Review of Cosmetics Europe's analysis of the contribution of the cosmetic industry to the extended producer responsibility in the context of (EU) 2024/3019

prepared by
K. Duis & T. Junker
ECT Oekotoxikologie GmbH
Flörsheim, Germany

for
Cosmetics Europe – The Personal Care Association
Brussels, Belgium

05 December 2025

SynTech Research Group
ECT oxicology

1 Objective

Review of the analysis 'Urban Wastewater Treatment Directive (recast). Cosmetics Europe analysis of the JRC list of substances found in urban wastewater as used in the EPR feasibility report' (Cosmetics Europe 2025):

(1) Evaluation of the conclusiveness of Cosmetics Europe's verification of the calculation method used in the feasibility report (FR; EC 2022a) considering the FR, the associated data made available by the EC (*BioInnovation – List of micropollutants - urban wastewater.pdf*) and the underlying dataset of Pistocchi et al. (2022).

(2) Review of Cosmetics Europe's verification of the allocation of substances to the sector personal care products / cosmetic products as made in the FR for the 20 substances allocated to this sector in the FR with the highest contributions to the total toxic load based on PNEC[1].

(3) Re-calculation of the contribution of the cosmetics sector to the total toxic load based on PNEC for wastewater treatment plant (WWTP) influents for those of the abovementioned 20 substances, for which the allocation to the cosmetics sector as main source appears to be justified.

(4) Calculation of the contribution of the cosmetics sector to the total toxic load based on PNEC for WWTP effluents prior to quaternary treatment for those of the abovementioned 20 substances, for which the allocation to the cosmetics sector as main source appears to be justified, using the original dataset of Pistocchi et al. (2022).

2 Evaluation of Cosmetics Europe's verification of the calculation method used in the FR

- It is correct that 60 inorganics were excluded from the dataset in the FR, resulting in a dataset including 1,294 substances.
- The total toxic load (based on PNEC) of these 1,294 substances was correctly derived (8,830 based on the FR dataset).
- We agree that in the FR the contribution (%) of each substance to the total toxic load (based on PNEC) was apparently derived by dividing the toxic load (based on PNEC) of each substance by the total toxic load.
- We also agree that in the FR the contribution (%) of each sector to the total toxic load (based on PNEC) was apparently derived by summing up the contributions of all substances allocated to this sector.

[1] PNEC: predicted no effect concentration. In the file *BioInnovation - List of micropollutants - urban wastewater.pdf* incorrectly termed 'potentially no effect concentration'.

3 Review of Cosmetics Europe's verification of the allocation of substances to the sector personal care products / cosmetic products

- The total dataset used in the FR contains 1,354 substances. For the present evaluation and in analogy to the evaluations in the FR and by Cosmetics Europe (2025), 60 inorganic micropollutants were excluded from the evaluation, resulting in 1,294 substances.
- In the FR dataset, 119 substances were allocated to the sector 'personal care products' (PCP) / cosmetic products[2]. If substances with PNEC values of '0' (5 substances) and '-1' (no data; 66 substances) are excluded, 48 substances allocated to the sector PCP remain. For the present evaluation, these 48 substances were ranked based on their contribution to the total toxic load based on PNEC using the FR dataset.
- For the 20 substances with the highest contribution to the total toxic load based on PNEC, a short internet search was carried out including relevant websites (e.g. ECHA, PubChem, DrugBank) to identify the main areas of use. Based on the identified information, it was verified for each of the 20 substances, if the allocation to the cosmetics sector as main source made in the FR appears justified. We would like to point out this verification is not based on production or sales data, which are generally not publicly available.
- On request of Cosmetics Europe and in analogy to the FR and the analysis of Cosmetics Europe (2025), substances were allocated to a single sector (their main source). It should be noted that most substances used in cosmetics (as well as many other substances) are used in various sectors.
- As specified by Cosmetics Europe, the present project did not include a verification of the allocation to sectors for substances allocated to sectors other than PCP in the FR.
- Based on the present evaluation, the allocation to the cosmetics sector as main source only appears justified for three of the evaluated 20 substances: 2-ethyl-hexyl-14-methoxy-cinnamate, benzophenone-4 and climbazole (see Table 1).

[2] In the FR, the term 'personal care products' (PCP) is incorrectly used as synonym for cosmetic products.

Table 1. Verification of the allocation for the 20 organic substances with the highest contribution to the total toxicity of wastewater treatment plant (WWTP) influents that were assigned to the sector personal care products (PCP) / cosmetic products in the feasibility report (FR; EC 2022a). Green: substances for which an allocation to the cosmetics sector appears justified. Red: substances for which an allocation to the cosmetics sector does not appear justified (see column 4).

Substance name (CAS number)	Use in cosmetic products	Other uses	Allocation to cosmetics sector as main source justified?	Allocation to cosmetics sector in Cosmetics Europe's evaluation
Permethrin (CAS 52645-53-1)	Not used in cosmetic products.	Used as biocide: in product types 8 (wood preservatives) and 18 (insecticides, acaricides and products to control other arthropods) (see https://echa.europa.eu/de/substance-information/-/substanceinfo/100.052.771, https://echa.europa.eu/de/information-on-chemicals/biocidal-active-substances/-/disas/factsheet/1342/PT18, https://echa.europa.eu/de/information-on-chemicals/biocidal-active-substances/-/disas/substance/100.052.771). Used in veterinary and human pharmaceuticals (see e.g. Rösch et al. 2019, Dierkes et al. 2025), included on the WHO's list of essential medicines (for the treatment of scabies and lice, see WHO 2023).	No	No
Oleic acid[3] (CAS 112-80-1)	Listed in CosIng, but the use in cosmetics is a minor rather than the main use (see next column).	Occurs naturally: most abundant fatty acid in nature. For instance, olive oil contains 70% oleic acid (Santa-Maria et al. 2023). Used as food additive (EFSA ANS Panel 2017), as pharmaceutical excipient and to prepare lotions (see https://www.ncbi.nlm.nih.gov/mesh/68019301, https://pubchem.ncbi.nlm.nih.gov/compound/Oleic-Acid, https://go.drugbank.com/drugs/DB04224).	No	Oleanolic acid: no
Hexadecanoic acid (palmitic acid) (CAS 57-10-3)	Used in cosmetic products (https://cosmetics.specialchem.com/inci-ingredients/palmitic-acid), but this is a minor rather than the main use (see next column).	One of the most common saturated fatty acids in plants, animals and microorganisms, being e.g. a main component of palm oil. The depot fat of humans consists of approx. 20-30% of hexadecanoic acid (https://pubchem.ncbi.nlm.nih.gov/compound/Palmitic-Acid and https://hmdb.ca/metabolites/HMDB0000220). Used as food additive (EFSA ANS Panel 2017).	No	No

[3] The file *BioInnovation - List of micropollutants - urban wastewater.pdf* provided by the EU in reply to our request under the Freedom of Information Act includes a substance with the CAS number 112-80-1 and the common name oleanolic acid. However, oleanolic acid has the CAS number 508-02-1, while oleic acid has the indicated CAS (112-80-1). In the dataset of Pistocchi et al. (2022), which was used in the feasibility report (EC 2022a), the CAS number 112-80-1 and the Dutch substance name "oleinezuur" (i.e. oleic acid) is used in most of the datasheets of the supplementary information (SI), whereas the CAS number 112-80-1 and the common name oleanolic acid are reported in one SI datasheet ('total pollution proxy substances') only. Therefore, we conclude that the substance oleic acid (CAS 112-80-1) is meant.

Substance name (CAS number)	Use in cosmetic products	Other uses	Allocation to cosmetics sector as main source justified?	Allocation to cosmetics sector in Cosmetics Europe's evaluation
Tetradecanoic acid (myristic acid) (CAS 544-63-8)	Used in cosmetic products (https://cosmetics.specialchem.com/inci-ingredients/myristic-acid), but this is a minor rather than the main use (see next column).	Saturated fatty acid found in animals (e.g. in milk fat), plants (e.g. in coconut oil) and bacteria (https://pubchem.ncbi.nlm.nih.gov/compound/Myristic-Acid, https://www.hmdb.ca/metabolites/HMDB0000806). Used as food additive (EFSA ANS Panel 2017) and to synthesize flavour compounds (https://www.hmdb.ca/metabolites/HMDB0000806).	No	No
N,N-Dimethyl-dodecylamine (CAS 112-18-5)	Use in cosmetic products is restricted: maximum concentration in leave-on products: 2.5% according to (EC) 1223/2009, Annex III / 62 (EC 2025b).	Used as corrosion inhibitor, detergent and as intermediate in chemical manufacture (https://echa.europa.eu/registration-dossier/-/registered-dossier/14856/3/1/7, https://pubchem.ncbi.nlm.nih.gov/compound/8168#section=Uses).	No	Yes
Triclosan (CAS 3380-34-5)	Use in cosmetic products is restricted: maximum concentration: 0.3% according to (EC) 1223/2009 Annex V / 25 (EC 2025b).	Also used as disinfectant in household and medicinal products (SCCS 2022, https://pubchem.ncbi.nlm.nih.gov/compound/5564#section=Use-and-Manufacturing, https://ec.europa.eu/health/scientific_committees/opinions_layman/triclosan/en/l-3/2-uses-cosmetics-disinfectant.htm#0p0).	No	No
Nonylphenol diethoxylate (2-[2-(2-nonylphenoxy) ethoxy]ethanol) (CAS 27176-93-8)	According to Annex XVII of Regulation (EC) 1907/2006 (EC 2025a), nonylphenol ethoxylates shall not be placed on the market or used in concentrations ≥ 0.1% (w/w) in cosmetic products. This has resulted in diminished use / elimination of nonylphenol diethoxylate in cosmetics (see CIR 2015).	According to ECHA, ethoxylated nonylphenols are currently not manufactured in and / or imported to the European Economic Area (see https://echa.europa.eu/de/substance-information/-/substanceinfo/100.105.533).	No	No
2-Ethyl-hexyl-14-methoxycinna-mate (octinoxate) (CAS 5466-77-3)	Mainly used as UV filter in cosmetic products. According to (EC) 2009/1223, Annex VI: max. concentration: 10% (EC 2025b).	Also used in other consumer products (auto products, home products, pesticides; see https://pubchem.ncbi.nlm.nih.gov/compound/Octinoxate#section=Industry-Uses).	Yes	Neither marked red nor green
Lauryl diethanolamide (CAS 120-40-1)	Use in cosmetic products is restricted according to (EC) 1223/2009, Annex III / 60 (EC 2025b).	Used as plastic additive (as antistatic) and in household products (as foam stabiliser in liquid detergents; see https://pubchem.ncbi.nlm.nih.gov/compound/8430#section=Use-Classification).	No	No

Substance name (CAS number)	Use in cosmetic products	Other uses	Allocation to cosmetics sector as main source justified?	Allocation to cosmetics sector in Cosmetics Europe's evaluation
Dodecylbenzene-sulfonic acid (CAS 47221-31-8 and CAS 27176-87-0[4])	Listed in CosIng (https://ec.europa.eu/growth/tools-databases/cosing/details/33729) as cleansing agent (see also Becker et al. 2010), but this is a minor rather than the main use (see next column).	Dodecylbenzenesulfonic acid has various uses including the manufacture of fine chemicals, the production of detergents, and use in flocculants, precipitants and neutralisation agents (https://echa.europa.eu/registration-dossier/-/registered-dossier/11796/1/1).	No	No
Butylhydroxy-toluene (butylated hydroxytoluene) (CAS 128-37-0)	Use in cosmetic products is restricted according to (EU) 2022/2195 Annex III: 0.001% in mouthwash, 0.1% in toothpaste, 0.8% in other leave-on and rinse-off products (EC 2022b).	The synthetic antioxidant butylhydroxytoluene is used to preserve food and animal feeds, and to improve the stability of various products including cosmetics (see column 2), but also pharmaceuticals, vitamins, petroleum products and plastics (SCCS 2021).	No	No
Indol (CAS 120-72-9)	Used in perfumes and fragrances (see Api et al. 2022), but the use in cosmetics appears a minor rather than the main use (see next column).	Used in air care products, biocides, polishes, waxes, washing and cleaning products, and in the manufacture of chemicals (https://echa.europa.eu/de/substance-information/-/substanceinfo/100.004.019). Formed in the intestinal tract of humans and animals during fermentation of the amino acid tryptophan by gut microbiota (Lee et al. 2015, Candeliere et al. 2022).	No	No
N,N-Dimethyl-tetradecylamine (dimethyl myristamine) (CAS 112-75-4)	Use in cosmetic products is restricted according to (EC) 1223/2009, Annex III / 62: maximum concentration in leave-on products: 2.5% (EC 2025b).	Used as corrosion inhibitor, detergent and in various chemical manufacturing processes (https://pubchem.ncbi.nlm.nih.gov/compound/Dimethylmyristylamine#section=Uses, https://pubchem.ncbi.nlm.nih.gov/source/hsdb/2785).	No	Not included in Table 2 of the evaluation
Piperine (CAS 94-62-2)	Used as fragrance component, but the use in cosmetics appears a minor rather than the main use (see next column).	Occurs in black pepper and causes its spiciness. Used a flavouring agent, in food supplements and pharmaceuticals to improve the bioavailability of other substances, and in repellents (e.g. for dogs; see Chaudri & Jain 2023 and https://pubchem.ncbi.nlm.nih.gov/compound/Piperine#section=Use-Classification).	No	Not included in Table 2 of the evaluation
7-Diethylamino-4-methyl-coumarin (coumarin 1) (CAS 91-44-1)	Used in hair dyes, nail polishes, and makeup (https://www.canada.ca/en/health-canada/services/chemical-substances/fact-sheets/chemicals-glance/coumarin-1.html), but this is a minor rather than the main use (see next column).	Used as optical brightener (in textiles, detergents, plastics and varnishes), in coatings (for paper, labels and book covers) and in fluorescent dyes and laser dyes (https://pubchem.ncbi.nlm.nih.gov/compound/7050, https://echa.europa.eu/de/substance-information/-/substanceinfo/100.001.881).	No	Not included in Table 2 of the evaluation

[4] In the FR, only one CAS number (CAS 47221-31-8) is indicated.

Substance name (CAS number)	Use in cosmetic products	Other uses	Allocation to cosmetics sector as main source justified?	Allocation to cosmetics sector in Cosmetics Europe's evaluation
Triclocarban (CAS 101-20-2)	Used as antibacterial agent in cosmetic products (SCCS 2022, https://pubchem.ncbi.nlm.nih.gov/compound/7547, https://go.drugbank.com/drugs/DB11155). Restricted use according to (EC) 1223/2009: Annex V / 23: max. concentration: 0.2%. Not to be used in toothpaste intended for children under 6 years of age. Annex III / 100: max. concentration in rinse-off products: 1.5% (EC 2025b).	Used e.g. in air care products, fillers, plasters, modelling clay, inks and toners, and pharmaceuticals (https://echa.europa.eu/substance-information/-/substanceinfo/100.002.659). Note that triclocarban is registered under REACH but currently not manufactured in or imported into the European Economic Area (https://echa.europa.eu/substance-information/-/substanceinfo/100.002.659).	No	Not included in Table 2 of the evaluation
Benzophenone-4 (sulisobenzone; 5-benzoyl-4-hydroxy-2-methoxybenzene sulfonic acid) (CAS 4065-45-6)	Mainly used as UV filter in sunscreens, and as UV filter / light stabilizer in face and hand creams, other leave-on and rinse-off products, lipsticks and shampoos (SCCS 2024, https://ec.europa.eu/growth/tools-databases/cosing/details/32143). According to (EC) 1223/2009, Annex VI: max. content is 5% (as acid) for use as UV filter (EC 2025b)	Also used as UV filter / UV adsorber / light stabilizer in other consumer products, e.g. for leather and textiles (see https://pubchem.ncbi.nlm.nih.gov/compound/Sulisobenzone).	Yes	Not included in Table 2 of the evaluation
Galaxolide (CAS 1222-05-5)	Synthetic musk used as fragrance in cosmetic products (perfumes, soaps, cosmetics; https://pubchem.ncbi.nlm.nih.gov/compound/91497). According to (EC) 1223/2009, Annex III / 336: restricted use (substance shall be indicated in the list of ingredients when its concentration exceeds: 0.001% in leave-on products or 0.01% in rinse-off products; EC 2025b).	Also used in a variety of other consumer products including washing and cleaning products (e.g. machine wash liquids/detergents, automotive care products), biocides (e.g. disinfectants, pest control products), polishes and waxes, air care products (air fresheners), paints and coatings / adhesives (https://echa.europa.eu/substance-information/-/substanceinfo/100.013.588, https://pubchem.ncbi.nlm.nih.gov/compound/91497).	No	Not included in Table 2 of the evaluation

Substance name (CAS number)	Use in cosmetic products	Other uses	Allocation to cosmetics sector as main source justified?	Allocation to cosmetics sector in Cosmetics Europe's evaluation
Climbazole (CAS 38083-17-9)	Mainly used as antimycotic (antidandruff) in shampoos and as preservative in different cosmetic products (e.g. face creams, hair lotions, foot care products and shampoos; SCCS 2005 and 2018, https://pubchem.ncbi.nlm.nih.gov/compound/Climbazole, https://echa.europa.eu/de/substance-information/-/substanceinfo/100.048.870). According to (EC) 1223/2009, Annex V / 32: restricted use as cosmetic preservative in face cream, hair lotion and foot care (maximum concentration: 0.2%), restricted use as cosmetic preservative in rinse-off shampoo (maximum concentration: 0.5%). According to (EC) 1223/2009, Annex III / 310: restricted use as anti-dandruff agent in rinse-off shampoo (maximum concentration: 2.0%) (EC (2025b).	Also used as antimycotic in pharmaceuticals (https://www.pharmaffiliates.com/en/38083-17-9-climbazole-api-pa3061000.html).	Yes	Not included in Table 2 of the evaluation
Theophyllin (CAS 58-55-9)	According to EC 1223/2009, Annex II / 1710: prohibited in cosmetic products (EC 2025b).	Occurs naturally in tea, green coffee beans, cocoa beans, mate, kola nuts and guaraná (https://www.ncbi.nlm.nih.gov/books/NBK507021/, https://pubchem.ncbi.nlm.nih.gov/compound/2153). Is formed during metabolization of caffeine in humans (Tang-Liu et al. 1983). Used in pharmaceuticals against chronic respiratory diseases (Barnes 2013, https://pubchem.ncbi.nlm.nih.gov/compound/2153).	No	Not included in Table 2 of the evaluation

4 Re-calculation of the contribution of cosmetic products to the total toxic load of WWTP influents (FR dataset)

- The contribution of the cosmetics sector to the total toxic load of WWTP influents based on PNEC was recalculated using the FR dataset.
- Based on this dataset, the total toxic load of all 1,294 substances (see section 2) in WWTP influents is 8,830.
- When all substances are ranked according to their contribution to the total toxic load of WWTP influents based on PNEC, the substances up to and including theophyllin (ranked lowest among the 20 substances considered in section 3) account for 99.8% of the total toxic load.
- On request of Cosmetics Europe, the contribution of the cosmetics sector was calculated based on those of the 20 substances considered in section 3, for which the allocation to cosmetics as main source appears justified. Accordingly, the contribution of the cosmetics sector was calculated based on three substances: 2-ethyl-hexyl-14-methoxycinnamate, benzophenone-4 and climbazole (see Table 1).
- The contribution of each of the three substances mentioned above was calculated by dividing its toxic load by the total toxic load (8,830).
- Based on these three substances, a contribution of 0.2% to the total toxic load (based on PNEC) of WWTP influents was derived for the cosmetics sector using the FR dataset (see Table 2).
- This estimate is lower than Cosmetic Europe's estimate of 1.54% (Cosmetic Europe 2025). This is mainly due to the fact that in the present evaluation, N,N-dimethyldodecylamine (which contributes 0.9% to the total toxic load) was not allocated to the cosmetics sector.
- Both, the present estimate and Cosmetic Europe's estimate of the contribution of cosmetics sector to the total toxic load (based on PNEC) are clearly below the estimate of 26% derived in the FR. This is mainly because permethrin, which according to the FR contributes with 16.4% to the total toxic load (based on PNEC), is not used in cosmetics and should thus not be allocated to the cosmetics sector. For most of the 20 evaluated substances, other uses and/or natural occurrence are more relevant than use in cosmetics products (Table 1).

Table 2. Re-calculation of the contribution of cosmetic products to the total toxic load of wastewater treatment plant (WWTP) influents based on PNEC using the dataset from the feasibility report (FR, EC 2022a). On request of Cosmetics Europe, only substances were considered, which were allocated to the sector personal care products / cosmetic products in the FR and for which the allocation to the cosmetics sector as main source appears justified (see section 3).

Substance name (CAS number)	**Toxic load based on PNEC in WWTP influents (using FR dataset)**	**Contribution to total toxic load based on PNEC for WWTP influents (%)**
2-Ethyl-hexyl-14-methoxycinnamate (CAS 5466-77-3)	16.15	0.183
Benzophenone-4 (CAS 4065-45-6)	0.63	0.007
Climbazole (CAS 38083-17-9)	0.44	0.005
Total:		0.195

5 Calculation of the contribution of cosmetic products to the total toxic load of WWTP effluents prior to quaternary treatment using the original dataset of Pistocchi et al. (2022)

- The contribution of the cosmetics sector to the total toxic load (based on PNEC) of WWTP effluents prior to quaternary treatment was calculated using the original dataset from Pistocchi et al. (2022).
- Based on this dataset, the total toxic load (based on PNEC) of all substances in WWTP effluents prior to quaternary treatment is 5,074.
- When all substances are ranked according to their contribution to the total toxic load of WWTP effluents prior to quaternary treatment based on PNEC, the substances up to and including theophyllin (ranked lowest among the 20 substances considered in section 3) account for 99.6% of the total toxic load.
- On request of Cosmetics Europe, the contribution of the cosmetics sector was calculated based on those of the 20 substances considered in section 3, for which the allocation to cosmetics as main source appears justified.
- Accordingly, the contribution of the cosmetics sector was calculated based on three substances: 2-ethyl-hexyl-14-methoxycinnamate, benzophenone-4 and climbazole (see Table 1).
- The contribution of each of the three substances mentioned above was calculated by dividing its toxic load (based on PNEC) by the total toxic load (5,074).
- Based on the three substances mentioned above, a contribution of 0.03% to the total toxic load of WWTP effluents prior to quaternary treatment was derived for the cosmetics sector using the original dataset of Pistocchi et al. (2022; see Table 3).

Table 3. Calculation of the contribution of cosmetic products to the total toxic load of wastewater treatment plant (WWTP) effluents prior to quaternary treatment based on PNEC using the original dataset of Pistocchi et al. (2022). On request of Cosmetics Europe, only substances were considered, which were allocated to the sector personal care products / cosmetic products in the FR and for which the allocation to the cosmetics sector as main source appears justified (see section 3).

Substance name (CAS number)	**Toxic load based on PNEC in WWTP effluents prior to quaternary treatment (using the dataset of Pistocchi et al. 2022)**	**Contribution to total toxic load based on PNEC for WWTP effluents prior to quaternary treatment (%)**
2-Ethyl-hexyl-14-methoxycinnamate (CAS 5466-77-3)	0.47	0.009
Benzophenone-4 (CAS 4065-45-6)	0.63	0.012
Climbazole (CAS 38083-17-9)	0.40	0.008
Total:		0.029

6 Conclusions

- Cosmetic's Europe's verification of the calculation method used in the FR to derive the contribution of the cosmetics sector to the total toxic load (based on PNEC) is conclusive.
- For 20 of the substances allocated to the cosmetics sector in the FR and having the highest contribution to the total toxic load based on PNEC, the allocation to the cosmetics sector was verified using publicly available information (i.e. no production or sales data).
- On request of Cosmetics Europe and in analogy to the FR and the analysis of Cosmetics Europe (2025), substances were allocated to a single sector, i.e. they were either allocated to the cosmetics sector as main source or not allocated to cosmetics.
- The allocation to the cosmetics sector as main source only appears to be justified for three of the 20 substances (2-ethyl-hexyl-14-methoxycinnamate, benzophenone-4 and climbazole).
- Based on these three substances, a contribution of 0.2% to the total toxic load of WWTP influents (based on PNEC) was derived for the cosmetics sector using the FR dataset.
- Both, the present estimate (0.2%) and Cosmetic Europe's estimate (1.54%) of the contribution of cosmetics sector to the total toxic load of WWTP influents (based on PNEC) are substantially lower than the estimate of 26% derived in the FR.
- Based on the three substances mentioned above, a contribution of 0.03% to the total toxic load of WWTP effluents prior to quaternary treatment was derived for the cosmetics sector using the original dataset of Pistocchi et al. (2022).

7 References

Api AM, Belmonte F, Belsito D, Biserta S, Botelho D, Bruze M, Burton GA Jr, Buschmann J, Cancellieri MA, Dagli ML, Date M, Dekant W, Deodhar C, Fryer AD, Gadhia S, Jones L, Joshi K, Lapczynski A, Lavelle M, Liebler DC, Na M, O'Brien D, Patel A, Penning TM, Ritacco G, Rodriguez-Ropero F, Romine J, Sadekar N, Salvito D, Schultz TW, Siddiqi F, Sipes IG, Sullivan G, Thakkar Y, Tokura Y, Tsang S (2022). RIFM fragrance ingredient safety assessment, indole, CAS Registry Number 120-72-9. Food Chem Toxicol 144 (Suppl. 1):111693.

Barnes (2013). Theophylline. Am J Respir Crit Care Med 188, 901-906.

Becker LC, Bergfeld WF, Belsito DV, Hill RA, Klaassen CD, Liebler DC, Marks JG Jr, Shank RC, Slaga TJ, Snyder PW, Andersen FA (2010). Amended safety assessment of dodecylbenzenesulfonate, decylbenzenesulfonate, and tridecylbenzenesulfonate salts as used in cosmetics. Int J Toxicol 29 (Suppl), 288S-305S.

Candeliere F, Simone M, Leonardi A, Rossi M, Amaretti A, Raimondi S (2022). Indole and p-cresol in feces of healthy subjects: concentration, kinetics, and correlation with microbiome. Front Mol Med 21:959189.

Chaudhri SK, Jain S (2023). A systematic review of piperine as a bioavailability enhancer. J Drug Delivery Ther 13(4):133-136.

CIR (2015). Safety assessment of nonoxynols as used in cosmetics. Draft amended report for Panel Review. 22 May 2015.

Cosmetics Europe (2025). Urban Wastewater Treatment Directive (recast). Cosmetics Europe analysis of the JRC list of substances found in urban wastewater as used in the EPR feasibility report. 04 September 2025 (15 pp).

Dierkes G, Becher S, Wick A (2025). Retrospektive Screening-Untersuchung auf Biozide in Schwebstoffen an urbanen Standorten. Abschlussbericht. UBA-Texte 55/2025.

EC (2022a). Feasibility of an EPR system for micropollutants. Final Report. 070201/2020/837586/SFRA/ENV.C.2. Prepared by bio innovation service in association with rdc environment, Air Quality Consultants, Valdani Vicari & Associati and CETAQUA.

EC (2022b). Commission Regulation (EU) 2022/2195 of 10 November 2022 amending Regulation (EC) No 1223/2009 of the European Parliament and of the Council as regards the use of Butylated Hydroxytoluene, Acid Yellow 3, Homosalate and HAA299 in cosmetic products and correcting that Regulation as regards the use of Resorcinol in cosmetic products.

EC (2025a). Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC. Consolidated version from 01 September 2025.

EC (2025b). Regulation (EC) No 1223/2009 of the European Parliament and of the Council of 3 November 2009 on cosmetic products (recast). Off J Eur Union L 342/59-209. Consolidated version from 01 May 2025.

EFSA ANS Panel (2017). Scientific opinion on the re-evaluation of fatty acids (E 570) as a food additive. EFSA J 15:4785. EFSA Panel on Food Additives and Nutrient Sources added to Food.

Lee JH, Wood TK, Lee J (2015). Roles of indole as an interspecies and interkingdom signaling molecule. Trends Microbiol 23, 707-718.

Pistocchi A, Alygizakis NA, Brack W, Boxall A, Cousins IT, Drewes JE, Finckh S, Gallé T, Launay MA, McLachlan MS, Petrovic M, Schulze T, Slobodnik J, Ternes T, Van Wezel A, Verlicchi P, Whalley C (2022). European scale assessment of the potential of ozonation and activated carbon treatment to reduce micropollutant emissions with wastewater. Sci Total Environ 848:157124.

Rösch A, Beck B, Hollender J, Stamm C, Singer H, Doppler T, Junghans M (2019). Nachweis von Pyrethroid- und Organophosphat-Insektiziden in Schweizer Bächen im pg L^{-1}-Bereich. Aqua & Gas 11, 54-66.

Santa-María C, López-Enríquez S, Montserrat-de la Paz S, Geniz I, Reyes-Quiroz ME, Moreno M, Palomares F, Sobrino F, Alba G (2023). Update on anti-inflammatory molecular mechanisms induced by oleic acid. Nutrients 15:224.

SCCS (2005). Opinion on climbazole. COLIPA n° P64. Scientific Committee on Consumer Safety (SCCS). SCCP/0918/05.

SCCS (2018). Addendum to the Scientific Opinions on climbazole (P64) ref. SCCS/1506/13 and SCCS/1590/17. Scientific Committee on Consumer Safety (SCCS). SCCS/1600/18.

SCCS (2021). Opinion on butylated hydroxytoluene (BHT). Scientific Committee on Consumer Safety (SCCS). SCCS/1636/21.

SCCS (2022). Request for a scientific advice on the safety of triclocarban (CAS No. 101-20-2, EC No. 202-924-1) and triclosan (CAS No. 3380-34-5, EC No. 222-182-2) as substances with potential endocrine disrupting properties used in cosmetic products. Scientific Committee on Consumer Safety. SCCS/1643/22.

SCCS (2024). Opinion on benzophenone-4 (CAS No. 4065-45-6, EC No. 223-772-2) used in cosmetics products. Scientific Committee on Consumer Safety. SCCS/1660/23.

Tang-Liu DD, Williams RL, Riegelman S (1983). Disposition of caffeine and its metabolites in man. J Pharmacol Exp Ther 224, 180-185.

WHO (2023). The selection and use of essential medicines 2023. Web Annex A. World Health Organization Model List of Essential medicines. 23rd list (2023). WHO, Geneva.