Acclimatization of the photosynthetic apparatus of the psychrotolerant unicellular *Coccomyxa subellipsoidea* C-169 algae to low temperature

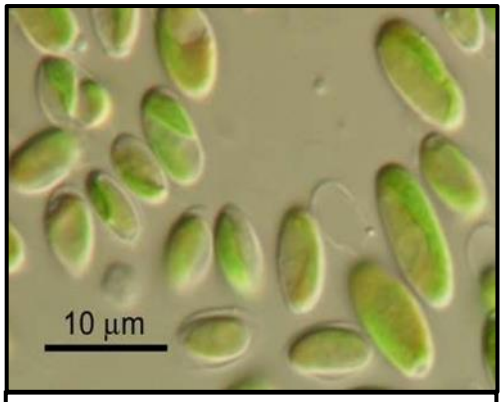

Fig. 1. *Coccomyxa subellipsoidea* C-169 cells

Coccomyxa subellipsoidea C-169 is a unicellular green algae. It is the first eukaryotic microorganism derived from the polar environment with a fully sequenced genome. It has been shown to have a relatively fragile cell wall and contains more enzymes involved in biosynthesis and lipid modification than any other previously sequenced similar organism. C-169 belongs to the group of psychrotolerants, i.e. a group of organisms which, like mesophiles, feels good in temperature from +20°C to about +30°C, but are able to tolerate much lower temperatures. Green algae was first isolated in Antarctica at Marble Point at the turn of 1959/1960. The greater part of this continent is located at an altitude of over 3000 meters above sea level, where the temperature in the troposphere decreases with increasing altitude. Given the environmental conditions in this place and comparing them to other places on Earth, Antarctica is the coldest (the temperature can drop to -90°C here), the driest and the windiest continent of all and yet, the C-169 is doing very well in such adverse conditions. C-169 stand out by a high content of lipids, which, combined with a wide temperature growth spectrum, makes it an attractive object to carry out research on the organism, which is a psychrotolerant adapted to life in extremely low temperatures. Literature data shows that lipid metabolism is one of the basic mechanisms enabling adaptation and acclimatization of plants to the cold, which are still so little known in psychrotolerants.

The aim of this project is to examine the photosynthetic apparatus in psychrotolerant unicellular C-169 algae adapted to life at low temperatures. We want to answer the question whether growth temperature and modification of lipids in thylakoid membranes of C-169, providing changes in membrane fluidity, are responsible for organization of thylakoids lamellae complexes, changes in protein to lipid ratio and thus in the physiological function of cells. Does the growth temperature affecting the thylakoid membrane lipids induce changes in the composition and activity of photosynthetic complexes?

During the experiment it will be necessary to study the changing properties of the photosynthetic apparatus associated with stress caused by temperature changes as well as the quantitative and qualitative analysis of lipid content. The results of this project will significantly broaden the knowledge about the biology and mechanisms affecting the ability to acclimatize psychrotolerant algae, which is so little in the literature.