Abstract

Bioconcentration, understood as the process of accumulation of chemical compounds in organisms, is an important factor in assessing the effects of environmental pollution. However, the knowledge on this topic for many chemical compounds, especially for charged species, is still limited. The aim of this dissertation was to comprehensively assess the potential for bioconcentration of such chemical entities. Ionic liquids (ILs) and selected transformation products (TPs) of pharmaceuticals were chosen as model chemicals. Specific objectives included both analytical tasks and experimental tests of bioconcentration using *in vitro* and *in vivo* methods. *In vitro* tests assessed the potential for bioconcentration of 27 ILs and seven TPs using solid-supported lipid membranes. In contrast, *in vivo* tests using the mussels *Mytilus trossulus* allowed confirmation of whether selected ILs cations can bioconcentrate in the tissues of aquatic organisms. The results indicate that ILs may have a high affinity to the cell membrane phospholipids. In the case of ILs cations, it was confirmed that the key parameter determining this process is the length of the side chain, which directly corresponds to the hydrophobicity of the compound. Moreover, although anions generally present weaker interactions with phospholipids than cations, when strongly associated with cations they have an effect as counter-ions. Contrary to ILs, the performed study confirmed that the analysed TPs do not undergo bioconcentration based on interactions with lipids. Furthermore, within the scope of the present work, the first procedure for the analysis of a mixture of imidazolium cations in marine invertebrate tissues was developed and fully validated, allowing the determination of these compounds at the concentrations on the ng/g level. By using this method, it was possible to carry out an *in vivo* experiment, in which it was demonstrated for the first time, that imidazolium cations can bioconcentrate in marine invertebrate tissues. The obtained results therefore include highly important information in the context of environmental risk assessment of charged chemicals, but also provide a fully validated analytical procedure for the determination of imidazolium cations in the complex biological matrices.

Keywords: bioconcentration, ionic liquids, pharmaceuticals, *in vitro, in vivo*, analytics, mussel, *Mytilus trossulus*