

Nickel

Atomic number 28
Atomic weight 58.71

Collection

Serum/Plasma 2 mL Plastic tube. No anticoagulant
Urine 20 mL Sterile Universal

Reference ranges

			Reference
Serum/plasma	nmol/L	7.5-21.5	1
Blood	nmol/L	Less than 25	1-3
Urine	nmol/L	<109	4,5
	nmol/24 h	275	6
	nmol/mmol creatinine	19	6
	µmol/mol creatinine	11 95th percentile	4

References

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Clinical

Nickel is thought to be an essential trace element and plasma concentrations are normally maintained within narrow limits. The kidney is the main site of accumulation with smaller amounts in the lung and adrenal. Nickel crosses the placenta into fetal tissue and cord blood. Nickel forms compounds with a range of oxidation states and a variety of co-ordination complexes. The main uses are in the formation of stainless steels and other corrosion resistant alloys, and for electroplating, to produce a hard tarnish resistant surface. Nickel and nickel compounds are widely used in coinage, enamel frits, ceramic glazes, as catalysts in the hydrogenation of fats and oils and as paint pigments. Substantial amounts

are used in the manufacture of rechargeable batteries and electronic components.

Biological Function

Nickel was shown to have a biological role in the 1970's when it was established as a cofactor for urease. There are now many known nickel dependent enzymes in a wide range of organisms, although a mammalian nickel enzyme has yet to be identified. One impact of nickel on human health is its role in nickel-dependant pathogens.

Deficiency

Deficiency states have been demonstrated experimentally in animals, but have not been described in man.

Toxicity

Toxicity can result from occupational exposure to certain compounds of the element. Acute toxicity can follow exposure to nickel carbonyl, a gas generated as part of the refining process for the metal. Headache, giddiness, nausea and vomiting may occur, followed in severe cases by dyspnoea, weakness, mental confusion and convulsions. Occupational exposure to nickel and its compounds can cause an allergic dermatitis which can be severe. Dermatitis due to the wearing of nickel plated objects such as jewellery is well documented.

Rarely, the nickel content of stainless steel orthopaedic implants may cause an allergic dermatitis. Exposure to nickel-containing dust can also result in sensitisation, causing conjunctivitis, pneumonitis and asthma. An increased incidence of lung and nasal sinus cancer occurs in those exposed long-term to some kinds of nickel ores. Nickel allergy cannot be detected by measuring of blood nickel concentrations.

Laboratory Indices of Exposure

Plasma or urine levels correlate with airborne concentrations, but there is much greater increase in urinary excretion. Measurement in urine is therefore preferred for monitoring exposure. There is no role for measuring nickel in most patients with surgical implants.

References

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