

Impact of environmental stress on composition of proteins and morphogenetic response in Foraminifera

Reports of uncontrolled marine pollution and increasing environmental stress due to climate change have been increasing in recent decades. Human activities, such as intensified agriculture and aquaculture, are increasing and directly influencing adverse environmental changes in coastal marine zones. Pollutants are present not only to the naked eye, but especially on a microscopic scale and in the form of dissolved toxic substances. Exactly these microscopic and dissolved particles can harm many microorganisms and disrupting the extremely sensitive food chain at the beginning. Nowadays, organisms are also exposed to higher levels of physical stress, caused by rising air and water temperatures. As a result, the oxygen concentration in the sea decreases, disrupting the environmental balance and consequently the food source for humans. This project is concerned with the identification of proteins produced by physical environmental stress in foraminifera when they are exposed to elevated levels of temperature and salinity. We will also analyse unknown stress proteins produced by foraminifera in response to various contaminants, including sunscreens, heavy metals and antibiotics. The second part of the study will focus on the morphogenetic response, which is recorded in the morphology of foraminifera shells. The phenomenon of abnormal (anomalous) foraminifera morphologies is well known in stress environments in the fossil and modern records. However, the cause of these phenomena is not known. We hypothesize that it is related to perturbations in the production and response of proteins to unfavourable microenvironment conditions during the growth and biomineralization of pinhole chambers. Our experiments will reflect the relationship between human-induced pollution and key microorganisms in the marine coastal area. To this end, foraminifera will be sampled from the North Sea, the Baltic Sea and the Mediterranean Sea for analysis. These three seas are important fishing areas, and their condition is very important for maintaining environmental balance. Based on this data, it will be possible to learn about the physiological and morphogenetic response of foraminifera to environmental stress, and to draw conclusions about the degree of pollution or physical stress by observing foraminifera from various sampling sites in their natural environment both in the past and today. Finally, we will draw conclusions about which pollutants are most harmful to marine microorganisms, and which ones humans should avoid in the future.