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Hair Analysis

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Theoretically, hair mineral analysis should be a great way to assess nutrient levels in a noninvasive manner. In an often-quoted 1985 study,[1] the reliability of this procedure was so poor that the author recommended government agencies step in and protect the public. The study was criticized for obtaining samples from more than one person, not taking all the samples from the scalp, and that some of the samples were too long (15 cm). Another criticisms of this study was author bias, since some of the research physicians involved have been outspoken critics of many types of alternative care and nutritional therapies.

The authors of this current study[2] felt that this diagnostic technique deserved another look after 15 years. One of the authors donated samples of her untreated brown hair, taken from several areas of the parietal and occipital regions of her head. The samples were then combined, mixed, weighed and sent to six major laboratories for analysis. The authors included tables of reference ranges, and result tables of 31 elements for which at least three of the six labs tested. I have edited the number of elements down to those that were included in the results from all six labs. I further edited the minerals into two categories. Table one shows the lab reference ranges for four multimineral toxic elements; table two contains lab reference ranges of elements commonly found in multimineral formulas, along with sodium; table three are the results of toxic metals in the donated sample; and table four shows the results of the other minerals in the test sample.

Table 1: Normal reference ranges of toxic minerals in parts per million.

Minerals	**lab #1**	**lab #2**	**lab # 3**	**lab #4**	**lab #5**	**lab #6**
Aluminum	<9	8-28	<7.0	<8.0	<10	<17.0
Arsenic	<4	0.4-2.8	<.06	<0.1	<1	<1.12
Lead	<8	2-20	<1.0	<0.8	<6	<5.0
Mercury	<2	0.2-2.8	<.95	<1.1	<1	<1.3

Comment on Reference Ranges

I did not expect different labs to have exact opinions on normal levels. However, one glance at tables **Table 1** and **Table 2** shows significant disagreements on what a normal value is. It is not surprising that, according to the authors, there was little agreement between the labs on how the donors' results were interpreted and what these results indicated.[2]

Table 2: Normal reference ranges in parts per million for minerals found in most multi-formulas.

Minerals	**lab #1**	**lab # 2**	**lab #3**	**lab #4**	**lab # 5**	**lab # 6**
Calcium	280-800	400-800	300-1200	260-1130	280-560	220-1600
Chromium	0.9-1.6	0.4-0.8	0.2-0.4	0.65-1.55	0.3-1.3	0.01-0.63
Copper	15-32	14-32	12-35	10.5-25	15-35	5.48-40
Iron	21-46	20-40	5.4-14	10-18	10-34	5.46-13.7
Magnesium	40-120	60-100	35-120	31-92	40-80	20-130
Manganese	1.2-2.4	0.6-1.8	0.15-0.65	0.08-0.29	0.7-2.5	0.07-1.0
Molybdenum	0.6-1.7	1.2-4.4	0.028-0.056	0.04-0.102	0.0-0.06	0.02-1.0
Potassium	50-180	30-160	8-38	4-22	50-150	5-40
Selenium	1.2-2.3	10-30	0.95-1.7	0.9-1.5	0.4-1.2	0.21-5.46
Sodium	130-450	50-250	12-90	6-50	120-360	10-130
Zinc	140-260	140-220	140-220	105-173	130-270	142-248

Table 3: Actual donor results of toxic hair minerals in parts per million.

Minerals	**lab #1**	**lab #2**	**lab #3**	**lab #4**	**lab #5**	**lab #6**
Aluminum	10.2	16.0	6.9	5.3	4.0	5.28
Arsenic	0.1	1.3	0.081	0.06	0.2	0.44
Lead	0.2	13.0	1.3	0.3	1.0	0.76
Mercury	0.1	0.9	0.32	0.4	2.0	0.10

Table 4: Actual donor results of hair minerals in parts per million.

Minerals	lab #1	lab #2	lab #3	lab #4	lab #5	lab #6
Calcium	270	487	270	248	270	274.36
Chromium	0.2	0.7	0.21	0.99	0.1	0
Copper	13	15	14	11	12	14.93
Iron	5	15	8.2	6.7	5	5.9
Magnesium	30	29	20	22.97	40	18.03
Manganese	0.1	0.2	0.11	0.04	0.1	0.02
Molybdenum	0.18	2.6	0.043	0.117	0.02	0.12
Potassium	30	15	50	6.8	40	0
Selenium	0.1	10	1.2	1.32	0.7	0
Sodium	70	59	34	28	70	5.01
Zinc	160	213	180	149	160	189.36

These numbers are very troubling, since the same hair from the same sites was sent to each lab. For example, aluminum is 10.2 ppm from laboratory one, which is high, according to its reference range; laboratory two measured 16 ppm, which is just about perfect, according to its reference range; and laboratory five measured aluminum as four ppm.

The copper results were much more reasonable; 13-15-14-11-12-14.9 ppm, but take a look at potassium, with 30-15-15-6.8-40-0 ppm. Laboratory one said selenium was .1 ppm, while laboratory two had selenium at 10.0 ppm, a hundred-fold difference! Laboratory five said sodium was 70 ppm, while laboratory six said sodium was five ppm. The message is that the variability of results is much too wide, especially when one considers that the samples are from, the same woman's hair. I would not expect, if a blood sample was sent to six laboratories and not mishandled, that the laboratory values would vary so widely.

When the authors of this paper discussed laboratory interpretations, they stated that laboratory one identified the donor as a slow metabolizer, and recommended the avoidance of purine protein foods and dairy foods; laboratory six identified the donor as a fast metabolizer and recommended that the consumption of dairy and purine proteins be increased. Pooled statements from the laboratories indicated the donor was at risk for anemia; adrenal insufficiency; cardiovascular disease; dysinsulinism; and passive-aggressive behavior. The authors stated that their 40-year-old co-author who donated the sample had **no clinical evidence** of any of these disorders.

Some of the laboratories also made nutritional recommendations. The authors included a table discussing this. They stated that laboratory one had recommended 25 different vitamin pills per day; laboratory two recommended 18 pills per day; laboratory five recommended 15 pills per day; laboratory six recommended eight pills per day; and laboratories three and four did not make nutritional recommendations.

I still feel that hair mineral analysis does hold potential, but colorings; soaps; shampoos; conditioners; normal hair color; site of sample; age; and individual rate of growth can all affect hair mineral content. It is this author's opinion that the hair mineral analysis testing industry needs standardization, and then to further study and decide what exactly is and is not a health hazard. In other words, much more research is needed before someone can make a health prediction based on minute variations of hair minerals - especially those not known for toxicity.

References

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2. Seidel S, Kreutcer R, Smith D, McNeel S, Gilliss D. Assessment of commercial laboratories performing hair mineral analysis. *JAMA.* 2001;285:67-72.

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