In recent years, environmental pollution and its impact on human health is not only the subject of many research, but also of media and politicians interest. Every year, an increasing number of new anthropogenic substances get into the environment, however its harmfulness people usually discover "after the fact" . As increasing attention of researchers attract endocrine disrupting compounds - EDCs. An endocrine disrupting compound was defined by the U.S. Environmental Protection Agency (EPA) as “an exogenous agent that interferes with synthesis, secretion, transport, metabolism, binding action, or elimination of natural blood-borne hormones that are present in the body and are responsible for homeostasis, reproduction, and developmental process”. Recent literature clearly shows that endocrine disrupting compounds have harmful effects on living organisms. Although the EDCs mechanism is not uniform, in many organisms they cause an adverse changes in the reproductive and immune systems as well as carcinogenic effects. Recently, EDCs are also considered as a factor that stimulates obesity. The number of defined EDCs range from a few dozen up to several hundred. Despite its harmfulness, they are still used in many industry branches (eg. production of paints and coatings, cosmetics and medicines, packaging as well as in agriculture). The authors focused on the study of extremely hazardous substances: mercury - one of the most toxic trace metals and its organic form - methyl mercury, which is the most powerful/potent neurotoxin as well as alkylphenols (4-tert-octylphenol and 4-nonylphenol), which imitate the action of 17 β estradiol, that may lead to hermaphroditism and bisphenol A with its carcinogenic effect. Not enough scientific information about these compounds in the Baltic Sea environment in combination with their toxicity indicates desirability of undertake research which aim is to identify the transfer of EDCs through the highest trophic level.

Selected endocrine disrupting compounds enter the environment with waste, sewage and garbage. They get to sea with river runoff and through atmospheric deposition. There are absorbed by the plant and then retrieved by the animals with food. This cause they pass through the entire food chain, on the top of which are birds, marine mammals and humans. The EDCs concentration in sea water has a trace value, but while going up the food chain they undergo accumulation and biomagnification. In consequence, EDCs concentration in the predator’s tissues is hundreds or even thousands of times higher than in the surrounding water. Authors of the project, undertaking experimental studies of transport of EDCs in the trophic chain, chose the largest marine mammals – grey seals (Helichoerus grypus). Grey seals are highly sensitive to environmental change and can therefore be considered as biovector - indicator of direction and "strength" of EDCs transformation at the highest level of the trophic web. Predatory mammals highest dose of endocrine disrupting compounds receive with food. However, only a part of these compounds is absorbed by the animals. The remaining part of EDCs is eliminated from their body with the excrements or is built into fur and claws. That's why one of the tasks of the research is the evaluation what part of the EDC’s dose introduced into the body seals with food may be eliminated from the seal’s body as well as do seal’s excrements can be considered as secondary pollution of seal’s habitat? The project also aims to examine intergenerational transport - from a female seals to her offspring. This transport of EDCs goes by the two ways. The first way is the transport of EDCs with blood through the blood-placenta barrier. As a result, at the end of pregnancy concentration of methylmercury and phenol could be the same in the blood of mother and fetus. A second way of EDC’s biological transport is lactation. Offspring with mother's milk receives some load of EDCs. Usually a three-week feeding period can provide the pup comparable or even higher dose of EDCs in relation to the pregnancy period. However, due to the rapid growth of young seals, all substances that enter their body undergo dilution.

The planned research are the first of this kind experimental studies carried out on the Baltic gray seals. The research will be carried out in the sealarium at Marine Station of Institute Oceanography University of Gdansk in Hel, where permanently reside 6 gray seals (2 males and 4 females). The authors provide a two-year experiment, during which regularly (every two months) will be collected blood samples, hair and feces from adult seals. Additionally, in the last month before the seal birth until the end of lactation frequency of collection of blood from pregnant females increase to one sample per week. After the birth, also the placenta and milk from the female will be collected. The experiments will be extended to seal pups, from which every week blood, fur and excrement (in the first period of life) will be collected. Sampling from the pups will last three months, until the release them to the sea. In addition, water from the pools and seal’s food (herring) will be collected. In the collected samples the following parameters will be analyzed: total mercury (AAS at AMA-254 analyzer), methyl mercury (GC/pyrolysis/CVAFS) and phenol derivatives (liquid chromatography). These analyzes will be carried out in the Institute of Oceanography University of Gdansk.

The project results allows us to determine the interaction between seals and the environment of their lives. The project provides information about the amount of EDCs food-consumer-excrement transfer as well as about the kinetics of this process and its conditions. This is one of the least understood steps in the mercury and phenol derivatives cycles. An important aspect of the research is the analogy to man. Man, like seals, is located on the highest trophic level, and the fish, which are the main source of EDCs in seals, are also an important part of human diet. Therefore, the research conclusions could indicate the direction of further research.