Anamol Laboratories

Anamol Laboratories is recognized by CAEAL for Proficiency Testing.

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Table of Contents:

The Controversy About H.M.A. Reliability

The controversy surrounding hair mineral analysis (H.M.A.) reappears from time to time, and there is a necessity to look into the questions raised.

First of all, the reliability of the analysis itself is questioned. The ideal solution would be that one should get identical results for the same sample from every laboratory performing hair analysis. This would presume that all laboratories are using the same procedure of sample preparation, identical washing procedures and similar quality control procedures. Unfortunately, there isn't a generally accepted consensus in this matter. When we approached one of the biggest laboratories in this matter, the proposal was declined. Unless this question is resolved, there is no hope to receive the expected identical results from the different laboratories!

There are claims that washing hair will lower intracellular levels of minerals, accordingly they analyze the hair sample without washing it. This may artificially elevate certain element excreted via sweat, and produce unreliable results. The washing procedure using de-ionized water containing a small quantity of non-ionic detergent may get rid of externally deposited elements, without altering the amino acid chelated minerals in the hair shaft.

The accuracy of the analytical result does not depend on the source of the sample itself, should it be blood, urine or hair. It depends on the quality control system used in the laboratory. At Anamol, we use certified analytical standards, which are checked against a ***certified*** hair sample supplied by the Shanghai Institute of Nuclear Research – Academia Sinica. Using a collected hair digest with known analytical result, controls the stability of the instrument. In case there is a deviation from the expected figures, the instrument automatically stops, and has to be restandardized to be able to continue the analysis.

Anamol is an ISO 9002 registered company and recognized by the Canadian Association of Environmental Laboratories for Proficiency Testing as well.

Therefore, we at *Anamol are confident that our results are correct* and we are not responsible for discrepancies, when compared with results of the same hair sample sent to other laboratories – large or small.

The next question is not less important. Namely, what is the most reliable source of information related to the mineral status of the body?

"Possible specimen sources include blood, urine, hair, teeth and nails. Three of these can be discounted for general use, since urine gives information only on what the body has lost (informative only for checking on removed elements in a detoxification procedure), not what it has retained; teeth are rarely used because they are not readily available; and little is known about nails – neither the normal range of elements, nor whether nails are likely to be contaminated by external contact. Two possibilities are left: blood and hair. Before the relative merits of either are considered, it must be emphasized that the two analyses are not different ways of assessing the same thing. The two methods reflect body trace element status over ***different scales of time***. Trace element concentrations in blood are transient, related to the supply of elements in the previous hours or days. In contrast, while offering no information on immediate levels, hair fixes trace elements, providing a lasting record of levels over the previous few months. (M. Laker, Lancet, 1982)"

When comparing mineral levels, it should be remembered the source of information, whether it is hair or blood. Since we are dealing with different compartments of the body, where hair reflects intracellular levels, and blood serum indicates extra cellular levels of minerals. When considering the analytical data, the dynamic nature of distribution of elements in the different compartments should be considered. Obvious, that the elements can't be represented equally in both compartments at the same time. This fact should be remembered when dealing with detoxification of elements.

Change in Fees

As prices of most of our supplies went up, and the Canadian dollar is on the low side, left us no choice, but to raise our fees. Despite this increase, Anamol's policy is to keep our services affordable. The lower price – in comparison to many other laboratories – *by no means compromises the quality of our services! It is just an expression of our social responsibility!*

The New & Improved First Page Has Arrived…..

The year 2002 had started on high note at Anamol. Starting January we introduced a colored first page with each hair analysis report.

We also made some minor adjustments in the graphic representation. Practitioners, who have received the new printout have congratulated us and expressed their appreciation of the new format. There is an additional change in the report. Several customers have drawn our attention to the unnecessary duplication of the interpretation, where the doctor's copy ends up in the wastebasket. So, from now on we will mail two colored 'first pages' and one interpretation for the patient's use.

Update on Seminars and Workshops

Anamol & Professional Health Products are sponsoring seminars on Hair Mineral Analysis and In-Office Lab Tests to favorable response. Our knowledgeable and articulate colleague, Dr. Patricia Wales, gives lectures in different cities of the country. The next seminar will take place in Winnipeg on the 23rd and 24th of March, 2002. Inquiries at 1-800-661-1366.

The monthly free workshops at our premises are in progress. At the workshop the participants will be given the opportunity to present their actual cases. Group discussion follows on interpretation and application of the given report. These meetings are proving to be the most efficient way to gain practice and understanding in the use of hair mineral analysis.

Sharing circle

In the present Newsletter we are starting a new feature, the '***Sharing Circle***'. We are asking all of our readers to share their experience, comments and suggestions regarding hair and urine analysis. Please, send us a paragraph by mail, email or fax and we will publish it in the coming newsletter.

Ask Dr. Tamari

There is a new column, called *Ask Dr. Tamari* where you may ask *a*ny questions of general interest. These will be answered in every upcoming newsletter. With specific questions or cases please call Dr. T. for a short consultation. He always finds the time to listen and share his knowledge and experience.

New Manager of Quality Control

Last but nor least, we would like to welcome to our staff Dr. L. Marai, Ph.D., analytical chemist with many years of U of T lab experience. He will be replacing D. Boomer, M.Sc.

A Review of the Literature

Mercury and Selenium concentrations in maternal and neonatal scalp hair

Mercury and selenium concentrations were determined in scalp and hair samples collected postpartum from 82 term pregnancy mothers and their neonates. Maternal mercury and selenium had median concentrations of 0.39 μg/g (range 0.1 – 2.13 μg/g) and 0.75 μg/g (range 0.1 – 3.95 μg/g), respectively, and corresponding median neonatal values were 0.24 μg/g (range 0.1 – 1.93 μg/g) and 0.52 μg/g (range 0.1 – 3.0 μg/g). Amalgam-based restorative dental treatment received during pregnancy by 27 mothers (Group I) was associated with significantly higher mercury concentrations in their neonates ($p < 0.0001$) compared to those born to 55 mothers (Group II) whose most recent history of such dental treatment was dated to periods ranging between 1 and 12 yr prior to pregnancy In the Group I mother/neonate pairs, amalgam removal and replacement in 10 cases was associated with significantly higher mercury concentrations compared to 17 cases of new amalgam emplacement. Selenium concentrations showed no significant intergroup differences. However, the selenium/mercury molar ratio values were lowest in the Group I neonates, compared to their mothers and to the Group II mother/neonate pairs. This ratio decreased as mercury concentration increased, and this interrelation was statistically significant in both groups of mother/neonate pairs. The data from this preliminary study suggest that amalgam-based dental treatment during pregnancy is associated with higher prenatal exposure to mercury, particularly in cases of amalgam removal and replacement. The ability of a peripheral biological tissue, such as hair, to elicit such marked differences in neonatal mercury concentrations provides supporting evidence of high fetal susceptibility to this form of mercury exposure. The data are discussed in relation to the differences between maternal and fetal mercury metabolisms and to mercury-selenium metabolic interactions in response to mercury exposure.

I.B-A. Razagui and S.J. Haswell. Biol. Trace Elem. Res. 81:1-19, 2001.

Calcium and magnesium content in hair as a predictor of diseases in children

The calcium and magnesium content of scalp hair taken from 153 children aged 1 – 15 years, and young people (16 – 18 years) with selected neurological disorders (hyperexcitability, losses of consciousness and epileptiform convulsions of unknown origin, etc.) were measured using the AAS method and were compared with a control group of healthy (n = 108). Statistically significant differences, $p < 0.05$, were shown to exist between the mean levels of calcium and magnesium in the hair of children with neurological disorders (calcium and magnesium levels lower by 30 – 64%, according to age group) in question and recorded in the control group. This indicates that children with such disorders suffer from significant deficiencies in such essential elements. Furthermore, children with neurological disorders are characterized by significant deficiencies in calcium in relation to magnesium, which increase with age. It might be suggested that a deficiency in calcium may be caused by a deficiency in magnesium.

T. Lech. Trace Elem. and Electrolytes. 18:112-121, 2001.

Diagnostic role of hair magnesium in migraine patients: higher than serum magnesium?

The present study was aimed at evaluating trace element changes and diagnostic role of magnesium levels in hair of migraine patients during interictal period. We assessed trace element levels in hair of migraine patients (n = 40) and control subjects (n = 21). In the group of migraineurs, magnesium ($p < 0.05$), and copper ($p < 0.001$) levels in the hair were significantly reduced with regard to the control subjects. Although the hair levels of manganese and serum levels

of magnesium are lower in migraine patients than the levels in controls, these differences were not found to be significant. Also, the mean trace element levels in the group of migraine patients showed no significant difference according to gender, age, and type of migraine (with or without aura). Our data show that some hair trace element levels change in migraine patients during interictal period and hair magnesium seems to be more valuable than serum magnesium as a diagnostic marker in migraine.

Ilhan, E. Uz, A. Var, S. Kali and O. Akyol. Trace Elem. and Electrolytes. 17:14-18, 2000.

Elemental anomalies in hair as indicators of endocrinologic pathologies and deficiencies in calcium and bone metabolism

Analytical results obtained by ICP-MS of hair samples from a group of women from Rio de Janeiro city show that abnormal Ca and P concentrations in this compartment can be an indication of pathologies affecting the metabolism of these elements. The study was conducted initially on 900 women (outpatients, >40 years). From this group, approx. 24% showed anomalously high or low Ca concentrations in hair, in some cases correlated to anomalies of other elements. In 144 cases (16%). Very high concentrations of Ca (up to 8285 mg/kg) were measured, frequently correlated with a high concentration of P (up to 4270 mg/kg), exceeding by far the reference intervals for this age/sex group. Follow-up studies of a few individuals from this group gave first indications that their abnormal hair compositions were related to endocrinologic pathologies affecting calcium/bone metabolism. Very low hair Ca-concentrations were observed in older women (72 cases, age >60 years) and related to senile osteoporosis. Complementary investigations of patients with recognized endocrinologic pathologies (hyperthyroidism, hyper- and hypoparathyroidism) and osteomalacia gave statistical support for the hypothesis that hair concentrations of Ca, P and various other trace elements are influenced characteristically by these diseases. In patients with hyperparathyroidism, both elements showed significant increase in hair, whereas patients with rickets/osteomalacia had only elevated Ca concentrations, together with suspiciously high toxic levels of Cd and various other elements (Fe, Mn, Mg, Sr, Ba). Patients with hypoparathyroidism had significantly decreased Ca and P concentrations in hair. Statistical evaluation of these data by multivariant analysis (MANOVA) using a contrast matrix and by discriminant analysis showed that elemental hair anomalies can be used to diagnose correctly the above-mentioned pathologies, demonstrating the usefulness of hair analysis as a complementary tool for the detection of disturbances in calcium/bone metabolism.

N. Miekeley, L.M. de Carvalho Fortes, C.L. Porto da Silveira and M.B. Lima. J. Trace Elem. Med. Biol. 15:46-55, 2001.

Effect of supplementation with organic selenium on mercury status as measured by mercury in pubic hair

The purpose of this study was to evaluate the effect of four months of yeast-based selenium supplementation on selenium and mercury status in subjects with low serum selenium.

The study was carried out in Rakvere, Estonia. Pubic hair mercury, serum selenium and blood selenium concentrations in 23 subjects (serum selenium < 90 μg/l) were investigated before and after selenium supplementation. Thirteen subjects were randomized into the selenium supplementation group and ten into the placebo group. The selenium supplementation group received daily 100 μg of selenomethionine. Selenium supplementation reduced pubic hair mercury level by 34 % ($p = 0.005$) and elevated serum selenium by 73% and blood selenium by 59% in the supplemented group ($p < 0.001$ for both). The study indicates that mercury accumulation in pubic hair can be reduced by dietary supplementation with small daily amounts of organic selenium in a short range of time.

K. Seppanen, M. Kantola, R. Laatikainen, K. Nyyssonen, V.-P. Valkonen, V. Kaarlopp and J.T. Salonen. J. Trace Elem. Med. Biol. 14:84-87, 2000.

Hair concentrations of calcium, iron, and zinc in pregnant and effects of supplementation

In this investigation, the concentration levels of hair elements of calcium, iron, and zinc were measured in pregnant women from Tianjin metropolis, China. The subjects were 93 cases of pregnant women who had been suffering from calcium, iron, or zinc deficiency judged by blood tests at the mid-term of the second trimester or early in the third trimester. Of these 93 cases, 82 subjects had their hair element levels measured when the blood tests were conducted. Then, they were supplied with mineral element nutrients of gluconic acidic zinc (noted as Zn-nutrient), gluconic acidic calcium (Ca-nutrient), or/and ferrous sulfate (Fe-nutrient) which were correspondent to the deficient element(s) for more than 2 mo before 84 subjects returned to hospital for further diagnoses and had their hair element levels measured for the second time. Finally, in the third trimester, or near-parturient phase, 13 subjects had their hair element levels measured again. Except for the deficiencies of calcium, iron, or/and zinc, these subjects were all healthy without symptoms of any diseases. The concentrations of hair Ca, Fe, and Zn were measured by X-ray fluorescence (XRF) spectrometry. These concentrations of the three hair elements measured at three times were statistically analyzed. From the analyses, it was clear that hair concentrations of Ca, Fe, and Zn could reflect the effects of supplementation. Also, the mutual resistant effects among Ca-, Fe-, and Zn- nutrients were revealed. However, by appropriate combination, the mutual resistant effects could be depressed and mutual promotional effects might be enhanced. Finally, it could be concluded that mineral element deficiencies might be convalesced by adequate compensations of mineral element nutrients.

P.L. Leung, H.M. Huang, D.Z. Sun and M.G. Zhu. Biol. Trace Elem. Res. 69:269-282,1999.

Hair trace elements in Friedreich's disease

Concentrations of zinc, copper, manganese, chromium, cobalt and selenium were measured in the hair obtained from subjects with Friedreich's disease, other inherited ataxias and neurological control patients. Although zinc and copper concentrations were significantly higher in Friedreich than in the two control groups, the mean values for all groups were well within the normal range. No major deficiency in zinc or selenium was demonstrated in Friedreich's disease using this approach. This does not, however, indicate that there is no defect in zinc and selenium metabolism, availability or transport in this disorder.

A. Barbeau, M. Roy and S. Paris. Can. J. Neurol. Sci. 11:620-622, 1984.

Low-dose Zinc administration as an effective Wilson's disease treatment

A case of a 11-yr-long Wilson's disease treatment in a 16-yr-old boy with neurologic presentation was analyzed and monitored. In the face of severe symptoms of chelator intolerance, a comparatively low dose of 100 mg of zinc has been administered for the entire 11-yr-long treatment. Considerable improvement of clinical status was achieved, with accompanying regression of central nevous system lesion. The parameters of copper metabolism were normalized with effective urine elimination. The low-dose oral zinc intake proved to be therapeutically effective, eliminating further copper tissue toxicity.

J. Najda, B. Stella-Holowiecka and M. Machalski. Biol. Trace Elem. Res. 80:281-284, 2001.

Role of vitamins in treatment of lead intoxication

The efficacy of thiamine, ascorbic acid, and becozinc (a pharmacological preparation containing vitamins of the B-complex group, vitamin C, and zinc) in enhancing excretion and reducing tissue burden of lead and reversing lead-sensitive biochemical alterations was investigated in lead pre-exposed rat. These vitamins were effective in mobilizing lead from blood, liver, and kidney into urine and/or feces and in restoring partially blood zinc protoporphyrin level. All the vitamins were effective in reversing completely

the lead-induced increase in blood and renal calcium levels, and becozinc was particularly effective in restoring the decreased hepatic and tibia zinc content. However, the inhibition of blood -aminolevulinic acid dehydratase activity and increase in urinary aminolevulinic acid excretion due to lead remainde uninfluenced, which may require more time for recovery. The results suggest the use of becozinc as a safe alternate to treatment of lead poisoning with the chelating agents.

S.K. Tandon and S. Singh. J. Trace Elem. Exp. Med. 13:305-315, 2000.

Report on the levels of Cadmium, Lead, and Mercury in imported rice grain samples

In an attempt to know whether highly consumed food might contribute to metal exposure, we analyzed cadmium, lead, and mercury in 27 rice grain samples commonly consumed in Saudi Arabia by atomic absorption spectrometry after acid digestion. The mean concentrations and ranges of cadmium, lead, and mercury in tested rice samples were 20.261 (range <DL – 178.026 μg/kg), 134.819 (range 23.1 – 1529.0 μg/kg), and 3.186 (range <DL – 43.573 μg/kg), respectively. The results showed high concentrations of metals and in some cases exceeded the Provisional Tolerance Weekly Intake (PTWI) recommended by FAO/WHO. It was also noted that different rice grain samples had varying concentrations of these metals. Because the bulk of literature warns against the cumulative effects of prolonged heavy metal exposure, regular consumption of rice by local populations might pose potential health problems.

I. Al-Saleh and N. Shinwari. Biol. Trace Elem. Res. 83:91-96, 2001.

EDTA chelation effects on urinary losses of Cadmium, Calcium, Chromium, Cobalt, Copper, Lead, Magnesium, and Zinc

The efficacy of a chelating agent in binding a given metal in a biological system depends on the binding constants of the chelator for the particular metals in the system, the concentration of the metals, and the presence and concentrations of other ligands competing for the metals in question. In this study, we make a comparison of the in vitro binding constants for the chelator, ethylenediaminetetraacetic acid, with the quantitative urinary excretion of the metals measured before and after EDTA infusion in 16 patients. There were significant increases in lead, zinc, cadmium, and calcium, and these increases roughly corresponded to the expected relative increases predicted by the EDTA-metal-binding constants as measured in vitro. There were no significant increases in urinary cobalt, chromium, or copper as a result of EDTA infusion. The actual increase in cobalt could be entirely attributed to the cobalt content of the cyanocobalamin that was added to the infusion. Although copper did increase in the post-EDTA specimens, the increase was not statistically significant. In the case of magnesium, there was a net retention of approximately 85% following chelation. These data demonstrate that EDTA chelation therapy results in significantly increased urinary losses of lead, zinc, cadmium, and calcium following EDTA chelation therapy. There were no significant changes in cobalt, chromium, or copper and a retention of magnesium. These effects are likely to have significant effects on nutrient concentrations and interactions and partially explain the clinical improvements seen in patients undergoing EDTA chelation therapy.

R.S. Waters, N.A. Bryden, K.Y. Patterson, C. Veillon and R.A. Anderson. Biol. Trace Elem. Res. 83:207-219, 2001.

Bioavailability and possible benefits of wheat intake naturally enrinched with selenium and its products

Bioavailability and possible benefits of wheat intake naturally enriched with selenium and its products was tested. Wheat obtained by application of an original combination and procedure of foliar supplementation of plants with Se was characterized on the average by five times higher content of Se, the main form being L-(+)-selenomethionine (SeMet). Substitution of Se-deficient wheat by wheat

naturally enriched with Se and its products contributed to the increase of daily intake on the average by 18 μg (12 – 35 μg) in volunteers, which is more than 50% of the average daily intake. Six weeks after the beginning of its application, increased daily intake of Se brought about the increase of its concentration in the plasma of the examined persons by 53%, in their erythrocytes by 37%, in their hair by 44%, and in their urine by 54%. This result was comparable to the effect obtained in the course of an 8-wk daily intake of supplements with 100 μg Se in the form of enriched bakery yeast. Analysis of glutathione peroxidase (GSH-Px) activity in blood, thiobarbituric acid reactive substances (TBARS) in plasma, lipid parameters (total cholesterol, high-density lipoprotein cholesterol, low-density lipoprotein cholesterol, and triglycerides), and glucose in serum of volunteers showed that the increased Se intake induced increased GSH-Px activity in blood and decreased concentrations of TBARS, lipid parameters, and glucose in blood. Using only one crop (wheat enriched with Se) the existing deficiency of Se in our population can be alleviated. In this way, one fourth of our population with lower Se intake than 21 μg/d will satisfy basal requirements, whereas one-half will become moderately deficient instead of distinctly deficient in Se.
I.S. Djujic, O.N. Jozanov-Stankov, M. Milovac, V. Jankovic and V. Djermanovic. Biol. Trace Elem. Res. 77:273-285, 2000.

Selenium and its role in nutrition

The review presents data available in the literature on the spread of selenium deficiency. Epidemiological surveys show that there is a potential risk for selenium deficiency in pregnant females and in 7 – 10 year-old children. The negative impact of radiation on serum selenium levels was evidenced by a survey of Chernobyl Atomic Power Station workers. Higher selenium levels in the hairs of the pubis, beard, celiac plexus, and axillary spaces than those in the hair of the head (by 1.41, 1.34, 1.36, and 1.14 times, respectively) confirm that there is a relationship between selenium and sexual hormones in the body. Dietary fiber concentrates that are derived from plant materials and contain a complex of structural carbohydrates and lignin may be used in combination with selenium compounds in human diets to prevent selenium deficiency.
L.F. Shchelkunov, M.S. Dudkin, N.A. Golubkina, V.K. Gins and P.F. Kononkov. Gig. Sanit. (5):32-35, 2000.