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Hair Analysis and Heavy Metals – Hidden Toxicity, Detox and Questions from the Field

By Dr David L Watts, Director of Research, Trace Elements Inc

We are frequently asked, what does hair analysis reveal about heavy metals? First, heavy metals are so ubiquitous in our environment that everyone is exposed to them. They cannot be avoided completely and are found in virtually everyone to some degree. Most clinician's are aware that hair tissue mineral analysis (HTMA) measures nutritional minerals and the heavy metals that are incorporated into the hair shaft during it's development. It is also generally known and accepted that HTMA reflects the accumulation of these metals within the tissues of the body, providing a record of long-term intake, retention, or excretion of various metals. What is less recognized, but a fact nevertheless, HTMA also provides an indication of the interrelationships between nutritional minerals as well as the interrelationships between nutritional minerals and heavy metals.

Another question that is often asked, can the HTMA reveal a recent exposure to a heavy metal? Of course the answer to this question is no, in that if a heavy metal such as arsenic was ingested, then the hair by virtue of its normal development and growth could not reveal the exposure until after it has been incorporated into the hair shaft. Therefore, it would take a minimum of thirty days for this to begin to occur. This leads to the main point of discussion for this newsletter, and that is, what should be the procedure if an elevated level of a heavy metal is actually found in a patient's HTMA result?

The Laboratory Perspective

From a laboratory perspective, when an elevated heavy metal is found above a certain level in a specimen being analyzed, the elevated test result(s) for that specimen are flagged and the entire specimen is placed on hold for review. The test data for that specimen will not be released for administrative processing until the elevated test result(s) for the particular elements in question have been verified. The verification or recheck process involves the retesting of the specimen on a completely independent analytical run, which involves prepar-

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Review: Practitioner HTMA Seminar Series 2009 Infertility and Developmental Disorders

During our recent national seminar series, the importance of reliable clinical data and addressing heavy metal body burden in cases of infertility and developmental disorders was addressed. The current article by Dr David Watts explains further about the validity of HTMA in testing for toxic metals and its application in clinic.

InterClinical Laboratories would like to thank our speakers, Tracey Yeend and Zac Bobrov, and all participants who attended our successful seminar series. It is only through the on-going support we receive from you, our referring practitioner's, that we can do what we do, gazette new and worthwhile clinical information and support your practice.

Here's what some of the delegates said about this year's seminar series:

"Very informative, I'm glad I came, will incorporate into my practice, very well done" **Melbourne**
"Well worth the time and investment" **Brisbane**
"Very good, informative seminar. The presenters were motivating and resourceful" **Adelaide**
"It gave me some extra tools to work with, and it really opened my eyes to hair analysis", **Adelaide**
"Very informative and enjoyable- containing what I needed to continue my practice". **Perth**
"I booked in as soon as I received the seminar flyer and thank you, you did not disappoint." **Sydney**

If you couldn't make it to the seminar, we have put together a special DVD compilation of the entire seminar with presentation notes. Please contact us for full details.

Finally, I would like to thank all our practitioners for your continued support.

Wishing you and your patients good health and happiness.

Kindest regards,
Ian Tracton Director, InterClinical Laboratories

PS: Stay tuned for upcoming events in 2010!

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ing another testing sample from the same original submittal specimen. This is accomplished by a second specimen reweighing, redigestion and eventual follow up analytical testing. Of course, verification also requires the end result, the test value obtained by this secondary analysis, to verify or confirm the initial high test result for the heavy metal. Provided all controls and calibrations are also within acceptable limits for both the initial analysis and this follow up recheck analysis, the original test results are then released for report processing and delivery to the attending clinician. In the event that the verification or recheck process does not confirm the initial elevated level, then the lab notifies the administrative department to request a new sample from the clinician.

TEI and InterClinical Laboratories are committed to providing their practitioners and patients with the most reliable tissue mineral analysis pathology service available. Our facilities utilise the most advanced sample validation processes and ICP-MS technology ensuring test result accuracy and reproducibility.

After a high level has been confirmed or verified within the laboratory and the report has been sent to the clinician, the next logical step is to rule out the possibility of an external source that may have inadvertently contaminated the sample before it was received in the laboratory. The lab report will request another sample be sent to us for analysis, usually a pubic sample since it would be less likely to have been exposed to an environmental source such as hair dye, or work place environmental contaminant. As an example, some individuals may use a hair darkening agent on their scalp hair that contains lead acetate. Obviously this would cause a false elevation of lead on the scalp sample. Another example might be a person that works in an environment where metal dusts are present and the sample was taken after the individual came to the practitioners' office directly from that environment.

Subsequent laboratory results would therefore, be adversely reflective of elements that settled on the scalp hairs surface. A pubic sample on the other hand, would typically not be exposed to these same sources nor at the same levels. A subsequent low level in a pubic sample retest may reveal that the high level from the original scalp sample was due to the possibility of external contamination. However, on the other hand, if the pubic sample test is also elevated, then it would definitely lead to the suspicion that an excess body burden does exist. Having just stated the benefits of using pubic hair for confirmation of elevated scalp hair results, it must be emphasized that scalp hair is the sample of choice for all initial analysis.

Pubic hair is only recommended for confirmatory testing. It should also be noted that analysis of specimens requested by the lab for heavy metal confirmation analysis are provided at no charge to the health professional.

The Clinicians Perspective

From a practical standpoint, the clinician should always take further steps when finding a markedly elevated heavy metal on a patient's HTMA results. If an external contamination has been ruled out, the next step would be to determine if the exposure is on-going or if the exposure was from the past. Blood tests would help in determining this. For example, if a markedly elevated level of mercury is found in the HTMA, as stated prior, HTMA is limited and cannot determine when the exposure took place. Blood testing then, if found elevated, would indicate an on-going exposure. At this point the source of the heavy metal should be sought and eliminated as quickly as possible. However, if the blood level is not elevated, then the HTMA results would indicate an exposure from sometime in the past. Again, how far in the past cannot be determined from the HTMA test. But, since it takes approximately thirty days for the mercury to be incorporated into the hair shaft the time frame of the exposure would be considered to have occurred at least thirty days previously. However, since heavy metals are sequestered into tissues, if they are not completely eliminated, the exposure could have been from months or even years prior. It should be noted that the estimated half life of some heavy metals in the body is on the order of fifteen years. Considering this, the clinician would then have to take a careful and thorough history to find the possible source. Unfortunately, sometimes the source may never be identified.

False Positives

We have just discussed the possibilities of external contamination of heavy metals on HTMA samples, which can also be termed as "false positive". However, in many cases even a false positive has clinical significance. For example, it is well known that heavy metals contained in cosmetics, hair dyes etc, when applied to the skin, can be absorbed. There have been numerous cases of mercury toxicity from skin lightening creams applied for the removal of age spots. Cosmetics and dyes containing lead acetate are also known to be absorbed into the body and can be a source of chronic accumulation.

In the case of children, we have often seen external accumulation of arsenic in HTMA test results. The source is often from deteriorating wooden playground equipment or weathered

wooden decks. In the recent past, this wood was treated with arsenic compounds to prevent attack by termites and other insects. Therefore, even a false positive HTMA result would indicate an undue exposure to the young who are much more sensitive to minute amounts than are adults. As a result, care should be taken to avoid future contact for that child. Even when blood tests show a false positive for a heavy metal such as lead, it is considered imminently better than a false negative.

Urine Heavy Metal Challenge

Often practitioners ask if a urine challenge should be performed regardless if the HTMA is positive or negative. A proper urine challenge involves testing a pre-challenged urine collection for heavy metals and then introducing a chelating substance. A post-challenge urine collection is then tested to see if the amount of heavy metals significantly increases. Unfortunately, the urine challenge does not have reference ranges based upon a challenged range and may not take into consideration the diet or fluid intake from previous days. Therefore, if the patient ingested seafood such as clams, tuna, etc..., the post-challenge may show an elevation of mercury or arsenic and would not necessarily be reflective of body burden. Without these factors being taken into consideration, almost anyone would show a post-challenge of elevation of heavy metals.

As mentioned previously, everyone is exposed to heavy metals in the environment. Another problem with a urine chelation challenge is that the specific chelating agent for a particular heavy metal would need to be used so the challenge may need to be repeated for multiple heavy and/or toxic metals. Calcium EDTA for example, is the treatment of choice for lead toxicity, and is also useful for chromium, manganese, nickel, uranium, thorium and plutonium, but is not effective for mercury, arsenic or gold whereas, dimercaprol is effective for mercury, arsenic and gold.

Heavy Metal Burden Vs. Heavy Metal Toxicity

The difference between 'burden' and 'toxicity' should be obvious. However, I often hear practitioners use the term 'toxicity' when a heavy metal is found at almost any level on a patient's HTMA results. Using the term toxicity so loosely is absolutely wrong, and by doing so, can cause anxiety and unnecessary concern to the patient. Toxicity is defined as being above a certain defined clinical level for some heavy metals when found using HTMA testing. This elevation is also accompanied by signs and symptoms related to the specific metal. Whereas, a burden actually falls below a defined limit and without accompanying signs and symptoms commonly associated with that specific metal. Under these circumstances, it should be termed a burden or increased burden and should not be referred to as a toxicity. This is not to say that the particular metal is not having a metabolic impact or that it should not be addressed. A patient can have a heavy metal burden, while not quite a toxicity, but still manifest many signs and symptoms, due to an allergic reaction to that metal.

Heavy Metal Accumulation

Sources of heavy metals range from environmental, occupational, household (including foods, water, paints, cosmetics, etc), medical and hobbies. Heavy metals can enter the body through inhalation, intestinal absorption as well as be absorbed through the skin depending upon their chemical form. Elemental forms of heavy metals are not well absorbed, but organometalic forms are lipophilic and can readily pass through membranes and even cross the blood-brain barrier. Their absorption is facilitated by metallothionein protein ligands.

Once absorbed into the body, heavy metals have a wide distribution in various organs, glands and the central nervous system. Some metals are bone seekers and ultimately settle into the teeth and skeletal system.

Heavy metals then can effectively poison enzyme systems, increase free radical production and displace or compete with essential elements that make up metalo-enzyme complexes and compete with the absorption of nutritional minerals.

Hidden Toxicity

This is a term often used to describe the possibility of the presence of excess heavy and toxic metals that are not shown to be elevated within the toxic range on the HTMA test. It is true that heavy metals can exert adverse metabolic effects even when not found in a cautionary or high range on the HTMA test result. This is why our interpretation includes the toxic metal ratios. The toxic ratios assess heavy metals in relationship to the protective nutritional metals. As an example, when we view the calcium to lead ratio (Ca/Pb) the ideal should be a minimum of 84 to 1. In other words, calcium should be at a level at least 84 times higher than lead to be protective. If the ratio is below that minimum, then lead could be interfering with calcium and calcium functions, even if the level of lead is within it's normal reference range.

HTMA is accepted as being an indicator of tissue status or levels of minerals. Heavy metals will often be elevated when there has been a chronic exposure. However, the HTMA can indicate the "tip of the iceberg" so to speak, in that heavy metals can be stored or sequestered in organs and tissues throughout the body. Lead and cadmium for instance are bone seekers. Eventually they will be sequestered into the bone. As bone turnover occurs, lead and cadmium will constantly be released back into circulation and continually be incorporated into the hair shaft, therefore, revealing the chronic nature of exposure. However, with therapy aimed at rebalancing the mineral pattern, removal of lead and cadmium will be hastened. This will result in even higher levels on follow-up HTMA tests as greater amounts are being released from storage areas. In a

sense this can be termed a hidden excess, but in reality it may be shown all along when one views the toxic mineral ratios. Often this term (hidden toxicity) is also used with nutritional minerals that can sometimes be toxic in excess, such as copper. Often the premise that it exists is based upon symptoms and not confirmed from laboratory tests. Some practitioners may treat a patient based upon a possible toxicity rather than an actual toxicity. This is poor protocol as no one can predict with certainty if a hidden toxicity exists or not, and therapy could instead produce an induced copper deficiency. There are of course exceptions, such as patients with Wilsons Disease. Wilson's disease is a condition where there is little incorporation of copper into the hair shafts but excessive body burden or toxicity is in fact present and therapy is warranted.

Metabolic Disturbance and Heavy Metals

I often find that many practitioners will place more emphasis on the presence of heavy metals found in a patient's laboratory test rather than the patient's overall metabolic pattern. Practitioners often ask "what came first the patient's disturbed metabolic pattern or does the accumulation of heavy metals cause the metabolic disturbance." This is actually a very good question and can be difficult to answer, similar to the age old question "which came first, the chicken or the egg?" The answer is actually either can come first. It is obvious that an acute toxicity will contribute to metabolic disturbances. However, in most cases of chronic increases of body burdens, the metabolic disturbance is what leads to the increased retention of the heavy metals. This of course can be explained by "metabolic individuality" in that several individuals can be exposed to the same heavy metal which may be retained by some and yet is not retained by another.

For example, children are much more susceptible to lead retention compared to adults. There are several reasons for this but one primary reason is due to their metabolic type. Children are found to typically have a fast metabolic rate with a low tissue calcium level. Calcium is a primary preventive for lead absorption and retention. Therefore, children will retain up to thirty percent more lead compared to an adult exposed to the same amounts and who has a slow metabolic pattern.

Low thyroid activity is related to increased mercury retention and of course mercury interferes with normal thyroid function. High estrogen can enhance the retention of cadmium and cadmium can enhance the effects of estrogen in the body. Both conditions will impact the immunological and neuro-endocrine systems. A disturbance in normal digestion and protein metabolism will also allow heavy metal accumulation, as well as the diet, nutritional status in general, stress, illness, medications, etc.

Detoxification of Heavy Metals

First, it should be said that in cases of acute heavy metal poisoning, appropriate I.V. chelation therapy should be considered. However, this discussion will be confined to heavy metal burdens rather than overt toxicities. After a heavy metal burden has been found on the HTMA or any other laboratory test, the first step is to identify and remove the source. Next, a product such as sodium alginate or pectin can be used to prevent further absorption from the intestinal tract if the heavy metal is being ingested. Of course, this can be a good measure to continue during the detoxification process as those heavy metals normally eliminated through the gastrointestinal tract will be bound and excreted, rather than produce auto intoxication. Saunas and Epsom salt baths may be instituted for the elimination through the skin.

Next, antagonism of heavy metals via the appropriate protective nutrients should be instituted depending upon the patient's individual metabolic type and mineral interrelationships in order to reduce heavy metal body stores. Appropriate antioxidants are also important, as well as modification of the diet in order to further hasten the removal of heavy metals. The patient's diet should be adequate in protein and sulfur-containing amino acids which aid in the mobilization and transport of heavy metals to the eliminative organs. Correction of protein metabolism must also be addressed. Without adequate protein synthesis or the reduction in protein catabolism, detoxification will not occur with efficiency.

What Can Be Expected During Detoxification

Based upon the individuals HTMA test his/her metabolic status is assessed as well as their nutritional interrelationships. Specific therapy aimed at rebalancing the persons' mineral pattern will aid the body in mobilizing and excreting the heavy metals that are present and will usually begin within ten days to two weeks. Some symptoms of detoxification may occur and depend upon the metal being mobilized and excreted. For example, cadmium is ultimately stored on the surface of the bones. Cadmium mobilization can cause aching of the long bones similar to flu symptoms. Lead however, is stored in the medullar portion of the bones and enters into the long bones through the joints. As lead is removed through the same region, joint pains or arthritic pains may arise. These symptoms can last a few days and usually come and go as mobilization progresses. Over time, this will become less and less following the elimination. In some circumstances if the discomfort gets to the point that it may interfere with normal daily activities the detoxification process can be lessened or stopped completely. The process can be lessened by stopping or reducing the specific supplementation for a few days in order to reduce the discomfort. Detoxification can be stopped completely by taking lecithin. Lecithin will in effect stop mobilization of heavy metals from storage and reduce the discomfort almost immediately. By the way, it is important that patients undergoing detoxification are not taking lecithin or other high phosphorous containing products such as phosphatidyl choline or serine as they may prevent mobilization of heavy metals.

Follow-up the laboratory results should show a significant change in heavy metals after two to three months on therapy, depending of course upon compliance and the metabolic type. HTMA results will show either an elevation of a heavy metal if significant underlying amounts are present and are not being taken out swiftly enough by the eliminative organs, or at least a fifty percent reduction from the original level. Therapy will then be modified or remains somewhat the same depending upon changes noted in the mineral pattern and metabolic activity. Oftentimes, if multiple heavy metals are present some will change but others may not significantly change as there is apparently a priority system of elimination the body has in removing them. The removal is dependent upon metabolic changes and therefore, takes place in due course reducing the possibility that an undue burden or strain is placed upon the eliminative organs during the mobilization and removal process.

Summary of Toxic Elements Antagonists

Toxic Element	Antagonists
Arsenic (As)	SE,S, Vit E, β-carotene
Beryllium (Be)	Ca,S
Mercury (Hg)	Cu, Zn, Fe,Se,S, Vit E, β-carotene
Cadmium (Cd)	Cu, Zn, Fe,Mn,Se,S, Vit C -
Lead (Pb)	Ca,Mg,Cu, Zn, Fe,Mn,Se,S, Vit C
Aluminium (Al)	Fe, Vit C

This table shows some of the majopr minerals and antioxidant nutrients which antagonise various toxic metals and can be supplemented as chelating agents..

Case Study – Lead

Male, sixty plus years of age experiencing arthritic pain that progressively worsened over the past four years. Symptoms included; joint pains particularly in the lower extremities with swelling and neuropathy extending from the feet to the knees leading to debilitation. Pain was also noted in the hands, hips and spine. HTMA revealed an excessive lead level of over 10 milligrams percent (mg%). Lab results were held for verification. After verification, results were released to the practitioner. Telephone conversation concerning the patient verified the patient having a bluish line present along the gum line "Burtons line", which is characteristic of plumbism. The source of lead could not be verified, but possible sources are known but not yet confirmed. The practitioner was instructed to give the patient lecithin to see if in fact the signs and symptoms were caused by excessive lead. Symptoms reduced dramatically following lecithin intake. Lecithin effectively inhibited the mobilization of lead by pushing it back into the bones. Therapy included metabolic assessment from the HTMA and specific supplementation along with sodium alginate and pectin was started about the end of December, 2008. Lecithin supplementation was discontinued. During therapy the symptoms were relieved significantly with periodic exacerbations. A follow-up HTMA was performed around the end of February, 2009. The lead level was reduced to 3 mg%. Still elevated, the test results were verified again before release. In discussing the patient's response with the practitioner it was related that his symptoms were markedly relieved by over 90 percent and the patient was able to resume normal activities. Supplementation was modified based upon changes noted in recent test results and another followup test was suggested in two months.

Case Study – Mercury

Male, age forty plus who was experiencing severe neurological symptoms and headaches. HTMA revealed mercury above 1.00 mg%. The results were retested and verified before releasing the report. An HTMA mercury level above 0.5 mg% is considered mercury toxicity by the World Health Organization (WHO). The source was eventually found and eliminated. Specific metabolic assessment and supplementation was initiated and a follow-up HTMA was performed after two months. The mercury level was reduced by half. Continued follow-up and modification of supplement regime based upon changes in the patients' pattern was performed approximately every two months. After ten months HTMA mercury was reduced to within the reference range with marked remission of symptoms.

Case Study – Cadmium

Male, age seven experiencing ADD, ADHD and low weight. Initial HTMA cadmium level was only moderately elevated at 0.16 mg%. Specific therapy and metabolic assessment was instituted and follow-up analysis was performed after two months. The child's cadmium revealed an elevation of 0.35 mg%. Continued therapy and follow-up HTMA found the cadmium level lowering toward the normal reference range. This is an example of an elevation of a heavy metal with therapy, indicating that a considerably higher body burden had existed.

Conclusion

I have intentionally not included the specific nutritional therapy that was used for each of these patients. The reason is that the therapy is based upon assessment of the individual's overall metabolic pattern as seen through HTMA tests. Everyone is an individual and therapy is designed for the individual rather than a specific heavy metal or even symptoms of the patient. Therefore, it is not prudent in my opinion to attempt the treatment of individuals with heavy metal burdens with a set protocol since each case can be so variable.

Please visit our archive of Newsletters at www.interclinical.com.au <http://www.interclinical.com.au> for more clinical data on heavy metals, nutritional therapy and tissue mineral analysis (HTMA).

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Zac Bobrov has been involved in environmental and nutritional medicine for over twenty years. He is one of Australia's leading specialists in the field of tissue mineral analysis and is the Technical Director for InterClinical Laboratories. Zac is an engaging speaker with expert knowledge of natural medicine in practice.

Tracey Yeend is a Registered Nurse, Registered Midwife and Naturopath with 23 years of experience in Obstetric, Reproductive and Women's Health. She runs a busy private practice in Stirling, SA and has assisted many couples to achieve successful pregnancy outcomes utilising HTMA.

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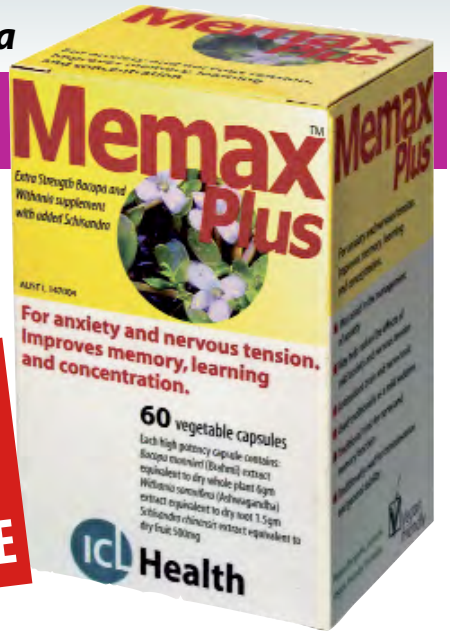

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