

[KN 3.2]

Biological Response for Aquatic Biota to Organometallic Ecotoxicants**Valery S. Petrosyan**Department of Chemistry, M.V. Lomonosov University, Moscow, Russia; e-mail : petros@org.chem.msu.ru

The most widely distributed organometallic ecotoxicants in the environment are organic derivatives of mercury, tin, lead and arsenic. Their presence in the tissues of fish and crustacea has been established experimentally. This is why the danger for people who consume sea food is evident. Particularly, the World Health Organization regulation states that the mean daily consumption by man of methylmercury compounds should not exceed 29 μg . The experimental data (compilation by CROMPTON, 1998) show that the consumption of 100 g of tuna, halibut, pike, trout and swordfish may substantially exceed this Maximum Permitted Limit. The toxic effects of organic derivatives of mercury are similar in river water and seawater, and cause 100% mortality in fish at the level of 3 $\mu\text{g L}^{-1}$.

The biological effects of organotin ecotoxicants depend mainly on the number and nature of the alkyl and aryl groups bound to tin. The most pronounced effects have been observed in the marine environment because of the intensive use of tributyl and triphenyltin containing antifouling paint compositions for ships. The recent compilation by Arakawa (1998) shows that trialkyl and triaryltin derivatives exert a powerful toxic action on the central nervous system and also suppress the thymus-dependent immune responses. Tributyltin compounds in marine ecosystems at 0.5 g L^{-1} have been shown to stimulate the adverse effects in fish and other creatures. LC50 values for organotin ecotoxicants are

extremely low (1-4 $\mu\text{g L}^{-1}$), thus confirming the high toxicity of these compounds.

The degradation of tetraalkyl lead (alkyl = Et, Me) brings the highly polar trialkyl and dialkyllead derivatives into the environment, which are known to have a high toxicity in mammals. The concentrations of organolead compounds in the river and coastal waters, as well as in crustacea, are not very high, but these concentrations are rather high (1.520-18.940 $\mu\text{g kg}^{-1}$) in sea fish (pike, carp). When the concentrations of organolead ecotoxicants in water are higher than 0.1-1.0 $\mu\text{g L}^{-1}$, many sea creatures demonstrate a risk of ill health or mortality. People who eat fish with higher levels of organolead concentrations run a risk of experiencing adverse effects in their health.

Organoarsenic compounds with pentavalent arsenic are the essential nutrients for crustacea and innoxious to mammals. On the other hand, organic derivatives of the trivalent arsenic are very toxic to most organisms. Highly toxic trimethylarsenic have verifiably been formed from the inorganic derivatives of arsenic via biomethylation (CHALLENGER, 1933).

The organic derivatives of mercury and tin have been shown by the author and his collaborators to be quite toxic for the Caspian Sea sturgeons, thereby strongly affecting their physiological characteristics.