ABSTRACT

My research work has focused on issues related to the transformation of mercury (Hg) in benthic organisms Mercury is one of the most toxic elements, so the problem of its emission to the environment, dispersal and transformation has been of great interest for many years. Mercury occurs in nature in low concentrations and in many forms. Knowledge of these forms is crucial to understanding the transformations that the metal undergoes in the environment, as well as its bioavailability to organisms. Identifying the fraction of Hg in organisms can help identify the main factors influencing the incorporation of this metal into the marine trophic chain and its accumulation and biomagnification in living organisms. It is worth noting that the thermal desorption method has not previously been used to fractionate Hg in organisms. It is important to know all forms of mercury, especially the labile forms that may be bioavailable to organisms (not only methylmercury). The form in which Hg occurs in nature affects its physical and chemical properties. This is why the proportion of different fractions of Hg can indicate the different origins of the metal in samples and influence its rate of accumulation.

The distribution of Hg in organs and the elimination pathways of mercury from organisms belonging to higher trophic levels, i.e. fish, birds and mammals, is quite well understood and described in the world literature. Research in organisms such as invertebrates has mainly focused on determining the concentration of Hg in soft tissue and the effect of seasonality on its variability. This is probably due to the size of the organisms and the small size of the individual organs, and thus the difficulty in obtaining a representative amount of material for chemical analyses. **Therefore, another of my most important scientific achievements is to identify the distribution of Hg and its form in soft tissues in organisms from lower trophic levels such as clams and crabs**. The concentration of neurotoxins in clams shells or crustacean exoskeleton is generally much lower than in tissues, so that also determination in whole organisms may give an underestimated picture of organismal intoxication. Therefore, in the present study, I paid great attention separately to the soft tissues and the hard tissues of the exoskeleton, which may play an important role in the detoxification of the organism from toxic Hg. **Accordingly, I have positively verified the hypothesis that exoskeleton elements may represent a site of accumulation and temporary deactivation of Hg in crabs, so that they can also live in polluted regions and their muscle tissue is fit for human consumption, and that the clams shell represents an important role in the transfer of mercury along the soft tissue-shell (hard tissue) pathway** . In addition to this, I verified the environmental aspect of my study, where I examined how physiological state (season), biometric parameters and sex determine the bioaccumulation and elimination of mercury in crabs and mussels in the southern Baltic.

Impact of my research on the development of the discipline

1) To determine in which form mercury enters the crustacean and mollusc organism with the food, and in which form it is bioaccumulated in soft and hard tissues.
2) Recognition of the distribution of mercury in the internal organs of organisms from lower trophic levels, using the example of the largest Baltic crustacean, *Eriocheir sinensis*.
3) Recognition of mercury transfer pathways in invertebrate organisms based on environmental factors, biometric parameters and sex.
4) To relate the accumulation of Hg fraction in hard tissues to the type of biomineralization of clams shells and crab's exoskeleton.
5) Filling the research gap on the identification of different pathways of Hg elimination in organisms from lower trophic levels.
6) Determination of mercury concentrations in alien species, with a view to determining their role in Hg trophodynamics, which are becoming a new link in the trophic chain of the southern Baltic.

Keywords

Mercury, Hg fractions, macrozoobenthos, alien species, bioaccumulation, elimination, trophic chain, *Dreissena polymorpha*, *Rangia cuneata*, *Eriocheir sinensis*, *Rhithropanopeus harrisii*