

## DISTRIBUTION OF MERCURY IN BIOLOGICAL FLUIDS

Hala Ghazi AL – Geboori\* Bsc. Msc

### Summary:

**Background:** Mercury is widely distributed in nature in both the inorganic forms. The mercury is distributed through out the soft tissues with high concentration in the kidneys .

**Aim:** the study are distribution of mercury in body fluids .

**Subject & methods :** In this study(50) samples of( blood, plasma, serum urine, saliva) were collected from subject of age ranged between 25-45 years attending medical city from April to July 2002.

All the samples were analyzed for their mercury concentration by spectrophotometer technique to study the distribution of mercury in all body fluids

**Results :**The study revealed that the method used can be considered as a suitable method in the study of the distribution of mercury in body fluids and it was found that distribution of mercury level increases as follows:- (blood, Plasma, Serum, Urine, Saliva)

**Conclusion :**the main portion of absorbed mercury is excreted from the body through the urine. The rest is concentrated in plasma, serum, blood & saliva.

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### Introduction:

Mercury is widely distributed in nature in both the inorganic and organic forms. Methyl mercury can be produced from inorganic mercury through microbial action and foods such as fish may have high concentration of methyl mercury . organic mercury is used as a seed dressing and though not intended for consumption. Such seeds, through error, do sometimes enter the food chain.(1)

The mercury is distributed through out the soft tissues with high concentration in the kidneys. It is mainly excreted in the urine and through the colon. It may take years to Eliminate mercury from the brain . Elimination from other tissues may take several months.(2)l

Mercury exists in three forms : Elemental mercury (Hg) inorganic mercury (Hg, Hg) and organic mercury(CH<sub>3</sub>Hg) .the sources, pharmacokinetics and biological effects vary among these different forms.

Elemental mercury possesses high lipid solubility and in blood oxidized it is to Hg. A rapid transfer occurs across the blood -brain barrier where large amounts of Hg are trapped in the central nervous system through oxidation to Hg(3).

Inorganic mercury compounds dissociate into the mercuric form (Hg) and are highly concentrated in the kidney(4).

Organic mercury from toxicological perspective there are two types of organic mercury compounds. The alkyl mercury group are readily lipid soluble and are distributed more uniformly throughout the body. Methyl mercury concentrated more in the blood and brain than inorganic form. The alkyl mercury compounds easily pass the placental barrier and they demonstrate a high affinity in the fetus(5,6).

Whole blood mercury level are the best measure of recent inorganic mercury and elemental mercury vapor absorption. Normal blood mercury levels do not exceed 1 to 3 ug/dl, Concentration of 22 ug/dl or more are associated with death, the History of exposure and the physical examination usually confirm organic mercury poisoning, elevated whole blood mercury levels may reflect acute exposure. Symptoms begin to appear when the blood mercury levels increase from 2 to 5 ug/dl.(7).

### Subjects and method :-

#### Subjects

Samples of study (blood ,serum. Plasma, urine, saliva) were collected from (50) subjects of age ranged between 25-45 years old attending medical city through the period between April to July 2002.

#### Method :-

To 5 ml of body fluid in a flask, 1 ml of sulfuric acid and 2 ml of nitric acid were added. A watch glass was placed as a lid and mixed and then heated gently for about 5 minutes. The samples were removed from heat and 5 ml of K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub> (5%) was added. MnO<sub>2</sub> will then start to precipitate out. The samples were heated again for about 10 minutes .and then were allowed to cool at room temperature a 3 ml of hydroxylamine reagent was added to them in

\* Department of Physiological Chemistry College of Medicine, University of Baghdad.

small portions to dissolve the MnO<sub>2</sub> and also to remove excess of oxidizing agents.

The samples were transferred to a small pyrex separating funnel and were shaken well with 5 ml of carbon tetrachloride.

5 ml of diluted dithiozone was added, a yellow to peach orange color was formed indicating the presence of mercury. An additional quantity of 5 ml of dithiozone was then added again and the samples were shaken vigorously. Another portion of 5 ml of dithiozone can be added if necessary so that all mercury can be extracted as indicated by persistent of a green dithiozone.

All the combined dithiozone extracted were shaken with 25 ml of ammonium hydroxide( 9N) to remove excess dithiozone.

The dithiozone was quickly separated through filter paper to remove droplets.

All samples were measured with a dithiozone.(8,9,10) using spectrophotometer(1kb 4050 uv/visible) at 490 nm.

#### Result :-

Fifty samples from apparently healthy subjects were included in the study.

The distribution of mercury in the different biological samples was measured by the above method and the age ranged from 25-45 years are shown in table(1).

#### Discussion :-

The method used in preparation of samples before being measured in spectrophotometer is reliable and can be used in determination of mercury in human body fluids and hence the distribution of mercury in human body fluids (blood, plasma serum, urine, saliva) (8).

This method is useful to measure concentration of mercury level in sample which contains between (0-15) ug/dl.

The table revealed that there is a relationship between the concentration of mercury in biological fluids and the different ages. There is a significant increase in the level of mercury in These fluids in order of blood, plasma, serum, urine, saliva.

The reason could be due to the wide distribution of mercury before being oxidised to mercuric form.

Concentrations can be detected in the brain .

Soluble inorganic mercuric salts are readily absorbed from the gastrointestinal tract and can also be absorbed through the skin (5-7).

It is clear from the results that the main portion of absorbed mercury is excreted from the body through the urine. The rest is concentrated in plasma, serum ,blood, saliva. Which may be oxidised after wards. As it is known that the Elimination of mercury from tissues may take several months. It may take years to Eliminate mercury from the brain.

**TABLE 1 :- correlation between the mean concentration of Mercury in biological fluids and the different ages.**

samples	Age(years)	Concentration of mercury ug/dl Mean ± SD
Blood	25-45	6.7+ 3.3
Plasma	25-45	5.3 ± 2.5
serum	25-45	4.1 + 3.4
Urine	25-45	3.9+ 1.9
saliva	25-45	3.6 ± 1.6

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