

TOXICITY ASSESSMENT OF CEFTRIAXONE, THIOTRIAZINONE AND THEIR MIXTURE FORMED DURING PHOTOCATALYTIC DEGRADATION USING TiO₂ AND ZnO

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Abstract

Annual consumption of pharmaceutical compounds has increased worldwide and great attention has been focused on their presence in different aquatic environments in many countries [1]. After the administration, drug molecules are absorbed, distributed, metabolized, and finally excreted from the body [2]. As one of the most frequently used antibiotics, ceftriaxone sodium has been widely used in human treatment and animal husbandry due to its broad-spectrum antimicrobial capability, which results in the release of residues into wastewater, causing environmental, ecological, and health issues, threatening biota, and disrupting indigenous microbial populations [3]. Ceftriaxone is subjected to hydrolysis and it is supposed that the main stable product of hydrolysis of ceftriaxone is thiotriazinone [4]. Thiotriazinone is mainly used in the preparation of beta-lactam antibiotics with proven effects as antibacterial agents and human leukocyte elastase inhibitors [5]. In this paper, photocatalytic degradation of antibiotic ceftriaxone and its intermediate thiotriazinone using TiO₂ Degussa P25 and ZnO under solar radiation was investigated. Also, toxicity of ceftriaxone and thiotriazinone alone and in mixtures with its photocatalytic degradation intermediates obtained by using TiO₂ Degussa P25 and ZnO under solar radiation in the presence of O₂ was evaluated in vitro in a panel of three histologically different cell lines: rat hepatoma (H-4-II-E), human colon adenocarcinoma (HT-29) and human fetal lung (MRC-5).

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