



2. Respondent caused the publication of false and potentially harmful medical advice on the web site entitled www.mercola.com.
3. On this web site www.mercola.com/1999/feb/14/armourthyrid.htm, Respondent states, "NEJM Study proves Armour Thyroid Better than Synthroid". The title is a false statement and he misstates the conclusion of the study.
4. At www.mercola.com/2000/sept/3/exercise ulcers.htm Respondent states that drinking 12 glasses of water per day and following the diet and supplementing with beneficial bacteria seem to resolve ulcers in well over 95% of the people that he cared for with ulcers. This is a claim of superior care. See Exhibit A attached hereto and made apart hereof.
5. At www.mercola.com/2000/jul/23/bee venon lyme.htm Respondent recommends 0.5 mml Bee-venom from Canada in 2.5 ml Procaine and injects 0.5 ml procain into the skin. Respondent claim this has an incredible effect in his Lyme Disease patients. Patients start to feel much better very soon, their depression and fatigue lifts, then their pain. Respondent overstates the thoughts and fails to state the consequences of this treatment.

6. Chet Day's Health and Beyond printed, "Why I Never Get Flu Shots," Respondent agrees and says "I have heard some authors state that there is a direct correlation of the number of flu shots one has and the incidence of Alzheimer's". See [www.mercola.com2000/nov/19/vaccine\\_sids.htm](http://www.mercola.com2000/nov/19/vaccine_sids.htm). Respondent states why shouldn't the head of your local health department's vaccination program be prosecuted for conspiracy to commit murder?
7. Respondent advertises the Most Consistent Form of a Miracle Treatment that I Have Ever Learned. This takes care of 85 % of most pain problem. He then lists 60 conditions from which people have claimed at least partial relief with NST. For this treatment he charges \$99.00 at [www.mercola.com/2000/sept./3/nst.htm](http://www.mercola.com/2000/sept./3/nst.htm). Respondent misleads the public with 85% of most pain claims.
8. Respondent states that there are over 20,000 pages on his web site, with over one million visitors per month.

9. These actions or omissions as alleged are grounds for revocation, suspension, or other discipline to a Certificate of Registration pursuant to 225 ILCS (2000) 60/26 (2)(3)& 225 ILCS(2000) 60/22(A)-10, 225 ILCS (2000) 60/22 (A)5.

WHEREFORE, based on these allegations, the DEPARTMENT OF FINANCIAL AND PROFESSIONAL REGULATION of the State of Illinois, DIVISION OF PROFESSIONAL REGULATION by MICHAEL J. LYONS, its Chief of Medical Prosecutions, prays that the Physician & Surgeon license of JOSEPH M. MERCOLA, D.O. be suspended, revoked, or otherwise disciplined.

Count II

1. Paragraph 1 of Count 1 is realleged as paragraph 1 of Count II.
2. Respondent states on the page called "Your First Step towards Optimal Wellness and Finding Out If This is the Type of Treatment You are Looking For" claims that he will "identify the root cause(s) of your illness rather than use symptomatic band aids." See Exhibit A attached and made a part hereof.

3. Respondent states, one of the most crucial steps you can do is to gradually switch all your fluid intake over to pure, filtered water. That will mean eventually stopping all milk, juice and soda. Respondent overstates the benefits of his practice.
4. Respondent offers Thyroid Profile to every patient at \$71.00. Thyroid Stimulating Hormone. It is improper to have every patient take this test.
5. Respondent requires hair Analysis \$76.00 See Exhibit A. Respondent claims that this helps with diet and/or supplement recommendations. He recommends hair analysis, his claims are refuted by recognized meaningful studies. See Exhibit B attached hereto and made a part hereof.
6. Other resources recommended by Respondent:
  - a. Live Cell test at \$149.00 See Exhibit A, recommended by Respondent; This test is performed by James Jordan, JD, CNC who is described as "a former attorney" who is a certified nutritional consultant and is completing his PH.D in Natural

healing and Doctorate in Naturopathy from the Clayton School of Natural Healing." See Exhibit C attached and made a part hereof. Clayton School of Natural Healing is non accredited. This test is of questionable value.

b. Respondent's therapist See Exhibit A, charges \$99.00 "who uses sophisticated bio energy techniques to rebalance organ systems that change as a result of emotional trauma or allergies." This is an improper claim by Respondent.

8. These actions or omissions as alleged are grounds for revocation, suspension, or other discipline to a Certificate of Registration pursuant to 225 ILCS (2000) 60/26 (2)(3)& 225 ILCS (2000) 60/22(A)-10, 225 ILCS (2000) 60/22 (A)5.

WHEREFORE, based on these allegations, the DEPARTMENT OF FINANCIAL AND PROFESSIONAL REGULATION of the State of Illinois, DIVISION OF PROFESSIONAL REGULATION, by MICHAEL J. LYONS, its Chief of Medical Prosecutions, prays that the Physician & Surgeon license of JOSEPH M. MERCOLA, D.O. be suspended, revoked, or otherwise disciplined.

COUNT III

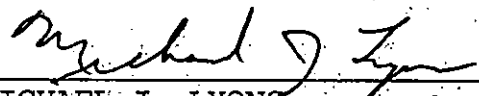
1. Paragraph 1 of Count I is realleged as paragraph 1 of Count III.
2. Respondent publishes "My Vision" on his web page at [www.mercola.com/fcgi/PrinterFriendly.fcgi](http://www.mercola.com/fcgi/PrinterFriendly.fcgi) (See Exhibit D attached and made a part hereof). "I will achieve this through Mercola.com by providing you with comprehensive, clear and researched guidance on the best nutritions, medical, emotional therapy and lifestyle choices to improve and maintain total health.
3. "I invite you to delve into the site for all its useful information, to sign up for my twice-weekly newsletter, and most of all, join me in this quest to transform the medical paradigm to one where all medical professionals are truly committed to their patients' health and well-being at the deepest levels." See Exhibit D.
4. The claims in "My Vision" claim superior treatment over other practitioners.
5. These actions or omissions as alleged are grounds for revocation, suspension, or other discipline to a Certificate of Registration, pursuant to 225 ILCS (2000) 60/26 (2) (3) & 225 ILCS (2000) 60/22(A)-10.

WHEREFORE, based on these allegations, the DEPARTMENT OF FINANCIAL AND PROFESSIONAL REGULATION of the State of Illinois, DIVISION OF PROFESSIONAL REGULATION, by MICHAEL J. LYONS, its Chief of Medical Prosecutions, prays that the Physician & Surgeon license of Joseph M. Mercola, D.O. be suspended, revoked, or otherwise disciplined.

DEPARTMENT OF FINANCIAL AND  
PROFESSIONAL REGULATION  
of the State of Illinois

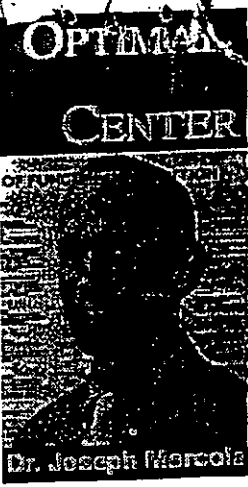
DIVISION OF PROFESSIONAL REGULATION

By:

  
MICHAEL J. LYONS  
Chief of Medical Prosecutions

Norman J. Lasko  
Attorney for the Department of  
Financial and Professional Regulation  
of the State of Illinois  
Division of Professional Regulation  
Suite 9-300  
100 West Randolph Street  
Chicago, IL 60601  
(312) 814-1690





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## Your First Step Towards Optimal Wellness And Finding Out If This Is The Type of Treatment You Are Looking For

Dr. Mercola is a D.O.

- Board Certified in Family Practice
- Specializes in Chronic Illness
- Feels that poor food choices is usually what is preventing health

### Food Changes are the First Strategy Dr. Mercola Will Use

One of the most crucial steps you can do is to gradually switch all your fluid intake over to pure, filtered water. That will mean eventually stopping all milk, juice, and soda.

Another important action is to reduce and eventually stop consuming sugar daily.

These changes do NOT need to be in place before seeing Dr. Mercola, you just need to be willing to work towards this goal. We have many resources to help you in this area.

### Dr. Mercola Will Attempt to

- Identify the root cause(s) of your illness rather than use symptomatic band aids
- Serve as your coach
- Serve as director for your individualized program of health improvement

### Do We Submit to Insurance Companies?

We submit to most PPO plans, however, we are only in network for BlueCross BlueShield PPO. If you have a PPO insurance that is out of network, your % of coverage will most likely be lower and you may also have a separate out of network deductible which needs to be met before the benefits will be in effect.

You would be required to pay your % of the entire visit each time you are here. We will submit the other portion and whatever your insurance does not cover we will bill you for.

### How do I know if I am In or Out of Network?

### What Happens at my First Appointment?

First appointment is 15 minutes with the nurse and 1 hour with Dr. Mercola.

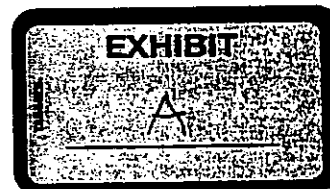
**\$200.00** for the New Patient visit

In the visit Dr. Mercola will go over your health appraisal questionnaire which is one of the forms you fill out. He will also discuss the program, treatment, and your concerns.

You will be in our office approximately 2 hours

Usually does bloodwork at this time

### What Bloodwork Will be Done?



REE Weekly Health Newsletter

our Email Address:

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ee Newsletter

ad this first

~~Metabolic Profiling Tests \$100.00~~  
Requires a **10 hour fast** of water and prescription medications only. No vitamins or food.

It is a detailed printout on your blood.

It shows all the levels of the blood and the range they should be in. If they are not in the correct range it will show what needs to be done to correct the levels through supplement and/or diet recommendations.

### **Thyroid Profile \$71.00**

Thyroid Stimulating Hormone

Thyroid; T3 Free

Free Thyroxine T4 RIA

### **Hair Analysis \$76.00**

Your hair is an appendage of your skin and holds a lot of valuable information in the tissues.

Tests for minerals and metals present in the body

Helps with diet and/or supplement recommendations

**Note:** Additional tests may need to be done depending on each individual's needs.

### **When Do I Get My Bloodwork Back?**

Approximately **1 week** later your results will be in.

You will be scheduled for an appointment with our Nutritionist Jim. He will go over your results with you in detail.

### **What Happens Next?**

Patients usually implement the changes Jim recommends for about a month and then will see Dr. Mercola for a **follow up. 30 minutes \$99.00**

Dr. Mercola may do a repeat blood test to be sure the changes you've made are working correctly and to see if anything else needs to be modified.

A repeat blood test is also a great way to see how the changes you've made are affecting you.

### **Other Resources You May Be Referred To:**

#### **Live Cell \$149.00**

A drop of blood is taken from your finger and placed under a microscope.

Jordan will be able to see how everything is effecting your digestive system, endocrine system, and if any parasites are present.

#### **Therapist \$99**

Many patients benefit from seeing therapists who use sophisticated bio-energy techniques to rebalance organ systems that change as a result of emotional trauma or allergies.

**NST \$125.00** which is an overall health optimizing treatment. It is great for back pain, Rheumatoid Arthritis, sports injuries, Asthma, TMJ.

**How Do I schedule?**

We mail the forms to you and you fill them out and return them to our office.

Once we receive them we will call on your insurance and get your information entered into our system.

You will then be called to set up your appointment.

Appointments are available in approximately **3-4 weeks** depending on your availability and Dr. Mercola's schedule.

**At the Optimal Wellness Center, you are treated as a whole person and not just a symptom. Everyone is committed to working with you to help you achieve your goal of wellness.**

If you are interested in further information please provide us with the following information and we will contact you as soon as possible.

You can block and copy the following information into an email that will pop up after you click on [summer@mercola.com](mailto:summer@mercola.com)

Answer the questions and then send your email.

Name:  
How did you hear about our office?  
Address:  
City: State: Zip:  
Daytime Phone:  
When is the best time to call?

Please also indicate if you have read the entire new patient section and read the [Nutrition Help section](#)? Yes or No

I understand, regardless of the reason for becoming a patient, that I must agree to work towards the guidelines as outlined in the Nutrition Help section. Yes or No

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Disclaimer - Newsletters are based upon the opinions of Dr. Mercola. They are not intended to replace a one-on-one relationship with a licensed health care professional and they are not intended as medical advice. They are intended as a sharing of knowledge and information from the research and experience of Dr. Mercola and his community. Dr. Mercola encourages you to make your own health decisions based upon your research and in partnership with a qualified health care professional.

## SPECIAL COMMUNICATION

# Assessment of Commercial Laboratories Performing Hair Mineral Analysis

Sharon Seidel, PhD  
 Richard Kreuzer, MD  
 Daniel Smith, DrPH  
 Sandra McNeel, DVM  
 Debra Gilliss, MD

**A**S PUBLIC HEALTH OFFICIALS IN a state health department, we were asked by a local health officer for assistance with interpreting results from hair testing performed on residents living near a hazardous waste site to assess their exposures to metals. We were surprised to learn that an average of 225 000 hair mineral tests costing \$9.6 million are performed yearly by 9 laboratories in the United States (TABLE 1). Some of these laboratories included claims in their client brochures such as "Hair element analysis . . . can assist the physician with an early diagnosis of physiological disorders associated with aberrations in essential and toxic element metabolism."

In 1985, Barrett<sup>1</sup> assessed the reliability of commercial hair mineral test results and found that "the reported levels of most minerals varied considerably between identical samples." He suggested that actions taken by the Federal Trade Commission to bar 1 laboratory from making false claims would make it "unlikely that any hair analysis laboratory will advertise directly to the public again," and he encouraged additional government action to protect the public. Because laboratory methods generally have improved since 1985 and because the Clinical Laboratory Improvement Act (CLIA) was passed in 1988 to regulate clinical testing, we decided to

For editorial comment see p 83.

**Context** Hair mineral analysis is being used by health care practitioners and promoted by laboratories as a clinical assessment tool and to identify toxic exposures, despite a 1985 study that found poor reliability for this test.

**Objective** To assess whether the reliability of data from commercial laboratories advertising multiminer hair analyses for nutritional or toxicity assessment has improved since the 1985 study.

**Design, Setting, and Participants** A split hair sample taken from near the scalp of a single healthy volunteer was submitted for analysis to 6 commercial US laboratories, which analyze 90% of samples submitted for mineral analysis in the United States.

**Main Outcome Measures** Agreement of test results for each analyte, laboratory reference ranges, laboratory characteristics, and interpretation of health implications.

**Results** Laboratory differences in highest and lowest reported mineral concentrations for the split sample exceeded 10-fold for 12 minerals, and statistically significant ( $P < .05$ ) extreme values were reported for 14 of the 31 minerals that were analyzed by 3 or more laboratories. Variations also were found in laboratory sample preparation methods and calibration standards. Laboratory designations of normal reference ranges varied greatly, resulting in conflicting classifications (high, normal, or low) of nearly all analyzed minerals. Laboratories also provided conflicting dietary and nutritional supplement recommendations based on their results.

**Conclusions** Hair mineral analysis from these laboratories was unreliable, and we recommend that health care practitioners refrain from using such analyses to assess individual nutritional status or suspected environmental exposures. Problems with the regulation and certification of these laboratories also should be addressed.

JAMA. 2001;285:67-72

www.jama.com

update Barrett's results. Hypothesizing that there should be no significant variations between test results on scalp hair from a single donor, we performed a small evaluation of interlaboratory agreement among laboratories currently offering these tests.

## METHODS

### Laboratory Selection and Characteristics

Laboratories were identified through California local health officers, other investigators, the Internet, and the laboratories themselves. A total of 9 US commercial laboratories were identified that advertised hair mineral analysis for health assessment purposes. The number of laboratories selected was limited

by the amount of scalp hair samples available from the donor. Six laboratories were selected, based first on laboratory volume of hair analyses and second on lower sample weight requirements. The 6 laboratories represent 90% of analyses performed and a cross-section of analytical methods used by all identified laboratories. Laboratory characteristics were identified from labora-

**Author Affiliations:** Impact Assessment Inc, for the California Department of Health Services, Environmental Health Investigations Branch (Dr Seidel), and California Department of Health Services, Environmental Health Investigations Branch (Drs Kreuzer, Smith, McNeel, and Gilliss), Oakland.  
**Corresponding Author and Reprints:** Sharon Seidel, PhD, California Department of Health Services, Environmental Health Investigations Branch, 1515 Clay St, Suite 1700, Oakland, CA 94612 (e-mail: sseidel@dhs.ca.gov).



## HAIR ASSESSING MINERAL ANALYSIS

tory client brochures, Internet sites, and telephone interviews of laboratory personnel. In the interviews, one author (S.S.) asked the technical staff from each laboratory a list of open-ended questions about sample preparation and analysis, data interpretation, and quality assurance/quality control.

## Specimen Preparation

Hair was donated by 1 author, a generally healthy 40-year-old white woman, with untreated brown hair. The hair was cut adjacent to the scalp from several areas of the parietal-occipital regions, using clean stainless steel scissors. Hair cuttings measuring 3.2 cm from the scalp were combined, mixed, weighed, and divided into the amounts required by each laboratory, from 0.25 to 1.0 g. One split of the hair sample was sent to each laboratory, using the sample envelope provided by the laboratory. The procedure was designed to address laboratory criticisms of the Barrett study,<sup>1</sup> that is, that the hair came from more than 1 donor, it was not taken from the scalp, and it was up to 15 cm long, leading to non-homogeneity in Barrett's pooled sample.

## Comparison of Laboratory Results

Each laboratory sent a report consisting of quantitative results and their interpretation of health implications. The distributions of reported values for each element were tested for extreme (outlier) values.<sup>2</sup> Values reported as

"<x" were treated as  $x/2$ . Differences among laboratories, adjusting for the differences across elements, were analyzed by Friedman analysis of variance for randomized blocks,<sup>2</sup> a nonparametric test that compares the ranking of each laboratory's values across elements. Independence in a cross-classified 3 × 6 table was tested by Fisher exact test,<sup>2</sup> using a search tree algorithm implemented in Stata.<sup>3</sup> The laboratories' interpretations of health implications were compared qualitatively.

## RESULTS

## Laboratory Characteristics

Characteristics of all 9 identified laboratories (A-I) are summarized in Table 1. All laboratories advertised CLIA certification in their client brochures. Follow-up with the Health Care Financing Administration (HCFA), the agency that enforces CLIA, confirmed that laboratory B had misrepresented itself as CLIA-certified. For the remaining laboratories, CLIA certifications were typically in specialty areas, such as chemistry or toxicology. (There is no CLIA specialty area for hair analysis.) All laboratories required hair samples to be submitted under the signature of a health care professional legally authorized to request laboratory tests (eg, a physician or chiropractor).

Cost for hair testing ranged from \$30 to \$69 per sample for a typical analysis, including the laboratory's interpre-

tation. The number of hair elements routinely analyzed ranged from 16 to 39. Nineteen elements analyzed by all laboratories, except laboratory I (Co, Ni, and P were not analyzed), included Al, As, Ca, Cd, Co, Cr, Cu, Fe, Hg, K, Mg, Mn, Mo, Na, Ni, P, Pb, Se, and Zn. Seven laboratories also calculated a number of hair "element ratios" from measured element concentrations (eg, sodium/potassium).

Some differences were found in laboratory sample preparation methods that could contribute to observed differences in results. Sample washing methods varied greatly among laboratories, including laboratory A that does not wash hair samples at all. Laboratories used either (plasma-coupled) atomic emission or mass spectroscopy for multiple element determination (Table 1). The potential advantage of mass spectroscopy is its lower limits of detection.<sup>4</sup> This may account for part of the variation in detection limits, for example, lithium in TABLE 2 and TABLE 3. Laboratories varied in their calibration standards. Some laboratories used only repeat analysis of in-house pooled hair samples. Others purchased non-hair mineral standards (for example, aqueous standards). Several laboratories claimed the use of a Chinese commercial hair standard certified for up to 17 elements.<sup>5</sup> At the time of this report, there were no hair standards certified for all elements analyzed by the

Table 1. Laboratory Characteristics\*

Characteristics	Selected Laboratories†						Remaining Laboratories‡		
	A	B	C	D	E	F	G	H	I
Licensed practitioner required to submit samples	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
CLIA certification advertised	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cost to health care practitioner, \$	49	38	42	48	37	46	69	30	55
Promotion or sale of brand-name supplements	Yes	No	No	No	Yes	Yes	No	Yes	No
Analytic instrumentation	AES	AES	MS	MS	AES	AES	AES	AES	MS
Hair samples, mean No./mo	2500	500	4000	4000	4000	2000	<100	1500	<100
Hair sample weight, g	1	0.5	0.25	0.25	0.3	0.5	1	1	1
Elements analyzed, No.	20	24	39	34	35	28	16	22	24
Elements ratios calculated, No.	50	9	5	3	27	16	0	12	0

\*CLIA indicates Clinical Laboratory Improvement Act; AES, atomic emission spectroscopy; and MS, mass spectroscopy.

†Selected laboratories: US laboratories selected for our analysis of split hair samples.

‡Remaining laboratories: other laboratories identified in the United States.

laboratories. Additionally, certified values of several elements in this commercial hair standard exceed, sometimes by several-fold, the laboratories' own reference ranges.<sup>3</sup>

All laboratories identified a normal reference range for each analyzed element. Table 2 summarizes the spread of reference ranges across laboratories for the most commonly analyzed elements. In telephone interviews, 5 of the 6 selected laboratories indicated their reference ranges represented concentrations found in approximately two thirds of their population, consistent with typical clinical reporting methods. Laboratory A, the sixth selected laboratory,

indicated that its reference ranges also were based on an older (unspecified) study of "healthy athletes." As noted in Table 2, interlaboratory differences in several cases are wide enough that the reference ranges do not overlap.

**Comparison of Laboratory Results**

Table 3 shows results of the split hair sample submitted to the 6 selected laboratories, for elements analyzed by 3 or more laboratories. Many reported values showed great differences. Twelve elements with nonzero reported values have an order of magnitude or greater difference between the highest and lowest values (ie, As, Ba, B, Co, Ge,

Hg, Mn, Mo, Pb, Na, Ni, and Sn). Outliers were identified in 14 elements' high value(s) as statistically significant ( $P < .05$ ) extreme values compared with the same element from the other laboratories. Laboratory B reported extreme high values for 13 elements, and laboratories D and E each reported 2 elements with extreme high values. No low values tested as significantly extreme. Focusing on the 19 elements reported by all selected laboratories, the nonparametric Friedman analysis of variance indicated a significant difference across laboratories ( $P < .001$ ), primarily because of laboratory B's extreme high values.

**Table 2: Reference Ranges for 31 Elements by Laboratory\***

Element	Selected Laboratories						Remaining Laboratories		
	A†	B	C	D	E	F	G	H	I
Aluminum	<9	8-28	<7	<8	<10	<17	<17	<8	<15
Antimony	NA	NA	<0.05	<0.03	<0.7	NA	NA	NA	NA
Arsenic	<4	0.4-2.8	<0.06	<0.1	<1	<1.12	<0.6	<2	<5
Barium	NA	NA	0.26-3	<1.5	<4	<4.43	NA	NA	<10
Beryllium	NA	NA	<0.02	NA	<0.04	<0.13	NA	NA	NA
Boron	NA	10-36	0.3-2	1.1-3.5	0.4-2.6	0.1-4	NA	NA	<100
Cadmium	<0.3	0.2-1	<0.1	<0.15	<0.4	<0.75	<4	<0.2	<0.8
Calcium	280-800	400-800	300-1200	260-1130	280-560	220-1600	200-2000	200-750	200-1000
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	0.1-4.1	0.2-0.5	0.2-3
Cobalt	0.3-0.6	2.4-6	0.013-0.05	0.01-0.03	<0.1	0.02-0.45	NA	0.1-0.5	0.05-0.7
Copper	15-32	14-32	12-35	10.5-25	15-35	5.48-40	4-25	12-35	7-40
Germanium	NA	0.4-2.4	0.045-0.065	NA	0.2-0.4	0.02-0.5	NA	0.1-5	NA
Iron	21-46	20-40	5.4-14	10-18	10-34	5.46-13.7	5-17	3-15	20-200
Lead	<8	2-20	<1	<0.8	<6	<5	<15	<3	<4
Lithium	1.25-3	NA	0.007-0.023	0.0035-0.025	<0.08	<0.53	NA	0.1-0.8	<1
Magnesium	40-120	60-100	35-120	31-82	40-80	20-130	15-130	25-115	28-100
Manganese	1.2-2.4	0.6-1.8	0.15-0.65	0.06-0.29	0.7-2.5	0.07-1	0.1-2.1	0.1-1.3	0.2-4
Molybdenum	0.6-1.7	1.2-4.4	0.028-0.056	0.04-0.102	0.02-0.06	0.02-1	0.02-0.49	0.1-1	<1.5
Mercury	<2	0.2-2.8	<1.1	<0.95	<1	<1.3	<1.5	<0.6	<1.2
Nickel	0.7-1.5	0.6-2.4	<0.4	<0.5	1-3	<1.1	NA	<0.5	<5
Phosphorus	130-190	120-180	160-250	115-170	100-220	134-240	NA	100-170	89-350
Potassium	50-180	30-160	8-38	4-22	50-150	5-40	2-39	2-28	30-200
Selenium	1.2-2.3	10-30	0.95-1.7	0.9-1.5	0.4-1.2	0.21-5.46	0.2-1.4	1-3	5-30
Silver	NA	NA	<0.15	<0.1	0.1-0.9	NA	NA	NA	NA
Sodium	130-450	50-250	12-90	6-50	120-360	10-130	15-150	10-50	50-350
Strontium	NA	NA	0.5-7.6	0.5-6	0.5-5.9	0.29-5.41	NA	NA	<3
Sulfur	NA	NA	44 500-52 000	48 500-55 500	13 200-43 700	NA	NA	NA	NA
Tin	NA	0.6-1.8	<0.3	<0.25	0.3-2.1	NA	NA	NA	NA
Titanium	NA	NA	<1	0.45-1	0.3-3.7	NA	NA	NA	NA
Vanadium	NA	0.4-1.2	0.018-0.065	0.014-0.08	0.02-0.1	0.01-0.55	NA	0.1-0.5	0.3-3
Zinc	140-260	140-220	140-220	105-173	130-270	142-248	100-280	100-250	90-265

\*Reference ranges for elements analyzed by 3 or more selected laboratories. Selected laboratories: US laboratories selected for analysis of split hair samples. Remaining laboratories: other identified US laboratories. NA indicates element was not analyzed by laboratory. All values reported as ppm.  
 †Translated from graphed data provided by laboratory.

00030