Patterns of Trace Minerals in the Hair and Relationship to Clinical States

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During the past four years, I have obtained tests for trace minerals in the hair of 230 patients in my private practice and have personally graphed the results on the form developed by Albion Laboratory. of Clearwater, Utah. Tests have been done by Albion Laboratory, by Bio-Medical Data, Inc., of West Chicago, and by Mineralab, at Levine Hospital Building in Hayward, California. The graphs have been compared with the patients' clinical histories and physical examinations. Histories are taken from birth and include infant feeding, allergic symptoms such as colic, respiratory illnesses, and eczema, as well as the present and past illnesses, family history, and psychiatric problems.

Some months ago, I became aware of distinct patterns in the hair graphs of 175 patients. The other 55 are at present not classified. Nine of the 175 are close to normal curves. Figure 1 is S.R., male, age 19, occupation Physical Education Teacher, whose chief complaint was back strain. We see here a relatively normal curve, although the manganese and iron are low, and the lead, while typical in our present culture, is not natural.

The next category of curves represents heavy metal toxicity.

(A) **Copper.** Twenty-six patients showed high copper, nine of whom had an otherwise normal curve. Eighteen were hyperactive children, and eight were adults with various problems. The source of the copper in one case was daily drinking of fruit juice from a silver baby cup from which the silver plating was worn, exposing the copper base. Others were drinking water in homes with copper water piping and/or refrigerators with internal copper piping that delivered ice water, as shown by K.B., male, age 13, hyperactive, with abdominal pain and headaches (Figure 2).

(B) **Lead and Zinc.** Twenty-one patients had high lead. Four of these were not allergic patients. P.P., male, age 58, is a spray painter who work'

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without a mask (Figure 3). He uses not only lead, but zinc-containing paints. His initial complaint was Bell's palsy. Because of the possibility of surface contamination of his hair having caused the 70 mg percent of lead, pubic hair was also tested, as shown in the circled figures. The zinc was approximately the same, that is, 32 mg percent in scalp hair and 30 mg percent in the pubic hair; and the lead, while only half as much in the pubic hair, was still above 30 mg percent. **NOTE:** If hair is being dyed, pubic, axillary, or pectoral hair should be tested to be sure that the hair reflects the condition of the body tissues and not the hair dye or other surface contaminants. Two other patients with abnormally high zinc were a construction worker and a welder. Up to now, I have not looked for mercury, cadmium, nickel, or other heavy metals.

Multiple Sclerosis

R.N., male, age 53, has severe multiple sclerosis. His graph reveals an abnormally low curve, with high lead (Figure 4). John Miller, biochemist of Bio-Medical Data, is computerizing test results of hair analyses and had data on this disease which has been considered to be incurable. I have been told that physicians, with his assistance, have recently been reversing multiple sclerosis with proper diet, environmental control, and trace mineral and vitamin supplements.

Low Curves

C.K., male, age 13, with obesity (Figure 5). There are 57 low curves, some of which have a normal zinc. C.F., female, age 26 (Figure 6), listless with many symptoms that are sometimes called hypochondriacal. CM., male, age 48, who is listless and unable to work (Figure 7). Of the 57 low curves, there are three with abnormally high copper and four with abnormally high lead. These are also included in the total figures for copper and lead toxicity. Therapy for the foregoing types, that is, the relatively normal with heavy metal toxicity and those with the low curves, can usually be accomplished by attention to diet, removal not only of hard drugs and alcohol but also tobacco, tea, coffee, chocolate, and sweets, and the addition of supplementary vitamins and trace minerals. In the case of heavy metal poisoning, after removal of the source, oral or intravenous chelation is used. Supportive counseling is helpful in many cases. If there are superimposed psychiatric problems, psychiatric referral may be indicated. However, it takes several months up to one year to rebuild a malnourished or toxic body.

Sometimes a patient with a low curve will have allergy symptoms, and the low curve may represent a malabsorption syndrome which is very likely to be caused by a glutenopathy.

The curve which interests me the most occurs in 95 percent of my allergic patients. At present, the other 5 percent have a low curve. M.B., female, age 13, has a startlingly irregular curve, of which there are 85 among the 230 tested (Figure 8). Four of. these 85 have in addition a high lead reading and 14 have high copper. These are included also in the figures for lead and copper. M.B. has respiratory allergy and is being treated for a kidney infection. Her mother (Figure 9), interestingly enough, has some asthma, but is functioning well and does not have the narrow jaw which is present in her daughter and which the anthropologists consider to be one of the signs of physical degeneration due to malnutrition.

B.L., female, age 10 (Figure 10) has a graph which shows what I call the allergy type curve with high copper. P.F., female, age 18, is a schizophrenic girl weighing only 80 pounds and has very dark circles under his eyes, typical of allergic patients (Figure 11). E.R., female, age 57, has had asthma, now completely controlled by an elimination diet. She had two psychotic breaks at age 30 and 40 before her food allergies were discovered (Figure 12).

This irregular trace mineral pattern has been railed by Pfeiffer and others the

pattern typical of hypoglycemia. The manganese, sodium, and potassium are extremely low; the calcium and magnesium two to 10 times the median normal values; the copper and zinc are usually in balance or close thereto. Occasionally there may be a superimposed copper or lead toxicity. The iron is variable. The cause of this type of curve puzzles me. Some possible explanations, as well as observations made by others, follow,

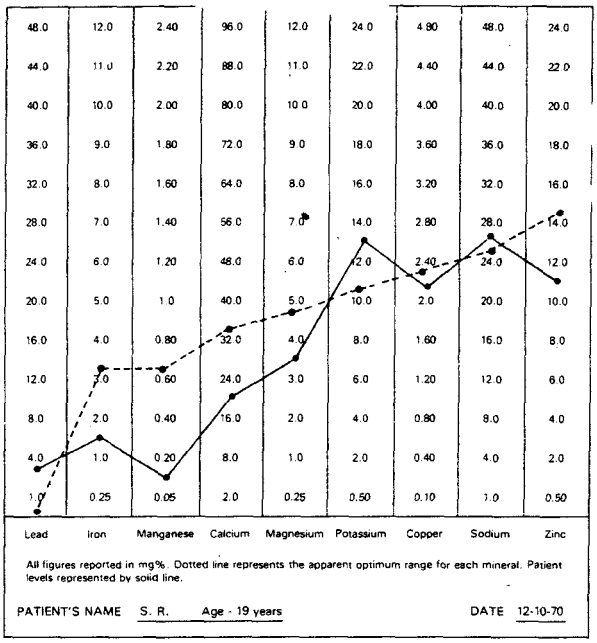
Theron Randolph uses two level teaspoons of soda bicarbonate with one level teaspoon of potassium bicarbonate orally to reverse a severe allergic reaction. How does this work? Does it simply balance the monovalent to bivalent minerals? Does it alter the reactivity of the cell in some way, perhaps by raising the sodium content of the intercellular fluid so that fluid leaves the cells which are swollen due to the allergy reaction? Randolph also states that hypoglycemia is a withdrawal reaction to the food to which the patient is allergically addicted and occurs one to several hours after ingestion of this food. Once the allergens are removed from the diet, the, hypoglycemic attacks cease. Some schizophrenias are reversed by removal of specific allergens from the diet and/or the environment. Hair analysis may be a useful tool in the differentiation of allergy-induced schizophrenia from other types.

Oxidative phosphorylation takes place in the mitochondria and is a magnesium-and manganese-dependent reaction. The catalytic interconversion of ATP <~> ADP is a part of this reaction. Interference with this mechanism could explain the fatigue associated with allergy and with schizophrenia. Mitochondria become swollen in allergy, and swollen mitochondria have been shown experimentally to leak their contents into the cellular cytoplasm (Lenniger, 1964). From whence comes the high calcium and magnesium? Artificial feeding of the human infant may play a role. Human colostrum is three to 10 times as high in race minerals as in human milk three weeks later. Colostrum is especially high in manganese (Orten and Neuhaus, 1970). Until recently not only were the overwhelming majority of infants artificially fed, but, if breast fed, were starved for 12 and often 24 hours after birth and then first given glucose water. This is unphysiological and does not occur in any other species. Colostrum is 2 percent protein compared to 1.21 percent protein in mature human milk. At birth the acid content of the stomach is high. The fat in mature milk is 114 times as high as in colostrum. The lactose is twice as high. Therefore, it is unphysiological to start feeding the newborn infant with glucose water. The minerals in the colostrum are necessary to activate the digestive enzymes after birth, and the total colostrum has a laxative effect which cleans out the meconium from the entire gastrointestinal tract (Rapaport and Buchanan, 1950).

The second stage of artificial feeding is cow's milk. Mature cow's milk contains $3^1/2$ times the calcium and 314 times the magnesium of mature human milk (Orten and Neuhaus, 1970). Davis (1959) states that "increasing calcium in the diet above 1 percent may have a. sharp depressing effect upon the utilization of other nutrients in the diet, including protein, fats and the vitamins; the macromineral elements, phosphorus and magnesium; and the trace mineral elements, especially iron, iodine, zinc, and manganese. In those instances where the intake of these nutrients is limited, increasing the calcium of the diet may have a markedly adverse effect and may produce a clinical deficiency of the other nutrients." Many allergists think that artificial feeding of infants and the very early introduction of solid foods is one cause of the increase of allergic patients.

During pregnancy, if the mother has a diet high in dairy products and refined carbohydrates, her manganese intake will be low. Manganese occurs mainly in the part of the whole grain that is removed by milling, in green plants, liver, pancreas, and the cream of milk. The present fad of drinking low fat or

FIGURE 1



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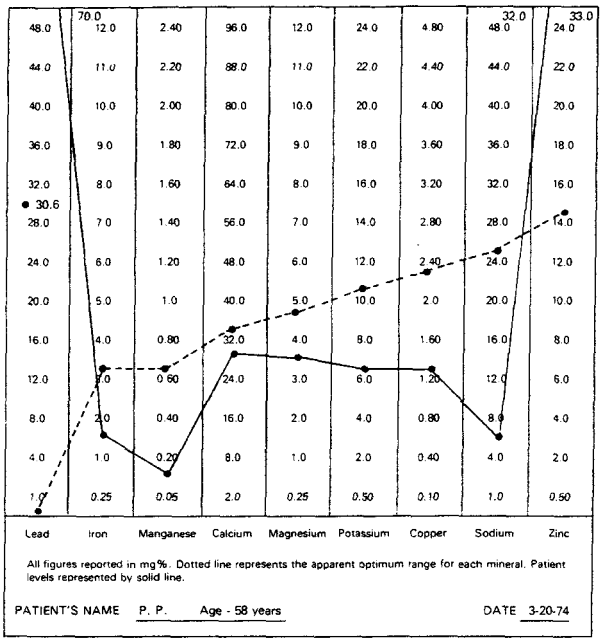

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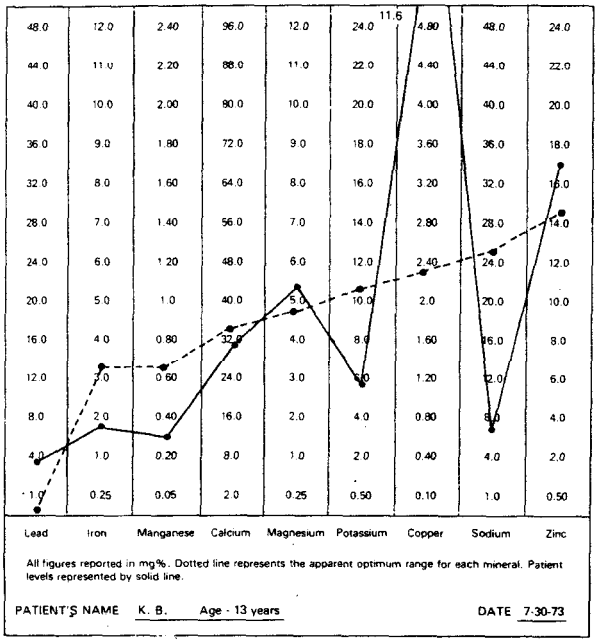

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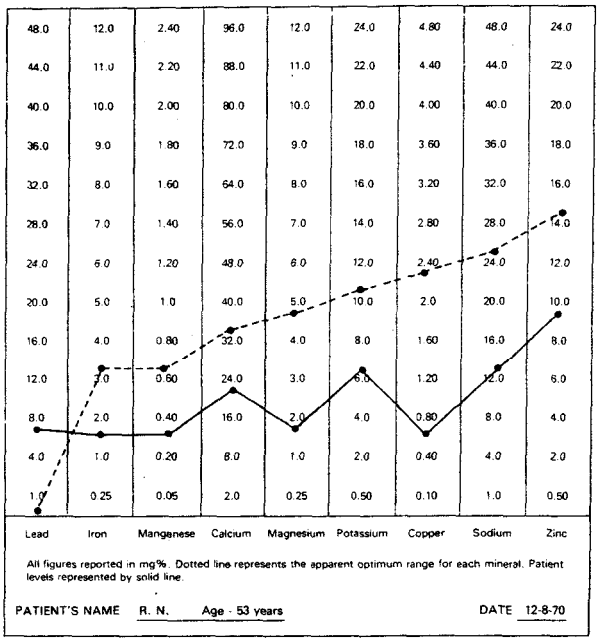

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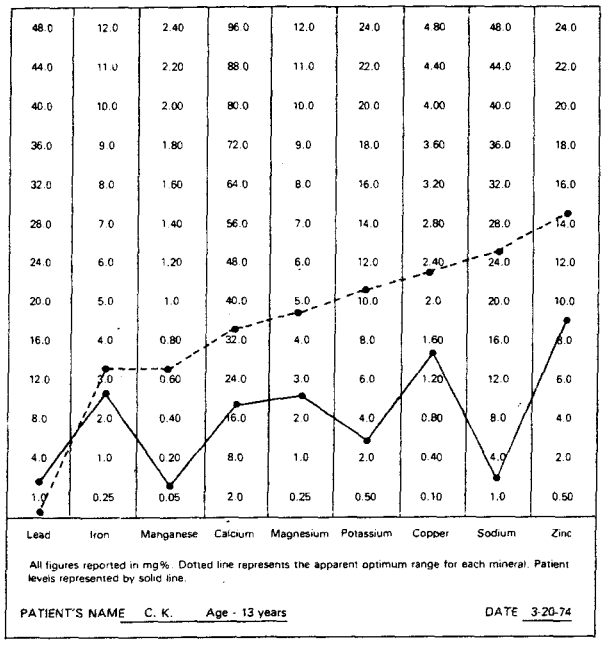

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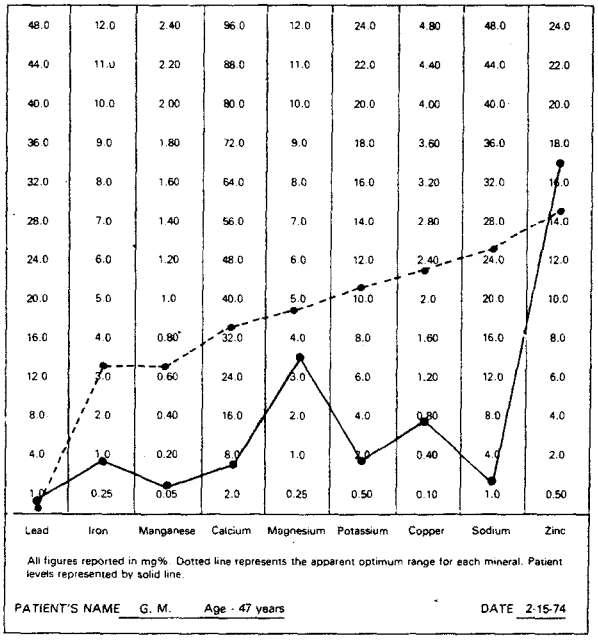

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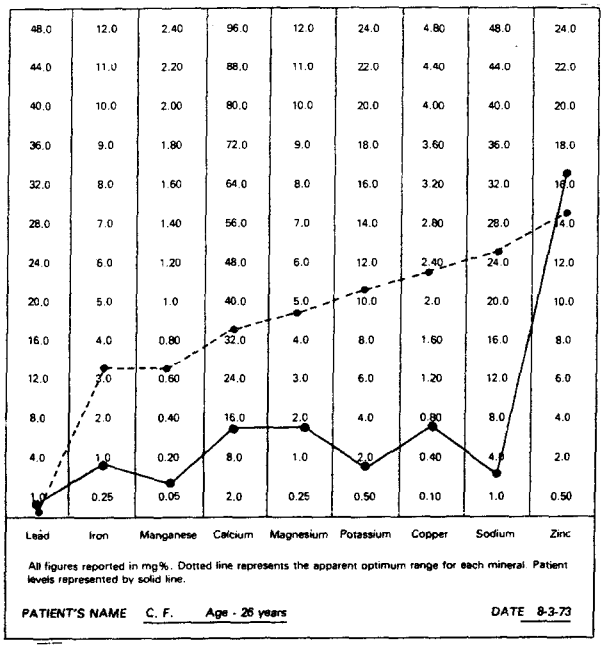

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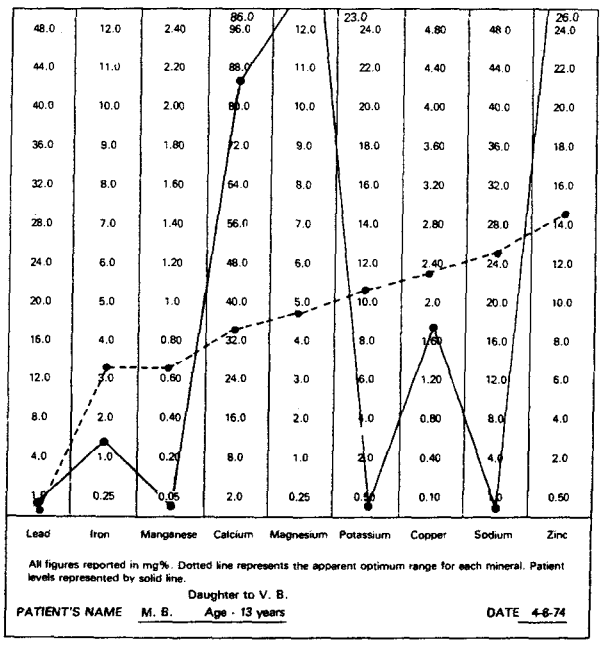

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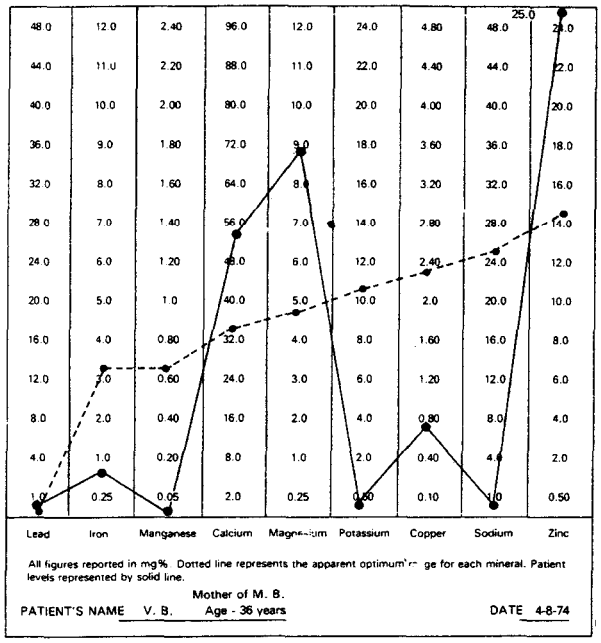

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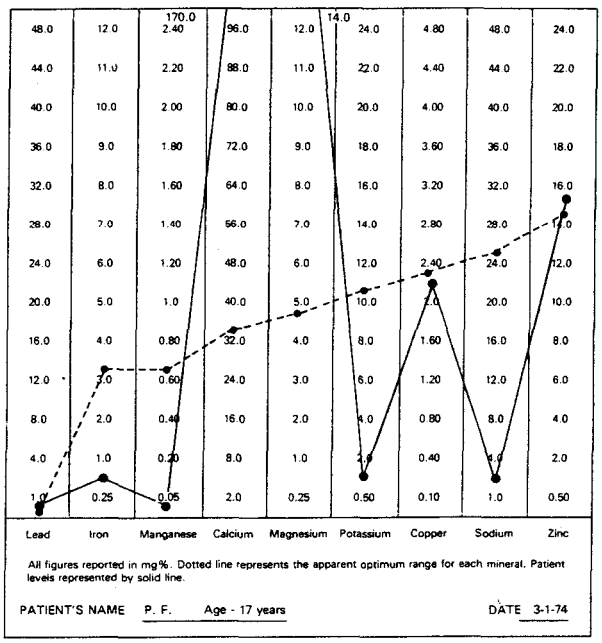

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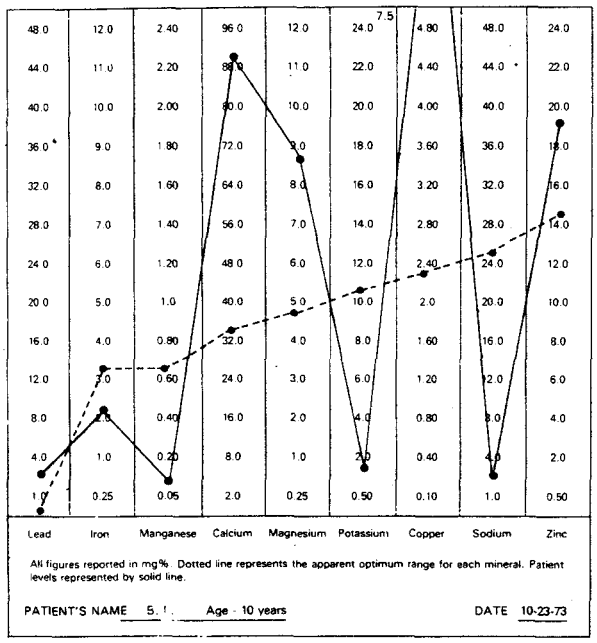

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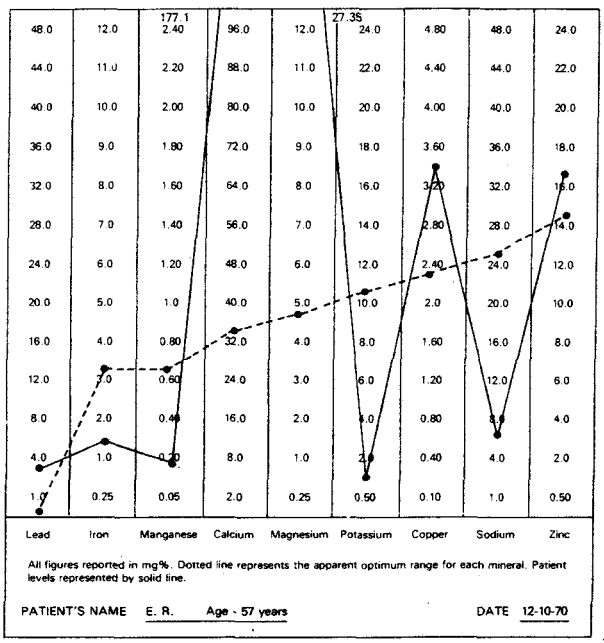

skim milk increases the calcium and decreases the trace minerals. The fetus further depletes the mother of manganese, and this may be one explanation of postpartum depression. Deficiency of manganese in experimental animals affects bone, reproduction, and the brain. The source of the green vegetables is also important. Soils which have been excessively limed have excessive calcium which interferes with absorption of manganese and other trace minerals by the plants. Furthermore, an alkaline pH in the soil results in the formation of manganese compounds which are not usable by the plants. Organic compost is essential for adequate plant nutrition and, unfortunately, is not being used in most commercial farming. With the dietary habits of our people, the artificial fertilization and liming of soils, and the artificial feeding of our infants, the stage may already be set for severe metabolic imbalances.

Are these imbalances inherited? The mother-daughter figures are interesting in this regard. Is the narrowing of the daughter's jaw due to manganese deficiency? Pavis (1959) quotes from the papers of Wilgus, Norris, and Heuser published in 1936 and 1937 showing that poultry suffer from high levels of calcium when associated with a manganese intake that is marginal. In mammals, numerous skeletal and neurological deformities occur in offspring when the mother has had a manganese-deficient diet. Schroeder (1966) discusses the possibility of Legg-Perthes-Calve's disease in man being caused by manganese deficiency. Some physicians feel that the high incidence of chronic degeneration disease in this country is nutritional, resulting from depleted soils, plus excessive use of refined grain products and white sugar from which all minerals have been removed and which, in the metabolic process, deplete the body of its trace minerals. The interesting animal and plant studies showing the effects of high calcium on absorption of trace minerals further support this observation.

It thus becomes obvious that treatment of patients with mineral imbalance is complicated and usually cannot be done with a simple hypoglycemia diet or mineral supplements or psychotherapy alone. It will take a combined program of allergy therapy, environmental therapy, dietetics, megavitamins, trace minerals, and various forms of psychotherapy in order to put the patient into a functional balance. Continued work needs to be done to see if this type of curve will change with therapy and time.

Summary

Of 230 patients, 175 can be grouped into four general types of trace mineral curves: (1) the normal; (2) heavy metal toxicity; (3) curves low in all or almost all minerals; and (4) the "allergy type." The first three may usually be treated successfully with diet, trace minerals, and chelation therapy if necessary. Treatment of patients snowing "allergy-type" curves of trace minerals is complicated and usually involves diet, allergy controls, minerals, megavitamins, and perhaps psychotherapy. It is possible that hair analysis may be a useful adjunct in differentiating the patient with schizophrenia caused by allergy from other types of schizophrenia.

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