A pilot experimental installation to evaluate the efficiency of a pharmaceutical industry treatment plant and the resulting decrease in effluents toxicity to aquatic microbial biofilms

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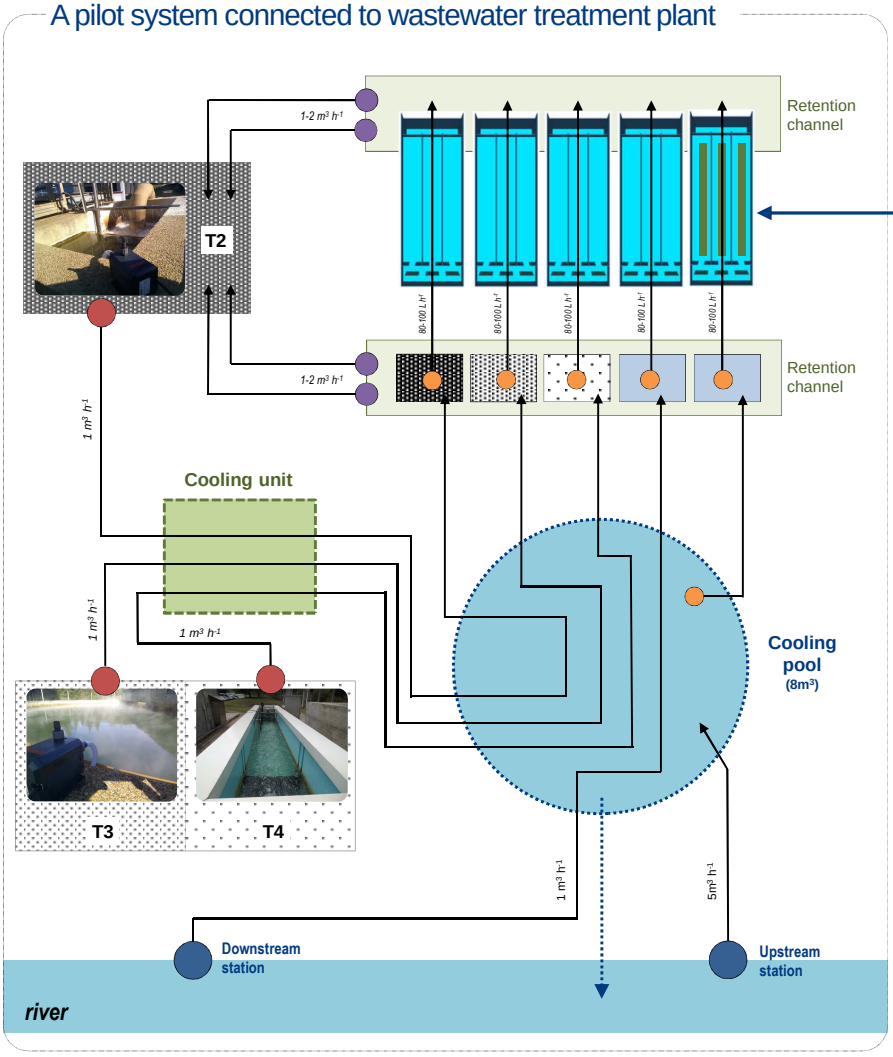
Scientific context

Pharmaceutical wastewaters are usually characterized as a complex mixture of chemicals with variable characteristics and compositions throughout the year. Accordingly, assessing the efficiency of industrial waste water treatment plants and the resulting decrease in effluent ecotoxicity and ecological impact throughout the treatment process remains very challenging. Microbial biofilms have been proven to be early warning natural assemblages to detect acute and long-term effects produced by chemical substances, including pharmaceuticals. Being composed of both autotrophic and heterotrophic microorganisms exhibiting a large range of sensitivity to many toxicants, biofilms are thus relevant models to assess environmental impacts of effluents by studying effects on microbial structure, diversity and functions.

In collaboration with SANOFI, we propose a pilot system to evaluate the decrease in acute and chronic toxicity of wastewater effluents on natural biofilm throughout the treatment process.

Sanofi Wastewater Treatment Unit

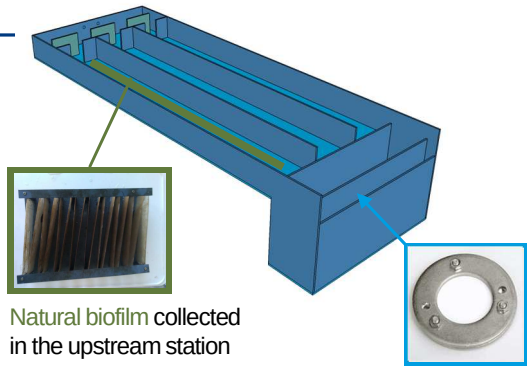
A pilot system connected to wastewater treatment plant



The system consists of five artificial channels continuously filled with wastewater collected after secondary (T2), tertiary (T3) and quaternary treatments (T4), respectively, as well as with stream water collected at the immediate upstream and downstream from the effluent discharge point in the river.

Experimental strategy…

Artificial outdoor channel subdivided in three compartments to ensure replication



Natural biofilm collected in the upstream station

Passive samplers (Polar Organic Chemical Integrative Samplers, POCIS)

The chronic and acute toxicity of effluents on natural biofilms will be evaluated by combining structural and functional analysis as well as a pollution community tolerance (PICT) approach using pharmaceutical mixtures directly extracted from the passive samplers.