

# MistraPharma news

**Newsletter June 2012**

MistraPharma is a Swedish research programme funded by the Foundation for Strategic Environmental Research (Mistra)

## **The fate of pharmaceuticals in sewage treatment plants and surface waters**

In a report from the Swedish Environmental Protection Agency MistraPharma scientists in Umeå investigated the fate of selected pharmaceuticals in sewage treatment plants (STPs) and the levels of these pharmaceuticals in receiving surface waters and exposed biota. The selection of pharmaceuticals included in this screening was based on the fish plasma model, i.e. potency, potential to bioconcentrate and predicted environmental concentrations.

In the study, 92 of the 101 selected pharmaceuticals were detected in the sewage treatment plant (STP) influent of at least one of the four Swedish STPs included in this study and 85 of the 101 pharmaceuticals were detected in the effluents.

Several surface water samples were measured and e.g. fifty pharmaceuticals were detected in the River Fyris samples in the range from low ng/L up to 1.8 µg/L. These measured surface water concentrations were evaluated by comparing them to critical environmental concentrations, i.e. the water concentration

that is expected to cause a pharmacological effect in fish. This evaluation showed that three pharmaceuticals in the River Fyris samples are expected to cause a pharmacological response in fish exposed to these waters. Twenty pharmaceuticals were also detected in the three pooled biota (perch) samples taken in the River Fyris. Concentrations were in the low µg/Kg range and highest detected levels were found in the perch caught in close proximity to the discharge point of the STP. Detected pharmaceuticals correlate to the surface water concentrations and previous reports on the occurrence of pharmaceuticals in biota.

These new data show that the MistraPharma approach of using the fish plasma model to assist the prioritization of pharmaceuticals is a powerful tool to use in the selection of pharmaceuticals to include in screening campaigns and also can be used to assist in the interpretation of the results.

*Jerker Fick and Richard H Lindberg, Umeå University*

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## **Pharmaceuticals in a Healthy Environment - MistraPharma Research 2008-2011**

This book – the fourth in an annual series – takes stock of the first four years of MistraPharma. It explains how the programme has contributed to advancing knowledge and outlines some of the concrete achievements made by both scientists and stakeholders. It also sets out challenges for the future, as MistraPharma embarks on a second phase from 2012 to 2015.

You can order it for free by sending an email to [info@mistrapharma.se](mailto:info@mistrapharma.se) or download a pdf-version from [www.mistrapharma.se](http://www.mistrapharma.se).

## Prioritization of pharmaceutical substances for environmental risk assessment

Since ecotoxicity data are lacking for most pharmaceutical substances and not all substances can be risk assessed at once, it is important to identify strategies for how to prioritize. MistraPharma researchers from KTH, University of Gothenburg and Umeå University have therefore evaluated nine different prioritization schemes.

The results show that there is a significant variation in data availability; some data, such as logP (lipophilicity), are available for most substances while information about environmental concentrations and bioconcentration are still scarce.

For well-studied substances like ethinylestradiol, diclofenac, and fluoxetine it was concluded that methods based on hazard were more successful in correctly ranking, compared to methods based on risk. But the fish plasma model, previously used in MistraPharma research, also showed a high success rate.

For pharmaceuticals in general it was concluded that a successful prioritization scheme should be based on risk, i.e. on both exposure and effect data.

In order to develop an adequate risk-based ranking method, exposure assessments cannot be based on sales statistics only, it also has to include degradation data, sewage treatment removal and bioconcentration ability.

Effect assessments should not necessarily include ecotoxicity data in a first-tier prioritization process since it might underestimate risks. It could instead for example include data on drug target conservation across species and pharmacological potency.

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## New partners in phase 2



### **Gen Larsson, the Royal Institute of Technology**

Gen Larsson is responsible for the MistraPharma project “Removal of prioritized APIs in wastewater treatment” and professor in biotechnology at the Royal Institute of Technology (KTH) in Stockholm. Her field of research is Bioprocess Engineering. The research integrates understanding in how process based on cells and/or enzymes can be designed to be economic, safe and sustainable. Several types of different cells are used which are grown both in suspension and in biofilm based processes. The application area of interest for MistraPharma is removal of APIs in wastewater.

### **Berndt Björleinius, the Royal Institute of Technology**

Berndt Björleinius is executive project leader for the MistraPharma project “Removal of prioritized APIs in wastewater treatment” at the Royal Institute of Technology (KTH) in Stockholm. Berndt is an expert in the fields of process design and optimization of sewage treatment plants. Further he has skill in project management for planning and realization of treatment plants with new technology, especially for research. Berndt was responsible for the Stockholm Water project “Removal of pharmaceuticals in WWTP by additional technologies”.



### **John Sumpter, Brunel University**

John Sumpter is professor of ecotoxicology in the Institute for the Environment at Brunel University, in West London, U.K. He heads a research group that studies the effects of chemicals on fish. He has an international reputation for his research on endocrine disruption in freshwater fish, caused by the presence of estrogenic chemicals in the aquatic environment. Most of his current research is focused on the possible effects of human pharmaceuticals on fish. Much of this research is conducted in collaboration with the pharmaceutical industry, with which he has strong and long-standing links.

*We wish you all a relaxing  
and wonderful summer!*

*Christina Rudén, Karin Liljelund & Héléne Hagerman*

