bio|vis DIAGNOSTIK

DAkkS Deutsche Akkreditierungsstelle D-ML-13188-01-00

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External ID

Name	**Muster**	Date of Birth	**28.01.1966**	Order ID	**11617824**
First Name	**Muster**	Sex	Male	Order Date	08.11.2018
Sampling Date	06.11.2018 18:30	Validation Date	Thomas Gugerel	Findings Status	**Final Report**
Sample Material	U	Validation on	12.11.2018	Findings Date	13.11.2018

Test	Result	Unit	Standard Range	Previous Result
Multi-Element Analysis (MEA-TOX) after Chelate				
Essential elements				
Boron after Chelate	2395,6	µg/g Crea	< 5000	U NA) ICP-MS
Chromium after Chelate	3,93	µg/g Crea	1,00 - 4,00	U NA) ICP-MS
Iron after Chelate	**638,9**	µg/g Crea	< 400,00	U NA) ICP-MS
Cobalt after Chelate	**3,46**	µg/g Crea	< 2,50	U NA) ICP-MS
Copper after Chelate	73	µg/g Crea	< 450,00	U NA) ICP-MS
Manganese after Chelate	**54,36**	µg/g Crea	< 40,00	U NA) ICP-MS
Molybdenum after Chelate	27,3	µg/g Crea	12,00 - 80,00	U NA) ICP-MS
Selenium after Chelate	22,7	µg/g Crea	12,00 - 100,00	U NA) ICP-MS
Vanadium after Chelate	**3,20**	µg/g Crea	< 3,00	U NA) ICP-MS
Zinc after Chelate	**28329**	µg/g Crea	2000 - 22500	U NA) ICP-MS
Further trace elements				
Germanium after Chelate	<0,1	µg/g Crea	< 0,20	U NA) ICP-MS
Lithium after Chelate	30,1	µg/g Crea	< 125,00	U NA) ICP-MS
Strontium after Chelate	180,9	µg/g Crea	< 400,00	U NA) ICP-MS
Tungsten after Chelate	0,726	µg/g Crea	< 1,00	U NA) ICP-MS
Potentially toxic elements				
Aluminium after Chelate	**78,0**	µg/g Crea	< 60,00	U NA) ICP-MS
Antimony after Chelate	0,22	µg/g Crea	< 1,00	U NA) ICP-MS
Arsenic after Chelate	**31,4**	µg/g Crea	< 25,0	U NA) ICP-MS
Barium after Chelate	4,4	µg/g Crea	< 7,50	U NA) ICP-MS
Beryllium after Chelate	<0,01	µg/g Crea	< 0,25	U NA) ICP-MS
Bismuth after Chelate	0,07	µg/g Crea	< 0,10	U NA) ICP-MS
Lead after Chelate	**44,1**	µg/g Crea	< 27,50	U NA) ICP-MS
Cadmium after Chelate	**3,23**	µg/g Crea	< 1,20	U NA) ICP-MS
Caesium after Chelate	9,7	µg/g Crea	< 20,00	U NA) ICP-MS
Gd nach Chelat	<0,2	µg/g Crea	< 0,5	U NA) ICP-MS
Gallium after Chelate	<0,2	µg/g Crea	< 0,20	U NA) ICP-MS
Gold after Chelate	<0,1	µg/g Crea	< 0,10	U NA) ICP-MS
Indium after Chelate	<0,025	µg/g Crea	< 0,03	U NA) ICP-MS
Iridium after Chelate	<0,1	µg/g Crea	< 0,10	U NA) ICP-MS
Nickel after Chelate	5,5	µg/g Crea	< 7,00	U NA) ICP-MS
Palladium after Chelate	<0,05	µg/g Crea	< 0,80	U NA) ICP-MS

U=Urin

* cooperate analytics (R), A) accredited, NA) not accredited

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Test	Result	Unit	Standard Range	Previous Result	
Platinum after Chelate	<0,1	µg/g Crea	< 0,20		U NA) ICP-MS
Mercury after Chelate	**15,8**	µg/g Crea	< 6,50		U NA) ICP-MS
Silver after Chelate	<0,1	µg/g Crea	< 0,15		U NA) ICP-MS
Thallium after Chelate	**0,73**	µg/g Crea	< 0,70		U NA) ICP-MS
Titanium after Chelate	13,50	µg/g Crea	< 14,00		U NA) ICP-MS
Uranium after Chelate	0,033	µg/g Crea	< 0,05		U NA) ICP-MS
Tin after Chelate	0,6	µg/g Crea	< 2,00		U NA) ICP-MS
Zirconium after Chelate	0,4	µg/g Crea	< 2,00		U NA) ICP-MS

Changed reference range after modification and validation.

Creatinine

Creatinine (enzym.) after Chelate	538	mg/l	400 - 2786	U A) PHOT

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Toxicology

Iron

Iron is probably one of the most utilized metals all over the world and has many uses. It is an essential trace element and rarely occurs in its pure state in nature. Iron is a central component of haemoglobin and thus essential for the transport of oxygen. In addition, iron is relevant for a number of enzymes as well as in the respiratory chain.

Cobalt

The essentiality of **cobalt** – except cobalamin (vitamin B12) – remains controversial.
In case of adequate vitamin B12 consumption no cobalt deficiency could be developed.
Cobalt is applied technically

- as alloy additive
- for colour pigments
- as catalyst and
- in batteries.

Cobalt-(II)-chloride is an important compound, which was contained in every “crystal growing kit”, but today it is considered to be carcinogenic, teratogenic and mutagenic and therefore classified as toxic. $CoCl_2$ is used for example as humidity indicator in desiccants. Cobalt-(II)-nitrate and sulphate are used for colour pigments. Toxicity is almost identical with $CoCl_2$.
Aside from carcinogenicity and mutagenicity, chronic cobalt poisoning shows in form of thyroid disorders and cardiomyopathy.
Acute toxicity is accompanied by gastro-intestinal complaints and dyspnoea. Also heart, kidney and liver damages are potentially possible.
Cobalt and cobalt compounds may have sensitizing effects.

Manganese

Manganese (Mn) is a silver, brittle transition metal which resembles iron in some properties and can be found quite often. In nature, it only occurs in a combined state. It is an essential trace element mainly involved in the function of many enzymes - not only in humans but in all organisms.
Increased values can be caused by:

- Alloy components of steel / stainless steel, aluminium and copper
- Welding and soldering additives
- Activator in luminescent materials (LEDs)
- Glass and ceramic production
- Potassium permanganate
- Dry Batteries
- Artificial fertilizer (“Thomasmehl”)
- Nuclear medicine (manganese isotopes)
- Manganese-containing well and spring water
- Manganese-containing deodorants
- Manganese-containing foods, like: rice, black tea, wheat germ, flaxseeds, oatmeal, hazelnuts, blueberries, spinach, soybeans, eggs

Furthermore, increased values also occur in case of enzyme blockades, induced by other heavy metals (Hg, Cd, Pb). Manganese possesses a great biological importance as component of diverse enzymes such as the anti-oxidative enzyme superoxide dismutase or one of the enzymes in the citrate acid cycle (isocitrate dehydrogenase). It is also important for the regulation of blood sugar, the construction of bones and cartilage and occurs in the amino acid metabolism at different stages. Manganese and zinc belong to the less toxic heavy metals so that in case of oral administration, it is usually sufficient to stop the medication. However, ab-

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sorbed through lungs manganese is dangerous (metal dusts) and may cause serious damage to the lungs. Besides, it can injure the central nervous system and have a neurotoxic effect, which manifests itself in manganism (Parkinson's disease - similar symptoms). An excessive intake can lead to impotence in men.
Further clarification of the manganese level in blood is recommended.

Vanadium

Vanadium is used in dental metal alloys. Dental alloys consist of gold and other metals in different proportions. Even high quality gold alloys consist - in addition to 70 – 90% of gold - of palladium, silver, platinum, copper and gallium with different proportions. However, low-gold alloys are composed of even up to 80% of palladium and 2 – 5% of gold, silver, copper and gallium (Staehle, 1994). Besides, chromium, cobalt, indium, ruthenium, tin and vanadium are also used for dental alloys.
Vanadium is recognized as potentially essential trace element. Intoxication with vanadium can lead to symptoms like headache, nausea, cardiovascular disruption and irritation of the respiratory tract.

Aluminium

Aluminium may cause concentration disorders, tiredness, depressive moods and EEG alterations in people with healthy kidneys.
In case of renal insufficiency, in addition to neuropsychiatric effects, osteomalacia as well as microcytic and hypochromic anaemia caused by aluminium intoxication have been described. So far, there is no proof for mutagenic or carcinogenic effects in humans.

Arsenic

Today, arsenic is mainly used for semi-conductor production (e.g. gallium arsenide for LEDs, ICs and FETs). In some countries arsenic compounds are also utilized for wood protection and pest control which is, however, just as controversial as the use for glass production. In earlier times arsenic compounds were also applied medically (e.g. Fowler's solution = potassium arsenide solution) against fever or later sodium hydrogen arsenate (Atosyl) against skin diseases and narcolepsy. However, the most famous medicinal compound is arsphenamine (Salvarsan) which was introduced by Paul Ehrlich in his "Institute for Experimental Therapy" in Frankfurt as first reliably effective drug against syphilis. The acute poisoning caused, for example by arsenic-(III)-oxide (As_2O_3), leads to severe gastrointestinal symptoms followed by cramps, vision disorders, disturbed consciousness and hypothermia.100 – 300 mg of As_2O_3 are considered to be lethal. Chronic arsenic poisoning comes along with skin, mucosa and liver damages. The Mees' lines across finger nails are also characteristic for arsenic poisoning. Arsenic and many arsenic compounds are considered to be carcinogenic.

Lead

The exposure to lead has decreased significantly since the introduction of lead-free fuel.
10 % of the worldwide lead processing (especially in emerging markets), however, produce organic lead compounds (such as tetramethyl lead and tetraethyl lead) for fuel additives. Further lead sources are lead pipes (only in very old houses), paints (only for special applications such as restorations) and above all accumulators.
Chronic lead poisoning causes numerous neurological disorders, especially a reduced nerve conduction velocity and radial nerve paralysis. In addition, encephalopathy develops with various psychiatric abnormalities. Besides neurotoxicity, lead may cause nephrotoxicity which might occur as glomerular and/or tubular renal damage. The blood count shows basophilic stippling of erythrocytes (early sign – but microscopic blood count necessary) and only much later hypochromic anaemia by inhibiting the delta-aminolevulinic acid dehydratase.
A chronic lead intake is particularly devastating for children as it leads to irreversible intelligence deficits, growth disorders (through interactions in the vitamin D metabolism), psychomotor abnormalities and possibly pituitary disorders.

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Cadmium

The use and emission of cadmium has been decreased considerably over the last two decades but due to the accumulation in soils, there is still considerable cadmium pollution. Cadmium is absorbed by plant roots and can be found in lettuce, root vegetables, mushrooms and offal. As tobacco plants absorb cadmium, too, it is easily resorbed by the lungs with smoking, which is why smokers in particular are concerned. Contrary to the good resorption by the lungs, the intestinal tract resorbs only about 5 % of the cadmium. In case of malnutrition, however, resorption increases considerably. Bad nutritional condition may thus be a reason for cadmium poisoning.
Chronic cadmium poisoning may induce nephropathy, respiratory mucosa damage (when inhaled), lung tumours and rarely osteomalacia. Besides, cadmium probably has toxic effects to reproduction. Cadmium may interfere with the production of 1.25(OH)2-D3, therefore the vitamins 1.25(OH)2-D3 and 25-OH-D3 should be determined.

Mercury

Mercury is found as elemental form (steam), inorganic salts and organic mercury compounds (mainly methyl-mercury). From an environmental medicinal point of view mainly the inhalation of elemental mercury from amalgam fillings (before all upon removal of those) or broken mercury thermometers as well as the pollution of fish and seafood with methyl-mercury are relevant. Industrial and medicinal use of mercury on the other hand has declined significantly in industrial countries (in Germany more than 90%), but not in developing and emerging nations, what explains high marine pollution.
The symptoms of chronic mercury poisoning are for example central nervous disorders (irritability, depressions, tremor, and polyneuropathy) and mucosa damage (stomatitis, metallic taste etc).
Acute intoxication is indicated by local mucosa irritation or even cauterisation, vomiting, bloody diarrhoea, renal failure and finally circulatory decompensation.

Thallium

Today, thallium is mainly used in electrical industry. In Central Europe, thallium salts as rodenticide (especially $TlSO_4$) are rarely used anymore. In Asian fireworks, however, thallium salts, mainly $Tl(NO_3)_2$, are still used for green flame coloration (even though copper or barium salts could alternatively be used). Acute intoxication: Acute life-threatening is approx. 1 g of $TlSO_4$. After a latency period up to 2 days it causes nausea, polyneuropathy, frequently accompanied by strongly increased sensation of pain, blurred vision, hair loss and circulatory disorders.
Chronic intoxication is similar to the acute, whereas the focus is on neuropathy and visual disturbances. Besides, like in case of an arsenic intoxication, Mees' lines across the nails can appear.

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Therapy Recommendation

Initially infusion therapy with 1 – 2 g **Na-Ca-EDTA** (ethylene-diamine-tetra-acetate) in 500 ml ringer lactate – infuse over a period of 90 minutes (experienced therapists may also chose shorter application period); one infusion weekly, or in case of bad general state of health only one every 2 – 3 weeks – all in all 4-8 infusions. Instead of EDTA one can also use DTPA (1 g **$Ca\text{-}Na_3$-DTPA diethylene-triamine-penta-acetate).** This should also be infused in 500 ml ringer lactate over a period of one hour.

In addition to the infusion therapy we recommend oral intake of 500 – 1000 mg **DMSA** (dimercaptosuccinic acid) on the days the infusions are given.

On the days the infusions are given liquid consumption should be at least 2500 ml and care should be taken that the urine remains in alkaline range (if necessary additional bases should be given). For this purpose one can give additional basic balanced electrolyte solution possibly with additional B-vitamins or glutathione.
Chelate therapies cannot be applied if there is already kidney damage or if existing mineral and trace element deficiencies have not been balanced.

On infusion-free days **essential trace elements** should be given, e. g.

- 25 – 75 mg zinc
- 2,5 – 5 mg manganese
- 0.5 – 1 mg copper
- 50 – 100 µg chromium^{3+}
- 50 – 200 µg selenium
- 25 – 100 µg molybdenum

As chelate therapies also washes out these essential metals.
Even in case of only latent iron deficiency (transferrin saturation 16-22 %) addition substitution of 35-50 mg iron^{2+} is necessary, in case of transferrin saturation below 16 % - which is a manifest iron deficiency 100 – 200 mg iron-II should be given.

During the first week daily and subsequently once a week 1-2 mg – subcutaneous injections

To improve phase-II detoxification of the liver one can apply **N-acetylcysteine** (200 – 600 mg / d orally) and **garlic extract.**

The source of the heavy metal pollution should be found and refurbished.

With kind regards

Your Biovis-Diagnostik

Attention: *The recommendations given are only advice based on the compiled findings and possible clinical information. They are exclusively addressed to the therapist/physician and are **not intended** for direct transfer to the patient. They cannot replace diagnosis and therapy of the treating therapist. The recommendations for therapy are a suggestion. The responsibility for the final selection/measure/dosage lies with the medical professional/therapist responsible for each individual case. Please also note that there may be contraindications/interactions associated with the recommended medication/nutritional supplements for pre-existing primary diseases and when taking certain medication. These must be investigated by the medical professional/therapist before starting therapy.*