TOYING with Toxicity

'Age labelling', choke-hazard tests, and advertisement restrictions are just some of the ways in which child-safety can be ensured vis-à-vis toys. Toxicity, flammability, and electrical properties are also important test-points.

In India, unfortunately, lead and cadmium toxicity is a major health hazard in toys. A recent study of toy samples from across India reveals cheap toys contain high concentration of lead and cadmium - both dangerous heavy metals.

Toys are an integral part of children's developmental processes. Besides providing entertainment to children, toys also serve as educational materials for them. Toys are also age-specific. What constitutes a toy at one age may be boring or unsafe at another age. Toys are manufactured for intended use to play by children. However, it may not happen in reality. A child may use or 'misuse' while playing with it simply because he/she is not aware of the intended uses. Therefore, toys must be safe both for their intended uses, and for realistically anticipated 'misuse' by children. Safe toys must be well designed, age appropriate, durable and non-toxic. Some toys are inherently hazardous and appropriate only for use by older children and under adult supervision.

Playing with toys should be fun and worry-free, but sometimes toys inflict injuries such as scratches produced by sharp edges or points, choking due to swallowing or other mechanical injuries such as electrical injury, hearing loss from excessive noise, penetrating wounds from projectiles, strangulation, or burns from flammable materials. All these injuries are what may be called accidents. However, exposure from toxic chemicals present in toys due to swallowing, chewing or sucking by children may not be discernible immediately but may have long term adverse health impacts.

Polyvinyl Chloride (PVC) Toys and Toxicity

Polyvinyl Chloride is a polymer or large chain-like molecule, made up of repeating units of Vinyl Chloride (a monomer), commonly referred to as Vinyl or PVC. PVC has a special problem of auto-digestion. Free hydrogen radicals and free chlorine radicals react to form Hydrochloric Acid (HCl), which leads to a complete loss of strength. Lead or cadmium is added into PVC as stabilizers to prevent the free chlorine radicals from reacting with hydrogen radicals to form HCl. Lead and cadmium are also added into PVC or other plastic products as colouring agents in form of organo-metallic compounds. Moreover, PVC is a chemically dependent material. Phthalate esters are added to PVC to make it soft and pliable. Phthalate are also known to cause liver damage. It is important to understand here that PVC releases its metal stabilizers as dust on its surface.

Health Impacts of Lead and Cadmium

Lead and cadmium are known poisons, being neurotoxins and nephrotoxins (Neurotoxins are agents that can cause toxic effects on the nervous system while nephrotoxins are agents that can cause toxic effects on the kidney) respectively. Physicians and scientists agree that no level of lead in blood is safe or normal. Progressive elevation of blood lead levels in a child's system can cause a potential genius to drop to an average achievement level and an average child to become learning disabled. The foetuses of pregnant women are severely affected by lead exposure since lead can pass through the placenta directly into the baby. When an expectant mother maintains a poor diet, the problem is compounded since she will start breaking down bone to release calcium and other minerals, thereby releasing lead stored in the bones, which passes to the developing baby. High lead

exposure could also result in fetal death.

The disturbing fact is that exposure to extremely small amounts can have long-term and measurable effects in children while at the same time causing no distinctive symptoms. Another problem of lead exposure is it being cumulative in nature. After lead is absorbed into blood, some of it is filtered out and excreted, but the rest is distributed in the liver, brain, kidneys and bones. What's more disturbing is what happens when lead gets into the bones. Lead can stay in bones for decades. It can re-enter the body when bone breaks down as part of a regular metabolic process or due to some specific physiological conditions like osteoporosis, causing re-exposure.

Human uptake of cadmium takes place mainly through food. An exposure to significantly higher cadmium levels occurs when people are exposed to tobacco smoke either directly or indirectly. Cadmium, upon entering into the body, is first transported to the liver through the blood. There, it bonds to proteins to form complexes that are transported to the kidneys. It accumulates in kidneys, where it damages filtering mechanisms. Cadmium dust (cadmium oxide, CdO) is another source for cancer in human beings. Cadmium, when released as fine airborne particles, then reacts almost immediately with oxygen to form respirable cadmium oxide, which is a carcinogen.

Exposure Pathways

The chewing and swallowing behaviour of children is a common source of lead and cadmium exposure. However, swallowing is not even necessary for exposure. Simply chewing and sucking on plastic cables is a known source of lead poisoning. Lead and cadmium contaminated dust is another source of exposure and is especially dangerous as it can enter into the body in multiple ways. Routes of ingestion include licking, sucking, mouthing, inhalation and hand-to-mouth behaviour. Another source of exposure to lead and cadmium can be the toxic dust released during the degradation of vinyl children's products. So a child may simultaneously be exposed to toxic metals like lead and Cadmium through various sources.

Lead compounds as stabilizers in PVC

- ***Basic lead carbonate,***
- ***lead stearate,***
- ***basic lead stearate,***
- ***tribasic lead stearate,***
- ***basic (dibasic) lead stearate, and***
- ***basic lead phthalate***

Lead and Cadmium in PVC Toys

In a recent study by Toxics Link, a total of 111 toy samples were purchased from three metro cities in India, viz., Delhi, Mumbai and Chennai. These toys were unbranded and in the price range of Rs 10-100. These toys mostly catered to the needs of both middle class and urban poor families. All samples were brought at one place in Delhi and then laboratory tested in Delhi Test House, a Delhi-based NABL accredited laboratory. Out of 111 toy samples tested for chlorine, 77 were found to be made up of PVC materials while rest 34 toy samples were made up of non-PVC plastic materials. A total of 88 samples (77 PVC and 11 non-PVC) were further analysed for lead and cadmium. Pb (lead) and Cd (cadmium) were found to be present in all tested samples in varying concentrations. The overall average concentrations of lead and cadmium are 112.51 ppm and 15.71 ppm respectively. The range for lead concentration in tested samples was 2104 ppm to 0.65 ppm. For cadmium, the range was from 0.016 ppm to 188 ppm. Eight samples, brought from Mumbai, showed concentration higher than 200 ppm. Five samples (close to 20 per cent of Mumbai samples analysed) showed very high lead concentration (from 878.6 ppm to 2104 ppm) even exceeding the US EPA limit of 600 ppm in painted toys.

Uncertainties Related to Standards

Defining standards is a first step in any regulatory mechanism and prevention, perhaps, is the key to safe environmental health. Unfortunately India does not have an enforceable standard for the total content of lead, cadmium and other toxics metals in toys. Whatever standard India has in this regard is with respect to migratory elements from toy materials, which has been adopted from European Union safety requirements (BS EN 71-3:1995) and International standards (International Organization for Standardization, ISO 8124-3:1997 Migration of Certain Elements). This too is only voluntary in nature. In fact safety requirements for toys related to physical and mechanical properties and flammability properties are also voluntary in nature. Manufacturers have to comply with this standard only when they export their toys to European or other countries. This is rather sad that an important policy feature that has crucial implications for children's health has not been given due consideration.

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