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**EFFECTS OF INORGANIC MERCURY ON THE NERVOUS SYSTEM**

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Since ages it is known that exposure to inorganic mercury produces a "mad hatter syndrome" where normal, balanced behavior fails. Also opinions on the possible or real risks of mercury poisoning seem to behave in this way. For several hundred years there was a hot debate on the use of mercury for the treatment of syphilis and opinions ranged from denying mercury poisoning to denying syphilis. Also when mercury comes from amalgam fillings in the teeth, the metal seems to provoke aggressions. There is a great need for serious, unbiased studies to find methods of diagnosis and treatment, to find which diseases can be precipitated or aggravated by mercury, to clarify how the metal acts and the pathological changes caused by this devious metal, once a treasured medical remedy for nearly every disease.

Today anyone knows that mercury is neurotoxic. The severe CNS damage caused by methylmercury in Minamata, Japan and in Iraq caused a major concern about environmental mercury pollution. After these disasters methyl mercury was the focus of mercury research for several years. Now there is a renewed interest in the effects of inorganic mercury. Perhaps there are more similarities between the two forms than

is immediately apparent.

Presently I will restrict myself to effects of inorganic mercury after a very short comparison:

In Japan people consumed large amounts of methylmercury for a long time. The loss of visual field was used as a diagnostic criterium and other studies indicate that this symptom is present in about a third of cases. Tremor is usually used to diagnose inorganic mercury poisoning but is also shown by about a third of such cases. Zangger in 1930 was the first to notice the formation of organic mercury compounds in the manufacture of acetaldehyde and noticed that exposed workers had more neurological and cardiac problems and less of oral and gastrointestinal symptoms than people exposed to only inorganic mercury. The symptom complexes were, however, overlapping.

In Iraq where peasants consumed bread made from methylmercury-treated grain, the doses could be

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estimated. Symptoms started when a cumulative dose of about 40 mg of mercury had been consumed during 1-2 months. Severe disease was produced by 200 mg and 350-400 mg caused deaths. (Bull. WHO, 1976)

Swallowed methylmercury, the most common route of exposure, should be compared to inhaled inorganic mercury, not swallowed mercuric chloride with its low absorption and subsequent mainly kidney localization.

What level of mercury vapor will give an absorbed dose of 40 mg mercury during one month? A crude estimate is 400 ug/m<sup>3</sup> when the exposure is 8h/day, 5 days/week or 80-100 ug/m<sup>3</sup> for a continuous exposure. Severe effects in Iraq then corresponds to 2 mg/m<sup>3</sup> vapor. Such levels produce symptoms and severe symptoms respectively also for inorganic mercury vapor exposures in most persons but some can tolerate these exposure levels for years.

Methylmercury exposure is very likely worse if the exposure is large and continues for a long time since the turnover in the body is slower. However, the effects of both inorganic and methylmercury are largely reversible if further exposure is rigorously prevented. In Iraq blind farmers got their sight back and paralyzed patients could again walk.

Methylmercury has been studied for a few decades. However, the toxicity of inorganic mercury has been describe for centuries and millennia. The metal is harmless but the vapor diffuses easily, only a magnitude less than hydrogen gas, and then ionizes to toxic forms. Swallowed metal will seldom give problems but metallic mercury in other places might give problems. Gabir, an arabian alchemist dead 820 described that: "only if some is poured into the ears or nose will it kill or cause prolonged disease." Rhazes from the same age, wrote "If mercury is poured into the ear there will be severe pain followed by delirium and cramps. If some mercury reaches the narrow passages in the ear severe effects can be expected. Some doctors have told me that they have seen such patients have epilepsy followed by stroke." (Ruska, 1926; Goldwater, 1972)

The most common form of exposure to inorganic mercury is by inhalation of vapor. There is general agreement that this leads to a slowly developing and insidious poisoning which primarily gives psychic effects and is very difficult to recognize until more objective symptoms appear. There are numerous more or less extensive descriptions. This one by Baader in Handbuch der gesamten Arbeitsmedizin is a moderately long one. Others have noted additional symptoms or more rare effects. (Baader, 1933, 1961; Stock 1926, 1936; Moeschlin, 1980; Poulsson 1922, 1949; Oettingen 1958; Burgener & Burgener, 1952; Schulz 1907; Kussmaul, 1861). Baader, E. Quecksilbervergiftung, 1961:

Stomatitis	disturbance of sleep
gingivitis	tremor, jerks, shaky handwriting
loose teeth	salivation/dry mouth, nose
difficulty to speak	foul breath
skin changes, eczema	anxious seclusion
metal taste	fatigue
redness of throat	pressure over head, headache
black line along teeth	irregular menstruation
diarrhea	dull pain in limbs and joints
anemia, relative lymphocytosis	disturbance of circulation
uncertainty	sudden changes of skin color in face
shyness	increased sweating
agony	irregular heart
irascibility	pressure over chest
labile mood	lowered blood pressure
forgetful, memory loss	sensory disturbance of skin
feeling of intellectual inadequacy	thyroid disturbance
eye pigmentation	