

Hair or tissue analysis to define past exposures to drugs and metals-

An update of Facts

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Hair mineral analysis has been around for decades and during all these years, the test has been considered controversial. However, in forensic toxicology hair testing for drugs and metals has quickly emerged and improved in recent years. (Kintz P.)

Fact 1. Hair testing reflects how efficiently the root was nourished (or intoxicated) over time. Hair grows approximately 1cm per months and as long as drugs or metals circulate in the blood stream, the hair follicle will be supplied. Consequently, the concentration of drugs or metals in hair tissue tells us a) that specific drugs or metals were transported by the blood stream to the hair follicle and then b) absorbed into the hair tissue.

Fact 2. The drug or metal concentration in hair does NOT reflect immediate use or exposure. Hair analysis does not replace blood or urine testing. Hair does not show what the body is exposed to NOW. Hair tells what happened in the past.

Fact 3. The concentration of drugs or metals in hair does generally NOT support the blood or urine concentration. However, when daily exposure or use continues over a given time, hair as well as blood or urine testing may provide similar results.

Example: Our research on metal analysis on physically and mentally challenged children of Punjab, India proved this. We tested hair and urine and found high concentrations of toxic metals such as lead and uranium in the hair *and* the urine of our test group. The urine results reflected immediate exposure, and the high metal concentration in hair signalled long term exposure. (Blaurock-Busch et al)

Explanation: Due to the daily intake of cadmium and uranium-rich water and food grown in uranium-rich soil, the children had been exposed to these metals on a daily basis over many months and years, if not throughout life.

Urine excretion values reflected this daily exposure. Since the body rarely excretes everything that is consumed, metals may also be stored in tissue, including hair tissue.

Fact 4: People living in polluted areas are exposed daily to higher levels of toxins than people residing in cleaner areas. The rise in chronic disease can, in part, be explained by this phenomena. In times of rising pollution, early detection of an existing exposure becomes important in the prevention of disease.

Research: High levels of arsenic, cadmium, lead, and nickel in scalp hair samples are associated with myocardial infarction (MI) patients. In this study the first, second, and third heart attack was studied. The researchers conclude that the development of heart disease seems influenced by the patient's metal burden. (Afridi HI et al)

Fact 5: The U.S. Food and Drug Administration (FDA) has recently published information stating that hair testing aids the diagnosis of autism. Also mentioned is previous research suggesting that autistic people's teeth contain atypical levels of some metals. Moreover, studies conclude that the bone surrounding the teeth of people living in polluted areas also

show higher levels of toxic metals than those living in cleaner environments. (Malara P et al 2016)

“Analyzing hair samples makes it possible to look at chemical exposures and how the body regulates them over time,” stated Edith J. Baerwald, Professor and vice chairman of environmental medicine and public health at the Icahn School of Medicine at Mount Sinai in New York City. “This is similar to how the rings of a tree can reveal its age and changing environment.”

Fact 6: Grey hair contains fewer metals

The binding and storage of metals in hair depends not only on the supply and bioavailability of them, but also on the body’s protein-metal binding ability, and that decreases with age. An indication of this is the fact that hair usually becomes thinner and lighter in weight. Due to this reduced protein-metal-binding ability, grey hair contains fewer essential elements such as calcium, magnesium, selenium etc. Fortunately, the toxic metal storage in hair tissue is also reduced in older, grey-haired people. Therefore when diagnosing and treating grey-haired people (of any age) it is important to pay attention to low hair levels of the essential elements, and at the same time take into account elevated levels of any toxic metal.

Summary of facts about the use and accuracy of testing

1. Method development and increased instrument sensitivity have improved metal analysis of all specimen, including hair.
2. Quality control samples are supplied by governmental agencies for blood, urine, hair etc, allowing laboratory personnel to double-check on measurement accuracy.
3. Hair is easily sampled and any type of scissor can be used for sample cutting.
4. Most important: only natural hair provides relevant results. Chemically treated hair (perming, bleaching, coloring) is not suitable for testing.
5. Hair samples are easily shipped. Samples are not time-sensitive.
6. Hair samples can be stored for a long, long time and the analytical end-result will not be affected.
7. No special containers are needed for shipping.
8. Hair testing is ideal for the evaluation of a chronic toxic burden in children and geriatric patients.
9. In the laboratory, hair **MUST** be carefully washed with metal-free solutions to free the sample from exogenous substances that have collected on the hair shaft (dust, conditioners, hair spray etc)
10. In the laboratory, hair samples are acid-digested. Acids used must be metal-free.
11. Sample drying is preferably done in closed-vessel containers, preventing the escape of metal fumes.
12. Hair test results only provide information about past exposure.

During the last fifty years or more, universities and research institutes, including governmental ones, have provided solid research on hair analysis.

As early as 1980, a report from the U.S. Environmental Protection Agency concluded that "human hair can be used effectively for the biological monitoring of the highest priority toxic metals - lead, cadmium, mercury and arsenic."

In 1993, another EPA report stated: “There has been an increasing interest in using hair mineral analysis for biological monitoring of human population exposure to environmental mineral pollutants. This is because hair has some ideal attributes for such purposes. It can be collected by simple, non-invasive methods, and is easily sampled and stored. Concentrations of most of the toxic trace elements, i.e. mercury and lead, in scalp hair are at least an order of

magnitude higher than those in body fluids or other easily accessible tissues. In addition, mineral elements in hair can easily be determined with good precision and sensitivity by nuclear as well as conventional methods of chemical analysis.”

At MicroTraceMinerals Laboratories we have carefully evaluated existing research. We have studied biological tissues from patients of various countries and with various diseases. This and more information is listed on our website [Hair Mineral Analysis - MicroTrace Minerals](#)

References

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