NSAIDS in the Environment: From Emerging Problem to Green Solution

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Abstract

NSAIDs (Non-Steroidal Anti-Inflammatory Drugs), are one of the most frequently recommended pain killer medicines. But NSAIDs in the environment have raised major concerns for their persistence and potential risk for the terrestrial and marine ecosystem. They may cause severe biotransformation or biodegradation of NSAIDs is a necessary requirement for the elimination of these drugs.

Keywords: Biodegradation; Ecosystem; Environment; Non-steroidal anti-inflammatory drugs

Introduction

During these days level of human health care is increasing, so the various pharmaceuticals are frequently used for high life expectations to cure diseases such as muscle pain, headache, and some inflammatory conditions. NSAIDs (Nonsteroidal Anti-Inflammatory Drugs) are generally used to cure any kind of pain. NSAIDs are mainly the derivatives of carboxylic acid that act as the inhibition of prostaglandin synthesis made by cyclooxygenase enzyme which is accountable for an indication in tissues from cell to cell [1,2]. Recently over-the-counter drugs are so common, mainly monocyclic or polycyclic nonsteroidal anti-inflammatory drugs (NSAIDs). Among all the human medicines, they are widely used. So, these medicines are preferred for the purchasing without any medical prescriptions due to their low price and fewer side-effects, although it is an inappropriate way to consume any medicine [3]. Monocyclic NSAIDs like- ketoprofen, naproxen, ibuprofen, salicylic acid, acetaminophen are the most frequently utilized drugs [4]. Thus, NSAIDs contains foremost position among extensively used drugs classes which are globally consumed. In the global survey, they represented the 15% of all drugs detection surveys [5] though, comprising various chemical and clinical profiles, they carry the identical therapeutic properties to a large extent and allied with alike harmful effects. According to Harirforoosh et al. [6] this drug causes gastrointestinal, cardiovascular and renal complications in humans.

In last few years, attention has been raised in the direction of presence, sources, discharge and potentially harmful impacts of pharmaceuticals on the environment. NSAIDs also cause the toxicity into the environment even at very low concentration ng L^{-1} to µg L^{-1} as well other pharmaceuticals [7]. Residues of NSAIDs are usually present in surface water, marine water and ground water [5,8]. In spite of this, they have been detected in sewage sludge, wastewater treatment plant and agricultural soils due to application of manure contaminated with pharmaceuticals, irrigation with non-reclaimed or treated wastewater [9-13]. After the disposal drugs to the municipal sewage system they come across to the aquatic environment and then usually reach to the ground water [4]. The presence of pharmaceuticals in natural water systems and their entrance into drinking water facilities affects the water quality and public health [14]. Though excreta of human and animals are the major source of these compounds but some other sources like effluent and spill accidents from manufacturing units, direct disposal of pharmaceuticals by households and medical units, leakage from sewage tanks are equally important factors. Pharmaceuticals are generally detected by Liquid Chromatography-Mass Spectrometry (LC-MS) and Gas Chromatography-Mass spectrometry (GC-MS) in environmental matrices over the past few years [3]. The occurrence of NSAIDs in the environment has become the issue of major concern due to their potential ecotoxicity into the environment as they severely affect the aquatic and terrestrial organisms at different trophic levels [15,16]. Biological activities of NSAIDs may negatively affect the non-targeted biota and consequently harm the ecosystem functioning and allied ecosystem services [17]. Furthermore, constant accumulation and abandoned disposal of pharmaceutical in water streams, municipal waste or landfills may pose the high concentrations and cause the potential risk to living organisms.


