Mineral Analysis in Whole Blood (EDTA/Heparin)

Identifying deficiencies, but avoiding overdoses

As cofactors of enzymes, trace elements play important roles in various metabolic processes. Even latent shortages may lead to subtle impairments of physiological processes, such as reduced cognitive abilities, increased susceptibility to infection, or chronic inflammation.

Excess intake of trace elements on the other hand may have toxic effects. Diagnostics of trace element supply helps identifying deficiencies and avoids oversupplies.

Why is haematocrit correction not recommended?

Some laboratories use the ratio of mineral levels and haematocrit as an indicator, but mineral deficiencies may in fact remain undetected in cases of reduced cell counts (particularly anaemia). Mineral deficiency itself may compromise hematopoiesis. Moreover, many trace elements, like selenium and copper, are located intra- and extracellularly, or their distribution may vary among patients. The intracellular distribution of other minerals, such as chromium, manganese and molybdenum, is unknown. "Normalising" values with respect to the haematocrit may distort the result and disguise mineral deficiencies.

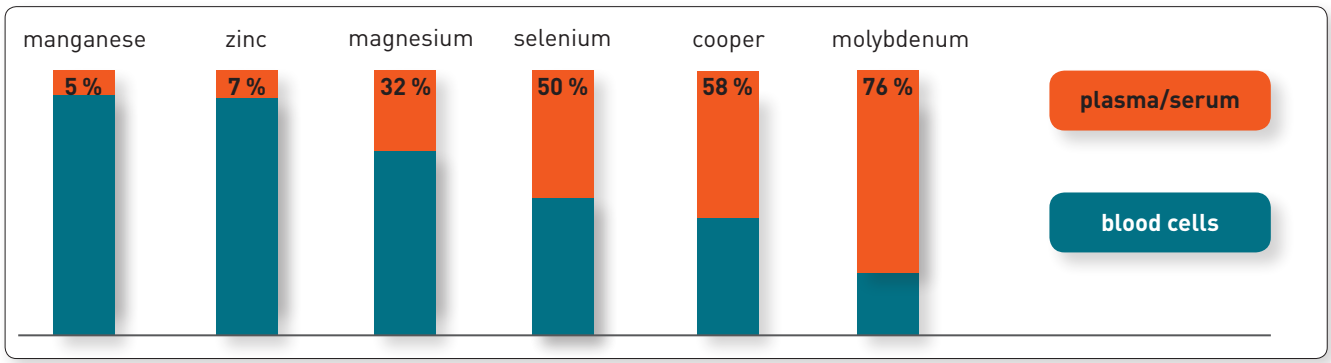

Fig. 1 Mineral analysis in lysed whole blood allows for the assessment of the overall level of supply both for primarily intra- and extracellular minerals. A haematocrit correction is not indicated, since results for most metals are distorted.

For diagnostics of trace element levels, whole blood is to be preferred over serum

Mineral analysis in lysed heparin or EDTA whole blood measures both intra- and extracellulary localized trace elements. Since metals such as potassium, zinc, magnesium, selenium, or copper are predominantly accumulated intracellularly (see fig. 1), only analysis of whole blood allows optimal assessment of trace element status.

Interactions between minerals and toxic metals should be taken into consideration

Some toxic metals show binding affinities similar to those of trace elements. This leads to competition between toxic minerals and trace elements at enzymatic binding sites. This type of antagonism has been identified for cadmium and zinc, nickel and magnesium, as well as for lead and calcium. Mercury binds to selenium with high affinity und thus inhibits its effect. Arsenic promotes selenium excretion. Therefore, a parallel detection of toxic elements provides crucial additional information ontrace element status.

Analytics

Analysis is conducted using inductively coupled plasma mass spectrometry (ICP-MS).

mineral profile	material	scale of fees for physicians (GOÄ)	content
„7+2"	EDTA or Li-heparin blood	50.13 €	magnesium, selenium, zinc, chromium, cooper, manganese, molybdenum + cadmium, nickel
„11+4"	Li-heparin blood	61.79 €	magnesium, selenium, zinc, calcium, potassium, sodium, phosphorus, chromium, copper, manganese, molybdenum + lead, cadmium, nickel, mercury
„11+6"	Li-heparin blood	81.03 €	magnesium, selenium, zinc, calcium, potassium, sodium, phosphorus, chromium, copper, manganese, molybdenum + aluminium, arsenic, lead, cadmium, nickel, mercury

Literature

- Hartmann M und Hartwig A. Disturbance of DNA damage recognition after UV-irradiation by nickel(II) and cadmium(II) in mammalian cells. Carcinogenesis 1998; 19: 617-621.
- Jennrich P. Schwermetalle – Ursache für Zivilisationskrankheiten. CO'MED 2007.
- Thomas L. Labor und Diagnose. TH-Books Verlagsgesellschaft 2012. Löffler BM, Die Calcium-Magnesium defiziente Bevölkerung: Vitamin D3 allein ist nicht genug. OM& Ernährung 2014.

Do you have questions? Our serviceteam will be happy to support you: +49 (0)30 770 01-220.

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Sample report “Mineral Analysis – 11+4 Profile”. Please find other profiles in the table on the recto.

IMD Labor Berlin

medical report

Mineralstoffanalyse im Vollblut - großes Profil (ICP-MS)

Die Analyse erfolgte im lysierten Heparin-Vollblut zur Bestimmung der intra- und extrazellulär lokalisierten Spurenelemente.

Analyt	Ergebnis		Referenzbereich	Abweichung vom Median *
magnesium	**35,5**	mg/l	30 - 40	**4** %
selenium	**65,5**	µg/l	90 - 230	**-39** %
zinc	**4,5**	mg/l	4,5 - 7,5	**-17** %
calcium	**49**	mg/l	55 - 70	**-20** %
potassium	**1342**	mg/l	1386 - 1950	**-15** %
sodium	**1678**	mg/l	1500 - 1850	**3** %
phosphorus	**463**	mg/l	403 - 577	**7** %
chromium	**0,41**	µg/l	0,14 - 0,52	**71** %
copper	**0,75**	mg/l	0,70 - 1,39	**-9** %
manganese	**14,2**	µg/l	8,3 - 15,0	**27** %
molybdenum	**0,5**	µg/l	0,3 - 1,3	**0** %
Wechselwirkungen mit toxischen Metallen:				
lead	**48,6**	µg/l	< 28	
cadmium	**2,8**	µg/l	< 0,6	
nickel	**1,7**	µg/l	< 3,8	
mercury	**0,2**	µg/l	< 1,0	

* Die Abweichung vom Median gibt an, wie stark der Messwert vom häufigsten Wert der Referenzpopulation abweicht. Der in der Referenzpopulation häufigste Wert (Median) stellt keinen therapeutischen Zielwert dar.

Potential causes and consequences of deviant blood levels:

Selenium low:
- Low intestinal uptake due to high intake of chromium, zinc, lead, cadmium, mercury, arsenic and thallium; due to „leaky gut“; excess intake of vitamin C
- Alcohol; certain medication*
- Low intake of high selenium food (such als fish, meat, egg, nuts); agricultural products from low selenium soil
- Potential effects: oxidative stress; decreased lymphocyte function; reduced activation of natural killer cells; decreased antimicrobial activity of macrophages; decreased detoxification capacity; "leaky gut"; disturbed thyroid metabolism
- The lower limit represents the 30. percentile of our reference population, determined in the selenium deficient region of central Europe. Selenium levels in the middle normal range are recommended, as saturation of the selenium dependent glutathione peroxidase enzyme activity is usually reached above a selenium concentration of 100 µg/L. Saturation of selenoprotein P is typically reached at levels >120 µg/L.

Calcium low:
- Decreased adsorption due to high intake of iron, zinc; oral intake of aluminium, lead, cadmium; vitamin B6 or D3 deficiency; magnesium deficiency; phytate rich diet; age-related low intestinal adsorption rate; certain medications*

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Lead increased:
- Replacement of calcium; inhibition of selenium absorption
- Potential effects: disturbance of hemoglobin synthesis; decreased detoxification capacity; oxidative stress; deposition of lead phosphate in bone and teeth; allergic sensitization
- Important sources of exposure: drinking water, wild mushrooms, entrails, seefood, dust, tobacco smoke, candle smoke, e-cigarettes, waste combustion, ammunition.

Cadmium increased:
- Replacement of zinc and calcium, inhibition of intestinal selenium uptake
- Potential effects: decreased detoxification capacity; DNA damage; reduced immune function, allergic sensitization.
- Important sources of exposure: tobacco smoke, E-cigarettes, wild mushrooms, seafood, algae, cocoa, lineseed, industrial fertilizer, dental solders, tattoo dyes

*) Eine Auswahl bekannter Wechselwirkungen zwischen Medikamenten und Mineralstoffen finden Sie auf www.inflammatio.de/fachbeitraege/mikronaehrstoffe/mineralstoffanalyse/interaktionen-medikamente.html

Befund medizinisch validiert durch Dr. med. Volker von Baehr

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