

# PVC at a Glance

## Production of PVC

Electricity and CO<sub>2</sub>: PVC production requires large amounts of chlorine. Chlorine production requires large amounts of electricity — as much as eight tonnes of oil per tonne of PVC. Chlorine manufacture often uses mercury and is also one of the few remaining uses of asbestos in Europe.

Harmful component molecules: PVC is made from vinyl chloride monomer (VCM) and ethylene dichloride (EDC). VCM is a potent carcinogen. EDC is a neurotoxin and its production releases dioxin. The result? PVC plant workers and surrounding communities suffer increased rates of cancer and other illnesses.

## Use of PVC

Heavy metal stabilisers: PVC breaks down in sunlight, becoming brittle. To prevent that, heavy metals are added to stabilise the plastic. Lead is common, but is a neurotoxin. Cadmium is often used. PVC is also flammable, needing flame retardants in many applications in order to be safe.

Phthalates: PVC is naturally stiff. To be usable in medical devices such as IV bags, it has to be softened with phthalates. The most common of these, DEHP, has shown reproductive toxicity in animal testing. DEHP leaches out of medical devices, especially in fatty solutions. This is of particular concern for neonates, whose small body size and sometimes intensive treatment results in extremely high exposures, many times above what is considered safe for adults.

## Disposal of PVC

The recycling myth: PVC is rarely recycled — most often it is downcycled, reprocessed into lower grade plastic products. Recycled PVC is also more expensive than virgin PVC. Even if PVC is recycled, it perpetuates the problem of harmful additives, and it interferes with the recycling of other plastics. If PVC is landfilled, it leaches toxic additives and releases dioxin.

Incineration: PVC releases a lot of energy during combustion, so is a popular "fuel" for incinerators. However, as a chlorinated plastic it produces a lot of dioxin when burned. Even if this is trapped in ash or stack scrubbers, it is still hazardous waste which needs to be disposed of. Burning one kilogram of PVC also produces more than one kilogram of residues.

## Reasons for Concern

Over the last 20 years, concern has grown about the safety of the phthalate DEHP, the phthalate most commonly used to soften PVC medical devices.

Because DEHP is not bound to the PVC matrix, it leaches out from medical devices into the solutions the devices are transporting into the patient. The effect is particularly pronounced in fatty solutions, such as feeding formulations.

The male reproductive tract appears to be the most susceptible organ. Because DEHP alters the way the reproductive tract develops, exposure leads to permanent deformities and effects on fertility.

- hypospadias, a deformity of the penis
- undescended testicles, which indicates increased risk of testicular cancer later in life
- reduced sperm count and fertility
- indications of feminisation

## What about Other Plasticisers?

DEHP isn't the only plasticiser — other phthalates such as DINCH are being touted as alternatives, as well as non-phthalate plasticisers such as citrates and adipates. There are two fundamental problems with these: firstly, much like DEHP there is little data on their safety; secondly, using a different plasticiser doesn't address the problems with the production and disposal of PVC. It is therefore best to use PVC-free plastics wherever possible.

## The Swan Studies

Shanna Swan, a professor at the University of Rochester School of Medicine and Dentistry, is well known for research connecting environmental exposure to DEHP with developmental problems in boys.

Swan has completed two studies. Her most recent, of 106 mothers and sons, is her second to suggest phthalates are affecting humans.

Swan measured phthalate levels in mothers' urine during pregnancy, then examined the babies at 12 months. Boys whose mothers had the highest phthalate levels were more likely to have smaller penises, a shorter distance between the anus and base of the penis, and undescended testicles.

HCWH believes Swan's research is significant as it indicates environmental exposure to DEHP is sufficient to interfere with the sexual development of young males, with potential repercussions for developing cancer and other problems later in life.