



Lead in toothpaste

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ABSTRACT

Lead is a heavy metal which has been termed as a harmful, poisonous metal. Lead toxicity is a common cause in Man and also animals especially cattle. Neurological diseases, gastrointestinal diseases, anaemia or male infertility are few examples of the harm that lead can do. In India, use of lead in toothpaste is regulated by Bureau of Indian Standards(BIS). Permissible level of lead in both fluoridated and non-fluoridated toothpaste is 20 ppm (0.002%) according to BIS and 5 ppm (0.0005%) under the British Standard. In this study, fifteen toothpastes available on the Indian market were analysed for lead content which includes six brands namely Close up, Colgate, Dabur, Himalaya, Pepsodent and Sensodyne. Sensodyne was found to have a level above the proposed limits set by BIS and the British Standard.

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Introduction

Lead toxicity has a devastating consequence which sometimes leads to death. The elevated amount of lead above the normal range accumulated in the body is known as lead poisoning. Lead poisoning is most prevalent in children as their growing bodies make them prone to absorbing and retaining lead^[5]. Moreover, lead predominately deposits in the bone and its half -life can vary from years to decades.

Toothpaste plays an important role in our day to day life. The main purpose^[3] of toothpaste is to provide oral hygiene by removing accessible surfaces of dental plaques, food debris and stain, thus making our teeth healthy. The original toothpaste tubes were made of lead in 1850s and its usage continued till 1950s. But however detergents like soap was used as an ingredient which would cause the leaking of lead into the paste thus contaminating it. Later, tubes made of plastic were used. In 2005, Crest brand^[4] of toothpaste was banned as it contained elevated amount of lead present on the outer coating were 5% of it was absorbed into the paste.

The toothpaste industry is regulated by the Bureau of Indian Standards. According to BIS^[1], the fluoridated and non-fluoridated toothpaste shall not contain more than 20 ppm, of any heavy metals such as lead, cadmium. According to the British Standards^[2] for toothpaste, the maximum allowable total lead content is 5ppm.

In this study, nineteen toothpastes available on the Indian market were analysed for lead content.

Materials and methods:

Sampling Methodology:

Nineteen toothpastes sample (6 Brand companies i.e.close up, Colgate, Dabur, Himalaya, Pepsodent and Sensodyne) were purchased from the local stores for sample preparation.

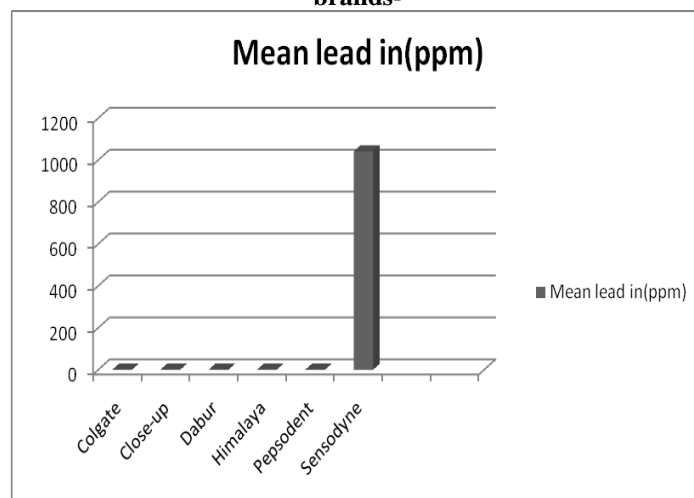
Sample Preparation:

A small amount of toothpaste was applied on sterilised glass slide and a thin smear was made. The preparation was then dried in hot air oven for 72 hours. After drying, these samples were carefully covered with a clean butter paper for analysis. The instrument by which the lead in toothpaste samples was estimated is X-Ray fluorescence spectroscopy.

Equipment's:

XRF- x-ray fluorescence spectrophotometer (INNOV-X Systems): XRF is an analytical method to determine the chemical composition of all kinds of materials. The materials can be in solid, liquid, powder, filtered or other form. XRF can also be used to determine the thickness and composition of layers and coatings. The XRF method depends on fundamental principles that are common to several other instrumental methods involving interactions between electron beams and x-rays with samples, including: X-ray spectroscopy (e.g., SEM - EDS), X-ray diffraction (XRD), and wavelength dispersive spectroscopy (microprobe WDS).

Graph 1: Average lead content in toothpastes of different brands-



Result and discussion:

Out of 19samples, lead was detected in 2 toothpaste samples. 87% (13/15) toothpaste samples were having lead content less than 20 ppm; these samples met the specification for the lead content prescribed by the BIS limit of 0.002% (20ppm) and British Standards for consumer product safety limit of 0.0005% (5 ppm) for toothpaste. 13% (2/15) toothpaste samples did not meet the specification by BIS and British Standards for consumer product safety.

Table I: Amount of lead in toothpaste

Sl. No.	Company Name	Brands	Amount of lead (ppm)	Average lead (ppm)
1.	Colgate	Sensitive Original	2	2.25
		Pro-relief	2	
		White	3	
		Max fresh	2	
		Calcium and mineral	2	
		Cibaca	3	
		Total advance teeth	2	
		Active salt	2	
2.	Close-up	Fire fresh	2	2.5
		Deep action	3	
3.	Dabur	Meswak	ND	2.5
		Red tooth paste	2	
		Babool	3	
4.	Himalaya	Sensitive	2	2
5.	Pepsodent	Whitening	2	2
		2 in 1	ND	
		Complete gum care	2	
6.	Sensodyne	Fresh Mint	1011	1042
		Fresh Mint Gel	1073	

The average concentration of lead in all the 19 toothpaste samples ranged from zero to 1073ppm. The highest concentration of lead (1073 ppm) was detected in Sensodyne Fresh Mint Gel. Lead concentration in different of Brand Company in decreasing order is shown as follows:

Sensodyne > Close up > Dabur > Colgate > Himalaya > Pepsodent

Conclusions:

Out of 19 samples 87% samples were having lead level lower than the maximum lead level prescribed by BIS (Less than 20 ppm) and British Standards for consumer product safety & (5 ppm) and 13 % samples did not meet the specification given BIS and British Standards.

In this study, it was observed that only the 2 brands of Sensodyne namely Fresh mint and Fresh mint gel were having lead level much higher than the prescribed by BIS and British Standards for consumer product safety where the average lead amount is 1042 ppm. So the company does not follow the regulations that have been set on the level of lead. However,

there have not been any cases of lead poisoning as far as brand is concerned.

Acknowledgements:

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