Intoxication by mercury and its compounds

Mercury in inorganic form


Rtuť

A silvery lustrous liquid metal, it evaporates at room temperature.

Salts

The most dangerous are soluble Hg 2+ salts (mercuric chloride, nitrate).

Professional exposure

Production of mercury measuring instruments, batteries, dental amalgams (with silver), formerly used in dermatology and as a diuretic .

Etiopathogenesis


Rtuťový lékařský teploměr

We must distinguish elemental mercury and salts.

Elemental mercury :

- most often by inhalation (80% is absorbed);
- high exposure – damages the respiratory system (pneumonia , edema);

target organs – brain , kidneys , chronic inhalation is the worst for the CNS , it reaches the brain in a moment, it is lipophilic;

- in the CNS it is then oxidized to divalent mercury, which no longer passes through the barrier → accumulation;
  - accumulates mainly in the cerebral cortex and cerebellum and in the BG;
- outside the CNS, elemental mercury is also oxidized by catalase (mainly in eras) and interferes with SH groups;
- it then accumulates in the cortex of the kidneys, binds to metallothionein (which protects the kidneys), kidney damage only occurs when it is saturated (mainly damages the proximal tubule → nephrotic sy), soluble mercury **salts** – by inhalation in the form of dust, but mainly they can be absorbed from the GIT and cause severe acute poisoning, up to 90% is resorbed from the GIT , *the cause of death is acute kidney failure* .

Chronically – by skin application of ointments with Hg, ingestion of alimentary mercury – e.g. from a thermometer by small children, poor absorption in the GIT (5%) → there is no risk of poisoning,

- but it has a strong laxative effect;
- kinking of a rectal thermometer with laceration tissue - hard-to-remove mercury may enter - poisoning;
- iv application of metallic mercury – it does not cause poisoning, but there is a risk of embolization;
- excretion of mercury is slow, due to binding to SH, mercury can be detected in hair and nails.

Clinical picture

- **Acute** - rarely - either by inhalation with elemental mercury or after with salts;
  - **by inhalation** – in a closed space with high mercury vapor tension, cough, shortness of breath, fever, pneumonia, pulmonary edema;
  - **oral salts** – vomiting, tenesmus , necrosis of the GIT mucosa, diarrhea with mucosal lines, proteinuria, hematuria, oliguria, kidney failure.

- **Chronic** - in both types, a triad can appear - gingivitis , tremor , erethism;
  - **gingivitis** – gingivitis, salivation, tooth loss;
  - **tremor** – of cerebellar origin, gentle, then pronounced intentional tremor (initially limbs, then eyelids, lips), then ataxia, fasciculations in muscles;
  - **erethism** – toxic organic psychosis – anxiety, shyness, nervousness, quarrelsomeness, emotional lability, memory disorders, concentration, depression, sleep rhythm inversion (sometimes reminiscent of schizophrenia), less often – kidney damage.

Investigation methods

- An increase in the concentration of mercury in the blood → indicates recent exposure (acute poisoning),
- increased values of mercury in the urine → rather indicate chronic intoxication (but they fluctuate significantly even during the day),
- better predicts the amount of mercury in the urine after administration of a chelating antidote,

- proteinuria – indicates kidney damage.

Therapy

Acute inhalation, with ingestion of salts – PP – milk or egg white (forms insoluble precipitates of Hg-albuminate), excretion of mercury in urine – chelating agent – DMPS, dimercaptopropane sulfonate (dimercaptopropanol was previously used – BAL (British anti-Lewisine)),

- with anuria - hemodialysis, assessment of professionalism - with acute inhalation, professionalism is usually obvious,
- alimentary salt poisoning is rather **suicide** ,
- chronic **occupational poisonings are a rarity** today .

Mercury in organic form

Alkyl compounds (methyl and ethyl mercury):

- These are highly toxic compounds, *central neurotoxicity* is typical .
- They cause central deafness, narrowing of the visual field, cerebellar symptoms, pyramidal symptoms, extrapyramidal symptoms, renal tubule necrosis .

Aryl compounds (phenylmercury):

- Cause mild proteinuria, dermatitis,
- they were previously used as fungicides.

In 1953 in Minamata Bay – mercury from the factories got into the fish, they incorporated it into methylmercury. The first symptoms were observed in cats, then fishermen with families (central deafness , dysarthria , ataxia). These compounds have been banned in our country.

Links

related articles

- Intoxication by lead and its compounds
- Intoxication with methemoglobinizing substances

Sources

- BENEŠ, Jiří. *Study materials* [online]. [feeling. 24/02/2010]. < http://jirben.wz.cz >.
- PELCLOVA, Daniela. *Occupational diseases and intoxication.* 2nd edition. Prague: Karolinum, 2006. 207 pp. ISBN 80-246-1183-X .