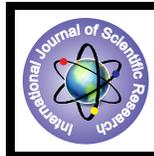


## Lead Poisoning-Causes, Effects and Treatment” (Review)



### CHEMISTRY

**KEYWORDS:** lead poisoning, heavy metal, children's health, toxicity, renal failure, human milk

DR SANJAY SHARMA

CHEMISTRY DEPARTMENT, DAV COLLEGE, AMRITSAR (INDIA)

### ABSTRACT

*Lead has no essential role in the human body. Presence of lead in the blood can cause Lead poisoning; it has detrimental effects on the health of the world's children. Lead exposure attacks central nervous system and it may cause loss of cognition, shortening of attention span, emotional and behavioural problems, dyslexia, hypertension, renal impairment, immunotoxicity, anaemia and even it may prove fatal. The effects are irreversible and untreatable by modern medicine. To avoid lead exposure is the best way to prevent lead poisoning.*

Lead is a highly toxic heavy metal, It cannot be smelled or tasted. It has a low melting point, it is easily moulded and shaped, and can be combined with other metals to form alloys. For these reasons, lead has been used by humans today in various products such as pipes, storage batteries, paints, glazes, electronic waste, weights, ammunition, cable covers, and radiation shielding. Tetra-ethyl lead (anti knocking agent) was used extensively from the 1930s to the 1970s as a petrol additive to improve engine performance (Rosner & Markowitz, 1985). It is invisible to the naked eye and is a very strong poison. The toxic nature of lead has been recognized since ancient age (Needleman 1999).

**Common sources of lead include:** lead-based paints, contaminated dust, gasoline products (used as anti knocking agent), older houses, toys and household items, bullets and fishing sinkers made of lead, pipes and sink faucets, soil polluted by car exhaust or chipping house paint, jewelry, pottery, and lead figures, storage batteries (Romieu 2001), lead solder in food cans, ceramic glazes, Kohl or kajol eyeliners, maintenance and repair of bridges and water towers, lead in the food chain, via contaminated soil, Some traditional ethnic medicines.

Lead accumulates over a period of months or years in human body. The poisoning can cause severe mental and physical impairment especially to Young children because their brains and nervous systems are still developing. The developing human brain undergoes rapid growth, development and differentiation, and lead can interfere with these extraordinarily complex and delicate processes. The sequelae of brain damage caused by chronic, low-level exposure to lead are irreversible and untreatable (Needleman et al., 1990; Bellinger, Stiles & Needleman, 1992)

Children can have more Gastrointestinal absorption of lead- up to 50%, as compared with 10% in adults

**Health effects;** Lead is associated with a wide range of toxicity in Children under the age of six; especially unborn babies. Lead poisoning can affect virtually every organ system in the body. The principal organs affected are the central and peripheral nervous system and the cardiovascular, gastrointestinal, renal, endocrine, immune and haematological systems.

Childhood lead poisoning includes reduced intelligent quotient (IQ) (Schwartz, 1994), affects central nervous system (Needleman et al. 1990, 1996), learning disabilities, attention deficit disorders, emotional and behavioural problems (Burns et al. 1999), stunted growth, hearing problems, anemia, memory loss, anemia, kidney damage, abdominal cramps, loss of appetite, fatigue.

High levels can cause mental retardation, coma, and even death. Exposed adults may suffer high blood pressure (Schwartz, 1988, 1991, 1995), fertility problems, nerve disorders, muscle and joint pain, irritability, and memory or concentration problems.

Evidence relating exposure to lead and various health effects has been reviewed extensively (International Programme on Chemical Safety 1977, 1995; National Research Council 1993; Pocock et al. 1994; Schwartz 1994)

**How lead works in body ;** Lead mimics biologically helpful minerals such as calcium, iron, and zinc. It settles in the bone, interfering with the production of red blood cells (leading to anemia) and interferes with the absorption of calcium, which is required for strong bones, muscles, healthy muscle contraction, and blood vessel function. Typically, lead-induced anaemia arises from a combination of reduced haemoglobin formation (caused either by impaired haem synthesis or globin chain formation) and reduction in erythrocyte survival because of haemolysis (National Research Council 1993).

**Lead in human milk;** From conception onward, lead that gets stored in the mother's skeleton in years past is released into the circulation under the metabolic stress of pregnancy. Lead readily crosses from the maternal to the infant circulation, and the blood lead concentration of the infant increases (Markowitz, 2000). Lead can penetrate the immature blood-brain barrier to enter the developing brain (Lidsky & Schneider, 2003) and this may prove highly dangerous for developing human brain.

**Lead and renal toxicity;** In kidneys, lead causes proximal tubular injury that progress to tubulo-interstitial disease and fibrosis. Lead accumulation in the proximal tubule leads to hyperuricaemia and gout – presumably by inhibiting uric acid secretion – and also to diminished renal clearance, tubular reabsorption and glomerular filtration rate (Gonick, 2008). Lead concentrations greater than 40 µg/dl in blood increases risk of nephropathy and related renal failure. Also, people with diabetes and hypertension are at increased risk of clinical renal dysfunction at lower exposures to lead.

**Lead and cardiovascular diseases;** More recently studies have found evidence that increased lead absorption, is associated with significant elevation in blood pressure. Beyond hypertension, studies in general populations have identified a positive relationship between exposure to lead and clinical cardiovascular events (mortality due to cardiovascular disease, coronary heart disease and stroke; and peripheral arterial disease), but the number of studies examining these effects is relatively small. In some studies, these relationships were observed at blood lead levels lower than 5 µg/dl (NavasAcien et al., 2007).

**Diagnosis of lead poisoning;** It is diagnosed with a blood lead test. The amount of lead in the blood is measured in micrograms per deciliter (mcg/dL), the higher levels of lead are of more serious concern in children as compared to adults. For adults, a normal result is less than 20 mcg/dL. For children, a normal result is less than 10 mcg/dL. A level greater than 45 mcg/dL should always be treated in children (in adults it is recommended 60 mcg/dL).

Levels of 10-25 mcg/dL have been associated with impaired neurobehavioral development in children. Levels of 25-50 mcg/dL may be associated with headache, irritability, and early nerve problems. Levels of 50-70 mcg/dL are associated with moderate toxicity, and levels greater than 70-100mcg/dL are associated with severe poisoning.

**Treatment;** Treatment depends on levels of lead is in the blood. In cases of mild lead poisoning, the source is removed. In cases of severe lead poisoning, with blood lead levels equal to or above 45 micrograms per decilitre in children and 60 mcg/dL in adults, excess lead can be extracted by complexation(chelation) with EDTA(chelation therapy).

Activated charcoal can also be used to bind the lead in the gastrointestinal tract and substances which encourage elimination via defecation (cathartics) may also be used.

**CONCLUSION;** exposure to lead is hazardous particularly for children, including those living in houses containing leaded paint, or lead piping, or in areas affected by industrial contamination containing lead. Control of these sources will require continuing efforts. Many countries have initiated programmes to lower the level of lead in the environment, it is result of these efforts that Blood-lead concentrations has reduced dramatically over a few years one of these efforts is the use of lead free petrol for vehicles(Thomas et al., 1999). Although leaded petrol is not the only source of lead in the environment, it is a good indicator of reduction in exposure to lead (Landrigan et al., 2000). Human exposure to lead remains of concern to health care providers and public health officials worldwide.

**REFERENCE**

1. C. F. Rokitsky, A Manual of Pathological Anatomy, vol. 2, Blanchard&Lea, Philadelphia, Pa, USA, 1855 | 2. S.Warren and A. S.Warren, "A study of 6797 surgically removed appendices," Annals of Surgery, vol.83, no. 2, pp. 222-235, 1926 | 3. N. Agarwala and C. Y. Liu, "Laparoscopic appendectomy," Journal of the American Association of Gynecologic Laparoscopists, vol. 10, no. 2, pp. 166-168, 2003 | 4. Mohammad Ezzedien Rabie et al. Mucus Containing Cystic Lesions "Mucocele" of the Appendix: The Unresolved Issues. International Journal of Surgical Oncology, Volume 2015, Article ID 139461 | 5. Four mucinous cystadenoma of the appendix treated by different approaches. Murat Özgür Kılıç et al. Ulusal Cer Derg 2014; 30: 97-99 | 6. Misdrabi J, Yantiss RK, Graeme-Cook FM et al: Appendiceal mucinous neoplasms: a clinicopathologic analysis of 107 cases. Am J Surg Pathol, 2003; 27: 1089-103 | 7. Appendiceal mucocele as a presentation of mucinous adenocarcinoma. Tynan JR, Marshall GB, Gray RR. Can Assoc Radiol J 2006 Apr; 57(2): 117-9 | 8. Appendiceal mucocele associated with colonic neoplasm: Report of 2 cases and review of the literature. Vincenzi L et al. Chir Ital 2001 May-June; 53(3): 420-4 | 9. A case of appendiceal mucocele associated with adenocarcinoma of left colon. Versaci A et al. G Chir 1999 Oct 20(10): 397-401 |