**Structure elucidation and residual antibacterial activity of danofloxacin *N*-oxide: a biotransformation product regioselectively formed by the ascomycetous fungus *Xylaria longipes***

Marina Rusch1, Annika Kauschat1, Astrid Spielmeyer1, Andreas Römpp2, Heike Hausmann3, Holger Zorn1 and Gerd Hamscher1

1 Justus Liebig University Giessen, Institute of Food Chemistry and Food Biotechnology, Heinrich-Buff-Ring 58, 35392 Giessen, Germany

2 Justus Liebig University Giessen, Institute of Inorganic and Analytical Chemistry, Schubertstrasse 60, 35392 Giessen, Germany   
3 Justus Liebig University Giessen, Institute of Organic Chemistry, Heinrich-Buff-Ring 58, 35392 Giessen, Germany

The interest in the occurrence, fate, and potential biological effects of residues of human and veterinary drugs in the environment is growing rapidly. Fluoroquinolones (FQs) are wellknown as potent synthetic antibiotics used in human and veterinary medicine. The worldwide usage of veterinary antibiotics in large amounts may lead to their accumulation in the environment as many of these compounds are only poorly metabolized. During fertilization of soil with liquid manure substantial amounts of veterinary drugs and their metabolites reach agricultural areas. Furthermore, the transfer of several compounds into plants and/or ground water resources has been reported. FQ residues in the environment may provide suitable conditions for the selective pressure towards resistant bacteria. Particularly for FQs, which serve as a last resort antibiotic for the treatment of multidrug-resistant pathogens, the amount of antibiotics in the environment should be reduced whenever possible.

In the present study, the microbial biotransformation of danofloxacin, which is exclusively used in veterinary medicine, by the soft-rot ascomycete *Xylaria longipes* was investigated. Fungal submerged cultures led to a regioselective and quantitative formation of a single metabolite within 3 days. The metabolite was isolated in pure form and unequivocally identified as danofloxacin *N*-oxide by high resolution mass spectrometry and a combination of one- and two-dimensional nuclear magnetic resonance spectroscopic techniques. The metabolite showed a reduced microbial activity of approximately 20% of the parent drug in Brilliant Black Reduction Maximum Residue Level test.

We conclude that fungal biotransformations of antibiotics accompanied by a remarkable reduction of their residual antibacterial activity may have an important ecological impact and are useful in biotechnological processes. Finally, fungal enzymes might be helpful to reduce the biological activity of antibiotics leading to a lower environmental burden.