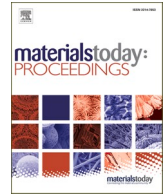




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Assessment of chemical constituents of personal care products (PCPs) and their environmental implications: A case of South Africa

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Handwritten notes: *skin care*, ** N.S.A. ...*

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ABSTRACT

Personal Care Products (PCPs) contain a wide range of chemicals which cleanse or enhance one's body appearance. These chemicals are continuously released into the environment, and if not properly regulated, they can be persistent, bioaccumulative and toxic in the environment. These chemicals are discharged into the environment through direct discharge from industries, hospitals, urban/municipal waste, and inefficient wastewater treatment systems. Previously chemicals in PCPs have not been considered harmful, and their effect on water, humans and the environment have not been investigated. However, emerging evidence suggests that some accumulate in body tissues and negatively impact humans and animals, impacting the endocrine systems and the environment since they are continuously being released and may not degenerate easily the environment. The contaminants are thus called emerging pollutants. The aim of this study was to investigate the presence of potentially toxic chemical ingredients of PCPs in South Africa by examining the product labels. A total of 185 PCPs were examined, with 57% of these products classified as skincare, 32% as rinse-off products and 11% as make-up products. Analysis of the database revealed that chemicals which function as fragrances, preservatives and UV-filters were present in 65%, 60% and 58% of the examined PCPs, respectively. Furthermore, the most frequently identified fragrances were limonene (73.33%), linalool (69.17.5%), coumarin (40%), and hexyl cinnamal (38.33%), which are weak allergens. However, alpha-isomethyl ionone and butylphenyl methylpropional are fragrances restricted by the IFRA but were found to be present in over 25 PCPs found in South Africa. This indicates the lack of set rules and regulations around PCP labelling and inconsistency in chemical regulation may promote the distribution of harmful chemicals into the environment.

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1. Introduction

The wide environmental occurrence of Personal Care Products (PCPs) is prompted by their daily use in various consumer goods. These products include cosmetics, body washes, perfumes and lotions; which are used to either cleanse or enhance one's body appearance. The great consumption of these products has led to their continuous release into the environment, which consequently threatens ecosystems and human health. The reported health risks associated with chemical ingredients in PCPs (such as ultraviolet (UV) filters, parabens, and phthalates) include potential endocrine disruption and exhibition of estrogenic activity [1,2]. As a result, PCPs are regarded as emerging environmental contaminants; arising from their persistence, exposure potentials, toxicity and environmental accumulation [3,4]. Most of these chemical

compounds enter the environment through direct discharge from industries, hospitals, urban waste and inefficient wastewater treatment systems [5]. Upon discharge into aquatic systems, some antimicrobial agents in PCPs such as triclosan have been reported to adsorb onto sediments, thus reducing their polarity [6]. In South Africa, environmentally toxic chemicals such as triclosan and triclocarban are still detected in influent and effluent samples of several wastewater treatment plants [7,8], despite their ban by the Food and Drugs Association (FDA). A recent study conducted by Mhuka and co-workers [9] revealed that one of the largest wastewater treatment plant (WWTP) in Pretoria (Daspoort Wastewater Treatment Works) showed an increase in concentration of triclosan from the influent to effluent samples. These findings indicate the incapability of the WWTPs to eliminate these organic pollutants and such poor removal ratios contribute to the

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