Center for Health, Environment & Justice
PVC Factsheet

Top Ten Reasons Your School Should Go PVC-Free

Polyvinyl chloride (PVC or vinyl) plastic poses serious environmental and health threats at all stages of its lifecycle: from manufacturing to use to disposal. Here are the top ten reasons schools should go PVC-free and build or renovate with PVC-free building materials.

1. Children More At Risk from Toxic Chemicals

Children are not "little adults" - their developing brains and bodies, their metabolism and behaviors make them uniquely vulnerable to harm from toxic chemicals such as those released by the PVC lifecycle:

- Exposure begins in the womb through the mother's exposures to toxic chemicals. Infants ingest chemicals through breast milk, formula and contact with their environment.
- Rapid brain development in the fetus, infants and young children make them more susceptible to harm from chemicals that may impair brain function and development.
- For their weight, children eat, drink and breathe more than adults - so pound for pound they take in a greater quantity of toxic contaminants. A small exposure translates into a big dose.
- Children put things in their mouths and spend a lot of time on the floor and ground, so they may ingest chemicals from toys, containers, dirt and dust on a regular basis.[i]

2. The Production of PVC Involves Cancer-Causing Chemicals

PVC products are made from toxic chemicals. Three chemicals are at the core of PVC production: chlorine gas is converted into ethylene dichloride (EDC), which is then converted into vinyl chloride monomer (VCM), which is then converted into PVC.[ii] Both VCM and EDC are extremely hazardous. Vinyl chloride, the key building block of PVC, causes a rare form of liver cancer, and damages the liver and central nervous system.[iii] Vinyl chloride is one of the few chemicals the U.S. EPA classifies as a known human carcinogen.[iv] EDC is a probable human carcinogen that also affects the central nervous system and damages the liver.[v]

3. PVC Products Contain Phthalates & Other Toxic Chemicals

PVC products often contain toxic additives such as phthalates, lead and cadmium.[vi] Many of these additives are not chemically bound to the plastic and can migrate out of the product posing potential hazards to consumers.[vii] In some cases, these additives can be released from the product into the air inside your home.[viii ix x] Some phthalates have been linked to reproductive problems including shorter pregnancy duration,[xi] premature breast development in girls,[xii] sperm damage,[xiii] and impaired reproductive development in males.[xiv] Certain phthalates have now been banned in children's toys in the United States effective February 2009.[xv] Lead has been used to stabilize and is found in many different PVC products.[xvi] PVC flooring and other PVC products can contribute to poorer indoor air quality as PVC products can offgass chemicals called volatile organic compounds (VOCs). A study by the California Air Resources Board found forty chemicals, some of which are toxic, off-gassing from PVC flooring.[xvii] Another study found PVC flooring can emit chemicals for a period of at least nine months, indicating a persistent risk of toxic exposure.[xviii] A study of PVC shower curtains found just one new vinyl shower curtain can release 108 VOC's into the air over a 28-day period. A number of the chemicals are classified as hazardous air pollutants by the EPA, and even worse, many are untested.[xiv]

4. PVC, Asthma and Autism – Are School Children, Teachers, and Custodians at Risk?

Asthma is a serious, sometimes life-threatening respiratory disease that affects 7 million American children and 16 million adults.[xx] An average of one out of every 13 school-age children has asthma. In fact, asthma is a leading cause of school absenteeism: 14.7 million school days are missed each year due to asthma.[xxi] In recent years, a number of studies have found a correlation between phthalates emitted from PVC building products and asthma:

- A study published in 2009 found a statistically significant link between PVC flooring, asthma , and autism spectrum disorder. The study found that children who live in homes with vinyl floors, which can emit phthalates, are twice as likely to have autism.[xxii]
- A 2008 study found an association between concentrations of phthalates in indoor dust and wheezing among preschool children. The presence of PVC flooring in the child's bedroom was the strongest predictor of respiratory ailments.[xxiii]
- A study of 10,851 children found the presence of floor moisture and PVC significantly increased the risk of asthma.[xxiv]
- A study among personnel in four geriatric hospitals found asthma symptoms were more common in the two buildings with signs of phthalate degradation in PVC flooring.[xxv]
- A study of workers in an office building found they were diagnosed with adult-onset asthma at a rate of about 9 times higher than expected. The researchers identified PVC flooring as the source of chemicals, such as 2-ethyl-l-hexanol, l-butanol, in the air.[xxvi]
- A study of adults working in rooms with plastic wall covering materials were more than twice as likely to develop asthma. These researchers pointed to other recent epidemiologic studies in children conducted in Norway, Finland, Sweden, and Russia that also found links between PVC, phthalates, and respiratory problems.[xxvii]

5. PVC and Hazardous Chemicals in Our Babies and Bodies

In recent years, a growing body of scientific evidence has found that toxic chemicals released by the PVC lifecycle are trespassing into our bodies.

- Today babies are being born pre-polluted with potentially harmful levels of phthalates[xxviii] and Dioxins[xxix] that may possibly cause lifelong health problems.
- Phthalates have been found in indoor air and dust, and in human urine, blood and breast milk.[xxx]

- An extensive study of 2,500 individuals found metabolites of at least one phthalate in 97 percent of those tested.[xxxi]
- Phthalates are highest in children ages 6 to 11, and in women.[xxxii] In a more recent study, certain phthalates were found to be present in 100% of girls age 6 to 9.[xxxiii]
- Dioxins build up in our bodies over our lifetime and can remain there for many years. The levels of dioxins in our bodies are at or near the levels known to cause harm.[xxxiv]
- The half-life of dioxin (the amount of time it takes for half of a given amount of dioxin to break down) in people ranges from seven to eleven years.[xxxv]
- Infants can be exposed to both phthalates[xxxvi] and Dioxins[xxxvii] in breast milk. However despite these exposures, breast milk is still best for baby.[xxxviii]

6. PVC Flooring and Unhealthy Cleaning Products

PVC flooring often requires the use of toxic cleaners to keep it durable and shiny. This wax and strip maintenance has long been a source of health concern due to the toxic VOCs such as formaldehyde (a known carcinogen) used in the maintenance products. A life cycle study of flooring installation and maintenance found that the amount of VOCs emitted from a single waxing of a floor may be comparable to the amount of VOCs emitted from the flooring itself over its entire life. While some PVC manufacturers have formulated "no wax" finishes for some of their flooring products, many PVC flooring products still require the use of toxic maintenance products.[xxxix]

7. PVC and Dioxins

The formation of dioxin is a major concern in PVC's lifecycle. When PVC is manufactured or burned as a waste material, or accidentally in landfill fires, burn barrels, accidental building and motor vehicle fires, numerous dioxins are formed and released into the air or water. The term 'dioxin' refers to a family of chemicals that are unintentionally made. They are generated as by-products during production and disposal of chlorinated compounds including PVC. Dioxins are a highly toxic group of chemicals that build up in the food chain, cause cancer and can harm the immune and reproductive systems.[xl xli xlii] Dioxins have been targeted for global phase out by the Stockholm Convention on Persistent Organic Pollutants.[xliii] Dioxins have also been targeted for virtual elimination in the Great Lakes through the U.S. and Canadian Great Lakes Binational Toxics Strategy.[xliv]

Young residents of Mossville play near PVC facilities, Condea Vista/Georgia Gulf. This historic African American community is surrounded by the largest cluster of PVC chemical plants in the country.

Photo © Gray Little/Greenpeace

8. PVC and Environmental Justice: PVC Plants Pollutes the Air and Groundwater of Surrounding Communities

PVC chemical plants are often located in or near low-income neighborhoods and communities of color, such as Mossville, Louisiana, making the production of PVC a major environmental justice concern. PVC manufacturing facilities have poisoned workers and fenceline neighbors, polluted the air, contaminated drinking water supplies, and even wiped entire neighborhoods off the map. Reveilletown, Louisiana was once a small African-American town

adjacent to a PVC facility owned by Georgia-Gulf. In the 1980s, after a groundwater toxic plume of vinyl chloride began to seep under homes, Georgia-Gulf agreed to permanently evacuate the entire community of one hundred and six residents.[xlv] In Pottstown, Pennsylvania, chemical waste dumped in lagoons at the OxyChem PVC plant contaminated groundwater and is now targeted for cleanup under the federal Superfund program.[xlvi] In Point Comfort, Texas, vinyl chloride was discovered in wells near a Formosa PVC chemical plant, and the company had to spend one million dollars cleaning up contaminated groundwater.[xlvii]

9. Dumping PVC in Landfills Leaches Chemicals and Forms Dioxins

The land disposal of PVC product waste, especially flexible materials, also poses environmental and public health risks. As flexible PVC degrades in a landfill, toxic additives leach out of the waste into groundwater, which is especially problematic for unlined landfills.[xlviii xlix l li] These additives also contribute to the formation of landfill gases,[lii] which are formed in municipal waste landfills.[liii liv] In addition, there are over 8,400 landfill fires reported every year in the U.S.[lv] These fires burn PVC waste and contribute to dioxin formation.[lvi] Land disposal is the final fate of between 2 and 4 billion pounds of PVC that are discarded every year at some 1,800 municipal waste landfills in the U.S.[lvii]

10. PVC Contaminates and Ruins Recyclable Plastics

PVC packaging has a national recycling rate far lower than other plastics. Just 0.7% of PVC bottles were recycled in 2006, compared to 23.5% for PET plastic bottles and 26.4% for HDPE bottles.[lviii] According to the Association of Postconsumer Plastics Recyclers, "PVC is a major contaminant to the PET bottle recycling stream."[lix] One PVC bottle can contaminate and ruin a recycling load of 100,000 recyclable PET bottles,[lx] if the PVC cannot be separated from the PET. This is because PET and PVC behave very differently when they are processed for recycling. PVC burns at a lower temperature than PET. It burns at the temperature that simply melts PET. [lxi lxii] When this occurs, "black spots" get into the PET resin contaminating the batch and ruining or seriously downgrading the quality of recycled PET residue.[lxiii]

What Can I Do? Take Action for Healthy PVC-Free Schools

Safer and cost-effective alternatives are already available for virtually every PVC product in our nation's schools. Here's how you can help today:

- **Encourage your school** to renovate or build their school with PVC-free building materials such as PVC-free linoleum flooring and TPO roofing.
- **Encourage your school district, county or state** to adopt a healthy PVC-free policy to avoid the use of PVC building materials and office supplies in favor of safer cost-effective alternatives.
- **Educate parents, teachers and students! Organize a screening of Blue Vinyl and Sam Suds** for your PTA, teacher's union, or concerned students.
- **Encourage organizations**, such as teacher's unions and parenting groups, to endorse the campaign.
- **Back to school – go PVC-free!** When buying your back-to-school supplies, shop for PVC-free products.
- **Get involved today!** If you're interested in getting involved, contact CHEJ at mike@chej.org or 212-964-3680.

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