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GENOTOXICITY DETECTION IN THE WATER OF THE BLACK SEA WATER
BY AMES TEST

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The Ames test has been extensively used for rapid evaluation of the action of chemical substances on the DNA molecule [2]. Several genetically modified strains have been produced which combine a low level of spontaneous mutation with an excellent response to mutagenesis induced by different classes of agents [3]. This test has been used to evaluate the mutagenicity of complex mixtures in the air, in rivers, lakes, sediments, industrial effluents, and in drinking water. Genotoxicity in water occurs due to the industrial and domestic wastes, to contamination by agricultural products or even to potentially reactive natural products [2, 3].

The use of the Ames test has been recommended for environmental studies by international organizations and is recognized as a primary test for the evaluation of

genotoxicity related to carcinogenic potential by the Federal Register, USA. The contamination of surface waters is an important chapter in the study of the genotoxicity of complex mixtures [2, 3].

The research aim was to investigate the genotoxic activity in the water of the Black Sea.

Materials and methods. Water samples from different sites along the coast of the Black Sea were subjected to the Ames test for the detection of possible mutagens. Strains *Salmonella typhimurium* TA 100 and *Salmonella typhimurium* TA 98 were used in the study. The procedure used in the experiment is set out in the Method of Comprehensive Toxicity Estimation [1].

Results. According to the results, it was showed that the majority of water samples isolated from the Black Sea in summer 2016 had a high level of toxic activity in the test system of *Salmonella typhimurium* TA 100. The highest toxicity was showed by the water isolated in the area of Kovalevskiy Dacha. The water from the tide wave line in this point lead to the death of more than 85,0 % of viable cells (fig. 1), which corresponds to the level of powerful toxic effects. It was this sample that caused mutagenic activity, which was $4,03 \pm 0,075$ times higher than the control values (fig. 2), which corresponds to the level of moderate mutagenic action. A sample of sea water taken from the coast in the area of Kovalevskiy Dacha caused the death of 77.0% of viable cells (fig. 1). The mutagenic activity of this sample corresponded to the level of "weak mutagenic effect" (1.1 ± 0.10 units, fig. 1).

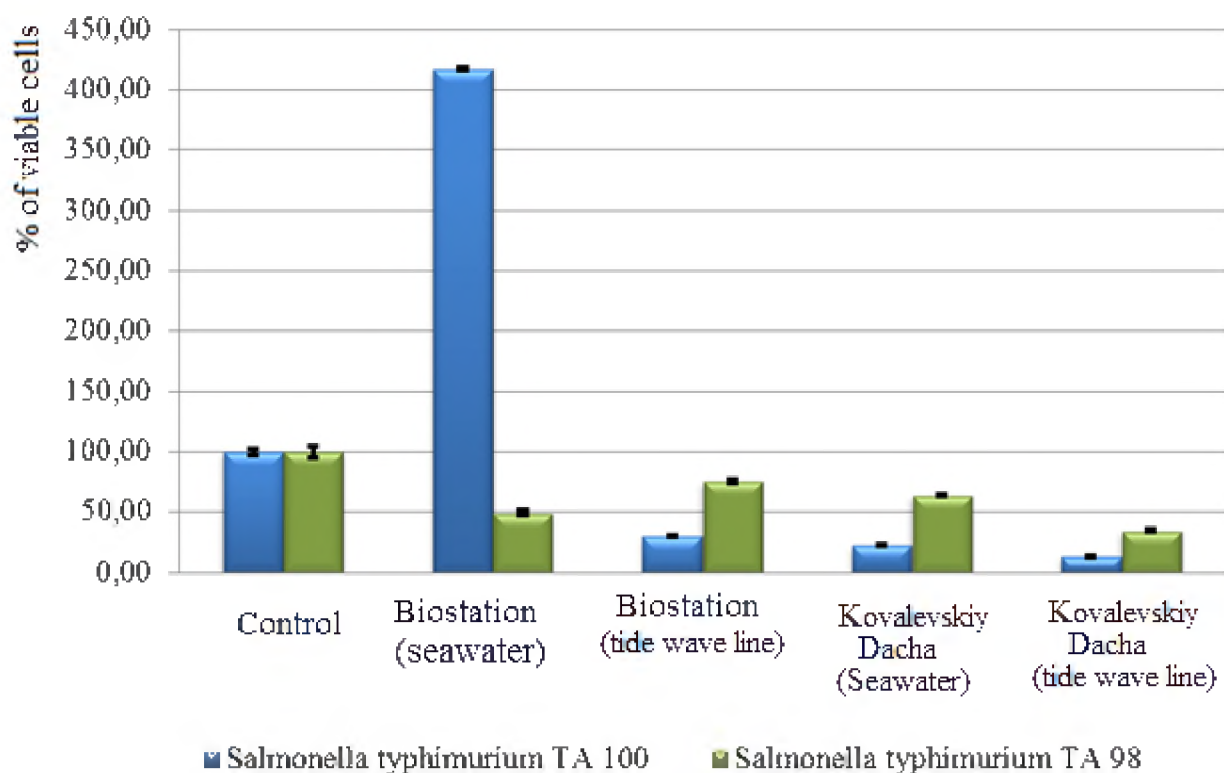


Fig. 1 Results of biotesting of sea water of the Black Sea using bacterial test systems of *Salmonella typhimurium* TA 100 and *Salmonella typhimurium* TA 98 (toxicity)

The results of biotesting of these water samples using the bacterial test system of *Salmonella typhimurium* TA 98 caused less loss of test strain cells (65.0 % of viable *Salmonella* cells, fig. 1). At the same time, a significant mutagenic activity was recorded, which was 6.03 ± 0.21 relative units compared to the control values (fig. 2). A sample of sea water taken from the coast near the Biological Station caused a strong mutagenic activity in the test system of *Salmonella typhimurium* TA 98 ($5,73 \pm 0,09$ units) with a simultaneous high toxicity - the death of more than 50,0 % of viable cells.

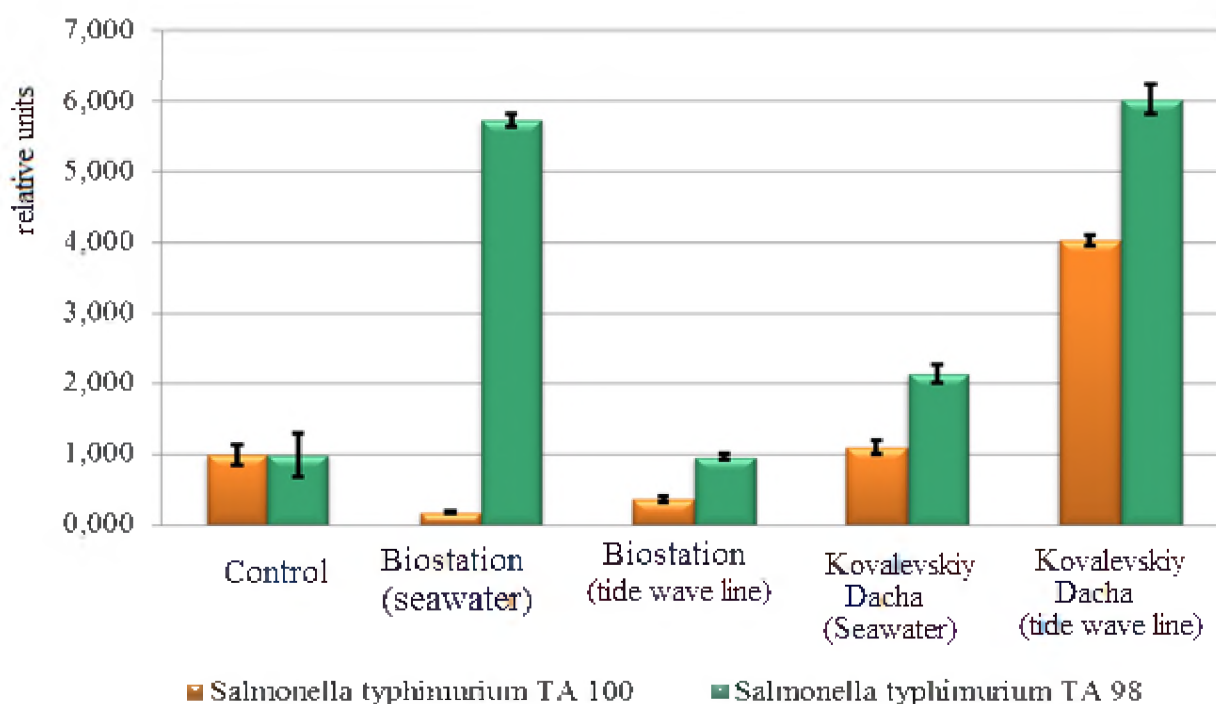


Fig. 2 Results of biotesting of sea water of the Black Sea using bacterial test systems of *Salmonella typhimurium* TA 100 and *Salmonella typhimurium* TA 98 (mutagenic activity)

Thus, the sea water of the Black Sea led to the negative biological responses in the *Salmonella typhimurium* TA 100 and *Salmonella typhimurium* TA 100 test systems. The most significant negative genotoxic parameters were recorded when biotesting water from the tide wave line near Kovalevskiy Dacha.

References

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