Proceedings of the 4th International Conference on Environmental Pollution and Remediation
Prague, Czech Republic, August 11-13, 2014
Paper No. 99

Assessing Toxicity of Anthelmintic Drugs (Fenbendazole and Flubendazole) to Aquatic Organisms

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Extended Abstract

Flubendazole (FLU) and fenbendazole (FEN) belong to benzimidazole group of anthelmintics widely used in veterinary and human medicine for the treatment of intestinal parasites as well as for the treatment of systemic worm infections (Danaher et al., 2007). Being excreted from the body with faeces and urine they reach environment via different routes. According to literature residues of FLU were found in the leachate from agricultural manure to drainage waters reaching values of up to 300 µg/L (Weiss et al., 2008) as well as in influent (19.9 – 89.7 µg/L) and effluent (55.0 – 671.0 ng/L) wastewater from the pharmaceutical industry (Van De Steene and Lambert, 2008). Moreover, they were also detected in the surface waters (the Llobregat River, Spain) at the concentrations up to 1.32 ng/L (Zrnčić et al., 2014). Even though the health-risk assessment of pharmaceutical compounds regarding their toxicity is available, little is known about the ecotoxicological effects on non-target organisms. Aquatic organisms are particularly important targets, as they are exposed via wastewater residues over their whole life. Hence, in our research we evaluated ecotoxicty of these pharmaceuticals towards four aquatic organisms: marine bacteria (*Vibrio fischeri*), green algae (*Scenedesmus vacuolatus*), duckweed (*Lemna minor*) and crustacean (*Daphnia magna*). Ecotoxicity tests were combined with chemical analysis in order to determine the actual exposure concentration of the compounds used in the experiment as well as to study their stability and adsorption. The strongest negative impact of FLU and FEN was observed to *Daphnia magna*. Obtained EC_{50} values were at low µg/L levels, the concentration range of FLU and FEN found in the environment, what suggests potential environmental risk posed by the investigated drugs. Difference in species sensitivity towards studied benzimidazoles was observed. No adverse effect on growth of algae *S. vacuolatus* and duckweed *L. minor* as well as to the luminescence of marine bacteria *V. fischeri* up to the highest tested concentration was noted.

Acknowledgments

Financial support was provided by Polish National Science Centre under grant DEC-2011/03/B/NZ8/03009.

References

Danaher M., De Ruyck H., Crooks S.R.H., Dowling G., O'Keeffe M., (2007). Review of methodology for the determination of benzimidazole residues in biological matrices J. Chromatogr., B., 845, 1-37.

Weiss K., Schüssler W., Porzelt M., (2008). Sulfamethazine and flubendazole in seepage water after the sprinkling of manured areas. Chemosphere, 72, 1292-1297.

Van De Steene J.C., Lambert W.E., (2008). Validation of a solid-phase extraction and liquid chromatography–electrospray tandem mass spectrometric method for the determination of nine basic pharmaceuticals in wastewater and surface water samples. J. Chromatogr., A, 1182, 153-160.

Zrnčić M., Gros M., Babić S., Kaštelan-Macan M., Barceló D., Petrović M., (2014). Analysis of anthelmintics in surface water by ultra high performance liquid chromatography coupled to quadrupole linear ion trap tandem mass spectrometry. Chemosphere, 99, 224–232.