NAME: MR. LIGHTNING, EQUINE

==== I N T R O D U C T I O N ==========

Hair is formed from a cluster of matrix cells that make up the follicle. During the growth phase of the hair, metabolic activity is greatly increased, exposing the hair to the internal metabolic environment; extracellular fluids, circulating blood and lymph. As the hair reaches the surface, its outer layers harden, locking in the metabolic products accumulated during this period of hair formation, providing a permanent record of metabolic activity. (TRACE SUBSTANCES IN ENVIRONMENTAL HEALTH VIII. Edited by D. Hemphill. Proceedings of the University of Missouri, June 1974)

Determining the levels of the elements in the hair is a highly sophisticated analytical technique: when performed to exacting standards and interpreted correctly, it may be used as a screening aid for mineral deficiencies, excesses, and/or biochemical imbalances. Tissue mineral analysis (TMA) provides the veterinarian and trainer with a sensitive indicator of the long term effects of diet, stress, and toxic metal exposure.

Most deficiencies in animals are brought about by altered relationships of minerals within the body. It has become evident that either the retention or loss of minerals by the animal is equally important as the nutrients consumed from the feed itself. Both appearance and performance can be greatly influenced by adequate tissue levels of essential nutrients due to their effect upon cellular function. Minerals are necessary for several important functions in the growing and mature horse, such as, formation of structural components, enzymatic co-factors, and energy transfer. They are also used in the production of hormones, vitamins and amino acids.

Tissue mineral testing can aid in measuring mineral retention; it may also help to determine which supplements and feeds are required and more importantly, what is not required in order to avoid nutritionally-induced deficiencies or imbalances.

THE TEST RESULTS AND THE REPORT THAT FOLLOWS ARE NOT INTENDED TO BE AND SHOULD NOT BE CONSTRUED AS DIAGNOSTIC IN NATURE, BUT ARE RESEARCH TOOLS FOR THE DEVELOPMENT OF NUTRITIONAL INFORMATION IN ANIMALS. THE INFORMATION GIVEN BELOW IS ONLY INTENDED TO COMPLEMENT CLINICAL OBSERVATIONS AND THUS FACILITATE TREATMENT TO RESTORE OR TO MAINTAIN GOOD APPEARANCE AND HEALTH. THIS ANALYSIS IS NOT INTENDED TO REPLACE VETERINARIAN COUNSEL.

==== METABOLIC TYPE ==========

Neuro-endocrine activity affects mineral absorption, retention and excretion; therefore, tissue mineral patterns reveal certain biochemical characteristics, which are termed metabolic types.

SLOW METABOLISM

This horse is considered to have a low metabolic rate due to an increase in Para- Sympathetic Neurological activity. Optimum performance is decreased in a slow metabolic state. The degree to which this neuro-endocrine activity affects the performance of this horse is reflected in the "Performance Index" listed in the following section.

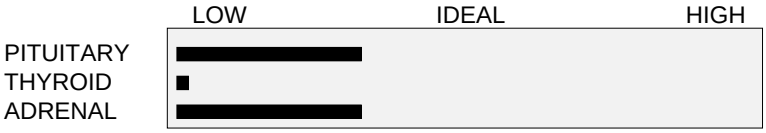
ENDOCRINE AND PERFORMANCE INDEXES

** ENDOCRINE INDEX **

The endocrine index is a graphic presentation of the pituitary-adrenal-thyroid relationship, or axis (P.A.T.). These endocrine

glands influence energy production on a cellular level and ultimately the performance of the horse. Ideally, there should be a balance within the P.A.T. They need not be at the ideal range as this range is used only as a reference point. However, they should be balanced above, below or at the "ideal" point. A major deviation between the P.A.T. axis can adversely affect the health of the horse. In the performance horse, a major deviation will particularly affect speed and/or stamina.

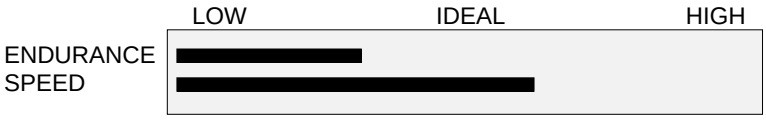
NOTE:
A "balanced" P.A.T. would appear on the following index with all three bar graphs extending the same length to the right. Ideally, all three would extend to the mid-way point, but as mentioned previously, a balance anywhere within the box is acceptable.



HYPOTHYROID ACTIVITY AND LOW ENERGY PRODUCTION
The thyroid gland influences energy production on a cellular level, resulting in sustained energy release. The current TMA pattern of the horse is indicative of low thyroid activity, which may adversely effect performance over long distances or for long duration.

ADRENAL ACTIVITY
The adrenal gland produces a number of vital hormones, which are responsible for quick energy production during stress. In conjunction with the thyroid gland, the adrenals greatly enhance energy production. The current mineral pattern of this horse indicates a slight adrenal insufficiency.

** PERFORMANCE INDEX **
The following performance index (P.I.) graphically displays the relationship of the energy producing glands on speed and endurance.



PERFORMANCE EVALUATION
The performance index displays the trend toward adrenal dominance relative to thyroid function. Since the adrenal glands produce hormones that are conducive to quick energy production, the pattern is indicative of adequate energy production for speed.

==== NUTRITIONAL MINERALS ==========

HIGH CALCIUM RELATIVE TO PHOSPHORUS

An elevation of calcium relative to phosphorus (see high Ca/P ratio) can produce abnormal bone integrity resulting in an increased tendency for fractures. The calcium-to-phosphorus ratio in the feeds should be evaluated. High energy foods containing phosphorus should be increased at this time, such as;

- Cottonseed Meal
- Soybean Meal
- Oats
- Barley
- Corn (Yellow)
- Wheat Bran

VITAMIN A

Elevated calcium to potassium (see high Ca/K ratio), in conjunction with low tissue potassium may indicate an increased requirement for vitamin A. Signs of vitamin A deficiency include

- Excessive Lacrimation
- Poor Appetite
- Difficult Breathing
- Weakness
- Cartilage and Bone Disorders
- Night Blindness
- Keratinization of Cornea
- Reproductive Failure
- Scaly Hoofs and Skin

Urine analysis may be helpful in confirming or ruling out the possibility of a deficiency. In the presence of a vitamin A deficiency, the urine shows increased crystalline sediment and keratinized epithelial tissue or cells.

The addition of good sources of vitamin A may be indicated at this time. High grade grass or legume hays that are green, carrots, sweet potatoes, and squash are good sources of this vitamin.

FEEDS THAT ARE CONSIDERED POOR SOURCES OF VITAMIN A

- Cottonseed Meal-Hulls
- Oats
- Wheat
- White Corn
- Low-Grade Hays
- Cereal Straw
- Linseed
- Soybean Meals
- Barley
- White Sorghum Grains
- Beet Pulp and Molasses

Until the calcium-to-potassium ratio improves, it is recommended that the above feeds not be used exclusively over a long period of time.

MAGNESIUM (Mg)

Tissue magnesium is within the "acceptable" range. The metabolic utilization and function of magnesium, however, depends upon its relationship to calcium, sodium, potassium, and phosphorus. Even though the test results reveal an acceptable level of magnesium, a relative deficiency or excess may be present in relation to these minerals. These ratios (Ca/Mg, Na/Mg, Mg/K and Mg/P) are also very important in determining magnesium nutritional status of the horse.

ELEVATED CALCIUM-TO-MAGNESIUM (Ca/Mg)

Magnesium is required for the activation of over 80% of the known enzymes in the body. Maximum bio-availability of magnesium and its metabolic potential depends upon (1) adequate tissue reserves, (2) balanced relationships to its synergistic minerals (normal ratios), (3) availability of vitamin co-factors, and (4) sufficient dietary intake of magnesium.

LOW IRON AND ANEMIA

Since the tissue iron level is low, the serum should be evaluated for the possibility of anemia. A decrease in tissue iron levels may precede a decrease in the serum level of iron. Therefore, iron supplementation may be indicated as a preventive measure.

Iron deficiency anemia can adversely affect health due to decreased oxygen supply to the tissues. This can contribute to fatigue, hard breathing, and an enlargement of the heart.

LOWERED RESISTANCE AND IRON DEFICIENCY
Iron deficiency has been associated with lowered resistance to infections.

FACTORS CONTRIBUTING TO IRON DEFICIENCY

- High Calcium Intake
- Protein Deficiency
- Parasites
- Hard Water
- Low Iron Intake
- Toxic Metal Accumulation
- Vitamin B6 Deficiency
- Copper Deficiency

HIGH CALCIUM INTAKE AND IRON DEFICIENCY
Excess dietary calcium intake can contribute to iron deficiency, as calcium will interfere with iron absorption. When calcium intake is high, the horse's iron requirements will be increased also.

HIGH ZINC RELATIVE TO COPPER (Zn/Cu) AND ELEVATED CHOLESTEROL
Elevated zinc-to-copper in the serum has been associated with elevated serum cholesterol and an increased tendency toward coronary heart disease in animals. Elevated zinc-to-copper in the hair tissue is an indication for further serological evaluation. This pattern also indicates that consideration should be given to the zinc to copper relationship in the feeds and adjusted accordingly.

INCREASE INTAKE OF THE FOLLOWING LOW ZINC-TO-COPPER FEEDS
The following feeds are high in copper relative to zinc and may be increased until the next evaluation:

- Alfalfa
- Brewers Yeast
- Liver Meal
- Buckwheat
- Cottonseed Meal
- Oat Hulls
- Corn Gluten Feed
- Hominy
- Barley
- Whey (Dried)
- Beet Molassas
- Corn and Cob Meal
- Soybeans
- Sorghum, Grain (Milo)

CHROMIUM (Cr) AND FAT METABOLISM
Chromium, which is involved in carbohydrate and lipid (fat) metabolism, acts as a potentiator for the effects of insulin. In some animals chromium supplementation has been shown to improve lipid metabolism by decreasing cholesterol levels and plaque formation in the aorta.

PHOSPHORUS (P)
Phosphorus is required in sufficient amounts for cellular energy production. A deficiency of phosphorus relative to calcium (see high Ca/P ratio) leads to a reduction in energy efficiency or production. An increase in high energy feeds containing phosphorus is appropriate at this time.

VANADIUM (V)
Vanadium is an essential element in lower life forms and recent research suggests it may be essential in humans as well. Vanadium is widely available in the food supply, where refining and processing appears to further increase its content. The

vanadium level is below the established reference range for this element. However, deficiency signs and conditions have not yet been documented in the equine. Therefore, at this time, clinical significance cannot be placed on a low vanadium level.

==== TOXIC METALS ==========

Every horse is exposed to toxic metals to some degree. The retention of these toxic metals, however, is dependent upon the horse's susceptibility. The balance of the protective nutrient minerals within the body in relation to the heavy metals can frequently be the determining factor to this susceptibility. By examining the toxic metal levels in relation to the protective minerals, the extent to which the heavy metals may be involved in abnormal chemistry can frequently be seen.

Hair is used as one of the tissues of choice by the Environmental Protection Agency in determining toxic metal exposure. A 1980 report from the E.P.A. stated that hair can be effectively used for biological monitoring of the highest priority toxic metals. This report confirms the findings of other studies which concluded that hair may be a more appropriate tissue for studying exposure to some trace metals.

Lead toxicity has been one of the most common toxicity problems in veterinary medicine. The most common source of lead accumulation in horses is contaminated soils.

LOW IRON RELATIVE TO LEAD (Fe/Pb) RATIO
Lead interferes with iron metabolism and ultimately results in iron-deficiency anemia. An iron deficiency is also conducive to increased lead absorption from the intestinal tract. Therefore, dietary and/or supplemental iron should be increased at this time.

NOTE:
At this time, further confirmation of elevated heavy metal toxicity using a blood test may or may not reveal an elevated level. This is due to the protective response of the body, in which following a toxic metal exposure, the element is sequestered from the blood and stored in various other tissues. Therefore, if the exposure is not ongoing or chronic, elevated blood levels may not be present.

NOTE:
The first step in reducing toxic metal accumulation is to isolate and remove the source. Environmental assessment of chemicals presently being used and testing of the feeds and water supply are suggested.

==== CONCLUSION ==========

This report provides a unique insight into the horse's nutritional biochemistry. The recommendations contained within are specifically designed according to individual metabolic type and current mineral status. Additional recommendations may be based upon other supporting clinical data as determined by the attending veterinarian or trainer.

OBJECTIVE OF THE PROGRAM
The purpose of this program is to re-establish a normal balance of body chemistry through individually designed diet and supplement suggestions, enhancing the horse's ability to utilize the nutrients efficiently and resulting in improved energy production and health.

WHAT TO EXPECT DURING THE PROGRAM
The mobilization and elimination of toxic metals may cause temporary discomfort. This can be expected until removal of the excess metal is complete. Temporary modification of the program can aid in reducing the discomfort associated with the mobilization of the metals.

MR. LIGHTNING, EQUINE

RECOMMENDATION	AM	NOON	PM
PARA-PACK	7	0	7
PYRIDOX PLUS	4	0	4
POTASSIUM PLUS	4	0	4
IRON PLUS	0	0	4
COPPER PLUS	0	5	0
VITAMIN C PLUS	5	0	0
VITAMIN E PLUS	5	0	4

THESE RECOMMENDATIONS MAY NOT INCLUDE MINERALS WHICH APPEAR BELOW THE IDEAL OR IN TURN MAY RECOMMEND MINERALS WHICH APPEAR ABOVE THE IDEAL ON THE TMA GRAPH. THIS IS NOT AN OVERSIGHT. SPECIFIC MINERALS WILL INTERACT WITH OTHER MINERALS TO RAISE OR LOWER TISSUE MINERAL LEVELS, AND THIS PROGRAM IS DESIGNED TO BALANCE THE HORSE'S MINERAL LEVELS THROUGH THESE INTERACTIONS.

THESE RECOMMENDATIONS SHOULD NOT BE TAKEN OVER A PROLONGED PERIOD OF TIME WITHOUT OBTAINING A RE-EVALUATION. THIS IS NECESSARY IN ORDER TO MONITOR PROGRESS AND MAKE THE NECESSARY CHANGES IN THE RECOMMENDATIONS AS REQUIRED.

TRACE ELEMENTS, INC.
4501 Sunbelt Drive · Addison, Tx · 75001 · U.S.A.

LABORATORY NO.:	16
PROFILE NO.:	16

EQUINE:	MR. LIGHTNING, EQUINE	AGE:	4	SEX:	S		
REQUESTED BY:	SMITHTOWN STABLES	ACCOUNT NO.:		DATE:	6/3/2003		

NUTRITIONAL ELEMENTS

	Ca	Mg	Na	K	Cu	Zn	P	Fe	Mn	Cr	Se	B	Co	Mo	S
HIGH	443	99.0	132	172	2.1	24	77	17.0	2.000	0.25	0.35	1.77	.055	.088	6650
	357	78.5	102	134	1.7	21	66	13.3	1.560	0.20	0.28	1.37	.042	.068	5750
	270	58.0	72	95	1.3	18	55	9.6	1.120	0.15	0.20	0.96	.029	.048	4850
REFERENCE RANGE	184	37.5	42	57	0.9	15	44	5.9	.680	0.10	0.13	0.56	.016	.028	3950
	97	17.0	12	18	0.5	12	33	2.2	.240	0.05	0.05	0.15	.003	.008	3050
LOW	11				0.1	9	22			0.00					2150
	Calcium	Magnesium	Sodium	Potassium	Copper	Zinc	Phosphorus	Iron	Manganese	Chromium	Selenium	Boron	Cobalt	Molybdeum	Sulfur
	357	45.0	31	17	0.5	13	40	1.6	.580	0.02	0.02	0.02	.003	.018	3750

TOXIC ELEMENTS

	Sb	U	As	Be	Hg	Cd	Pb	Al
HIGH	.032	.0245	.245	.0070	0.28	.105	1.4	16.8
	.027	.0210	.210	.0060	0.24	.090	1.2	14.4
	.023	.0175	.175	.0050	0.20	.075	1.0	12.0
	.018	.0140	.140	.0040	0.16	.060	0.8	9.6
	.014	.0105	.105	.0030	0.12	.045	0.6	7.2
REFERENCE RANGE	.009	.0070	.070	.0020	0.08	.030	0.4	4.8
	.004	.0035	.035	.0010	0.04	.015	0.2	2.4
				<<				
	Antimony	Uranium	Arsenic	Beryllium	Mercury	Cadmium	Lead	Aluminum
	N/A	.0043	.030	.0010	0.01	.010	0.7	3.0

ADDITIONAL ELEMENTS

	Ge	Ba	Bi	Rb	Li	Ni	Pt	Tl	I	V	Sr	Sn	Ti	W	Zr
HIGH	.022	0.81			.029	.14	.015			.093	1.12	0.03		.015	0.08
	.016	0.56			.020	.10	.010			.068	0.76	0.02		.010	0.05
REFERENCE RANGE	.010	0.31			.011	.06	.005			.043	0.41	0.01		.005	0.03
	.004	0.06			.002	.02	.000			.018	0.05	0.00		.000	0.00
LOW										<<	<<			<<	<<
	Germanium	Barium	Bismuth	Rubidium	Lithium	Nickel	Platinum	Thallium	Iodine	Vanadium	Strontium	Tin	Titanium	Tungsten	Zirconium
	.010	0.31	N/A	N/A	.002	.08	.010	N/A	N/A	.001	0.15	0.01	N/A	.001	0.01

"<<": Below Calibration Limit; Value Given Is Calibration Limit

"QNS": Sample Size Was Inadequate For Analysis.

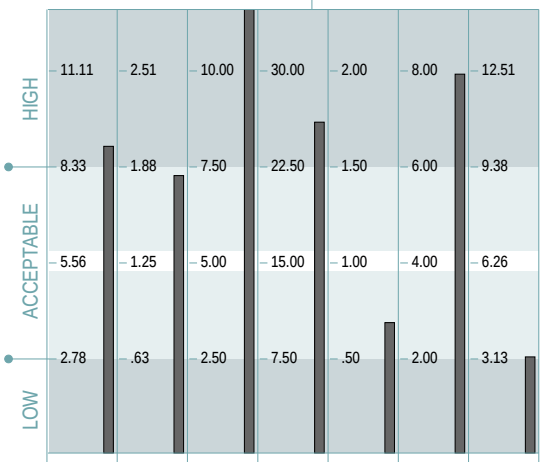
"NA": Currently Not Available

Laboratory Analysis Provided by Trace Elements, Inc., an H. H. S. Licensed Clinical Laboratory. No. 45 D0481787

6/3/2003
CURRENT TEST RESULTS

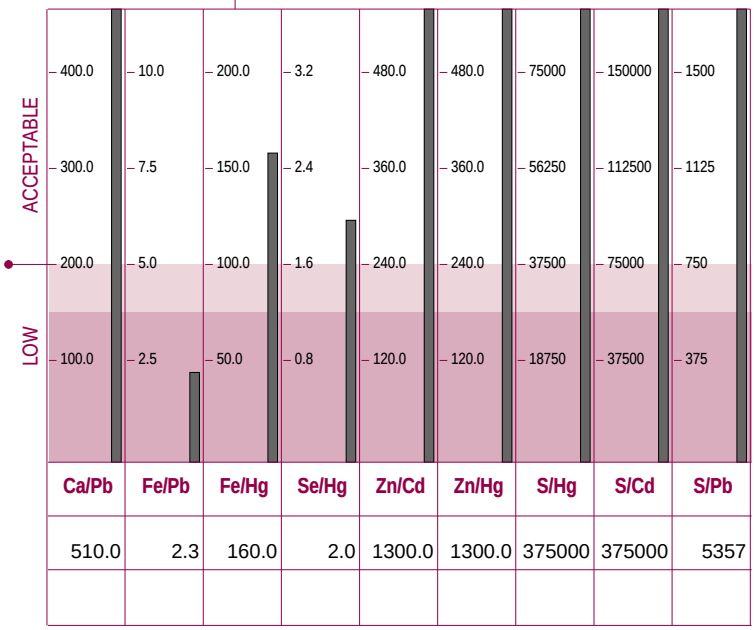
PREVIOUS TEST RESULTS

SIGNIFICANT RATIOS



Ca/P	Na/K	Ca/K	Zn/Cu	Na/Mg	Ca/Mg	Fe/Cu
8.93	1.82	21.00	26.00	.69	7.93	3.20

TOXIC RATIOS



Ca/Pb	Fe/Pb	Fe/Hg	Se/Hg	Zn/Cd	Zn/Hg	S/Hg	S/Cd	S/Pb
510.0	2.3	160.0	2.0	1300.0	1300.0	375000	375000	5357

ADDITIONAL RATIOS

RATIO	CALCULATED VALUE		OPTIMUM
	Current	Previous	
Ca/Sr	N/A		N/A
Cr/V	N/A		N/A
Cu/Mo	N/A		N/A
Fe/Co	N/A		N/A
K/Co	N/A		N/A
K/Li	N/A		N/A
Mg/B	N/A		N/A
S/Cu	N/A		N/A
Se/Tl	N/A		N/A
Se/Sn	N/A		N/A
Zn/Sn	N/A		N/A

LEVELS

All mineral levels are reported in milligrams percent (milligrams per one-hundred grams of hair). One milligram percent (mg%) is equal to ten parts per million (ppm).

NUTRIENT MINERALS

Extensively studied, the nutrient minerals have been well defined and are considered essential for many biological functions. They play key roles in such metabolic processes as muscular activity, endocrine function, reproduction, skeletal integrity and overall development.

TOXIC MINERALS

The toxic minerals or "heavy metals" are well-known for their interference upon normal biochemical function. They are commonly found in the environment and therefore are present to some degree, in all biological systems. However, these metals clearly pose a concern for toxicity when accumulation occurs to excess.

ADDITIONAL MINERALS

These minerals are considered as possibly essential. Additional studies are being conducted to better define their requirements and amounts needed.

RATIOS

A calculated comparison of two minerals to each other is called a ratio. To calculate a ratio value, the first mineral level is divided by the second mineral level.
EXAMPLE: A sodium (Na) test level of 24 mg% divided by a potassium (K) level of 10 mg% equals a Na/K ratio of 2.4 to 1.

SIGNIFICANT RATIOS

If the synergistic relationship (or ratio) between certain minerals is disturbed, studies show that normal biological functions and metabolic activity can be adversely affected. Even at extremely low concentrations, the synergistic and/or antagonistic relationships between minerals still exist, which can indirectly affect metabolism.

TOXIC RATIOS

It is important to note that animals with elevated toxic levels may not always exhibit clinical symptoms associated with those particular toxic minerals. However, research has shown that toxic minerals can also produce an antagonistic effect on various essential minerals eventually leading to disturbances in their metabolic utilization.

ADDITIONAL MINERALS

These ratios are being reported solely for the purpose of gathering research data. This information will then be used to help the attending health-care professional in evaluating their impact upon health.

REFERENCE RANGES

Generally, reference ranges should be considered as guidelines for comparison with the reported test values. These reference ranges have been statistically established from studying a population of "healthy" animals.
Important Note: The reference ranges should not be considered as absolute limits for determining deficiency, toxicity or acceptance.