Report

Chemical Detection Project: New Technology Sheds Light on Chemicals in Our Environment

Chemical Detecting Wristbands Show Americans Can’t Avoid Toxic Chemicals

A simple looking wristband can shed new light on the previously invisible problem of toxic chemicals in our midst. Environmental Defense Fund (EDF) conducted a pilot project asking 28 individuals to wear the wristbands for one week. The project’s findings make clear the power of this technology to detect the presence of chemicals in our everyday lives and to advance our understanding of the health effects of exposures.

Thousands of chemicals are used in the products that surround us every day—from our couches, to our carpets and even the clothes on our backs. Chemicals are used to make 96% of all products sold in America, and some 85,000 chemicals are available for use on the market.

Scientific research is increasingly linking chemicals in common use to some cancers, infertility, diabetes, Parkinson’s and other illnesses. Pregnant woman, infants, and children are especially vulnerable. National CDC studies routinely detect hundreds of chemicals in the blood and urine of virtually all Americans tested, and many babies are born with hundreds of chemicals already in their bodies.

Yet, we still have a very limited understanding of the chemicals in our own lives and little assurance of their safety.

Harnessing a new technology to overcome an environmental health challenge

A cutting edge monitor from MyExposome, Inc., developed by researchers at Oregon State University (OSU), promises to transform our understanding of environmental exposures to chemicals—to make the invisible, visible—and, in so doing, open up new opportunities for reducing exposures.

The monitors are surprisingly simple: Silicone wristbands, like the ones worn in support of various causes, are specially prepared to act as a sponge to absorb hundreds of different chemicals (current analytic methods detect over 1,400) in our environment—the air, water, and even personal care products. (Detailed background on the wristbands is at myexposome.com.)

The simplicity of this new technology opens a range of opportunities to empower individuals with information about what chemicals are present in the environment. They also offer the possibility to explore important questions about the efficacy of interventions to reduce exposures.

To better understand the potential and limitations of this technology, EDF conducted a small pilot project to engage individuals to become “environmental sensors” for a week. Detailed findings follow.
Key Findings

Summary Results

- 28 people participated in this project.
- The wristbands were analyzed for a total of 1,418 chemicals.
- A total of 57 chemicals were detected in all the wristbands.
- Each wristband detected an average of 15 chemicals (range: 10-27).
- All of the wristbands detected persistent, bioaccumulative and toxic chemicals ("PBTs").
- 86% of the wristbands (24 of 28) detected one or more flame retardants.
- 93% of the wristbands (26 of 28) detected one or more pesticides.
- Every wristband detected galaxolide, a common fragrance used in cleaning and beauty products.

Where might these chemicals be found?

The wristbands detected chemicals used in a wide variety of consumer products – from plastics and personal care products to furniture. The primary functions of the chemicals detected in this project include:

- 13 combustion by-products
- 12 pesticides
- 9 plasticizers
- 7 flame retardants
- 4 chemicals in personal care products*
- 4 fragrances

Are any of these chemicals hazardous**?

- The most common hazards associated with the 57 chemicals detected in this project are cancer (35%), developmental and/or reproductive effects (28%), endocrine disruption activity (61%), respiratory effects (28%) and skin sensitization and/or skin irritation (42%).

- Of the 8 phthalates detected – chemicals shown to have adverse effects on the male reproductive system – 3 (DEHP, BPP, and DnOP) have been banned by Congress for use in toys and certain children’s products. They remain legal for many other uses. Bans are pending for 3 additional phthalates detected: DCHP, DIBP, and DHEXP.

- Several hazardous flame retardant chemicals were detected, including TCEP, banned in the EU due to its toxicity to the reproductive system.

- A number of polycyclic aromatic hydrocarbons (PAHs) detected are persistent in the environment and associated with health effects such as cancer, including naphthalene, phenanthrene, and anthracene.

* The chemicals in personal care products category includes preservatives, antimicrobials, UV filters and fragrance enhancers. Plasticizers and fragrances may also be found in personal care products.

** The hazard of a chemical refers to its intrinsic ability to cause harm or induce a toxic effect. Risk is a function of both hazard and exposure, the amount of the chemical substance that enters a person’s body.
Chemicals Detected

- Combustion by-products
- Chemicals in personal care products
- Flame retardants
- Fragrances
- Pesticides
- Plasticizers
- Other
Appendix

I. Definitions

Hazard – The hazard of a chemical refers to its intrinsic ability to cause harm or induce a toxic effect, such as those listed below in “Chemical Hazard Types.” Risk is a function of both hazard and exposure, the amount of the chemical substance that enters a person's body. Assuming a constant exposure, chemicals will differ in the type and magnitude of toxic effect(s) that they may induce.

Persistent bioaccumulative toxic chemicals ("PBTs") – Chemicals that do not break down readily from natural processes, accumulate in organisms – concentrating as they move up the food chain, and are harmful in small quantities.

Chemical Hazard Types

Cancer (i.e., carcinogenicity) – Can cause or increase the risk of cancer.

Developmental effects – Can harm the developing child; effects may include birth defects, low birth weight, and biological or behavioral problems that appear as the child grows.

Reproductive effects – Can disrupt the male or female reproductive systems, changing sexual development, behavior or functions, decreasing fertility, or resulting in loss of the fetus during pregnancy.

Endocrine disruption activity – Can interfere with hormone communication and production, which controls metabolism, development, growth, reproduction, and behavior.

Respiratory effects – Can result in high sensitivity such that small quantities trigger asthma, rhinitis or other allergic reactions in the respiratory system.

Skin sensitization – Can trigger allergic reactions on the skin.

Skin irritation – Can irritate or seriously damage the skin.

Functions & Uses

Chemicals in personal care products – Chemicals added to personal care products (e.g., lotions, soaps, and cosmetics), such as preservatives and antimicrobials. Plasticizers and fragrances (see below) are excluded from this category.

Combustion by-products – Chemicals formed from the incomplete burning of coal, oil, gas, garbage, or other organic substances. Most chemicals included in this category are polycyclic aromatic hydrocarbons (PAHs).

Flame retardants – Chemicals added to a variety of materials, including textiles, electronics, plastics, and foam to reduce flammability.

1 Chemical hazard type definitions are based on the Pharos Project, available here: https://www.pharosproject.net/
Fragrances – Chemicals with an inherent odor. These chemicals are often added to personal care products, cleaning products, food products, and more.

Pesticides – Chemicals designed to kill, repel, or mitigate any pest (insects, rodents, weeds, fungi, and microorganisms). This category excludes antimicrobials designed for use in personal care products.

Plasticizers – Chemicals used to provide plasticity and flexibility to plastics, such as polyvinylchloride (PVC). This category includes phthalate chemicals, which are added to a variety of items, including construction materials, personal care products, toys, food packaging, medical devices, and more.

Other – The “Other” category includes food additives, tobacco derivatives, chemical intermediates, and chemicals that cannot be classified due to many overlapping functions.
II. Full List of Chemicals Detected

1,6-DIMETHYLNAPHTHALENE (CASRN: 575-43-9)
Specific Hazards: No data
Primary Function(s): Combustion by-product
Found in or Used in the Manufacture of: Air

1-METHYLNAPHTHALENE (CASRN: 90-12-0)
Specific Hazards: Little human data available; harmful if swallowed
Primary Function(s): Combustion by-product, chemical intermediate
Found in or Used in the Manufacture of: Air; pesticides (inert ingredient); food packaging and additives; ink, pigments, and dyes

2,2',4,6'-TETRABROMODIPHENYL ETHER (BDE 51) (CASRN: 189084-57-9)
Specific Hazards: Medium hazard for endocrine disruption activity
Primary Function(s): Flame retardant
Found in or Used in the Manufacture of: Building materials; fabric, furniture, and upholstery; electronics

2,6-DIMETHYLNAPHTHALENE (CASRN: 581-42-0)
Specific Hazards: No data
Primary Function(s): Combustion by-product
Found in or Used in the Manufacture of: Air; food packaging and additives
Government Resource: Not available

2-METHYLNAPHTHALENE (CASRN: 91-57-6)
Specific Hazards: Little human data available; harmful if swallowed
Primary Function(s): Combustion by-product, chemical intermediate
Found in or Used in the Manufacture of: Air; pesticides (inert ingredient); building materials; ink, pigments, and dyes; petroleum products/fuels

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2 Chemical hazards data is based on the Pharos Project database, available here: https://www.pharosproject.net/
3 Chemical uses data is based primarily on EPA’s CPCat database (http://actor.epa.gov/cpcat/faces/home.xhtml), ATSDR’s Substance List (http://www.atsdr.cdc.gov/substances/indexAZ.asp), and EPA’s InertFinder database (http://iaspub.epa.gov/apex/pesticides/f?p=101:1).
**4-Chloro-3-methylphenol (CASRN: 59-50-7)**

**Specific Hazards:** High hazard for skin sensitization; medium hazard for endocrine disruption activity, skin irritation

**Primary Function(s):** Preservative in personal care products (antimicrobial), antiseptic, pesticide (industrial preservative) (“Other”)

**Found in or Used in the Manufacture of:** Personal care products; pesticides; food packaging and additives; cleaning products; building materials; fabric, furniture, and upholstery; ink, pigments, and dyes; pharmacological products

**Government Resource:** Not available

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**4-Chlorophenyl isocyanate (CASRN: 104-12-1)**

**Specific Hazards:** High hazard for skin irritation; medium hazard for cancer, respiratory effects, organ toxicity

**Primary Function(s):** Chemical intermediate in manufacture of pesticides and pharmaceuticals (“Other”)

**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); pharmacological products


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**Acenaphthene (CASRN: 83-32-9)**

**Specific Hazards:** PBT; high hazard for cancer

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air; pesticides (manufacture); building materials; ink, pigments, and dyes; pharmacological products


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**Acenaphthylene (CASRN: 208-96-8)**

**Specific Hazards:** PBT; high hazard for cancer

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air


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**Anthracene (CASRN: 120-12-7)**

**Specific Hazards:** PBT; high hazard for cancer, skin sensitization; medium hazard for endocrine disruption activity, respiratory effects, skin irritation

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air; pesticides (manufacture); building materials; manufacture/maintenance of vehicles; ink, pigments, and dyes; pharmacological products

**BENZOPHENONE** *(CASRN: 119-61-9)*

Specific Hazards: High hazard for cancer; medium hazard for endocrine disruption activity

Primary Function(s): UV filter and fragrance enhancer in personal care products, food additive

Found in or Used in the Manufacture of: Personal care products; pesticides (inert ingredient); food packaging and additives; cleaning products; building materials; fabric, furniture, and upholstery; paper products; ink, pigments, and dyes; toys and children's products; electronics; cigarette chemicals; pharmacological products


**BENZYL BENZOATE** *(CASRN: 120-51-4)*

Specific Hazards: Little human data available; harmful if swallowed

Primary Function(s): Fragrance fixative and preservative in personal care products, food additive, antiparasitic (treats scabies), pesticide, solvent, plasticizer

Found in or Used in the Manufacture of: Personal care products; air fresheners; pesticides (inert ingredient); food packaging and additives; cleaning products; building materials; manufacture/maintenance of vehicles; cigarette chemicals; pharmacological products


**BIFENTHRIN** *(CASRN: 82657-04-3)*

Specific Hazards: PBT; high hazard for organ toxicity; medium hazard for cancer, endocrine disruption activity, respiratory effects, skin irritation

Primary Function(s): Pesticide

Found in or Used in the Manufacture of: Pesticides


**BIPHENYL** *(CASRN: 92-52-4)*

Specific Hazards: High hazard for skin irritation; medium hazard for cancer, endocrine disruption activity, respiratory effects, organ toxicity

Primary Function(s): Chemical intermediate (“Other”)

Found in or Used in the Manufacture of: Air; personal care products; pesticides (inert ingredient); food packaging and additives; building materials; paper products

Government Resource: [http://www.epa.gov/ttnatw01/hlthef/biphenyl.html](http://www.epa.gov/ttnatw01/hlthef/biphenyl.html)

**BIS(2-ETHYLHEXYL)PHTHALATE** *(DEHP)* *(CASRN: 117-81-7)*

Specific Hazards: High hazard for cancer, developmental effects, reproductive effects; medium hazard for endocrine disruption activity, respiratory effects, organ toxicity, skin irritation; potential concern for neurotoxicity

Primary Function(s): Plasticizer

Found in or Used in the Manufacture of: Air; personal care products; pesticides (inert ingredient); food packaging and additives; cleaning products; building materials; fabric, furniture, and upholstery; manufacture/maintenance of vehicles; ink, pigments, and dyes; arts, crafts, hobby materials; toys and children's products; electronics; pharmacological products

**BISPHENOL A (BPA) (CASRN: 80-05-7)**

**Specific Hazards:** High hazard for developmental effects, reproductive effects, skin sensitization; medium hazard for endocrine disruption activity, respiratory effects, organ toxicity, skin irritation

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Food packaging and additives; building materials; manufacture/maintenance of vehicles; paper products; ink, pigments, and dyes; arts, crafts, hobby materials; toys and children's products; electronics; petroleum products/fuels

**Government Resource:** [https://www.niehs.nih.gov/health/assets/docs_a_e/bisphenol_a_bpa_508.pdf](https://www.niehs.nih.gov/health/assets/docs_a_e/bisphenol_a_bpa_508.pdf)

**BUTYL BENZYL PHTHALATE (BBP) (CASRN: 85-68-7)**

**Specific Hazards:** High hazard for developmental effects, reproductive effects; medium hazard for cancer, endocrine disruption activity, respiratory effects, skin irritation

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Air; personal care products; pesticides (inert ingredient); food packaging and additives; building materials; manufacture/maintenance of vehicles; paper products; ink, pigments, and dyes; arts, crafts, hobby materials; toys and children's products

**Government Resource:** [http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/phthalates.html](http://www.epa.gov/oppt/existingchemicals/pubs/actionplans/phthalates.html)

**BUTYLATED HYDROXYANISOLE (BHA) (CASRN: 25013-16-5)**

**Specific Hazards:** High hazard for cancer, skin sensitization; medium hazard for developmental effects, reproductive effects, endocrine disruption activity

**Primary Function(s):** Preservative (antioxidant) in personal care products and food

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); food packaging and additives; building materials; toys and children’s products; pharmacological products

**Government Resource:** [https://ntp.niehs.nih.gov/ntp/roc/content/profiles/butylatedhydroxyanisole.pdf](https://ntp.niehs.nih.gov/ntp/roc/content/profiles/butylatedhydroxyanisole.pdf)

**CAFFEINE (CASRN: 58-08-2)**

**Specific Hazards:** Medium hazard for endocrine disruption activity

**Primary Function(s):** Food additive ("Other")

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); food packaging and additives; cigarette chemicals; pharmacological products


**CARVONE (CASRN: 99-49-0)**

**Specific Hazards:** Little human data available; harmful if swallowed

**Primary Function(s):** Preservative (antimicrobial) in personal care products, food additive, fragrance, pesticide (insect repellent) ("Other")

**Found in or Used in the Manufacture of:** Personal care products; pesticides; food packaging and additives; cleaning products; cigarette chemicals

**CASHMERAN (CASRN: 33704-61-9)**

**Specific Hazards:** Medium hazard for endocrine disruption activity

**Primary Function(s):** Fragrance

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); cleaning products

**Government Resource:** Not available

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**DIBENZOFURAN (CASRN: 132-64-9)**

**Specific Hazards:** PBT

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air

**Government Resource:** [http://www.epa.gov/ttnatw01/hlthef/difuran.html](http://www.epa.gov/ttnatw01/hlthef/difuran.html)

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**DICYCLOHEXYL PHTHALATE (DCHP) (CASRN: 84-61-7)**

**Specific Hazards:** High hazard for reproductive effects; medium hazard for endocrine disruption activity, respiratory effects

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Food packaging and additives; building materials; ink, pigments, and dyes

**Government Resource:** [http://www.cdc.gov/biomonitoring/DCHP_BiomonitoringSummary.html](http://www.cdc.gov/biomonitoring/DCHP_BiomonitoringSummary.html)

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**DIETHYL PHTHALATE (DEP) (CASRN: 84-66-2)**

**Specific Hazards:** High hazard for reproductive effects, skin sensitization; medium hazard for endocrine disruption activity, respiratory effects, skin irritation

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); food packaging and additives; cleaning products; building materials; manufacture/maintenance of vehicles; ink, pigments, and dyes; toys and children’s products; pharmacological products


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**DIISOBUTYL PHTHALATE (DIBP) (CASRN: 84-69-5)**

**Specific Hazards:** High hazard for developmental effects, reproductive effects; medium hazard for endocrine disruption activity, respiratory effects

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Food packaging and additives; building materials; fabric, furniture, and upholstery; manufacture/maintenance of vehicles; paper products; ink, pigments, and dyes; toys and children’s products

**DI-N-HEXYL PHTHALATE** *(DHEXP) (CASRN: 84-75-3)*

**Specific Hazards:** High hazard for reproductive effects; medium hazard for developmental effects, endocrine disruption activity, respiratory effects

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); food packaging and additives; building materials; manufacture/maintenance of vehicles; toys and children’s products


**DI-N-NONYL PHTHALATE** *(CASRN: 84-76-4)*

**Specific Hazards:** Little human data available; harmful if swallowed

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Data unavailable


**DI-N-OCTYL PHTHALATE** *(DnOP) (CASRN: 117-84-0)*

**Specific Hazards:** High hazard for skin sensitization; medium hazard for developmental effects, endocrine disruption activity, respiratory effects; low hazard for reproductive effects

**Primary Function(s):** Plasticizer

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); food packaging and additives; building materials; manufacture/maintenance of vehicles; arts, crafts, hobby materials; toys and children’s products; electronics; pharmacological products


**DIPHENYLAMINE** *(CASRN: 122-39-4)*

**Specific Hazards:** High hazard for skin sensitization; medium hazard for cancer, developmental effects, reproductive effects, organ toxicity

**Primary Function(s):** Pesticide (antioxidant)

**Found in or Used in the Manufacture of:** Pesticides; food packaging and additives; building materials; manufacture/maintenance of vehicles; ink, pigments, and dyes; petroleum products/fuels


**ETHOFENPROX** *(CASRN: 80844-07-1)*

**Specific Hazards:** High hazard for developmental effects; medium hazard for endocrine disruption activity

**Primary Function(s):** Pesticide (used to repel bed bugs)

**Found in or Used in the Manufacture of:** Pesticides

**EUGENOL** *(CASRN: 97-53-0)*

**Specific Hazards:** High hazard for respiratory effects, skin sensitization; medium hazard for skin irritation

**Primary Function(s):** Fragrance, food additive, antiseptic, analgesic (“Other”)

**Found in or Used in the Manufacture of:** Personal care products; air fresheners; pesticides (active and inert ingredient); food packaging and additives; cleaning products; building materials; manufacture/maintenance of vehicles; pharmacological products; petroleum products/fuels


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**FIPRONIL** *(CASRN: 120068-37-3)*

**Specific Hazards:** PBT; high hazard for organ toxicity; medium hazard for reproductive effects, endocrine disruption activity; potential concern for neurotoxicity

**Primary Function(s):** Pesticide

**Found in or Used in the Manufacture of:** Pesticides

**Government-Academic Collaboration:** [http://npic.orst.edu/factsheets/fipronil.html](http://npic.orst.edu/factsheets/fipronil.html)

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**FLUORANTHENE** *(CASRN: 206-44-0)*

**Specific Hazards:** PBT; high hazard for cancer; medium hazard for endocrine disruption activity

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air; building materials


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**FLUORENE** *(CASRN: 86-73-7)*

**Specific Hazards:** PBT; high hazard for cancer; medium hazard for endocrine disruption activity

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air; pesticides (manufacture); building materials; ink, pigments, and dyes


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**GALAXOLIDE** *(CASRN: 1222-05-5)*

**Specific Hazards:** PBT; high hazard for developmental effects; medium hazard for endocrine disruption activity

**Primary Function(s):** Fragrance

**Found in or Used in the Manufacture of:** Personal care products; air fresheners; pesticides (inert ingredient); cleaning products; building materials; manufacture/maintenance of vehicles


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4 Evidence for reproductive/developments effects for galaxolide is based on preliminary studies. The majority of research demonstrates that galaxolide exerts its toxic effects on the environment; there is limited data to indicate that this chemical is toxic to humans.
**METHOPRENE II (CASRN: 999045-03-3)**

**Specific Hazards:** Medium hazard for endocrine disruption activity

**Primary Function(s):** Pesticide

**Found in or Used in the Manufacture of:** Pesticides

**Government-Academic Collaboration:** [http://npic.orst.edu/factsheets/methogen.html#whatis](http://npic.orst.edu/factsheets/methogen.html#whatis)

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**MUSK KETONE (CASRN: 81-14-1)**

**Specific Hazards:** PBT; medium hazard for cancer, endocrine disruption activity

**Primary Function(s):** Fragrance

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); food packaging and additives; cleaning products

**Government Resource:** [http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+7694](http://toxnet.nlm.nih.gov/cgi-bin/sis/search/a?dbs+hsdb:@term+@DOCNO+7694)

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**N,N-DIETHYL-M-TOLUAMIDE (DEET) (CASRN: 134-62-3)**

**Specific Hazards:** High hazard for skin irritation

**Primary Function(s):** Pesticide (insect repellent)

**Found in or Used in the Manufacture of:** Personal care products; pesticides; food packaging and additives; cleaning products

**Government Resource:** [http://www2.epa.gov/insect-repellents/deet](http://www2.epa.gov/insect-repellents/deet)

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**NAPHTHALENE (CASRN: 91-20-3)**

**Specific Hazards:** PBT; high hazard for cancer, organ toxicity, skin sensitization; medium hazard for endocrine disruption activity, skin irritation

**Primary Function(s):** Combustion by-product, chemical intermediate (manufacture of plastic and moth repellants)

**Found in or Used in the Manufacture of:** Air; pesticides (inert ingredient); cleaning products; building materials; fabric, furniture, and upholstery; manufacture/maintenance of vehicles; ink, pigments, and dyes; petroleum products/fuels; pharmacological products

**Government Resource:** [http://www.epa.gov/ttnatw01/hlthef/naphthal.html](http://www.epa.gov/ttnatw01/hlthef/naphthal.html)

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**NICOTINE (CASRN: 54-11-5)**

**Specific Hazards:** High hazard for developmental effects; medium hazard for reproductive effects, endocrine disruption activity; potential concern for neurotoxicity

**Primary Function(s):** Tobacco derivative (“Other”)

**Found in or Used in the Manufacture of:** Cigarette chemicals; pharmacological products

**o-Phenylphenol** *(CASRN: 90-43-7)*

**Specific Hazards:** High hazard for cancer, skin irritation; medium hazard for endocrine disruption activity, respiratory effects, organ toxicity

**Primary Function(s):** Pesticide

**Found in or Used in the Manufacture of:** Personal care products; pesticides; food packaging and additives; cleaning products; building materials; fabric, furniture, and upholstery; paper products

**Government Resource:** [http://www.cdc.gov/biomonitoring/Orthophenylphenol_BiomonitoringSummary.html](http://www.cdc.gov/biomonitoring/Orthophenylphenol_BiomonitoringSummary.html)

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**Permethrin** *(CASRN: 52645-53-1)*

**Specific Hazards:** High hazard for respiratory effects; medium hazard for endocrine disruption activity, organ toxicity, skin sensitization, skin irritation

**Primary Function(s):** Pesticide

**Found in or Used in the Manufacture of:** Personal care products; pesticides; building materials; fabric, furniture, and upholstery; paper products; pharmacological products

**Government Resource:** [http://www.epa.gov/oppsrrd1/reregistration/REDs/factsheets/permethrin_fs.htm](http://www.epa.gov/oppsrrd1/reregistration/REDs/factsheets/permethrin_fs.htm)

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**Phenanthrene** *(CASRN: 85-01-8)*

**Specific Hazards:** PBT; high hazard for cancer, skin sensitization; medium hazard for endocrine disruption activity

**Primary Function(s):** Combustion by-product

**Found in or Used in the Manufacture of:** Air; pesticides (manufacture); building materials; ink, pigments, and dyes; pharmacological products; explosives


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**Piperonyl butoxide** *(CASRN: 51-03-6)*

**Specific Hazards:** Medium hazard for endocrine disruption activity, skin irritation

**Primary Function(s):** Pesticide (synergist)

**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); pharmacological products


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**Promecarb** *(CASRN: 2631-37-0)*

**Specific Hazards:** Little human data available; harmful if swallowed

**Primary Function(s):** Pesticide

**Found in or Used in the Manufacture of:** Pesticides

**Government Resource:** Not available

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**Promecarb Artifact** [5-isopropyl-3-methylphenol] *(CASRN: 485106)*

**Specific Hazards:** Little human data available; harmful if swallowed

**Primary Function(s):** Pesticide

**Found in or Used in the Manufacture of:** Pesticides

**Government Resource:** Not available
**Pyrene** *(CASRN: 129-00-0)*

**Specific Hazards:** PBT; high hazard for cancer; medium hazard for endocrine disruption activity  
**Primary Function(s):** Combustion by-product  
**Found in or Used in the Manufacture of:** Air; pesticides (manufacture); personal care products; cleaning products; building materials; manufacture/maintenance of vehicles; ink, pigments, and dyes  

**Pyriproxyfen** *(CASRN: 95737-68-1)*

**Specific Hazards:** Medium hazard for endocrine disruption activity  
**Primary Function(s):** Pesticide  
**Found in or Used in the Manufacture of:** Pesticides  

**Thymol** *(CASRN: 89-83-8)*

**Specific Hazards:** Very high hazard for skin irritation; medium hazard for respiratory effects  
**Primary Function(s):** Preservative (antimicrobial) in personal care products, food additive, fragrance, pesticide ("Other")  
**Found in or Used in the Manufacture of:** Personal care products; pesticides; food packaging and additives; cleaning products; building materials; cigarette chemicals; pharmacological products  

**Tonalide** *(CASRN: 1506-02-1)*

**Specific Hazards:** Medium hazard for endocrine disruption activity  
**Primary Function(s):** Fragrance  
**Found in or Used in the Manufacture of:** Personal care products; pesticides (inert ingredient); cleaning products; building materials  

**Tributyl phosphate** *(TBP) (CASRN: 126-73-8)*

**Specific Hazards:** High hazard for skin irritation; medium hazard for cancer, developmental effects; potential concern for neurotoxicity  
**Primary Function(s):** Flame retardant, plasticizer, solvent  
**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); food packaging and additives; cleaning products; building materials; fabric, furniture, and upholstery; manufacture/maintenance of vehicles; ink, pigments, and dyes; electronics; toys and children’s products; petroleum products/fuels  
**TRICLOSAN (CASRN: 3380-34-5)**

**Specific Hazards:** PBT; high hazard for skin irritation; medium hazard for endocrine disruption activity

**Primary Function(s):** Preservative (antimicrobial) in personal care products and other consumer products, pesticide

**Found in or Used in the Manufacture of:** Personal care products; pesticides; cleaning products; building materials; fabric, furniture, and upholstery; pharmacological products

**Government Resource:** [http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm205999.htm](http://www.fda.gov/ForConsumers/ConsumerUpdates/ucm205999.htm)

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**TRIETHYLPHOSPHATE (CASRN: 78-40-0)**

**Specific Hazards:** Little human data available; harmful if swallowed

**Primary Function(s):** Flame retardant, plasticizer, chemical intermediate, solvent

**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); food packaging and additives; building materials; electronics


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**TRIPHENYL PHOSPHATE (TPP) (CASRN: 115-86-6)**

**Specific Hazards:** Medium hazard for endocrine disruption activity; potential concern for neurotoxicity

**Primary Function(s):** Flame retardant

**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); food packaging and additives; building materials; fabric, furniture, and upholstery; manufacture/maintenance of vehicles; paper products; ink, pigments, and dyes; arts, crafts, hobby materials; toys and children's products; electronics


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**TRIS(2-CHLOROETHYL) PHOSPHATE (TCEP) (CASRN: 115-96-8)**

**Specific Hazards:** PBT; high hazard for cancer, reproductive effects; medium hazard for skin irritation

**Primary Function(s):** Flame retardant

**Found in or Used in the Manufacture of:** Personal care products; building materials; manufacture/maintenance of vehicles; toys and children’s products


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**TRIS(2-CHLORO-1-METHYLETHYL) PHOSPHATE (TCPP) (CASRN: 13674-84-5)**

**Specific Hazards:** PBT

**Primary Function(s):** Flame retardant

**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); building materials; fabric, furniture, and upholstery; electronics

**Tris(2-ethylhexyl) phosphate (TEHP) (CASRN: 78-42-2)**

**Specific Hazards:** Medium hazard for skin irritation

**Primary Function(s):** Flame retardant, plasticizer, solvent

**Found in or Used in the Manufacture of:** Pesticides (inert ingredient); food packaging and additives; building materials; fabric, furniture, and upholstery

**Government Resource:**
http://oehha.ca.gov/prop65/public_meetings/CIC101211/101211Tris2ethylhexylphosphate.pdf
III. Additional Information on the Wristband Technology

EDF partnered with MyExposome, Inc. on this project using the wristband technology and analytic methods from MyExposome. You can find more information here: www.MyExposome.com.

The personal environmental monitors used in this project are designed to detect organic chemical compounds in the environment. The monitors cannot detect metals (e.g., lead and mercury) or inorganic air pollutants (e.g., ozone and sulfur dioxide).

See here for the full list of chemicals the wristbands are able to detect:
http://www.myexposome.com/testedchems