# Non Essential Ions
# Lec:4

## Fluoride

Fluoride are widely used today for their anticariogenic action ( inhibition of dental cavity development ), also required for bones and act as inhibitor of certain enzymes.
About 95% of orally taken fluoride is absorbed.
Sodium fluoride has a wide range of therapeutic index.
Many reports indicated that fluoride reduces the prevalence of osteoporosis.
Visible aortic calcification were actually higher in low fluoride area because fluoride facilitate calcium deposition in hard tissues rather than soft tissues.

## Bromide

Bromides were introduced into medicine in 1853 for their antiepileptic effect.
Administration of small doses (0.5-2 gm) of bromide serve to cause depression to CNS, while large doses ( 4-8 gm) may depress all reflexes and cause narcotic type effect.
Bromides usefulness in epilepsy depend on their ability to depress the motor areas of the brain , an effect brought about by large doses .
Bromides are rapidly absorbed and are excreted mainly in urine, and repeated doses tend to cause accumulation with a consequent replacement of chloride ion.
The use of bromide is stopped because of the possibility of bromism (bromide poisoning) , the early sign of intoxication include insomnia, dizziness, weakness and headache.
Treatment of bromism by administration of sodium chloride (6 gm daily in divided doses) or ammonium chloride used.

## Lithium

It is readily absorbed from intestine , accumulates in the body.
the extent of its accumulation depends on sodium intake (decrease sodium intake accelerate lithium accumulation) and potentiate toxicity.
Lithium intoxication is treated by withhold lithium and provide sodium intake.
Lithium is a depressant to the CNS and has a diuretic action.

Lithium carbonate is administered orally in manic depressive disorder.
Lithium carbonate can affect thyroid function causing myxedema( deficient thyroid function) and decrease protein bound iodine levels and increase iodine intake.
Lithium can cause diabetes incipidus (increase urination without glucosurea).

**Gold**

It is used in the rheumatoid arthritis, and therapeutic gold compounds are administered i.m.
Orally is poorly absorb and irritant.
The gold is rapidly enters the plasma where it remains bound to albumin for several days so it is usually administered weekly.
Gold toxicity involves the skin, mucous membrane, joints, blood, kidney, liver and nervous system.
Treatment of toxicity involve cessation of administration, supportive treatment and dimercaprol can be used.

**Aluminium**

Soluble aluminium compounds are astringent and antiseptic.
Several of soluble aluminium salts are used by the cosmetic industry as deodorants because of their mild astringent action.
The insoluble aluminium compounds are mostly used as non systemic antacid.

**Lead**

Its salts were used topically as astringent.
Oral lead generally absorbed slowly and excreted reasonably well.
Inorganic lead can not pass through intact skin but it will absorbed through abraded skin, thus Lead solution used as astringent could be absorbed systemically while organic Lead such as tetraethyl Lead can penetrate skin rapidly.
Once absorbed , the Lead can be found initially in the erythrocyte and soft tissue.
Later the kidneys contain the most Lead with the liver ,then over time redistribution occur to be found in bone,teeth and hair.

**Lead poisoning**

While Lead may be considered a protein precipitant by combining with the cysteine sulfhydryl groups of protein, chronic Lead poisoning manifests itself by inhibition of heme synthesis.

The most serious Lead poisoning symptoms is encephalopathy which is more common in children.

Renal damage.

**Treatment of lead poisoning**

Treatment is based on the use of chelating agents to remove the accumulated Lead from erythrocyte and soft tissue.

Dimercaprol and calcium disodium edetate are used initially followed by pencillamine for follow up treatment.

Acute poisoning from oral ingestion can be treated by administrating sodium or magnesium sulphate to precipitate the Lead followed by gastric lavage.

Mercury

Metallic mercury is relatively non toxic as such since its the mercurous $Hg^{+}$ and the mercuric $Hg^{+2}$ cations are toxic, in addition that mercury vapour is toxic.

Poisoning by soluble inorganic mercury salts can be avoided while organic mercurial compounds are very toxic and are the cause of most reports of mercury poisoning.

Toxic effects of mercury similar to that of Lead due to its combining with protein sulfhydryl groups.

Once absorbed , the mercuric cation concentrates mostly in kidney, with less concentration in liver, blood, bone marrow, and other tissues.

It is excreted by kidney and colon.

Acute poisoning usually occurs by ingestion of soluble mercuric salts, vomiting and diarrhea may result with diuresis (suppression of tubular reabsorption) and kidney damage.

**Treatment of acute poisoning**

gastric lavage.

using of reducing agent such as sodium formaldehyde sulfoxylate to reduce the mercuric cation forming less soluble mercurous salt.

3.using of chelating agents such as dimercaprol or pencillamine.

**Mercurial salts are used as :**

diuretics

2.antiseptics

parasiticides

Fungicides

**Disadvantages of organic mercurial diuretics:**

1.Poor absorption from GIT

2.Slow onset of action

3.Sever toxicity

## Gastrointestinal agents

inorganic agents used to treat gastrointestinal disorders include:

products for altering gastric PH.

2.protectives for intestinal inflammation.

Adsorbents for intestinal toxins.

Cathartic or laxative for constipation.

Most of GI agents do not require a prescription which places the responsibility directly on the pharmacist.

### Acidifying Agents

Achlorhydria is the absence of hydrochloric acid in the gastric secretions.

Patients with this condition fall into one of two groups:

1.those who remain free of gastric hydrochloli.c acid after stimulation with histamine phosphate.

2.those in whom there is normally a lack of gastric hydrochloric acid but who respond to stimulation by histamine.

Patients with the first type of achlorhydria include those with a subtotal gastrectomy, atrophic gastritis (chronic gastritis with atrophy of the mucous membranes and glands), carcinoma of the stomach or gastric-polyps.

The second type, in which the patients are initially free of gastric hydrochloric acid but will secrete it upon histamine stimulation, ·include those with chronic nephritis (inflammation of the kidneys), chronic alcoholism, tuberculosis, hyperthyroidism, and parasitic infestations.

It is common in otherwise normal individuals after age 50.

Gastric hydrochloric acid functions by killing the bacteria in ingested food and drink ,softening fibrous food, and promoting formation of the proteolytic enzyme , pepsin.
Pepsin is formed by pepsinogen being converted to pepsin when the PH of gastric content drops below 6.
Thus , a lack of hydrochloric acid could reasonably be expected to cause gastrointestinal disturbances.
The symptoms of achlorhydria can vary with the associated disease, but they generally include mild diarrhea or frequent bowel movements, epigastric (upper middle portion of the abdomen) pain, and sensitivity to spicy foods.
Because pepsin possesses its greatest proteolytc activity below pH 3.5.
This usually is not considered to be a problem, since many proteolytic enzymes in the intestinal tract are still present and fully functional.
It is common for patients with achlorhydria to have pernicious anaemia due to a lack of intrinsic factor, the protein necessary to carry vitamin B12 across the intestinal wall.

In an attempt to relieve the gastrointestinal symptoms caused by achlorhydria, *Diluted Hydrochloric Acid* has been utilized.
The usual 5-ml dose of *Diluted Hydrochloric Acid* added to 200 ml of water provides about 15 mEq of acid.
In order to avoid exposure of dental enamel to hydrochloric acid, the use of products such as glutamic acid hydrochloride (Acidulin®) which is administered in capsules.
However, this product provides only 1.7 mEq of hydrochloric acid, and the recent drug efficacy study of the National Academy of Sciences-National Research Council for the Food and Drug Administration concluded that the glutamic acid preparations were ineffective.
It must also be kept in mind that it is not clear if the decrease in gastric hydrochloric acid is the cause of any specific symptoms, or if it is a symptom associated with many possible pathological conditions. For this reason it is doubtful if the administration of *Diluted Hydrochloric Acid* with its higher acid content serves any useful clinical or physiological purpose.