

THE EFFECT OF A COMMON ANTIBACTERIAL PHARMACEUTICAL (TRICLOSAN) ON BIOLOGICAL WASTEWATER TREATMENT PROCESSES

K. STAMATELATOU, S.N. DOKIANAKIS, M. FOUNTOULAKIS, C. FROUDA,
M.E.KORNAROS and G. LYBERATOS

Department of Chemical Engineering, University of Patras
Karatheodori 1, 26500 Patras, Greece
E-mail: lyberatos@chemeng.upatras.gr

EXTENDED ABSTRACT

Pharmaceuticals used as antibacterial agents are present in many health care products such as toothpaste, soap and cleaners and are often found in wastewater effluents. Triclosan is a typical antibacterial agent. Its effect on the various biological processes in a sewage treatment plant, such as activated sludge, nitrification and anaerobic digestion, is studied in this paper. Batch experiments with and without triclosan were conducted in parallel and at various triclosan concentrations using synthetic wastewaters (with acetate and carbonate as the source of carbon for the aerobic activated sludge and the nitrification experiments, respectively), so that the impact of triclosan on these processes could be assessed as a function of its presence and concentration. These experiments showed that triclosan decreased the efficiency of the activated sludge process, to a degree that depends on the concentration of the pharmaceutical. At a concentration of 10 mg triclosan/l, the chemical oxygen demand (COD) removal was decreased by 25-30% compared to the COD removal observed in the absence of triclosan (reference). The nitrification process was also affected significantly at a concentration above 6 mg triclosan/l.

Anaerobic digestion experiments were conducted in digesters operated continuously in a draw-and-fill manner at 35^oC with a sludge retention time of 20 days. The feed contained, apart from glucose and other nutrients, triclosan at a concentration of 10 mg/l. The dissolved COD in the digester increased significantly over a period of approximately 80 days, exhibiting inhibition of methanogenesis, but in the sequel, the digester was able to recover.

All three biological processes studied were seriously inhibited by the presence of triclosan at concentrations in the range of 2-10 ppm. However, after a certain acclimation period, the microorganisms adapted to the bactericide presence of triclosan.

Key words: pharmaceuticals, triclosan, inhibition, wastewater treatment