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

Download the poster to share: <https://www.fragrancefreecoalitionusa.com/>

**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.

## **PETS**

*Shampoo/Conditioner, Leave-in Spray, Kitty Litter, Dog Pads, Wipes, Pet Deodorant, Perfume for Pets/Cologne/Body Spray, Bug Spray, Scented Toys, Dog Bed Sprays.*

### **1. Coughing in Small Animal Patients**

Hsieh BM and Beets AK (2020) Coughing in Small Animal Patients. Front. Vet. Sci. 6:513. doi: 10.3389/fvets.2019.00513

**Article Link:** <https://www.frontiersin.org/articles/10.3389/fvets.2019.00513/full>

“Environmental factors play a large role in some **chronic airway disease** processes and can cause exacerbation of coughing. Owners should not smoke indoors and any possible **airborne irritants such as air fresheners, incense, perfumes, and noxious fumes should be eliminated.**”

“**Coughing is a common clinical problem in humans and veterinary patients** that is difficult to manage and severely impacts quality of life.... Current guidelines are largely based on expert opinion, anecdotal clinical evidence and relatively few rigorous clinical trials.”

### **2. [Occupational asthma caused by scented gravel in cat litter boxes]**

Jensen OC, Petersen I. Erhvervsasthma fremkaldt af duftstoffer i kattedrus [Occupational asthma caused by scented gravel in cat litter boxes]. Ugeskr Laeger. 1991 Mar 25;153(13):939-40. Danish. PMID: 2024303.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/2024303/>

“Perfumes are now added to articles in everyday use to an increasing extent. One example of this is addition of **perfume** to gravel (kitty litter) in cat toilets. **It is recognized that perfumes may cause toxic and allergic skin reactions while perfume as the cause of asthma is not so well recognized.** In the case described here, exposure to industrial perfume resulted in asthma on account of irritation. “

### **3. Association between indoor air pollution and respiratory disease in companion dogs and cats**

Lin CH, Lo PY, Wu HD, Chang C, Wang LC. Association between indoor air pollution and respiratory disease in companion dogs and cats. J Vet Intern Med. 2018 May;32(3):1259-1267. doi: 10.1111/jvim.15143. Epub 2018 Apr 21. PMID: 29681128; PMCID: PMC5980393.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/29681128/> - [PDF](#)

“Among various well-known air pollutants, environmental tobacco smoke (ETS) has long been suspected of causing or exacerbating some chronic respiratory diseases in the veterinary literatures, such as feline lower

airway disease, canine chronic bronchitis, and canine lymphoplasmacytic rhinitis.”

“The prevalence of signs of **respiratory problem** in pet dogs and cats was 89.0% and 73%, respectively, and the presence of signs of respiratory problem with “often or more” frequency was found for 45.0% of pet dogs and 19% of pet cats. **The prevalence of secondhand smoke, cooking behavior/cooking fumes, incense burning, and household chemicals** in the pets home were 32.9%, 72.6%, 17.1%, and 11.6%, respectively.”

[**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.]

#### **4. An observational study of the role of indoor air pollution in pets with naturally acquired bronchial/lung disease**

Lin CH, Lo PY, Wu HD. An observational study of the role of indoor air pollution in pets with naturally acquired bronchial/lung disease. Vet Med Sci. 2020 Aug;6(3):314-320. doi: 10.1002/vms3.231. Epub 2020 Jan 3. PMID: 31901015; PMCID: PMC7397909.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/31901015/> - [PDF](#)

“In conclusion, this study showed that **poor air quality** (PM2.5 level >35 µg/m<sup>3</sup> or VOC concentration >1 ppm) was **associated with a hypercellular response in the mucosa of the lower airways in dogs** with naturally acquired **bronchial/lung disease**. ... The possible threat of IAP is an emerging ‘One Health’ issue that affects both pets and their owners in modern society.”

[**Note:** [Fragranced products](#) emit [VOC's](#) that can contribute to higher [particulate matter \(PM\)](#) indoors and out.]

#### **5. Histo-morphometric Evidences for Testicular Derangement in animal models submitted to chronic and Sub-chronic Inhalation of Fragrance**

Akunna GG, Saalu LC, Ogunlade B, Akingbade AM, Anderson LE, Olusolade FS, Histo-morphometric evidences for testicular derangement in animal models submitted to chronic and sub-chronic inhalation of fragrance. American Journal of Research Communication, 2015, 3(1): 85-101| www.usa-journals.com, ISSN: 2325-4076.

**Article Link:**

[https://www.researchgate.net/publication/315065887\\_Histo-morphometric\\_Evidences\\_for\\_Testicular\\_Derangement\\_in\\_animal\\_models\\_submitted\\_to\\_chronic\\_and\\_Sub-chronic\\_Inhalation\\_of\\_Fragrance](https://www.researchgate.net/publication/315065887_Histo-morphometric_Evidences_for_Testicular_Derangement_in_animal_models_submitted_to_chronic_and_Sub-chronic_Inhalation_of_Fragrance) - [PDF](#)

“Copious documentations have indicated that **82 percent of perfumes labeled “natural ingredients” actually contain synthetic fragrances** (Rastogi et al.,1996). Such chemicals that affect **male reproductive hormones** may be a factor in **infertility** and has been known as **endocrine disruptors**.(Giudice, 2006, Saalu et al., 2010, Akunna et al., 2013)”.

“It has been reported that perfumes, colognes, body sprays and care products contained an average of four potential hormone-disrupting chemicals. In male reproductive anatomy, **endocrine disruptors** have severally been implicated as teratogens, resulting in **cryptorchidism, hypospadias** and **impairment of body function** normally regulated by natural hormone signaling (Wang and Baskin, 2008, Akunna et al., 2011, Akunna et al., 2013). Studies have shown that these chemicals causes damage by **mimicking or disrupting natural estrogen, testosterone and thyroid pathways** (Soto et al., 2009). Although the implication of subsequent

exposure to these chemicals have not been critically understood, recent findings has clearly demonstrated disruption in **spermatogenesis**,(Akunna et al., 2014) **liver damage** (Akunna et al., 2011) and **other tissue toxicity in animals** exposed to fragrance components(Johansen et al., 2003, Elberling et al., 2004, Breast Cancer Fund, 2008, Schnuch et al., 2010). In animal model studies, fragrance exposure has lead to **spermatotoxicity** and **infertility, congenital malformation in penises and abnormal testes** (Akunna et al., 2014).”

“According to published scientific studies, **diethyl phthalate** and octinoxate which are major components of perfume and sunscreen respectively has been implicated in **sperm damage, apoptosis** and **interference with estrogen and androgens** in human respectively (Giudice, 2006, Wang and Baskin, 2008, Silva et al., 2004 ,Schreurs et al., 2005, Swan, 2008, CDC, 2009).”

“From our studies on fragrance, we can conclude herein that fragrance components are **testiculotoxic** in rat.”

**[Note: Definition** - Teratogens are substances that people are exposed to (in utero) that may lead to birth defects, miscarriages, pre-term labor or stillbirth.. **Cryptorchidism** (undescended testicals) may also increase the risk for testicular cancer. **Hypospadias** is a birth defect where boys have an altered location of the opening of the urethra.]

## **6. Canine toys and training devices as sources of exposure to phthalates and bisphenol A: quantitation of chemicals in leachate and in vitro screening for endocrine activity**

Wooten KJ, Smith PN. Canine toys and training devices as sources of exposure to phthalates and bisphenol A: quantitation of chemicals in leachate and in vitro screening for endocrine activity. Chemosphere. 2013 Nov;93(10):2245-53. doi: 10.1016/j.chemosphere.2013.07.075. Epub 2013 Sep 3. PMID: 24007620.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/24007620/>

“Chewing and mouthing behaviors exhibited by pet dogs are likely to lead to oral exposures to a variety of **environmental chemicals**. These results confirm that toys and training devices are potential sources of exposure to **endocrine disrupting chemicals** in pet dogs.”

“Chemicals reported in tissues of pets include polychlorinated biphenyls, organochlorine pesticides, and dioxin-related compounds in genital tissues and adipose tissue and **phthalates**, BPA, perfluorinated compounds, polybrominated diphenyl ethers, flame retardants, and selected heavy metals in blood and urine samples. **Chemical concentrations in pet tissues are often comparable to or higher than those in corresponding human samples, which suggests that pets and humans are exposed via similar sources.**”

**[Note:** Fragrances are also added to chew toys, stuffed items, poop bags, etc. [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?](#)]

**[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”.]

## 7. Phthalate Exposure Changes the Metabolic Profile of Cardiac Muscle Cells

Posnack NG, Swift LM, Kay MW, Lee NH, Sarvazyan N. Phthalate exposure changes the metabolic profile of cardiac muscle cells. *Environ Health Perspect.* 2012 Sep;120(9):1243-51. doi: 10.1289/ehp.1205056. Epub 2012 Jun 6. PMID: 22672789; PMCID: PMC3440133. (Neonatal rat cardiomyocytes)

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/22672789/> - [PDF](#)

“Data suggest that **DEHP** exposure results in metabolic remodeling of cardiomyocytes, whereby cardiac cells increase their dependence on fatty acids for energy production. This fuel switch may be regulated at both the gene expression and post transcription levels. Our findings have important clinical implications because chronic dependence on fatty acids is associated with an accumulation in lipid intermediates, lactate, protons, and reactive oxygen species. This dependence can sensitize the **heart** to ischemic injury and **ventricular dysfunction**.”

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## 8. Aromatic Amines Sources, Environmental Impact and Remediation

Pereira, L., Mondal, P.K., Alves, M. (2015). Aromatic Amines Sources, Environmental Impact and Remediation. In: Lichtfouse, E., Schwarzbauer, J., Robert, D. (eds) *Pollutants in Buildings, Water and Living Organisms. Environmental Chemistry for a Sustainable World*, vol 7. Springer, Cham. [https://doi.org/10.1007/978-3-319-19276-5\\_7](https://doi.org/10.1007/978-3-319-19276-5_7) (Book Chapter)

**Article Link:** [https://link.springer.com/chapter/10.1007/978-3-319-19276-5\\_7](https://link.springer.com/chapter/10.1007/978-3-319-19276-5_7)

“Aromatic amines are widely used industrial chemicals as their major sources in the environment include several chemical industry sectors such as oil refining, synthetic polymers, dyes, adhesives, rubbers, **perfume**, pharmaceuticals, pesticides and explosives. They result also from diesel exhaust, combustion of wood chips and rubber and tobacco smoke. Some types of aromatic amines are generated during cooking, special grilled meat and fish, as well. The intensive use and production of these compounds explains its occurrence in the environment such as in air, water and soil, thereby creating a potential for human exposure. **Since aromatic amines are potential carcinogenic and toxic agents**, they constitute an important class of environmental pollutants of enormous concern, which efficient removal is a crucial task for researchers, so several methods have been investigated and applied.”

**[Note:** Aromatic amine levels have been studied in pets. See the next article: [Urinary and fecal excretion of aromatic amines in pet dogs and cats from the United States](#).]

## 9. Urinary and fecal excretion of aromatic amines in pet dogs and cats from the United States

Chinthakindi S, Kannan K. Urinary and fecal excretion of aromatic amines in pet dogs and cats from the United States. *Environ Int.* 2022 May;163:107208. doi: 10.1016/j.envint.2022.107208. Epub 2022 Mar 30. PMID: 35366557; PMCID: PMC9035069.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/35366557/> - [PDF](#)

“Eight of the 30 AAs (aromatic amines) ( $\Sigma$ 8AAs) were found in > 38% of dog and cat urine samples, at median

concentrations of 7.99 (range: 0.42–52.3 ng/mL) and 31.4 (2.63–75.9) ng/mL, respectively. Nine of the 30 AAs (Σ9AAs) were found in > 73% of dog and cat feces samples, at median concentrations of 278 (range: 61.7–613 ng/g) and 240 (55.4–645) ng/g dry wt, respectively. ... **The lack of significant Spearman’s rank correlation between the concentrations of AA and nicotine in pet urine/feces suggested that sources other than tobacco smoke contributed to AA exposure in pets.** Little is known on the **toxicokinetics** of AAs in pets.”

“Pet dogs and cats have been used as sentinels of human exposure to a variety of environmental/indoor chemicals as they share a common living environment (Karthikraj et al., 2019, Karthikraj et al., 2020, Ma et al., 2020). Exposure levels of pets to AAs are not known to date. In this study, we report the occurrence of AAs in urine and feces of pet dogs and cats collected from the Albany area of New York State, USA.”

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

**[Note:** [Aromatic Amines](#) are found in fragrance/frgranced products.]

## **10. Evaluation of the health risk to animals playing with phthalates containing toys**

Müller, A. K., Nielsen, E., Ladefoged, O., Dalgaard, M., & Hass, U. (2006). *Evaluation of the health risk to animals playing with phthalate containing toys*. Miljøstyrelsen. Survey of Chemical Substances in Consumer Products No. 74

-Department of Toxicology and Risk Assessment & -Danish Institute for Food and Veterinary Research

**PDF Link:** <https://www2.mst.dk/udgiv/publications/2006/87-7052-192-1/pdf/87-7052-194-8>

“The exposure via toys may be a major source of phthalate exposure to dogs. However as for humans, animals may also be exposed to phthalates via other sources (**environment**, food, **consumer products**). This includes exposure to **DEHP** and **DINP**, but also other phthalates e.g **DBP** where combined actions could be expected.”

“As an advice to the animal owners, they can reduce the potential health risk to their animals by limiting the animal’s use of toys that potentially contain phthalates especially during pregnancy and as pups.”

**[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.

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## **11. Exposure to Dibutyl Phthalate and Reproductive-Related Outcomes in Animal Models: Evidence From Rodents Study**

Wang J, Zhang X, Li Y, Liu Y, Tao L. Exposure to Dibutyl Phthalate and Reproductive-Related Outcomes in Animal Models: Evidence From Rodents Study. *Front Physiol.* 2021 Dec 8;12:684532. doi: 10.3389/fphys.2021.684532. PMID: 34955869; PMCID: PMC8692859.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/34955869/> - [PDF](#)

“**Dibutyl phthalate (DBP)** was an endocrine disruptor, which may lead to cancer and affects reproductive

function when accumulated in the body...The results of this paper showed that **DBP had a significant negative effect on the weight of testis, epididymis, and seminal vesicles**. Second, it was mainly found that it **harmed** the sperm parameters: **sperm motility, sperm morphology, and sperm count**. In addition, lower than the safe dose of DBP still showed negative effects on reproductive system outcomes.”

[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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## 12. Urinary concentrations and distribution profiles of 21 phthalate metabolites in pet cats and dogs

Karthikraj R, Lee S, Kannan K. Urinary concentrations and distribution profiles of 21 phthalate metabolites in pet cats and dogs. Sci Total Environ. 2019 Nov 10;690:70-75. doi: 10.1016/j.scitotenv.2019.06.522. Epub 2019 Jul 2. PMID: 31284197.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/31284197/>

“**Phthalates** are widely used in several consumer products, including plastics, toys, cosmetics, and medical devices. We measured **21 phthalate monoester metabolites** (PhMs) in the **urine** of pet **cats** (n = 50) and **dogs** (n = 50) collected from New York State, USA. PhMs were widely **detected in all samples**, and 12 of 21 PhMs had detection frequencies (Dfs) N80%. The median urinary concentrations of total PhMs in pet cats and dogs were 630 ng/mL and 186 ng/mL, respectively. **Monoethyl phthalate (mEP)** was the most abundant compound in both cats and dogs. **Phthalic acid** (PA; a non-specific metabolite of phthalates) was found at very high concentrations in cats (median: 520 ng/mL). The estimated daily intake (EDI) and hazard quotient (HQ) for major phthalates in pets showed that **DEHP exposures in cats and dogs were only 2-fold less than the US Environmental Protection Agency suggested reference dose (RfD) for humans....**”

“Phthalate metabolites (PhMs) were found in all feline and canine urine... Cat- and dog-specific RfD values are needed to accurately assess the risks, as these animals may be more vulnerable to chemical exposures.”

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## 13. Effects of Di(2-ethylhexyl) Phthalate (DEHP) on Female Fertility and Adipogenesis in C3H/N Mice

Schmidt JS, Schaedlich K, Fiandanese N, Pocar P, Fischer B. Effects of di(2-ethylhexyl) phthalate (DEHP) on female fertility and adipogenesis in C3H/N mice. Environ Health Perspect. 2012 Aug;120(8):1123-9. doi: 10.1289/ehp.1104016. Epub 2012 May 15. PMID: 22588786; PMCID: PMC3440070.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/22588786/> - [PDF](#)

“Background: **Di(2-ethylhexyl) phthalate (DEHP)** and its metabolites are known to affect **lipid metabolism**

and **adipogenesis**, mainly by activation of peroxisome proliferator-activated receptors (PPARs). Exposure to DEHP has been linked with **testicular impairment** and **male subfertility**. However, the effects of DEHP on female reproductive health and metabolism have not been studied in detail.”

“Objective: We examined the effects of dietary DEHP exposure on **metabolism** and **fertility** in female mice.”  
“Results: In study I, DEHP-exposed F0 females (all dose groups) had a **significant increase in body weight**, food intake, and visceral adipose tissue compared with controls. In the 500-mg DEHP group, PPAR $\alpha$  and PPAR $\gamma$  transcripts were **significantly changed in liver tissue**. In the same group, PPAR $\gamma$  mRNA was significantly reduced in liver but not in fat tissue. In addition, leptin and FABP4 (fatty acid binding protein 4) mRNA were increased in adipose tissue, whereas adiponectin was decreased. In study II, we detected a **100% abortion rate** in F0 dams in the 500-mg group. **F1 offspring exposed in utero and during lactation had an increase in visceral fat tissue and body weight.**”

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## **14. Comparative toxicological evaluation of phthalate diesters and metabolites in Sprague-Dawley male rats for risk assessment**

Kwack SJ, Kim KB, Kim HS, Lee BM. Comparative toxicological evaluation of phthalate diesters and metabolites in Sprague-Dawley male rats for risk assessment. *J Toxicol Environ Health A*. 2009;72(21-22):1446-54. doi: 10.1080/15287390903212923. PMID: 20077217.

Article Link: <https://pubmed.ncbi.nlm.nih.gov/20077217/>

“**Liver weights were significantly increased** in groups treated with DEHP, DBP, BBP, DIDP, DINP, MEHP, and MBuP compared to the control. **Testes weights were significantly reduced** only in DEHP, DBP, and MEHP-treated groups compared to the control. Significant **decreases in red blood cell (RBC)** and hematocrit (Ht) levels were observed in DEHP-treated rats, whereas **significant increases in mean corpuscular hemoglobin (MCH), mean corpuscular hemoglobin concentration (MCHC), and platelet (PLT) levels** were found in the DEHP-treated group. Hemoglobin (Hb) level was reduced only in the DMP group. Similar to effects on testis and epididymal weights, DEHP and MEHP significantly **reduced sperm numbers and motility.**”

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## **15. Companion animals get close to the toxic aspects of antropogenic world: cytotoxicity of phthalates and bisphenol A on dog testicular primary cells**

Tekin K, Arslan P, Cil B, Filazi A, Akçay E, Yurdakok-Dikmen B. Companion animals get close to the toxic aspects of antropogenic world: cytotoxicity of phthalates and bisphenol A on dog testicular primary cells. *Cytotechnology*. 2020 Oct;72(5):629-638. doi: 10.1007/s10616-020-00401-y. Epub 2020 May 20. PMID: 32435861; PMCID: PMC7547924

Article Link: <https://pubmed.ncbi.nlm.nih.gov/32435861/> - [PDF](#)

“This study aimed to reveal and compare the cytotoxic effects of selected phthalates... According to cytotoxicity results, **DEHP was found to be the most toxic phthalate**... Further studies should focus on morphological, physiological and molecular differences to comprehend the mechanisms involved as well as decreasing the risk for impaired **spermatogenesis** caused by environmental toxicants in companion animal medicine”

“• Human and dog share similar environment where pollutants such as plasticizers lead reproductive disorders in both species.

- DEHP was the most toxic on primary testicular cell culture of dog.
- Comparative evaluation of endocrine disrupters on male reproductive system would allow us to understand the protective mechanisms involved.”

“Phthalates and Bisphenol A (BPA) are the most common synthetic chemicals, widely used in automotive, **personal care consumer product and medical industries**. Phthalates, also called plasticizers, are a group of chemical substances used to soften plastics. Some phthalates have shown detrimental effects on the endocrine and reproductive system...”

“Environmental concentrations of **DEHP and DBP have been linked with decreased sperm motility both in vivo and in vitro in humans as well.**”

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## **16. *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.”



## 17. 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?](#)]

## 18. An alternative approach for investigating the carcinogenicity of indoor air pollution: pets as sentinels of environmental cancer risk

Bukowski JA, Wartenberg D. An alternative approach for investigating the carcinogenicity of indoor air pollution: pets as sentinels of environmental cancer risk. Environ Health Perspect. 1997 Dec;105(12):1312-9. doi: 10.1289/ehp.971051312. PMID: 9405322; PMCID: PMC1470413.

**Article Link:** <https://pubmed.ncbi.nlm.nih.gov/9405322/> - [PDF](#)

“In many respects, pet dogs form an excellent surrogate population for exploring the **carcinogenic potential of the domestic environment** in which people live. Pet dogs live in close association with people and share **domestic exposures** with them; however, dogs do not directly engage in the high-risk behaviors and occupations experienced by their human masters. Also, dogs have shorter life spans and cancer latency periods than do people, allowing them to be used as **early sentinels of environmental problems**.”

“Pets are not only good markers of effect; they have also proven to be useful markers of exposure. Thomas et al. (104) found that pet dogs with high blood lead levels could be used to predict higher blood lead levels in children from the same family.”

“...pet studies represent a unique line of inquiry that explores cancer causality from an independent direction. This makes pet studies ideally suited to the weight-of-evidence approach that is currently used to define the **carcinogenic potential of environmental exposures**.”

**[Note:** Fragrance is an ‘environmental exposure’ to an unknown combination of chemicals.]

**[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.]

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<https://www.fragrancefreecoalitionusa.com/>