
Water-soluble polymers as new emerging concern: toxicity evaluation of polyvinyl alcohol

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Abstract

Despite plastic pollution represents a well-known emerging global issue, no information about the impact on organisms of another emerging category of synthetic polymers, namely the water-soluble polymers (WSPs), are available. However, WSPs are produced in large quantities and used in a plethora of consumer applications, with a consequent continuous release into the environment. The aim of this study was the investigation of toxicity induced by polyvinyl alcohol (PVA), one of the main used WSPs, and a PVA-commercial bag used for carp-fishing. Firstly, the hydrolysis degree, as well as the eventual presence of additives in the PVA bag have been characterized through the Fourier Transform Infrared Spectroscopy (FT-IR) and Nuclear Magnetic Resonance (NMR), respectively. Then, we assessed the acute and chronic toxicity on two freshwater organisms: the crustacean *D. magna*, exposed for 14 days in semi-static conditions, and the embryos of the teleost *D. rerio* (exposure from 0 to 120 hours post fertilization - hpf). We evaluated the immobilization/mortality of specimens as acute effects, while for chronic toxicity we selected the behavioral alteration on swimming performance and the activity of monoamine oxidase (MAO). The main results showed firstly a hydrolysis degree of 85% in the PVA bag, as well as the presence of some additives. Regarding the effects, significant alterations in vertical and horizontal movement have been observed in *D. magna* after the exposure of both materials, while for *D. rerio* only the exposure to the commercial product led to swimming performance alteration. Despite this, no significant differences in MAO activity have been observed in all treated groups. However, other investigations are necessary to provide the initial knowledge of risk assessment for these compounds and to clarify WSP ecotoxicological impact. For this reason, further analysis is underway, to identify the potential effects of other kinds of WSP on aquatic organisms' health.

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