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Lead Intoxication and Its Sources of Exposure

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ABSTRACT

Lead is poisonous and produces a variety of negative clinical outcomes in both children and adults. Human exposure to lead occurs predominantly in the environment, at work, and in the home. The aim of current study is to explore various sources of lead (Pb) exposure in environment that can induce lethal complication in human beings. The literature was searched form various research data basis like google scholar, pubmed and scopus by using different key words such as “lead exposure”, “occupational lead exposure”, “non-occupational lead exposure” etc. A total of 40 papers were searched and out of those only 18 papers were selected for this study. Human exposure to lead can occur predominantly through environment, at work, and in the home. Water, soils, paint chips from older homes, and dust are all major concerns. Ingestion of lead from water is a prevalent cause of lead exposure in many families, and corrosion of lead service lines, outdated fixtures, and/or lead solder that link drinking water pipes is one of the primary sources of lead in drinking water. There are two major sources of lead exposure namely occupational and non-occupational sources. The children and adult populations both are susceptible to heavy metals exposure as result of which various metabolic and genetic complications can be raised.

Keywords: lead; exposure; occupational; non-occupational

INTRODUCTION

Despite the fact that over one million tons of lead are processed and utilized in the United States alone each year, neither the incidence of lead poisoning nor precise statistics regarding groups at risk of intoxication are accessible.(1) Lead is poisonous and produces a variety of negative clinical outcomes in both children and adults. Because of past and contemporary industrial pollution, lead-contaminated air, soil, and water are substantial in China. Moreover, some studies have found that more than one-third of Chinese children had blood lead levels (BLLs) greater than 10 g/dL.(2)

LEAD INTOXICATION

Sources of lead exposure, with a focus on environmental and occupational sources as documented in the literature (Table 1). Human exposure to lead occurs predominantly in the environment, at work, and in the home. Water, soils, paint chips from older homes, and dust are all major concerns. Ingestion of lead from water is a prevalent cause of lead exposure in many families, and corrosion of lead service lines, outdated fixtures, and/or lead solder that link drinking water pipes is one of the primary sources of lead in drinking water. Because of health concerns, numerous communities replaced lead-based pipes with polyvinyl chloride (PVC) or copper pipes. In 2017, the United States had an estimated 6.1 million service lines to residences and an estimated 9.3 million households with lead pipes.(1)

Lead contamination of soils comes from a wide variety of anthropogenic sources, affecting both agricultural and urban soils. It has been estimated that a 1000 mg/kg increase in soil lead concentration could result in a child's BLL increasing by 3 to 7 g/dL.(3) Heavy metals have brilliant colors and are so commonly employed in glazes, dyes, inks, and paint pigments. To increase the longevity of paints, a well-known Pb salt (e.g.,

Pb carbonate) is utilized as well as drying time. As a result, Pb paints have been prohibited in Belgium, Austria, and France since 1909.[4]

Table 1. Source of lead intoxication

Occupational sources	Non-occupational sources
1) Painting	1) Battery burning
2) Construction or home remodeling	2) Bullet retention
3) Radiator repair	3) Ceramic making
4) Battery or scrap metal recycling	4) Eating from unfired pottery
5) Pottery manufacturing	5) Cooking in leaden pots
6) Working with guns and ammunition	6) Home-distilled wine/whiskey
7) Industries using lead solder	7) Home abortifacients
8) Roadwork	8) Target shooting
9) Glazing and firing ceramics	9) Ingestion of lead -containing herbal medicines
10) Refinishing furniture	10) Use of lead-containing cosmetics
	11) Soldering

There were three significant sources of lead exposure for children: 1) lead in the air from leaded petrol; 2) chips and dust from deteriorating lead-based paint in the home; and 3) lead in soil from both geogenic and anthropogenic sources.[5] Children that crawl on Pb-contaminated flooring might readily inhale and absorb Pb dust. Individuals who live in historic houses may be exposed to high levels of Pb since their homes are covered with Pb paints. [4]

According to CDC research with an age-adjusted geometric mean BLLs and a prevalence of BLLs of at least 5 g/dL, BLLs are greater among persons who live in homes constructed before 1978 (when lead was removed from paint via a government mandate). Moreover, employees with high lead exposure were mostly working in the mining, construction, or manufacturing industries. Adult employees were exposed to lead in jobs involving nonferrous metal production and processing, battery manufacture and painting, and wall covering contractors. Moreover, among the most prevalent causes of lead exposure in the United States include shooting weapons, using lead-containing alternative medicines, and remodeling, refurbishing, or painting homes/buildings.[2]

Food (meat, as in the example mentioned owing to metal leakage from pots) or vegetables grown in soil polluted by industrial discharges (not just Pb, but also cadmium and mercury) can be harmful.[6] Adult lead poisoning frequently remains unrecognised for lengthy periods of time due to a low index of suspicion. [7]

The presence of lead in several Indian-made Ayurvedic medicines has raised consumer concerns, with some tested samples carrying 100 to 10,000 times the legal level for lead. This lead is derived from the chemicals used in the manufacture of these medications. Rasa Shastra, for example, is a practise in which herbs, metals, minerals, and jewels containing trace levels of lead are mixed to create concoctions believed to heal diseases such as migraines.[3] Fetuses are predominantly exposed to skeletal lead from their mothers during the third trimester of pregnancy, which is a critical time for central nervous system development in growing fetuses. [8,9]

Candy is another unexpected cause of lead exposure and poisoning in youngsters. When ingredients are poorly dried, stored, or ground, lead can be incorporated into the candy. Plastic wrappers may also contain tiny levels of lead, which can contaminate sweets. Popular spices like chilli powder and tamarind can contain lead as well.[10,11] Other routes of exposure include inhaling lead particles from burning materials and activities that require the construction or creation of lead-containing materials and items.[12,13]

Lead concentrations in breast milk are frequently identical to those seen in the mother's blood, and are mostly composed of lead derived from skeletal tissues.[5] Lead absorption in breastfed children is lower than that observed during foetal development. This is because intestine absorption absorbs less lead than exposure to lead via the placenta. [14-23] Toys imported from other countries are another source of lead exposure for children in the United States, with some surpassing the regulation level of 90 mg/kg for surface coatings of toys. [24]

CONCLUSION

Lead is widely distributed in our environment and its exposure is very common in human beings. The exposure of lead is very common now a days and it cannot be escaped because it is found even in our routine life articles. It can induce various lethal complications and various other health related issues both in children and adults. However, its exposure can be avoided by its proper management.

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