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The Building Blocks of Nitrile Gloves A Compilation of Internet Resources

This compilation reaffirms the right choice of gloves is still Natural Latex Glove. PVC gloves give rise to Dioxin (Reference: <http://www.gloves.com.my/files/What%20is%20Dioxin.pdf>) problem. This article explains the risks posed by **Hydrogen Cyanide** and many others potential environmental harms of Nitrile gloves.

Nitrile, a copolymer containing acrylonitrile, butadiene and methacrylic acid, is the base material in latex form for the manufacture of Nitrile gloves. The chemical properties and risks of these building blocks starting raw materials are as follows:

Acrylonitrile is the [chemical compound](#) with the formula CH_2CHCN . This pungent-smelling colorless liquid often appears yellow due to impurities. It is an important [monomer](#) for the manufacture of useful [plastics](#). In-terms-of its molecular structure, it consists of a [vinyl](#) group linked to a [nitrile](#).

Acrylonitrile is highly flammable and toxic. It undergoes [explosive polymerization](#). The burning material releases fumes of [hydrogen cyanide](#) and [oxides of nitrogen](#). Acrylonitrile is classified as a recognized human carcinogen

(Reference: <http://en.wikipedia.org/wiki/Acrylonitrile>)

What effect might acrylonitrile (2-propenenitrile) have on my health?

Acrylonitrile is a central nervous system depressant and a respiratory irritant. Within the body it is converted to cyanide and many of the effects are related to the effect cyanide has in preventing the absorption of oxygen into the blood. Conversion is slow so effects may not occur for a number of days. Symptoms include headache, dizziness, nausea, feelings of apprehension and nervous irritability, muscle weakness, cyanosis, and convulsions sneezing, nausea, vomiting, weakness.

Acrylonitrile is an irritant to the skin and eyes and will cause damage with prolonged exposure and is a suspected causative agent of toxic epidermal necrosis.

(Reference: <http://www.npi.gov.au/database/substance-info/profiles/7.html#environmentaleffects>)

1,3-Butadiene is a simple [conjugated diene](#). It is an important industrial chemical used as a [monomer](#) in the production of [synthetic rubber](#). When the word **butadiene** is used, most of the time it refers to 1,3-butadiene

Most butadiene is [polymerized](#) to produce synthetic rubber. While [polybutadiene](#) itself is a very soft, almost liquid material, polymers prepared from mixtures of butadiene with styrene or [acrylonitrile](#), such as [ABS](#), are both tough and elastic

At acute high exposure, damage to the central nervous system will start to occur. Symptoms such as distorted blurred vision, vertigo, general tiredness, decreased blood pressure, headache, nausea, decreased pulse rate, and fainting may be witnessed. As the exposure to butadiene occurs at a higher level and for a longer duration, the effects witnessed will become more serious. The actual link between chronic effects of butadiene has been argued over the years, though human epidemiological studies have been performed over the years showing increased risks in serious adverse health effects.

Several studies show butadiene exposure increases risk in cardiovascular diseases and cancer. Animal data suggests the carcinogenic effects of butadiene may have a higher sensitivity to females over men when exposed to the chemical. While this data reveals important implications to the risks of human exposure to butadiene, more data is necessary to draw more conclusive risk assessments. There is also a lack of human data on the effects butadiene has on reproductive and developmental effects shown to occur in mice, but animal studies have shown breathing butadiene during pregnancy can increase the number of birth defects.

(Reference: <http://en.wikipedia.org/wiki/Butadiene>)

Methacrylic Acid, or 2-methyl-2-propenoic acid, is a low molecular weight [carboxylic acid](#) that occurs naturally in small amounts in the oil of [Roman chamomile](#). It is a corrosive liquid with an acrid unpleasant odor. It is soluble in warm water and miscible with most organic solvents. Methacrylic acid polymerizes readily upon heating or treatment with a catalytic amount of strong acid, such as [HCl](#). The resulting polymer is a ceramic-looking plastic. Methacrylic acid is used industrially in the preparation of its [esters](#), known collectively as methacrylates, such as [methyl methacrylate](#). The methacrylates have numerous uses, most notably in the manufacture of polymers with trade names such as [Lucite](#) and [Plexiglas®](#).

(Reference: http://en.wikipedia.org/wiki/Methacrylic_acid)

Effects on Humans: Methacrylic acid can affect the eyes, skin, and immune system in humans [ACGIH 1991]. Exposure to methacrylic acid vapor may produce skin and eye irritation [Patnaik 1992]. In a case study involving 37 acrylic acid resin workers, methacrylic acid caused sensitization in a few of the workers and thus appears to be a sensitizing agent [ACGIH 1991]. Skin toxicity and a severe corneal burn were observed in a population of workers exposed to up to 113 ppm methacrylic acid [ACGIH 1991].

(Reference: <http://www.osha.gov/SLTC/healthguidelines/methacrylicacid/recognition.html>)

Acrylonitrile Butadiene Rubber (NBR) is a family of unsaturated copolymers of 2-propenenitrile and various butadiene monomers (1,2-butadiene and 1,3-butadiene). Although its physical and chemical properties vary depending on the polymer's composition of acrylonitrile (the more acrylonitrile within the polymer, the higher the resistance to oils but the lower the flexibility of the material), this form of synthetic rubber is generally resistant to oil, fuel, and other chemicals. Its resilience makes NBR the perfect material for disposable lab, cleaning, and examination gloves.

Environmental Concerns

Acrylonitrile is considered an environmentally hazardous substance that cannot be freely ejected into the environment (it must be disposed through a rotary kiln, fluidized bed, liquid injection incineration, or underground injection). Because the compound is quite volatile and readily soluble in water, its release to the environment from waste sites is a concern. 1,3-butadiene is very reactive in the presence of hydroxyl radicals, and therefore possess high ozone creation potential. As mentioned previously, however, unreacted monomer recovery is nearly 100% in the process outlined above. Since unused monomers can easily be recycled, its disposal is not an unbearable concern. Thus, despite more stringent disposal restrictions, acrylonitrile butadiene rubber is produced throughout North America.

(Reference: http://en.wikipedia.org/wiki/Nitrile_rubber)

Conclusion

Nitrile gloves are synthetic gloves using potentially damaging and toxic raw materials, both to workers engaged in their productions as well as the environment. While it may possess some properties like better resistance to organic solvents and absence of latex proteins, the negative impacts must be considered in balance when choosing them for use.

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19th February 2008