CWPharma2
CLEAR WATERS FROM PHARMACEUTICALS

Interreg
Baltic Sea Region

EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

Webinar

Advanced removal of pharmaceuticals from wastewater - Possibilities and developments in Denmark -

28.10.2021

Program CW Pharma 2 webinar & welcome

Session 1
Moderator:
Michael
Stapf

Lunch break

Session 2
Moderator:
Kai Bester

10:00	Intro to CWP2, pharmaceuticals, short overview on tech, guideline (Kai Bester, AU)
10:20	New developments on demands on micropollutant removal in wastewater treatment from the Ministry of environment (Joannis Gaard, Ministry for Environment (DK))
10:30	Needs and possibilities for pharmaceuticals removal (Anna G. Holm, Miljøstyrelsen (DK))
10:45	Motivation for pharmaceuticals removal in Hillerød HCR Syd (target values and starting concentrations) (Britta Sevelsted Lauritzen, Jørgen Skaarup, Hfors)
11:10	Results from testing and technology planning for ozonation and GAK treatment at Hillerød (Kai Bester, AU)
11:40	Ozonation operations and bromate mitigation (Preben Thisgaard, Kalfor)
12:05	Lunch
13:00	Results from “Less is more” on GAK filtration and AOP (Åsa Davidson &Ulf Nielsen)
13:30	Advanced wastewater treatment – a measure for ecotoxicity removal? (Marcus Lukas, German Environment Agency)
14:00	WWTP fitness check – results from Danish WWTPs (Michael Stapf, KWB)
14:30	Feedback & discussion on CWPharma output (Ulf Miehe, KWB)
14:50	Hillerød the next steps and farewell (Jørgen Skaarup, Hfors)
15:00	The End

Things to know for this webinar

- Webinar will not be recorded, but presentations will be published afterwards
- You can leave (e.g. during breaks) and re-join the webinar at any time. Simply access again by using the same link that you used before.
- After most talks there will be time for questions from the audience, which can be asked via the question panel.

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Introduction

Advanced removal of pharmaceuticals from wastewater - Possibilities and developments in Denmark –

Contact: Kai Bester kb@envs.au.dk

Pharmaceuticals

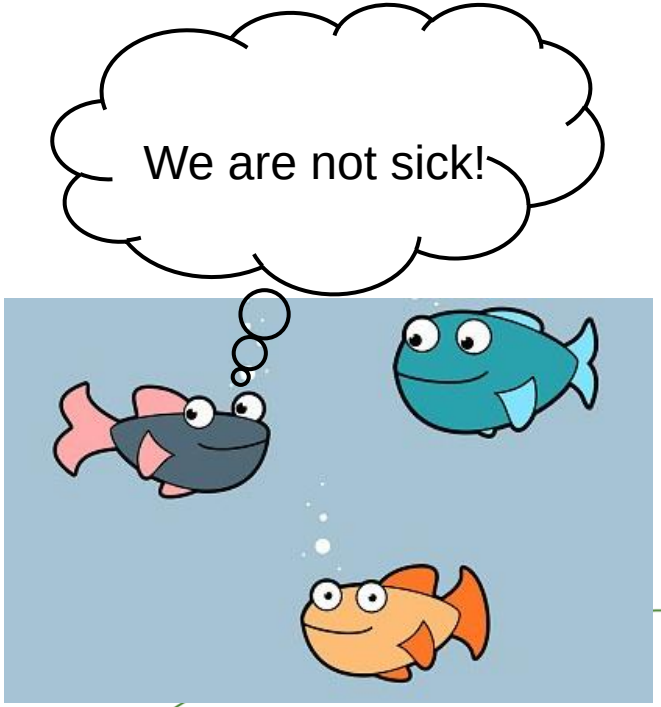
- Are emitted from each person taking medication
- 95% pharmaceuticals are taken at home -> most countries approach pharmaceuticals at municipal WWTPs
- Big hospitals are considerable emittents of pharmaceuticals and are considered as industrial point sources in Denmark

Pharmaceuticals 2

Generally:

- Are emitted via wastewater
- Do not sorb well
- Do not degrade well

- Are generally not removed by activated sludge



CW Pharma 2

- Is follow up project of the larger CW Pharma on mitigation, status and removal of pharmaceuticals to decrease input into the Baltic Sea.
- CW Pharma 2 focusses on the three guidelines/recommendations from CW Pharma and is helping municipalities to implement the solutions.
- A) fitness check on WWTPs for pharmaceutical removal (motivation/what to be reached, preconditions, concentrations)
- B) feasibility of pharmaceutical removal in given WWTPs (exclusions of certain technologies due to border conditions, loads, uses of sludges)
- C) detailed planning 2 – towards a concrete solution (HFORS)

Focus of this meeting

Technologies for pharmaceuticals removal I: Oxidation

- Chemical oxidation (e.g. by ozone) usually the compound is reacted to form something else
- High removal of estrogenic compounds
- High formation rates of ozonation products (from pharmaceuticals and water matrix)
- Should always be used together with a polishing step

CW Pharma 2 topic

Technologies for pharmaceuticals removal II: Sorption

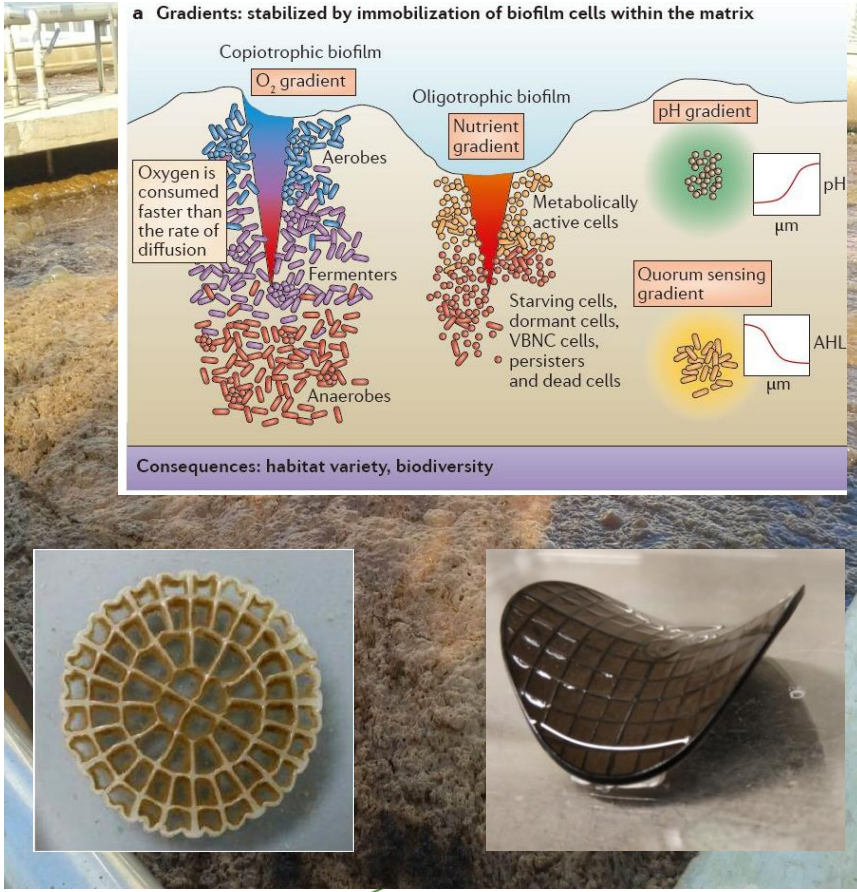
- Sorption (e.g. to activated carbon) – powdered and granulated
- Activated carbon needs replacing
- The “loaded” activated carbon needs proper disposal (cannot be done together with sludge)

CW Pharma 2 topic

Technologies for pharmaceuticals removal III:

- Biodegradation (e.g., in biofilm reactors such as MBBRs) -> compounds are biodegraded to other compounds or used to form biomass
- Though biofilm approaches have been successful in the past their ability to remove pharmaceuticals is still subject to development.

No CW Pharma 2 topic

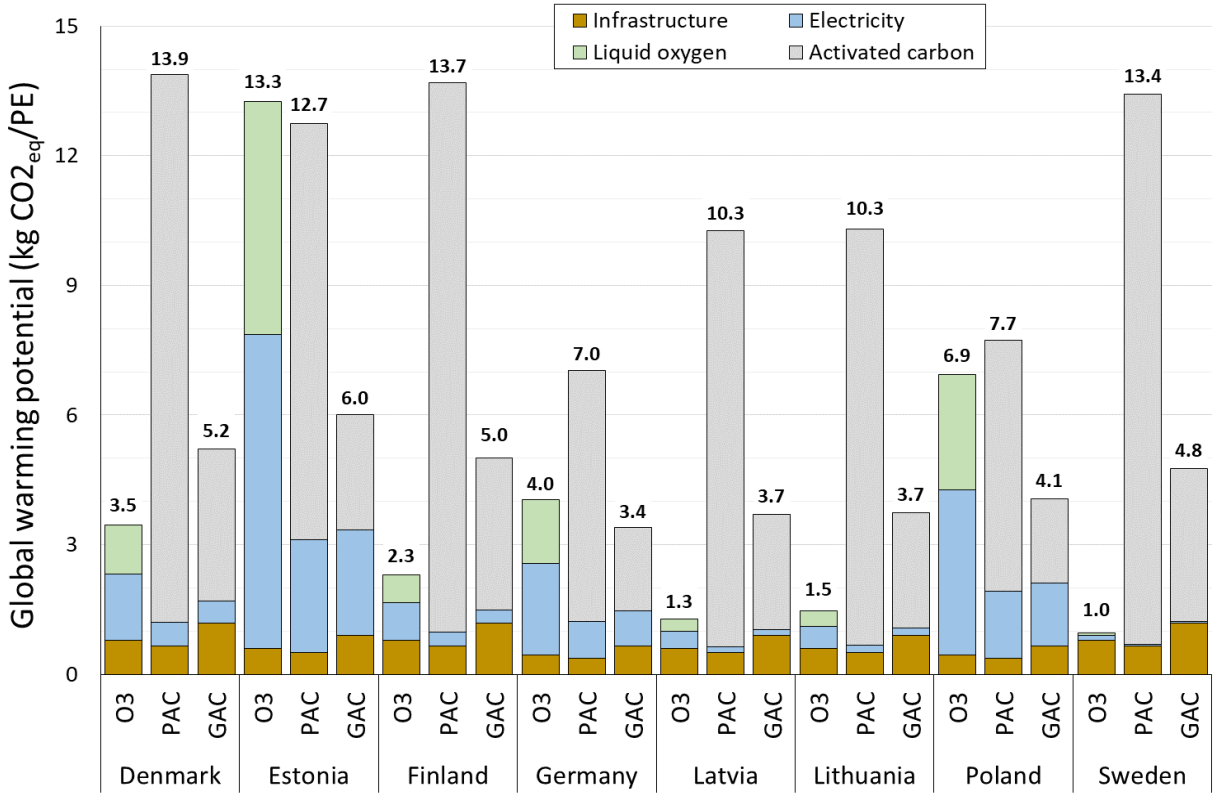


Technologies overview (from CW Pharma guideline 3.4)

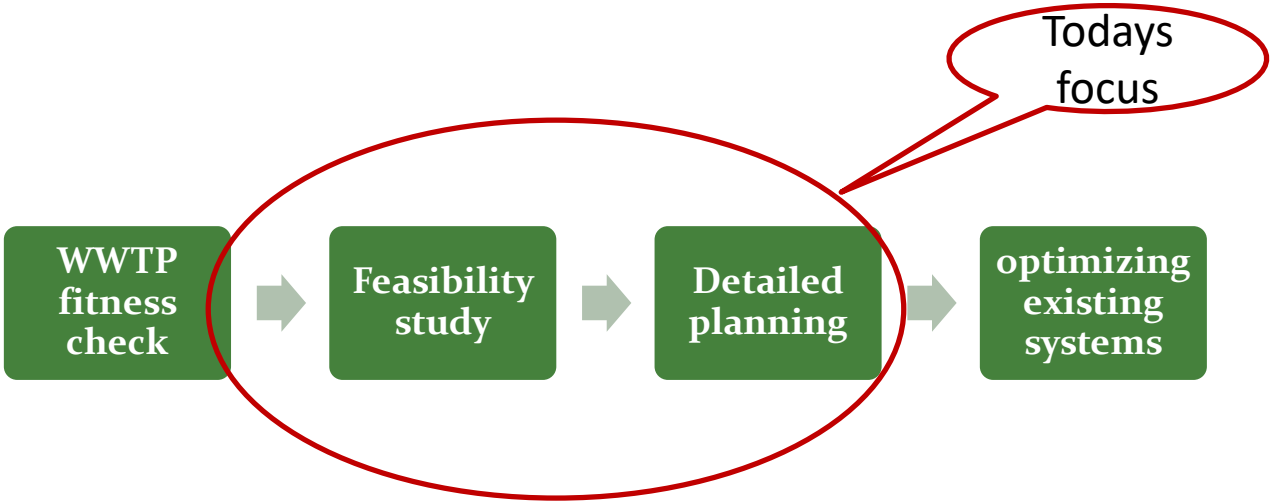
Category	Ozone	GAC	PAC	MBBR
API removal	++	++	++	0 / +
Technology maturity for API elimination	++	++	++	-
Complexity of operation	+	++	0	+
Reaction products from the water matrix	-	++	++	++
Transformation products or metabolites	-	++	++	-
Costs[#]	+	+	+	0
Energy usage in operation	-	+	0 / +	+
Carbon footprint	0	0	-	+
Space requirement	++	+	- / ++	-
Compatibility to sludge usage in agriculture	++	++	-	++

https://zenodo.org/record/5069819#.YXlCIZ5BxPY

Climate change potential of the same technologies in different regions (from CW Pharma guideline 3.4)



Steps as defined by CW pharma 1 towards full scale removal



CW Pharma materials are available

https://www.cwpharma.fi/en-US/Publications

Especially WP 3 (removal from wastewater)

Short title		Link
Experiences in full scale (Linköping)	Evaluation and experiences of full-scale ozonation followed by MBBR post-treatment and comparison with previous pilot tests.	https://zenodo.org/record/4032487#.YXlUYJ5BxPZ
Flexible use of existing infrastructure (Kalundborg)	Evaluation and experiences of full-scale ozonation followed by MBBR post-treatment at Kalundborg wastewater treatment plant.	https://zenodo.org/record/4275618#.YXlVMZ5BxPY
Comparison of post-treatment options	Impact of ozonation and post-treatment on ecotoxicological endpoints, water quality, APIs and transformation products.	https://zenodo.org/record/4003461#.YXlVYZ5BxPY
Guideline for advanced API removal	Optimization and control of advanced treatment	https://zenodo.org/record/5069819#.YXlViZ5BxPY

CW Pharma 2 activity 2.3

Focusses on removal of pharmaceuticals in Hillerød wastewater treatment plant - enjoy

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