Enantiomeric pharmaceuticals and illicit drugs occurrence in wastewater and surface waters – Krakow agglomeration case study

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STSM purpose:
This project aims providing information and the knowledge concerning the occurrence of emerging contaminants in the aquatic environment of the Krakow agglomeration together with the analysis of selected drug biomarkers in wastewater.

Description of the work carried out during the STSM:
Samples of influent and effluent (two main wastewater treatment plants in Krakow (“Płaszow” and “Kujawy” WWTPs), were collected by each sampling sites over 6 day periods, transported to the laboratory and extracted by SPE. Surface water samples were collected by each sampling sites over 4 days. Samples were collected from Drwina and Vistula rivers – the main receiver of influent rivers as well as effluents from local wastewater treatment plants. Water was collected at upstream and downstream of the discharge points.

Description of the main results obtained:
Study of occurrence and levels of most targeted human biomarkers and another, selected emerging contaminants from broad range of chemical classes in wastewater and surface water were performed.

Most of tested compounds were found at quantifiable concentrations in analysed samples. The highest concentration from stimulants found in influent corresponds to R-(-)-amphetamine. Amphetamine, methamphetamine and MDMA were found enriched with R-(-)-enantiomers. Among others, target emerging contaminants, in crude wastewater, the highest concentration was observed for naproxen. In effluent, the highest concentration was observed for valsartan. Also in water samples from Vistula river, the highest concentration was reported for valsartan.

Conducted experiments allowed to estimate removal efficiency of tested compounds in selected WWTPs, their loads discharged via effluents into aquatic system and occurrence in surface water located upstream and downstream of the WWTPs. Furthermore, enantiomeric analysis of 13 pairs of enantiomers were performed.