

## Assessment of mercury concentration in major drains of hospitals in Bhopal, (M.P.) India

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### ABSTRACT

The concentration of mercury in nearby drain of health care units was studied during 2005-06. The enrichment of mercury in wastewater discharge from various hospitals / health care facilities (HCF) have been reported in the present study. The concentration of mercury ranges between Below Detectable Limit (BDL) to 0.02 mg/l. Maximum concentration of mercury reported in the wastewater coming from Priyadershani market area where cluster of HCFs are located and the drain near Sultania hospital. The concentration of Mercury in these locations were found twofold than the prescribed limit by the Central Pollution Control Board. In the second year of study the concentration mercury got reduced remarkably at all location due to precautionary measure taken by the hospital authority.

**Key words:** Major drains, health care, mercury concentration, Bhopal hospitals.

### INTRODUCTION

Water pollution due to heavy metal particularly mercury resulting from various anthropogenic sources are causing serious ecological problems in many part of the world. Poor environmental management with respect to use of mercury in the society to meet our day to day requirement may aggravate the adverse effect on the various component of environment. This may leads to the transformation mercury from one compartment of environment to another, including the biota with detrimental effects. Literature shows the sufficient accumulation of the mercury in biota through food chain transfer, there is also an increasing toxicological risk for man.

A famous episode of Minanata disease occurred in Japan in fifties due to consumption of fish contaminated by methyl mercury<sup>5</sup>. Mercury in natural water can exists in truly, colloidal and suspended forms.

The mercury is used in various medical devices particularly temperature and blood pressure measuring gadgets. The following are the major equipment in which mercury is used.

- Clinical and normal thermometer
- Sphygmomanometer
- Dilators
- Dental amalgam
- Lab chemicals such as zenkers solution, histological fixatives

In normal case leakage or spillage of mercury from thermometer or any devices, clean up without use of protective gears and proper disposal system. This not only exposes the health workers who are handling mercury spills but also the community at large in long term. The waste spilled mercury is thrown in community dustbin, flushed down the sewer or incinerated. When incinerated, it may volatilize and become airborne or eventually settles in water bodies from where through bioaccumulation and bio magnification route

may reach to humans kind. The accumulation of mercury in muscle tissue may jeopardize cell division, binds with DNA interfering with replication of chromosomes and protein synthesis.

### MATERIAL AND METHODS

The Bhopal city, capital of Madhya Pradesh state is situated above 500 m. above MSL between 23.16 N latitude and 77.36 E longitude having population figure just over 1.8 million, has been selected for the study. During the study both kind of drains, which cover private and government hospitals were covered. In Bhopal more than 250 health care facilities are operating at various part of the city.

Five monitoring location on various hospital drains were identified to assess the contribution of mercury to public sewer. The sampling was carried out on quarterly basis for two year continuously during January 2005 to October 2006. Sampling schedule were fixed in the first week of every quarter month of year in the morning hour between 10.00 am to 1.00pm. The details of the sampling location are as given in Table -1.

The standard methods as prescribed in APHA adopted for analysis of wastewater samples during study<sup>1&4</sup>. The primary conditioning of the samples were carried at the site followed by analysis in the laboratory using Mercury analyzer, Electronic Corporation model -5840<sup>2&6</sup>. The instrument work on cold vapor atomic absorption spectroscopy technique at 353nm.

Take a suitable aliquot of the sample, blank and standards in a reaction vassal. Add the required amount of 10% HNO<sub>3</sub> to maintain a vol. of 10 ml. Add 2 ml of 20% SnCl<sub>2</sub> in sample and placed the stopper immediately, switch on the magnetic stirrer. The cold vapor of the Hg is produced. Measure the absorbance of the sample and extra polote the Hg concentration from analytical calibration graph. Plot the analytical calibration graph of absorbance vs concentration of Hg in micro gm/l.

$$\text{Calculation :Hg mg/l} : \frac{\text{mg value by graph} \times \text{dilution}}{\text{Vol. of sample}}$$

Table -1

S.No.	Nearest hospital from drain	Owned by	Drain ultimately joins to
1.	Hazela hospital near P&T square	Private sector	Shahpura lake
2.	J.P.Hospital	Government	River Betwa
3.	Kasturba Hospital	Public sector	River Betwa
4.	Sultania hospital	Government	Halali dam
5.	Cluster of hospital near Jawahar chowk behind Priyadershani market.	Govt. & Pvt.	Chotta Talab in the city.

### RESULTS AND DISCUSSION

Concentration of mercury in studied drains is presented at table. The results, shows that concentration of mercury well within the discharge limits set by CPCB<sup>3</sup> except at two drains i.e. near Priyadershni market and Sultania hospital. The highest concentration i.e. 0.02 mg/l were recorded

at these locations. This higher concentration in the aquatic environment may pose serious threats to aquatic biota, which may ultimately reflect to human health. Concentration of mercury at other location ranges between BDL to 0.005 mg/l. In the month of July 2005 and 2006 mercury value found BDL due to dilution by rainwater.

**Table - 1: Mercury Concentration in major public sewers near hospitals**

Location(Drain Near)	Jan 2005	Apr. 2005	Jul. 2005	Oct. 2005	Jan 2006	Apr 2006	Jul 2006	Oct. 2006
Hazela hospital ,P&T square	0.002	BDL	BDL	0.001	BDL	0.004	BDL	BDL
J.P.Hospital	BDL	0.004	BDL	BDL	0.001	0.001	BDL	BDL
Kasturba Hospital	0.002	BDL	BDL	0.001	0.002	BDL	BDL	0.002
Sultania hospital	BDL	0.005	BDL	0.02	0.002	BDL	BDL	BDL
Priyadershani market	0.002	0.001	BDL	0.02	BDL	0.005	BDL	0.002

*All the values are in mg/l*

*BDL-Below detectable limit*

### Conclusion

Variation in the concentration of mercury with relation to time and locations were observed in the study. In the second year of study i.e. 2006, the concentration of mercury reduced remarkably. Major causes for the reduction of mercury concentration may be due to replacement of the traditional mercury based instrument by digital

instrument as well as strict implementation of BMW ( M & H) rule by the hospital authority.

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