Nickel is one of the elements widely distributed in the terrestrial or freshwater environment, and it can come from both natural sources and as a result of anthropological activity. However, it is an essential metal for some species of animals, microorganisms, and plants, therefore, with insufficient or excessive supply of this element, symptoms of deficiency or toxicity may occur. One of the invertebrates' organs that have direct contact with xenobiotics in the living environment, or the water and food consumed, is the midgut. In freshwater crustaceans, such as the *Neocaridina davidi*, popular among breeders worldwide, it is composed of the intestine and the hepatopancreas. These organs are covered with epithelium formed by specialized cells: D (in the intestine) or B, F, and R (in the hepatopancreas), while E-cells are responsible for regenerative functions in these organs.

This study aimed to investigate the effect of nickel on the midgut of the freshwater shrimp *N. davidi*, which is not naturally present in high concentrations in their habitat. The animals were exposed to nickel in the water for one week and two weeks and then returned to clean water for one week and two weeks to verify that the changes that appeared were reversible. Using quantitative and qualitative methods, several parameters were checked:

- accumulation of metal in the body of animals;
- activation of degenerative processes, including autophagy, apoptosis, and necrosis;
- the structure and function of mitochondria, including the ATP level in cells;
- induction of oxidative stress;
- the cell cycle and proliferation.

The obtained results indicate the harmful effect of nickel on *N. davidi* shrimps. In the exposure groups, an intensification of changes in the above-mentioned conditions was observed, proportional to the length of exposure. In the intestine, the changes were more intense than in the hepatopancreas. Returning the shrimp to clean water after previous exposure to metal was associated with a gradual regeneration, more intensive after 2 weeks of purification. However, in most of the analyzed parameters, this time was not sufficient to restore the control parameters.