



## Ecotoxicity of chosen pharmaceuticals in relation to micro-organisms—risk assessment

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Received 29 March 2013; Accepted 21 October 2013

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### ABSTRACT

The aim of this study is to assess the impact of three pharmaceutical substances from the group of antibacterial drugs (ciprofloxacin), estrogens (17 $\alpha$ -ethinylestradiol) and cytostatic drugs (5-fluorouracil) on micro-organisms. Enzymatic tests (bioluminescence tests with *Vibrio fischeri*, dehydrogenase and hydrolytic activity of activated sludge organisms) and growth tests (with *Pseudomonas fluorescens* and microbial assay for toxic risk assessment with 10 species of bacteria and 1 species of fungi) were performed. The obtained values of concentrations of EC<sub>50</sub>-t and NOEC showed a different sensitivity of the organisms to the examined active substances. According to the EU criteria, ciprofloxacin was extremely toxic and very toxic to nine species and toxic to three species of bacteria. 17 $\alpha$ -ethinylestradiol was extremely toxic and toxic to five species and also harmful to five species. 5-fluorouracil proved to be extremely toxic to seven micro-organisms and very toxic and toxic to five. All active ingredients were non-toxic to activated sludge micro-organisms. The lowest NOEC values for ciprofloxacin and 17 $\alpha$ -ethinylestradiol equalled 0.0015  $\mu\text{g/L}$  (*V. fischeri*), and for 5-fluorouracil 0.08  $\mu\text{g/L}$  (*K. gibsonii*). The risk assessment, conducted on the basis of the PEC/PNEC quotient, showed a significant risk in relation to micro-organisms caused by the presence of ciprofloxacin and 17 $\alpha$ -ethinylestradiol in concentrations detected in surface waters.

**Keywords:** Ecotoxicity; Ciprofloxacin; 17 $\alpha$ -Ethinylestradiol; 5-Fluorouracil; Micro-organisms; Risk assessment

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Presented at the 11th Scientific Conference on Microcontaminants in Human Environment. 25–27 September 2013, Wisla, Poland  
Organized by Department of Chemistry, Water and Wastewater Technology,  
Faculty of Environmental Engineering and Biotechnology, Czestochowa University of Technology

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