FOOD & WATER WATCH

Vinyl Chloride:
A Threat to Our Health and Environment

Harmful chemicals are all around us — especially in our plastics. One of the world's most commonly used plastics is polyvinyl chloride (PVC), and the main ingredient in PVC is a colorless, flammable gas called vinyl chloride (VC), which is derived from fossil fuels.[1] In addition to the harmful effects VC has on humans at any level of exposure, the production of VC, from start to finish, has significant environmental impacts — disproportionately borne by low-income communities and communities of color.[2] Further, the use of products containing vinyl chloride, such as PVC plastic, can have harmful health effects through water and food contamination.[3]

Nonetheless, the vinyl and plastics lobbies are now spending more money than ever to ensure future demand for VC and other fossil fuel-based plastics.[4] While health and environmental issues surrounding plastics and their ingredients are not new concerns, events such as the February 2023 train derailment[5] in East Palestine, Ohio, and intensifying climate change make clear that plastics and the chemicals needed to make them pose a threat to our planet's well-being. There is simply no way to regulate this inherently dangerous product safely. Vinyl chloride should be banned.

Vinyl Chloride and Public Health

Vinyl chloride poses numerous health risks. No level of VC exposure is considered safe for humans.[6] The U.S. Environmental Protection Agency (EPA) states that short-term exposure to vinyl chloride in the air affects the central nervous system in humans, causing effects such as dizziness, drowsiness, and headaches. On top of these short-term effects, impacts of long-term exposure to VC include liver damage, increased risk of liver cancer (angiosarcoma of the liver), and increased chance of birth defects.[7]

One of the most dangerous features of vinyl chloride is the release of dioxins when it is burned. Dioxins are organic pollutants that cause cancer and disrupt the hormonal, reproductive, developmental, and immune systems.[8] Like VC, there is no safe level of human exposure to dioxins.[9] One study on the open burning of eight different types of wastes (PVC-based agricultural plastic, electrical cables, tires, etc.) found that PVC-based agricultural plastics released the most contaminants (polychlorinated dibenzodioxins and dibenzofurans) of all

wastes.[10] When considering PVC's entire life cycle — including the chemical reaction during production as well as the release of pollutants from accidental and intentional burning — PVC is responsible for more dioxin formation than any other single product.[11]

Given the dangers of vinyl chloride, it is no surprise that products and other materials containing VC also pose serious health risks at the point of consumption. PVC pipes used in water systems can leach VC into water carried by the pipes. [12] PVC pipes also allow permeation, the "passage of contaminants external to the pipe, through porous, non-metallic materials, into the drinking water."[13] In addition, studies have found that volatile organic compounds (VOCs) with harmful health effects are more likely to migrate from PVC pipes in residential plumbing systems than other plastic pipes.[14] VOC contamination from PVC pipes is especially dangerous in areas prone to wildfires. The pipes can become damaged from heat and release toxic chemicals into the water such as benzene, a carcinogen.[15]

These dangers highlight the need to move away from PVC pipe-based water systems, at a time when the plastics lobby is pushing for more water systems to use PVC pipes rather than concrete or metal pipes. PVC pipes are clearly not safe and, in some cases, PVC pipes that are supposed to last for 50 years exploded within one year of installation, causing flooding and injuries.[16] More environmentally friendly alternatives to PVC pipes exist and can be used for all water system needs.[17]

Similar health concerns are raised when vinyl chloride is used in agricultural and food packaging and medical devices. VC can contaminate food directly from the use of PVC gloves and packaging materials. Phthalates, harmful chemical additives used to make PVC more durable,[18] have been found to seep into food through PVC products, specifically fatty foods like meat and cheese.[19] For this reason, PVC in food packaging is banned in many countries such as Canada, Spain, South Korea, and the Czech Republic.[20] PVC is also used in many medical devices, which leads to similar concerns about leaching as seen in water pipes and food packaging.[21] Alternatives to PVC in medical devices include latex, nitrile, silicone, and polyethylene, depending on the device.[22] A number of hospitals have phased out PVC products over the past few decades and are now nearly PVC-free.[23]

Vinyl Chloride and Our Reliance on Fossil Fuels

Like many ingredients in plastics, vinyl chloride is produced using fossil fuels such as natural gas produced by hydraulic fracturing, or fracking.[24] Given the connection between VC and fossil fuels, the massive subsidies that currently support fossil fuels are, in essence, also supporting plastics. This connection is apparent, given the growth in plastics production following increased natural gas production in the U.S.[25] Going forward, as other industries transition away from the use of

fossil fuels for energy, plastics will make up a larger portion of demand for the fossil fuel industry.[26] It is estimated that plastics will account for half of the growth in fossil fuel demand between now and 2050.[27] By 2050, as much as one-fifth of all consumption of oil and natural gas will be for plastics.[28]

In line with vinyl chloride's connection to fossil fuels, all steps of the production process pose significant health and environmental harms to surrounding areas, due to the release of dangerous chemicals in the manufacturing process.[29] While the train derailment in East Palestine, Ohio, shed light on the dangers of transporting VC, even without such disasters, VC is one of the most-released chemicals into the atmosphere in the U.S.[30] Further, PVC contributes more to global warming than other plastics due to its higher levels of energy use and thus carbon dioxide emissions.[31] In addition to the environmental harm from the toxic chemicals released during VC manufacturing, workers at VC plants are at risk of injury both from long-term exposure to chemicals and from accidents such as fires, explosions, and suffocation.[32]

Vinyl Chloride and Environmental Justice

The majority of vinyl chloride in the U.S. is manufactured in low-income communities and communities of color in Louisiana, Texas, and Kentucky, where it threatens the health of local residents.[33] This issue dates back to 1959, when Dow Chemical Company began manufacturing VC in Louisiana. Twenty years later, after years of chemical poisoning, VC was found in local wells.[34] Residents are still fighting against the expansion of VC and plastics plants. In 2021 a $1.3 billion expansion was announced for Shintech plastics plants in the Iberville and West Baton Rouge parishes. This announcement came shortly after the company paid $356,500 in fines for toxic chemical releases and worker injuries.[35] Shintech is one of the largest VC emitters in Louisiana, releasing one-third of all VC emitted in the state.[36]

The disparity in toxic chemical exposure manifests in significant health disadvantages for local residents compared to the rest of the country. Specifically, rates of cancer in one particular area of Louisiana are so much higher than the U.S. average that this corridor has become known as "Cancer Alley." As of 2022, "Cancer Alley" was home to more than 150 petrochemical facilities and refineries.[37] One town in West Baton Rouge parish, where one of Shintech's factories is located, has higher cancer rates than 95% of the U.S. [38]

The EPA found that of the 10 census tracts in the U.S. with the highest risk of cancer from air toxins, 7 are in the "Cancer Alley" area. Further, some residents in this area are 50 times more likely to develop cancer from air pollution than the average American.[39] Within the overly exposed areas, there exist racial and economic disparities in cancer risk. A 2012 study found that

residents in low-income and predominately Black census tracts had 12% and 16% higher cancer risks, respectively, than higher-income and predominately white tracts.[40]

The EPA Must Ban Vinyl Chloride

Vinyl chloride and the products it is used to make are dangerous for public and environmental health. VC is highly toxic and cannot be safely regulated. For these reasons, it is critical that the production of this chemical be banned. Under the Toxic Substances Control Act, the EPA has the authority to enforce a total ban on a chemical in order to protect the public.[41] It should exercise this authority for the reasons outlined above.

Vinyl chloride is a hidden danger that impacts all people through PVC pipes and other products — and specific low-income communities and communities of color are overwhelmingly impacted during its production. An EPA ban on VC production would protect the public, workers, and those communities currently being impacted. It would also mitigate the impact of vinyl chloride on the global environment, both by setting a precedent to ban production of the chemical, and by moving us away from plastics and fossil fuels.

Endnotes

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