

TOXIC EFFECT OF AIR POLLUTANTS ON HUMAN HEALTH

Dr. (Mrs.) Sadhna Goyal
Professor, Deptt. of Chemistry
Govt. Motilal Vigyan Mahavidhyalay, Bhopal(M.P.)
shalu2505@yahoo.co.in

ABSTRACT

The pollution sources of heavy metals Pb, Fe, Cr, Zn, Cd, Ni, Cu and Hg increase their concentration both at the global as well as local level. The increase in concentration of metals in a localized area reach sometime to a significantly higher level and be one deleterious to biological population and human beings. Several disasters of the metal poisoning have been recorded from time to time which have been caused great ecological damage and led to a large number of human casualties. The recommended maximum lead concentration in drinking water is 0.01 ppm.

Key words - pollution, Heavy Metals

Introduction

Most of the elements present in the "periodic table" are metals^{1,2}. The metals work as electron pair acceptors and react with electron donor to form a variety of compounds like coordination compounds, metal complexes or donor acceptor compounds, chemically, the metals have been classified variously, but biologically^{3,4,5,6}, we used the term heavy metals to denote certain category of metals which are most deleterious ecologically. These heavy metals have a specific gravity of 4 - 5 times greater than that of water and usually belong to atomic number 22 - 34 and 40 - 52 and members of lanthanides and actinides of the periodic table^{7,8,9,11,12}.

Experimental

Physico-chemical analysis of water samples of Bhopal city was carried out by standard methods of APHA(2005)¹⁰.

Lead can be determined by following methods-

100 ml acidified water sample + 20 ml HNO₃+ 50 ml ammonium citrate cyanide solution in 25 ml separating funnel. Mix and cool it at room temperature add 10 ml dithizone. Shake funnel and separate organic layer cherry red in colour measure absorbance at 510 nm.

Result and Discussion

Environmental pollution is the result of urban industrial technological revolution and speedy exploitation of every bit of natural resources rapid industrialization have created adverse effect on all living organism in the biosphere. Toxic metals are added in aquatic system from industrial process, domestic sewage discharge, street dust, land sun of and fossil fuel burning. Traces of heavy metals such as Hg, Cd, Pb, As, Co, Mn, Fe and Cr have been identified as deleterious to aquatic system and human health waste containing high concentration of toxic metals either separately or in combination are extremely toxic to all organism. Lead compounds discharge in auto exhaust main lead compounds are-

Pb BrCl, Pb Br Cl.2Pbo, PbCl₂ etc.

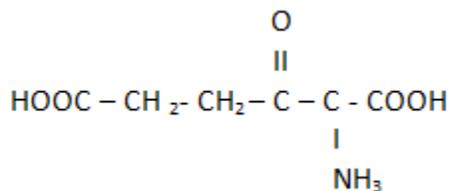
Cigarette smoking may be an important source of lead to man. An average cigarette contains about 0.8 gram of lead. A heavy smoker can inhale a quantity of lead as higher 4.8 gram per day.

Toxic response of heavy metals to man:

Anemia and disruption of hemoglobin synthesis, damage to nervous system and kidneys, brain damage.

The major biochemical effects to Pb has been attributed to its interference with heme synthesis which gives rise to hematological damage. Pb is reported to inhibit several of the key enzymes which are involved in the overall process of heme synthesis where by the metabolic intermediates get

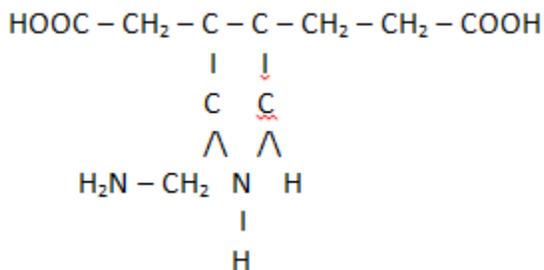
accommodated one such intermediate has been delta-amino levulinic acid. An important phase of heme synthesis involves the conversion of delta-aminolevulinic acid to porphobilinogen:



Delta aminolevulinic acid

(a)

(ALA dehydrase : cytoplasm)

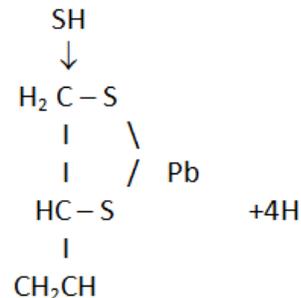
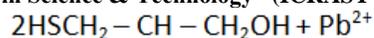


Porphobilinogen

(b)

As, Pb inhibits the ALA – dehydrase enzyme it cannot react further to form (b) porphobilinogen. The overall effects involves the disruption of the synthesis to hemoglobin as well as the other respiratory pigments like cytochromes, which need heme. Finally Pb does not allow the using of O₂ and glucose for life sustaining energy production. At level of Pb in blood (>0.8 ppm) symptoms of anemia due to the deficiency of hemoglobin appears. Elevated Pb levels more than (>0.5-0.8 ppm) in the blood may bring about kidney disfunction and finally cause brain damage.

Methods for removal of lead from the body all depends to some extent, on coordination of the metal to give a soluble species that may be excreted from the body. The most common methods used today is chelation using CaNa₂ EDTA. Other approaches to administer a low calcium high phosphate diet are to prescribe sodium citrate and 2,3 dimercapropanol.



The recommended maximum lead concentration in drinking water is 0.10 ppm. The lead concentration in upper lake of Bhopal city is found to be 0.086 ppm. Toxicity of lead is more acute in infants and children than the adults.

References

- [1] O.P.Tyagi and Mehra, Environmental Chemistry 2nd Edition (2000), pp.25
- [2] B.K.Sharma, Analytical Chemistry, 2nd Edition (2006), pp.104-125
- [3] P.S.Sindhu, Environmental Chemistry, 2nd Edition (2010), pp.3-35
- [4] A.K.Dey, Environmental Chemistry, 7th Edition(2010), pp.277
- [5] H.Kaur, Environmental Chemistry, 3rd Edition(2009), pp.187
- [6] Gray W Vanloon, Stephen J Duffy Oxford, 2nd Edition(2008), pp.101
- [7] Current Science, Vol 108 No 8, 25 April (2015), pp 1421-1465
- [8] M.C.Vachanth & N.karthi, Journal of ECO Toxicology & Environmental Monitoring, Volume 22, Nos 1&2 Jan. & Mar. (2012), pp.198-200
- [9] R.M.Verma, Analytical Chemistry, 3rd Edition(1994) pp.89-90
- [10] APHA, Standard Method for the Examination of Water and Waste Water 14th Edition American public health association, New York (2005)
- [11] Alka L.Gupta, Analytical Chemistry, 4th Edition(2012), pp.146
- [12] Tale S. Shivkumar & wavde, Journal of ecotoxicology & environmental monitoring, Volume 22 nos 1 & 2 Jan 7 March (2012) pp 50-54