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BOOK OF ABSTRACTS

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Bioenergetics of haloalkaliphiles

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Abstract

The research aims at finding out the distinctive lines of energetics in natronophilic microorganisms started to be described (Banciu & Muntyan, 2015). Among used methods were analyses of respiratory characteristics, electrical potential generation, pH changes in cells/vesicles suspension upon light/oxygen impulses, effects of ionophores and uncouplers, visualization of sodium transport using radioisotope ²²Na, phylogenetics. Summary of results: So far, a novel type of primary energy transformer, Na⁺-motive cytochrome oxidase, which has been proven to operate in natronophilic strains of the genus Thioalkalivibrio (Muntyan et al., 2015), has been discovered, and then found in several other extremophiles. It has been demonstrated that in these same strains, cell motility is provided by Na⁺-motive flagella. In addition, it was shown that the rhodopsin-like pigment, proteorhodopsin, in the new natronophilic strain of a novel deep-lineage of the phylum Balneolaeota, *Cyclonatronum proteinivorum*, pumps Na⁺ from cells (Sorokin *et al.*, 2018). The screening of Na⁺-motive energy mechanisms revealed the sodium energy cycle, consisting of (i) primary mechanisms for generating Na⁺-potential and (ii) Na⁺-potential consumers, represented by flagella and FoF1-ATPase. Conclusion: Along the way, we first discovered that several species of bacteria simultaneously have in their genomes: (i) oxygen-consuming generators of Na⁺-potential (Na⁺-pumping *cbb*₃ oxidases) and (ii) consumers of Na⁺potential such as Na⁺-ATPase of F0F1-type and flagella. Thus, for the first time, it became possible to establish the presence of a complete Na⁺-cycle in energetics of oxygen-respiring bacteria.

Keywords: alkaliphiles, Na⁺-motive enzymes, soda lakes.

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