

# Toys- As a source of poisoning

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## Abstract-

Children are mostly attracted towards different colourful toys and these play an important role for their physical as well as mental development.

Toys are made up of different materials like plastics, wood, rubber, etc. Previously, phthalates were also used as a component of toys nowadays these has been banned as they are toxic in nature. Moreover, toys are coated with different paint layers to impart color which may contain heavy metals which leads to chronic poisoning.

A number of cases have been reported in literature, in which health problems and death of children was due to chewing and exposure towards various toys. A Forensic toxicologist has to give opinion about cause of poisoning.

Keywords- Toys, chronic poisoning, heavy metals, children, poisoning

## Introduction

Toys are the things available in different shapes and forms which are used for play by the children. Various toys like construction sets help in physical and mental development of small children as well as increase their creativity level. However, some other toys also play an educational role by teaching new things and training the child's mind. The toys have mainly two functions that are to inspire, maintain child mentality and to help in peer grouping as in case of shared play theme (Trawick-Smith et, al 2014).

The toys can be made up of various materials like paper, wood, clay, copper etc. Toys can be categorized in the following categories-

- Construction sets- the separated pieces are used to made same model or to solve some puzzle.
- Dolls- a human model or animal model which is made up of plastic, cloth piece, fibres, wood etc.
- Teddy bears- mainly made of small fibres
- Vehicles – tiny copy or miniature vehicles like car, truck, bus, bike, bicycle, train, etc.
- Digital toys- like small robots, robotic cars, small gazettes etc.
- Physical activity- includes football, cricket ball, ropes, etc.( Prof. Misra et, al 2015)

In ancient times, handmade things like wood, stones, animal bones, or clay were used as toys. Wooden tops, barrel hoops, and horses were made up of wood and rattles, dolls made up of clay were used for playing by Romans and Greeks till 1600s. Scientists used rocks, wood, clay, paper, cotton, and paper for making toys. After 1800s machines helped in production of affordable and larger volume toys from metals like aluminium, iron and tin. From 1870s plastic was used for toys making. In 1920s polystyrene was invented which can be

stretched and shaped into various forms. Plastic covered whole market along with wooden toys, Barbie dolls since 1945.

**PLASTICIZERS-** are the additive polymers that help in increasing the workability, flexibility of the material. These decrease the cohesive intermolecular forces due to which chains can move freely and reduce the stiffness of polymer. The plasticizers are of two types, internal and external. The chemical alteration of polymer and its monomer come under internal plasticizers. In industry, external plasticizers are used. The main plasticizers used in PVC are Phthalates. (Brian Amato et al 2001)

Polyvinyl chloride (PVC) - is the main compound used for making of plastic toys. PVC get auto-digested inside the body. It is used to increase the stability and flexibility of the toys. For this, the lead and cadmium are mainly used because they act as additives. The natural characteristics get changed by the addition of PVC. It interferes in the hormones which are responsible for the growth of children and also affect their reproductive system

**PHTHALATES PLASTICIZERS-** help in softening the PVC. These are the colourless liquid insoluble in water but miscible in hexane, mineral oil and organic solvents. The structure of phthalates plasticizers involves an ester group with phthalates. DEHP (Di-Ethylhexyl Phthalate), DINP (Di-Isononyl Phthalate), and DINCH are the main examples of phthalate plasticizers. ( Brian Amato et al 2001)

**TOXICS PRESENT IN TOYS -** the toys which are more likely used to suck and chew by the children contain toxic metals. They are added during manufacturing of plastic toys like a soft duck to increase their flexibility and stability. The toxic substances include heavy metals are lead (Pb), cadmium (Cd), mercury (Hg), barium (Ba), arsenic (As), selenium (Se), chromium (Cr), etc. (Davidowski et).

These metals effect on the cellular level, organ and organ system. The toxicity of heavy metals depends upon the exposure, route of administration, pathway and pharm kinetics. The most common heavy metals which cause toxicity in children are Pb and Cd. These two metals effect on the nervous system and kidney.

Lead and cadmium are used as stabilizers in PVC for the toys manufacturing. These also help to increase the elasticity of toys. It introduced inside the body by chewing and sucking habit of children. The small amount of ingestion of these elements or metals leads to harmful effects in children. Lead and cadmium effect nervous system, liver, kidney and small intestine. They also penetrate deep into the bones and stored there for many years. (Dr. Kumar and Pastore 2006). It leads to hearing, developmental, headache, and growth problems. Lead and cadmium are not only used in manufacturing of toys, but they are also present in packaging products.

Out of 10 chemicals, lead is one of the most toxin heavy metal. According to a study done in 2016, lead effects on intelligence quotient (IQ) level which remains for a long time and it also causes deaths to half a million cases. Lead is present in children's toys, paints; dust whose exposure takes place due to sucking or chewing nature of children. (Shen et, al 2018).

**LEAD-** Pb is a silver coloured toxic metal whose widespread use cause environmental contamination and hazardous health problems. Drinking water, smoking, food, gasoline, paint, pipes, batteries, industrial processes, and toys are the sources of lead exposure. Lead affects both plants and animals. It affects physiological processes of plants as well.

**CADMIUM-** Cd exposure may take place through environment by both plants as well as animals. It accumulates inside the body throughout life on one-time absorbance. In coating, pigments, plating,

and as a plastic stabilizer, cadmium is used. Through inhalation and ingestion, human beings get exposed to this metal which further causes acute and chronic toxicity. Cd gets remained in soil and sediments for many decades. It is well-known for its adverse effects on cells. Cadmium is also restricted to use in toys because it also causes a deleterious effect on a child's body, but Cd is valid for use for paints. (Guney and Zagury 2011).

**BIOACCUMULATION-** when metals get incorporated in the body, then this type of biosorption is known as bioaccumulation. The incorporation of metals lies on active as well as passive uptake. With intracellular proteins like sulphur containing peptides, metals get immobilized

through complexation. Intracellular organelles are space where metals can be stored in eukaryotic organisms. The organism's affinities towards metal and physicochemical conditions which influence metal toxicity are the main reasons of bioaccumulation. (Bindschedler 2017).

**TOYS AS SOURCE OF POISONING-** toys become source of poisoning when it contains high concentration of heavy metals like Lead, Cadmium, Mercury, Chromium, Bromine, etc. The children have habit of mouthing and chewing of toys which leads to exposure of these heavy metals inside the body and as metabolism rate of heavy metals is lower than rate of their administration, so these get accumulated in body which is termed as bioaccumulation. Thus becomes the source of chronic poisoning.

**Conclusion-** Toys have been used by children but these can also become a source of chronic poisoning due to its presence of various toxic components So there should be proper monitoring of toys before their entry into market.

### **REFERENCES-**

1. Abhay Kumar and Prashant Pastore, Lead and cadmium in soft plastic toys, 2007, Vol. 93, No. 6, pp. 818-822.
2. Al-Qutob, M., Asafra, A., Nashashibi, T., & Qutob, A. A. (2014). Determination of different trace heavy metals in children's plastic toys imported to the West Bank/Palestine by ICP/MS-environmental and health aspects. *Journal of Environmental Protection*, 5(12), 1104
3. Ahmad, N., Nasibullah, M., Hassan, F., Singh, A. K., Patel, D. K., Khan, A. R., & Rahman, M. (2012). Heavy metal assessment of leachates of some plastic toys purchased from different districts of UP, India. *Int Res J Environ Sci*, 1(4), 32-36.
4. Davidowski, Heavy Metal Analysis for the Toy Industry by Inductively Coupled Plasma Optical Emission Spectroscopy, Laura Thompson PerkinElmer Life and Analytical Sciences 710 Bridgeport Avenue Shelton, CT 06484 USA
5. Ratnakumar, A., De Alwis, A. A. P., & Adikary, S. U. (2017). Investigation of the Presence of Heavy Metals in Plastic Toys Available in Sri Lankan Market. In Proceedings of International Forestry and Environment Symposium (Vol. 22).