Lack of awareness resulting in lead poisoning in YAKSHAGANA artists due to makeup material

[1]Sripathy.L* , [2] Venkatesh.T, [3]Naveenchandra

1.HOD, Department of Chemistry ,Vivekananda Degree College, , Dr. Rajkumar Road, Rajajinagar, Bangalore.
2.Department of Biochemistry, St. John's Medical College, Bangalore, India
3. St.Joseph's college Bngaluru

Abstract: The main aim of this study is to determine the blood lead level of Yakshagana artists and their children and also analyze the lead present in makeup materials.Thirty subjects were selected for the study of which: Group A had 15 Controls; Group B had 15 Yakshagana artists. They were evaluated for their Blood lead level by Anodic Stripping voltametry method using 3010B lead analyzer and also estimated the concentration of lead present in colours by Flame Atomic Absorption Spectroscopy (FAAS).This study shows that there is statistical significance between Group A and Group B in Blood Lead level ranging from 3.7 to 23.2. This effect was observed due to the usage of colours by some troops and found lead present in high concentrations ranging from 0.7 mg/kg to 56000 mg/kg. From this study we can observe that authentic transfer of lead into the human being those who are using colours procured from commercial sources. We also have some cases, where in blood lead level of the artists was normal due to the usage of natural colours i.e., extracted from plant source. Correlating with the values of control it was found that there is a considerable rise in the blood lead level. The artists have the Blood lead level at alarming levels. From the analysis of colours it was found that, particularly yellow colour procured from the artists contains very high concentration of Lead in the form of lead chromate, lead acetate.

KEYWORDS: Lead toxicity, Yakshagana artists, makeup material (colour, paste, base), Lead poison, and Blood lead level.

INTRODUCTION

Lead is a metal found in the earth, and it is a poison. Lead poisoning is as ancient as Roman history, and indeed lead has been used extensively by the Romans and described by the Romans. The purpose of the manuscript is not to discuss classic lead toxicity and lead poisoning effects, but to address the concept of low-level environmental lead toxicity and poisoning. Lead is ubiquitous in the human environment as a result of industrialization. It has no known physiologic value. Children are particularly susceptible to lead's toxic effects. Lead poisoning, for the most part, is silent: most poisoned children have no symptoms. The vast majority of cases, therefore, go undiagnosed and untreated. Lead poisoning is widespread. For years, lead was used in paint, gasoline, plumbing and many other items. Lead is practically everywhere in today's environment (Ref: 9 & 10). It enters our bodies from many sources including defective glazes (pottery), drinking water, contaminated soil, airborne particulate, leaded gasoline, paint and several other sources. There is no safe age to be exposed to lead. Adults can have problems from lead poisoning, but it is most harmful to children younger than age 6 (especially those younger than age because it can permanently affect their growth and development. A pregnant woman who is exposed to lead can pass it to her unborn baby (fetus) (Ref: 27). Lead can also be passed to a baby through the mother's breast milk. Lead reduces levels of antioxidants—compounds that mop up toxic free radicals—in the brain. Free radicals kill neurons in the hippocampus, the brain region that controls learning and memory.

Lead poisoning occurs when you absorb too much lead by breathing or swallowing a substance with lead in it, such as food, dust, paint, or water. The result can be damage to the brain, nerves, and many other parts of the body. Acute lead poisoning occurs when a person takes in a large amount of lead over a short period of time. Acute lead poisoning is rare. Chronic lead poisoning occurs when small amounts of lead are taken in over a longer period. Chronic lead poisoning is a common problem among children. Too much lead in the body can cause irreversible problems in growth and development in children, including:

- Behavior problems.
- Hearing problems.
- Learning problems.

- Slowed growth.

Effects of lead from animal studies

- Impaired attention, learning and short-term memory in primates.
- Behavioural impairment; inflexibility in behavioural change in primates.
- Elevated blood pressure at moderate levels.
- Impaired immune system in new-borns of rats fed lead [greater susceptibility to asthma].
- Increased incidence of tumours (cancer) in rats born to mothers fed lead.
- Altered response to stimulant drugs; attenuation of drug induced hyperactivity in rats.
- Impaired attention, learning and short-term memory in primates.
- Teratogenic effect causing birth deformities.
- Low bone density in lab animals such as mice and fractures due to lead-induced osteoporosis do not heal properly.

In adults, lead poisoning can cause serious health problems, including high blood pressure and damage to the brain, nervous system, stomach, and kidneys (Ref: 66). Although it is not normal to have lead in your body, a small amount is present in most people. Lead can damage almost every organ system, with the most harm caused to the brain, nervous system, kidneys, and blood. The seriousness of lead damage depends on two factors: the amount of lead that gets into the body and the length of time it remains there. Over the long term, lead poisoning in children can lead to learning disabilities (see learning disorders entry), behavior problems, and mental retardation (see mental retardation entry). At very high levels, lead poisoning can cause seizures, coma, and even death.

IJSER

Lead is absorbed by ingestion, inhalation and through skin (Ref: 66). Absorption varies from individual to individual and depends on the chemical form of lead and type of exposure. The alimentary and respiratory tracts are the main portals of entry for lead into the body. It is estimated that 150-300µg of lead is ingested through the oral route and about 10-20 µg is inhaled via the respiratory tract daily

(1). The absorption of lead through oral route is 5-10% and 35-50% from respiratory tract in adults. Unlike adults, children absorb about 50% of ingested lead and retain 8% of dietary lead.

(2). The organic lead compounds like tetraethyl or tri alkyl lead can be readily absorbed through the unbroken skin. Approximately 90% of absorbed lead is reported to be stored in the bone with a half-life of 600-3000 days. The remaining 10% is stored in soft tissues like kidney, brain and liver. The half-life of lead in these tissues ranges from 100-200 days. (3). Lead passes through the placenta easily and fetal blood has almost the same lead concentration as maternal blood. (4). Ninety per cent of the ingested lead is excreted in the stool and urine, whereas the inhaled lead is excreted through renal pathway. Lead is also eliminated through sweat and mother's milk.

The aim of this study is to report on levels of lead found in **Yakshagana artists and also analyzes the lead present in makeup materials** providing a reminder that high concentrations certainly do still exist.

METHODOLOGY

Subject:2ml of blood was collected for the analysis, from Yakshagana artists randomly of different age group (years of exposure to the makeup).

Approach: Concerning to this pilot study, the starting point was a preliminary list preparation and discussion about how this project is to be executed, with the guidance of our Professor. We visited the academy of Yakshagana artists, spoke to them, tried to convince. However, it was not an easy thing to convince them, been through many obstacles. Finally with all the efforts and through recommendations they were convinced and agreed to give us the information as well as the blood samples for the analysis. Each of them searched for data's independently between the period of 3-4 months then we prepared a case study sheet to know and to collect the personal information/data of each individual, authentically. We gave them the date and

time of when we are coming to collect the blood samples (2ml) and with the guidance of Mr.Raju, the blood samples and as well as data were collected from each individual.
Sampling: Venous blood samples were collected in plain vaccutainer tubes with EDTA anticoagulant. All samples were measured using a 3010B ESA Lead Analyzer in St. John's Medical College (NRCLPI).

Analytical method used:

From one tube, 100 µl of blood was transferred to the meta-exchange reagent provided by the ESA Inc USA. Calibration of the 3010B analyzer was done using calibration standards supplied by the company. High, medium and low controls supplied by Control (USA) were used to check the efficiency of the methodology. Lead concentrations were then analyzed using an Anodic Stripping Voltametry.

Lead in blood may be bound to various binding sites on cells. Bound lead will not be plated onto the electrode and thus will not be detected by the lead analyzer. The Metexchange reagent is designed to rapidly displace lead from the bound condition so that all lead in the sample is present in the unbound state.

Theory of Anodic Stripping Voltammetry (ASV)

Anodic Stripping Voltammetry is a highly precise, virtually interference-free method.

1. Whole blood is added to the reagent solution (Fig. 1),
2. Any lead present is released from the blood components (Fig. 2).
3. Now any lead in the reagent solution is concentrated (plated) onto a thin-film electrode during the plating step of the analysis cycle (Fig. 3).
4. The plated lead is removed from the electrode by applying a stripping current (Fig. 4) and the amount of lead is measured by integration of the electrical current released during this rapid electrochemical step.

IJSER

Anodic Stripping Voltammetry

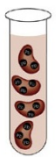


Figure 1

Figure 2

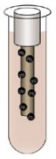


Figure 3

Figure 4

The current released during the stripping step, is directly proportional to the amount of lead present in the blood sample. The Model 3010B provides the sensitivity you need for the detection of blood lead in childhood lead screening, industrial hygiene and occupational health monitoring programs.

FLAME ATOMIC ABSORPTION SPECTROPHOTOMETRY

Flame atomic absorption is the technique used for detecting metals and metalloids in environment samples. The technique is based on the fact that ground state metals absorb light at specific wave length. Metal ion in a solution is converted to atomic state by means of flame. Light of appropriate wavelength is supplied and amount of light absorbed can be measured against a standard curve.

PRINCIPLE:

The basic technique of flame atomic absorption spectroscopy (FAAS) requires light sample to be aspirated, aerosolized and mixed with combustible gases such as acetylene and air or acetylene and nitrous oxide. The mixture is ignited in flame whose temperature ranges from 2100-2800° C. During combustion, atoms of element of interested sample are reduced to, unexcited ground state atoms which absorb light at characteristic wavelength. The characteristic wave lengths are element specific and accurate to 0.01-0.1nm. To provide specific wave length, a light beam from a lamp whose cathode is made of element being determined is passed through the flame. Photomultiplier can detect amount of reduction of light intensity due to absorption by analyze and this can be directly related to amount of element in sample. FASS methods are referred to as direct aspiration determination. They are normally completed as single element analysis and are relatively free of inter element spectral interference. For some elements the temperature or type of flame used is critical. If flame and analytical condition are not used properly, chemical and ionization interference can occur.

APPARATUS:

1. Atomic absorption spectrophotometer with Air Acetylene flame.
2. Hollow cathode lamps9283.3nm

REAGENTS:

1. Hydrochloric acid- concentrated.
2. Nitric acid – concentrated.
3. Nitric acid-diluted (HNO3: WATER:: 1:499).
4. Lead solution of 1000ppm(MERCK GRADE)

IJSER

SAMPLE DETAILS: Different categories of colors have been used:

Sample: 1

1) Red 1
2) Lavender
3) Maroon
4) Orange
5) Red 2
6) White
7) yellow

- **Sample: 2**
  1. Red
  2. Yellow
  3. White

STANDARD LEAD SOLUTION:

A working lead standard solution of 100ppm concentration was prepared. Dilute using dilute nitric acid (1:499).

Establish a linearity of 5, 10, 15, 20, 25ppm solutions using 100ppm solutions.Dilute using nitric acid (1:499).

SAMPLE PREPARATION:

To 25ml of sample add 0.125ml of cone nitric acid. Nitric acids, 1.25ml of concentrated HCL and heat it not to boil but reduce the volume to 5ml in a well ventilated hood. Cool filter sample and make up to 25ml using dilute HNO3 (1:499) Aspirate nitric acid (1:499) prior to the sample aspiration.

PROCEDURE:

1ml of sample was pipette into 10ml volumetric flask and made up using nitric acid (1:499). This solution is then aspirated to get the result in ppm.

The present project "Analysis of lead present in makeup materials" preliminary analysis i.e., Test for Radicals was done in the Department of chemistry, Vivekananda Degree College. By this we came to know for the presence of lead in the samples, then it was later subjected to FAAS for the analysis to know the concentrations of lead present in makeup materials. The colour samples were analyzed in the laboratory using Flame Atomic Absorption Spectrophotometry.

INCLUSION & EXCLUSION

The study is basically related with the artists of Yakshagana, who regularly apply colors since years wandering from place to place performing the ancient culture ***YAKSHAGANA.*** The aim of this study is to report on levels of lead found in **Yakshagana artists and their children and also analyze the lead present in makeup materials**, by collecting the blood samples and data as well, providing a reminder that high concentrations certainly do still exist. We have included artists of Yakshagana, Kathakali, Kuchipudi as our site area and excluded other traditional fine arts like Hulivesha, Doddata who were not willing to support with a fear that, the blood collected will be used for something else away from the project.

RESULTS & DISCUSSION

IJSER

The main aim of this study is to determine the blood lead level of **Yakshagana artists and their children and also analyze the lead present in makeup materials** and the analytical report is shown below along with the graphical representation. The Blood lead level is ranging from 3.7 to 23.2(Fig: 1). Correlating with the values of control (Fig: 2) it was found that there is a considerable rise in the blood lead level. The artists have the Blood lead level at alarming levels.

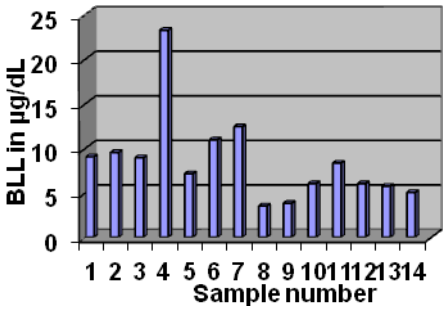
This effect was observed due to the usage of colors by some troops were found lead present in high concentrations ranging from 0.7 mg/kg to 56000 mg/kg. From this study we can observe that authentic transfer of lead into the human being those who are using colors procured from commercial sources. We also have some cases where in blood lead level of the artists was normal due to the usage of natural colors i.e., extracted from plant source.

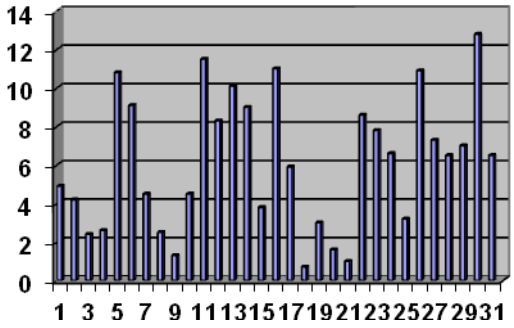
From the analysis of colors it was found that, particularly yellow color procured from the artists contains very high concentration of Lead in the form of lead chromate, lead acetate.

Table-I REPORT OF BLL **of Yakshagana artists** **Table-II Report of controls** **Date: 24/03/2010**

Sl. No	AGE/SEX	YEARS OF EXPOSURE	TEST	RESULT in µg/dl	Sl. No	TEST	RESULT in µg/dl
1.	13/F	04	BLL	9.0	**1.**	BLL	**4.9**
2.	11/F	04	BLL	9.5	**02.**	BLL	**4.2**
3.	09/F	04	BLL	8.9	**03.**	BLL	**2.4**
4.	38/M	24	BLL	23.2	**04.**	BLL	**2.6**
5.	28/F	05	BLL	7.1	**05.**	BLL	**10.8**
6.	21/M	10	BLL	10.9	**06.**	BLL	**9.1**
7.	32/M	15	BLL	12.4	**07.**	BLL	**4.5**
8.	26/F	08	BLL	3.5	**08.**	BLL	**2.5**
9.	24/F	08	BLL	3.8	**09.**	BLL	**1.3**
10.	26/F	06	BLL	6.0	**10.**	BLL	**4.5**
11.	25/M	08	BLL	8.3	**11.**	BLL	**11.5**
12.	26/M	04	BLL	6.0	**12.**	BLL	**8.3**
13.	29/M	03	BLL	5.7	**13.**	BLL	**10.1**
14.	30/M	02	BLL	5.0	**14.**	BLL	**9**
					17.	BLL	**5.9**
					18.	BLL	**0.7**
					19.	BLL	**3**
					20.	BLL	**1.6**
					21.	BLL	**1**
					22.	BLL	**8.6**
					23.	BLL	**7.8**
					24.	BLL	**6.6**
					25.	BLL	**3.2**
					26.	BLL	**10.9**
					27.	BLL	**7.3**
					28	BLL	**6.5**
					29.	BLL	**7**
					30.	BLL	**12.8**
					31.	**BLL**	**6.5**

IJSER





(Graph- 1) Blood lead level of Yakshagana artists

(Fig: 2) Blood lead level of control Courtesy: Mr. Raviraja..A St.John's Medical College, Bangalore.

Table –III Lead concentration in makeup material

Sl. No	Colors	Concentration in mg/kg
1.	Red 1	18.4
2.	Lavender (natural)	0.7
3.	Maroon (natural)	0.84
4.	Orange	18.0
5.	Red 2 (natural)	9.7
6.	White (natural)	17.6
7.	Yellow	5517
8.	Red	184.1
9.	Yellow	56,000
10.	White	38.4

IJSER

Sample: 1
Sample: 2

Photo gallery





REFERENCES

1. " Effect of lead on employees working in paint industry" Hariprasad.B.N. Vinay.c, Vinay.G Vivekananda Degree College, Department of Chemistry.
2. "Lead, Mercury and Arsenic in US- and Indian-Manufactured Ayurvedic Medicines sold via the internet" 915 – 923 JAMA Venkatesh Thuppil PhD,Robert B.Saper,MD,MPH, Russell S.Phillips, MD , Anusha Sehgal, MD (Ayurveda), Nadia Khouri, MPH , Roger B. Davis, ScD , Janet Paquin, PhD, Stefanos N. Kales, MD, MPH.
3. T. Venkatesh, Department of Biochemistry and Biophysics, St. John's Medical College, Koramangala, Bangalore, Karnataka-560034.India. Sources of lead in blood from Bangalore (India) female adults using stable lead isotopes
4. Ravi Raja A**,** Department of Biochemistry and Biophysics, St. John's Medical College, Koramangala, Bangalore, Karnataka-560034.India. LEAD TOXICITY AS A RESULT OF HERBAL MEDICATION.
5. "Cater to the Childrssen"The Role of The Lead Industry in a Public Health Tragedy, 1900-1955 American Journal of Public Health, Vol. 90, No. 1 Jan00Gerald Markowitz PhD, arid David Rosner, PhD, MSPH
6. Centers for Disease Control and Prevention, Morbidity and Mortality Weekly Report 46 (1997): 141, cited in B.E. Lanphear, "The Paradox of Lead Poisoning Prevention," Science 281 (1998): 1617-1618.
7. R. Rabin, "Warnings Unheeded: A History of Child Lead Poisoning," American Journal of Public Health 79 (1989):1668-1674; E. Silbergeld, 'Preventing Lead Poisoning in Children;' Annual Review of Public Health 18 (1997):187-210; P Reich, The Hour of Lead: A Brief History of Lead Poisoning in the United States Over the Past Century, and of Efforts by the Lead Industry to Delay Regulation (Washington, DC: Environmental Defense Fund, 1992); R. Wedeen, "Shaping Environmental Research: The Lead Industries Association 1928-1946;" Mount Sinai Journal of Medicine 62 (1995): 386-389.
8. Elizabeth Foes article on lead poisoning among children in Baltimore (E. Fee, "Public Health in Practice: An Early Confrontation With the 'Silent Epidemic' of Childhood Lead Paint Poisoning," Journal of the History of Medicine and Allied Sciences 45 [1990]: 588) was perhaps the most detailed community study.
9. C. C. Sellers, Hazards of the Job: From Industrial Disease to Environmental Health Science (Chapel Hill: University of North Carolina Press, 1997).
10. J. L. Gibson, "The Importance of Lumbar Puncture in the Plumbic Ocular Neuritis of Children," Australian Medical Congress Transactions 11 (1905): 750-754:
11. A.J.Turner, "Load Poisoning in Childhood," Australian Medical Congress (1908): 2-9; J.L. Gibson, "Plumbic Ocular Neuritis in Queensland Children" British Medical Journal 2 (1908): 1488-1490; T. Oliver, "A Lecture on Lead Poisoning and the Race," British Medical Journal 1911 (May 13): 1096-1098.
12. K. D. Blakfan, "Lead Poisoning in Children with Especial Reference to Lead as a Cause of Convulsions," American Journal of the Medical Sciences 153 (1917): 877,887.
13. "Prohibition of White Lead in Belgium," American Journal of Public Health 13 (1923): 337.
14. "If Your Children Chew Paint," Scientific American 149 (1933): 291.
15. C. F McKhann and E C. Vogt, "Load Poisoning in Children," Journal of the American Medical Association 149 (1933):1131-1135.
16. R Kehoe, abstract of discussion in C. F McKhann and E. C. Vogt, "Lead Poisoning in Children," Journal of the American Medical Association 101 (1933):1131-1135.
17. McKahnn and Vogt, "Lead Poisoning in Children."
18. The A Shoenhut Company to Ella Oppenheimer, Children's Bureau, 17 April 1935, National Archives, Record Group 102 (Children's Bureau), Central File,1933--1936, File: Diseases Due to Metallic, 4-5-17.
19. Newark Varnish Works to Ella Oppenheimer, 25 April 1935, National Archives, Record Group 102 (Children's Bureau), Central File, 1933-1936, File: Diseases Due to Metallic, 4-5-17.
20. "I3o Not Forget The Children---Some Day They May Be Customers," The Dutch Boy Painter (August 1920):126.

IJSER

21. "The Dutch Boy § Lead Party," The Dutch Boy Painter (July 1924):139.
22. "When the School Room is Empty," Dutch Boy Painter (July 1924): back page.
23. The Dutch Boy Conquers Old Man Gloom -A Paint Book for Boys and Girls (New York, NY: National Lead Company,1930).
24. Lead Industries Association, Useful Information About Lead, 1st ed (New York, NY: Lead Industries Association, 1931), 49-53,104.

IJSER