Overview of organic contaminants in municipal sewage biosolids and approaches and treatments to decrease these

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Technology Development innovative – effective - sustainable

Knowledge gap

- Insufficient removal in conventional systems
  - Processes involved
  - Process conditions are not optimal
  - Adding new treatment units ??
- Sorption to biosolids is an obstacle for reuse
- Removal micropollutants is crucial for Biosolids Reuse in Circular Economy
- Source Control measures may be a solution

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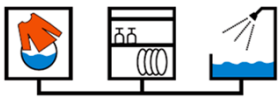
What are the alternatives to existing sanitation systems?

– ?

Resource recovery by separate collection of wastewater streams: where do micropollutants come from?

BLACK WATER (Organics, Nutrients)

Pharmaceuticals hormones



GREY WATER (H_2O)

Personal care and household Products (PCP)

Pharmaceuticals in GW
Personal care/household products in BW

17 pharmaceuticals measured, 5 were found in GW:

- anti-inflammatory (diclofenac, naproxen, ibuprofen)
- paracetamol
- metformin

14 PCPs measured, 8 were found in BW:

- biocides (triclosan, benzalkonium chloride, 2,4-DCP)
- fragrance (galaxolide)
- parabens

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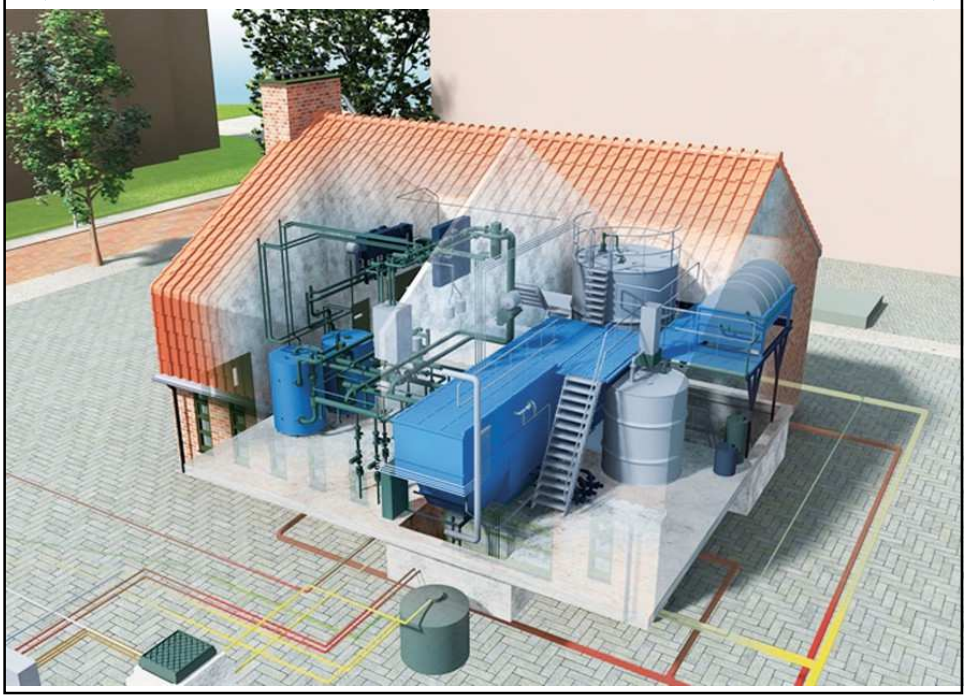

Pharmaceuticals are present in UASB sludge, but not in struvite

Pharmaceutical	Concentrations in UASB sludge, µg/g	PNEC, µg/g
Ciprofloxacin	41.8	5380
Metoprolol	17.2	740
Propranolol	30.9	3300

No pharmaceuticals detected in struvite

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PCPs are present in UASB sludge (and struvite)

Micropollutant	Concentrations in UASB sludge, µg/g	PNEC, µg/g
Galaxolide	3.0	280
Triclosan	4.7	0.8 – 4
Triclocarban	2.6	40
2,4-dichlorophenol	0.2	2.2
Benzalkonium chloride	38.7	203

2,4 dichlorophenol was found in struvite (0.5 µg/g)

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PCPs are present in grey water sludge

Micropollutant	Concentrations in UASB sludge, µg/g	PNEC, µg/g
Galaxolide	226.3	280
EHMC	217.7	n.d.
HCA	27.4	n.d.
Triclosan	140.6	0.8 – 4
Triclocarban	105.5	40
Benzalkonium chloride	102.7	203
Avobenzone	46.3	n.d.

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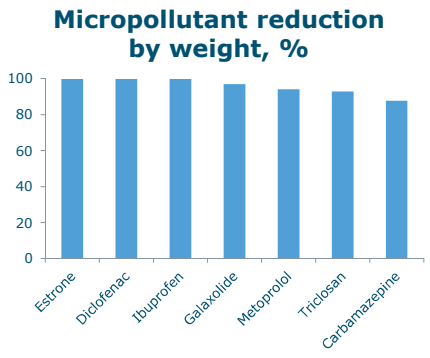
Composting of UASB sludge

+ Micropollutant removal ranged between 87% and 99%

+ Decrease pathogen counts and bioavailability of heavy metals



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Conclusions

- UASB sludge contains 3 out of 17 analysed pharmaceuticals...
- ...and composting can further reduce their concentrations
- Struvite does not contain analysed pharmaceuticals
- Therefore soil application of UASB sludge and struvite should be promoted
- Grey water sludge is not advised for soil application due to the high risk quotients calculated for biocides

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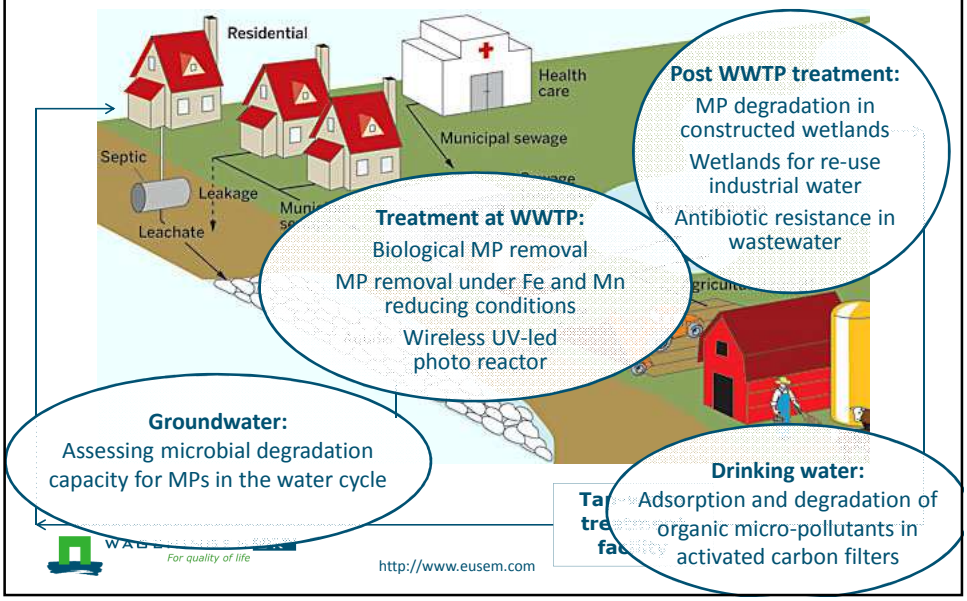
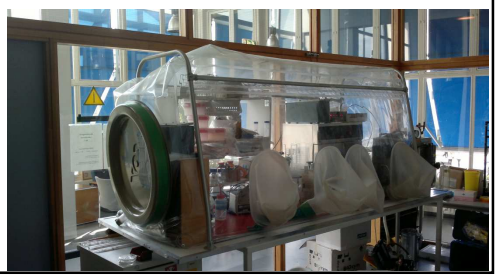
Micropollutant research in Wageningen



Micropollutant research in Wageningen
Our facilities







Thank you for attention!

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