COLD ADAPTED MARINE ENZYMES

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The world's oceans cover more than 70% of the earth's surface and therefore a large proportion of life on earth is contained in these oceans and includes the largest range of habitats. The marine environment ranges from nutrient rich areas to nutrient sparse areas. In addition high salinity, high pressure, different light conditions and low/high temperature add to the complexity of the marine environment. This may contribute to significant differences between enzymes from marine organisms and homologous enzymes from terrestrial organisms.

Organisms that thrive in cold environments are referred to as psychrophiles or cold-adapted organisms. In order to survive and proliferate in the harsh cold environment, marine organisms must possess a capacity to synthesize cold-adapted enzymes. Cold-adapted enzymes have evolved a range of structural features that are necessary to perform their action at low temperatures and are in general more catalytically efficient and possess usually a lower thermal stability compared to enzymes from organisms adapted to warmer climate. These characteristics make cold-adapted marine enzymes very interesting for biotechnological and industrial purposes.

LIPID CONTENT OF MUSSELS, *MYTILUS EDULIS*, AS A BIOMARKER OF MARINE ENVIRONMENT HEAVY METAL POLLUTION

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The blue mussel, *Mytilus edulis*, is a unique bioresource of the White Sea (Bioresources of the White Sea, 2008). An important area of applied science use of these bivalves is biomonitoring and biotesting of water quality. *Mytilus edulis* satisfies a variety of criteria of a model object. One of them is the ability to accumulate high pollutant concentrations in tissues (Gudimova, 2002). Changes at the level of lipids are an essential strategy organisms employ to protect themselves against various stress factors (Kurashvili and Vasilkov, 2003). A characteristic response at the lipid composition level to adverse impact of pollutants, including heavy metals, is storage of neutral lipids, primarily triglycerides (Capuzzo and Leavitt, 1988; Chetty and Indira, 1994; Bergen et al., 2001). *Mytilus edulis* from the White Sea have also been shown to undergo a reduction in cholesterol content in response to oil pollution (Bakhmet et al., 2009). Heavy metals are high hazard ecotoxicants (Isidorov, 1999), wherefore optimization of the lipid metabolism and mobilization of its reserves notably promotes the organism's adaptation to the adverse environmental conditions. In this study we investigated the effect of various concentrations of such heavy metals as cadmium and copper on the lipid composition in gill and digestive gland from White Sea mussels, *Mytilus edulis*.

To study how the lipid composition in *Mytilus edulis* L. was modified in response to heavy metal pollution, we carried out an experiment in which the animals were kept for 24 and 72 hours in aquaria with different concentrations of copper and cadmium ions in seawater: 5, 50 and 250 µg/l and 10, 100 and 500 µg/l, respectively. The values of 5 (for copper) and 10 µg/l (for cadmium) are maximum allowable concentrations (MAC). Mussels kept under the same regime in the laboratory, but in unmodified seawater, were used as the control. Lipids were extracted by the chloroform/methanol mixture (2:1 by volume) following Folch et al. (1957). The qualitative and quantitative composition of total lipids was determined by thin-layer chromatography, as well as using spectrophotometric techniques (Sidorov et al., 1972; Endelbrecht et al., 1974).