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Biomedical Importance of Toxic Metal with Special Reference to Champa-Janjgir District of Chhattisgarh State

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ABSTRACT:
Transition metal ions have unique properties of forming ionic and special type of covalent bond (Co-Ordinate bond) hence plenty of metalloenzymes are known to act as electron carriers and act in the electron transfer reaction in the plant and animal systems. Over 25% of all enzymes contain tightly bound metal ions required activity. The functions of these metal ions are studied by **X-ray Crystallography**, **magnetic resonance imaging (MRI and electron spin resonance (ESR))**. Coupled with knowledge of the formation and decay of metal complexes and reactions within co-ordination spheres of metal ions in enzymatic catalysis. This way metal ions facilitate substrate binding and catalysis. Metalloenzymes contain a definite quantity of functional metal ion that is retained throughout purification. Metal-activated enzymes bind metals less tightly. The distinction between metalloenzymes and metal activated enzymes thus rest on the affinity of a particular enzyme of its metal ion.

Key words: - Transition metals, Complexes, Enzyme system and X-ray Crystallography, magnetic resonance imaging (MRI and electron spin resonance (ESR)).

I. INTRODUCTION

By the going through the results of physico-chemical parameters of River water, Soil which affected by the industrial effluents, mainly from Dipika Coal Field, MB Paper Mill, Nuvoco Cement Factory and NTPC. Coal ash from Korba, NTPC shows lower concentration of Zn,Mg and Mo deficiency in soil and water. Coal and coal ash of the Dipika coal field area is of concern. Mo is needed in the least amount of all the essential micronutrients as it as involved in the several enzyme systems including nitrogenase, nitrate reductase, xanthine oxidase, aldehyde oxidase, sulphate oxidase. Effluent of Madhya Bharat Paper Mill is highly colored due to lignin and forms sludge bank in the river bed.

*Cd is present as Cd++ ion complexes in effluents with coordination No.4. Cadmium was measured by dithizone method.

*Cu is present as Cu++ complexes with co-ordination No. four. Copper was measured by Neocuproin method.

*Lead is present as Pb++ Lead was measured by Dithizone method.

*Zn is present as Zn++ complexes with co-ordination No. 4 It was measured by Zincon method.

TABLE 1
Concentration of trace and toxic elements in soil

ELEMENTS	IN SOIL		EARTH WORM	
	In Control	In Sludge treated	In Control	In Sludge treated Soil

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Zn	14-20	40-50	50-60	200-210
Mn	10-15	20-30	40-50	100-110
Mo	0.15-20	0.30-0.40	0.35-0.40	2.5-3.5
Pb	14.4+5.1	24.4+4.2	1.5+4.5	18.5+5.5
Cd	0.4+0.2	0.5+0.32	0.35+1.50	0.5+1.00

TABLE NO.2
Indian standard for industrial effluents is as described below:

S.NO.	PARAMETERS	LIMIT
1	Suspended Solids	100 mg/l
2	Dissolved Solids	2000 mg/l
3	pH	5.5 to 9
4	B.O.D.	30 mg/l
5	C.O.D.	250 mg/l
6	Pb^{++} Concentration	0.1 mg/l
7	Cd^{++} Concentration	0.2 mg/l
8	Cr^{+++} Concentration	0.1 mg/l
9	Total Cr	2.0 mg/l
10	Se	2,0 mg/l
11	Zn	5.0 mg/l

TABLE NO.3
RECOMMENDED DAILY ALLOWANCES

S.NO.	MACRO AND OF MICRO ELEMENTS					
1.	Ca(mg)	P(mg)	Mg(mg)	Fe(mg)	Zn(mg)	Se(µg)
	1200	1200	350	10	15	70

Safe daily intake:

	Cu(mg)	Mn(mg)	Cr(mg)	Mo(µg)	K(mg)
2.	1.5-3.0	2 to 3	0.05-0.02	75-750	1100-3300

There are case studies described below which are related with deficiency of Cr, Cu and toxicity of Cd and Pb.

Case No. 1
Case Report of Myocardial Infarction

From Dipika Coal Field, MB Paper Mill, Nuvoco Cement Factory and NTPC area cases of myocardial infarction is common. Forty five years old businessman was admitted to the hospital which chest pain and acute neuromotor instability, his blood pressure was 160 and 115 mm of Hg.

Laboratory Findings

The initial ECG showed S.T. segment elevation and other changes indicative of and acute anterior transmural left ventricular infarction. Plasma cholesterol was elevated (8.5 m. mol./L). WBC was 1000 cells, SGOT I. V/L was 70% creatine kinase (NAC) I.U/L was 1800 mg. Creatine kinase (M.B.), I.U/L was 70 mg. Lactate dehydrogenase I.U/L was 75% concentration is blood of the trace and toxic elements are as mentioned below.

Cu	140.50 micro gram /L
Pb	80.9 micro gram/L
Cd	0.45 micro gram/L

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Diagnosis: -
Coronary heart disease of old inferior wall. Myocardial infarction, unstable angina, diabetes mellitus and essential hypertension.

Cardiac Catheterization Report: -
CAD Diffuse TVD with mildly impaired L.V. function.
LAD30 eccentric stenosis and 90% stenosis in proximal segment.
D_1Inferior division line 90% block just before origin.

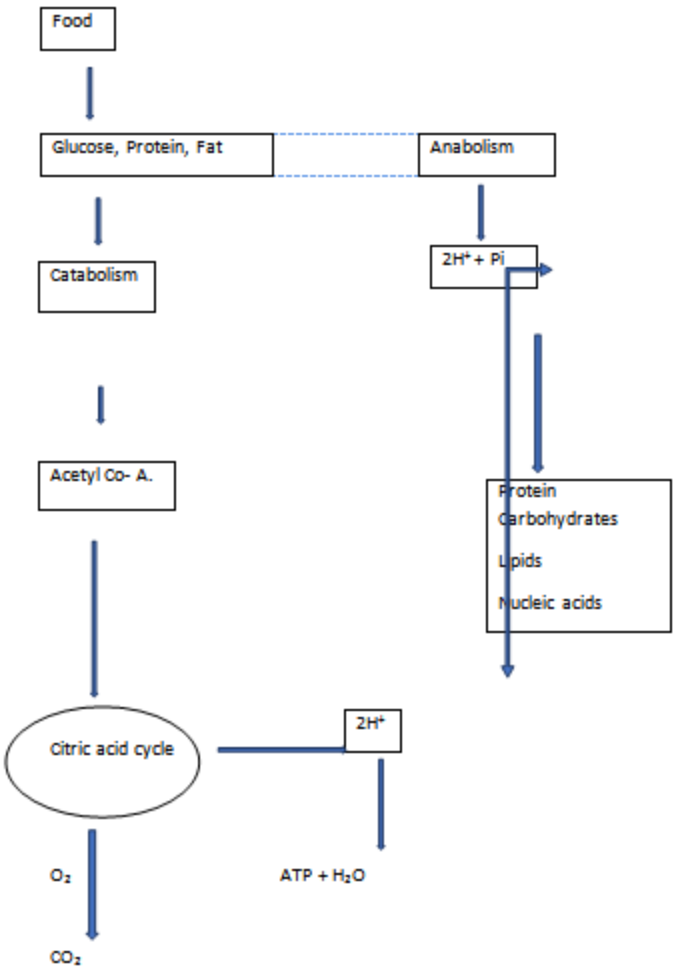
Case No. 2

Case Report of Diabetes with Ketoacidosis: -
58-Year-old man with diabetes and throat fifer and loss of appetite was admitted to the hospital, made complaint about undue thirst. He was dehydrated. His skin was cold.

II. DISCUSSION: -

Disease associated with carbohydrate metabolism include diabetes mellitus, galactosemia, glycogen storage diseases and lactose intolerance. It is a metabolic disease; Overview of intermediary metabolism is shown as following.

Overview of intermediate metabolism



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