

Multi-pathway exposure modelling of chemicals in cosmetics with application to shampoo - DTU Orbit (09/11/2017)

Multi-pathway exposure modelling of chemicals in cosmetics with application to shampoo

We present a novel multi-pathway, mass balance based, fate and exposure model compatible with life cycle and high-throughput screening assessments of chemicals in cosmetic products. The exposures through product use as well as post-use emissions and environmental media were quantified based on the chemical mass originally applied via a product, multiplied by the product intake fractions (PiF, the fraction of a chemical in a product that is taken in by exposed persons) to yield intake rates. The average PiFs for the evaluated chemicals in shampoo ranged from 3×10^{-4} up to 0.3 for rapidly absorbed ingredients. Average intake rates ranged between nano- and micrograms per kilogram bodyweight per day; the order of chemical prioritization was strongly affected by the ingredient concentration in shampoo. Dermal intake and inhalation (for 20% of the evaluated chemicals) during use dominated exposure, while the skin permeation coefficient dominated the estimated uncertainties. The fraction of chemical taken in by a shampoo user often exceeded, by orders of magnitude, the aggregated fraction taken in by the population through post-use environmental emissions. Chemicals with relatively high octanol-water partitioning and/or volatility, and low molecular weight tended to have higher use stage exposure. Chemicals with low intakes during use ($< 1\%$) and subsequent high post-use emissions, however, may yield comparable intake for a member of the general population. The presented PiF based framework offers a novel and critical advancement for life cycle assessments and high-throughput exposure screening of chemicals in cosmetic products demonstrating the importance of consistent consideration of near- and far-field multi-pathway exposures.

General information

State: Published

Organisations: Department of Management Engineering, Quantitative Sustainability Assessment, University of Michigan

Authors: Ernstoff, A. S. (Intern), Fantke, P. (Intern), Csiszar, S. A. (Ekstern), Henderson, A. D. (Ekstern), Chung, S. (Ekstern), Jolliet, O. (Ekstern)

Pages: 87–96

Publication date: 2016

Main Research Area: Technical/natural sciences

Publication information

Journal: Environment International

Volume: 92-93

ISSN (Print): 0160-4120

Ratings:

BFI (2017): BFI-level 2

Web of Science (2017): Indexed yes

BFI (2016): BFI-level 2

Scopus rating (2016): SJR 2.465 SNIP 2.389 CiteScore 7.33

Web of Science (2016): Indexed yes

BFI (2015): BFI-level 2

Scopus rating (2015): SJR 2.577 SNIP 2.129 CiteScore 6.49

Web of Science (2015): Indexed yes

BFI (2014): BFI-level 2

Scopus rating (2014): SJR 2.714 SNIP 2.317 CiteScore 6.54

Web of Science (2014): Indexed yes

BFI (2013): BFI-level 2

Scopus rating (2013): SJR 2.664 SNIP 2.209 CiteScore 6.06

ISI indexed (2013): ISI indexed yes

BFI (2012): BFI-level 2

Scopus rating (2012): SJR 3.193 SNIP 2.46 CiteScore 6.37

ISI indexed (2012): ISI indexed yes

Web of Science (2012): Indexed yes

BFI (2011): BFI-level 2

Scopus rating (2011): SJR 2.773 SNIP 2.346 CiteScore 5.43

ISI indexed (2011): ISI indexed yes

Web of Science (2011): Indexed yes

BFI (2010): BFI-level 2

Scopus rating (2010): SJR 2.55 SNIP 1.894

BFI (2009): BFI-level 2

Scopus rating (2009): SJR 2.35 SNIP 2.07

Web of Science (2009): Indexed yes

BFI (2008): BFI-level 1

Scopus rating (2008): SJR 1.861 SNIP 2.086

Web of Science (2008): Indexed yes

Scopus rating (2007): SJR 1.615 SNIP 2.221

Web of Science (2007): Indexed yes

Scopus rating (2006): SJR 1.978 SNIP 2.083

Scopus rating (2005): SJR 1.754 SNIP 1.7

Web of Science (2005): Indexed yes

Scopus rating (2004): SJR 1.347 SNIP 1.395

Web of Science (2004): Indexed yes

Scopus rating (2003): SJR 0.707 SNIP 1.008

Web of Science (2003): Indexed yes

Scopus rating (2002): SJR 0.625 SNIP 0.647

Web of Science (2002): Indexed yes

Scopus rating (2001): SJR 0.516 SNIP 0.913

Web of Science (2001): Indexed yes

Scopus rating (2000): SJR 0.417 SNIP 0.61

Scopus rating (1999): SJR 0.655 SNIP 0.713

Original language: English

Exposure, Life cycle assessment, High-throughput screening, Cosmetics, Personal care products

DOIs:

10.1016/j.envint.2016.03.014

Source: PublicationPreSubmission

Source-ID: 123374784

Publication: Research - peer-review › Journal article – Annual report year: 2016