Pollution at Home
<table>
<thead>
<tr>
<th>Sources</th>
<th>Pollutants released</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Household products</strong></td>
<td><strong>VOCs such as formaldehyde, benzene, toluene, xylene, hexane. Many other VOCs also possible. Some emit particulates and other pollutants</strong></td>
</tr>
<tr>
<td>• Paints, stains, strippers, polishes, cleansers, solvents, air-fresheners</td>
<td></td>
</tr>
<tr>
<td>• Cosmetics perfumes, colognes</td>
<td></td>
</tr>
<tr>
<td>• Hobby supplies (paints, glues, metals, wood, glass etc)</td>
<td></td>
</tr>
<tr>
<td>• Propellant in aerosol sprays</td>
<td></td>
</tr>
<tr>
<td>• Pesticides and other solvents</td>
<td></td>
</tr>
<tr>
<td><strong>Household furnishings</strong></td>
<td><strong>New furnishings: VOCs, formaldehyde</strong></td>
</tr>
<tr>
<td>• Drapes, upholstered furniture, pressed-wood (particle board) in cabinets, walls, sub-flooring</td>
<td><strong>Old furnishings: Dust, biological pollutants</strong></td>
</tr>
<tr>
<td>• Carpets, shelving, “dust catchers”</td>
<td></td>
</tr>
<tr>
<td>• Carpets, furnishings, bedding</td>
<td><strong>Dust mites and dust</strong></td>
</tr>
<tr>
<td><strong>Dust and dirt getting into the home</strong></td>
<td><strong>Can contain pesticide residue, metals and biological pollutants</strong></td>
</tr>
<tr>
<td>Sources</td>
<td>Pollutants released</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td><strong>Combustion Sources</strong></td>
<td></td>
</tr>
<tr>
<td>• Oil and gas furnace, unvented kerosene or gas stoves, wood stoves, fireplaces</td>
<td>Carbon Monoxide, Nitrogen oxides, sulfur dioxide, particulates, VOCs</td>
</tr>
<tr>
<td>• Gas water heater, clothing dryer</td>
<td>ETS emits these and other chemicals: CO, C6H6, HCHO, Cd, Pb, As, even dioxin. Lung cancer, pulmonary and heart diseases.</td>
</tr>
<tr>
<td>• Environmental tobacco smoke (ETS)</td>
<td></td>
</tr>
<tr>
<td><strong>Biological Hazards</strong></td>
<td></td>
</tr>
<tr>
<td>• Moist areas (basement, bathroom etc).</td>
<td>Mold, VOC, bacterial toxins, viruses</td>
</tr>
<tr>
<td>• Humidifiers, dehumidifier</td>
<td>Same as above</td>
</tr>
<tr>
<td>• Pets, rodents, insects: dust mites, roaches</td>
<td>Animal Dander, pet hair, saliva, urine, feces : Pollen and dust</td>
</tr>
<tr>
<td>• can increase asthma, infectious diseases</td>
<td></td>
</tr>
<tr>
<td>• Outdoor air</td>
<td></td>
</tr>
<tr>
<td>Sources</td>
<td>Pollutants released</td>
</tr>
<tr>
<td>------------------------------</td>
<td>-----------------------------------------------</td>
</tr>
<tr>
<td>Hazards old and new</td>
<td></td>
</tr>
<tr>
<td>Old Paint</td>
<td>Lead</td>
</tr>
<tr>
<td>Old insulation</td>
<td>Asbestos</td>
</tr>
<tr>
<td>Construction materials, wood</td>
<td>VOCs including Formaldehyde</td>
</tr>
<tr>
<td>paneling</td>
<td></td>
</tr>
<tr>
<td>New carpets, padding, adhesives</td>
<td>VOCs</td>
</tr>
<tr>
<td>Painting, stripping, old paints etc</td>
<td>VOCs</td>
</tr>
<tr>
<td>Basement Floor</td>
<td>Radon</td>
</tr>
<tr>
<td>Household water</td>
<td>Radon</td>
</tr>
<tr>
<td>Municipal chlorinated drinking water</td>
<td>Chloroform and other VOCs</td>
</tr>
<tr>
<td>Well water</td>
<td>Radon, sometimes VOCs</td>
</tr>
</tbody>
</table>
Effect if indoor air pollutants

• Depends on the method and length of exposure
  – Acute effects from high levels
  – Chronic effects from on-going pollution

• NO (Nitrogen Oxides) and Formaldehyde: Irritation of eye, nose, and throat

• Mold, airborne microorganisms: allergies

• CO: flu-like symptoms, headache
Some effects of indoor air pollution

• A women was temporarily paralyzed after vigorous application of flea-spray in a closed room
• A student fainted while applying spray cleaner in a bathtub in a closed bathroom
• A student reported coughing and choking after applying aerosol spray near the face
• Eyes water and sneezing occur to some people near a store isles lined with VOC emitting products
• A women, whose hobby was refinishing furnitures, developed liver cirrhosis after using paint stripper in a closed room over several winters
• A man in Maine, who stripped lead paint from the interior of his house, developed fever and other symptoms. He was found to have a blood lead level of 116 microgram/ 100 ml – highest in the state
Reducing indoor air pollutants

• Become aware of polluting products – reduce or eliminate—i.e., practice source reduction (P²)
• Ensure no long-lasting wet spots. Keep humidity between 30-50%. Check damp attics and basements, refrigerator drip pans, air conditioners, house plants. If home is too dry, drink plenty of water instead of installing a humidifier.
• Make sure your home has good ventilation: “seal tight, ventilate right”
• Use electronic air filters or high efficiency hepa filters. Change filters regularly. Not effective against VOCs
Radon

• Radon is an odorless, colorless, and tasteless radioactive gas.
• Radon is produced by the natural breakdown of uranium found in some rocks, sediments, and water.
• Radon moves out of the ground and dilutes to harmless levels in the atmosphere, but it can accumulate to high levels in houses.
• High radon levels are associated with an increased risk of lung cancer.
• Radon can enter a home through openings in basement walls and floors.
• Radon concentrations in a home can be lowered by sealing these entry points, by depressurizing the sediment around home foundations, and by improving home ventilation.
• Basements, schools are areas of concern.
• Trailers don’t touch ground hence are radon free
• Outside air has Rn between 0.1 and 0.4 pCi/l
• Average home: 1 pCi/l = 50 chest X-rays
• Action level for US: 4 pCi/l, Canada: 20 pCi/l
• 6-8 million use homes have levels > 4 pCi/l
• $^{238}\text{U} \rightarrow ^{222}\text{Rn} \rightarrow ^{218}\text{Po} \rightarrow ^{214}\text{Pb} \rightarrow ^{214}\text{Bi} \rightarrow ^{214}\text{Po} \rightarrow ^{210}\text{Pb}$
• Radon has a half life of 3.8 days so an average Radon atom is breathed out before it decays
• However radioactive daughter isotopes like $^{218}\text{Po}$ is solid and attaches to dust particles and can get deposited in the lungs and airways
• Decay of this radioactive isotope produces radiation which can damage DNA and cause cancer.
• 18000 (out of yearly 150,000) deaths in US due to lung cancer is because of Radon
• Polonium attaches to tobacco particles and hence the risk is compounded for smokers or people living in homes with smokers
• **Air:**
  – Test kits can check for Radon exposure in a home
  – Sealing basement cracks
  – Diversion system consisting of Installing a pipe below basement that vents outside with a suction fan

• **Water:** Well water are richer in Rn than municipal water
  – Only 1-2% of Rn in a home escapes from water
  – Can build up in a closed bathroom during showering
  – About 160 lung cancer deaths /year in US
  – 20 out of 13000 stomach cancer deaths due to drinking radon rich water
  – EPA proposed limit of 300 pCi/l but dropped it: interesting conundrum – other regulated contaminants have lower levels – should those be controlled? – industrial vs. natural pollutant.
Top 10 Common Household Toxins

1. Bisphenol A (BPA)
2. Oxybenzone
3. Fluoride
4. Parabens
5. Phthalates
6. Butylated Hydroxyanisole (BHA)
7. Perfluorooctanoic Acid (PFOA)
8. Perchlorate
9. Decabromodiphenyl Ether (DECA)
10. Asbestos

Read more:
http://www.time.com/time/specials/packages/completelist/0,29569,1976909,00.html#ixzz0kAKDEEJL
Bisphenol A (BPA)

• **What It Is:** A chemical used in plastic production

• **Found In:** Water bottles, baby bottles, plastic wraps, food packaging

• **Health Hazards:** The government's National Toxicology Program has concluded that there is some concern about brain and behavioral effects on fetuses and young children at current exposure levels

• **What You Should Know:** Switch to glass products when possible
Oxybenzone

- **What It Is:** A chemical used in cosmetics
- **Found In:** Sunscreens, lip balm, moisturizers
- **Health Hazards:** Linked to hormone disruption and low-birthweight babies
- **What You Should Know:** About 97% of Americans have the compound in their urine, but current exposure levels have been deemed safe
Fluoride

**What It Is:** A form of the basic element fluorine

**Found In:** Toothpaste, tap water

**Health Hazards:** Neurotoxic and potentially tumorigenic if swallowed; the American Dental Association advises that children under 2 not use fluoride toothpaste

**What You Should Know:** Government studies support current fluoride levels in tap water, but studies on long-term exposure and cancers are ongoing
Parabens

• **What They Are:** Synthetic preservatives

• **Found in:** Products like moisturizers and hair care and shaving products

• **Health Hazards:** Causes hormone disruptions and cancer in animals

• **What You Should Know:** The FDA has deemed current levels in cosmetics safe, but paraben-free products are available
Phthalates

- **What They Are:** Chemicals that give plastic its resilience and flexibility
- **Found In:** Toys, raincoats, shower curtains, vinyl flooring, detergents, food packaging, shampoos
- **Health Hazards:** Animal studies show reduced sperm counts and reproductive abnormalities; evidence of a link to liver cancer in humans
- **What You Should Know:** Congress passed legislation in 2008 to ban six phthalates from toys and cosmetics
Butylated Hydroxyanisole (BHA)

- **What It Is:** An additive that preserves fats and oils in food and cosmetics
- **Found In:** Chewing gum, snack foods, diaper creams. Health hazard may promote cancer in lab animals
- **What You Should Know:** BHA is hard to avoid in foods, but the government limits its levels
Perfluorooctanoic Acid (PFOA)

• **What It Is:** A component of Teflon nonstick coatings

• **Found In:** Tap water, nonstick pots and pans

• **Health Hazards:** Has been found to cause hormone disruption and reproductive abnormalities in animal and human studies

• **What You Should Know:** The EPA is urging makers to stop using PFOA by 2015. Until then, avoid heating empty Teflon cookware to high temperatures
Perchlorate

- **What It Is:** An oxidant in rocket fuel
- **Found In:** Drinking water, soil, some vegetables
- **Health hazard:** Disrupts thyroid's hormone production
- **What You Should Know:** Environmental groups are urging the government to lower perchlorate levels in drinking water
Decabromodiphenyl Ether (DECA)

- **What It Is:** A flame retardant
- **Found In:** Electronics, furniture, carpets
- **Health Hazards:** Permanent learning and memory deficits; hearing defects; decreased sperm count in animals
- **What You Should Know:** Following EPA advice, the industry began phasing out the chemical in December 2009
Asbestos

- **What It Is:** A naturally occurring fibrous mineral
- **Found In:** Housing insulation, drywall, artificial fireplace logs, toys
- **Health Hazard:** Mesothelioma, a fatal cancer
- **What You Should Know:** Asbestos in products is not always labeled, and while most manufacturers have abandoned it or reduced its levels, it's still not banned by the U.S. government
Pharmaceuticals

- there are about 3,000 prescription pharmaceuticals in use in the U.S. and thousands more over-the-counter drugs, not to mention creams and ointments we smear on and then shower off.
"Between cosmetics, pharmaceuticals and other sources there are 80,000 potential combinations of chemicals." : John Spatz, commissioner of Chicago's department of water management,

Wastewater from homes gets treated at sewage plants, but it's never possible to remove every trace of drugs.

sewage pipes break, septic tanks overflow, and in some parts of the U.S. "straight-piping" — which sends untreated sewage flowing directly into surface water — is still practiced.

One way or another, the drugs find their way back to us.
• In 1990s estrogen (from birth control pills) started appearing in waterways in a big way
• Just 5 or 6 nanograms/Lt can cause defects in male sex organs in frogs and fish.
• Pharmaceutical Pollutants are designed to react with human tissues
• New contaminants are being discovered at a rate faster than we are addressing them.
• EPA is working on newer, more stringent regulations and developing new water-treatment techniques
Some of these drugs are at extremely low concentrations and do not pose immediate danger to human health.

For example, one has to drink 1.24 million gallons of water with highest ever reported concentration of anti-anxiety medicine to equal one medicinal dose.

Not much research has been done on long term exposure or on the effect of combination of drugs.