increase in Na ion content is insignificant – from 1.0 mg/l in Lake Kamennoye water to 17 mg/l in the polluted zone. The concentrations of elements (Co, Ni, Cr) are a few microgrammes per litre of water in the polluted zone, which slightly exceeds the corresponding values observed in the clean zone (Morozov, 2006).

Research into the activity of Na^+/K^+-ATPase in different tissues (gills, muscles, kidneys, liver, gonads) of fish from the lakes in question revealed tissue-specificity and reduction in the activity of the enzyme in the fish caught in the polluted zone. Since the activity of Na^+/K^+-ATPase is regulated, first of all, by univalent cations, a change in the Na^+/K^+ ratio changes the enzyme activity in a specific way. Suppression of the activity of the active transport enzyme Na^+/K^+-ATPase, which concentrates potassium ions within the cell, is presumably a consequence of the substantial rise (~ 500-fold) in the potassium ion concentration in the ambient environment – the highly mineralized impoundment reservoir, as compared with the normal freshwater habitat. Changes in the composition of the medium, first of all in the content of sodium and potassium ions, as the most variable component, alter the electrolytic composition of an organism (Hlebovich, 1974) and thus trigger adaptive modification of the activity of the membrane enzyme which maintains the intracellular ion homeostasis.

Thus, changes in the activity of Na^+/K^+-ATPase is an example of biochemical adaptation which success depends on the ability of the fish to modify their water-salt metabolism in accord with the environment. The optimal microenvironment of the organism's macromolecules is thus maintained, which is the main principle behind the strategy of biochemical adaptation (Hochachka and Somero, 1977; Nemova and Vysotskaya, 2004).

The study was supported by the RF Presidential Programme "Leading Scientific Schools of RF" grant NSh-3731.2010.4, Russian Foundation for Basic Research grant № 08-04-01140-a, RAS Presidium programme "Biological resources of Russia: 2009–2011".

References

Boldyrev A.A. 1998. Na^+/K^+ ATPase. Properties and biological role. Soros Educational Journal. Biology. No 4. P. 2–10. [in Russian]

Hlebovich V.V. 1974. Critical salinity in biological processes. Leningrad, 230 p. [in Russian]

Hochachka P.W., Somero J.N. 1977. Strategies of biochemical adaptation. 396 p. [Russian translation]

Lozovik P.A., Kalmykov M.V., Dubrovina L.V. Chemical composition of industry-generated waters. Chapter 4. Kostomuksha area water. In monograph: "Status of water objects in Republic of Karelia. 1998–2006 monitoring results". Petrozavodsk. KarRC of RAS, 2007. P. 100–106. [in Russian]

Morozov A.K. Chemical composition of water. Chapter 4. Kostomuksha area water. In the monograph "Status of water objects in Republic of Karelia. 1998–2006 monitoring results". Petrozavodsk. KarRC of RAS, 2007. P. 125–128. [in Russian]

Nemova N.N., Vysotskaya R.Y. 2004. Biochemical indication of fish state / Ed. M.I. Shatunovskii, Moscow: Nauka. 215 p. [in Russian]

Stroganov O.F., Filenko G.D., Lebedeva L.I., et al. 1983. Principles of basic biotesting of sewage water and estimation of the quality of natural reservoirs. In: Teoretichewskie voprosy biotestirovaniya/ Moscow, pp. 21–30. [in Russian]

ROLE OF THE INSERTION SEQUENCE ELEMENTS IN THE GENOME ORGANIZATION OF THE *ALIIVIBRIO SALMONICIDA*

A. Kashulin[1], E. Hjerde[2], M.S. Lorentzen[3], N.P. Willassen[4]

[1]Department of Chemistry, University of Tromsø, Norway, Tromsø
[2]Department of Medical Biology, University of Tromsø, Norway, Tromsø
[3]Department of Chemistry, University of Tromsø, Norway, Tromsø
[4]Department of Chemistry, University of Tromsø, Norway, Tromsø
e-mail: aleksandr.kashulin@uit.no

Growing evidence show that bacterial genomes actively evolve under pressure of environmental changes. Rearrangements caused by mobile genetic elements and insertion sequence (IS) elements in particular, greatly contribute to the generation of the occasional fitter mutants and thus increase the genetic variability in bacterial populations. IS elements normally encode no functions other than transposases

necessary for their mobility. While sole movement of the IS element normally leads to gene disruption, simultaneous transposition of two IS elements as parts of composite transposon promote relocation, inversion, excision of large DNA regions or even lead to a plasmid fusion as well as new gene acquisition from the environment or horizontal gene transfer. These dramatic events can result in the assembly of new gene clusters providing multidrug resistance or encoding new metabolic pathways. Starting from the first outbreaks of cold-water vibriosis, plasmid pattern investigations had revealed 6 different naturally occurring *Aliivibrio salmonicida* plasmid profiles. Our work is focused on the *A. salmonicida* plasmid profile flexibility and impact of the IS elements to this phenomenon. Our experiments will be carried out on numerous isolates collected from diseased fish and from the water surroundings since the early 1980's and up to present days. Revealing the possible mechanisms of transposition of different isolates of *A. salmonicida* IS elements will bring us closer to understanding the role of this class of mobile genetic elements for the integration/excision of plasmids into the chromosome. Discovering the molecular basis of this process and its impact on virulence of *A. salmonicida* will contribute to the development of revolutionary new types of protective measures against future cold-water vibriosis outbreaks.

SEARCHING OF THE BIOLOGICALLY ACTIVE SUBSTANCES THAT MEDIATE INTRA- AND INTERSPECIFIC COMPETITION BETWEEN EPIBENTHIC ORGANISMS. INVESTIGATION ON THE EXAMPLE OF THE WHITE SEA FOULING COMMUNITIES

Vyacheslav V. Khalaman[1], Violetta S. Skidchenko[2], Rimma U. Vysotskaya[2], Maria A. Daugavet[3]

[1]Zoological institute RAS, Russian Federation, Saint-Petersburg
[2]Institute of Biology Karelian Research Centre RAS, Russian Federation, Petrozavodsk
[3]Saint-Petersburg State University, Russian Federation, Saint-Petersburg
e-mail: VKhalaman@gmail.com

Essential role in itraspecific competition between marine sedentary organisms belongs to allelopathy – negative influence of the one species to another one by chemical agents. Nowadays scientist's interest in allelopathic chemicals rises worldwide. However the White Sea invertebrate's potentials have been studied negligibly in this interest and thus respective biological resources are poorly developed. Actually in the White Sea, just blue mussels (*Mytilus edulis*), brown (*Laminaria saccharina, L. digitata*) and red (*Ahnfeltia plicata*) algae are used as the source of biologically active substances (BAS). Besides of this, there are some prospective producers of chemicals with biological effects or another practicable properties, like a soft coral *Gersemia fruticosa* (prostaglandins), hydroid *Obelia longissima* (photoproteins).

It seems quiet logical to search BAS from organisms possessing allelopathic action. This feature could be a basis for narrowing of BAS screening and increasing of its effectiveness. But such approach implies good knowledgebase of organism's interrelation complex in this or that communities.

From this point of view, fouling communities are the most useful and prospective model for investigations of this kind in the White Sea. Species composition, development dynamics and intraspecific interaction patterns of these communities have been well established by the present time, what could be a reliable basis for directed search of chemical mediated competition among the White Sea sedentary invertebrates.

Therefore, investigations of influence of secretory-excretory products (SEPs), produced by different sedentary organisms, on another hydrobionts were conducted. We tested SEPs of some the most abound species in the White Sea, as follows: bivalve mollusks *Hiatella arctica* and *Mytilus edulis*, sponge *Halichondria panicea*, solitary ascidium *Styela rustica* and starfish *Asterias rubens*. Juvenile or adult mussels (*Mytilus edulis*) were used as a test-object in the work.

On the first stage, competitive relationships among organisms mentioned above were estimated by behavioral reactions. According to the results of field and laboratory experiments, it was shown, that mussels (*M. edulis*) increased byssus production and, thus, movement in response to waterborne cues from sponge *Halichondria panicea* and solitary ascidian *Styela rustica*. Increment of byssus production by mussels in the presence of competitor's SEPs apparently directed to avoidance or even immobilization of a source of stress (Khalaman, Komendantov, 2007; Khalaman et al., 2008a; Khalaman, Lesin, 2008). This reaction is similar to a well known behavioral defense of mussels against carnivorous whelks (Davenport et