



Our Health & PVC: What's the Connection?



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For much of the time when children's bodies and intellect are developing, they are spending their time inside a school. Healthy schools free from toxins that damage development are therefore critical to children's health and well-being. However, our nation's schools are in trouble, and many are actually a threat to our children's health and ability to learn. An emerging toxic plastic of concern, polyvinyl chloride (PVC or vinyl), is used widespread in schools across the nation.

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.

- 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.¹

Health Problems Suffered by Children On the Rise

Increasingly, children are being found to be hyperactive, slow to learn, and disruptive in school. The number of children in special education programs classified with learning disabilities increased 191% from 1977 to 1994.ⁱⁱ Asthma is a leading reason for school absenteeism and the number one chronic childhood illness.ⁱⁱⁱ One in a hundred American children has an autism spectrum disorder (ASD).^{iv} 8,000 American children are diagnosed each year with cancer,^v and the



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incidence of cancer in children jumped 26% between 1975 and 1998.^{vi} The incidence of testicular cancer in young men has increased by 60% and the incidence of hypospadias (abnormal positioning of the opening of the urethra on the penis) in newborn boys doubled from 1968 to 1993.^{vii} These rising trends in toxic-related childhood illnesses indicate the urgent need to eliminate children's exposure to toxins in all areas where children learn, play and live.

Chemicals released by the polyvinyl chloride (PVC or vinyl) plastic lifecycle such as Dioxins and phthalates have been linked with many of these diseases.^{viii} Even worse, PVC building products, school and office supplies are widespread in our nation's schools.

PVC and Toxic 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^{ix} and Dioxins^x that may possibly cause lifelong health problems.
- Phthalates have been found in indoor air and

dust, and in human urine, blood and breast milk.^{xi}

- An extensive study of 2,500 individuals found metabolites of at least one phthalate in 97 percent of those tested.^{xii}
- Phthalates are highest in children ages 6 to 11, and in women.^{xiii} In a more recent study, certain phthalates were found to be present in 100% of girls age 6 to 9.^{xiv}
- 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.^{xv}
- 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.^{xvi}
- Infants can be exposed to both phthalates^{xvii} and Dioxins^{xviii} in breast milk. However despite these exposures, breast milk is still best for baby.^{xix}

PVC and Asthma: Are Schoolchildren, 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 and asthma.^{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.^{xxxv}
- 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-1-hexanol, 1-butanol, in the air.^{xxxvi}
- 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.^{xxxvii}

Learning and Developmental Disabilities and PVC

According to recent studies, the incidence of learning and developmental disabilities appears to be rising, affecting about one in six children in the U.S. under the age of 18.^{xxxviii} Many factors – heredity, gene expression, social environment, nutrition and chemical contaminants – contribute to brain development in complex ways. Chemical contaminants, however, have historically been the least researched and are the most preventable. Recent research also shows that the developing fetus and children are particularly vulnerable to environmental exposures. Given this, protecting children from exposures to neurotoxicants starting as early as fetal development is an essential public health measure if we are to help prevent further increases in LDDs.^{xxxix} Additionally according to the American Association on Intellectual and Developmental Disabilities, “students with disabilities are a special “at risk” population for the harmful effects of exposures to environmental hazards at school.”^{xxx} A number of chemicals released by the PVC lifecycle have been linked with or have been shown to cause learning and developmental disabilities. These include Dioxins,^{xxxi xxxii} Lead,^{xxxiii}

and Mercury.^{xxxiv} Preliminary research suggests phthalates may also be linked to learning and developmental disabilities.^{xxxv} A study published in 2009 found a statistically significant link between PVC flooring 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.^{xxxvi}

Is PVC Plastic Making us Fat?

Obesity is a serious health concern for children and adolescents, making children at risk for health problems during their youth and as adults. The prevalence of obesity has increased dramatically in recent years. For children aged 6-11, prevalence increased from 6.5% to 17.0%.^{xxxvii} While exposure to toxic chemicals is not the primary cause of obesity, the latest scientific studies suggest that certain chemicals may contribute to obesity.^{xxxviii} PVC chemicals that have been linked to obesity include hormone-disrupting phthalates^{xxxix} and organotins.^{xl} One new study examining organotins found that, “developmental or chronic lifetime exposure to organotins may therefore act as a chemical stressor for obesity and related disorders.”^{xli} Another study found that exposure to phthalates may be linked with childhood obesity.^{xlii} Additionally, exposure to Dioxins have been linked to Diabetes.^{xliii xliiv}

Breast Cancer and PVC: What's the Connection?

Not counting skin cancer, breast cancer is the most common cancer in women, and is on the rise. Incidence rates in the United States increased by more than 40 percent between 1973 and 1998. A woman's lifetime risk of breast cancer is now one in eight.^{xliv} According to the Breast Cancer Fund, “no more than 10 percent of breast cancers are genetic, and science points to toxic chemicals and radiation as factors in the sharp rise of breast cancer incidence.”^{xlvi} A number of the cornerstone chemicals used and released by the PVC lifecycle into our environment have been found to cause or may be linked with breast cancer. These include vinyl chloride,^{xlvii} Dioxins,^{xlviii} and phthalates.^{xlix} For example:

- Vinyl chloride is classified as a known human carcinogen by the EPA, National Toxicology Program, and IARC. It's been linked to increased mortality from breast cancer among workers involved in the manufacture of PVC. Additionally, animals exposed long-term to low levels of airborne vinyl chloride show an increased risk of mammary tumors.ⁱ
- Certain phthalates, including DEHP, have been found to significantly increase cell proliferation in MCF-7 breast cancer cells. In addition, this same phthalate inhibited the anti-tumor action of tamoxifen in MCF-7 breast cancer cells.^{li}
- Dioxins are known human carcinogens and endocrine disruptors. A recent study on women exposed to dioxins during a chemical plant explosion found a tenfold increase in TCDD levels were associated with more than twice the risk of breast cancer. Additionally, several studies have shown that administration of dioxin (especially TCDD) to pregnant rats leads to structural abnormalities in the development of their pups' mammary tissues and higher incidence of tumors when the pups grow to adulthood.^{lii}
- Early puberty is a known risk factor for breast cancer, and studies have suggested exposure to phthalates and Dioxins may be possible causes of early puberty.^{liii}

Reproductive Health Problems and PVC

Across the country, reproductive health problems are on the rise. Fertility problems, miscarriages, preterm births, early puberty, and birth defects are all up. Women under 25 and women between 25 and 34 have reported an increasing number of fertility problems over the last several decades. Reproductive health problems aren't limited to women. Average sperm count appears to be steadily declining, and there are rising rates of male genital birth defects such as hypospadias, a condition in which the urethra does not develop properly.^{liv} At the same time, scientific researchers are finding that exposure



PVC's lifecycle releases dioxins, a highly toxic group of chemicals that build up in the food chain, can cause cancer and harms the immune and reproductive systems.

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to toxic chemicals may cause many of these disorders. Toxic chemicals released by the PVC cycle associated with these disorders include the endocrine disrupting phthalates^{lv} and Dioxins. These chemicals interfere with the body's natural hormones and can scramble messages that natural hormones transfer between cells. Exposure to these chemicals before birth may possibly increase the chance of reproductive health problems. There may be no other plastic than PVC that releases as many reproductive toxicants during its lifecycle.

- Exposure to phthalates have been linked to reproductive problems including shorter pregnancy duration,^{lvi} premature breast development in females,^{lvii} early onset of puberty,^{lviii} sperm damage,^{lix} and impaired reproductive development in boys.^{lx}
- Research in male animals has shown that exposure to various phthalates causes birth defects of the genitals – such as hypospadias (an abnormal location for the opening of the urethra on the underside of the penis) and undescended or small testicles – resulting in low sperm counts and infertility.^{lxi}

- Exposure to dioxin can cause or has been associated with birth defects,^{lxii} decreased fertility,^{lxiii} inability to carry pregnancies to term,^{lxiv} endometriosis,^{lxv} lowered testosterone levels,^{lxvi} decreased sperm counts,^{lxvii} and decreased testis size.^{lxviii}
- Studies in workers have found lowered testosterone levels,^{lxix} decreased testis size,^{lxx} and birth defects in offspring of Vietnam veterans exposed to Agent Orange.^{lxxi}

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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