

## SCIENTIFIC INVESTIGATIONS ON SURMA

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Studies were undertaken to investigate lead levels in the blood of rabbits as a sequel of Surma application to their eyes for 60 days and also to observe harmful effects if any. For this purpose blood was sampled at 15 days intervals and analysed for lead content employing absorption spectroscopy. No significant difference in blood lead levels was found among the treated and control animals. Moreover, studies on rats were carried out by intraperitoneal administration Surma which also showed no toxic/untoward effects on animals.

Key words: Surma, Application to Eyes, Blood lead levels.

### Introduction

Al-kohl (or Surma) has been closely associated with the human civilization and used as eye-collyrium since the earliest historic times in Egypt, Greece, Rome, China, Japan and India [1,2]. Although its major constituent is galena, some authors confused it with antimony because of the similarity in the local name and to some extent in appearance. For example, in Egypt, galena was known as 'Mestem' or 'Stim', while this word was identical to the Greek word 'Stimmi' or 'Stibi' and to Latin Word 'Stibum' which means antimony. Fischer [1] examined the antique eye preparations collected from Fayum (Egypt) from the ruins of Illahum, Kahun and Gurob. Out Of about two dozen samples analysed, most contained natural galena or its altered states, thus establishing historically and scientifically that galena was the major constituent of the ancient Egyptian eye preparations

In the traditional System of medicine, Surma has been recommended for use against eye diseases [3], and has been regarded as adsorptive, astringent and anti-infective agent. It is formulated with certain herbs or minerals together with carbon black and grounded into an ultrafine powder for use. The astringent action of galena based Surma is observed at the site of its application where it may cause precipitation of proteins in very low concentrations. In Addition, it has a powerful surface adsorptive property, which helps in protecting the eyes from dust and other foreign matter. The anti-infective properties are due to the oligodynamic action of galena [4]. In our traditional system of medicine, Surma has always occupied a premier position for the protection and treatment of eyes and has a long history of beneficial application in the field of ophthalmology.

In contrast another school of thought exists which argues that use of Surma is injurious to health because of the possible absorption of lead into blood through application of Surma to the eyes, or by accidental ingestion of Surma by infants and children on lachrymation following application of Surma to their eyes [9]. Present studies were undertaken to investigate.

Whether the application of Surma was responsible for elevation of blood lead levels in rabbits and also to investigate its toxicity by Intraperitoneal administration to rats.

### Materials and Methods

*Al kohl (Surma)* .It was obtained from the local market (Source: Mohammad Hashim Tajir Surma, Karachi). Its Lead content was estimated gravimetrically by lead chromate method.

*Blood lead levels in rabbits.* Rabbits weighing between 1.0-15 kg, of either sex, were purchased from an animal supplier of Karachi and housed in separate cages. 24 rabbits were randomly divided into 4 groups each consisting of 6 rabbits. Group-I was designated as control-given no Surma application. The animals of the other groups II, III and IV were given one, two and three application of Surma per day respectively up to 60 days (average amount applied between 0.5-1.0 mg each time). Blood was withdrawn from the marginal car vein of each rabbit at intervals of 15 days each and analysed for lead level using a Hitachi Z-8000, Atomic Absorption Spectrometer.

Deproteinization of the samples was carried out by the method of Stoeppler and Brandt [5].

The mean values of blood lead found for each set of experiment were compared by the students 't' test for evaluating the level of significance.

*Toxicity Studies.* Toxicity studies were undertaken by intraperitoneal administration of Surma to rats. 12 Rats of Sprague-Dawley strain, weighing between 200-250 gm, were randomly divided into two groups. Group-II animals were given 2.6gm of Surma /kg body weight via intraperitoneal route. Surma was slurried with normal saline and injected with the help of a large - bore needle. Group-I animals serving as controls were given equivalent volumes of saline but no Surma. The animals were watched for two weeks to observe mortality if any, and then autopsied to see any gross changes in various organs.

## Results and Discussion

The Surma used in these studies contained 69 % lead as Pbs. Table 1 shows the blood lead values after application of Surma to the eyes of the rabbits. in group-I, values of lead were found to be  $25.5 \pm 4.1 \mu\text{g}/100 \text{ ml}$  after 15 days and  $24.7 \pm 3.1 \mu\text{g}/100 \text{ ml}$  at the end of 60 days of Surma application. Among groups II, III and IV, with 1,2 and 3 applications of Surma per days respectively, the values ranged between  $26.4 \pm 1.3 \mu\text{g}/100\text{ml}$  and  $30.4 \pm 3.4 \mu\text{g}/100$ . These values were not significantly different from the control values or when compared among each other, showing that application of Surma did not cause higher levels of lead in the blood.

Table 2 shows the results of Intraperitoneal administration of Surma to rats. No mortality was observed during the 15 days of observation period. After autopsy, no gross changes were found in the liver, kidneys or spleen.

A number of reports on use of Surma and its implications have appeared recently in the literature [6-9]. Our data on rabbits show that application of Surma does not cause an increase in blood lead levels (Table 1). Similar results have previously been reported by Aslam et al. [9]. It means that lead from Surma is not absorbed through application to eyes. This is under-stand able because Surma which mainly comprises of an inorganic lead compound (Pbs), is practically insoluble in the aqueous medium of the eye. Moreover, a positive intra-ocular pressure and the alkaline nature of the lacrimal fluid further prevent the absorption of lead from the eyes [10, 11].

TABLE 1. BLOOD LEAD VALUES ( $\mu\text{G}/100 \text{ ML}$ ) AFTER APPLICATION OF SURMA TO THE EYES OF RABBITS (MEAN  $\pm$  S.E.M.).

Group No. (6rabbits/gp)	After 15 days of application	After 60 days of application	Probability*
Group-I			
Control (No Application)	$25.5 \pm 4.1$ (6)	$24.7 \pm 3.1$ (6)	N.S
Group-II			
One (Application)	$30.5 \pm 3.4$ (6)	$26.5 \pm 2.9$ (6)	N.S
Group-III			
Two (Application)	$29.4 \pm 3.0$ (6)	$26.4 \pm 1.3$ (6)	N.S
Group-IV			
Three (Application)	$29.8 \pm 3.3$ (6)	$28.5 \pm 2.4$ (6)	N.S

\*N.S. = Non-significant.

TABLE 2. INTRAPERITONEAL TOXICITY IN RATS

Group	No. of Animal in the group	Initial weight in (gms)	Final weight in (gms)	Surma administered to each animal	Mortality
Control	6	$233 \pm 5.9$	$236 \pm 6.3$	-	Nil
Experim ental	6	$230 \pm 7.4$	$233 \pm 9.2$	2.6 gm/kg body weight	Nil

Attenburrow et al.[12] have studied the relation between the use of Surma and blood lead levels. They found mean blood lead concentrations of  $0.799 \pm 0.285 \mu\text{ mol/litre}$  in Surma users and  $0.760 \pm 0.302 \mu\text{ mol/litre}$  in controls among the Asian Children Living in Glasgow. They concluded that 'Surma remains a theoretical rather than a practical health hazard'.

However, there is also a report[9] according to which the mean blood lead level in Asian Children Living in Nottingham was found to be  $1.65 \pm 0.68 \mu\text{ mol/litre}$  in Surma users and  $0.98 \pm 0.42 \mu\text{ mol/litre}$  in non-surma users. Thus there are contradictory reports in the literature regarding the possibility of Surma being responsible for causing higher blood lead concentrations, and it is imperative that further work be undertaken to establish the relationship, if any .

Bradley and Fredric [13] have reported LD 50 of lead sulphide (Pbs) in rats to be 1.8 gm/kg body weight via the intraperitoncal route. In our hands 2.6 gm Surma/kg body weight (Eequivalent to 1. gm/kg Pbs) i.p., did not cause any mortality in rats (Table 2). All the animals appeared to be normal and showed no gross changes in the liver and kidneys on autopsy performed after 15 days.

Further studies both on children and adult Surma users are in progress to establish the factual position. The results of these studies will be published in due course of time.

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