


Fig.1. Antimicrobial resistance of *Enterococcus* strains (isolated from the Vtoraya Rechka).

There were studied the antimicrobial agents resistance of 27 strains of *Enterococcus* genera isolated in low and normal temperatures in a media with anthropogenic load. When analysing the gained data there was revealed that the most of the strains were sensitive to tetracycline and vancomycin, intermediately sensitive to erythromycin and 100% resistant to streptomycin.

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