

WASTE WATER TREATMENT PLANTS ENVIRONMENTAL IMPACT ASSESSMENT

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Wastewater treatment plants (WWTPs) play an extremely important role in shaping modern society's environmental well-being and awareness, however only well operated and supervised systems can be considered as environmentally sustainable. For this reason, an attempt was undertaken to assess the environmental burden posed by WWTPs in major Polish cities by an appropriate monitoring scheme including water samples prior to and just after wastewater outlets. Both classical and biological methods (Microtox[®], Ostracodtoxkit F[™] and comet assay) were utilized to assess environmental impact of given WWTPs. Multivariate analysis was performed in order to reveal internal dataset relations and latent factors controlling surface water quality.

The four latent factors ("total inorganic pollution", "organic toxic effluents", "ecotoxicity", "soil nutrition) are responsible for explanation of nearly 60% of the total dataset variance. The environmental impact assessment of WWTPs was performed for each of the identified latent factors.

Interestingly, in some cases, received water bodies are negatively impacted according to one and positively to another latent factor. This fact proves that WWTP should undergo individual evaluation of pollutant removal efficiency and tuned to selectively remove pollutants of highest risk to surrounding regional ecosystems. Biotests proved to be an extremely important tool to fully assess the impact of environmental stressors on water bodies receiving effluents from WWTPs.

Nowadays one of the most important problems facing the WWTPs' environmental impact assessment is the estimation of the effect of new emerging pollutants, such as pharmaceuticals on ecosystems of interest. Assessment of the impact of pharmaceutical residues on living organisms is a complex task taking into account the toxicity of individual compounds, interactions between them and environmental conditions.

In the present study, attempts were made to assess the impact of coexisting inorganic ions and changes in pH on the toxicity of ten selected pharmaceuticals. Two bioassays were used to measure the estrogenic and androgenic effects (XenoScreen YES/YAS – *Saccharomyces cerevisiae*) and acute toxicity (Microtox[®] - *Vibrio fischeri*).

Environmental risk assessment of mixtures was performed by model deviation ratio approach using concentration addition model. Results from both biotests were found utilizable in performing studies on impact of ions/pH fluctuations on drugs mixtures' toxicity confirming in most cases synergic impact of parameters studied on toxicity. The approach proposed seems to be proven as a reliable tool in assessing impact of abiotic factors on toxicity and endocrine potential of complex mixtures of pharmaceuticals.