Rapid development of many branches of industry, architecture, construction, agriculture or power engineering in recent years, conducted to rapid utilization and degradation of the natural environment, and, consequently, the risk of metal pollution. Anthropogenic activity, as well as natural processes, such as volcanic eruptions, earthquakes and others cause the release of numerous harmful substances into the environment. Eventually they can be accumulated in soil, water, air, plants and animals. Among them, heavy metals have an extremely significant impact on the environment. As one of the heavy metals that is commonly found in the natural environment (e.g., in rocks and minerals), but also used by anthropogenic activity is nickel (Ni). This highly reactive metal is the fifth most abundant element on Earth. Due to the fact that it is common in human life (e.g. component of tools, cosmetics, laundry detergents, jewelry and many other everyday objects), nickel is a difficult metal to be eliminated from human environment. Currently, it is considered as one of the most common allergens in the world, but unfortunately it also has immunotoxic and carcinogenic effects. Ni, as well as other xenobiotics, can enter the animal's body by ingestion along with food or water consumed, as well as through the body's surface. Through the body cavities, it can be distributed throughout the body, where it causes changes that are often irreversible. Mitochondria are organelles which play an important role in activation of many mechanisms responsible for cell survival or cell death. Numerous changes of their activity or their membrane potential could appear after stressor treatment. However, no information about the possibility of mitochondrial regeneration after Ni treatment is available. Nickel is described as occurring in the water as e.g. (a) in a freshwater environments (lakes, rivers) (0.02 mg/l), meaning that it is the highest acceptable concentration of nickel in drinking water, (b) water that comes in contact with nickel coatings (0.2mg/l). Toxic concentration determined for freshwater invertebrates, including freshwater crustaceans is 8mg / l. In the literature, however, sporadic data on the effects of nickel on organs in animals can be found, while there is the lack of a holistic approach, i.e. the presentation of changes caused by this heavy metal at all levels of the organization of the animal's body, i.e. from tissue level, through cells, cell organelles, ATP level, ROS and even specific proteins (whether enzymatic or regulatory). When preparing the project, we relied on literature data and the research of, among others, Polish scientists studying the content of nickel in freshwater environments and soils from various regions of Poland, as well as data on reports from regions from around the world. Due to the fact that this metal is present in soil, air or water, both natural and polluted environments, we chose one of the freshwater crustacean species *Neocaridina davidi* (Crustacea, Malacostraca) as the object of research. This species is of great interest among crustacean breeders around the world, it is characterized by simple body structure, including digestive system, high fertility, as well as ease of breeding. Hence, this species has been of interest to scientists for a long time. For the analysis and comparison of changes at different levels of animal body organization, two regions of the midgut (a middle region of the digestive system that is responsible for the synthesis, secretion, absorption, storage of reserve materials and xenobiotics) were selected: the intestine and the hepatopancreas. This organ together with epidermis that covers the body, is one of the first barriers for the whole body against the influence of external stressors, such as heavy metals. The description and analysis of changes at the ultrastructural level of the midgut in freshwater organisms cultured in nickel-contaminated water (different concentrations of Ni selected on the basis of literature and our preliminary studies when we established LC50 and conducted first analysis using light microscope ) have been performed during our preliminary studies. Here we plan to describe the changes that may occur in the mitochondria of described organ as a result of returning animals to life in uncontaminated water (devoid of Ni). Therefore, we will be able to determine what mechanisms connected with mitochondria are activated in the midgut epithelium as involved in maintaining homeostasis of the entire organism, and whether the changes under the effect of Ni are reversible. Thanks to modern methods used all over the world, such as flow cytometry, confocal microscopy, we want to show what relationships appear in the mitochondria, in their membranes, and even at the level of activation of the production of various substances, such as reactive oxygen species, enzymes, etc. The obtained results should be widely used because they will combine the issues of morphology, histology, ultrastructure, physiology and environmental changes, so they should be of interest not only to biologists, histochemists, histologists or cytologists, but also toxicologists and ecotoxicologists.