

# **Experimental Studies of Energy Trends Development of Artificial Ecosystems and Their Links**

N.S. Pechurkin (1,2), L.A.Somova (2), A.V. Brilkov (1,2), I.A. Loginov (2), E.V. Morozova (2),

(1) Krasnoyarsk State University, (2) Institute of Biophysics SB RAS, Krasnoyarsk, 660036, Russia (nsla@akadem.ru /Phone: +7-3912-495319)

Two types of artificial ecosystems with different trophic links have been used for experimental studies of energy trends development and microevolution processes.

1. Microbial populations in artificial ecosystems (AES) for water purification are the most active transforming organisms and consumers of organic substances of wastes. In our experiments we observed different changes in Active Sludge (AS) structure and populations composition connected with changes in environmental factors and self-development of AS. As a result of biological adaptations, unutilized substrate concentration decreased in many cases. The exact structure of microbial community also changed, the biological diversity decreased. But, in all experiments, we observed certain increase of fluxes of energy utilized by the system.

2. In experiments with continuous microbial cultures, we used *Escherichia coli* genetically engineered strains. They contain (in plasmids) the cloned genes of marine photobacteria bioluminescence and genes of green fluorescent protein (GFP), which expression level can be

easily changed and controlled. We observed kinetic diversity of evolutionary transfers in systems. But general mechanisms characterized the increase of used energy flow by bacterial populations under study.

According to our experimental data, at spontaneous development and microevolution processes, heat dissipation characterizing the rate of entropy growth increased rather than decreased or maintained steady as G. Nikolis and I. Prigogin believed. The results require further development of

thermodynamic theory of biological systems evolution.