

# Removal of Pharmaceutical Residues and Other Priority Contaminants in the Effluent of Sewage Treatment Plants

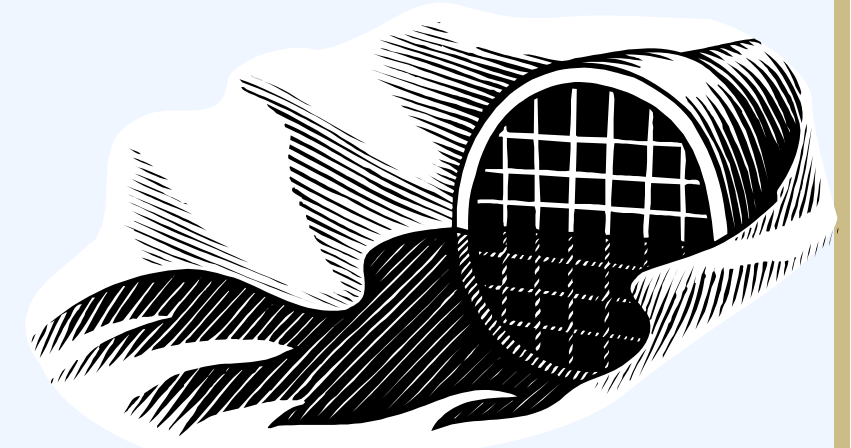
C. Baresel\*, H. Ejhed\*, K. Westling\*, U. Fortkamp\*, M. Hörsing\*\*, J. Magnér\*, A-S. Allard\*, A. Palm Cousins\*, C. Wahlberg\*\*\*, S. Söhr\*\*\*\*

IVL Swedish Environmental Research Institute; \*\*KTH Royal Institute of Technology; \*\*\* Stockholm Water Company; \*\*\*\* SYVAB Himmerfjärdsverket, Sweden

## Background

Many pharmaceutical residues and other priority pollutants pass through modern wastewater treatment plants (WWTPs) and end up in recipients, which may affect aquatic organisms in different ways. Further, antibiotics in the environment may contribute to the rise of antibiotic resistant genes in bacteria, which is a serious threat to the society's possibility to cure life-threatening diseases on a global scale.

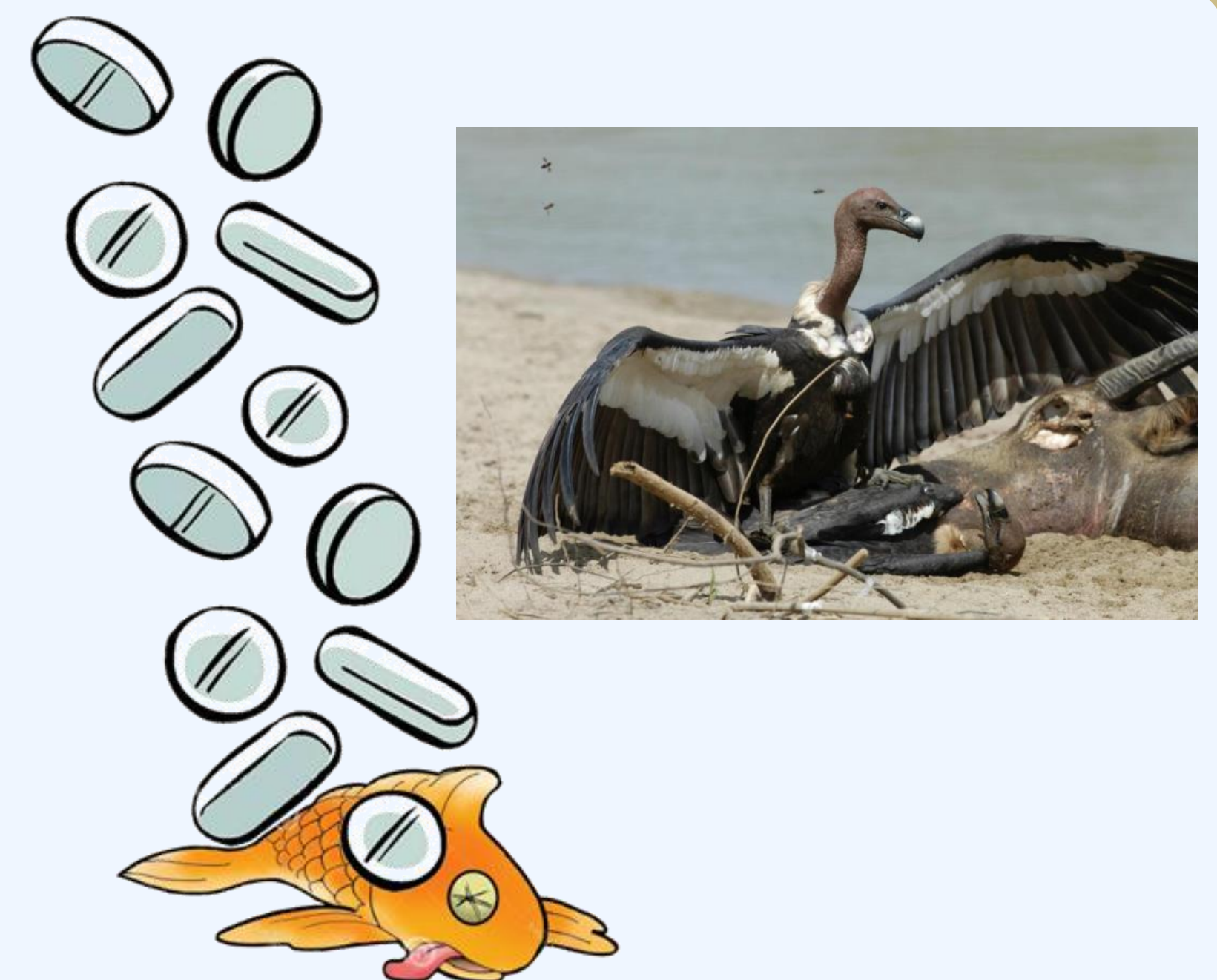
Current WWTPs are not able to meet these new challenges if not existing processes are enhanced or complemented with other removal processes.



## Challenges

- What is to be removed, to which levels and which reference should be applied?
- Current assessments of various technologies are deficient
- Some substances may metabolize into potentially more harmful substances in WWTPs
- Some substances may be re-formed in the WWTPs
- Existing analytical methods are inadequate for most substances including quantification of toxicity

Furthermore, representative priority substances/groups have to be used to facilitate cost-efficiency in the assessment. In-fact removal efficiencies, system perspectives, future trends and all potential environmental impacts need consideration.



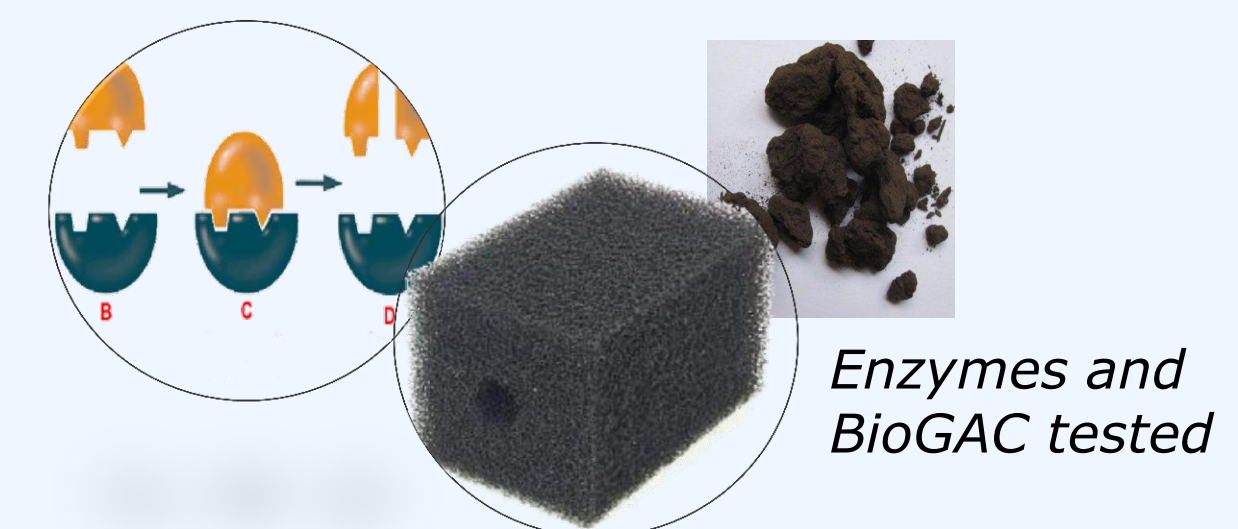
## Results and Recommendations

### Effluent water quality

- Environmental Quality Standard values or PNEC-values should be applied together with relevant dilution factors
- Zero emissions should be targeted for very persistent, bio accumulating and/or reproduction disturbing substances
- Complementary whole effluent toxicity tests are recommended when presence of unknown substances is expected

### Detection and quantification

- Laboratory instructions and sampling protocols have to be harmonised
- Quantification limits must be low enough
- Eco-toxicity tests need to be designed or adapted to each situation

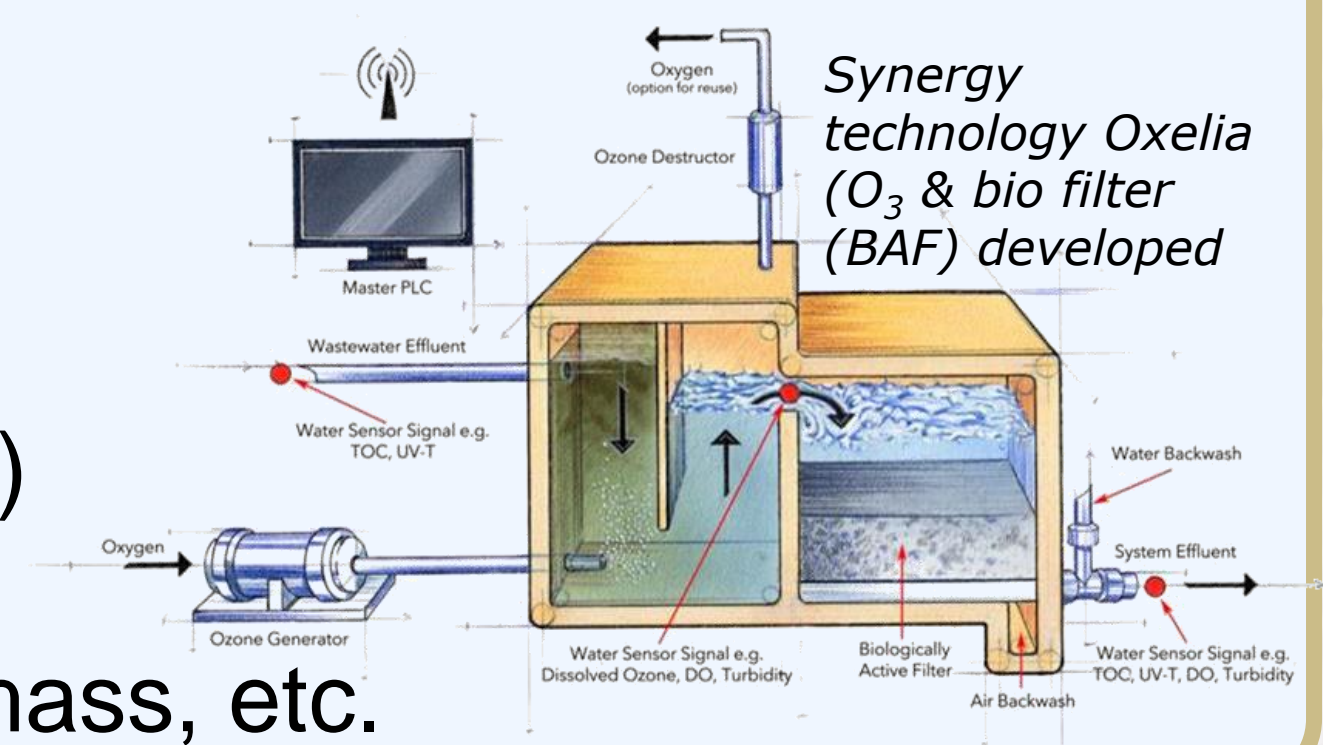


### Priority substances of particular interest

- Pharmaceuticals** (Antibacterial and anti-inflammatory substances, Antidepressants and antipsychotics, Stimulants, antihypertensives and sex hormones), **Phthalate esters** and alternative **plasticizers**, **Flame retardants** and per- and polyfluoroalkyl substances (**PFAS**), **Phenolic substances**, and personal care products (PCPs) including UV-filters, preservatives and fragrances, **Pathogens**, i.e. bacteria and viruses, in particular antibiotic resistant bacteria and their resistant genes

### Removal of priority substances (combinations of treatment systems are highly relevant)

- Upstream activities to reduce influent levels are first priority, but have natural limitations
- Improved secondary treatment options may support a better removal (e.g. MBR process)
- Solutions have to be assessed based on total environmental impact
- Synergy technologies, e.g. ozonation + GAC-filtration, active carbon produced from biomass, etc.



## Acknowledgements

The presented work is part of the Swedish project “**Systems for the purification of pharmaceutical residues and other priority pollutants**” financially supported by

In-depth review: <http://goo.gl/AXR4P1>



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