Pharmaceuticals in Soil, Sludge and Slurry

Nicole Adler, Christoph Schlüter, Ines Vogel

&

Unit IV 2.2 - Pharmaceuticals, Washing and cleansing agents

Federal Environment Agency of Germany

Dessau, 18/19 June 2013
Dessau, 18/19 June 2013

Federal Environment Agency - UBA

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**Routes of exposure of pharmaceuticals**

- **Sewage Sludge**
- **Food**
- **Slurry**
- Soil

Antibiotic Resistance, Soil Activity, Dung Fauna

- Groundwater, surface water, drinking water

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Pharmaceuticals in the Environment

Background:

- First detection of clofibric acid in the effluent of a sewage treatment plant in the USA 1976 (Garrison et al. 1976) – in the 1990ies first detection of clofibric acid in Berlin drinking water as well as surface and ground water

- Germany: > 150 pharmaceuticals and metabolites were found in diverse environmental matrices according to a paper of Bergmann (2011) summarizing actual literature data

- Forecast: further increasing consumption of pharmaceuticals

- Lots of publications concerning pharmaceuticals in surface water and groundwater – but only few publications about pharmaceuticals in soil, sludge and slurry
Environmental Risk Assessment of Pharmaceuticals

Pharmaceutical Regulation/ Authorization process


UBA assessed about: VMPs 600, HMPs 1250

The environmental risk assessment of pharmaceuticals is part of EU regulations:


EU-wide harmonised guidelines for conducting an ERA
Environmental risk assessment of pharmaceuticals

General ERA Framework for pharmaceuticals

Phase I

? 

STOP

Action limit not applicable for some compounds, e.g. hormones (both) or anti-parasiticides for pasture animals

VICH - EU TGDs
General ERA Scheme

Estimation of exposure → Base set data

Predicted Environmental Concentration (PEC) → Risk quotient

Benefit-risk analysis (VMPs) → Risk mitigation

Risk quotient → Risk → no risk

Marketing → Stop

Estimation of effects → Predicted No Effect Concentration (PNEC)

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Substances of concern

Pharmaceuticals (HMPs) with identified Environmental Risk
UBA results

Same situation for VMPs
2/3 of the substances which enter Phase II are classified as persistent (dt50 normalised to 12°C). Approximately 15% of the active ingredients have to undergo a PBT assessment.
No monitoring obligatory for pharmaceuticals after authorization.

Approximately 85 HMP and VMP are currently monitored in special campaigns of the Federal States of Germany.

According to an expertise provided for our agency in 2011 (Bergmann et al.) more than 200 pharmaceutical substances and more than 20 metabolites were detected in diverse environmental matrices – but for only for 15 of them an ERA was provided.

There is a lack between substances found in the environment and the knowledge about them!!!
Pharmaceuticals in soil, sludge and slurry

Hidden danger or overestimated risk?
Conference Topics

- **Occurrence and problems of pharmaceutical residues in soils**
  - Lots of data and efforts concerning pharmaceuticals in surface water – Water Framework Directive
  - Small data basis about pharmaceutical residues in sewage sludge and slurry
  - Only few data available concerning fate, bioavailability and impact of pharmaceuticals on soil microbial community, soil fauna, enrichment in soil, reduction/recovery

- **Necessity of the implementation of indicator substances for pharmaceutical residues in monitoring strategies for sewage sludge**
  - At present not enough data for the estimation of risk
  - How many pharmaceuticals at which loads are concentrated in sewage sludge?
  - Are more reduction techniques necessary to reduce pharmaceutical loads?
Conference Topics

- Transfer in plants
  - Mechanisms of transfer?
  - Problems for human health?

- Resistance to antibiotics
  - Selective advantages for the growth of resistant bacteria, possibility of gene transfer
  - Risk of accumulation and dissemination to animal husbandry and human-being?
  - Until now no strategies for the implementation into risk assessment

- Do parasiticides have long term effects on dung fauna?
  - High toxicity against dung fauna and daphnia

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Mixture Toxicity

- Until now only single substance assessment but mixture of lots of substances spread on soils!!!
- Addition of impact possible!
- Is our risk assessment protective enough?
Thank you very much for your attention!

Dessau, 18/19 June 2013
10:00 - 12:30  Scientific programme
12:30 -13:30 Lunch Break
13:30 - 15:00 Scientific programme
15:00 -15:30 Break and posterwalk
15:30 - 17:15 Scientific programme
19:00 - ... Dinner „Georgengarten“
Workshop Dinner 18.6.2013

• **Location**: Restaurant „Am Georgengarten“
  Entry of the parc area Georgengarten coming from the city
• **Start**: 7 p.m.

*Dessau, 18/19 June 2013*
Restaurant „Am Georgengarten“
Heinz-Röttger-Straße

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