

A Complete Picture of the Disinfection By-products of Irbesartan after Hypochlorite Treatment and Eco toxic Risk Associated

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Abstract

Emerging contaminants (ECs) have long been an object of attention for the scientific community and, more recently, by planning and control organizations at both global and national levels, and new substances or classes of substances are being increasingly identified and added to the lists of ECs. ECs are chemical compounds that are found in very low concentrations (in the order of ng/L or a few g/L) in urban, agricultural and industrial waste and water bodies. However, these ECs are not yet subject to regulatory control, and data relating to their environmental persistence and their chemical transformations in biotic and abiotic conditions are scarce, and even less information is known about their relative toxicology. Traditional wastewater treatment plants (WWTP) have a limited capacity to remove many of these ECs because they have been designed and operate effectively to remove other types of pollutants. It is not clear whether and which degradation byproducts (DPs) are obtained from the methods traditionally adopted in WWTPs before the waters return to the environment. Irbesartan is part of the family of so-called Sartans, a class of ECs, used in the treatment of essential arterial hypertension and in the treatment of kidney disease in adult patients with type 2 diabetes mellitus. The drug is considered an emerging pollutant having been found in surface waters in increasing concentrations over time and only partially degraded in WWTP. This communication provides a complete picture of the chemical fate of Irbesartan in a simulated chlorination phase, according to the conditions of a WWTP. Sixteen new DPs have been isolated by HPLC and identified by MS-TOF and 1D and 2D NMR. These ones allow to confirm and to expand the supposed mechanism of degradation. A preliminary Eco toxicity assessment with the crustacean *Daphnia magna* showed that some of the identified by-products were up to 12-times more toxic than Irbesartan.

Biography

Armando Zarrelli is Professor of Chemistry at the University of Naples. His current interest is aimed at studying the transformations associated with the use of sterilizing agents in urban wastewater treatment plants or abiotic environmental factors (e.g. light and water), on drugs, products for personal care and hygiene, antibiotics, endocrine disruptors and licit and illicit drugs, which have been identified in surface and waste water in recent years. Furthermore, its interests range from the study of pharmacological active molecules (including flavolignans derivatives, nucleoside analogues, synthetic oligonucleotides and glycomimetics), to the development of innovative methodologies in organic synthesis, as well as to the study of natural products used in the nutraceutical field. He is currently author of 145 peer-reviewed publications, 3 patents, 2 chapters in books, and has presented several invited lectures, oral, and poster communications at national and international congress.

Recent Publications

1. Romanucci V, Siciliano A, Guida M, Libralato G, Saviano L, Luongo G, Previtera L, Di Fabio G, Zarrelli A (2020). Disinfection by-products and Eco toxic risk associated with hypochlorite treatment of irbesartan. *Science of the Total Environment* 712:135625.
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3. Luongo G, Guida M, Siciliano S, Libralato G, Saviano L, Amoresano A, Previtera L, Di Fabio G, Zarrelli A (2021). Oxidation of diclofenac in water by sodium hypochlorite: identification of new degradation by-products and their Eco toxicological evaluation. *Journal of Pharmaceutical and Biomedical Analysis* 113762.
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