

Hair Mineral Analysis;

A Practitioner's Guide



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1. Introduction

Assessment of a client's elemental status is essential in diagnosis. Hair mineral analysis is a simple, non-invasive, diagnostic tool that has been developed for this exact purpose. There is no other test that can inexpensively and effectively give you, the practitioner, information on the deficiencies and excesses of 38 minerals, trace elements and heavy metals that you may need to address as part of your patient's treatment program.

With hair mineral analysis, we at MediScan, in association with BioCeuticals®, offer a reliable and accurate service for the assessment of mineral and heavy metal status as relevant to the Australian population, that is, your patients.

2. About MediScan

MediScan was established by a group of practitioners in 2006 to offer a comprehensive, world-class, scientifically sound laboratory for hair tissue analysis.

After looking world-wide for a world-class facility we found our first-rate laboratory on our very own doorstep at the University of Western Australia.

This facility has not only state-of-the-art analytical equipment, but some of the best academic minds to provide an accurate assessment of the readings.

With this facility, we are able to offer you an efficient, accurate, low-cost test with access to technical advice whenever you need it.

3. About Hair Mineral Analysis (HMA)

Now that you have accessed the HMA for your patients, it is our job at MediScan to give you a ready interpretation of the results in a user-friendly format.

The common mistake in interpretation is to read too much into the data and complicating the results.

Before analysing the results, it is important to understand the strengths and limitations of any diagnostic test you use, including hair analysis.

What a hair mineral analysis will tell you about your client:

1. Deficiencies of certain trace minerals.
2. Excesses and imbalances of trace minerals.
3. Presence of heavy metal toxicity.

What a hair mineral analysis won't tell you about your client:

1. In most cases, HMA will not give a diagnosis other than for heavy metal poisoning.
2. The value of mineral ratios may be overestimated and should be used with caution.
3. Exogenous contamination from dust, water and hair treatments should always be considered if one mineral is especially high and out of context with other minerals. Table 1 lists common exogenous contaminants and their likely sources.

Table 1: Exogenous contaminants

Mineral	Sources
Aluminium	Air/dust pollution
Cadmium	Air/dust pollution
Copper	Water from copper pipes used to wash hair
Lead	Hair restorers, e.g. Grecian 2000
Selenium	Medicated shampoos, e.g. Selsun Blue

Poor laboratory technique has been a criticism of HMA, however over 3000 reported studies on hair analysis have demonstrated HMA's strong potential as a useful clinical tool. Recent advances in testing equipment and MediScan's use of two different methods for analysis and cross-reference have gone a long way to eliminate the criticism of inconsistent results.

4. Elements and minerals that are assessed by HMA

Toxic Elements	Sources	Signs/Symptoms of Excess
Aluminium (Al)	Aluminium cookware, antacids, tobacco/cannabis smoke.	Abnormal speech, myoclonic jerks, osteomalacia, progressive encephalopathy, Alzheimer's disease, Parkinson's disease.
Antimony (Sb)	Flame retardant drapes, wall coverings and carpets, cosmetics, incinerators, smelters, anti-parasitic treatments.	Sudden infant death syndrome (SIDS) - ?, nausea, vomiting, abdominal pain, haematuria, haemolytic anaemia, renal failure.
Arsenic (As)	Metal foundry, drinking water, seafood, glues, industrial exposure, contaminated wine, contaminated herbal supplements, cigarette smoke, arsenic-treated wood.	Peripheral arteriosclerosis, "rice water" stools, proteinuria, hyperkeratosis, "milk and roses" hyperpigmentation, garlic breath odour, stomatitis.
Cadmium (Cd)	Industry, spray paint, tobacco smoke, car emissions, plants grown in cadmium-rich soil.	Femoral pain, lumbago, osteopenia, renal dysfunction, hypertension, vascular disease.
Lead (Pb)	Paint, contaminated soils (and plants grown in them), plumbing.	Microcytic hypochromic anaemia, renal dysfunction, hypertension, anorexia, muscle discomfort, constipation, metallic taste, low IQ (children).
Mercury (Hg)	Dental amalgams, fish consumption, preservatives in older vaccines, industrial release.	Mental symptoms (excessive shyness, timidity, irritability, insomnia, fatigue, poor short-term memory), tremor, stomatitis, gingivitis, gastrointestinal and renal disturbances, decreased immunity.
Uranium (U)	Military and industrial use, nuclear power plants.	Renal damage, increased bone turnover; inhalation causes lung cancer.
Other Elements	Sources	Signs/Symptoms of Excess
Barium (Ba)	X-rays; enemas; manufacture of steel, copper and other metals.	Abdominal cramping, severe hypokalaemia, paralysis, renal failure.
Beryllium (Be)	Metalwork, dental castings and prostheses, X-ray tube windows, manufacture of electrical/electronic components, radars.	Inhalation causes acute pneumonitis and chronic beryllium disease (granulomas of the lungs, liver, spleen, heart, lymph nodes, kidneys), hepatic and renal complications; skin contact may cause dermatitis and granulomas.
Bismuth (Bi)	Cosmetics, pharmaceuticals (including anti-diarrhoeal agents), solders.	Hepatotoxicity, stomatitis, hyperpigmentation of oral mucosa, kidney dysfunction.
Germanium (Ge)	Used in the produced of semiconductors.	Haemolysis; irritant to the skin, eye and respiratory tract.
Gold (Au)	Medical treatment of rheumatoid arthritis, dental crowns, gilding and electroplating.	Hepatotoxicity, haematuria, nephrotic syndrome, contact dermatitis.
Lithium (Li)	Pharmaceutical agent; nuclear power plants; manufacture of batteries, greases and aircraft fuel.	Persistent cognitive/neurological impairment, thyroid suppression, increased alopecia; may be life-threatening.
Nickel (Ni)	Stainless steel cookware, tobacco smoke, industrial exhaust fumes, batteries.	Excess iron intake; allergic individuals may experience localised dermatitis with skin contact; inhalation may cause mucosal tissue irritation (asthma, rhinitis, sinusitis) or cancers.
Palladium (Pd)	Electronic products, dental restorations.	Asthma, contact dermatitis and hypersensitivity allergic reactions in susceptible individuals.
Platinum (Pt)	Petrol refineries, automotive industry, electronics, pharmaceuticals, dentistry.	Nephrotoxicity, contact dermatitis/urticaria.
Silver (Ag)	Dental amalgams, photographic processing, burn therapy.	Acute renal failure, argria (blue-grey discolouration of the skin or mucous membrane).
Strontium (Sr)	Green leafy vegetables, Brazil nuts, nuclear waste product.	Reduced calcium absorption, decreased vitamin D levels, osteopenia, osteoporosis, cancers.
Thallium (Tl)	Cigarette smoke, plants grown in contaminated soil, exposure to old sites treated with thallium pesticides (pre-1972).	Painful neurological and gastrointestinal symptoms, alopecia, black pigmentation of the hair root.
Tin (Sn)	Stannous (tin) fluoride dentifrices (toothpaste), PVC, glass coverings, paints, pesticides, medicines (including Ayurvedic treatments).	Cancers, immunotoxicity, neurotoxicity.
Titanium (Ti)	Dental implants.	Increased inflammatory markers (e.g. nitric oxide synthase); inhaled titanium is associated with increased lung fibrosis.
Vanadium (V)	Buckwheat, parsley, soybeans, safflower oil.	Insulin insensitivity, abnormal blood lipids.
Zirconium (Zr)	Nuclear energy/medicine technology, cosmetics, water repellent textiles.	Irritation of the skin and respiratory tract.

Minerals	Sources	Clinical Indications	Signs/Symptoms of Excess
Boron (B)	Apples, soy, grapes, nuts.	Prostate cancer; to promote bone health; to modulate steroid hormones.	Stunted growth, impaired steroid hormone production.
Calcium (Ca)	Dark green vegetables, whole grains, nuts.	Tetany, osteomalacia, arrhythmia, dry skin, brittle nails, mood changes (depression or irritability).	Anorexia, constipation, nausea, vomiting, confusion, depression, fatigue, polyuria, arrhythmia, dehydration.
Chromium (Cr)	Whole grains, legumes, nuts, yeast, meats.	Glucose intolerance, sugar cravings.	None known.
Cobalt (Co)	Internal organs, nuts, yeast extract.	Vitamin B12 deficiency, pernicious anaemia.	Goitre, hypothyroidism, heart failure.
Copper (Cu)	Liver, cashews, black-eyed peas, sunflower seeds, copper pipes, copper cooking utensils.	Anaemia, refractory anaemia depigmentation, impaired glucose tolerance, cardiac-related problems, hypercholesterolaemia, neutropaenia. Excess zinc intake may reduce copper absorption.	Nausea, vomiting, hepatic necrosis, abdominal pain, splenomegaly, jaundice, weakness, tremors of arms or hands, slow movement, speech impairment, Kayser-Fliescher rings.
Iron (Fe)	Organ meats, brewer's yeast, wheat germ, egg yolk, oyster, dried beans, dried fruits (raisins, prunes).	Anaemia, fatigue, depression, palpitations, tachycardia, delay in growth or cognitive development, weakness, arthralgias, organ damage.	Cirrhosis, heart failure, skin pigmentation, diabetes, arthropathy, tarry stools, nausea, vomiting, lethargy, bradycardia, hypotension, dyspnoea, coma.
Magnesium (Mg)	Whole grains, nuts, legumes, molasses, brewer's yeast.	Muscular twitching and weakness, arrhythmias, irritability, convulsions, poor growth, insomnia, depression, hypertension, cardiovascular disease, diabetes.	Nausea, vomiting, hypotension, weakness, hyporeflexia, confusion, lethargy, decreased heart and respiration rates.
Manganese (Mn)	Tea, whole grains, legumes, nuts, green vegetables.	Hypercholesterolaemia, weight loss, increased oxidative activity.	Hallucinations, neural damage (including parkinsonism).
Molybdenum (Mo)	Beans, nuts, grains, green leafy vegetables.	Sulfur metabolism irregularities (e.g. sulfite intolerance), copper toxicity, mental disturbance, coma.	Copper deficiency, altered nucleotide metabolism, gout, oxidative stress.
Phosphorus (P)	Processed foods, soft drinks.	Use of phosphate-binding antacids.	Bone loss, osteoporosis.
Potassium (K)	Avocado, banana, mango, corn on the cob, dried beans, potatoes, tomatoes.	Muscle weakness, arrhythmia, tetany, hypertension, stroke, kidney stones, osteoporosis.	Paresthesia, confusion, cardiac depression, weakness, nausea, abdominal pain, diarrhoea.
Selenium (Se)	Garlic, onions, broccoli, Brazil nuts, brewer's yeast.	Cardiomyopathy, osteopathy, decreased cell-mediated immunity, functional hypothyroidism, impaired inflammation regulation in asthma, compromised reproductive health (male and female).	Brittle hair and nails, hair loss, fatigue, peripheral neuropathy, rashes, halitosis similar to garlic odour, irritability.
Silicon (Si)	Whole grains, bananas, raisins, beans, lentils.	General mineral deficiencies; acne; to promote health of connective tissue (hair, skin, nails, bone, cartilage); osteoporosis; aluminium excess (Alzheimer's disease).	Kidney stones.
Sodium (Na)	Salt, processed foods.	Apathy, muscle twitching, anorexia, hypotension, heart disturbances (e.g. tachycardia), vomiting, diarrhoea, perspiration.	Hypertension.
Zinc (Zn)	Red meat, oysters, whole grains.	Depressed growth; poor immune function; alopecia; eye and skin lesions; diarrhoea; alcoholism; excess intake of iron, calcium, cadmium or copper.	Immune suppression, decreased HDL, reduced copper status.

5. Interpretation of results

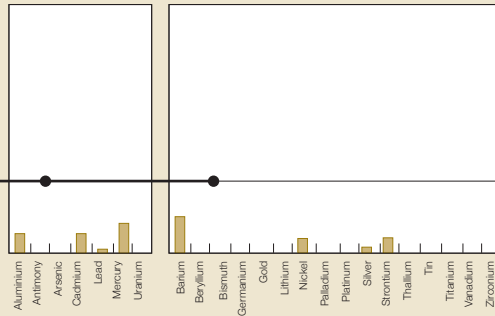
A. How to read your HMA report

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Toxic Elements

Other Elements



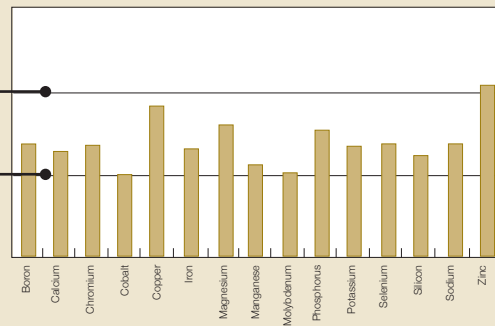
Upper limit

Results expressed in parts per million (ppm)
 Reference ranges and results © 2008, 2009 Mediscan

	23-05-08	Reference
Aluminium	3.48	0 - 12
Antimony	< 0.05	0 - 0.2
Arsenic	< 0.05	0 - 0.2
Cadmium	0.032	0 - 0.12
Lead	0.166	0 - 3.3
Mercury	0.43	0 - 1.0
Uranium	< 0.2	0 - 0.2

Date of testing

Minerals



Upper reference value

Lower reference value

Not detected

Barium	1.57	0 - 3.0
Beryllium	< 0.002	0 - 1
Bismuth	0	0 - 0.5
Germanium	< 0.1	0 - 0.4
Gold	< 0.04	0 - 0.3
Lithium	< 0.01	0 - 0.2
Nickel	0.16	0 - 0.8
Palladium	0	0 - 0.12
Platinum	< 0.13	0 - 0.6
Silver	0.07	0 - 1.2
Strontium	1.564	0 - 7.0
Thallium	0	0 - 0.2
Tin	< 0.11	0 - 1.2
Titanium	0	0 - 10
Vanadium	< 0.01	0 - 0.2
Zirconium	0	0 - 0.5

	23-05-08
Hg channel effect (Mg > Na > K)	No
Significant Pb effect (Mn, Cr, Fe high)	No
Overt or hidden copper overload	No
B > 3.0	No
Zn/Cu < 6	No
Ca > 1000	No
Hg > 4	No
Ca/K > 100	No
Na/K < 2.2	Yes
Mo < 0.03	No
Cu/Mo > 625	Yes
K < 2	No
Ba > 2.6	No

Boron	1.44	0.3 - 3.5
Calcium	702	300 - 1800
Chromium	0.13	0.04 - 0.3
Cobalt	0.03	0.002 - 0.3
Copper	23.68	10 - 27
Iron	8.5	6 - 14
Magnesium	67.3	20 - 100
Manganese	0.11	0.07 - 0.4
Molybdenum	0.033	0.02 - 0.3
Phosphorus	150	115 - 180
Potassium	7.7	1 - 20
Selenium	0.98	0.6 - 1.6
Silicon	18	7 - 55
Sodium	16.4	2 - 40
Zinc	225	145 - 220

Ratio	23-05-08	Ideal
Na/K	2.13	2.4
Ca/K	91.36	42
Zn/Cu	9.51	8
Cu/Mo	717.57	625

A picture of health

This is the chart of a 37-year-old female in good health. In this chart, all Toxic Elements and Other Elements are below the upper limit. All Minerals except zinc (which is slightly high) are between the upper and lower reference values.

This chart is a rarity. Most charts will show greater abnormality than this.

Clinical Question:

Can a “healthy chart” actually indicate problems with elimination rather than good health?

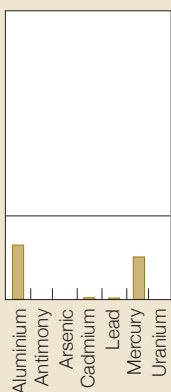
Hair mineral analysis is a powerful tool to help assess mineral status, but like any other diagnostic tool, must be used in conjunction with patient history and clinical judgment.

Therefore, consider the context of a “healthy report”. These charts are more likely to be seen at the end of extensive treatment, when a patient is in good health and is symptom-free. However, it is also possible to see these at the beginning of treatment, when your patient presents with symptoms.

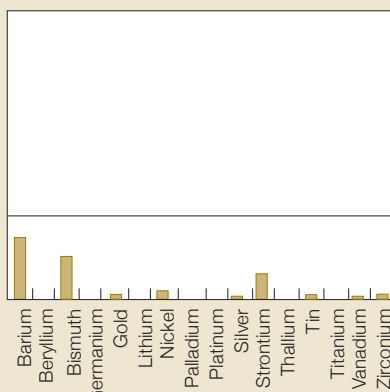
If the symptom picture and history of the patient lead you to suspect a mineral imbalance or heavy metal toxicity, supplementation with antagonistic elements will cause the toxic elements to be flushed out. The next HMA will show this as an increase in the toxic element as it is being excreted through the hair.

B. Deficiencies

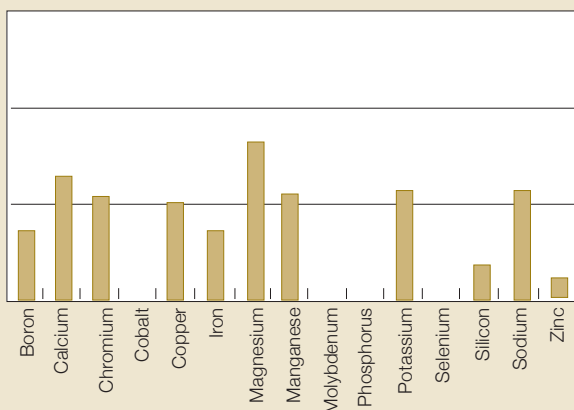
Toxic Elements



Other Elements



Minerals



General mineral deficiency

This chart illustrates a picture of general mineral deficiency. All minerals except calcium, manganese, magnesium, potassium and sodium are below their respective lower reference values.

Clinical Question:

What can cause a general mineral deficiency?

This chart was obtained from a 54-year-old female who had a history of fatigue and gastrointestinal disturbance diagnosed as irritable bowel syndrome (IBS).

Although HMA cannot make diagnoses other than that of heavy metal toxicity, this chart certainly raises a strong suspicion of dysfunctional absorption. The patient may have hypochlorhydria; pancreatic enzyme insufficiency; small bowel problems including malabsorption or leaky gut related to medication; food allergy; or a bacterial, parasitic or fungal overgrowth.

Blood tests may be required to further assess the vitamin B12, iron and zinc status.

Thorough investigation, identification and treatment of the underlying causes are required for long-term resolution of symptoms.

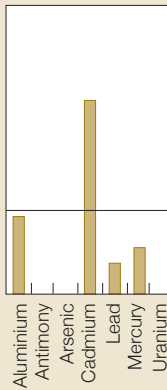
In addition, general mineral replacement is indicated.

The importance of silica

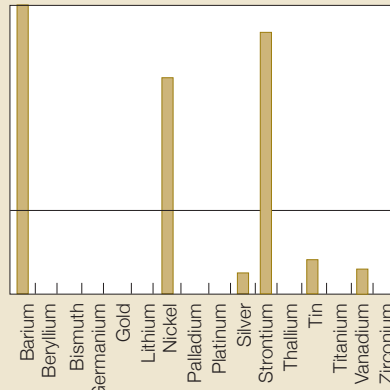
Silica levels must be brought up to normal levels before or during general mineral repletion as it facilitates the uptake and retention of other minerals.

C. Excesses and deficiencies (element antagonisms)

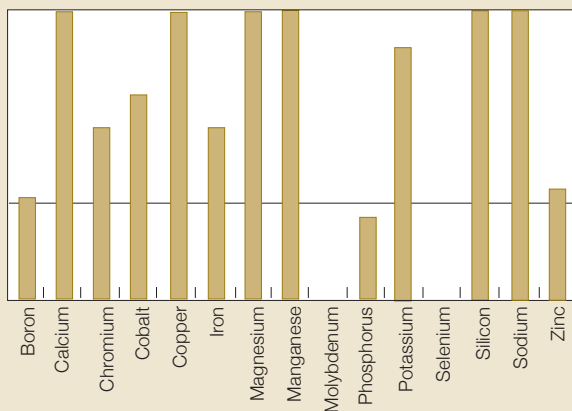
Toxic Elements



Other Elements



Minerals



Balancing act

Element antagonism is the relationship between certain elements that leads one to become deficient as another increases in tissue concentration, or vice versa.

There are a number of element antagonisms that need to be recognised in order to use HMA to best effect.

This chart shows several different mineral antagonisms taking place.

i) Mercury/selenium

Often when selenium is low, mercury will tend to be high. This is because, in cases of mercury excess, selenium will be used up as it binds in a one to one ratio to form a relatively inert selenomercurial salt.

Treatment guidelines:

- **Selenium** 50-400µg daily: Whenever a chart shows low selenium and high mercury, selenium supplementation is indicated.



ii) Cadmium/zinc

Cadmium is antagonistic to zinc.

In this chart, the high level of cadmium is lowering the tissue level of zinc. Even though zinc is within the reference range, it is at the low end and may drop below the lower limit if left untreated.

Treatment guidelines:

- **Zinc** 15-65mg daily: Antagonist.
- **Selenium** 50-400µg daily: Selenium deficiency may enhance cadmium toxicity. If deficient, selenium supplementation is indicated.



iii) Aluminium/silicon

Aluminium is antagonistic to silicon.

In this chart, aluminium is tending towards a toxic level but silicon appears to be more than adequate. Reducing possible aluminium exposure is advised. The aluminium and silicon levels will need to be revisited in the next HMA.

Treatment guidelines:

- **Silica** 300mg daily: In cases of aluminium excess accompanied by silicon deficiency, silica supplementation is indicated.



v) Common antagonistic elements

Element	Antagonist
Aluminium	Silicon
Arsenic	Selenium Zinc
Cadmium	Calcium Zinc
Copper	Manganese Molybdenum Zinc
Lead	Calcium Zinc
Mercury	Selenium Zinc

iv) Copper / molybdenum, zinc, manganese

The chart shows a high copper level and correspondingly low levels of zinc and molybdenum.

The manganese level is currently high to compensate for the low molybdenum and zinc levels but will drop as the copper, zinc and molybdenum levels begin to normalise.



Treatment guidelines:

- **Zinc** 15-65mg daily: Antagonist.
- **Molybdenum** 200-500µg daily: Antagonist.
- **Antioxidants**: Protect against oxidative effects of toxicity.
- **N-acetyl cysteine**: Protects against oxidative effects of toxicity.
- **Selenium** 50-400µg daily: Selenium deficiency may enhance copper toxicity. If deficient, selenium supplementation is indicated.

D. Heavy metal toxicity

Heavy metals are involved in the pathogenesis of numerous diseases including major neurological and developmental diseases in children, and cancer, hypertension, heart disease, neurological disease and renal diseases in adults.

Hair mineral analysis is an efficient and reliable way of screening for heavy metals. This is because hair concentrates toxic metals at levels up to 10 times greater than those in the blood. Hair's major component is keratin. Keratin is rich in sulfur-containing cysteine residues and therefore has a high affinity for heavy metals. In active growth, circulating elements in the blood will bind with keratin in the hair follicle.

Hair mineral analysis gives a good record of the previous 3-6 months exposure. In addition, its ability to detect other mineral abnormalities at the time of heavy metal toxicity analysis allows for a more complete assessment for a more effective therapeutic intervention.

i) Aluminium (Al)

Toxicity symptoms/conditions: Abnormal speech, muscle spasms, osteomalacia, neurological degeneration (including Alzheimer's disease).

HMA Fact:

Hair aluminium readings can be affected by exogenous contamination as aluminium dust is common in industrial sites.

If high aluminium is suspected, reducing exposure is recommended.

Common sources: Cookware, canned drinks, antacids, deodorants, tobacco, marijuana.

Treatment guidelines:

- **Silica** 300mg daily: Antagonist.
- **Iron:** Check blood levels of iron. Maintain healthy levels; high levels may lead to increased aluminium.
- **Calcium** 800-1300mg daily: Maintain healthy levels; calcium deficiency increases aluminium absorption.
- **Zinc** 15-65mg daily: Maintain healthy levels; zinc deficiency increases neurotoxicity.
- **Phosphorus:** Lowers intestinal absorption of aluminium.
- **Probiotics:** Reduce toxic effects on intestinal microbiota.

Further investigations/treatments:

Investigate markers of bone resorption, urinary catecholamines, oxidative stress and vitamin D levels in severe aluminium toxicity.

ii) Arsenic (As)

Toxicity symptoms/conditions: Peripheral atherosclerosis, liver disease, renal disease, hyperkeratosis and skin cancers, stomatitis and dental disease, neurological disease.

HMA Fact:

As arsenic is rapidly cleared from the blood, blood levels will only indicate recent (2-3 days) exposure. Arsenic in hair, however, strongly correlates with longer-term arsenic ingestion.

Common sources: Timber treatments (pine poles for ground use), bore water, seafood, contaminated food, contaminated herbal products, cigarette smoke.

Treatment guidelines:

- **Selenium** 50-400µg daily: Binds to arsenic and renders it non-toxic; a dose up to 400µg/d will gradually reduce arsenic toxicity.

Detoxification Protocol:

- 1. Antagonism:**
 - Selenium 50-400µg daily
 - Zinc 15-65mg daily
- 2. Methylation:**
 - Folic acid 400µg daily
 - Vitamin B12 1000mg daily
- 3. Glutathione regeneration:**
 - N-acetyl cysteine
 - Alpha lipoic acid
 - Milk thistle (*Silybum marianum*)
- 4. Clearance:**
 - Chlorella

Further investigations/treatments:

Investigate serum betacarotene and vitamin A levels; supplement if deficient.

For severe arsenic toxicity, chemical DMPS (2,3-dimercapto-1-propanesulfonic acid) challenge and chelation may be necessary.

iii) Cadmium (Cd)

Toxicity symptoms/conditions: Back pain, osteopenia, renal disease, cardiovascular disease (including hypertension).

HMA Fact:

Cadmium in hair is strongly related to exposure and toxicity.

Common sources: Industrial release (including smelters and power stations), spray paints, welding, cigarettes, car emissions.

Treatment guidelines:

- **Zinc** 15-65mg daily: Antagonist.
- **Calcium** 800-1300mg daily: Antagonist.
- **Vitamins A, C and E:** Antioxidants, neutralising, detoxifying.
- **Iron** 10-30mg daily: Check blood levels of iron. Maintain healthy levels; iron deficiency predisposes to cadmium toxicity.
- **Vitamin D:** Levels should be checked; supplement as necessary.
- **Selenium, alpha lipoic acid, N-acetyl cysteine:** Glutathione replenishment, liver detoxification, reduce free radical damage.
- **Pectin, chlorella, coriander:** Chelators.

Further investigations/treatments:

For severe cases, DMSA (dimercaptosuccinic acid) chelation may be necessary.

iv) Lead (Pb)

Toxicity symptoms/conditions: Microcytic anaemia, renal failure, hypertension, brain and cognitive impairment (including low IQ and poor brain development in children), anorexia, fatigue, myalgia, osteomalacia.

In pregnancy, lead can leach from the maternal bone and cause foetal impairment.

HMA Fact:

Hair mineral analysis has been a useful tool in assessing exposure and body burden. It is especially useful in children and has been under-utilised in exposed children.

Common sources: Contamination from mines and industrial areas, electrical wiring, hair restorers, paint (particularly old paints removed in renovations), contaminated soil, old roofing and plumbing.

Treatment guidelines:

- **Zinc** 15-65mg daily: Antagonist.
- **Calcium** 800-1300mg daily: Antagonist.
- **Selenium** 50-400µg daily: Binds to lead directly.
- **Magnesium** 300-750mg daily: Deficiency increases gastrointestinal absorption of lead.
- **Vitamin C** 500-1000mg daily: Deficiency increases gastrointestinal absorption of lead.
- **Vitamin D:** Check blood levels and supplement as necessary; deficiency increases gastrointestinal absorption of lead.
- **Iron** 10-30mg daily: Check blood levels of iron. Maintain healthy levels; iron deficiency enhances gastrointestinal absorption of lead.
- **Modified citrus pectin** 5g three times daily for at least one month: A good chelator; will reduce tissue levels and increase renal excretion.
- **Alpha lipoic acid:** Protects against toxic effects.
- **N-acetyl cysteine:** Glutathione replenishment.

Further investigations/treatments:

For severe cases, intravenous EDTA (ethylenediamine tetraacetic acid) challenge and chelation may be necessary.

v) Mercury (Hg)

Toxicity symptoms/conditions: Neurological changes (including behavioural changes), poor memory, insomnia, fatigue, tremor, renal impairment, hepatitis, poor immune function, allergies.

HMA Fact:

Hair mineral analysis gives a good assessment of mercury exposure over a 3-6 month period.

Common sources: Dental amalgams, fish, industrial release (particularly coal-fired power stations), high-fructose corn syrup, preservatives in vaccines up until 2002.

Treatment guidelines:

- **Selenium** 50-400µg daily: Antagonist; needs to be supplemented even if within normal range on HMA.
- **Zinc** 15-65mg daily: Antagonist; needs to be supplemented even if within normal range on HMA.
- **Coriander, chlorella, alpha lipoic acid, N-acetyl cysteine:** Chelating agents; should be used over a long period with periodic (6-monthly) HMA to assess progress.

Note: HMA will show increased mercury levels after six months of treatment. This is an indication of mobilisation from the tissues and will reduce over time.

Further investigations/treatments:

For serious mercury toxicity, chemical chelators – DMSA (dimercaptosuccinic acid) and DMPS (2,3-dimercapto-1-propanesulfonic acid) – may be used.

6. Notes on using HMA

- In general, hair levels of boron, chromium, copper, cobalt, lithium, manganese, molybdenum, silicon and zinc correlate with tissue levels.
- External contamination should not be excluded when the HMA shows an abnormally high level of any one element, particularly if it is not accompanied by low levels of its antagonist elements.
For example, copper contamination is common and is confirmed if blood ceruloplasmin levels and serum copper are normal. However, if zinc and molybdenum (copper's natural antagonists) are low, then copper intake is likely to be excessive.
- When one mineral is high and its natural antagonist is correspondingly low, this is a good indication of a valid test.
- Only replace minerals you know to be deficient. This may mean giving one or more individual mineral supplements rather than a mineral complex. Mineral complexes may contain minerals that are already reading high on the HMA and will only interfere with the uptake of deficient minerals.
- Cobalt is a good indicator of vitamin B12 status. Low cobalt could indicate high homocysteine levels. Check folate and vitamin B12 status with blood tests and supplement if necessary.
- Calcium levels are best checked with blood tests and bone densitometry.
- The macrominerals (sodium, potassium and chloride) should be cross-referenced with blood tests.
- Use serial HMAs (every six months) to indicate progress; modify the prescription as the levels begin to normalise.
- Use your HMA as a therapeutic guide. Use blood and urine excretory tests to validate your findings.

7. More about our laboratory

TSW Analytical Pty Ltd is the contracted company based at the University of Western Australia which exclusively conducts MediScan's hair mineral analyses.

The TSW team, headed by its scientific director Professor John Watling, is a distinguished team of scientists with backgrounds in geology, forensic chemistry, geochemistry, and organic and inorganic chemistry.

TSW has many various areas of extensive experience and expertise including the field of forensic science. TSW is frequently called upon to undertake casework for international law enforcement agencies.

Other projects at TSW include the construction of an elemental fingerprint for many tissue types including hair.

Which analytical process does TSW use?

A commonly asked question of any hair mineral analysis laboratory is: *What is the best analytical process for hair mineral analysis and do you use it?*

Table 2 compares the two most advanced processes available for hair mineral analysis.

Table 2: Comparison of HMA analytical processes	
Inductively coupled plasma mass spectrometry (ICP-MS)	Inductively coupled plasma atomic emission spectrometry (ICP-AES)
<ul style="list-style-type: none"> • Great detection limits • Excellent analytical range • Too sensitive in some circumstances 	<ul style="list-style-type: none"> • New generation technology - excellent detection limits • Good analytical range • Better for higher concentrations

TSW uses both methods and, after extensive testing, can correlate both results into one highly accurate reading.

8. Bioavailable single nutrients

Vitamin A Drops



Supports the body's
first-line natural defences

AUST L 165589 | 50mL liquid emulsion (vanilla flavour)

- Supports healthy vision (day and night), skin (wound healing and skin renewal), immunity and mucosal surfaces (conjunctival, respiratory, gastrointestinal and urinary).
- Provides nutritional support for healthy cognition in older adults.
- *Vanilla-scented - The BioCeuticals® difference!*

Each Dose (1 Drop = 40µL) Contains:

Retinyl palmitate750µgRE*
equiv. to vitamin A2500IU

*RE = retinol equivalents.

B12 Liquid



Sublingual spray
for efficient absorption

AUST L 163660 | 50mL liquid (fresh mint flavour)

- For the maintenance of a healthy nervous system, methylation pathway, red blood cells, gastrointestinal function, male and female fertility, and energy production.
- Suitable for people at risk of vitamin B12 deficiency, including the elderly, vegetarians and vegans.

Each Dose (1 Spray) Contains:

Cyanocobalamin (vitamin B12) 500µg

D3 Drops



Patent pending

Economical...convenient
...high strength!

AUST L 152218 | 50mL liquid emulsion (vanilla flavour)

- Vitamin D3 plays an intrinsic role in calcium metabolism, the immune and nervous systems; and bone, heart and kidney health.
- Suitable for those who have difficulty swallowing capsules, including children and the elderly.
- *Vanilla-scented - The BioCeuticals® difference!*

Each Dose (1 Drop = 38µL) Contains:

Cholecalciferol 8.3µg
equiv. to vitamin D3 333.3IU

Iodine Drops



Healthy pregnancy
and thyroid support

AUST L 158658 | 50mL liquid emulsion (vanilla flavour)

- Maintains healthy functioning of the thyroid gland.
- Nutritional support for a normal healthy pregnancy including healthy maturation of baby's brain, eyesight and hearing.
- *Vanilla-scented - The BioCeuticals® difference!*

Each Dose (1 Drop = 38.35µL) Contains:

Potassium iodide 125.4µg
equiv. to iodine 95.87µg
equiv. to potassium 29.52µg

Molybdenum Drops



May aid in the reduction of copper absorption

AUST L 167046 | 50mL liquid (vanilla flavour)

- May aid in the reduction of copper absorption.
- A cofactor for critical enzymes that metabolise xenobiotics and sulfites.
- *Vanilla-scented - The BioCeuticals® difference!*

Each Dose (1 Drop = 42.9µL) Contains:

Molybdenum trioxide..... 41.5µg
equiv. to molybdenum 27.7µg

Selenium Drops



Liquid antioxidant support

AUST L 162236 | 50mL liquid emulsion (orange flavour)

- A key nutrient in the body's antioxidant network.
- Nutritional support for a normal healthy heart, thyroid, immune system and sperm.
- Selenium deficiency may enhance mercury toxicity

Each Dose (1 Drop = 40µL) Contains:

Selenomethionine 62µg
equiv. to selenium..... 25µg

Silica Liquid



Highly concentrated, great-tasting liquid silica

AUST L 168572 | 50mL liquid (citrus flavour)

- Maintains healthy connective tissue of the hair, skin, nails, bone and cartilage.
- May decrease intestinal aluminium absorption.
- Supports healthy cognition of older adults (aged 65+ years).

Each Dose (5mL) Contains:

Silica colloidal anhydrous 150mg
equiv. to silica..... 70mg

Zinc Drops



Advanced technology for higher bioavailability and absorption

AUST L 169888 | 50mL liquid (vanilla flavour)

- Features SunActive® Zinc - an advanced technology for higher bioavailability and faster absorption with improved taste and smell.
- Maintains healthy immunity, blood glucose levels, prostate, sperm, growth and development
- May provide symptomatic relief of acne, improve wound healing and inhibit intestinal copper absorption.
- *Vanilla-scented - The BioCeuticals® difference!*

Each Dose (10 Drops = 400µL) Contains:

Zinc oxide..... 24mg
equiv. to zinc 19.2mg

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