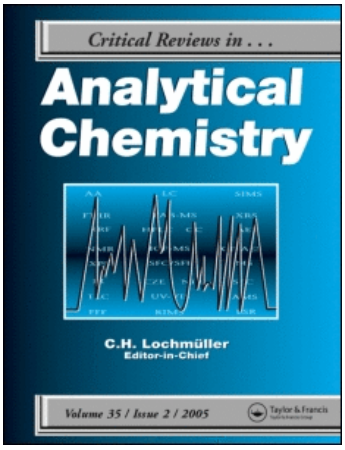

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SEMIPERMEABLE MEMBRANE DEVICES FOR MONITORING POLLUTANTS AND THEIR EFFECTS IN AQUATIC ECOSYSTEMS OF LITHUANIA

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Modern environmental analysis and monitoring methods have become increasingly expensive as a consequence of constantly rising environmental quality criteria and the necessity to measure concentrations of pollutants at ultra-low levels. This is especially acutely felt in East European countries undergoing rapid economic and infrastructural changes. Most of these countries, like Lithuania, aspire to keep up with modern environmental quality standards yet little money is available for this purpose. Nowadays there are clear needs for rapid, effective and low-cost integrated methods that would allow not only to monitor the fate and concentrations of chemical pollutants in the environment directly but also to evaluate their effects and assess the hazard these chemicals pose for the environment and human health.

Membrane-based passive samplers seem to be a promising tool for the time-integrated monitoring of hydrophobic pollutants in aquatic ecosystems. In these devices, the uptake of chemicals is based on the process of passive partitioning of a compound between water and a lipophilic solvent enclosed in a semipermeable polymeric membrane. Thus, the passive samplers can be used as indicators of bioavailability of chemical pollutants. Triolein-filled low density polyethylene-based semipermeable membrane devices (SPMDs) have proven to be most effective. In 1995 and 1996, we deployed SPMDs in aquatic ecosystems in several locations in Lithuania, including the River Neris upstream and downstream from Vilnius, the Kulpė River in northern Lithuania, and the Ūla and Vilnia Rivers. The samplers were analysed by gas chromatography/spectrometric methods. In addition, SPMD dialysates were tested in standard toxicity and genotoxicity assays including Microtox^{R}, the Ames test, Rotoxkit^{TM} and Daphntoxkit^{TM}. Polynuclear aromatic hydrocarbons were the most prominent pollutants found in the samples during the chemical analysis. Most of the samples were highly toxic in the bioassays. Results of our studies suggest that SPMDs are a valuable tool in the environmental monitoring of chemical pollutants, and integration of the passive sampler technique with bioassays may permit early warning detection of pollutants before they cause appreciable damage at the organism or ecosystem level.