

HAIR TISSUE MINERAL ANALYSIS

by Dr. Lawrence Wilson, MD

HTMA (hair tissue mineral analysis) is an exciting and important medical screening test designed to provide a lot of information rapidly and inexpensively. Used correctly, as explained later, it is an extremely sophisticated method for removing all toxic metals, many thousands of toxic chemicals and hundreds of chronic infections from the body in a painless and inexpensive manner.

From a technical view, hair testing is a *biopsy* type of test. A biopsy is an analysis of a body tissue. This one detects the levels of 20 or more minerals in the hair. Hair is a soft tissue of the body, so one can say that HMA is a *soft tissue biopsy* that uses hair as the sampling tissue.

Hair is extremely useful for testing many things besides minerals. These include drugs, toxic chemicals and DNA. These, however, are not the focus of this article. At times I have heard people say that hair is not helpful for testing the body, when in fact the very opposite is the truth.

WHY USE HAIR FOR ANALYSIS?

Hair makes an excellent biopsy material because sampling is simple and non-invasive. Also, hair is a stable biopsy material. It requires no special handling and will remain viable for years. In addition, mineral levels in the hair are about ten times that of blood, making them easy to detect and measure accurately in the hair.

Mineral levels are kept relatively constant in the blood even when pathology is present. Hair mineral values often vary by a factor of ten, making measurement easier. Toxic metals are also much easier to detect in the hair. They are not found in high concentrations in the blood except right after an acute exposure. Also, blood tests can vary from hour to hour, depending upon diet, activity level, the time of day and many other factors. This is beneficial in some instances, but is not helpful when seeking an overall metabolic reading. Advancements in technology have also rendered hair mineral analysis very cost-effective and reliable when performed correctly.

WHAT DOES HAIR TESTING MEASURE?

HMA provides a measure of the *chemical elements deposited in the cells and between the cells of the hair*. It provides a reading of the deposition of the mineral in the hair during the 3-4 months during which the hair grew. It does not provide a measure of the total body load of the mineral, as some claim.

At least 20 elements are measured, depending on the laboratory. The three classes of these elements are:

- 1) **Macrominerals** such as calcium, magnesium, sodium, potassium and phosphorus.
- 2) **Trace Minerals** such as iron, zinc, copper, manganese, selenium, chromium, boron and others.
- 3) **Toxic Minerals** including lead, mercury, cadmium, arsenic, aluminum, nickel and perhaps others such as uranium and beryllium. The significance of many other minerals in the hair and in human physiology is less well understood. Therefore care must be exercised in interpreting these values.

The minerals listed above are the most important chemical elements used in the body. They are locked into the hair as it grows. Readings are reported in *parts per million (ppm)*, or in *milligrams per 100 grams (mg%)*. To convert parts per million to milligrams per 100 grams, divide the ppm number by 10.

One can assess the *levels* of these minerals, the *ratios* between the minerals, *patterns of levels and ratios*, the *changes over time of all these*, and *the rate of change in all parameters*. This provides a dynamic and intriguing picture of the changes in the body chemistry over a period of some months. Corrective interventions can be monitored and controlled easily by retesting and comparing present and previous readings.

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DOCUMENTATION

Mineral analysis by mass spectroscopy and related methods is a standard testing procedure used at laboratories and universities throughout the world. Hair mineral testing on human and animal populations has been carried out for over 50 years.

Well over two million analyses have been performed. Several thousand papers and other research have been published on this method of biological monitoring.

Regarding toxic metals, the United States Environmental Protection Agency published a 300-page study in August 1979. They reviewed over 400 medical reports on hair testing. The authors concluded that hair is a "meaningful and representative tissue for biological monitoring for most of the toxic metals". A list of some of these studies, along with others that are more recent, is found at the end of this article.

Very few physicians are trained in hair tissue mineral analysis. The author, himself medically trained, was also very skeptical about its use. However, research and clinical experience with over 40,000 patients have dispelled any doubts as to its efficacy and significance for health care.

CHALLENGES TO THE VALIDITY OF HAIR ANALYSIS

Several studies critical of hair analysis have been published. Most criticism stems from two studies published in the *Journal of the American Medical Association*. The first was published in August 1985. In this study, standard hair analysis protocol was ignored in three ways, any one of which would be enough to discredit the entire study:

- 1) Instead of using one-inch samples cut close to the scalp, a few long strands of hair were chopped up into small pieces to obtain the samples. The ends of long hair are more subject to contamination and should never be used.
- 2) Samples were washed under the kitchen tap before being sent to the laboratory. Tap water is often rich in minerals. Hair samples should never be washed in this manner.
- 3) Hair samples were mixed together by hand. It is difficult or impossible to obtain a homogenous sample this way.

Not only was the study's methodology flawed, but the author of the study is openly critical of many nutritional therapies. He is the director of a national 'anti-quackery' group. He admitted he had no professional experience with hair analysis whatsoever.

Another study appeared in JAMA, #285, #1, Jan.3, 2001. Six hair samples were cut from one person and sent to six laboratories for analysis. Flaws in this study include:

1) It compared apples and oranges. Some hair analysis laboratories wash the hair while others do not. It is common knowledge that washing hair at the laboratory will alter the readings. Yet the authors of the study criticized the fact that the readings did not come out the same from all the laboratories.

Actually, the two laboratories that use the same procedure, which is to not wash the hair, provided identical results in 6 of 9 trace minerals and extremely close results on the other three. In other words, *in the only valid comparison of hair analysis laboratories, results indicated the exact opposite conclusion than that drawn by the authors.*

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2) An unlicensed lab was included in the study. Why include a laboratory in a study that is not considered a valid testing laboratory? This makes little sense, unless one wishes to discredit the field of hair analysis. As might be expected, their results were the least accurate and were the main reason the authors concluded hair analysis is unreliable.

3) The “study” involved only one patient. The word study is in quotes because valid medical studies usually involve many, rather than one patient. This report was at best anecdotal, since one patient hardly constitutes a study. It is shocking that the *Journal of the American Medical Association* would accept such a report and print it. It is also a poor reflection on the authors that they would draw any conclusions at all from this anecdotal “study”.

4) Rather than compare the raw data, the authors compared whether readings were reported as high, normal or low. This is not a measure of the reliability of hair analysis, as they claim. This is comparing the reference ranges of various laboratories, which is another issue.

5) The authors demonstrated clear bias and ignorance of hair analysis. They referred to the 1985 JAMA study, stating, “we decided to update Barrett’s results”. This implies they were unaware or unconcerned with all the flaws in the earlier study. Also, there was no mention of the hundreds and perhaps thousands of other studies done before and since 1985 that validate hair mineral analysis.

PREPARING THE HAIR FOR TESTING

Accurate results depend on cutting hair samples correctly. A small hair sample (about 125 mg for most labs) is all that is needed. This can be cut from anywhere on the scalp or even from other parts of the body, although these are not as accurate in most cases. Thinning shears may be used if the hair is short. If thinning shears are used on long hair, it may be hard to tell which end was cut.

The hair must be cut as close as possible to the scalp to reveal the most recent metabolic activity. The long ends of the hair strands, any length greater than about 1 inch long, must be cut off and thrown away so that the sample is only about 1 inch long or less. Shorter hair is excellent and can be cut with a razor if the hair is very short. The most common sampling errors are leaving the sample over one inch long, or not sending in enough hair.

The hair sample is placed in a clean paper envelope. The sample is sent to a federally licensed clinical laboratory for analysis.

HOW IS THE HAIR ANALYZED?

The procedure described here is used at Analytical Research Laboratories in Phoenix, Arizona. Similar but not as thorough procedures may be used at other hair testing laboratories. In addition, *many laboratories wash the hair in harsh solvents, alcohol, water or detergents.* This is *not* recommended and is discussed in the section below.

Hair analysis laboratories are inspected annually by the U.S. Department of Health and Human Services, Health Care Financing Administration, Division of Health Standards and Quality. An operating license is issued only if personnel and procedures meet rigorous standards.

Hair samples arriving at the laboratory are first cut into small pieces with surgical scissors. Then a precisely weighed amount of hair is digested overnight in nitric and perchloric acid. The following day the sample is rehydrated and placed in the measuring instrument to be assessed for minerals. A small amount of hair is set aside and any readings that are far out of range are retested automatically at no extra

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charge. This is not done at many laboratories.

Analysis methods include atomic absorption spectroscopy (AA), inductively-coupled plasma (ICP), mass spectroscopy and the graphite furnace. Most laboratories use an ICP or the newer mass spectroscopy instrument. Essentially, the dissolved sample is burned at a high temperature. Each mineral gives off a characteristic spectrum or frequencies of light, which is picked up by sensitive detectors in the measuring instrument. Calibration and precise control of the flame temperature are essential to obtain accurate readings.

Hair tissue mineral analysis is not something that can be done in an office or at home. If someone offers a test that is done at the office, it is not the same test. Only about eight or nine laboratories offer commercial hair tissue mineral analysis in America and a few exist overseas. All other laboratories send hair samples to one of the few labs that have the correct equipment and licensing to perform the test.

WASHING THE HAIR AT THE LABORATORY

The danger of environmental contamination has prompted many mineral testing laboratories to wash the hair before analyzing it. However, studies indicate this is far *worse* than the occasional contamination due to an environmental agent. Studies by Raymond LeRoy, DSc. indicate clearly that *washing the hair at the laboratory erratically and unpredictably removes calcium, sodium and potassium*. Zinc, magnesium, nickel and most other elements are also affected by washing. *Thus, we recommend only using a laboratory that does not wash the hair at the laboratory.*

At this time, two labs only do not wash the hair. These are *Analytical Research Laboratories* in Phoenix, Arizona, the lab we use, or *Trace Elements, Inc.* The second laboratory is owned by a former employee of Analytical Research Labs. He understands why the hair must not be tampered with before it is analyzed at the laboratory.

Those who favor washing the hair at the lab contend that any mineral that is washed out is 'exogenous' - not really part of the hair. Judging by the excellent predictability the mineral ratios provide when the hair is not washed, one is lead to conclude that the loosely bound minerals are not simply exogenous. They are part of the biopsy material.

CONTAMINATION OF HAIR SAMPLES

Some say that hair samples are inaccurate due to hair treatments and environmental contamination. However, our experience indicates that shampoo, conditioners, rinses, light sweating and air pollution generally do not significantly affect hair readings. Most people wash their hair frequently. Most hair products do not contain many minerals that remain in the hair after the product is used. Therefore the test is not affected. Hair is not very porous, about 10% in men and 15% in women. Most contaminants do not remain within the hair.

However, swimming in pools can raise sodium and copper levels. Heavy sweating immediately before cutting the sample can raise sodium and potassium readings. 'Grecian Formula' and 'Youth Hair' hair dye contain lead. They will elevate the lead level (and should be avoided!). Head & Shoulders shampoo can elevate the zinc level. Selsun Blue shampoo can elevate the selenium level. These contaminants are usually easy to identify on a hair test because the readings are heavily skewed. Asking the patient what products are on their hair will usually be sufficient to rule out abnormal readings due to hair products.

Showering may wash out a small percentage of water-soluble minerals. However, minerals from the sweat or oil glands appear to re-establish equilibrium on the hair within a half-hour after washing. Of course, this re-equilibration cannot occur if the hair is washed after it is cut from the head at a laboratory.

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Bleach or other chemicals used in permanents will have some effect on hair readings. If possible, take a hair sample *before* having a permanent or bleaching. After a beauty parlor permanent or bleaching treatment, it is best to let the hair grow out for several weeks. Second best is to wash the hair 4-5 times after these treatments before having a hair analysis. However, if a person is very ill, a sample can be taken at any time. It may not be perfectly accurate, but will provide enough information to begin a corrective program.

TESTING HAIR VERSUS TESTING THE BLOOD OR OTHER MATERIALS

Analyzing hair tissue for chemical elements is quite different from testing blood, urine or feces, although all have great value in the right situation. No one method is superior when used correctly. Hair mineral analysis, however, is our subject and ignorance abounds regarding its use. Let us examine why hair mineral analysis is so helpful and why other tests do not measure the same thing:

1) A Systems Approach. Hair analysis as I use the test is based on *general systems theory*. Many practitioners do not approve of this use of the hair mineral test, however, so be warned if you share this article with them. General systems theory is fascinating. The basic principles are:

- 1) The whole is greater than the sum of the parts.
- 2) One cannot understand a system from simply knowing the parts.
- 3) If one can identify behaviors of the whole system and some of the parts, one can accurately predict the behavior of many other parts.

This approach to the body is quite different from conventional medicine, which often focuses on body parts or body systems rather than investigating the whole system first. This is one reason hair mineral analysis is misunderstood and at times called a fraud by medical authorities. A few of the whole system behaviors are listed here.

2) Energetic Analysis. A hair analysis can provide an energetic analysis of the body. Energy is a common denominator of health and fatigue is a common problem today. Restoring one's biochemical or adaptive energy is a key to healing. This is one of the most basic general systems principles of the human or animal body.

3) Metabolic Typing. This is an important whole system behavior, used primarily for nutritional guidance but helpful for many other uses as well.

4) Personality, Emotional, and Mental Assessment. Medical research confirms a close relationship between healing the body and certain personality or emotional traits. Hair tissue mineral analysis is helpful to assess a person's tendencies for anxiety, depression, irritability and others. One can also gain insights into emotional and mental disorders such as hyperkinetic behavior, autism, bipolar disorder, schizophrenia and other serious mental health conditions.

5) Gland and Organ Insights. Hair testing can provide indicators of glandular activity, liver and kidney function, and carbohydrate tolerance. Although other tests such as a glucose tolerance test (GTT) may be better in some cases, the hair tissue test can quickly screen for stress on major organs and a tendency for carbohydrate intolerance. At the same time, it provides insight into the cause of the problem.

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6) Toxic Metal Assessment. While hair is not best for all situations involving toxic metals, it is by far the simplest and most cost-effective way to assess general toxic metal status. This we say after some 28 years experience. Other methods of assessment, such as urine challenge tests and feces tests, are in fact better in some instances. However, the hair provides an overall reading, once again, that we find much more useful in most situations. No one can escape toxic metals today. They are everywhere and on most things we eat, touch and breathe. However, some people carry many more than others.

7) Reducing guesswork in recommending diets, nutritional supplementation and detoxification methods. Many physicians are becoming aware of natural healing methods, but apply them in a haphazard manner that can make matters worse. Hair analysis for minerals can assess a person's ability to withstand certain treatments and where problems may arise.

8) Trends or tendencies for over 50 common health conditions can be identified from a properly performed and interpreted hair tissue mineral analysis. One can begin preventive and corrective measures immediately, perhaps years before symptoms appear. This trait of hair analysis alone would save billions of dollars if it were used widely as a screening test for tendencies for diabetes, heart disease, chronic fatigue and other serious conditions.

9) Other Assessments. There are some 20 other assessments available through a properly performed and interpreted hair tissue mineral test. These are beyond the scope of this article. Many of these are discussed in other articles on this website.

10) Monitoring Progress. Hair analysis can help monitor a person's healing progress, even if the person is not following a nutritional program. Changes in body chemistry due to any cause may be reflected on the hair tissue mineral test.

CAN HAIR ANALYSIS HELP DESIGN NUTRITION PROGRAMS?

Some authors criticize hair mineral testing when it is used to recommend nutritional supplements or even foods for improving one's health. In particular, vitamins may seem difficult to recommend because the test only detects mineral levels. Let me explain how this is done, however, with a simple example.

It is known that certain vitamins, such as vitamin C, can be used to help remove toxic metals. Thus a practitioner may recommend supplementary vitamin C if a hair analysis reveals excessive toxic metals. There are many other ways the test can be used to recommend herbs, vitamins and other nutritional products.

SUMMARY

Hair tissue mineral analysis has now come of age, after some 40 years of experimental use. It is widely used in biological monitoring of animal species and its use with human beings will grow as people understand its benefits for prevention and cure of many human health conditions.