

BIOLOGICAL TRANSMUTATION OF COBALT AND MAGNESIUM IN THE SUPPORT OF GOOD TEETH AND GOOD HEALTH

John A. Myers, M.D., F.R.S.H.
Baltimore, Maryland

Summary

Pioneers of nutrition and diseases of metabolism have shown repeatedly that food lacking in adequate amounts of vitamins, minerals and other important nutrients lead to serious illness. Modern methods of preservation, sterilization, cooking and staleness made necessary by mass storage and distribution, destroy essential nutrients even when the food is good to start with.

This paper deals with an effort to answer the question: "How and what is eliminated in this deterioration process?" A new concept is introduced to show that the natural elements essential to good health are very labile in a process of transmutation. This sensitive process of transmutation can lead to the change of elements so that absolute or relative deficiencies of some essential elements are produced. A discussion of the principle of transmutation as originated and set forth by Dr. Louis C. Kervran of Paris, France is outlined and applied to the picture of metabolic disease as we see it today. Individual organ systems are discussed in relation to symptoms that appear from inadequacies of Cobalt and Magnesium.

EDITORIAL COMMENT: by Dr. Michael Walczak, Book Review Editor.

The following article presents much stimulating material for thought. We recognize that some of the material is not commonly believed or accepted. But of all the books reviewed in this Journal in the past several years, Kervran's BIOLOGICAL TRANSMUTATIONS has received the greatest and widest interest. Therefore, the interested readers are offered the opportunity to extend their knowledge of that theory through this paper of Dr. John A. Myers. The use of capital letters within this paper is requested by the author.

The transmutation of Lead into Gold was the quest and hope of the ancient alchemist. Transmutation of Cobalt into Fluorine and Argon may be the answer to our present-day quest and hope for good teeth and good health. Until the age of atomic energy, transmutation of chemical elements was considered impossible. It is now known that some of the elements can be transmuted from one to another by atomic bombardment of their nuclei. However, the amount of material transmuted is infinitesimal, and the amount of energy required is tremendous.

In a recent book by Professor Louis C. Kervran, entitled *Biological Transmutations* he shows that in nature transmutations occur constantly and in great quantity at ambient temperature and with a reasonable expenditure of energy.⁵ Biological transmutation is a phenomenon that involves the nuclei of the atoms. It occurs most frequently among the first 20 elements, and to a lesser extent with the next 10, from a total of 104 elements. It is impossible to understand and appreciate the adaptability of the biological systems of animal, vegetable and mineral until one studies this book and becomes familiar with this new concept of transmutation. A few illustrations will serve to show how this Concept was discovered.

In 1799 the French chemist Vauquelin was so intrigued by the quantity of Lime (Calcium) excreted by hens that he decided to isolate a hen in a cage and feed it Oats exclusively. He measured the quantity of Lime present in a pound of Oats before feeding it to the hen. He then analyzed the amount excreted by the hen through her eggs and feces. The hen excreted *five times* more Lime than she had consumed from the Oats. Vauquelin concluded that Lime had been created, but he was unable to determine how it was accomplished. Lime is Calcium Oxide and is made by heating Calcium Carbonate called Marble or Limestone. Vauquelin was measuring the creation of the element Calcium, which is called Lime from the Latin.

In 1822 Prout, an Englishman, was the first to clearly define the problem of the transmutation of elements. He systematically studied the increase of Limestone (Calcium Carbonate) inside an incubating chicken egg, and proved that Limestone is not contributed by the shell.

Professor Kervran, through his concept of biological transmutation, was able to prove that Vauquelin was correct when he concluded that Lime was created. He also proved that Prout was correct when he showed that an embryo chick did not use Limestone from its shell to make its skeleton.

Professor Kervran lived in Brittany, France, where the area was full of Slate-Rock and Granite, but absolutely devoid of Limestone. Limestone was never given to the chickens, yet every day during the egg-laying season, they laid eggs with Calcium Carbonate shells. The chickens scratched about incessantly for fragments of Mica strewn on the ground. Mica contains Potassium Silicate and is a component of Granite. When the chickens were killed and the gizzards opened, he was surprised to find small grains of Sand, which is Silicon Dioxide, but never any Mica. He came to the conclusion that the chickens used the Silicon, to which was added a molecule of Carbon to produce Calcium; and Potassium, to which was added a molecule of Hydrogen to produce Calcium. He noted that an embryo chick walks out of its shell on leg bones hardened with Calcium, but that there is not enough Calcium available to the chick to manufacture this amount of bone from the Calcium in the egg. Here again he showed that the chick uses Silicon, which is stored in the membrane under the shell, to make the Calcium skeleton.

Our present knowledge of the physiology of egg-shell production is contained in the following excerpt taken from *Chemistry* Volume 43, Page 22, December 1,

1970. It was reproduced by John J. Miller, Ph.D., in his "Miller News and Comments", and was so interesting it was re-published in the May 1972 "Newsletter" of The International College of Applied Nutrition. It says: "Egg shells of the common hen weigh on the average 5 grams, of which 2 grams is Calcium. This represents 80 times the amount of Calcium in the hen's blood at any moment. Yet hens can lay 5 to 7 eggs per week and continue to do so for days on a Calcium-free diet. Shell formation starts with a dome-shaped structure surrounding the embryo and its 2-layer membrane. The dome consists of protein mucopolysaccharide complexes on which Calcium Carbonate crystals grow for about 16 hours — while forming tightly packed columns of Calcite, but allowing pores through which the embryo can breathe during incubation. A thin coating is added just before the egg is laid. To supply the Calcium needed, 25 mgms. of Calcium must be removed from the hen's blood every 12 minutes despite the fact that the total Calcium content of hen's blood at any one time is only 25 mgms. Therefore the extra Calcium required is released from cavities in the bone marrow as fast as demanded." Dr. Miller comments: "Considering this miracle performance in producing eggs for man's use, it seems unfair that we humans cannot eat the shell."

It is well known by any housewife today that eggs produced by chickens in 'egg factories' where the chickens are fed ground oyster shells for Calcium, have shells that are so weak they are hardly strong enough to handle without breaking — whereas eggs produced by chickens raised on a farm and allowed to peck on the ground where they eat Sand and Mica, have shells that are very hard.

The crab lives in sea-water with a very low concentration of Calcium — 0.04 per cent, but it hardens its shell by manufacturing Calcium from Magnesium and Potassium. Magnesium exists in the sea-water to the extent of 5.0 per cent, and Potassium to the amount of 0.5 per cent. Tests have been made in which all Calcium has been removed from sea-water and the crab continues to harden its shell.

In the human body Professor Kervran shows that bones heal poorly and slowly when Calcium is fed as the healing agent, but they heal rapidly and almost as if they have been welded together with no evidence of a break, when the healing agents are Magnesium and Silicon.^{5A} Long before I ever heard of this concept of transmutation (30 years in fact), I produced healing in un-united fractures by supplying the patient's metabolism with Potassium Chloride by mouth, and Magnesium Chloride intravenously. It never occurred to me at that time that these chemical elements were being transmuted into Calcium. I felt that they were promoting the utilization of Calcium and improving the metabolism of the patient in general.

One of the most fascinating aspects of this transmutation concept is applicable to our ecological fears today. With the fantastic burning of gasoline, gas, oil, coal, forests, rubbish and garbage, etc., the ecologists have frightened us with the idea that the envelope of Oxygen around the earth will be consumed. They make this statement and pass laws to prevent the burning of leaves and garbage by

homeowners, despite the fact that the concentration of Oxygen in the atmosphere has never varied from the 21 per cent it has always been. Professor Kervran shows that Nitrogen, N_2 , is constantly being converted to Carbon and Oxygen at the outer edges of our atmosphere by the energy of the cosmic radiation and ultraviolet light. N_2 (2 atoms of Nitrogen¹⁴) shift a single proton within the 2 atoms and produce Carbon¹² and Oxygen¹⁶. We have here an internal remodeling by removal of a proton from one nucleus of Nitrogen to the other. This reaction also takes place in industry when Nitrogen comes in contact with red hot metal such as in welding or heating metal to a red heat in a furnace, forge, or stove. Welding of steel produced a number of deaths from Carbon Monoxide poisoning — sufficient to require an investigation of this catastrophe. Pot-bellied stoves produced Carbon Monoxide headaches in elementary school teachers and students at the turn of the Century when these stoves burned to a cherry red to heat the classrooms. Thus by transmutation the pollutants of the atmosphere are reduced at the outer reaches of the ionosphere where Oxygen is released to maintain its stable concentration of 21 per cent, as it has always been, and it is folly for the harbingers to despair to frighten the public into believing we will suffocate in the future from an accumulation of pollutants and a lack of oxygen.

We know that the Chlorophyll of plants has the same molecular structure as the hemoglobin of blood. The hemoglobin of blood becomes a carrier of Oxygen when a molecule of Iron is attached, and the Chlorophyll of plants becomes a carrier of Carbon Dioxide when it acquires a molecule of Magnesium. Tons of Magnesium are removed when crops are harvested from soil which did not have this amount of Magnesium available. Liming the soil is one of the necessities for growing large crops. Lime is Calcium Oxide and when this Calcium loses a molecule of Oxygen it becomes Magnesium, which is used by the plants. It is interesting to note that the plant does not thrive well on Magnesium. It seems to have an evolutionary pathway built into its metabolism that must be satisfied by Calcium, which is transmuted to Magnesium. Mineral Calcium is a residue and the animal organism does not assimilate it; it is found in this terminal stage in man and higher animals. However, plants have the opposite reaction and can use Calcium directly.

Professor Kervran says that we are to assume the body does not use Calcium directly *until proven otherwise*.⁵⁸ It is well known that Calcium is poorly ionized and exists in a very low concentration in solution. There has always been a controversy as to how to get Calcium into solution to build the bones of the skeleton. It seems thrilling to think of highly ionizable Magnesium and Potassium, minerals that are freely transported throughout the body, being able to be transmuted into Calcium by enzymes at the sites where it is needed to form the structure of the bones in various degrees of density, from the outside dense layer to the inner porous layers. Decalcification occurs when saltless diets are prescribed, especially diets without Chloride.

A similar mechanism exists in the teeth, where the very hard outer surface of enamel prisms is laid down by an ectodermal organ called the ameloblast. Then a decreasing density and hardness through the dentine to the porous dentinal canal

is controlled by the odontoblasts, similar to the osteoblasts of the bone. It is interesting that in both of these hard structures, bone and teeth, Fluoride exists as part of the apatite. It is for this reason that the fluoridation of drinking water has been promoted to supply Fluoride to harden the enamel and protect the teeth from decay and disintegration.¹⁶

Professor James E. Shaw of the Harvard School of Dental Medicine, states in his Paper entitled "Chemistry of Caries Prevention": "The distribution of Fluoride in the enamel is not uniform.¹⁴ There is a much higher level of Fluoride on the external surface of the enamel than in the deeper layers. This gradient in Fluoride from the external surface to the deeper layers of enamel exists in teeth *before* eruption as well as afterward and is true, not only for teeth formed in areas where normal or above-normal amounts of Fluoride are present, but also in those formed in low-Fluoride areas. The gradient is in the neighborhood of ten times greater for the surface than for the deeper layers of enamel." Thus it is seen that even before the tooth is erupted the Fluoride gradation is present, and even in areas where Fluoride is low. The question immediately arises: "Where does the Fluoride come from, and what determines the gradient when the tooth is not even exposed to any carrier in the mouth — certainly not Fluoride?"

It is my thesis that Fluoride is produced by transmutation of Cobalt into Fluorine and Argon and its gradation determined by the enzymes in the areas where it is most needed. Its concentration in the enamel prisms on the surface of the teeth is part of the hardening mechanism and can easily account for the gradient of a ten times higher concentration in the enamel surface, as compared to the deeper layers of enamel.

Kervran discusses in detail and supplies proof of the transmutations shown in Table 1. He points out as does Schroeder, the basic requirement for these elements in the beginning of life in primordial time. Chlorine is a vital element of great importance. Sodium and Chloride of the plasma are common to all animal life and their values are so constant they must be considered to be under some kind of internal regulation. From Nitrogen, Hydrogen and Lithium of the ionosphere he can account for most of the essential elements of life by biological transmutation.

TABLE 1.

**TRANSMUTATIONS THAT HAVE BEEN DISCOVERED AND
PROVED FUNCTIONING IN BIOLOGICAL SYSTEMS**

$2(N_{14})_{28}$ (Nitrogen)	{	Cosmic Rays <i>Ultraviolet light</i> → O_{16} (Oxygen) plus C_{12} (Carbon) Red hot metal
O_{16} (Oxygen)	plus	Li_7 (Lithium) → Na_{23} (Sodium)
C_{12} (Carbon)	plus	Na_{23} (Sodium) → Cl_{35} (Chlorine)
C_{12} (Carbon)	plus	O_{16} (Oxygen) → Si_{28} (Silicon)
C_{12} (Carbon)	plus	Si_{28} (Silicon) → Ca_{40} (Calcium)

Na ₂₃ (Sodium)	plus	O ₁₆ (Oxygen) →	K ₃₉ (Potassium)
Na ₂₃ (Sodium)	plus	H ₁ (Hydrogen) →	Mg ₂₄ (Magnesium)
Mg ₂₄ (Magnesium)	plus	O ₁₆ (Oxygen) →	Ca ₄₀ (Calcium)
Mg ₂₄ (Magnesium)	plus	Li ₇ (Lithium) →	P ₃₁ (Phosphorus)
P ₃₁ (Phosphorus)	plus	H ₁ (Hydrogen) →	S ₃₂ (Sulphur)
O ₁₆ (Oxygen)	plus	O ₁₆ (Oxygen) →	S ₃₂ (Sulphur)
Cl ₃₅ (Chlorine)	minus	O ₁₆ (Oxygen) →	F ₁₉ (Fluorine)
F ₁₉ (Fluorine)	plus	C ₁₂ (Carbon) →	P ₃₁ (Phosphorus)
Mn ₃₅ (Manganese)	plus	H ₁ (Hydrogen) →	Fe ₃₆ (Iron)

My clinical work has shown Cobalt active in all the important body systems, as indicated later. Schroeder's work shows it to exist in Vitamin B₁₂ and only in small amounts elsewhere in the body.¹² Sognaes, in his "Chemistry And Prevention of Dental Caries" does not even mention Cobalt, but goes into great detail as to the mechanics of Fluoride in hardening the enamel surface against dissolution by acids that produce 'white spot formations' which he indicates are the first recognizable stage of what will become a carious cavity.¹⁵ He says: * "The most significant fact is that the demineralizing agents do reach the underlying enamel structure along preformed pathways. These pathways appear to be primarily related to the regions of the prism peripheries, the prism sheaths, and the interprismatic substance." It has long been shown that this interprismatic substance is keratin and is a honeycomb-like structure, in which the hexagonal prisms of the enamel are secreted by the cells of the ameloblast, which is discarded and destroyed when the tooth is erupted. The integrity of this keratin is maintained by a flow of nutrients from the odontoblasts through dentinal tubules to the surface of the enamel by way of this interprismatic substance. If the integrity of this keratin is damaged, the enamel in this area will fall out and leave a white spot. If the odontoblasts should lose their ability to supply nutrients to these dentinal tubules, the entire pathway from the odontoblasts through the dentine to the enamel will lost its integrity and die. It is through this impaired pathway that the bacteria enter the tooth structure.

The integrity of the odontoblasts is maintained by nutrition that is fed to them by the blood supply of the dentinal canal. Their viability depends on an adequate supply of all nutrients, plus the trace elements such as Copper, Zinc, Magnesium, Manganese, Vanadium, Molybdenum, Silver, Cobalt and Iodine. Intravenous Magnesium Chloride will tighten the teeth in the socket within a few hours after injection, when they are not too bad. Copper and Cobalt may be evaluated in their support of the keratin by the way in which they improve the health of the nails and hair, both of which are keratin structures. The same response is produced in the keratin structures of the teeth. When the surface of the tooth is dry and there is a precipitation of plaque, that is an indication of the need for Iodine. When a proper balance is obtained, the surface of the tooth is slippery from mucous which has been secreted by the odontoblasts and exuded through the dentinal canal onto the surface of the tooth. When this procedure is functioning, there is no possibility of invasion by bacteria. The entire intestinal mucosa from the lips to the anus exudes

this protective cover of mucous. Teeth have the same protection and produce the mucous through Tomes' Canals, which are extensions from the odontoblasts.

In my previous paper I pointed out the remarkable effect of Magnesium Chloride, Zinc Iodide and Methionine in controlling painful teeth and gums.⁸ It is remarkable how this trace element therapy, using intravenous Magnesium, reduces the sensitivity of the teeth, so that a patient who could hardly stand a dental drill is no longer bothered by it. Methionine is also indicated when the gingival margin is sensitive to the touch of a toothbrush. It is also indicated when the gingival margin retracts from the neck of the tooth. Proper balance of Methionine, along with the trace elements, will cause the gums to grow back up along the tooth and maintain a very tight attachment at the gingival margin. These changes are not easy to accomplish, and certainly not in a very debilitated patient. This is why prevention is our greatest help to all people.

It was shown by Dr. Ralph Steinman many years ago how completely permeable the teeth were to Iodine. Dental caries is not a disease of bacterial invasion. Dental caries is a disease of the loss of integrity of the odontoblasts and their nutrient tubules through the dentine to the enamel surface. When the nutrition to these cells is impaired, or they actually die, the dentinal tubules no longer carry nutrition to the keratin that holds the enamel prisms in place and the keratin disintegrates. A 'white spot' is formed, where the enamel falls out of the disintegrated keratin and leaves a pathway for the bacteria to enter the tooth and produce the decay which we see as dental caries.

In a Monograph entitled "Pharmacology And Therapeutics of Cobalt", Lloyd Brothers, Inc. conclude that Cobalt is non-toxic even in large doses, far above the amounts used in my patients.⁶ Their work was planned to study the control of anemia by Cobalt, and ultimately the development of a drug for its corrector.

It is my suggestion that along with its use as Cobalt ion in Vitamin B₁₂, etc., it also serves to satisfy an evolutionary pathway by transmutation to Fluorine and Argon. In this manner it supplies Fluoride at specified places in the bone and teeth to produce hardness and strength. Cobalt splits perfectly with respect to Atomic Number and Atomic Weight, as shown in Table 2.

TABLE 2.

	Atomic Number	Atomic Weight
Fluorine	9	18.9984
Argon	18	39.948
Summation	27	58.9464
Cobalt	27	58.9332

Table 2: Cobalt splits perfectly with respect to atomic number and atomic weight. (This is not a proven reaction, it is my suggestion and the thesis of this paper.)

Kervran shows that starting with Sodium Chloride and water, by transmutations indicated in Table 1 the organism can manufacture all of the essential elements it needs for homeostasis.^{5c} There are certain elements that it cannot produce, such as Iodine, Chromium and Cobalt, but one thing is certain — in the presence of a saltless diet (Sodium Chloride) the organism cannot continue to grow and live.

With this perspective from Kervran, we can now understand and account for a number of the enigmas of life. *First*, the fertility of starvation. In many areas of the world where people are starving, their numbers are increasing and they maintain some semblance of existence, even though their bodies are thin and scrawny. They become rapidly ill when they are fed a high calorie diet of sugar and white flour, devoid of minerals. *Secondly*, life is completely dependent upon certain mineral elements that are indispensable; or ill-health, compromised health, or cancer will appear.

Charles A. Huggins, M.D., who received a Nobel Prize for his work in cancer, electrified an audience at The Johns Hopkins University when he said: "There is *one* cure for cancer" — and after what seemed like an interminable pause, he added "Starvation". He pointed out that calories in any form: protein, fats or carbohydrates, when given in sufficient amount, would produce cancer.

Henry A. Schroeder, M.D., in his book "The Trace Elements And Man", in a brilliant discourse points out the indispensable need of the body for the trace elements.¹² In particular he makes a plausible case for the need for Chromium in preventing the disease of modern civilization — atherosclerosis and its attendant ills, diabetes, heart disease, and stroke. At no place in his book do I find the slightest indication that he is aware of Kervran's thesis of the biological transmutation of the elements. Throughout his treatise he minimizes the need for Cobalt, except in the minute amount that is necessary in the manufacture of Vitamin B₁₂. He does not seem to recognize the fact that Cobalt and Chromium are miscible in all proportions in the liquid and solid state.¹⁸ Many of the characteristics which he attributed to Chromium in the protection of the body against atherosclerosis, I find true of Cobalt. It could be quite possible that because of their complete miscibility, they are actually working together in these specific sites.

After reading Kervran's book, one can read with great interest and much greater understanding an excellent book by J.I. Rodale, entitled "Magnesium, The Nutrient That Could Change Your Life". This book gives a compilation of all of the information in the literature about Magnesium in the human body.

"The Biology of the Trace Elements: Their Role in Nutrition" by Karl H. Schutte, Department of Botany, University of Cape Town, South Africa, is the most comprehensive book on the subject.¹³ He points out the following principles of nutrition: "It is well known that food is necessary for life and that the nature of the food that an animal or human consumes is reflected in his behavior and degree of

well-being. It is not as well appreciated that micro-organisms and plants have the same requirements as man and animals, and the nature of their food influences their development. Over the great expanse of biological existence food must cover a wide range of materials. Plants do not eat steak and onions, and man does not normally eat soil. Food is consumed for its nutritional factors, which we call 'nutrients'. All living organisms require a regular supply of nutrients. This is as true for microbes as it is for man. If there is a deficiency, or an excess, or in fact if there is an imbalance of nutrients, their normal development will cease and abnormal development will result. If the imbalance is acute and severe, death will result."^{13A} If the imbalance is such that life can continue at a lower level of energy, according to Warburg, cancer will result and eventually death.¹⁷

Richard H. Follis, Jr. M.D., in a paper entitled "Some Observations On Experimental Bone Disease", shows in a remarkable way with clear-cut histological sections, the need for the specific effect of Copper on osteoblastic activity.¹ Both Ascorbic Acid and Copper deprivation lead to a serious breakdown in the developing bone cells. As indicated by Schutte,* Copper deficiency is the cause of the 'Falling Disease' of cattle, and I find that Cobalt supplementation is necessary along with Copper and Molybdenum. On page 55 he shows the interdependence of Copper and Molybdenum. An increase in one produces a relative deficiency and need of the other.^{13B}

When Weston A. Price, a dentist, observed primitive tribes around the world, he came to the conclusion that they maintained their health and excellent heredity by eating unprocessed foods obtained from their natural surroundings.¹⁰ When these natural foods were replaced by the white flour, sugar and preserved and cooked foods of civilization, they became ill in exactly the same way of civilized man. What is more, they lost their ability to have good teeth and a good dental arch to hold them. With our perspective from Kervran, Schroeder and Schutte, we can now see that the abundance of trace elements in the primitive diet was discarded for the high calorie, low protein, low vitamin and low mineral diet of modern civilization.

Sir Robert McCarrison published his magnificent book "Studies In Deficiency Disease" in 1921.⁷ In discussing his observations on nutrition in both England and India from 1914 to 1919, he was impressed with the finding that disease states were brought on by a de-vitaminized diet. It was shown that the evidence of vitamin deficiency diseases manifest themselves as certainly when partial deficiency is protracted over long periods of time, as when more extreme deficiency is experienced over shorter periods. It is obviously of great importance to be aware that food deficient in certain vitamins will ultimately cause nervous symptoms of a definite order, and be designated by a classical name such as beri-beri, scurvy, rickets, pellagra, etc. Since these are end-results, it is of still greater importance to realize that the same faulty food will give rise *more early* to gastrointestinal disturbance and other forms of vague ill-health, and that these, like the nervous

symptoms, can be prevented by supplying the necessary vitamins and minerals and adjusting the balance of the food. In his nutritional studies on experimental animals, to be sure that he eliminated the vitamins from the food that he fed to them, he autoclaved it, that is, heated it to 250° F. under 10-pounds pressure. This severe processing not only eliminated the heat-sensitive vitamins, but also disassociated metals such as Cobalt and Magnesium, and may have produced other damage to the elements that we are not completely aware of. In any case, he produced a severe debilitation of the intestinal tract, even to the appearance of cancer. Also, a debilitation of the glands of internal secretion and the nervous system.

When Francis M. Pottenger, Jr. M.D., performed his experiments on cats in which only part of the diet was heated, he produced a marked debilitation in the offspring that was similar to the debilitation seen in the primitive tribes by Dr. Price and by Dr. McCarrison.⁹ What made his work more important was the fact that his diet, which was capable of supporting development and reproduction, by just heat alone was capable of producing such changes that the offspring were born with thyroid disease, poor development in the facial structure and jaw, and with a fragile skeleton throughout. Thus he demonstrated in a remarkable way that an adequate diet of raw meat and raw milk, alone or in combination, *affected by heat alone*, produced a pattern of complete tissue and skeletal degeneration. He concluded that the modern civilized diet after much processing, modification, staleness and complete cooking, produced children with rampant dental caries, skeletal defects, allergies and fatigue, along with emotional and nervous changes seen in the experimental animals.

In 1946 I was introduced to 'dry ions' by Mr. Frank L. LaMotte, Owner and Director of the LaMotte Chemical Company of Chestertown, Maryland. The metal ions were prepared on carboxyl ion exchange resin obtained from Rohm and Haas Co. from reagents of chemically pure quality supplied by Baker. The metal was approximately twenty per cent of the weight of the preparation. I started using these metal ions in my practice immediately, the first recipient being Mr. LaMotte and myself. Zinc was used first because of its high value in the body, almost as great as iron.

Dr. Warfield M. Firor, Professor of Surgery at The Johns Hopkins Hospital, was my mentor as well as my patient and I discussed with him my experience and clinical results concerning metabolic support to my patients. He became very enthusiastic about my success and brought to me his wife and son as patients. They also obtained excellent results.

In August of 1958 Dr. Firor introduced me to Dr. James P. Isaacs, who was then working with him as Surgical Assistant in Research Work at The Johns Hopkins School of Medicine. Dr. Isaacs showed me a plan of the metabolism and step-by-step disintegration of the glucose molecule, using Krebs' Cycle and its associated vitamins and minerals. It was at this meeting that I pointed out to him my clinical

findings in applying metabolic support to my patients, using vitamins, amino acids and minerals in ion form such as Magnesium, Manganese, Zinc, Cobalt, Copper and Molybdenum in angina pectoris, rheumatic heart disease, fibrillation and ectopic beats. Potassium Chloride and Iodine as 'Calcidin' were also given by mouth. He was thrilled with the knowledge that someone was already applying clinically what he was trying to visualize in a theoretical pattern. Immediately we envisioned a cooperative research project to test the value of this therapy on the heart action of experimental animals in the Hunterian Laboratory at The Johns Hopkins Medical School. I supplied him with the trace elements that he was to use on experimental animals and on carefully selected patients in his clinical work at Hopkins, and later on at Piedmont Hospital in Atlanta, Georgia. I had hoped that a collaborative effort would develop into a positive, creative association. Unfortunately this effort was not successful and in 1963 our association was terminated. In 1972 he published an article entitled "Trace Metals, Vitamins And Minerals In Long-Term Treatment of Coronary Atherosclerotic Heart Disease", the plan of which I had suggested to him in 1958 and amplified to him in frequent meetings up until 1962.³ In this Paper he admits in two places that he was aware of my use of these elements in ion form. He subsequently published a resume of this work in the "National Inquirer" Magazine of May 12, 1974, assuming responsibility for originating a plan of controlling heart disease.

My reason for not publishing my theory on alleviation of coronary symptoms sooner was because I had with myself an unsettled controversy over Vitamin E. I was greatly impressed with the work of Dr. Wilfrid E. Shute and Dr. Evan V. Shute of The Shute Institute of London, Ontario, Canada and the sincerity of their observations, but could not corroborate their findings. I could easily see that Vitamin E had a very helpful effect on the heart muscle and the system in general, but it had other actions that deterred me from using it in the suggested doses that they recommended with the *Alpha Tocopherol acetate*:

First, it always produced a depression in the hypothyroid patient. It seemed to make his hypothyroid condition worse.

Second, it produced severe cramps in the calf muscle, so bad in several patients (including myself) that they could hardly walk at all. The literature maintains it will prevent cramps in calf muscles.

Third, throughout international papers, as well as papers from The Shute Institute, are statements that Vitamin E can be given in unlimited amounts without symptoms of discomfort or toxicity. In my experience even reasonable therapeutic amounts produced metabolic discomfort, but not toxicity.

I felt that these conditions were brought about by insufficient interaction of needed trace elements, but it never occurred to me that Cobalt was the key element until after many unsuccessful attempts to find the answer in other metals.

This discovery of the synergism in Cobalt and Vitamin E opened up a brand

new line of inquiry for me and ultimately led to the satisfaction of writing this Paper.

In carrying on a rehabilitative program, it was quickly discovered that a certain pattern of preference had to be followed. First, Magnesium Chloride mixed with Solu-B intravenously; and B-Complex, Vitamin C and Potassium Chloride by mouth. This combination allowed the respiratory activity of the cells to operate at a much higher and more efficient level. The patient always felt warmer. Vitamin A, Vitamin E, Zinc and Iodine were the next basic group of elements that must be supplied. In many of these patients a thyroid hormone supplement was required, and in women a supplement of estrogen was required. In the following clinical discussions, it is assumed that these basic materials have already been supplied and are functioning reasonably well. In fact, long before I discovered the effectiveness of Cobalt, Manganese, Molybdenum and Copper, I was getting remarkable results from the previously mentioned materials.

Magnesium by mouth in any form, whether Sulfate, Acetate Chloride or Citrate, produces stimulation of the bowel and eventually diarrhea. When given intravenously it produces a quieting effect to the nervous system, with no stimulation to the bowel. For this reason Magnesium Chloride was given intravenously throughout this work.

One of the most disturbing patterns of discomfort is the pain in the left back, extending to the left shoulder and neck and down the left arm into the hand. This is a common complaint and is many times associated with a numbness and tingling of the hand and wrist. Sometimes the pain would follow the facial nerve into the left side of the face and produce soreness in the left upper molar teeth. Sometimes it would extend to the lower ones also. This condition could be either precipitated or made worse by the use of Sulphur Compounds, particularly Cystine and Methionine. It was found that only ionic Silver relieved this condition, and in a remarkably specific way.

Further investigation showed that Silver is a component of natural Vitamin A and the Intrinsic Factor supplied by the Armour Company for pernicious anemia. This Silver was identified spectroscopically for me in two laboratories. From the remarkable specificity with this ionic Silver operating in the stomach and in the vagus and facial nerves, I would suggest that it is the Factor that we have been looking for in what is now termed the Intrinsic Factor of pernicious anemia — the Extrinsic Factor being Cobalt. Silver also has a remarkable effect on the stability of color vision. It made the colors more vivid and aided in the light sensitivity control in the retina, that is, one could go into very dim light and have the sensitivity control remarkably sensitive; and then into brilliant sunlight and have the sensitivity control greatly reduced. An adequate amount of Tyrosine and Tryptophane must also be supplied with this mechanism, as well as Vitamin A.

The specificity of the action of Cobalt is indicated by the clinical response in the following systems and organs.

1. Heart.

It strengthens the pulse and stops irregular ectopic beats. In the early phases of cardiac irregularity, when ectopic beats are about to occur, there is a peculiar pressure discomfort in the precordium just above the nipple. Cobalt ions in a No. 5 capsule will ease this discomfort in a few minutes and the entire chest feels more open and easier to breathe.

I have experienced this feeling myself and have seen it in many patients. Some I can remember complaining of it in my student days in The Johns Hopkins Hospital Dispensary. These patients complain of a vague uneasiness in the left chest when they lie on their left side, and feel more comfortable lying on their right side. Physiological experiments on the heart beat by Ringer showed it to be modified and regulated by Potassium, Sodium, Calcium and Magnesium, but now we must consider Zinc, Copper, Molybdenum, Manganese, Vanadium, Cobalt and Iodine.

Throughout this Paper it will be pointed out that Cobalt and Copper are constantly complimentary. If one gives Cobalt ions too rapidly, a tightness will occur between the shoulder blades, and a dryness of the mucous membranes of the mouth, which is relieved by Copper and/or Molybdenum ions. If pushed too far, Thiamine 250 milligrams may also be required.

"The Biology of The Trace Elements" states, "There is a Copper deficiency disease of cattle reported from Australia and it is called 'Falling Disease'.^{13c} The animals fall over and die of heart failure quite suddenly. Death is the termination of a *severe Copper deficiency*, and autopsy reveals glomerular lesions of the kidney and myocardial fibrosis of the heart muscle. The condition is *seasonal* and yet the Copper deficiency is chronic. The extent of myocardial degeneration is not proportional to the incidence of 'Falling Disease'. The entire explanation of this disease is obviously complex and still escapes us." In this statement Dr. Schutte agrees that something is missing in this explanation. It would be my opinion that Cobalt would be a big part of this explanation, possibly Molybdenum also.

2. Blood Vessels.

After much experience in intravenous therapy, both in blood transfusion and intravenous treatment, I am impressed with the way most patients' veins would fill and stand up easily, producing a full lumen, while others would not stand up at all, making it extremely difficult to get into the veins. With the use of Cobalt ions, these 'flat' veins regained their turgency.

3. Skin and Nails and Hair.

Skin becomes stronger and tougher. The fragility and thinness of aged skin disappears. The skin appears youthful and fresh. It does not get the blemishes of old age. In several remarkable cases large black moles washed away, leaving normal skin on face and arms. Warts cleared up in several weeks and in one case a hard needle-pointed, wood-like wart behind the right thumb nail began to soften

within fifteen minutes of giving the Cobalt, and disappeared completely in two weeks. Another 'coral brain' type wart beside it disappeared in another month after a second treatment, with no return in thirteen years, and the patient is now 78 years old.

The basal cells of the growing nail require both Cobalt and Copper. A Cobalt need can lead to black disintegration of the nails and the nails eventually coming off their base and fungus growing under them. Fungus is the usual diagnosis, but it is not the cause: it is the after-result. When the nail is normal, fungus does not grow.

Cuticle and nail grow faster and stronger and without waves, with adequate Cobalt. Interestingly, a deeply waved thumb nail can become smoother under Cobalt action, without the wrinkled portion of the nail growing off. I have had two elderly patients do this. Mrs. Janet Clautice, 87 years of age, had thumb nails that looked like they had passed through a set of gears that produced the waves. The other was Mr. Buchanan Shreve, 83, who had similarly disfigured nails. Both of them now have smooth, strong, thick thumb nails. Both of these patients also had tissue-thin corium layers on the palms of their hands and finger-tips; so thin they appeared almost transparent. Their skin greatly improved with vitamin and mineral supplementation.

Hair grows rapidly, strands are thicker and smoother, and ends do not split and fray. Hair is more easily dressed and lays in place better. Several patients have had a natural curl return to their hair. This may be due to Copper. Proof of the remarkable effect of Copper on wool may be seen in photographs on page 72 of "The Biology of the Trace Elements".¹³ Poor quality of wool, of a steely, disrumpled, hay-like pattern, changed to a normal quality crimped, organized pattern in twenty-four hours after being supplied adequate Copper.

4. Eyes.

Before I knew the beneficial effects of Copper on precordial distress I treated a woman 42 years of age for this condition and gave her Vitamin E, along with other metabolic support. She responded well, but obtained a most amazing response to Vitamin E. She had been wearing contact lenses for some years with no discomfort. The Vitamin E almost immediately caused her corneas to be so sensitive that she could not stand the contact lenses. This patient also had very wrinkled lips of her mouth that looked like the edge of a pie crust decorated with the prongs of a fork. Her lips were tender and sore, as were her vaginal lips at times. The addition of Cobalt has relieved the distress in all these places, as well as her precordial distress.

Cobalt makes the eyeballs feel completely at ease and makes the eyeball mucous more lubricating. Copper plays a role here also and will make the tears flow more freely to relieve dryness.

Cobalt and Copper, along with Iodine, improves light sensitivity of the retina

and reduces irritation from light glare. They also make vision sharper and colors more vivid. Most of the patients I see have a reduced ability to see the color red. Under treatment the ability to see red color returns in a remarkable way. One artist-designer from the Maryland Institute was told by her artist husband that she never could see colors properly. At 44 years of age, during rehabilitation following a hysterectomy, she suddenly realized her ability to see color had completely changed. She could now see all colors more vividly, but especially the color red appeared more intense. She could see red tints that had been absent before. Also, the general light intensity of my office increased about 10-foot candles to her. Several artist patients have had to re-paint pictures because they were so dark and shadowy they looked dirty and dismal.

A doctor brought his wife to me in 1947. She was nine months postpartum of her first pregnancy. She was extremely nervous, emotional, weepy, and on the verge of hospitalization for her emotional state. Part of this emotional response was brought on by the fact that her eyes were diverged 23 degrees and she was greatly distressed by her inability to read or see anything clearly. She was then already posted for operation at the Wilmer Clinic of The Johns Hopkins Hospital to shorten the internal rectus muscles of both eyes. Intravenous injection of Magnesium Chloride mixed with Thiamine 100 mgms., Pyridoxine 100 mgms. and Calcium Pantothenate 50 mgms., along with minerals by mouth, caused this patient's eyes to return to normal within fifteen minutes. She was immediately relieved of her emotional tension and her tendency to cry. Subsequent treatments brought her eye condition back to a permanent state of normality and her operation was cancelled. Her emotional condition was relieved also. Twenty-five years later, after three more pregnancies, she is perfectly well. This patient also had extremely flat veins, which eventually responded to Cobalt.

In 1949 an orthopedic surgeon from the Peter Brent Brigham Hospital in Boston, Massachusetts brought his wife to me, 36 years of age, complaining of a severe pain and stiffness of her neck. Because he could see no X-ray evidence for this pain he was dubious of her complaint, despite the fact that her neck was so sore she would not let anyone turn it. The condition had appeared when she almost lost her life with toxemia of pregnancy with her third baby about a year before. During the consultation I was amazed to find that she could hardly see me across the desk and complained that the room was so dark. While injecting intravenous Magnesium Chloride, Thiamine and Solu-B, she became excited and screamed that if the room got any brighter it would explode. The room had changed for her from the darkness of a cave to almost normal brightness during the injection time of one treatment. The addition of the trace elements brought her back to normal and relieved the tenseness and pain in her neck. It is interesting to note that her surgeon husband, who observed the treatment, was so skeptical of her change of light sensitivity that he told her at home that I must have turned on a light switch in the room, because it was impossible for her to make such a change in such a short length of time. I pointed out to him at our second appointment that he must

be a poor observer because he should have seen the room become brighter if I had flipped a light switch for his wife. He acknowledged that he did not see any change of light when the room became even more brilliant to her after her second treatment.

Styes disappear with the aid of Zinc Iodide and Cobalt ions by mouth. Red irritated corneas and lid margins clear up also. The cholesterol accumulation of pinquecula will disappear with the aid of Cobalt, showing its direct effect on cholesterol metabolism.

5. *Herpes Simplex.*

Several patients have had fever blisters in the mouth and nose, some starting at 4 years of age. Later, they would appear with each menstrual period and sometimes on vaginal lips also. These patients are almost free of this discomfort with Cobalt added to their metabolic support. Interestingly, Molybdenum will precipitate a fever blister. As is well known, Copper and Molybdenum are in close balance — an excess of one produces a relative deficiency of the other.¹³ Shingles, or Herpes Simplex of the skin of various parts of the body, are greatly aided and many times completely relieved by Magnesium Chloride intravenously, and Pyridoxine and Cobalt ions by mouth.^{13D} These must be continued for prophylaxis.

6. *Athlete's Foot.*

Athlete's Foot is a similar breakdown of the sympathetic nerves between the toes. Zinc and Cobalt ions are mostly involved, Zinc being the greatest requirement. Once the lesions appear, as in a fever blister, the fungus grows in the damaged tissue. Fungus is usually the diagnosis, but it does not start the lesion by primary invasion of the skin.

7. *Nose, Throat and Mouth.*

Spontaneous and profuse bleeding of the nose is a frequent problem in medicine. Packing and cautery are used, but the condition is difficult to control and is recurrent. Cobalt stops the bleeding and improves the turgency of the turbinates, and this strengthens the integrity of the blood vessels. By improving the erectile quality of the turbinates the stuffiness and bogginess of the nose is relieved.

Patients who resorted to sub-mucous resection without results were helped by Cobalt ions and intravenous Magnesium Chloride. One male patient had the left side of his nose closed for years and had frequently rejected offers of sub-mucous resection to cure it. He was amazed when his nose opened completely in the course of treatment for his heart condition. Magnesium, Thiamine, Iodine, Vitamin A and E, Tryptophane and Manganese all play an interdependent role in nasal physiology.

The mucous membrane of the nose and throat is frequently the site of infection.

The common cold, or the grippe as it is called, is a universal phenomenon and few people ever escape an attack of it. Most people suffer an attack once a year, and some more often. In my youth I had a sore throat and cold almost constantly, and severe attacks of the grippe several times a year. A sudden change to cold weather was sure to precipitate an attack. I was impressed at the regularity with which the female members of our family would come down with a cold or the grippe at a menstrual period transition. Later, in my professional work, mothers would comment that their daughters would develop a cold with their periods, and at ovulation time.

Long before Linus Pauling's Orthomolecular Concept was suggested, I came to the conclusion that these attacks of the grippe and the common cold were not precipitated by bacteria or viruses — they were precipitated by the inability of the cellular mechanism (orthomolecular, if you will) being unable to adjust to the demands of the change of the metabolic requirements brought on by the menstrual transition, or the response to turning on the body's heat in cold weather. Throughout history modifications of metabolism have been used to build the body's resistance against colds. The most celebrated of course is the Swedish sauna, in which the person warms himself with steam to the sweating stage, then slides into icy cold water. This is a severe shock to the system and requires a violent reversal of the regulators of the body to withstand it. Many people are killed by this even today, when after sunning themselves on the beach or on the deck of a boat, they dive into cold water and never come up again.

The name 'cold' is given to this condition because the person gets chilly and cold before the onset of infection. Many people are cold all the time and they are the ones who acquire a cold most frequently. Thyroid hormone is often administered in an effort to overcome the tendency of being cold all the time, but in my experience it seldom has helped. When two per cent Magnesium Chloride is injected slowly intravenously, the patient gets a flush of heat first in the throat, then in the pelvis, and then into the hands and the rest of the body. If treatment is continued at regular intervals of approximately a week, the patient takes on a feeling of being more alive, more energetic, and he stays warmer all the time.

A Navy Captain 42 years old had become severely debilitated trying to heal a spiral fracture of his right tibia. It was unhealed after nine months of general orthopedic care in a cast and on crutches. He had become tired, irritable, with frequent colds and skin that developed moles and warts. Intravenous injection of two per cent Magnesium Chloride in doses of 20 c.c. at weekly intervals, along with vitamin and mineral supplementation by mouth, brought rapid healing of his fracture, a decrease in his tendency to have colds, a remarkable resurgence of his ability to see color, and a 10-foot candle increase in his recognition of the brightness of my office. His skin lost its weather-beaten appearance and the moles and warts fell off his ears and face within one month. He was amazed at the fantastic return of his mental acuity, the remarkable improvement in his eyesight,

and a feeling of well-being throughout his body. He had been a Navy aviator and was now President of an Airplane Company and flying his own plane.

When patients begin to feel chilly and tired, I start them on Potassium Chloride by mouth; Magnesium Chloride intravenously; Vitamin C 500 mgms. four times a day; Vitamin A 25,000 Units four times a day; Vitamin E 100 mgms. four times a day; Cobalt, Copper and Molybdenum ions by mouth; and Iodine in the form of 'Calcidin' 60 mgms. once a day for four days. Many times this will abort a cold and the patient will get back his temperature regulation and feel warm, his throat will lose its stickiness, and the lymphoid tissues will return to normal.

I give small doses of penicillin to prevent the normal bacterial flora of Hemolytic Streptococci, Staphylococci, Pneumococci, Influenza and N. Catarrhalis from 'rioting' when the patient's resistance is down. This secondary infection of the edematous mucous membrane, associated with the metabolic depression, is called the cold. It is not the primary cause of the cold, but must be controlled until the patient's metabolic balance is regained.

The Asian Flu of 1918 reached epidemic proportions rapidly. Patients did not die from the virus; they died of the toxin of the associated Hemolytic Streptococcus Pneumonia and Pleurisy. This dangerous complication is just as likely to happen with an attack of the Flu today, but its danger is eliminated by the administration of small doses of penicillin. The American Heart Association will supply penicillin free of charge to any person under 21 years of age, having had an attack of rheumatic fever, to prevent another attack of Hemolytic Streptococcus that might damage his heart. It seems prudent to apply this prophylaxis to any attack of the Flu or Grippe until the patient regains his metabolic balance.

This entire procedure is in line with Linus Pauling's orthomolecular medicine. I have practiced it for the past thirty years with great success, but with vitamin doses that are reasonable, not the excessive 'mega' ones that he recommends. I would agree with his statement that Vitamin C in large quantity does assist many people in aborting a cold of the type I have described. It will not abort or cure a true virus infection. In my experience more metabolic agents than Vitamin C are usually required, as indicated in the regimen which I have just outlined.

Transitional metabolic changes such as colds and menstruation are frequently accompanied by aphthous ulcers of the mucous membrane of the mouth. One woman after her third pregnancy at 21 years of age had ulcerations of her mouth and extensive ulceration of her vaginal lining. Her mouth was so sore she could hardly eat, and her vagina so sore she could hardly walk. She was a severe hypothyroid, but responded quickly to supportive therapy and had no further trouble through three more pregnancies. Cobalt is almost a specific for healing the mucous membrane ulcerations.

I would like to suggest that gastric ulcers are produced by the death of

mucous-producing cells, due to lack of Cobalt and other metabolic support. High concentration of Hydrochloric Acid does not cause the ulcer; it only serves to make the condition untenable after the lining is denuded of its mucous covering.

8. *Pancreas.*

Several female patients after the debilitation of pregnancies and subsequent surgery, complained of pain in the left upper quadrant of the abdomen. This pain extended up the left back, into the left shoulder and down the left arm. Often the entire abdomen was tender to the touch and in several cases the gallbladder had been removed in an effort to find the cause of the generalized abdominal discomfort. These patients had repeated barium enemas and G.I. Series in an effort to find the reason for their constant abdominal complaints. Under the action of intravenous Magnesium Chloride, with Zinc, Copper and Cobalt ions by mouth, all pain and discomfort were eliminated from the abdominal area. It was quite striking that the Cobalt had the greatest effect on the area of the pancreas and completely relieved the pain in the left back and side.

9. *Brain and Nervous System*

Many young women are hospitalized in psychiatric institutions following the debilitation brought on by their pregnancies. Some of these patients go bad with their first pregnancy, but most of them are seen after their third. They had been hospitalized and given shock therapy (some several courses), which failed to rehabilitate them. Like the doctor's wife previously mentioned, some of them respond in a spectacular way from the first treatment of intravenous Magnesium. Subsequent support from vitamins and minerals, especially Zinc, Cobalt, Copper and Iodine, bring them back to normal without relapse.

A 26-year old fighter bomber pilot, on his thirty-fifth and last flight over Germany, was shot down with shrapnel in his left hip. After nineteen operations for rehabilitation, he was completely disoriented and was on his way to St. Elizabeth's Hospital for psychiatric confinement. He was brought to me by his doctor brother, who watched him make a spectacular recovery with the first treatment of intravenous Magnesium and vitamins. He was spared the trip to St. Elizabeth's.

Magnesium intravenously is well known to quiet convulsions in babies but, so far as I know, has not been used for its fantastic sedative and supportive effect on the entire nervous system to remove the emotional tension and restlessness seen in many patients. Magnesium, along with Zinc, Copper, Cobalt and Iodine, have a remarkable effect on the thyroid function — serving to regulate its activity, as well as to supply the gland with the necessary basic materials with which to carry on its normal control activity of the body. Many patients after receiving this kind of supportive metabolic help, comment how tranquilizing it is. They feel calm and at ease and yet have strength and interest to carry on a normal pattern of life. Under 'drug' tranquilizers they feel dopey, ill at ease, and without the normal exuberance to carry on their daily duties.

In "The Biology of the Trace Elements", Dr. Schutte shows brain lesions in Copper deficient lambs.^{13E} Copper deficiency in the mother leads to a complete lack of development of the brain in her offspring. Subsequent replenishment of her diet with sufficient Copper will allow her to give birth to lambs with normal brain and nervous systems.

Conclusion

Cobalt, along with Potassium, Magnesium, Copper, Zinc, Molybdenum, Vanadium, Silver, Manganese and Iodine, aids in the development of the brain, pituitary, thyroid and other control devices of the endocrine and sympathetic nervous systems. These systems control the size, shape and growth of the bony skeleton, and the size and shape of the face and dental arches. It is my suggestion that Cobalt is lost by transmutation in the food by cooking, even when an adequate diet is consumed. Most of the food of modern civilization is sterilized by pressure cooking for preservation. It is subsequently re-cooked for sterilization and the pleasantness of eating. Processing, cooking, sterilizing and staleness cause a loss of valuable nutrients. This leads to the degeneration of the skeleton and produces a face that is narrow and a dental arch too small for the teeth. Supplementation of the diet of the mother, and especially the baby, with vitamins and minerals (especially minerals), will serve to correct many of these deficiency patterns which we see so rampant in our population. Most important, it will aid the developing embryo and prevent the birth of so many defective children.

Professor Kervran's principle of biological transmutation gave new insight into metabolic processes and the knowledge of how heat-processing of food could change its nutritional value by transmutation of important trace elements. I am sure that the application of these principles in nutrition in the future will produce children with sturdy skeletons, broad dental arches and good teeth free of caries, unneeded of orthodontal manipulation, and a degree of general health of the nervous system and body beyond our fondest hopes and dreams.

PREPARATION OF METAL IONS OF TRACE ELEMENTS

The various Metal Ions used in this clinical investigation are not available through any commercial outlet that I know of. For those who may wish to use these Ions to confirm my results, the following outline gives the procedure by which the Ions are prepared.

The Resins are obtained from Rohm and Haas and are the same as those supplied for deionizing water to make it palatable for drinking purposes; or for use in the laboratory to make the equivalent of Distilled Water.

Resin No. IRC-50 is negatively charged and used for the Cations of Zinc, Cobalt, Copper, Iron, Manganese, Magnesium and Silver.

Resin IR-4B is positively charged and used for the Anions of Molybdenum and Vanadium.

Both of these Resins have to be prepared by a preliminary treatment as described below in the example for the preparation of the Zinc Resin.

The same procedure is followed for all other batches of Resin, substituting the appropriate Anion or Cation solution in place of the Zinc.

EXAMPLE OF PREPARATION OF ZINC RESIN

1. 400 grams of IRC-50 is mixed with 1200 ml. of 6% Sodium Hydroxide solution and allowed to stand for 1 hour. It is then filtered, using a 1 liter Buchner funnel, to which suction is applied to remove as much solution as possible. This allows the Sodium to displace the Hydrogen from the Resin and coats the Resin completely with Sodium Ion.
2. Carefully and slowly wash the Resin in the filter with 4 liters of 5% Sodium Acetate solution. After all of the Acetate solution has been added, apply suction to remove as much of the Sodium Acetate solution as possible. Washing the Resin with Sodium Acetate solution washes away all traces of the Sodium Hydroxide and leaves the Resin neutral.
3. To the Resin in the funnel slowly add 8 liters of Zinc solution, as described in the following Table, allowing it to filter by gravity, then apply suction.
4. Wash the Resin in the filter with 2 liters of Distilled Water.
5. Air dry on plastic tray.

THE FOLLOWING COMPOUNDS, IN THE AMOUNTS INDICATED, ARE EACH DISSOLVED IN 8 LITERS OF DISTILLED WATER AND WASHED THROUGH THE APPROPRIATE ION EXCHANGE RESIN, AFTER PREPARATION.

Zinc	Zinc Acetate $\text{ZN}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$	260 grams
Cobalt	Cobalt Nitrate $\text{Co}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$	300 grams
Copper	Copper Sulfate $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$	200 grams
Iron	Ferrous Sulfate $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$	350 grams
Manganese	Manganese Sulfate $\text{MnSO}_4 \cdot \text{H}_2\text{O}$	200 grams
Magnesium	Magnesium Sulfate $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$	200 grams

Silver	Silver Nitrate AgNO ₃	200 grams
Molybdenum	Ammonium Molybdate (NH ₄) ₆ Mo ₇ O ₂₄ ·4H ₂ O	200 grams
Vanadium	Ammonium Vanadate NH ₄ VO ₃	200 grams

REFERENCES

1. Follis, Richard H. Jr., M.D.: "Some Observations On Experimental Bone Disease". In O'Connor, Cecelia M., B.Sc., and Wolstenholme, G.E.W., O.B.E., M.A., M.B., B.Ch.: "Bone Structure And Metabolism", Little Brown & Co., 1956, pp. 249-257.
2. Goodhart, Robert S., M.D., D.M.S., and Shils, Maurice E., M.D., Sc.D., "Modern Nutrition In Health And Disease", Lea & Febiger 1973. p. 390.
3. Isaacs, James P., M.D.: "Trace Metals, Vitamins And Hormones In Long Term Treatment Of Coronary Atherosclerotic Heart Disease". Reprinted from "Trace Substance In Environmental Health" V 1972. A Symposium D.D. Hemphill, Ed., University of Missouri, Columbia.
4. Isaacs, James P., M.D.: "New Treatment Can Prevent One-Half Of All Heart Attack Deaths". National Inquirer Magazine. May 12, 1974. p. 37.
5. Kervran, Louis C. Ph.D.: "Biological Transmutations", Swan House Pub. Co., Brooklyn, N.Y., 11223. 1972 A. p. 137; B. pg. 45; C. pg. 91.
6. Lloyd Brothers, Inc.: "Pharmacology And Therapeutics of Cobalt", Lloyd Brothers, Inc., Cincinnati, Ohio. 1953. p. 18.
7. McCarrison, Sir Robert, M.D., D.Sc., Hon. LLD. (Belf): "Studies In Deficiency Disease". Lee Foundation For Nutritional Research, Milwaukee, Wisconsin. 1921.
8. Myers, John A., M.D., F.R.S.H.: "The Role Of Some Nutritional Elements In The Health Of The Teeth And Their Supporting Structures", Annals Of Dentistry, Vol. XVII. No. 2, June 1958. Reprinted in The Journal of Applied Nutrition, Vol. II, No. 4. 1958.
9. Pottenger, Francis M. Jr., M.D.: "The Effects Of Heat Processed Foods And Metabolized Vitamin D Milk On Dento-Facial Structure Of Experimental Animals". Am. J. Orthodontics & Oral Surgery 32:1946, pp. 467-485.
10. Price, Weston A., D.D.S.: "Nutrition and Physical Degeneration". American Academy of Applied Nutrition, Los Angeles, California. 1950.
11. Rodale, J. I.: "Magnesium - The Nutrient That Could Change Your Life", Pyramid Books, New York, N.Y. 1968.
12. Schroeder, Henry A., M.D.: "The Trace Elements And Man", Devon-Adair Pub. Co. 1973.
13. Schutte, Karl M.Sc., Ph.D.: "The Biology Of The Trace Elements" (Their Role In Nutrition). J. B. Lippincott Co. 1964. A. pg. 1; B. pg. 6; C. pg. 96; D. pg. 56; E. pg. 97.
15. Shaw, James H., D.D.S.: "Chemistry of Caries Prevention". In "Chemistry And Prevention Of Dental Caries". Charles Thomas Pub. Co. 1962. Ch. 6.
15. Sognnaes, Radar Fauske, D.M.D., M.S., Ph.D.: "Microstructure and Histochemistry Of Caries". In "Chemistry And Prevention Of Dental Caries". Charles Thomas Pub. Co. 1962. Ch. 1 p. 11.
16. Sutton, Philip R.N., D.D.Sc. (Melb), L.D.S. (Vic): "Fluoridation". Melbourne University Press. 1960.
17. Warburg, Otto, Ph.D.: "The Prime Cause And Prevention of Cancer". English translation by BURK, Dean, M.D., National Cancer Institute, Bethesda, Md. 1967.

BIOGRAPHY

John A. Myers, M.D.
Baltimore, Maryland

The undergraduate education of Dr. Myers was in Electrical Engineering at Johns Hopkins University where he graduated in 1927 with the degree of B.E.E. He continued his education in the graduate school of J.H.U. with the intention of earning a doctorate in engineering. This plan was delayed when he became involved in helping develop a Primary Frequency Standard at the Westinghouse Co. under Dr. Conrad. This frequency measuring equipment was installed at Grand Island, Neb. for the U.S. Government. It is still used to police measure, and adjust the broadcast frequencies of radio transmitting stations in the United States. He was awarded his M.D. degree from Johns Hopkins School of Medicine. His training in measurements and control devices in electrical engineering made him acutely aware of functional control in metabolic disease. As a branch of Internal Medicine he is particularly interested in the interrelationships of the biochemistry of cellular function and the application of nutritional elements to improve the metabolism of the body systems. He uses teeth, a highly differentiated structure, as a measuring instrument to evaluate conditions in the body. He is a founding member of I.C.A.N.

