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BEWARE LEAD IS STILL INTRUDING OUR DAILY LIFE

Suleiman I. Sharif*[1,2], Manal S. Al-Sharawy[2] and Saleh Edlibi[2]

[1]Department of Pharmacology, Faculty of Medicine, University of Benghazi-Libya.
[2]Department of Pharmacy Practice and Pharmacotherapeutics, College of Pharmacy –University of Sharjah, P.O. Box 27272, Sharjah-United Arab Emirates.

***Corresponding Author: Suleiman I. Sharif**
Department of Pharmacology, Faculty of Medicine, University of Benghazi-Libya.

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ABSTRACT

Lead (Pb) is a toxic metal that has been known for ages and has also been used widely and wildly in plumbing, leaded petrol, as antiknock, rubber industry, paints, and lead batteries. We aimed at investigating several children toys and household utensils for the presence of lead. A lead test kit. (Apotex kit) was used in all tests performed. The kit can be applied to almost all materials suspected of containing Pb. A surface detection procedure was used where the surface of the material is cleaned of dust or dirt and 4 drops of the kit solution are dispensed on a cotton swab and the swab tip is rubbed on the surface under investigation for 30 to 60 seconds. Change in color of surface or swab indicates the presence of Pb, the quantity of which can be approximated from a color chart provided with the kit. Surprisingly, most items tested proved positive for the presence of lead and in particular children's toys. The method, although it is purely qualitative but it proved useful in detecting the presence of lead in the items tested. Considering the normal hand to mouth behavior of children, they are more vulnerable to the hazardous effects of chronic exposure to low lead concentration. we recommend that both the public and decision makers should be aware of the danger of lead and stringent regulations and measures of intervention should be taken to establish a healthy community free of lead.

KEYWORDS: Lead, Poisoning, Toys, Intervention.

INTRODUCTION

Lead (Pb) is a toxic metal that has been known for centuries. although the problem of Pb toxicity it is a global one, but it remains rather a matter of concern in developing countries where most of the attention by heath agency was focused mainly on presence of Pb in paints and petrol. The main sources of Pb in ambient air are leaded gasoline where it is added as antiknock, Pb batteries, ore smelting, rubber products and industry, glass, firearms and in cigarette smoking as a result of spraying tobacco with Pb arsenate insecticides.[1] Another source of Pb in the environment is water where Pb may be released from pipelines, or welding material used on pipelines connection or from the main source of water supply. Unlike manganese, zinc, copper, chromium, calcium and magnesium it has no physiological function in the body. On the contrary, Pb absorption and hence toxicity increases in cases of deficit in any of these essential trace elements.

Lead in various forms, principally as lead-based paint, street dirt and household dust, is absorbed through the lungs, skin and intestinal tract.[1] It has also been pointed out that Pb may be found in Pb soldered canned food, baby evaporated milk, and juice.[1]

Other materials that should be suspected to contain and be source of Pb include; toys, porcelain utensils, ceramics, cheap jewelry, make up, hair dyes, metal coins, keys, dishes and cups, kohol, Bakhoor, henna. The list is rather lengthy. There is evidence that even concentrations less than 10 µg/dL, may impair cognition, and there is no threshold yet identified for this effect.[1] Pb toxicity in the newly born and children and even the unborn embryos is extremely devastating since Pb has been frequently and beyond doubt shown to influence the central nervous system development and produces neuro-behavioral changes. As pointed out earlier, Pb absorption and toxicity increase by condition characterized by deficiency in essential metals such as calcium. This adds to the problem of long-term exposure to low Pb levels considering the fact that loss of calcium is significant in growing children because of increased metabolic rate. It has also been shown that in children Pb absorption is greater than in adults and it also increases with iron deficiency[2] which is not uncommon in childhood particularly in poor communities. It has also been

demonstrated that high fat content and total calories meals is associated with high blood Pb concentration at 1 year of age.[3] It is also interesting to mention that summer sun, and hot climates also accelerate Pb absorption.[2]

It is possible that in hot climate, the excessive sweating and loss of essential metals like sodium & calcium may increase Pb absorption / mobilization from accumulation sites like bone. This may lead to precipitation of an acute attack of Pb poisoning which is more common in summer.

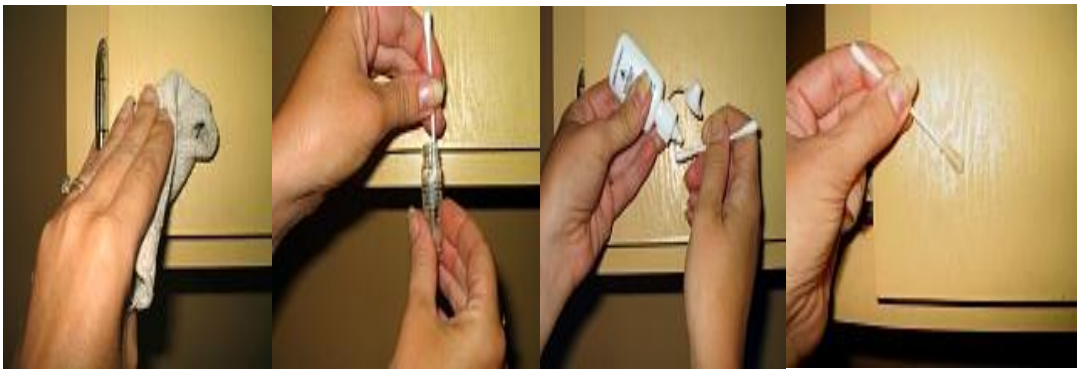
Neurotoxicity caused by lead is the most serious problem particularly in the developing brain of neonates and children. The toxic effect of Pb on cognitive impairment, measured by IQ tests has been proved by multiple studies in several countries.[4]

In the present study, we qualitatively investigated the presence of Pb in household utensils, children toys, cosmetics and other daily handled items. Emphasis is made on children toys and used materials as this age group is more vulnerable[5] to low exposure that affects their health without apparent clinical symptoms.

MATERIALS AND METHODS

All items shown in results including children toys, bibs, cheap jewelry and some households were tested for the presence of Pb at the homes of the authors and also at heavily attended malls with approval permission of the attendant staff.

A lead test kit. (Apotex kit) was used in all tests performed. The kit can be applied to almost all materials suspected of containing Pb. A surface detection procedure: the surface of the material is cleaned of dust or dirt and 4 drops of the kit solution are dispensed on a cotton swab and the swab tip is rubbed on the surface under investigation for 30 to 60 seconds. Change in color of surface or swab indicates the presence of Pb, the quantity of which can be approximated from a color chart provided with the kit. This method can be used to test the presence of Pb in children's toys, dry painted surfaces/paint chips, toy cars, baby bibs, children's lunch boxes, pottery/ceramic ware, mini-blinds, plumbing/lead pipe/solder, bath tub glazes, furniture, food can seams, antiques, ceramic tile, computers , refrigerators and other electrical appliances.



Resultant Color Produced	Approx. Lead Release in parts per million (ppm) of the sample
Faint yellowish tint	1-3 ppm
Light brown	5 ppm
Medium brown	10 ppm
Dark brown	25 ppm
Black	over 50 ppm

Jewelry, coins, rings, can lids, small items can be immersed in white vinegar for at least 4 hours and the add 4 drops of the solution to the vinegar and observe any change of color of the tested vinegar. This method can also be followed with house and outdoor dust, sand, and clay, henna, bakhoor, garden/lawn soil, dust/dirt, play sand and renovation/construction dust and similar materials. In the case of cosmetics, the latter is rubbed on a small piece of white paper which is then immersed in white vinegar for a minimum of 4 hours. Then the tested vinegar can be examined for the presence of Pb by the addition of 4 drops of kit solution.

It is important to use small quantity of dust or similar materials that comes in a powder or solid form. Also the object is placed and tested in Pb –free container preferably glass or plastic.

Pb in water is tested by allowing water to stand in pipes over night and then a sample is tested by the addition of 4 drops of kit test solution as previously mentioned.

Sensitivity of test

The lower detectable limit is 1 ppm of Pb. The method is approved for lead detection Department of Public Health, Massachusetts, Lead Law (105 CMR - 1923).[6]

Source of Materials

The kit is used by Government Agencies - LEAD INSPECTOR is used by the USA Food and Drug Administration (FDA) and Health Canada to pre-screen items for lead. It is a Patented Test Kit & Method - Patent #1,256,782 / Other Patents Pending (2008) - Reg. Trademark of Abotex Ent. Ltd. (USA & Canada).

RESULTS

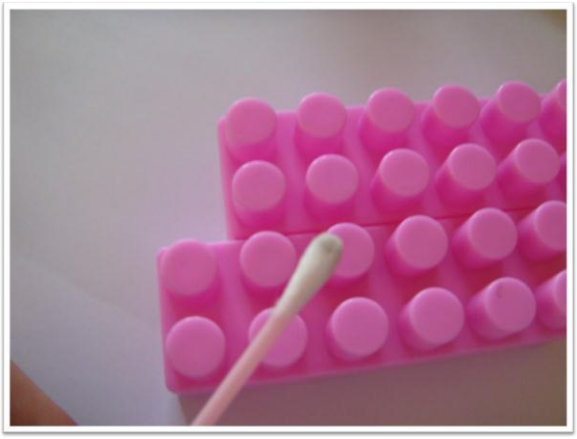
The results shown in Table 1 were surprising, as most items tested for the presence of Pb proved positive. However many items because they are made of cloth or rubber were not susceptible at all but once tested change in the color of the cotton swab proved positive indicating the presence of the toxic metal. As can be seen in Table 1, levels of lead ranged from 1-3 ppm to as high as 50 ppm in some of the items tested. Table 2. Shows items which should be suspected for the presence of Pb and should be tested.

Table 1. Items tested for the presence and proved positive.

Item tested	Colour change/ Method
	+ ve (Faint Yellowish) Rapid Method
	+ve (light brown) Rapid Method

	+ve (light brown) Rapid Method
	+ve (Black) Rapid Method
 +ve (Black) Rapid Method	+ve (Black) Rapid Method
	+ve (Medium Brown) Rapid Method

	+ve (Faint Yellowish Tint) Rapid Method
	+ve (Faint Yellowish) Rapid Method
	+ve (Faint Yellowish) Rapid Method
	+ve (Black) Leach Method

	+ve (light brown) Rapid Method
	+ve (Medium Brown) Rapid Method
	+ve (Faint Yellowish) Rapid Method
	+ve (Faint Yellowish) Rapid Method

	+ve (Light Brown) Leach Method
	+ve (Light Brown) Leach Method
	+ve (Medium Brown) Rapid Method
	+ve (Medium Brown) Rapid Method

	+ ve(Medium Brown) Rapid Method
	+ve (Faint Yellowish Tint) Rapid

Table 2: Items suspected of containing Pb.

Item	Possible Pb presence
- Bakhoor	Not all types
- Henna	Worth testing
- Make up	Not all types
- Keys	Cu-like +ve
- Baby evaporated milk	Worth testing
- Canned food: Okra, Tomato. etc	Worth testing
- Baby Pyjamas	Some contain Pb

DISCUSSION

The main aim of the study was to investigate the presence of Pb in as many as possible of daily handled items such as household utensils and children's toys. It seems that although Pb has been wisely removed from car petrol and paints, the metal still intrudes our daily life and that of our children through other means. This study was not conducted with the aim to discuss consequences of Pb poisoning in its traditional form but to point out possible sources of Pb poisoning and stress on the need for a stringent control on imports of children toys, household utensils and other items that may contain Pb. As can be seen in Table 1 many toys, items used by adults and house hold utensils contain Pb. This increases the exposure potential of particularly children to the metal. The kit used in this study is an approved method of pretesting of the presence of Pb both in USA and Canada. Results obtained by this test were verified by results obtained by atomic absorption methods and were found comparable. It may be argued that in many cases of tested materials, the qualitative method showed the presence of only low Pb concentration. However, it must be stressed that children are more vulnerable especially when considering the fact that any thing held by their hands is eventually taken into their mouths. Moreover, it is well known that harmful Pb effects may not appear sudden and ill effects may progress with unnoticed clinical symptoms. It has been frequently shown by many environmental protection and regulatory agencies that long-term exposure to low Pb concentrations is associated with deleterious effects on children as well as adults. Such health problems in children include among others; brain dysfunction.[7, 8] Decreased learning and memory, lowered IQ, decreased verbal ability, impaired speech and hearing functions and early signs of hyperactivity or ADHD. Blood lead concentration is

associated with lower IQ scores in children of approximately 5 years of age when testing is more reliable.[4] Other deleterious effects of Pb exposure on brain or nerve function, especially behavior have also been observed. School teachers reported that students with elevated tooth lead concentrations were more inattentive, hyperactive, disorganized, and less able to follow directions.[9,10] Follow-up of some of those children[10] showed higher rates of failure to graduate from high school, reading disabilities, and greater absenteeism in the final year of high school.[7] The effects of lead exposure are long lasting and perhaps permanent. Subclinical effects on both hearing **[11]** and balance[12] may occur at commonly encountered blood lead concentrations. On the other and, symptoms in adults may include neurobehavioral changes, hypertension and chronic kidney disease. Based on results of the present study it seems that the community is not aware of the veiled sources of Pb that our children are exposed to daily and may constitute a dangerous source of Pb poisoning. We therefore highly recommend that new and stringent measures must be taken to reduce the exposure potential of children to Pb by implementing rigid policies on import of toys, baby food and canned food. We also suggest that primary care providers must be trained through inclusion in medical curriculum and continuing medical education programmes of topics covering blood level testing, symptoms associated with chronic low level exposure and more thorough clinical examination methods to be capable of proper evaluation and identification of suspected cases that may not show the classical symptoms of Pb poisoning. This is rather important when one consider the fact that most medical educational programmes concentrate on occupational toxicology that deals with acute or chronic exposure to high Pb concentrations with the obvious traditional symptoms. We recommend that the government should cover and mandate blood Pb measurement around 1 and 2 years of age. We also recommend that every child with developmental delay, behavioral disorder, or speech defect or suspected of being exposed to Pb should be screened with a blood lead test. Other children who are playmates, housemates or have been in long –term contact with the suspected cases should also be screened for Pb.

CONCLUSION

Parental and children education on Pb sources, hazardous effects and preventive interventions is also of utmost importance. Primary health care providers should increase the awareness of parents to hand-mouth behaviour of children and to the importance of avoiding toys, utensils or other materials that contains Pb and also ascertaining that their work, hobbies and homes are not a source of contamination of their homes with Pb. **[2]** Government, universities and research institutes should encourage scientific testing of simple, low-cost strategies and interventions that might decrease Pb exposure.

REFERENCES

1. Eck,P.C.; Wilson, L. Lead Toxicity. Analytical Resrearch Labs Inc. The Eck Institute of Applied Nutrition and Bioenergetics, Ltd. http://www.arltma.com/AboutARL.htm (Accessed on 13/03/2014), 1989.
2. Committee on Environmental Health (2005). Lead Exposure in Children: Prevention, Detection, and Management. PEDIATRICS, 2005; 116 (4): 1036-1046
3. Gallicchio L, Scherer RW, Sexton M. Influence of nutrient intake on blood lead levels of young children at risk for lead poisoning. Environ Health Perspect., 2002; 110: A767–A772.
4. Pocock SJ, Smith M, Baghurst P. (1994). Environmental lead and children's intelligence: a systematic review of the epidemiological evidence. BMJ., 1994; 309: 1189–1197.
5. Crain, E. F. Environmental Threats to Children's Health: A Challenge for Pediatrics: 2000 Ambulatory Pediatric Association (APA) Presidential Address. *Pediatrics*, 2000; 106: 871-875.
6. Detection Department of Public Health, Massachusetts. (6) Lead Law 105, CMR1923). http://www.leadinspector.com/leadlaw.htm#105 (Accessed on 13/3/2014).
7. Needleman, H.L., Schell, A., Bellinger, D., Leviton, A., and Allred, E.N. The long-term effects of exposure to low doses of lead in childhood. An 11-year follow-up report. New Eng J Medicine, 1990; 322: 83-88.
8. Canfield RL, Henderson CR Jr, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP Intellectual Impairment in Children with Blood Lead Levels below 10mcg per Deciliter, New Engl J Med, 2003; 348(16): 1517-1525.
9. Needleman HL, Gunnoe C, Leviton A, Reed R, Peresie H, Maher C, Barrett P. Deficits in psychologic and classroom performance of children with elevated dentine lead levels [published correction appears in N Engl J Med, 1994; 331(9): 616–617]. N Engl J Med., 1979; 300: 689–695.
10. Sciarillo WG, Alexander G, Farrell KP. Lead exposure and child behavior. Am J Public Health, 1992; 82: 1356–1360.
11. Schwartz J, Otto D. (1991) Lead and minor hearing impairment. Arch Environ Health, 1991; 46: 300–305.
12. Bhattacharya A, Shukla R, Bornschein RL, Dietrich KN, Keith R. Lead effects on postural balance of children. Environ Health Perspect, 1990; 89: 35–42.