Title:

Treatment of wastewaters contaminated with heavy metals using aerobic granules in a sequencing batch reactor

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Since the beginning of the industrial revolution, production of heavy metals (HM) increased steeply, with concomitant releases to the environment; these emissions occur through a wide range of processes and pathways, and are mainly directed to surface waters (*via* runoff and releases from storage and transport) and to the soil with consequent contamination of groundwater. Processes of HM contamination of water include mining (production of acid mine drainage) and industrial (paint, metallurgical, chemical, etc) activities. In fact, many water systems contain HM in excess accordingly to the approved standards, but even when the levels of these contaminants remain "acceptable," their effects when the exposure is prolonged for several years is not taken into consideration, as HM accumulate in plants and animals, permanently contaminating the food chain.

Aerobic granule formation is used as a novel technology for the biological treatment of wastewaters. These bioreactor systems present high biomass retention and have especially gained interest recently, as they have shown to be extremely promising for the treatment of effluents containing toxic compounds, and to economically compete with conventional activated sludge systems. Additionally, previous studies reported that granules seem to be more resistant to toxic effects of contaminants than flocculated sludge, due to the compact and protective structure of the granules.

The main aim of this study is to investigate the robustness and performance of a laboratory scale sequencing batch reactor (SBR) towards the presence of different loads of HM in wastewater. An additional goal of the study is to follow the microbial dynamics by using molecular tools such as DGGE and FISH.

To our knowledge, this is the first study on the application of this technology to the treatment of HM contaminated wastewaters.

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