

IAEA-CN-332/203

Antibiotics Degradation and Toxicity Removal by Electron Beam Irradiation

S. Borrelly (Instituto de Pesquisas Energeticas e Nucleares (IPEN-CNEN/SP), A. Feher (IPEN/CNEN), F. Tominaga, M. Helena Sampa, N. Boiani (IPEN/CNEN), A. Carlos Teixeira (USP) – Brazil

Radiation technology is one of the possibilities for cleaning wastewater once radiation can drastically reduce microorganisms while starting the decomposition of organic molecules using relatively low dose (0.5 – 5.0 kGy). Ecotoxicology and other biological assays have extensively been applied for demonstrating the benefits for cleaning wastewater technologies: to prioritize the needs of industrial sectors; to help risk analysis; cytotoxicity and mutagenicity determinations, etc. Pesticides and pharmaceuticals are the prevalent emerging pollutants in water samples in Brazil (de Souza et al, 2021). Electron beam treatment of antibiotics resulted in high degradation efficacy: amoxicillin (> 97%), ciprofloxacin (> 95%), and sulfadiazine (> 99%); radiation doses 0.75, 1.0 and 0.50, respectively. Comparing acute effects to *D. similis*, ciprofloxacin was more toxic from the three treated pharmaceuticals after irradiation, and these similar procedures have also been applied for mixture of pharmaceuticals. EB irradiation may be considered for the treatment of pharmaceuticals in a combined processing of wastewater, an alternative and advanced oxidative process.

Reference

SHEN Y, CHU L, ZHUAN R, XIANG X, SUN H, WANG J. Degradation of antibiotics and antibiotic resistance genes in fermentation residues by ionizing radiation: A new insight into a sustainable management of antibiotic fermentative residuals. *Journal of Environmental Management* 232 (2019) 171-178.

DE SOUZA RC, GODOY AA, KUMMROW F, DOS SANTOS TL, BRANDAO CJ. Occurrence of caffeine, fluoxetine, bezafibrate and levothyroxine in surface freshwater of São Paulo (Brazil) and risk assessment of aquatic life protection. *Environmental Science and Pollution Research* (2021), 28(16):20751-20761.