

# Health Impacts of Lead Poisoning

## A preliminary listing of the health effects & symptoms of lead poisoning

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The following list of the symptoms and effects of lead poisoning has been compiled to raise awareness that more blood lead assessments must be done in time for further poisoning to be prevented. After each symptom or effect, the numbers indicate the publications which refer to that effect. So far, only 64 publications have been examined of the thousands published. More will be reviewed and this list updated as time permits.

However, remember that most people who are lead poisoned present with no symptoms at all.

### Children

#### Nervous system

- Encephalopathy [brain disease] (1,2,3,4,20,35)
- Acute encephalopathy (11)
- Alters function of developing brain (16)
- Alters electroencephalogram [EEG] (16)
- Convulsions (1, 2, 3, 4)
- Cerebral Palsy (1)
- Neurotransmitter release disrupted (11)

#### Peripheral nervous system

- Peripheral nerve disturbances [reduced touch sensitivity] (2, 3, 4, 5, 6,18)
- Slowed nerve conduction velocity [decreased reaction times] (2,14,18,35,39,58)
- Foot/ hand drop (1,3)
- Proprioceptive pathways involved in balance altered (2)
- Dizziness (1,4,38)

#### Growth & development

- Delayed neurodevelopment [e.g. in sitting up, walking, talking] (2,58)
- Stature and growth rate reduction (1,2,3,18,35,39)
- Impaired pituitary-thyroid endocrine system (18,21)
- Osteoporosis in later years (43)
- Weight loss (58, 60)
- Delayed Puberty (60)
- Reduced postnatal growth (60)

#### Cognitive development

- I.Q. levels decrease (1,2,3,4,5,6,15,24,35,36,39,41,58, 60)
- Cognitive function deficits (2,26,33)
- Verbal function / linguistic deficits (2,14,15)
- Learning difficulties (11,15,35)
- Decreased educational performance (35, 60)

- Decreased reading, maths, non-verbal reasoning ability & short term memory, even at blood lead levels less than 10ug/dL (41)
- Autism (7) in genetically predisposed individuals with metallothionein dysfunction (42)

#### Behaviour

- Aggression, violence, hostility, anti-social or delinquent behaviour (8,26, 60)
- Attention problems; distractibility, restlessness (8,12,15,21,38,58, 60)
- Externalising and internalising behaviours (8)
- Hyperactive behaviours, difficult to manage (1,2,8)
- Inappropriate / uncontrolled behaviours similar to ADD behaviours, increased frequency (2,11)
- Irritability (1,38)
- Lethargy (1)
- Increased school absenteeism (35)

#### Hearing

- Hearing impairment; auditory sensitivity decreased (2,3,5,10,14,18,21,26,32,35,39,58, 60)
- Auditory evoked response patterns altered (2)
- Auditory processing altered (2,10)

#### Sight

- Retinal degeneration (6,10)
- Depressed sensitivity of rod photoreceptors (10)
- Perceptual function deficits (2,21)
- Visio-spatial skills deficit [eg difficulty doing jigsaws] (15)
- Cataract (63)

#### Movement and muscular

- Visual-motor skills deficits [hand-eye coordination] (2,3,15,26)
- Fine motor dysfunction (1, 2, 3)
- Motor function deficits (2)
- Impaired muscular strength and endurance (26)

- Paralysis (3)
- Somatic complaints [aches and pains] (8,38)

### **Digestive system**

- Impaired Vitamin D metabolism [affecting bone remodelling, mineral absorption and calcium uptake] (2,3,6,18,24,35,38,39,58)
- Colic (3,25,35)
- Loss of appetite (1,2)
- Vomiting (1,4)
- Constipation, diarrhoea, anorexia (38,58)
- Abdominal cramps (39,58)

### **Renal (kidneys), blood and circulation**

- Renal disease – acute nephropathy (14,21,35,38,58)
- Queensland nephritis (14)
- Anaemia (1,2,3,4,5,6,35,38,58)

**Death** (1,2, 3, 4,19,35,46,58)

## **Perinatal Development and Reproductive Health Effects**

### **Foetal**

- Preimplantation loss (3)
- Miscarriage, still birth, neonatal death (2,3,4,5,18,20,24,31,47)
- Reduced gestational age, preterm birth (1,2,3,5,18,24,62)
- Reduced birth weight (1,2,3,4,5,6,18,19, 60,62)
- Minor congenital / chromosomal anomalies (2,3,4,18,31)
- Reproductive abnormalities; disorders (5,13,38)
- Decreased placental functioning (19)
- Lead passed via placenta to foetus from mother (39,58)
- Reduced foetal growth (60,62)

### **Maternal**

- Pre-eclampsia (64)
- Increased risk of maternal death (due to preeclampsia) (64)

### **Adults**

- Altered testicular functioning (24)
- Hypospermia [low sperm count] (3,5,19,47, 60)
- Asthenospermia [sperm weakness] (3,5,20, 60)
- Teratospermia [sperm abnormalities] (3,5,31)
- Erectile dysfunction, impotence (3,40)
- Decreased serum testosterone (3)
- Lead presence in seminal fluid (31)
- Pituitary effects (31)
- Sterility, infertility (5,31,35,39,58)
- Effects on ovaries (19)
- Decreased libido / sex drive (2,21,31)
- Impotence (31)

- Delayed conception time (60)

## **Adults**

### **Kidneys**

- Renal damage (2,3,5,13,14,21,23,24,28,30,34,39,58)
- Chronic lead nephropathy [kidney disease] (2,3,14,21,22,24,38,58, 60)
- Death from nephritis [kidney inflammation] (29,30)
- Fanconi Syndrome (14)
- Gout (2,3,14)
- Renal hypertension (17)
- Decrease in glomerular filtration rate and Increase in creatinine concentration (23, 60)

### **Nervous system**

- Encephalopathy [brain disease] (2,4,20,24,25,34)
- Cerebrovascular diseases, stroke, cerebral haemorrhage (2,27,28,29,30)
- Psychomotor impairment (13,34)
- Peripheral nervous system (13,24,40,47)
- Peripheral Arterial Disease [PAD](53,54)
- Slowed nerve conduction velocity [slowed reaction time] (2,34,58)
- Tremor (25,26,38,40,55, 60)
- Paresthesia, paralysis (25)

### **Cardiovascular and circulation**

- Hypertension, elevated blood pressure (2,14,17,22,35,38,40,58, 60)
- Increased systolic blood pressure in men (35)
- Cardio-toxic effects (14)
- Increased risk of cardiovascular disease (17, 61)
- Coronary artery disease (2)
- Anaemia; falling haemoglobin levels (2,3,5,13,24,35,38,39,47,58)
- Platelet dysfunction (2)
- Increased erythrocyte [red blood cell] protoporphyrin (35)
- Increased ALA in urine (34)
- Increased protoporphyrin in urine (34)
- Increased risk of early death from heart attack or stroke (46,61)
- Left-ventricular hypertrophy (61)
- Peripheral arterial disease (61)
- Electrocardiographic abnormalities (61)
- Promotes development of atherosclerosis (plaque build-up in arteries) and thrombosis (formation of blood clots) (61)
- Ischaemic heart disease (61)

### **Intellectual and mental**

- Depression (2,13,38)
- Anxiety (38)
- Personality changes (34)

- Death from violence, suicide, accidents (29)
- Impaired concentration (19,25,34,38)
- Deficits in short term memory (2,13,19,34,38)
- Cognitive function deficit (58)
- Oxidative stress (61)

### Behaviour

- Fatigue, muscular exhaustion (2,19,25,34,38, 47)
- Sleep disturbance, insomnia (19)
- Irritability, agitation, restlessness, aggression (2,13,24,34,19, 47,58)

### Sensory

- Abnormalities in visuomotor coordination (2)
- Abnormalities in fine motor control (2)
- Deficits in visual acuity (2)
- Hearing loss (18,35,39,47,58)
- Somatosensory dysfunction [eg deficits in detection of vibration, changes in temperature] (2,23)

### Gastrointestinal / Digestive

- Effects on gastrointestinal tract (24)
- Loss of appetite (19,40)
- Nausea (19)
- Constipation, diarrhoea (25,38)
- Abdominal pain, cramps (25,34,40,47)
- Weight loss, anorexia (25,38)

### Bone, muscle and joint

- Bone marrow alterations (21)
- Myalgia [muscle pain] (25,38,40,58)
- Pain in buttocks and cramps in the legs as early stages of peripheral arterial diseases [PAD](53,54)
- Muscular weakness (34,38,39,40,47)
- Arthralgia [joint pain] (25,38,40,47)
- Bone lead mobilisation during menopause leads to decreased neurocognitive performance and increased systolic blood pressure in post-menopausal women (44)
- Wrist drop [the inability to hold the hand

extended] (47)

- Long term effect: linked to osteoporosis which has symptoms of decline in bone density and increase risk in fractures, also inhibit normal fracture healing (48,49,50,51,52)

### Other

- Headaches (2,19,21,40, 47)
- Decreased longevity (35,39)
- Adrenal dysfunction (38)
- Teeth with blue black-lines near gum base (38,40)
- Pallor (40)
- Cell damage (at blood lead level between 20 to 30 µg/dL for men and between 10 to 20 µg/dL for women) (39)
- Probable human carcinogen (56,57)

### Death (2,4,19,39,46,61)

- Increased risk of early death from cancer and all other causes (46)

## Effects of lead from animal studies

- Impaired attention, learning and short-term memory in primates (12)
- Behavioural impairment; inflexibility in behavioural change in primates (12)
- Elevated blood pressure at moderate levels (17)
- Impaired immune system in new-borns of rats fed lead [greater susceptibility to asthma] (37,45)
- Increased incidence of tumors (cancer) in rats born to mothers fed lead (45)
- Altered response to stimulant drugs; attenuation of drug induced hyperactivity in rats (2)
- Teratogenic effect causing birth deformities (4)
- Low bone density in lab animals such as mice and fractures due to lead-induced osteoporosis do not heal properly (52)

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