

DETOXIFYING PROPERTIES OF HUMIC SUBSTANCES TO FLUORANTHEN IN RELATIONSHIP WITH HYDROPHOBICITY AND MOLECULAR WEIGHT OF THE HUMICS

Irina V. Perminova, Natalia Yu. Yaschenko, Natalia N. Danchenko,
Valeriy S. Petrosyan

Lomonosov University of Moscow; Department of Chemistry
119899 Moscow, Russia

Detoxifying properties of humic substances (HS) to PAH in relationship with hydrophobicity and average molecular weight of HS were studied on the example of the following toxicological model: fluoranthen - HS - *Daphnia magna*. HS samples under study were isolated from peat, as well as from riverine and marine water. Grazing activity of *D.magna* was used as a test-function. Concentration of fluoranthen in all the tested solutions was 0.14 mg/l, concentration of HS varied in the range of 1-12 mg/l. An impact of HS on the toxicity of fluoranthen was estimated in the percentage from the initial grazing activity of *D.magna* in control solutions. Hydrophobicity of the HS samples were estimated by means of measuring their distribution between aqueous phase and C18-phase of Sep-Pak cartridges. Average molecular weight of HS were determined with a use of gel-permeation chromatography on TSK 40 and 50 HW gels. Grazing activity of *D.magna* in the presence of 0.14 mg/l of fluoranthen accounted for 40% from the control one. The highest detoxification potential in relation to fluoranthen was displayed by alcali-extracted peat HS: at the presence of HS in concentration of 12 mg/l grazing activity of *D. magna* achieved the control one. HS isolated from riverine water supported grazing activity on the level of 70%. No reduction in the toxicity of fluoranthen was registered in the presence of both marine HS and concentrate of water-extracted organic matter of peat. The latter was used as a model of the least molecular humics, which is being lost under conditions of the traditional technique of alcali-extraction of HS from peat, as well as from soil. A comparison of the determined hydrophobicity and molecular weight distribution of the HS under study with the obtained toxicological data displayed an important role of the both parameters in the level of the effect exposed by HS on toxicity of fluoranthen in aqueous medium. The obtained data showed that maximum detoxifying effect was characteristic both to the highest molecular HS (average molecular weight in the range of 3-10⁵ KD) represented in this study by the alcali-extracted samples from peat, and to the most hydrophobic HS (log Kow 1,0-1,5) - the XAD-2 extracted samples of riverine HS with the average molecular weight in the range of 0.7-1.5 KD. No effect on the toxicity of fluoranthen was displayed by the two samples - marine HS and water-extract from peat of the similarly low molecular weight (< 700 KD), but of the quite different hydrophobicity. It was concluded that it is the combination of the both characteristics - molecular weight and hydrophobicity intrinsic to the HS sample, which determines its detoxifying properties in relation to PAH.