الكلية : كلية طب العام

الفرع : طب الاسرة والمجتمع

المرحلة : الرابعة

أستاذ المادة : د بديعه ثامر يحيى

اسم المادة باللغة العربية : الصحة المهنيه

اسم المادة باللغة الانكليزيه : Occupational health

اسم المحاضرة الثالثة باللغة العربيه : التسمم بالرصاص والزئبق

اسم المحاضرة الثالثة باللغة الانكليزية: Lead and mercury poisoning

LEAD :More industrial workers are exposed to lead than to any other toxic metal.

• Lead is used widely in a variety of industries because of its properties :

(1) low boiling point

(2) mixes with other metals easily to form alloys

(3) easily oxidized and

(4) anticorrosive.

All lead compounds are toxic –

1. lead arsenate,

2. lead oxide and

3. lead carbonate are the most dangerous;

4. Lead sulphide is the least toxic.

INDUSTRIAL USES

- Over 200 industries are counted where lead is used
- - manufacture of storage batteries;
- glass manufacture;
- ship building;
- printing and potteries;
- rubber industry
- Pesticides (lead arsenate) and several others.

NON-OCCUPATIONAL SOURCES The greatest source of environmental (non-occupational) lead is

- gasoline. Thousands of tons of lead every year is exhausted from automobiles.
- Lead is one of the few trace metals that is abundantly present in the environment.
- occur through drinking water from lead pipes
- chewing lead paint on window sills or toys in case of children
- lead-soldered food cans,
- ceramic glazes,
- and industrial pollution
- Cigarettes

Uses and Sources of Lead

- Paint (until 1970)
- Petrol (tetraethyl lead)
- Household dust (via settlement of air pollution)
- Ceiling dust
- Solder
- Ceramic glazes

• Mines, smelters

More Uses and Sources of Lead

• TV's, Computer monitors

• Batteries, Bullets Sinkers

• Aviation

• X-ray shields

• Explosives

• Non-stick linings of pots (in the past)

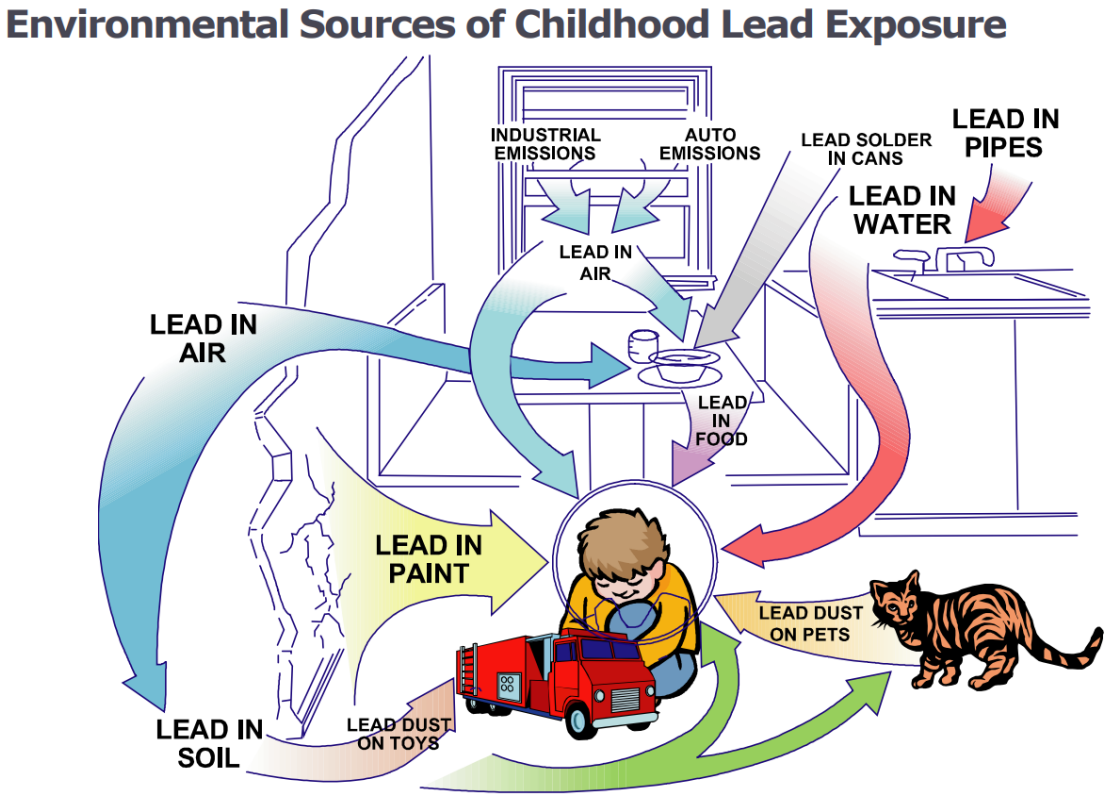
• Plastic colouring (wire, blinds)

Lead Hazard Sources

• Most lead hazards come from lead paint chips that have been ground into tiny bits.

• These tiny bits of lead become part of the dust and soil in and around our homes

50%.



Why are Children at High Risk?

• Children's nervous systems are still developing

• Young children have more hand-to-mouth activity than older children

• Children absorb more lead than adults, immature gastrointestinal tract is relatively permeable to lead, and oral intake may result in absorption rates of 30–50%.

Children's Health Risks Related to lead exposure

• Reductions in IQ and attention span

• Behavioral problems (e.g., hyperactivity)

• Impaired growth and hearing loss

• At very high levels, seizures, coma, and even death

MODE OF ABSORPTION

• (1) INHALATION : Most cases of industrial lead poisoning is due to inhalation of fumes and dust of lead or its compounds.

• (2)INGESTION : Poisoning by ingestion is of less common occurrence. Small quantities of lead trapped in the upper respiratory tract may be ingested.

• Lead may also be ingested in food or drink through contaminated hands. Inorganic lead compounds are absorbed only to a minor degree in the gastrointestinal tract of adults, usually about 10%

(3) SKIN: Absorption through skin occurs

• only in respect of the organic compounds of lead, especially tetraethyl lead. Inorganic compounds are not absorbed through the skin

Distribution of Lead

• 95% long bones.

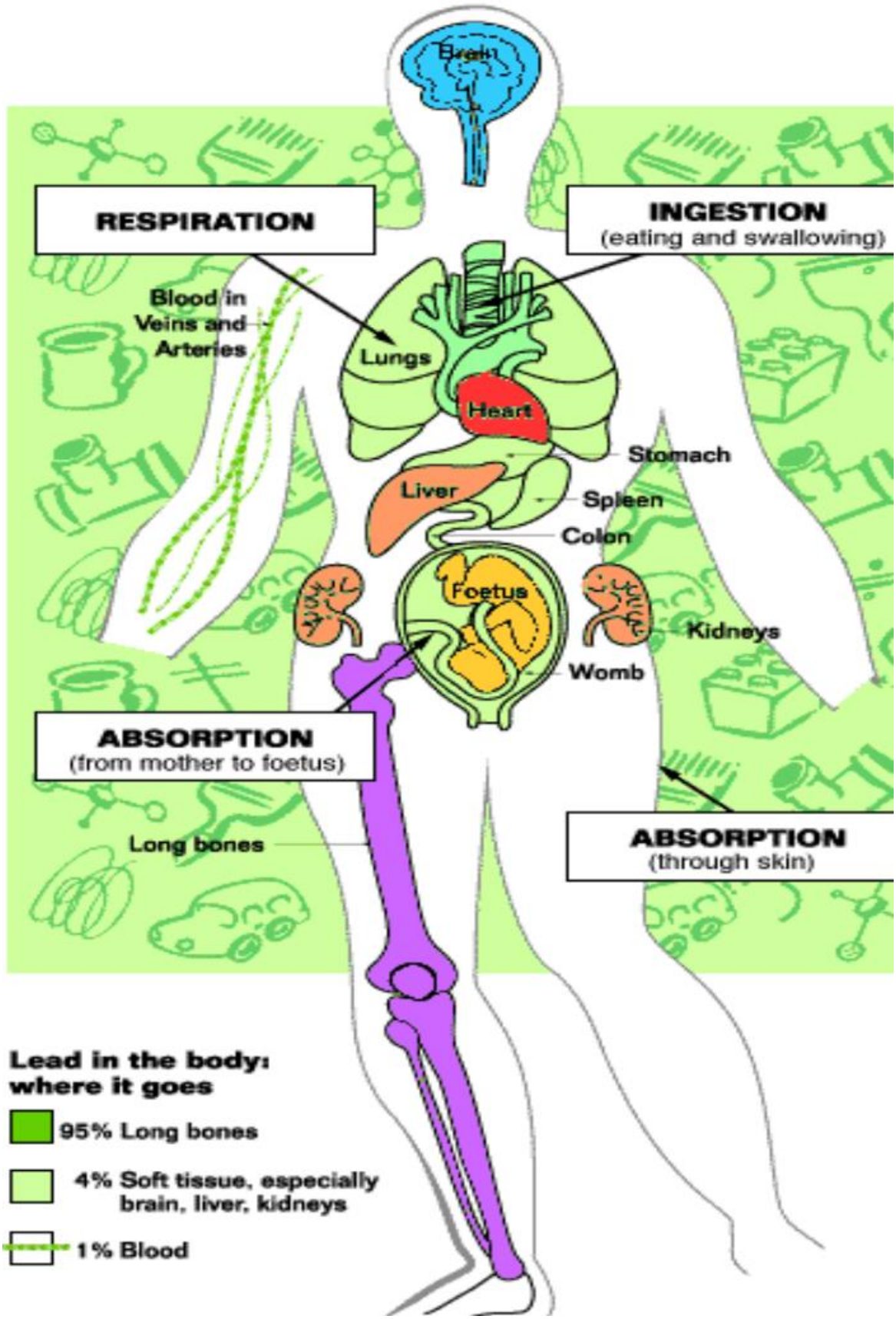
• Binds into matrix.

• Released during osteolysis.

• 4% brain,liver, kidneys.

• 1% blood.

• Crosses placenta, foetal BBB is open


Brain
RESPIRATION
INGESTION
(eating and swallowing)
Blood in Veins and Arteries
Lungs
Heart
Stomach
Liver
Spleen
Colon
Foetus
Kidneys
Womb
ABSORPTION
(from mother to foetus)
Long bones
ABSORPTION
(through skin)
Lead in the body: where it goes
95% Long bones
4% Soft tissue, especially brain, liver, kidneys
1% Blood

CLINICAL PICTURE

• The clinical picture of lead poisoning or plumbism is different in the inorganic and organic lead exposures.

• The toxic effects of inorganic lead exposure are

1. Abdominal colic

2. obstinate constipation,

3. loss of appetite,

4. blue-line on the gums,

5. stippling of red cells,

6. anaemia,

7. wrist drop and

8. foot drop,

DIAGNOSIS

• (1) HISTORY : a history of lead exposure

• (2) CLINICAL FEATURES : such as loss of appetite, intestinal colic, persistent headache, weakness, abdominal cramps and constipation, joint and muscular pains, blue line on gums, anaemia,

• (3) LABORATORY TESTS

• : (a) Coproporphyrin in urine (CPU) : Measurement of CPU is a useful screening test. In non-exposed persons, it is less than 150 Microgram\ litre.

• (b) Amino Ievulinic acid in urine (ALAU) : If it exceeds 5 mg/litre, it indicates clearly lead absorption.

(c) Lead in blood and urine: Measurement of lead in blood or urine requires refined laboratory techniques. They provide quantitative indicators of exposure.

• Lead in urine of over 0.8 mg\litre (normal is 0.2 to 0.8 mg) indicates lead exposure and lead absorption.

• A blood level of 70 µgl100 ml is associated with clinical symptoms.

• (d) Basophilic stipling of RBC : is a sensitive parameter of the heamatological response.

MANAGEMENT

• The major objectives are the prevention of further absorption,

• the removal of lead from soft tissues and prevention of recurrence.

• Early recognition of cases will help in removing them from

• further exposure. • A saline purge will remove unabsorbed lead from the gut.

• The use of d-penicillamine has been reported to be effective. Like Ca-EDTA, it is a chelating agent and works by promoting lead excretion in urine

PREVENTIVE MEASURES

(1) Substitution : That is, where possible lead compounds should by substituted by less toxic materials.
(2) Isolation : All processes which give rise to harmful concentration of lead dust or fumes should be enclosed and segregated.

(3) Local exhaust ventilation: There should be adequate local exhaust ventilation system to remove fumes and dust promptly

(4) Personal protection : Workers should be protected by approved respirators

5) Good housekeeping: Good housekeeping is essential where lead dust is present .Floors, benches, machines should be kept clean by wet sweeping.

(6) Working atmosphere : Lead concentration in the working atmosphere should be kept below 2.0 mg per 10 cu.metres of air, which is usually the permissible limit or threshold value.

• (7) Periodic examination of workers:

All workers must be given periodical

1. medical examination.

2. Laboratory determination of urinary lead, blood lead, red cell count, haemoglobin estimation and coproporphyrin test of urine .

3. Estimation of basophylic stippling may also be done. in the case of exposure to lead, it is not the average level of lead in the blood that is important, but the number of subjects whose blood level exceeds a certain value

(8) Personal hygiene: Hand-washing before eating is an important measure of personal hygiene. There should be adequate washing facilities in industry. Prohibition on taking food in work places is essential.
(9) Health education: Workers should be educated on the risks involved and personal protection measures.

(10) eat balanced diet:

Mercury

Most volatile of all metals

• Highly toxic in vapor form

• Liquid mercury itself is not highly toxic, and most of that ingested is excreted

Sources of Mercury

 Elemental mercury is employed in many applications due to its unusual property of being a liquid that conducts electricity

 Used in electrical switches, fluorescent light bulbs and mercury lamps

 Emission of mercury vapor from large industrial operations

 Unregulated burning of coal and fuel oil

 Incineration of municipal wastes (البلدية النفايات)

 Emissions from mercury-containing products:batteries, thermometers, etc.

 Mercury amalgams: dental fillings

Health effects

 Skin burns

 Irritation of nose and skin

 Rashes

 Excessive perspiration

 Damage to the kidneys

 Damage to vision

 Minamata disease

 Dysfunctions of the central nervous system

 Loss of hearing and muscle coordination

 Severe brain damage

 Death

Inorganic mercury in the aquatic environment tends to sediment, where certain microorganisms are able to methylate mercury, possibly as a means of detoxication. The methylmercury generated then accumulates in fish. Particularly high methylmercury concentrations are reached by marine carnivores

Inhalation of metallic mercury results in an almost complete absorption of the vapors in the alveoli.

• Small amounts are released from dental amalgam fillings, especially from those in the molar teeth that are subjected to the highest pressures during chewing. However, only negligible absorption of the metal takes place in the gastrointestinal tract, unless some is retained, for example, in diverticula or the appendix.

• Inorganic mercury compounds from aerosols may be absorbed through the lungs as well, and some absorption (about 5–10%) also takes place in the gastrointestinal tract.

prevention

1- Biological monitoring is useful in the diagnosis of mercury exposure and in the control of occupational exposure levels.
   • blood, inorganic mercury has a half-life of about 30 days, and methylmercury has a half-life of about twice as long.
   • Urine levels are usually preferred as an indicator of occupational exposures
   • hair mercury analyses useful for screening,
2- the limitation of mercury released from industrial operations to the environment

3- Important nonindustrial sources are discarded batteries (for cameras and watches), fluorescent light tubes and bulbs, and thermometers. collecting and recycling the mercury from such consumer products

4- Thimerosal is been phased out as a pharmaceutical preservative, but still occurs in certain vaccines

5- 5- advise the population to eat low in the food chain, preferably smaller and younger fish that contain less mercury