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(This category highlights potential health issues from fragrance chemicals and fragranced products.)

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Go Fragrance Free: Healthier Air Has Never Been Easier

Many hospitals, businesses, and employees are not aware that fragranced products can create access barriers to their facilities and can adversely affect the health of those working there. Fragranced products include fragranced cleaning products, hand sanitizers, lotions, laundry products, deodorant, air fresheners or any other scented items.

CLEANING SUPPLIES and DISINFECTANTS

Dishsoap, Floor Cleaner/Polish, Handsoap, Wipes, Sprays, Window/All Purpose Cleaner, Dishwasher Detergent, Toilet Bowl Cleaner, Sanitizers, Sterilizers, Disinfectants

1. Risk in cleaning: chemical and physical exposure

Wolkoff P, Schneider T, Kildesø J, Degerth R, Jaroszewski M, Schunk H. Risk in cleaning: chemical and physical exposure. *Sci Total Environ.* 1998 Apr 23;215(1-2):135-56. doi: 10.1016/s0048-9697(98)00110-7. PMID: 9599458.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/9599458/>

“...both field studies and **emission testing** indicate that the use of **cleaning agents** results in a temporal **increase in the overall VOC level**. This increase may occur during the cleaning process and thus it can enhance the probability of increased short-term exposure of the cleaners. However, the increased levels can also be present after the cleaning and result in an overall **increased VOC level** that can possibly **affect the indoor air quality (IAQ)** perceived by occupants.”

“**Perfumes or fragrances** are used either to give the products a pleasant odour or to mask an unpleasant smell... They **are not essential for the technical function of the product**. Some of the used perfumes or fragrances are reported allergens. **Therefore, the risk of the exposure of cleaners to these substances is often unnecessary.**”

2. Cleaning Agents and Asthma

Quirce S, Barranco P. Cleaning agents and asthma. *J Investig Allergol Clin Immunol.* 2010;20(7):542-50; quiz 2p following 550. PMID: 21313993.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/21313993/> - [PDF](#)

“Perfumes and scents are components common of many cleaning products. **Pine scent** containing **terpenes** can act as a **sensitizer**, as can **limonene, eugenol, and other fragrances**. The main sensitizers contained in cleaning products are **disinfectants**, quaternary ammonium compounds (such as benzalkonium chloride), amine compounds, and fragrances.... Exposure to the ingredients of cleaning products may give rise to both **new-onset asthma**, with or without a latency period, and **work exacerbated asthma**. High-level exposure to irritants may induce reactive airways dysfunction syndrome.”

“**Terpenes can cause secondary emissions due to reactions of the primary exposures with oxidizers present in indoor air**. These reactions can **release secondary ultrafine particles** that may be responsible for **respiratory irritation** symptoms.”

“Exposure to different cleaning compounds, including **fragrances**, has been reported to **cause asthma-like symptoms** with no significant changes in lung function. High-level **respiratory irritant exposures** can **induce new onset of asthma** with no latency period, namely, **reactive airways dysfunction syndrome.**”

“Most of the cleaning agents associated with asthma like symptoms have harmful irritative and/or sensitizing properties and may be involved in the development of chronic respiratory symptoms.

Sensitizers

- Amine compounds (eg, monoethanolamine)
- Disinfectants (eg, **aldehydes**)
- Quaternary ammonium compounds (eg, benzalkonium chloride)
- **Scents containing terpenes (eg, pinene, d-limonene), eugenol**
- Isothiazolinones, **formaldehyde** (preservatives)
- Others: natural rubber latex “

“The main chemical classes of disinfectants are alcohols (eg, ethanol, isopropanol), **aldehydes** (glutaraldehyde, orthophthalaldehyde), oxidizers (eg, sodium hypochlorite, H₂O₂), phenolics (phenol, thymol, o-phenylphenol), and quaternary ammonium compounds. **Disinfectants have been identified as the most hazardous group of cleaning agents.**”

[**Note:** Fragrance does not clean or disinfect, yet many cleaning products are unnecessarily scented.]

[**Note:** Fragrance is considered the new ‘second hand smoke’, “[The parallels between second-hand smoke and synthetic fragrance use are many. At its core, both are battles over indoor air quality](#) “ - quote and link from De Vader, Christy L. & Barker, Paxson.

Chemicals that cigarettes/cigarette smoke and fragranced products can have in common are: Acetone, Formaldehyde, Benzene, acetaldehyde, terpenoids and phenols.]

3. A pilot study of total personal exposure to volatile organic compounds among Hispanic female domestic cleaners

Oyer-Peterson K, Gimeno Ruiz de Porras D, Han I, Delclos GL, Brooks EG, Afshar M, Whitworth KW. A pilot study of total personal exposure to volatile organic compounds among Hispanic female domestic cleaners. J Occup Environ Hyg. 2022 Jan;19(1):1-11. doi: 10.1080/15459624.2021.2000615. Epub 2022 Jan 28. PMID: 34731075; PMCID: PMC8813894.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/34731075/> - [PDF](#)

“Cleaners have an elevated risk for the development or exacerbation of **asthma** and other **respiratory** conditions, possibly due to exposure to cleaning products containing **volatile organic compounds (VOCs)** leading to **inflammation** and **oxidative stress**. ...29% and 20% reported suffering from **skin irritation** and **trouble breathing**...”

“...the highest exposures experienced by the women were from **d-limonene** (mean = 22.5 ppb; median = 4.3 ppb), followed by **toluene** (mean = 1.5 ppb; median = 1.1 ppb), **α-pinene** (mean = 0.8 ppb; median = 0.7 ppb) and **β-pinene** (mean = 0.7 ppb; median = 0.6 ppb)...”

“Additionally, while they are exposed to myriad **VOCs**, these women were particularly exposed to **terpene compounds**, which are often **found in scented cleaning products.**”

4. Update on asthma and cleaning agents

Folletti I, Siracusa A, Paolucci G. Update on asthma and cleaning agents. *Curr Opin Allergy Clin Immunol*. 2017 Apr;17(2):90-95. doi: 10.1097/ACI.0000000000000349. PMID: 28141626.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/28141626/>

“Asthma due to cleaning products has been known for 20 years... There is some evidence that an **irritant mechanism is more common, although several case reports showed an immunologic mechanism** (e.g. disinfectants, **amine compounds, aldehydes and fragrances**).”

“Moreover, two interesting reviews published in 2010 suggested that **occupational asthma in cleaning workers** may be due to **specific sensitization to disinfectants** such as quaternary ammonium compounds (e.g. benzalkonium chloride and lauryl dimethyl benzyl ammonium chloride), chloramine T, glutaraldehyde, **fragrances** and ethanolamines.... **Many cases of cleaning-related asthma occur in healthcare workers.**”

5. Ethanol-based disinfectant sprays drive rapid changes in the chemical composition of indoor air in residential buildings

Jiang J, Ding X, Isaacson KP, Tasoglou A, Huber H, Shah AD, Jung N, Boor BE. Ethanol-based disinfectant sprays drive rapid changes in the chemical composition of indoor air in residential buildings. *J Hazard Mater Lett*. 2021 Nov;2:100042. doi: 10.1016/j.hazl.2021.100042. Epub 2021 Sep 8. PMID: 34977843; PMCID: PMC8423670.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/34977843/> - [PDF](#)

“Preclinical studies on animals revealed potential **neural, hepatic, pulmonary, and cardiovascular risks** of inhalation of **ethanol** and 2-propanol.... Epidemiological studies have identified associations between **inhalation exposure to VOCs** and numerous **respiratory diseases** VOC exposures in residential and office buildings have been related to various adverse human health outcomes.”

“Products A and B contained ethanol at 30–60 %wt. and 58 % wt., respectively. Both sprays utilized alkanes as propellants (A, B: propane (C₃H₈), A: isobutane (i-C₄H₁₀), B: n-butane (n-C₄H₁₀)) and included **fragrances.**”

“**Monoterpenes and monoterpenoids are common fragrance ingredients in disinfectants and could cause occupational asthma**.... Epidemiological studies have identified associations between **inhalation exposure to VOCs** and **numerous respiratory diseases**.... VOC exposures in residential and office buildings have been related to various adverse human health outcomes....”

6. Indoor Exposure to Selected Air Pollutants in the Home Environment: A Systematic Review

Vardoulakis S, Giagloglou E, Steinle S, Davis A, Sleuwenhoek A, Galea KS, Dixon K, Crawford JO. Indoor Exposure to Selected Air Pollutants in the Home Environment: A Systematic Review. *Int J Environ Res Public Health*. 2020 Dec 2;17(23):8972. doi: 10.3390/ijerph17238972. PMID: 33276576; PMCID: PMC7729884.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/33276576/> - [PDF](#)

“There is increasing awareness that the quality of the **indoor environment** affects our health and well-being.... Identified indoor **PM_{2.5}** sources include smoking, cooking, heating, use of **incense, candles, and insecticides**, while **cleaning**, housework, presence of pets and movement of people were the main sources of coarse particles.... Household characteristics and occupant activities play a large role in indoor exposure,

particularly cigarette smoking for PM2.5, gas appliances for NO2, and **household products** for **VOCs** and **PAHs**.”

“Typical **VOCs** found in the indoor environment include **benzene, toluene, ethylbenzene** and **xylene (BTEX)** from fuel combustion and evaporation, and house renovations; benzene and **styrene** from cigarette smoking; alkanes from natural gas; 1,4-dichlorobenzene from moth repellents; **a-pinene** from wood-based building materials; and **limonene** from **fragranced household cleaning and laundry products**... Reported **VOC concentrations were generally higher indoors than outdoors**, including for **benzene**, particularly in colder seasons due to reduced ventilation and the use of oil and gas heaters.”

“Indoor sources were dominant for most **VOCs** and particularly for **limonene, a-pinene, hexanal, pentanal, o-xylene**, and **n-dodecane**. Use of **artificial air freshener** was **significantly associated with total VOC (TVOC), benzene, toluene** and **ethylbenzene**.”

“Indoor air quality (IAQ) in particular has an impact on multiple health outcomes, including **respiratory and cardiovascular illness, allergic symptoms, cancers, and premature mortality**.”

[Note: A synonym for pentanal is valeraldehyde. Valeraldehyde is on the [IFRA list](#) of disclosed fragrance ingredients.]

7. Identification of combinations of endocrine disrupting chemicals in household chemical products that require mixture toxicity testing

Lee I, Ji K. Identification of combinations of endocrine disrupting chemicals in household chemical products that require mixture toxicity testing. *Ecotoxicol Environ Saf.* 2022 Jul 15;240:113677. doi: 10.1016/j.ecoenv.2022.113677. Epub 2022 May 26. PMID: 35642859

Article Link: <https://pubmed.ncbi.nlm.nih.gov/35642859/> - [PDF](#)

“The present study listed the ingredients contained in 11064 household chemical products from a publicly available database, and identified **EDCs** related to **estrogenicity, androgenicity, thyroid hormone disruption, and changes in steroidogenesis**.”

“A total of 293 chemicals were related to **endocrine disruption**, and **nearly two-thirds of the products contained more than one of these chemicals**. Cleaning products, synthetic detergents, fabric softeners, air fresheners, and deodorants have several hotspots for **fragrances**, isothiazolinones, glycol ethers, and parabens. The **three most prevalent EDCs** in household chemical products were **added to act as fragrances** and preservatives.”

“The most frequently observed **EDCs** in the five product groups are **hexyl cinnamaldehyde, geraniol, citronellol, 2-(4-tert-butylbenzyl)propionaldehyde** (CAS no. 80-54-6), and **benzyl benzoate** (CAS no. 120-51-4). **These EDCs** are commonly **used to add fragrance**.”

“The most frequently identified combinations were benzisothiazolinone and **butylated hydroxytoluene** (CAS no. 128-37-0) in cleaners, benzisothiazolinone and **hexyl cinnamaldehyde** in synthetic detergents, **2-(4-tert-butylbenzyl)propionaldehyde** and **citronellol** in fabric softeners, **benzyl benzoate** and **hexyl cinnamaldehyde** in air fresheners, and **geraniol** and **citral** (CAS no. 5392-40-5) in deodorants. The **EDCs** in these products were mostly included to act as **fragrances** and preservatives.”

“Consistent with the results of this study, Wieck et al. (2018) reported that 26 fragrances were named approximately 2000 times on the ingredient list of 1447 household detergents, and **fragrances** such as **limonene**, **linalool**, **hexyl cinnamaldehyde**, **2-(4-tert-butylbenzyl)propionaldehyde**, and **citronellol** were frequently mentioned (Wieck et al., 2018, Yazar et al., 2011)...**Geraniol** appeared to have the potential to **interact with estrogen receptors** in estrogen-inducible yeast expressing the human estrogen receptor (Howes et al., 2002)... **Benzyl benzoate** and **2-(4-tert-butylbenzyl)propionaldehyde** added to **synthetic detergents, fabric softeners, and air fresheners** were reported to induce estrogenic responses in **MCF-7 human breast cancer cell line** (Charles and Darbre, 2009).

“This study confirmed that DEHP, DINP, and DBP were used in cleaners, synthetic detergents, coating agents, adhesives, **air fresheners**, and paints. **Exposure to DEHP or DBP at levels seen in human populations** has been **linked to male reproductive defects**, such as **poor semen quality** and **abnormal genital development** (Radke et al., 2018).”

8. Indoor secondary organic aerosols formation from ozonolysis of monoterpene: An example of d-limonene with ammonia and potential impacts on pulmonary inflammations

Niu X, Ho SSH, Ho KF, Huang Y, Cao J, Shen Z, Sun J, Wang X, Wang Y, Lee S, Huang R. Indoor secondary organic aerosols formation from ozonolysis of monoterpene: An example of d-limonene with ammonia and potential impacts on pulmonary inflammations. *Sci Total Environ.* 2017 Feb 1;579:212-220. doi: 10.1016/j.scitotenv.2016.11.018. Epub 2016 Nov 11. PMID: 27842959.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/27842959/>

“**Monoterpene** is one class of biogenic volatile organic compounds (BVOCs) which widely presents in **household cleaning products** and **air fresheners**. It plays reactive role in **secondary organic aerosols (SOAs) formation with ozone (O3) in indoor environments**. Such ozonolysis can be influenced by the presence of gaseous pollutants such as ammonia (NH₃). This study focuses on investigations of ozone-initiated formation of indoor SOAs with **d-limonene**, one of the most abundant indoor **monoterpenes**, in a large environmental chamber.... The results indicated that there was 22-39% stronger **pulmonary inflammatory** effect on the particles generated with NH₃ (ammonia).”

[**Note:** **Limonene** is a common skin sensitizer and **known allergen** in fragrance and **fragranced products**. Limonene (natural or **synthetic**) is a terpene. Terpenes can create **formaldehyde and particulate matter** in air as **secondary pollutants**. Limonene is on the **IFRA** list as a fragrance ingredient.]

9. Prevalence and predictors of occupational asthma among workers in detergent and cleaning products industry and its impact on quality of life in El Asher Men Ramadan, Egypt

Ahmed AS, Ibrahim DA, Hassan TH, Abd-El-Azem WG. Prevalence and predictors of occupational asthma among workers in detergent and cleaning products industry and its impact on quality of life in El Asher Men Ramadan, Egypt. *Environ Sci Pollut Res Int.* 2022 May;29(23):33901-33908. doi: 10.1007/s11356-022-18558-8. Epub 2022 Jan 15. PMID: 35034305; PMCID: PMC8761047.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/35034305/> - [PDF](#)

“Cleaning products are mixtures of many chemical ingredients that are known to contain sensitizers, disinfectants, and **fragrances**, as well as **strong airway irritants** which associated with **lower respiratory tract and asthma symptoms**.”

“Workers in detergent and cleaning products industry are vulnerable group for developing occupational asthma and other **respiratory problems** as they are exposed to a wide range of irritants and sensitizers in the chemical substances used, besides common indoor allergens and pollutants (Quirce & Barranco, 2010).”

“**When the airway epithelium is damaged as a result of repeated irritating exposure, the inflammatory Th2 response is triggered** (Tarlo & Lemiere, 2014).”

10. Pediatric allergic contact dermatitis. Part I: Clinical features and common contact allergens in children

Neale H, Garza-Mayers AC, Tam I, Yu J. Pediatric allergic contact dermatitis. Part I: Clinical features and common contact allergens in children. J Am Acad Dermatol. 2021 Feb;84(2):235-244. doi: 10.1016/j.jaad.2020.11.002. Epub 2020 Nov 17. PMID: 33217510.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/33217510/> - [PDF](#)

“Children can develop ACD (Allergic Contact Dermatitis) at any age.... Therefore, all children should be asked about the use of personal care products such as **shampoos, soaps, lotions, detergents, and topical medications**....systemic contact dermatitis can occur through oral ingestion of contact allergens in food, such as carmine in red velvet cupcakes, nickel in oatmeal and cocoa, and **balsam of Peru (BoP)** in ketchup....Nickel, **fragrance mix (FM) I, BoP, propylene glycol, CAPB, bacitracin, neomycin, cobalt, formaldehyde (and its releasers)**, methylisothiazolinone (MI), and **lanolin** are top relevant allergens in the United States.”

“Fragrances are ubiquitous environmental allergens, and although **there are potentially thousands of allergenic fragrance chemicals**, fragrance markers such as BoP, FM I, and FM II are most frequently used in patch testing.... Fragrances are often used in household products like candles and cleaning supplies. **Children may also be exposed to fragrances used by their care takers, such as perfumes, leading to cases of conubial ACD.**”

“**Formaldehyde** is found in cosmetic and personal care products (**including baby products**), cleaning supplies, adhesives, sporting equipment, and paints. **One study showed that more than 25% of those with PPTs to formaldehyde were also sensitized to its releasers** such as quaternium-15, dimethyloldimethyl hydantoin, bronopol, diazolidinyl urea, and imidazolidinyl urea.

“Often, products such as **baby wipes may contain formaldehyde releasers** even though they may not be listed among the ingredients. **Formaldehyde (and releasers) contact allergy is more frequent in the United States compared to Europe, likely reflecting stricter regulation of product concentration and labeling in Europe.**”

[**Note: Balsam of Peru** is used in [fragrance](#) and is a [known allergen](#). Like with all fragrance allergies, [avoidance is suggested.](#)]

[**Note: Formaldehyde** is a [secondary pollutant](#) from fragrance and fragranced products.

Also, a 2012 study, 21 out of 30 perfume samples were shown to [release formaldehyde](#) when tested but formaldehyde was not listed on any of the labels. Formaldehyde is a [sensitizer](#) and [known allergen](#).]

11. Household air pollution and its effects on health

Apte K, Salvi S. Household air pollution and its effects on health. F1000Res. 2016 Oct 28;5:F1000 Faculty Rev-2593. doi: 10.12688/f1000research.7552.1. PMID: 27853506; PMCID: PMC5089137.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/27853506/> - [PDF](#)

“Cigarette smoke contains 7,357 different chemical compounds such as **benzene**, CO, PAHs, heterocyclic amines, cyanide, **formaldehyde**, **terpenoids**, **phenols**, nicotine, and heavy metals.”

“Various studies have reported that toxic levels of air pollutants are emitted when these **fragrances** are burnt. ... Among the Chinese, 76.9% currently burn incense at home every day and over 90% of the population has been using these for over 20 years. **Burning of these fragrances emits high levels of PAHs, benzene, nitrous oxide, and CO.** ... Household air pollution begins to affect a human even during **fetal life. Increased household air pollution increases oxidative stress**, which has been implicated in **decreased fertility** or, in some cases, even **infertility**. Increased oxidative stress leads to **decreased sperm motility** and **poor zygote quality**. It also plays an important role in **increasing insulin resistance**, which is associated with **polycystic ovarian disease**, a major cause of infertility.”

“...a study of 10 **newborn infants** in New York by the Environmental Work Group revealed that these infants, born to mothers exposed to pollutants, had as many as **232 pollutants circulating in the cord blood collected at birth**....Similarly, another study reported that increased exposure to polycyclic aromatic hydrocarbons and heavy metals (especially lead and mercury) in the second trimester of pregnancy resulted in decreased length of the baby at birth.... They also have lower heights, which do not recover later in life.... The effect of perinatal exposure to PAHs has also been studied, revealing compromised lung function in otherwise-healthy children... Household air pollutants are also implicated in cognitive and judgmental skills”

12. Fragranced consumer products: exposures and effects from emissions

Steinemann A. Fragranced consumer products: exposures and effects from emissions. Air Qual Atmos Health. 2016;9(8):861-866. doi: 10.1007/s11869-016-0442-z. Epub 2016 Oct 20. PMID: 27867426; PMCID: PMC5093181.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/27867426/> - [PDF](#)

“Fragranced consumer products, such as cleaning supplies, **air fresheners**, and personal care products, **are a primary source of indoor air pollutants** and personal exposure.... The study investigated the prevalence and types of fragranced product exposures, associated health effects, awareness of product emissions, and preferences for fragrance-free policies and environments.”

“**Secondhand scents** (as termed in this article) **refers to indirect or involuntary exposure to fragranced products (in an analogy to secondhand smoke).** ... Individuals report **health problems when exposed to fragranced products in society**, other than through intentional use of products.”

“**Fragranced products (even ones called green or organic) emit a range of volatile organic compounds**, including hazardous air pollutants, but relatively few are disclosed to the public (Steinemann 2015).... Further, 67.3 % were not aware that **fragranced products typically emit hazardous air pollutants such as formaldehyde**, and 72.6 % were not aware that even so-called natural, green, and organic fragranced products typically emit hazardous air pollutants.”

13. Health risks of chemicals in consumer products: A review

Li D, Suh S. Health risks of chemicals in consumer products: A review. *Environ Int.* 2019 Feb;123:580-587. doi: 10.1016/j.envint.2018.12.033. Epub 2019 Jan 7. PMID: 30622082.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/30622082/> - [Full Text](#)

“It should also be noted that some chemicals have multiple functional uses, while we chose the most dominant functional use for each chemical. An example is the grouping of **phthalates**. Despite categorized as plasticizer together in this review, several phthalates such as **diethyl phthalate** and **dimethyl phthalate** are used as solvents in personal care products and cosmetics as **carriers of fragrance** (Schettler, 2006).”

“...we found that the volume of the peer-reviewed literature that addresses human health risks of the chemicals in consumer products did grow over the last two decades, while its growth could by no means match the speed of increasing volume and diversity of the chemicals produced and used in consumer products by the society. This **growing gap between increasing reliance on chemicals in consumer products and our knowledge on their human health risks raises a potential public health concern**, given the pervasive nature of today's mass production and consumption practice.”

“As a result, peer-reviewed journal publications largely failed to serve as an early warning or a preventive mechanism. The **humidifier disinfectant incident** in South Korea is a stark example that shows the potential vulnerability in chemical exposure through consumer products and its consequences, as well as the limited role for peer-reviewed journal publications to prevent them. It also **highlights the needs for understanding the risks of chemicals before putting them into consumer products**, while the rapidly growing diversity of synthetic chemicals often makes the generation of necessary data cost-prohibitive. As a result, we observed that scientific literature tends to appear only after the outbreak of major exposure incidents, or they tend to be concentrated in the chemicals or chemical groups of which human health risks have been previously reported. This is a structural problem that is poised to grow under the current practice.”

“We believe that there is an urgent need for creating the framework conditions that encourage more exploratory and speculative risk assessments and their publications in peer-reviewed journal space in the absence of known human health risks. Reducing the costs and time needed for toxicity and exposure assessments is a key, to which the developments in predictive toxicity and risk assessment techniques for screening-level assessment, as well as **the use of systematic prioritization for high-risk exposure pathways and chemicals in consumer products would be crucial.**”

14. Volatile emissions from common consumer products

Steinemann, A. Volatile emissions from common consumer products. *Air Qual Atmos Health* 8, 273–281 (2015). <https://doi.org/10.1007/s11869-015-0327-6>

Article Link: <https://link.springer.com/article/10.1007/s11869-015-0327-6>

“This study investigates and compares **VOCs emitted from 37 common products** (air fresheners, **laundry products**, cleaners, and personal care products) including those with certifications and claims of green and organic.”

“**For laundry products**, cleaning supplies, and air fresheners, regulated under the US Consumer Product Safety Act (CPSA), **labels do not need to list all ingredients or the presence of a fragrance in the product** Fragrance ingredients are exempt from full disclosure in any product, not only in the USA but also internationally.”

“This study found **156 different VOCs emitted from the 37 products**, with an average of **15 VOCs per product**. Of these 156 VOCs, **42 VOCs are classified as toxic or hazardous under US federal laws**, and each product emitted at least one of these chemicals.”

“The primary difference between the **fragranced** and fragrance-free versions is the presence of **terpenes (such as d-limonene, β -pinene, α -pinene)** in the fragranced versions but not the fragrance-free versions... Consumer products used indoors, such as **laundry supplies, can affect outdoor air quality**, such as through dryer vent emissions...”

15. Developmental Exposure to Endocrine Disrupting Chemicals and Its Impact on Cardio-Metabolic-Renal Health

Singh RD, Koshta K, Tiwari R, Khan H, Sharma V, Srivastava V. Developmental Exposure to Endocrine Disrupting Chemicals and Its Impact on Cardio-Metabolic-Renal Health. *Front Toxicol.* 2021 Jul 5;3:663372. doi: 10.3389/ftox.2021.663372. PMID: 35295127; PMCID: PMC8915840.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/35295127/> - [Free Full Text](#)

“**Endocrine disrupting chemicals (EDCs)** include **phenols, phthalates, parabens, flame retardants, heavy metals, pesticides, perfluorinated chemicals, UV filter components, triclosan, and organochlorines.**”

“**Cumulative exposure to mixtures of EDCs can lead to adverse effects on the health of the exposed individuals** (Crews et al., 2003). Multiple studies, including the studies of the National Health and Nutrition Examination Survey (NHANES), have shown that **about 75–97% of US and Asian adults have detectable levels of phthalates and phenols [bisphenol A (BPA) and polyfluoroalkyl chemicals] in their urine** (Silva et al., 2004; Calafat et al., 2007, 2008; Vandenberg et al., 2010; Zhang et al., 2011; Husøy et al., 2019).”

“Epidemiological and experimental studies have also linked **adult exposure to EDCs** with **abnormal male and female reproductive health, diabetes, obesity, cardiovascular and metabolic disorders, thyroid function, and hormone sensitive cancers** (Howard and Lee, 2012; Bodin et al., 2015; Heindel et al., 2015, 2017).”

“**Children are also vulnerable to EDCs** (Calafat et al., 2017; Hendryx and Luo, 2018), **making EDC exposure a major health concern for all age groups.**”

“**Chronic kidney disease** is a growing health problem among children and adults. The incidence and the prevalence of chronic kidney disease (CKD) **among children have been steadily increasing since the 1980s....** A number of traditional risk factors associated with CKD in children include hypertension, obesity, diabetes, and aberrant divalent mineral metabolism.... There is growing evidence that **links exposure to EDCs with early progression to end-stage renal disease (ESRD)** (Kataria et al., 2015)....”

“**Early-life exposure to EDCs was associated with elevated levels of kidney toxicity markers such as albumin-to-creatinine ratio (ACR), estimated glomerular filtration rate (eGFR), and urinary protein-to-creatinine ratio (UPCR) in some human population studies** (Li et al., 2012; Trasande et al., 2013a, 2014; Malits et al., 2018).”

[Note: **Phthalates** are **synthetic** odorless plasticizers used as solvents, binders or fixatives **in many fragrances**. Why are phthalates **in the news**? **Phthalates** are considered Endocrine Disrupting Chemicals.

On the [California Safe Cosmetics Program Product Database](#): [DEP](#), [DIDP](#), and [DBP](#) are reported as fragrance while [DEHP](#) and [DBP](#) are perfume solvents. [IFRA](#) lists [DEP](#) and [DMP](#), as “reported fragrance ingredients”.]

[Note: [Endocrine Disrupting Chemicals](#) (EDC's) are [commonly used in perfumes and fragranced products](#) as preservatives or fragrance. [What are EDC's](#) and how can they [affect us?](#)]

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