ANIMAL
TRACE-MINERALS
EQUINE

MONTMORILLONITE. TECHNICAL- REPORT

1. INTRODUCTION

Based on original research and excerpts from the book
The Trace Mineral Story
By Dr. Melchior Dikkers PH.D
Research Biochemist.

"In 1931, while Professor of Biochemistry and Organic Chemistry at Loyola University, a natural mineral compound was brought to my attention, which later on proved to be one of the most amazing and unique materials I have ever been fortunate enough to come in contact with. Its properties were such that it caused me to become deeply involved in a research program that was to take me into many years of painstaking analysis and, findings. The material was subsequently identified as a form of Montmorillonite, a colloidal silicate mineral generally formed by the deposit of volcanic ash in lakes. Its basic chemical structure is **MgO Al_2 O_3 $5SiO_2$ nH_2O** *(* This form of Montmorillonite is the same used in the product named* ***Equine Animal Trace Minerals****. Compiler's Note).*

"Twenty some years ago, I began research on this natural clay mineral as a food supplement. At the onset of this research, the experimental work was done on laboratory animals. In the case of various forms of intestinal infections in rabbits, poultry, swine and cattle, amazing results were obtained that did not respond to treatment with other orthodox treatments. These findings were, of course on a control basis, meaning certain groups of animals were put on the natural clay mineral others were not, the results were then determined for both groups. The results of the research experiments proved that the minerals contained the natural mineral clay had a very definite value in the biochemistry of the body"

"The results of my research and findings on the natural clay-mineral Montmorillonite are as follows:

1. The mineral adsorbs toxic substances from the intestinal tract, and at the same time possesses a healing and soothing quality.
2. The adsorptive power of this natural clay - mineral compound is very great, it adsorbs gaseous substances and aids in regularity.
3. The natural clay mineral helps supply mineral trace elements that may be lacking in the diet.
4. The natural trace elements act as catalysts, which aid in metabolism and cell building.
5. These minerals form a gel-like substance, which acts as a protective coating in the intestinal tract.
6. These minerals contain both ferrous and ferric iron; ferrous ions for the hemoglobin (red coloring matter of the blood) formation and ferric for the mucosal cells.
7. Minerals function in maintaining osmotic pressure and influence contractility of muscles.
8. Minerals enter into the synthesis of every living cell and they influence the vital processes of oxidation, secretion, growth, and reproduction.
9. Mineral elements are essential to the structure of certain complex chemical compounds which influence the course of metabolism."

"An interesting side light on the background of this rare natural Montmorillonite mineral is written and told by any persons who have delved into the history of this mineral. It is told that deposits were rare and greatly esteemed by the Indians. Medicine Men wandered for hundreds of miles in search of the cherished minerals."

"The most outstanding form of Montmorillonite, in my many years of experimenting with trace elements, is the brown trace mineral from Nevada, *(* This form of Montmorillonite is the same used in the product named **Equine Animal Trace Minerals**. Compiler's Note).*

The Montmorillonite deposit is superior to all other known deposits. All of the other deposits of which I am aware were formed by volcanic action, which means that most of the elements present are m the inorganic state and are not readily assimilated by animals and humans. Inorganic minerals such as dolomite, ferrous sulfate, zinc gluconate and calcium gluconate when ingested must be made soluble in the stomach. At the same time protein is hydrolyzed into amino acids. When both are done and conditions are right, the mineral is chelated by the amino acids, meaning suspended between two or more amino acids. Once chelated, the mineral can be metabolized."
"The deposit was formed by heavy sedimentation of mineral elements in plants and animal marine life, such as seaweed, shrimp and algae. In this form, the minerals are naturally chelated in the plant and animal organism. Or in other words, they are in an "organic form".

2. CLAY MINERALS FOR MAN

"Since 1950 1 have advocated the use of the clay mineral Montmorillonite for the very reason that this clay mineral Montmorillonite contains all of the essential mineral trace elements in a balanced ratio, as laid down by Nature. Montmorillonite as mined and processed, is a natural mineral containing no harmful elements of any kind. It has no direct therapeutic effects, but acts as a normalizer of physiological activities in animal tissues In comparing the chemical analysis of the mineral with the chart of biological elements we notice that the mineral contains all of the variable and invariable elements of the animal tissues. In comparing the chemical analysis of the mineral with the analysis of blood and tissues we again notice a similarity. However, the mineral contains the elements in slightly higher percentage. According to these findings, there are indications that the growth promoting effect of the mineral clays under the conditions of some experiments was due in large part to its sodium content. Calcium supplements alone were devoid of growth promoting activity. These research Findings might be interpreted as an indication that sodium could not exert its maximal growth promoting effect until the calcium deficit of the diet was at least partially corrected. Research findings indicate that the ingestion of Montmorillonite mineral clays can profoundly affect the nutritional state of an animal and mineral clays vary greatly in growth promoting activity. The most active material tested was Montmorillonite clay mineral, *(* This form of Montmorillonite is the same used in the product **Equine Animal Trace Minerals***s. Compiler's Note).* whereas Kaolin and Hydrobiotite were virtually devoid of growth promoting activity. Clay mineral samples, which were obtained within one mile of the original mineral clay deposit, were consistently less active in growth promoting activity.

3. NEW RESEARCH DEVELOPMENTS IN REGARDS TO THE VALUE OF CLAY MINERALS

Clays composed of the Montmorillonite group of minerals someday may replace calcium as a dietary supplement for promoting BONE HEALTH, according to Dr. Benjamin Ershoff, University of Southern California Biochemist. During a study supported by the Manned Spacecraft Center, Dr. Ershoff discovered that the bone loses large amounts of calcium under conditions of weightlessness such as space men endure. Adding calcium alone to the diet does not change the situation, but adding clay does. Montmorillonite clays contain something (trace elements) besides calcium, which improves the body's ability to change calcium into bone.

The Montmorillonite clays of particular interest are those, which contain many trace elements, 40 or more. The research by Dr. Ershoff shows again the value of natural products. We immediately ask ourselves the question, "Are the trace elements found in clay the functional elements in the process of bone formation?"

4. SILICON AND ALUMINUM

"The Montmorillonite used in the trials *(* This form of Montmorillonite is the same used in the product*

named ***Equine Animal Trace Mineralss****. Compiler's Note).* contains approximately 23% Silicon and 8% Aluminum, and for that reason I want to discuss these two elements in a little more detail."

"Silicon is by far the most abundant element in rocks and soils, where it is present largely in the form of quartz and silicate. With aluminum, iron and water, it constitutes the bulk of the colloids, or what we call the clays. It is invariably found in plants and animals. The amount of silicon in different plants and in different parts of the same plant varies greatly so that no general average may be given. The large amounts of silicon present in many plants led to the early belief that it might be an essential element in the nutrition of plants. Silicon is also thought to have an effect on phosphorus availability. There is evidence that indicate that plants grown in solutions deficient in silicon are less resistant to attacks from disease."

"All animal tissues that have been examined have been found to contain silicon in varying amounts. One or two Milligrams per hundred are present in the blood serum of farm animals, and a compound of silicon and carbohydrate has been found in the urine. Wool contains from .02% to .08% of silicon but this variation apparently has no relation to wool quality. Silicon constitutes up to 77% of the ash of feathers. Mature roughages are especially rich in silicon, since their cellulose is infiltrated with the element."

"Silicon resembles aluminum in its high concentration in soils and atmospheric dust. It differs markedly from aluminum, however in being present in most plants, particularly the germinal species in comparatively large amounts; and in animal tissues and fluids, in very much higher concentration than aluminum; or indeed than the majority of trace elements. A great deal of silicon is present in the cell walls. The silicon of plants is apparently partly present as insoluble silica, partly as soluble silicates and partly in organic combination."

"Silicon is essential in the nutrition of the higher plants. Improved growth from additions of silicates has been demonstrated with rice, millet, sunflower, barley and beets. Silicon is of importance in nutrition of man and higher animals. Even fetal tissue has been shown to contain appreciable quantities, 40 to 400 parts per million, expressed as silicon dioxide. Fifty one thousand parts per million for normal adult tissue. The highest levels in the adult are found in the lungs and the lowest in the muscles. In the fetus, the lungs are the lowest in silica, and muscle the highest, of the tissues examined."

"Blood of man contains an average of .*5* milligrams of silicon per 100 cc. The possibility that silicon may play some part in the acid base equilibrium of the animal body has been suggested, but there is no proof of this yet. Silicon dioxide is commonly excreted daily in the urine from farm animals as a true solution (as silicates or in colloidal dispersion). Silicon is most abundant in oats, unpolished rice, whole wheat, apricots, figs, barley, strawberries, spinach, celery, beets, cucumbers, asparagus, tomatoes, peaches, cabbages, Swiss chard, cauliflower, parsnips, lettuce, okra, and endive."

"Silicon is found in abundance in the vegetable kingdom as I have mentioned. In the human organism, it is found in the connective tissue - the hair, nails, teeth, bones, nerves, mucous membranes, epithelial cells and the skin. The heart muscle contains not only the most iron but also the largest quantity of silicon. Undernourished patients with poor assimilation respond well to silicon. It increases the white blood cells and is the main remedy in ailments with pus formation, fetid secretions, inflamed glands, swollen, hard, with pus. If silicon is given in time it will prevent pus formation; but if a pus condition has developed it will ripen the abscess and promote suppuration. In inflammation and pus condition in bones and bone marrow, chronic rheumatism as well as arthritis, silicon will dissolve the crystallization of uric acid. Silicon is found mostly in the skins of fruit and in the seed coats of cereals. Therefore, these parts should not be discarded."

"Aluminum is the second most common mineral element in the biosphere. Aluminum has been found in the ash of all plants. The amount varies greatly in the different plants and the different plants possess considerable specific selective powers to accumulate.

"Therefore the mineral will furnish any one of the variable and invariable elements which might be lacking in the animals' body tissues or in the feeds furnished."

"Because of the many interactions and interdependencies among minerals, it is believed that the availability of many minerals even in minute quantities may be more effective than larger quantities of only two or three minerals. We quote Dr. Walter Mertz MD, head of the United States Department of Agriculture's Nutrition Institute at Beltsville, Maryland: "It is not enough to be concerned about the optimal intake range of any one nutrient by itself -what is optimal varies, depending on how other nutrients are interacting with it, at that

particular time. A given intake of a specific nutrient can be ideal, deficient, or excessive, depending on how other substances are also present."

"Take dietary iron. The requirement for human nutrition is very strongly dependent on the presence and concentration of several factors: vitamin C, copper, nickel, and a special factor in meat, poultry, and fish, all enhance the availability of iron. In other words, helps you absorb it. But then there are other substances, such as the tannin in tea, which reduce the availability. So, if you have a certain iron intake and your diet is favorable in regard to the "enhancing" factors - containing some vitamin C, copper, and nickel or meat, poultry, or fish factor - the amount of iron may be ample. But if you have a diet that contains a lot of tannin and phosphate but is low on "enhancers," then the same amount of iron will be insufficient."

"There are at least a hundred other interactions that have already been identified. And I am sure there are many more which we have not yet been able to spot."

"We provide you with a quantitative analysis of the essential elements and those suspected as essential but not yet proven. It is obvious that the relative quantities do not correspond with the FDA RDA's, but because of the similarity of the ratio of the elements in the deposit to that found in blood and tissue, it just may be that nature knows more than we humans.

Two (2) tablets of *650* mg each will supply approximately the following trace mineral elements:

(76 Minerals ®)

Mineral:	**2 Tablets**	**RDA**
Silicon	200 mg.	*
Aluminum	50 mg.	*
Potassium	33 mg.	*
Iron	15mg.	18mg
Sulfur	14 mg	*
Iodine	8 mg.	150 mcg
Calcium	8 mg.	1 grin.
Fluorine	6mg.	*
Sodium	4mg.	*
Magnesium	3mg.	*
Phosphorus	450 mcg.	1 gm.
Boron	220 mcg.	*
Chlorine	220 mcg.	*
Strontium	180 mcg	*
Vanadium	80 mcg.	*
Manganese	70 mcg.	*
Arsenic	*55* mcg.	*
Molybdenum	30 mcg.	*
Chromium	20 mcg.	*
Zinc	12 mcg.	15 mg.
Nickel	l0mcg	*
Cooper	*5* mcg.	2 mg.
Selenium	*5* mcg.	*
Silver	4mcg	*
Cobalt	3 mcg.	*
Lithium	3 mcg.	*
Gallium	3 mcg.	*
Tin	2 mcg.	*
Gold	1 mcg.	*

*RDA not established or requirement not known

In addition to the elements listed above, laboratory analysis has identified 49 other elements in PPM or trace levels.

5. TOXIC METALS

"The mineral does not accumulate in the tissues, an excess not needed by the tissues is expelled. Although traces of lead, mercury, cadmium and arsenic are found in the mineral, they do not accumulate in the tissue. Indications show that toxic levels of heavy metals will be reduced when the body is supplied a complete balance of minerals." A recent blood test on a man who has been taking an average of 4 mineral tablets per day for over 10 years showed the following results:

Test date 12-5-79

Arsenic	Result: 0.3 mcg/ml	To Bio-Science Normal range	0.0-3.0 mcg/ml
Lead	Result: 15 mcg/dl	To Smith-Kline Normal range	0.0-40.0 mcg/dl

6. EFFECT OF CLAY-MINERAL SUPPLEMENTS ON BODY WEIGHT INCREASE, BONES AND TEETH

"Dr. F. J. McClure reported in 1958 that young (immature) rats fed a ration consisting of 80% non heat processed whole wheat — 18% cerelose – 2, liver powder and supplements of vitamin A-D-and E, had retarded growth and after 60 days, a high incidence of smooth surface caries."

"Similar findings were obtained in 1962 by Dr. Ershoff, who reported that rats fed this diet also were highly susceptible to a "paralytic-like syndrome" of the fore and hind limbs, seen when rats were dropped onto a hard surface."

"Subsequent studies indicated that the long bones of these experimental rats fed this diet appeared rachitic and that "paralytic like syndrome" was associated with newly formed fractures of the cortical bones. (Ershoff, 1965)."

"The McClure diet is deficient in essential nutrients including calcium (0.03% level) and phosphorus (0.2% level). lt contains 10.8% to 12.8% protein, and is low in amino acids, lysine-methionine, and threonine. It also contains only 2% fat."

"Research findings indicated that Montmorillonite clay minerals when incorporated at levels of 1% to 4% in the diet caused a highly significant increase in body weight and prevented the occurrence of pathological changes in the tibia and alveolar bones of rats fed a McClure diet. The maximal protective effect was obtained at the 4% level of supplementation although the 2% level was only slightly less active."

"Amounts have been found up to 6.2% in the ash of certain pteridophytes; which are ferns, horsetails, club mosses; 4,500 living species of these plants. They are the most highly developed seedless plants and arise from spores."

"Some plants are aluminum accumulators. In such plants aluminum seems to be of a nutritional value. When aluminum is present in excess in soluble form, it is a limiting factor to the growth of certain plants. As the acidity of the soil solutions decrease to the neutral point, the solubility of the aluminum decreases to almost nothing. When the acidity becomes greater than pH5, the aluminum acidity increases rather rapidly. Until pH4.5 is reached, the solubility of aluminum does not increase noticeably. Phosphate treatment, liming, and large applications of decomposing organic matter, reduce the aluminum toxicity of the soil. Most of the aluminum taken up by herbivores is excreted in the feces and the net result is an organism considerably poorer in aluminum than the food it has consumed."

"Mammalian muscle is low in aluminum. The viscera may contain as much as 1 milligram per kilogram of body weight. The best general value from mammalian tissue is probably *.5* milligrams per kilogram, which represents about 1 /40 of the quantity of aluminum in the food. Aluminum is not considered vitally essential, because it appears that certain other tetravalent elements can substitute for it. Massive doses of aluminum in excess of phosphate intake may cause rachitic conditions. Not under any known naturally occurring conditions does aluminum constitute a toxic hazard to man or his domestic animals. The amount of

aluminum in human diets may be increased by contamination from domestic aluminum cooking utensils and vessels used in food processing plants, by the use of aluminum sulfate baking powder and by use of body deodorants containing aluminum chlorhydrate. Excessive intake of aluminum is known to produce gastro intestinal irritation and colic, and to produce rickets by interference with the absorption of phosphates."

7. TRACE ELEMENTS...THEIR VITAL IMPORTANCE IN HEALTH

The most valuable packages are often the smallest. This is very true in regard to trace elements.

a. IMPORTANT SOURCE

The mineral substances are present in infinitesimal amounts in the soil, water, food, and air, the most important source of origin being the soil. If our soil is deficient in trace elements, our food and water will be deficient also. The health of plants, animals and men is linked to the mineral balance of the soil. Soil makes the food and feed of man and animal.

If we continually interfere with nature, we must sooner or later, pay the penalty. High chemical fertilization of soils may create trace element imbalances. Another possibility is that a deficiency of trace elements may occur for the simple reason that we remove them by heavy cropping and do not replace them with our routine chemical fertilizers.

Disease may well be defined as merely a summation of chemical reactions, which have gone wrong; a chemical imbalance has occurred. Health, on the other hand, is chemical balance.

b. IMPORTANT TOOLS

The word "metabolism" means the sum total of all chemical reactions, which takes place in every single cell of the body during 24 hours of the day. The tools of these reactions are the enzymes, which are present in vast numbers in each body cell. If a cell were represented as a factory, the enzymes are the machinery in that factory. Each cell manufactures (synthesizes) its own enzymes from the amino acids that are being furnished to it by the blood. Enzymatic reactions are dependent on trace elements for their activities. We should also keep in mind that these enzyme activities or reactions are extremely sensitive to injurious influences such as may occur in our foods; and that enzyme reactions are also influenced by a deficiency of some functional nutrient. The breakdown of the enzyme system results in disease or death of the cell.

The body manufactures from 1,000 to 2,000 different enzymes, every single one a protein. Enzymes are subject to greater wear and tear than are ordinary catalysts. Being proteins, they are rather unstable, and are rapidly degraded by many factors. A large quantity of enzymes is lost in the secretions of the digestive canal and also in the urine.

A great part of the protein synthesis, which is taking place constantly in the body, consists in the replacement of enzymes during every minute of the day. Enzymes, however, consist of two parts: a so-called apo-enzyme, which is a true protein, and a co-enzyme, which is a non-protein material; being this a vitamin (generally of the B-complex group) or a metallic element.

Many enzymes are inhibited in their activity by metals, whereas metals (for example the trace elements) activate many others. An enzyme inhibitor may attack the apo-enzyme, but it may also attack the co-enzyme. Another important fact is that hormones may accelerate or retard the production of enzymes. This point of view is interesting when we consider that in old age we have a slowing up of hormone production by a number of glands. However, at the same time, in the process of aging we have decreased enzyme activity.

c. Enzymes, **ORIGIN OF DISEASE**

It is the opinion of the late Dr. Rudolph Abderhalden, Director of the Laboratory for Endocrinological and Enzymatic Diagnosis in Basel, Switzerland, and Professor of Biochemistry at Halle University in Germany, that the majority of all diseases are probably enzymatic in origin. He states that all hypovitaminosis (avitaminosis) of the B vitamins result in enzymatic deficiencies, and thus constitute

the enzyme pathologies. He also has the opinion that the endocrine diseases are enzyme pathologies.

Dr. Abderhalden cites further examples of enzyme pathologies, the metabolic disturbances and the myocardial (heart) insufficiencies. He asserts that metabolism is synonymous with enzyme activity, which no one can deny. By now, we may definitely say that disease is a disturbance in the harmonious pattern of enzyme activity. We can readily state that this enzyme activity is dependent on the presence of trace elements, which engineer all the complex chemical activities of the living cell, are manufactured by every cell in the so-called "protein factories", scientifically known as "ribosomes". Messengers from the genes, directing the synthesis of the protein, enzymes are constantly being carried to the ribosomes.

The presence of many chemical additives in our food may very well cause some trace elements to become unavailable (fixation or immobilization). The same can be said regarding chemical fertilizers in our soils. They also may cause trace elements to become unavailable to our plants.

Dr. A. Voisin, Member of the French Academy of Science and Professor of Veterinary Science at Ecole Normale in Pans, France, have very well described this point of view.

Dr. Ira Allison, Springfield, Missouri, mentioned a number of years ago that a man might literally be starving even while eating an ample supply of what we call "proper foods"; starving because these proper foods were being grown on land lacking in the basic mineral elements needed by the human body.

d. SCIENTISTS AGREE

Dr. William Albrecht and Dr. Arnold Klemma of the College of Agriculture at the University of Missouri have made similar statements in the past. These scientists voiced the opinion that when humans or animals fail to receive essential trace elements, they are more susceptible to the bacteria Brucella, the causative agent of undulant fever; and that they lack resistance to fight off infection.

As I have stated, enzymes contain trace elements as an integral part of their chemical structure (protein structure). The known defense enzyme of the body, catalase, contains iron and copper; molybdenum is a component of two enzymes (oxidases). Many trace elements are also a part of vitamins. One example is cobalt, which is a component of vitamin B-12.

e. OTHER ELEMENTS

Iodine is a part of the complex protein molecule thyroglobulin in the thyroid gland. The trace element zinc is a part of the insulin molecule in the pancreas. Magnesium is contained in the protein chlorophyll, the green coloring matter of plants. Iron, on the other hand, is a part of the hemoglobin molecule, the red coloring matter of the blood.

Copper is a valuable catalyst, especially in the oxidation-reduction mechanisms of all living cells. Essential enzyme systems, including those responsible for the oxidation of ascorbic acid (vitamin C), seem to be dependent on traces of copper.

The trace element manganese activates the enzymes arginase, upon which the formation of urea in the liver depends. Lack of manganese in soils causes citrus plants to be low in vitamin C content.

f. POWERFULL INHIBITOR.

Traces of fluorine are regularly present in human tissue, notably in the bones, teeth, thyroid gland, and the skin. However, since fluorine is a powerful inhibitor of cellular metabolism, it is poisonous in large doses. It inhibits a wide variety of enzymes as it combines with the metallic catalysts such as Calcium, Magnesium, Iron, Copper, zinc and manganese. This fact explains fluorine's powerful effectiveness in preventing the growth of bacteria, so why not also in preventing the growth of animal and human cells?

g. CATALYTIC FUNCTION

I think the foregoing facts prove that trace elements carry out a great variety of functions in the body,

animal and human, and that they are absolutely indispensable to metabolic activity.

Let us recall that trace elements function as catalysts and that a catalyst functions merely by its presence and never becomes a part of the reacting substances. Its value lies in the fact that its mere presence sets off any and all metabolic activity. Its action, known as catalysis, is a physical-chemical process having the property to facilitate, speed up, and possibly even initiate a chemical reaction. In all of these processes the catalyst itself does not undergo any change. To be able to utilize catalysts intelligently, one must constantly bear in mind the facts just given. We should also remember that minute quantities of trace elements are constantly needed to correct deficiencies that may occur.

Trace elements are so named because they exercise their influence and action on the mechanism of life even when they are present in very small amounts (parts per million or even less) in the soil or in the living cell; plant, animal or human. We know today the reason of this enormous influence.

Mineral trace elements can directly influence the enzyme content of plants. According to their correct use, mineral fertilizers improve or reduce the quality of agricultural products. It is understandable, therefore, that a slight variation in the content of a trace element in the soil is sufficient to reduce the capacity of the animal or human organism to resist microbial attacks.

The soil must be kept in good health if the animal is to remain in good health. The same is true of man.

h. FUNCTIONS OF TRACE ELEMENTS

1. Trace elements function as catalysts. The most known trace elements are: iodine - iron -zinc - copper - manganese - cobalt - silver - gold - nickel - chromium. Trace elements act as catalysts and are involved in hormone and enzyme systems, acting as enzyme activators.

2. Trace elements produce profound biological effects within all living cells and are at the root of all living processes, whether its plants, animals or man.

3. Significant inter-actions exist among trace elements. For instance, iron and copper both are concerned in the human with blood formation. In plants, iron and magnesium are closely associated in chlorophyll formation (the green coloring matter of plants).

4. Trace elements are functional elements; they act on a cellular basis.

5. Combinations of trace elements acquire under certain conditions entirely new properties, very different from the properties of the individual elements acting single.

6. Trace elements are used in case of inhibited enzyme activities. They re-establish chemical balance in disturbed cells.

7. Their function is to normalize enzyme activities.

8. Trace elements act as catalysts as mentioned before. Catalysts act merely by their presence; they regulate electronic exchanges and re-establish a balance in physico-chemical metabolic reactions.

9. A group of different catalysts behaves very different from the single chemical element catalyst.

10. Trace elements help form enzymes or co-enzymes and in such manner, function associating enzymes and proteins. We must at all times keep in mind that all enzymes are proteins.

The only characteristic, which all trace elements have in common, is their capacity to function in small amounts. It is this capacity which indicates to us that they must act as catalysts, involved in hormone or enzyme systems, either as the constituent part of the molecules of hormones, vitamins and enzymes; or as co-enzymes; or as enzyme activators.

Enzyme catalysis is the only rational explanation of how a trace element can produce profound biological

effects.

Trace elements function as activators or as catalysts within the living cell, be it plant, animal or human and they lie at the root of all living processes.

And let me not forget to mention that a significant inter-reaction exists among trace elements. I have mentioned already the inter-reaction between iron and copper. The deficiency of one will clearly limit the requirement of the other.

8. DECLINE IN TRACE MINERAL ELEMENTS IN GRAINS AND VEGETABLES

Dr. R. G. Rasmussen - Director of Research for Triple "F" Feeds in Des Moines, Iowa stated in Feedstuffs, August 9, 1969. Spectroscopic analyses of more than 4,000-grain samples taken in 11 Midwest States (Ohio - Indiana -Illinois -Wisconsin - Iowa - Minnesota - Missouri - Nebraska -Kansas - Dakotas) over just the last four years indicate a definite decline in mineral trace element content of the grains.

The average copper content in all of the corn analyzed for the first three years of the study was 2.56 ppm - but for the last year of the study - 1968 - the average copper content of the corn samples was less than 0.82 ppm, a decline of 68%.

The analyses showed also that the average iron content of the corn samples for the first three years was 21 ppm; while in 1968 the average was only 15 ppm, a decline of 29%.

Iron and copper are essential trace mineral elements in blood building.

Calcium	41%
Sodium	*55%*
Magnesium	22%
Potassium	28%
Manganese	34%
Phosphorus	8%

These crops were only over a four-year period. Rutgers University did a similar study in which they found the mineral content of vegetables varied considerably. The amount of iron in spinach varied from1, 584 ppm down to 19 ppm. In tomatoes, it ranged from 1, 938 ppm to 1 ppm. In lettuce, it varied from 516 ppm down to 9 ppm. Elements such as Aluminum, Barium, Strontium, and Chromium, also show a definite decline. There is convincing evidence today of the relationship between human malnutrition and soil malnutrition, between faulty diet and ill health; between soil health and human health.

9. ADSORPTION OF SERUM LIPIDS BY MONTMORILLONITE

by: Esko Nikkila and Nils Oker-Biom
University of Helsinki, Finland
December 19, 1952.

1. Montmorillonite is very effective because of its high ion exchange and non-swelling capacities. Montmorillonite adsorbs large protein molecules such as albumen, gelatin, hemoglobin, and humic colloids of soil.

2. Because the adsorption of organic colloids in Montmorillonite is most effective at low pH, it is possible that a reaction takes place between the basic groups of the proteins and the negative charges of the clay.

3. Montmorillonite combined with proteins has a much smaller Base Exchange capacity than uncombined Montmorillonite, which shows that a blockage of exchangeable groups must occur. The properties of the proteins combined with this clay mineral are also altered. The high resistance of the protein-Montmorillonite shows this complex to hydrolyze by proteolytic enzymes, and to decompose by soil microorganisms.
4. Montmorillonite added to diluted serum removes cholesterol and lipids (fats), besides remnants of fibrin

and euglobins.

5. Montmorillonite used at a slightly alkaline pH (8.0) adsorbs all the cholesterol *85%* of the phospholipids and 15-20% of the proteins.
6.

10. HOW TO USE THESE CLAY MINERALS

It is recommended that the average daily intake for adults be 2 - 6 capsules.

Contraindications: No known side affects have been experienced with these minerals**;** however some people have experienced slight headaches and mild diarrhea for 2 to 3 days due to the detoxifying effect of the minerals and clay. If this should occur, it is recommended to reduce the dosage and gradually build up again.

What specific results have been experienced? As stated earlier, the mineral has no direct therapeutic effects, but acts as a normalizer of physiological activities in human tissue.

There is no claim that these - or any minerals- cure anything. But, provide them to the body, along with exercise, good health habits and an all-important balanced diet, free of junk foods - and the body begins to use the minerals to repair and heal itself, as Nature intends. We have seen many benefits from multi-mineral therapy. Some are dramatic. But we purposely avoid claims of any kind.

Obviously, it is not logical to expect dramatic overall results from taking a single mineral. Many common illnesses have responded to therapy from the ingestion of this combination of elements. A deficiency of even one element in the body can result in the entire bio-system being out of balance.

How long does it take for noticeable improvement? This depends upon how deficient someone may be in certain essential minerals. A mineral excess or deficiency-related problem of long standing wouldn't resolve itself overnight. The body works slowly. However, some persons have reported improvement after only 2 weeks; but would suggest that 30 days is not uncommon.

> Dr. John A. Myers M.D. a member of the International College of Applied Nutrition reported in January 1978 issue of "Let's Live" regarding the clay mineral Montmorillonite deposit at Nevada *(* This form of Montmorillonite is the same used in the product named 76 Minerals. Compiler's Note).* . His original research and findings were based on mineral extracted from this exact deposit.
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> We quote from Dr. Myers article:
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> John Meyers then adds "there's a supply of such material available in our country. One in particular that has come to his attention is mined from an ancient inland sea bed near Las Vegas, Nevada What impresses him is its content of Seventy-six minerals (giving it the name 76 MINERALS), which are recognized and measured by spectrographic analysis", he emphasizes. Myers says he's using the material in tablet form on a wide range of patients - babies, children, of 2, 3 or 13 and on up to individuals in their 80's, as well as on patients " dogs and cats."
>
> "At this time, based on his experience with this substance John Myers finds 'the product is very effective in supporting the sympathetic nervous system in all of its functions.' He's observing, too, a remarkable improvement in hair, nails and skin - one of the first noticeable signs that the patients discover for themselves."

"How about canine response? Dr. Myers finds that 'weakness in dogs' hind legs, making them limp and even preventing them from standing up, were completely relieved when their diets included the minerals.' 'Also a tendency for dandruff to form on their skins was reduced'."

All of Dr. Myers' human patients have said they felt calmer and generally had an easier disposition. Many commented they were improved in their bowel action and all felt they were less tired, more rested after sleep at night."

"John Meyers believes that if such a mineral supplement were given to children in the first grade, within a year the improvement in all of them would be remarkable. He reports seeing improvement in young patients within two weeks on as little as one tablet daily. He continually urges clinicians to launch such programs in schools, not

only for general health purposes, but to achieve the improved dental conditions that artificial fluoridation programs have not accomplished."

"The Baltimore metabologist's recommended basic supplement routine, presented to his ICAN colleagues, is: two of the multi-mineral tablets three times daily after meals. But he hastens to emphasize that each of us determine what seems best for him or her specifically."

"Dr. Myers also states that the 76 minerals combination doesn't replace but supplements other minerals, which he gives his patients in ion form. He also suggests taking kelp for iodine - one tablet three times daily and 1,000 milligrams of vitamin C in time-released form three times a day. This would lay a general support foundation, of metabolic excellence on which you could supplement other vitamins and minerals as they were indicated.' Myers adds, however, that vitamins 'are limited or useless without iodine and trace elements for metabolic excellence'."

11. CONCLUSIONS:

One can conclude that trace mineral nourishment becomes very important in establishing proper physiologic function in man. In the past, little emphasis has been placed on the need of optimal trace mineral nutrition and as a result many potential medical problems may have existed as a result of health practitioners being insensitive to trace mineral imbalances. The amount of research currently being done is staggering compared to just five years ago. As we learn more about the effects on optimizing human health through trace mineral nutrition and deficiency symptoms caused by sub-optimal mineral nutrition, the principals and concepts can be better applied and accepted. In the meantime, a conservative approach is recommended in assuring adequate trace mineral nutrition of the patient on a daily basis either therapeutically or for prevention.

12. COMBINED ANALYSIS REPORT

Sample: **Brown Material**
Guaranteed by two testing laboratories: **1) University of Arizona**
2) Ford Chemical Laboratory
Date: **December 31, 1981**

ALUMINUM	Al	9.3%	HYDROGEN	H	.05	RUTHENIUM	Ru	7.8
ANTIMONY	Sb	10.5	INDIUM	In	.38	SAMARIUM	Sa	3.5
ARSENIC	As	.2	IODINE	I	7	SCANDIUM	Sc	3.7
BARIUM	Ba	22.5	IRIDIUM	Ir	.51	SELENIUM	Se	4.1
BERYLLIUM	Be	.10	IRON	Fe	1.6%	SILICON	Si	25%
BISMUTH	Bi	14.3	LANTHANUM	La	18	SILVER	Ag	.3
BORON	Bo	7	LEAD	Pb	15	SODIUM	Na	1.2
BROMIDE	Br	5.2	LITHIUM	Li	1.44	STRONTIUM	St	240
CADMIUM	Cd	1.12	LUTETIUM	Lu	.45	SULFUR	S	1.6%
CALCIUM	Ca	.23%	MAGNESIUM	Mg	.83%	TANTALUM	Ta	.50
CARBON	C	.19	MANGANESE	Mn	150	TELLURIUM	Te	.1
CERIUM	Ce	40	MERCURY	Hg	.166	TERBIUM	Tb	.62
CESIUM	Cs	183	MOLYBDENUM	Mo	61	THALLIUM	Tl	10.0
CHLORIDE	Cl	250	NEODYMIUM	Ne	20	THORIUM	Th	>100
CHROMIUM	Cr	70	NICKEL	Ni	60	THULIUM	Tm	.25
COBALT	Co	4.8	NIOBIUM	Nb	2.89	TIN	Sn	.44
COPPER	Cu	2.2	NITROGEN	N	.03	TITANIUM	Ti	.23%
DYSPROSIUM	Dy	4.0	OXYGEN	O	.2	TUNGSTEN	W	8.1
ERBIUM	Er	2.0	PALLADIUM	Pa	.74	URANIUM	U	> 100
EUROPIUM	Eu	.49	PHOSPHATE	P	320	VANADIUM	V	8
FLUORIDE	Fl	3.85	PLATINUM	Pt	.08	YTTERBIUM	Yb	1.4
GALLIUM	Ga	25	POTASSIUM	K	4.8%	YTTRIUM	Y	1.2
GERMANIUM	Ge	25	PRASEODYMIUM	Pr	2.0	ZINC	Zn	20
GOLD	Au	.68	RHENIUM	Rh	1.0	ZIRCONIUM	Zr	10

HAFNIUM	Hf	2		RHODIUM	Ro	.44			
HOLMIUM	Ho	1.1		RUBIDIUM	Rb	36.5			

All values are noted in parts per million by weight, unless noted as percentage (%).