Effect of the pharmaceuticals metformin, escitalopram and furosemide in cyanobacteria growth

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Worldwide one of the most prevalent water problems is eutrophication, a result of high nutrient concentration, mainly phosphorus and nitrogen. In freshwater environments, anthropogenic inputs of nutrients and other substances are a major contributing to eutrophication and consequent formation of cyanobacteria and algal blooms. The formation of cyanobacteria blooms can result in toxin production and have ecological and human health impacts. Another emerging water quality concern is the impact of personal care products and pharmaceuticals in the environment. In eutrophic waters the increased availability of pharmaceuticals can interfere with cyanobacteria cells and disrupt or enhance cyanobacteria growth. This study describes the effect of metformine, escitalopram and furosemide in the cyanobacteria *Microcystis aeruginosa.* Cyanobacteria tests were conducted following the European Guideline (OECD 201) for algal and cyanobacteria growth inhibition test. Cyanobacteria were incubated in microplate with pharmaceuticals solutions prepared in Z8 medium under continuous light and shaking at 22ºC. Results were quantified in terms of average growth rates calculated from cell numbers based on OD determination at 24h period until 120h. Pharmaceuticals used were metformin an anti-diabetic, escitalopram an antidepressive and furosemide a diuretic in ten concentrations. At 120h exposure and at the higher concentration tested the three pharmaceuticals (metformin-10mg/mL; 100% inhibition; escitalopram- 0.1mg/ml; 100% inhibition and furosemide-0.4 mg/mL; 50% inhibition) inhibited *Microcystis* growth rate. Escitalopram response showed hormesis but at higher concentrations it was more toxic than metformin and furosemide. Time related response was different between pharmaceuticals. The three pharmaceuticals interfere with *Microcystis* growth rate in different ways.

Palavras-Chave/Palabras Clave: Microcystis, metformine, escitalopram, furosemide, hormesis