



wetsus
european centre of excellence
for sustainable water technology

Research into micropollutants and antibiotic resistance at Wetsus

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19-10-2017

combining scientific excellence with commercial relevance


Micropollutants a growing concern

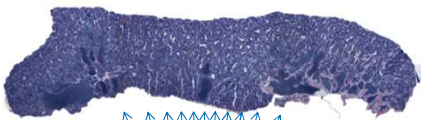



the Good Old Days

without pharmaceuticals in the water

♂ Testis




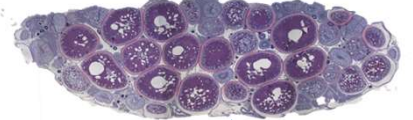





Sperm

Ovary ♀









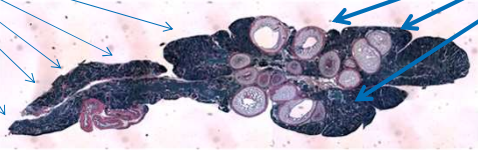
Oocytes


Slide: A. de Wilt Pictures: Meghan Fuzzen

Fish feminization







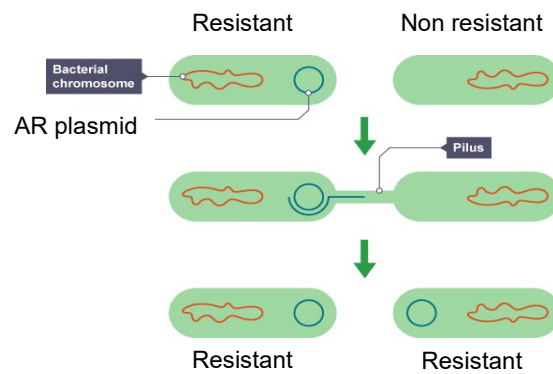


Sperm

♀♂

Oocytes

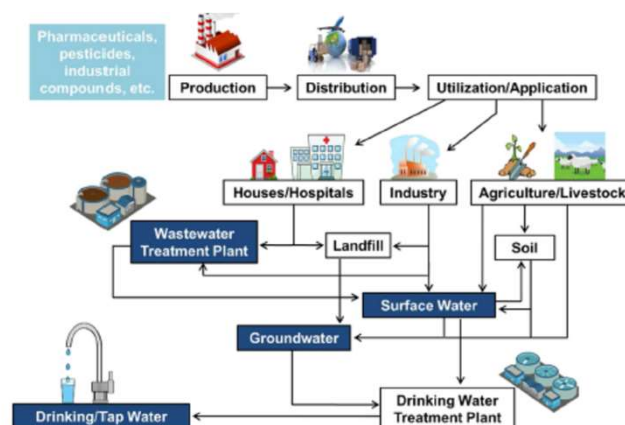
Low (subinhibitory) concentrations of antibiotics a problem?



What doesn't kill you makes you stronger!



Routes to the environment



Wastewater is the main source of human pharmaceuticals in the environment



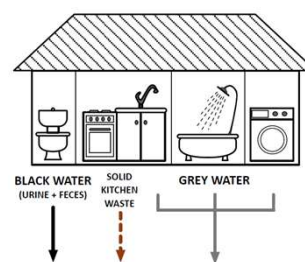
Switzerland as an example

- Based on precautionary principle they decided to upgrade wastewater treatment plants.
- WWTPs < 100,000 p.e., sensitive waters, waters serving as drinking water sources
- 80% removal of representative compounds:
 - Benzotriazole, carbamazepine, diclofenac, mecoprop and sulfamethoxazole

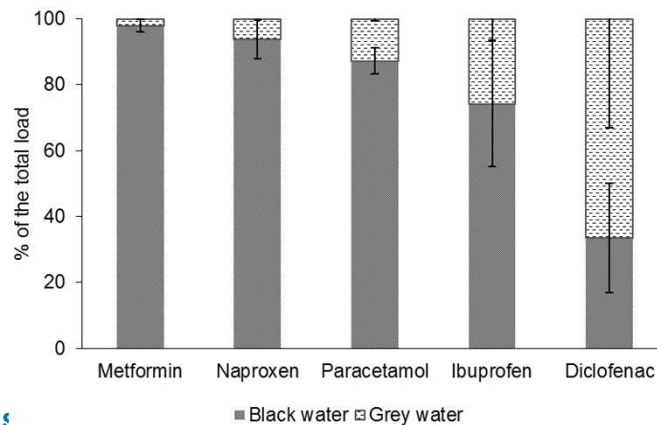


Adriano Joss, EAWAG 2013

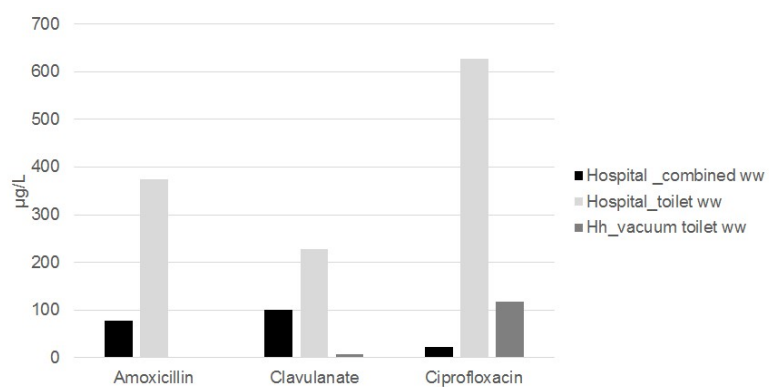
Strategies to reduce micropollutants in the environment



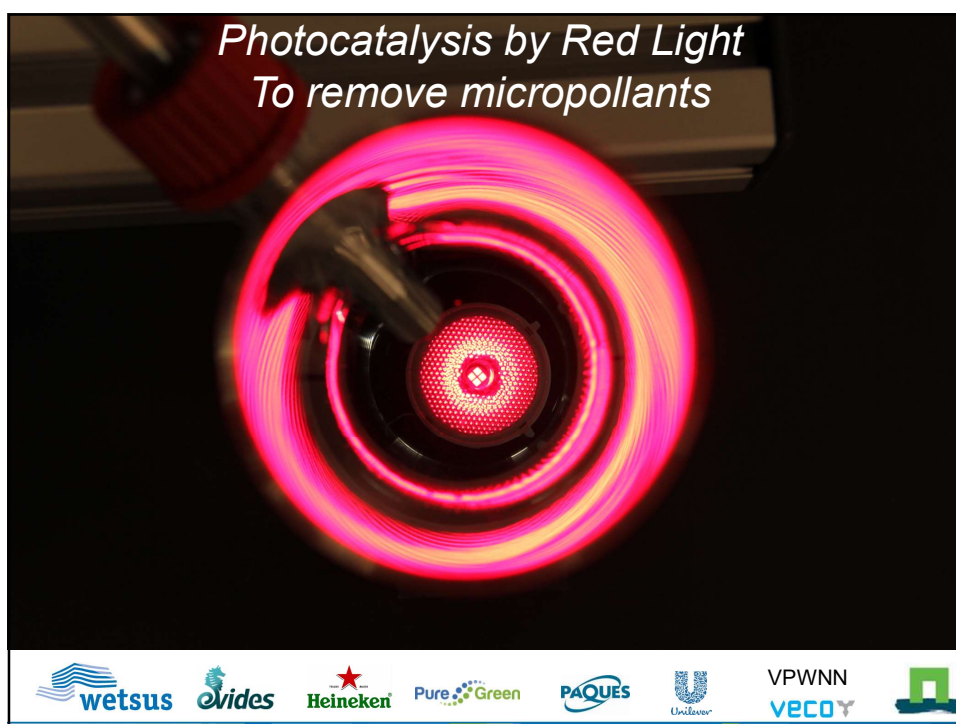
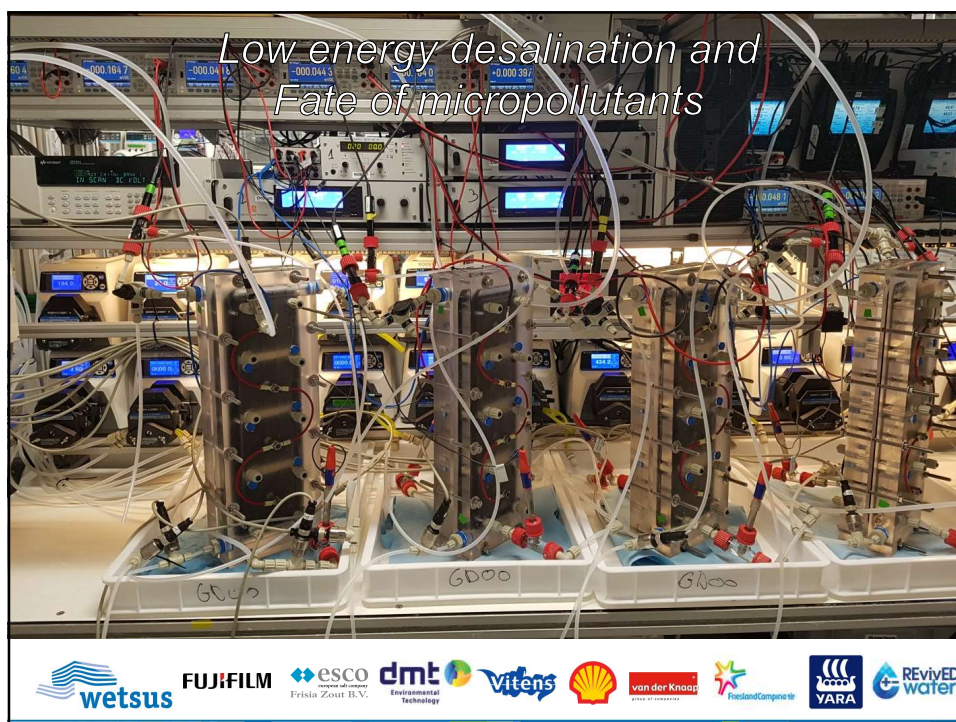
Micropollutants: How effectively do we separate at the source?

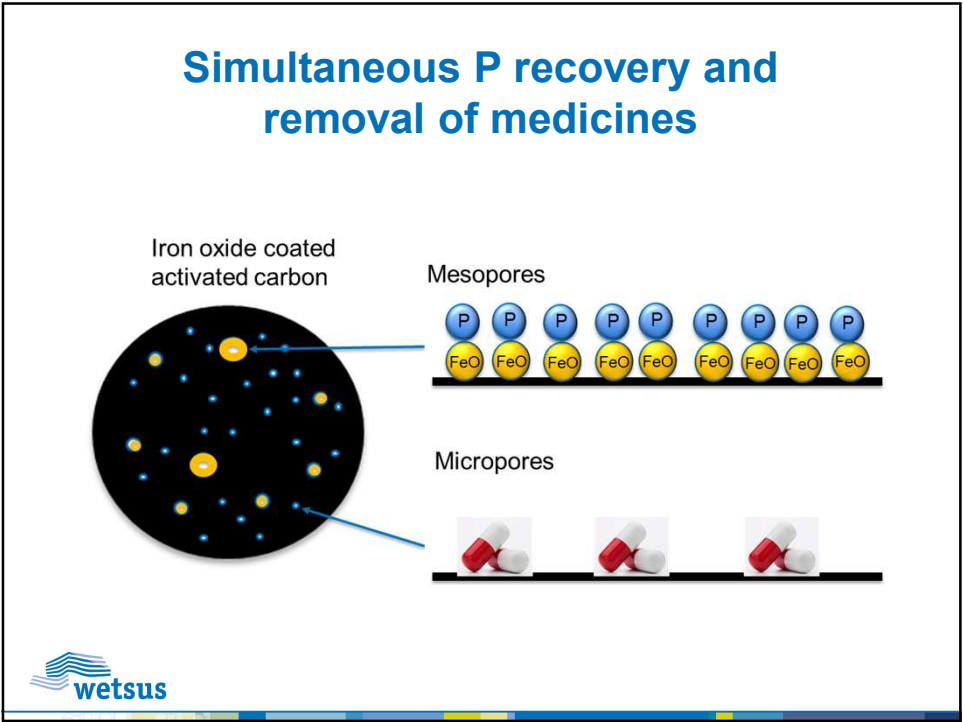


Are hospitals the main source of human pharmaceuticals in the environment?



Concentrations are high, loads are 10-20% of the total.





Antibiotic resistance projects within Wetsus

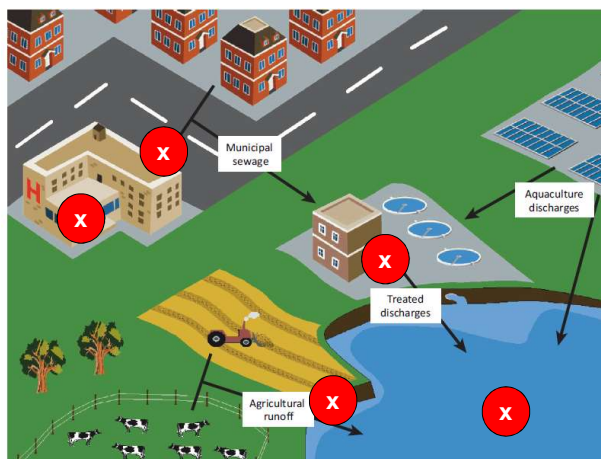
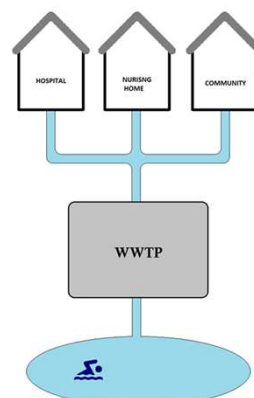


Figure 1. Different anthropogenic activities that result in the dissemination of antibiotic resistance genes (ARGs) in aquatic environments.



Origin and spread of AR

Health sector focus



Manure based AR spread



Ministerie van Economische Zaken, december 2013



Universiteit Utrecht
Institute for Risk Assessment Sciences

Environmental = low = subinhibitory concentrations?

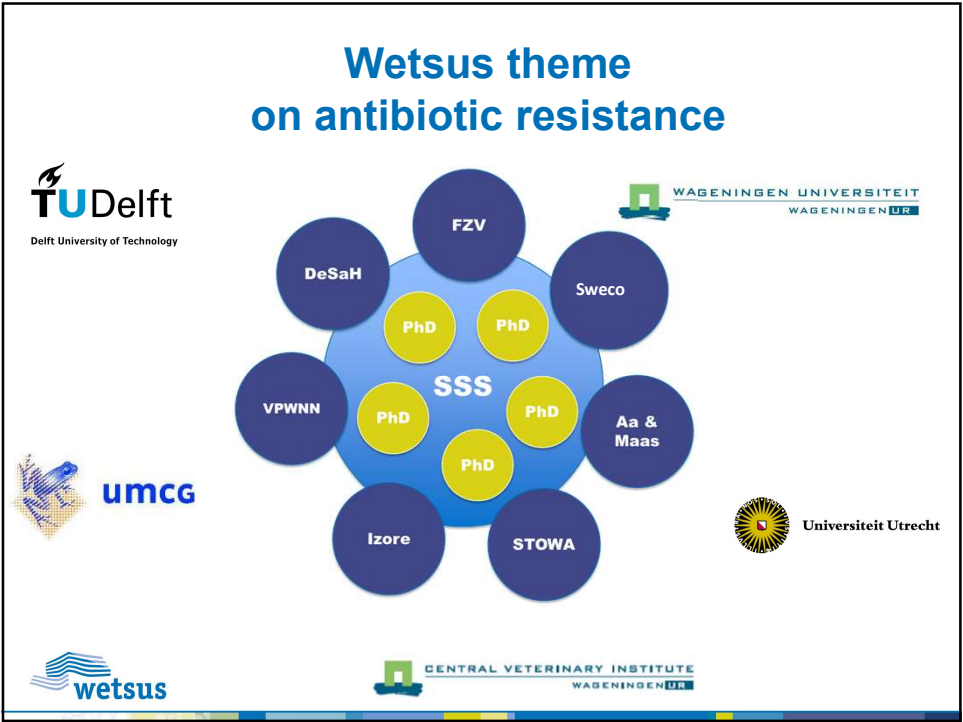
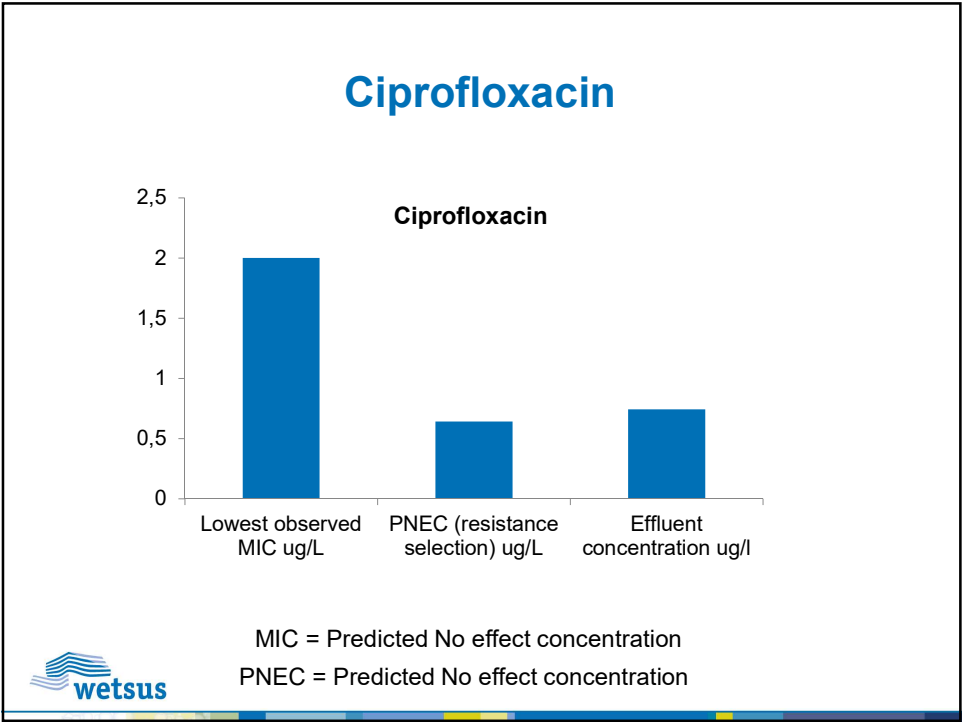
Minimal inhibitory concentrations (MIC – $\mu\text{g/L}$ - mg/L range)

- MIC tetracycline and E.coli 1500 $\mu\text{g/L}$

Concentrations in the environment – ng/L - $\mu\text{g/L}$

- Tetracycline in wastewater 0.62 $\mu\text{g/L}$





Outlook

- Micropollutants gain attention and measures are underway
- Antibiotic resistance can be tackled alongside the issues of micropollutants
- Water technology is/will be required should we want to reduce loads of micropollutants/antibiotic resistance into the environment

