

Abstract

Dubánková, M. (2010) – Ecotoxicological Screening of the Select Drug II.
Diplomová práce.

Charles University in Prague, Faculty of Pharmacy in Hradec Králové,
Department of Pharmaceutical Botany and Ecology

Quinolone antibacterial agents represent a chemically homogenous group of purely synthetic antibiotics which originated in the early 1960s and still play an important role in the antimicrobial chemotherapy.

Quinolones (or more specific, fluoroquinolones) are frequently used in human therapy for treatment of both common and serious diseases (they are irreplaceable also against bioterrorist weapons, such as anthrax). Some of the fluoroquinolones are also among the most used veterinary antimicrobials, including their large-scale usage in aquaculture. Only in the Czech Republic, their annual consumption is in the order of millions of defined daily doses (DDD).

Fluoroquinolones as entirely synthetic compounds do not have any natural source in the environment – therefore their occurrence in both terrestrial and aquatic ecosystems is the result of human activity. Excluding the direct application to the aquatic environment (prophylaxis and treatment of bacterial diseases in the aquaculture), the most common point of entry of fluoroquinolones into the environment is via the wastewaters. Numerous studies carried out in different countries have shown that even after several steps of wastewater cleaning process, fluoroquinolones can be found in the final effluent of the wastewater treatment plants (the amounts of fluoroquinolones are mostly in the order of tens or hundreds of ng L^{-1}). The effects of fluoroquinolones on the aquatic ecosystem are not known enough.

In this study, I performed an ecotoxicological screening of three fluoroquinolone antibiotics (ciprofloxacin, norfloxacin, and ofloxacin, that are most commonly used in the Czech Republic) on four freshwater organisms in order to determinate acute toxicity of the tested chemotherapeutical agents. The experimental organisms included a green algal species, *Pseudokirchneriella*

subcapitata, a ciliated protozoan, *Tetrahymena pyriformis*, a rotifer, *Brachionus calyciflorus*, and an anostracan crustacean, *Thamnocephalus platyurus*. All tests were conducted as acute toxicity tests. The concentrations of fluoroquinolones started at 12 mg L⁻¹, 3 mg L⁻¹, and 0.3 mg L⁻¹, respectively and in each test at least eight different concentrations of the antibiotics were investigated.

The results suggest that the acute toxicity of the three fluoroquinolones is considerably different to various species. The fluoroquinolones exhibited low acute toxicity on algal species *P. subcapitata* and crustacean *T. platyurus*. Significantly higher acute toxicity of the quinolone antibiotics was observed on *B. calyciflorus* (with the exception of norfloxacin) and *T. pyriformis* with the respective LC₅₀ or IC₅₀ values in the range of reported quinolone concentrations occurring in the environment, and thus a possible negative impact on the natural population of these organisms.

Key words: ecotoxicology, fluoroquinolones, *Pseudokirchneriella*, *Tetrahymena*, *Brachionus*, *Thamnocephalus*