

# Removal of pharmaceutical residues from sewage

## Avlägsnande av läkemedelsrester i avloppsvatten



### Collaboration partners

Hammarby Sjöstadsverk

### Summary

Most of the pharmaceutical compounds we use leave the body with small or no changes, mainly via the urine. They come to the sewage treatment plants (STP) in very low concentrations (ng/L to µg/L), but many of them can still be found after the normal treatment. This is due to high water solubility compared to the concentrations and a design to make the compounds stable in the body. STPs are designed to remove particles, biodegradable organic material and nutrients in much higher concentrations.

In spite of the very low concentrations of pharmaceuticals in the effluent, there is a risk that they can have a negative effect in the receiving waters due to their high specific activity in living systems. Today no direct effects are seen in Swedish water bodies, but effective concentrations of endocrine disrupting compounds (artificial estrogens) might be found close to the outlet of some STPs.

It is possible that also other compounds can be found in concentrations close to giving effects over longer periods. Predictions can be made from actual or calculated concentrations in relation to concentrations with noted or suspected effects in tests. However, so far it is not possible to point out all potentially harmful substances, so most of the research is still aiming at removal of as many of the used compounds as possible.

These compounds, like other potentially harmful xenobiotics, constitute a very small part of the total organic content in sewage. Thus, we need a specific biological degradation method or a more general oxidation/separation of compounds in already conventionally well treated sewage. Specific biological treatment is difficult since there are so many different compounds. The most commonly discussed methods are separate steps after normal treatment, comprising oxidation (ozone, hydrogen peroxide and UV in different combinations), membrane filtration (reverse osmosis (RO) or possibly nano filtration) or adsorption to a solid material (like activated carbon).

Based upon earlier results at Hammarby Sjöstadsverk we start with experiments with granulated activated carbon (GAC) and plan experiments with a low dose of ozone combined with UV and  $\text{TiO}_2$  catalyst.

### Description

Well-treated sewage (now from Henriksdal STP) is treated on line in pilot scale, big enough and representative for the method in full scale. Three columns with GAC (F400) are connected in series and about 100 L/h is pumped into the system. Composite samples are automatically taken from the inlet and after all three steps. Samples are stored frozen. COD is analysed in all samples, while pharmaceuticals are analysed in a few samples to find the capacity of the GAC.

### Goal

To determine the amount of GAC needed to remove most of the studied compounds to be able to calculate the total cost for this treatment in full scale.

### Expected benefit

Further decreased risk for long term negative effects on the environment if this or some other extra treatment step is used. Cost-benefit estimations can later be done for tested methods.

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