

Orthomolecular Treatment

in Disturbances

Involving

Brain Function

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Despite recent increasing publicity via the press, popular magazines, and a few professional journals, relatively few people are acquainted with the concept of Orthomolecular (megavitamin) therapy. Part I was written in April, 1973, primarily to communicate some basic information to all persons involved with patients for whom such treatment has been recommended by me. The paper was, therefore, designed to be intelligible to concerned members of families as well as to professionals. In this manner, it was hoped that the treatment would not be construed as a panacea by anyone. It was also and still is my intent, however, not to underestimate my increasing interest in this concept of treatment for certain disorders of brain function. There is also reason to believe that this concept may be found to relate to other medical problems as well.

Part II was written in April, 1974. In the past year we have had the opportunity to study and treat over 250 additional patients, and this together with further experience with those in whom treatment was initiated earlier has made it possible for the writer to present some further observations and brief comments.

PART I-APRIL, 1973

In March, 1972, I first became aware of a concept and method of therapy that had been originally recommended for patients with mental illness (schizophrenias) and that had been subsequently utilized for the treatment of children with hyperactivity, coordination difficulties, perceptual learning disabilities, and psychological problems in which the cause is primarily of metabolic and/or of neurologic origin. This involves the use of large doses of certain B-complex vitamins along with vitamins C and E and some minerals. Treatment is also often implemented with dietary regulation, depending on the clinical findings and the results of laboratory studies which are concerned with metabolism and intestinal function.

Treatment with large doses of vitamins is known as megavitamin therapy, but is now also designated as Orthomolecular therapy, a term first proposed by Linus Pauling, Ph.D. (1968), Professor of Chemistry at Stanford University, and Nobel prize winner. A molecule is a chemical term which refers to one of the smallest particles that make up matter. When sufficiently large numbers of molecules are joined and function

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together, they make up all substances that we normally recognize—including the various tissue cells that constitute the organs of the body. Ortho is a Greek term meaning correct, so that in essence Orthomolecular refers to correct functioning at the molecular level. Dr. Pauling not only supports the principle that the brain's functioning is dependent on the nutritional and chemical state of the brain, but his writings suggest that this is a rational and scientific approach not only to the diagnosis and treatment of many neurologic and psychological problems, but also to numerous other medical disorders as well. Roger Williams, Ph.D. (1971), Professor of Chemistry at the University of Texas and Past President of the American Chemical Society, discovered pantothenic acid, an important element of the vitamin B complex. He has written a number of books and articles which support an applied nutritional approach to health and disease. He first stated the concept of "Biochemical Individuality," which means each one of us differs as to his nutritional and biochemical requirements. Bernard Rimland, Ph.D. (1973) Director of the Institute for Child Behavioral Research at San Diego, California, is a leading authority on psychotic (autism) disorders of children. He reports that his research confirms that there is a substantial proportion of disturbed children who can be expected to benefit with high dosage of vitamins. Orthomolecular treatment was at first limited to the use of niacin or niacinamide with equal amounts of ascorbic acid. Some physicians now also add fairly large amounts of other members of the vitamin B-complex which are considered important factors in enzyme systems related to brain function. These include vitamin B6 (Pyridoxine), pantothenic acid, and B1 (thiamine). In some instances, vitamin B12 and folic acid are considered necessary. Vitamin E may also be added since a lack or dependency may interfere with proper oxygen utilization in the brain cells. Irritability and nervousness

develop when diminished levels of blood sugar and certain minerals occur. For example, if blood glucose and/or serum calcium drop below a certain critical level, convulsions may occur. Therefore, studies involving blood glucose and minerals in tissues and serum may suggest the need for special dietary regulation. The efficiency of intestinal absorption and thyroid function is also measured since defects in these systems can be an important contributing cause, if not primary. Disabilities caused by allergy can create additional stress, and there is reason to believe that in some instances the brain may be directly affected by allergic reactions. For some girls and women, premenstrual tension may complicate the problem and will require treatment. The possibility of epilepsy, brain tumor, or other gross anatomic defect must always be considered, since these may also begin initially with psychological changes.

The vitamin concept for the treatment of mental illness begins properly with the discovery of the cause and cure of pellagra. This disease, which was once very prevalent in the South, is caused by a vitamin B3-deficient diet. The illness occurred in people who subsisted mainly on corn and maize products, a food item which is very low in vitamin B3 content. Pellagra is accompanied by diarrhea, skin rash, and mental illness. When vitamin B3 (which exists in two forms—niacin or nicotinic acid, and nicotinamide) was discovered in 1937 and was found to be the specific antipellagra factor, this disease was soon eliminated as a public health problem. It was also subsequently reported that about 10 percent of the patients in mental hospitals in the South not only were quickly relieved of their diarrhea and rash, but also recovered completely from their mental symptoms and were discharged.

Because in some patients pellagra presented only with mental difficulties, it was subsequently stated by some observers that the psychological symptoms were often similar to those exhibited by people suffering from

schizophrenia, which is the cause of more than 50 percent of all mental illness. It occurs worldwide and can strike children, youth, and adults of all ages, regardless of intelligence or social class. Since there seem to be a number of single unrelated causes, schizophrenia is often referred to as a syndrome, which usually manifests with characteristic symptoms and behavioral changes.²

The first symptoms of schizophrenia may begin as disorders of perception. By perception is meant the way things appear to us. It is the mental process that allows us to receive reliable information from our environment so that we can cope and adapt effectively. In schizophrenia, altered perception (or dysperception) may occur as unusual or abnormal sensations in vision, hearing, touch, taste, smell, and sense of time. It may be accompanied by extremely intense changes in mood which may lead to hyperactivity and excitement or depression. A person may experience altered thinking which may result in inappropriate or antisocial behavior. Sometimes the illness begins gradually with increasing fatigue, preoccupation, and nervousness, and the person may soon have difficulties coping with the ordinary activities of living.

Following the eradication of pellagra, there was speculation that some people might be vitamin B3 dependent; that is, they might require much larger amounts than that which is present in an adequate diet. This would be similar to the situation in which people with diabetes whose pancreas does not function adequately require extra insulin to properly metabolize sugar. Since vitamin B3 cleared the mental changes in

pellagra, it lent support to the idea that this vitamin might play a part in the biochemistry of brain function.

Although there had been some isolated reports of the use of vitamin B3 in mental illness since 1939, it was not until 1957, when Abram Hoffer, M.D., Ph.D., at that time Director of Psychiatric Research at the University Hospital, Saskatoon, Saskatchewan, and Humphry Osmond, M.D., on the basis of their research begun in 1952, formally concluded that large doses of vitamin B3³ were of value in the treatment of some cases of schizophrenia (Hoffer et al., 1957).

The word metabolism is derived from the Greek and means change. The term refers to the sum of all the physical and chemical reactions occurring in our bodies that allows us to produce and maintain tissues and obtain energy to function. It also includes biochemical processes whereby tissues are broken down into simpler compounds which the body then excretes as waste matter. The initial steps in metabolism, therefore, are concerned with the food we eat, the water we drink, and the air we breathe. Foods must contain adequate amounts of protein, carbohydrates, fats, minerals, and vitamins. Before any of these can be utilized, however, they must be processed or transformed into less complex substances by a well-defined sequence of chemical reactions so they can be absorbed from the intestine into the blood stream. For example, dietary proteins cannot be absorbed as such, but must be converted to substances called

² The term syndrome, when used in medicine, refers to a recognizable group of characteristic symptoms that suggest a certain disease process irrespective of cause. For example, physicians often apply the term respiratory distress syndrome to a patient who may have severe cough, chest pain, shortness of breath, and loss of usual pink color of skin because of inability of the lungs to properly utilize oxygen. The symptoms may be caused by infection (pneumonia), of bacterial or viral origin, a foreign body, tumor or fluid in the chest, a failing heart that is enlarged, allergic asthma, etc.

³ The recommended daily allowance of vitamin B3 is about 20 mg. The so-called high potency vitamin tablets or capsules usually contain 100 mg of niacinamide. In megavitamin therapy as much as 1000mg (1 gram) or more is given three times daily, and an equal amount of ascorbic acid (vitamin C) is also administered concurrently which represents about 30 times the daily recommended allowance. The daily recommended allowance may be an end point requirement that prevents scurvy, but this may not be sufficient for people whose biochemical needs differ. All mammals except man and the primates and the guinea pig are able to manufacture their own vitamin C so in a sense we are all vitamin C dependent. It is of interest to note that studies indicate that most animals manufacture 3 to 4 grams of vitamin C daily which is 100 times the so-called minimal daily requirement.

amino acids which then enter the blood stream. The amino acids are then transported or diffused via the blood to all tissue cells where numerous further biochemical transformations must occur for proper cell metabolism.

All our organs then, including our brain, can be said to exist in a biochemical environment. These biochemical transformations or reactions, some of which can be duplicated in the laboratory, are made possible by enzymes which are similar to chemical ferments. Enzymes are complex chemical compounds which trigger or catalyze biochemical reactions and are often called catalysts. For example, pepsin is an enzyme in the stomach which together with hydrochloric acid acts on dietary proteins, converting them through stages of decreasing complexity into substances called polypeptides, which in turn are converted by other enzyme systems in the small intestine into the amino acids.

Enzymes depend for their integrity on vitamins. Vitamins are accessory food factors which in nature are present in varying amounts in fruits, vegetables, cereal grains, and animal tissues. They are necessary components of the enzyme systems which facilitate biochemical reactions, and some are labeled coenzymes. For example, niacin (B3) and Pyridoxine (vitamin B6) function as coenzymes in a number of enzyme systems, some of which are vital to the function of all our organs including the brain. It is for this reason they were named vitamins—a contraction of vital amine. Some enzyme vitamin systems need certain minerals in minute amounts to function properly. These may include copper, zinc, manganese, cobalt, and others, and when referred to in these systems are called trace minerals.

The relation of vitamin D to bone metabolism in the prevention of rickets and vitamin C to intercellular connective tissue formation in the prevention of scurvy is well known. However, when any one of the other innumerable enzyme-vitamin systems is absent or

deficient, because of either poor nutrition, infection, poisoning, or because of congenital defects, any one of our biologic functions may fail. We may not digest properly, we may not assimilate oxygen efficiently, or we may not be able to form normal red blood cells, etc. Some enzyme system defects can seriously affect the nervous system on a transient or permanent basis.

For example, in 1953 there was an outbreak of severe convulsive disorders in infants. This was caused by a change in the manufacturer's processing of a popular infant milk formula which resulted in an abnormally low level of vitamin B6—Pyridoxine. When these infants were given 10 mg of Pyridoxine daily, the convulsions stopped. Since then, it was learned that some infants have congenital defects in their vitamin B6 enzyme systems and require extra amounts of B6 to remain free of seizures, and their illness is described as vitamin B6-dependency disease.

Dietary proteins are chemically constructed from about 20 amino acids in various combinations. An amino acid named phenylalanine is an important constituent of milk protein. If the enzyme system that is necessary for the proper biochemical transformation of phenylalanine is defective, abnormally large amounts of this amino acid build up in the blood and spill out in the urine. Abnormally large amounts of phenylalanine in the blood may cause brain damage in some babies and result in mental retardation. Therefore, every newborn infant now has a blood test to determine the possible presence of this inherited metabolic defect so that, if necessary, the feeding may be changed in sufficient time to a milk and diet which is free of phenylalanine.

Physicians classify illnesses such as vitamin B6 dependency and phenylketonuria as inborn errors of metabolism. An inborn error in the metabolism of another amino acid called methionine gives rise to a disease called homocystinuria. This disorder is associated with defects in the lens of the eye, the bones,

ORTHOMOLECULAR TREATMENT

and the walls of the blood vessels, and is also accompanied by mental retardation. Folic acid (a B-complex vitamin) and large doses of Pyridoxine (B6) plus a special dietary supplement is now well documented as the treatment of choice. In this metabolic disorder there is said to be a direct correlation between the I.Q. and the serum folic acid level.

Gerald W. Fenichel, M.D. (1970), Professor and Chairman, Department of Neurology, Vanderbilt University School of Medicine, in an article discussing biochemical treatment of homocystinuria and several other inborn errors of metabolism, writes:

"The direct equation of brain function to brain structure developed over two centuries provided a scientific basis for a 'throwing up of hands' when confronted with a neurologic illness. For if one accepts a simplistic relationship of skills to tracts, the replacement of parts seems the only hope of restoring function. This approach has enjoyed a limited success in cardiology but remains unthinkable in neurology. The interposition of chemistry between structure and function has allowed a new assessability to function." There have now been classified a number of such disorders which not only involve dietary proteins, but also those of the carbohydrates and fats, a number of which can also be associated with defects in the nervous system. In discussing another such metabolic defect of childhood (Lesch-Nyhan-Uricemia syndrome) which is associated with a severe behavioral disability, an authority in the field of inborn errors of metabolism, David Yi-Yung Hsia, M.D. (1970), stated:

"The association of specific enzyme defect with a neurological disease, mental retardation, and characteristic aggressive behavior opens up new possibilities for the study of behavioral disorders."

In this context, one might contemplate a theory for one of the biochemical causes of schizophrenia as put forth by Drs. Hoffer and Osmond (1966). They believe that in some persons there is a faulty biochemical transformation involving

adrenalin (catecholamines). This may involve one of the vitamin B3 enzyme systems, giving rise to some abnormal intermediate products which can alter perception and behavior. These intermediary substances are said to have a chemical structure and properties similar to mescaline and LSD which are well known to alter states of consciousness. If it is true, as reported by some observers, that niacin can serve as a specific antidote for a bad LSD trip, this would tend to give some support to this idea.

There have been some negative reports published concerning the treatment of schizophrenia with niacin. It is claimed that the treatment with vitamins is controversial because these ideas have not been substantiated by adequately controlled clinical studies. As a result, this concept has not been universally accepted and, at present, is probably not even familiar to most of the medical profession.

Moreover, since vitamins are commonplace and easily available and, in some instances, subject to commercial exploitation, their prescribed use seems rather "simplistic" and frequently "turns off" many physicians, especially those whose interest in nutrition is secondary. However, water, salt, oxygen, and most minerals are also commonplace items that are easily available. These are also vital to biological function and are used without question and sometimes with great energy in medical treatment.

If one concedes, therefore, that brain function depends on biochemical mechanisms, it should occasion no surprise that the various disabilities related to nervous system performance may also be associated with biochemical defects that are similar or overlap. When Orthomolecular treatment was first administered to very disturbed children, it was noted that improved behavior in some was accompanied by improved speech and learning skills. When the treatment was administered to children with lesser behavioral difficulties who also had learning disability associated with

minimal neurologic changes, a certain number of unexpected and gratifying results were reported. As a result, this method of treatment is now gaining recognition in certain medical circles and also seems to have favorably impressed some professionals in the field of education.

In April and in June of 1972 I had the opportunity of interviewing some people who had recovered from serious mental illness of many years' duration only after Orthomolecular therapy was instituted.⁴ After evaluating the principles of treatment, some of which have been described here, a few therapeutic trials were attempted in children and the initial results seemed favorable. Since July, 1972, this treatment has been recommended and initiated by me in well over 150 private patients of various ages with moderate to severe problems and has been administered in a manner similar to that suggested by Abram Hoffer, M.D., Ph.D., Saskatoon, Saskatchewan, Bella Kowalson, M.D., Winnipeg, Manitoba, William Brauer, M.D., and Robert Meller, M.D., Minneapolis, Minnesota, Allan Cott, M.D., of New York City, Carl Pfeiffer, M.D., Ph.D., and Humphry Osmond, M.D., formerly of the New Jersey Neuropsychiatric Institute, Princeton, New Jersey, and David Hawkins, M.D., Director of the North Nassau Mental Health Center in Manhasset, Long Island, New York, and Director of Psychiatric Research at the Brunswick Hospital Center, Amityville, New York. I have visited personally with these physicians in the various cities mentioned to obtain firsthand accounts of this concept and details of treatment. Following increasing experience, some

modifications in the treatment plan have been adopted by me.

I have also had the opportunity of consulting frequently with W.E. Cornatzer, M.D., Ph.D., Chairman of the Department of Biochemistry at the University of North Dakota, regarding these concepts and laboratory procedures as they pertain to nutritional and biochemical disturbance. Dr. Cornatzer, who is an eminent authority on nutrition and metabolism, has entertained these ideas for years and believes they are the basis for a logical approach to treatment and further research.

Since their introduction for the treatment of neurological and psychological problems, the following drugs have been recommended and are currently prescribed by me. These include the stimulants (Dexedrine and Ritalin), tranquilizers (Valium, Librium, and Atarax), anticonvulsants (Phenobar-bital, Dilantin, Mysoline, etc.), antihistamines (Benadryl), antipsychotic agents (Thorazine, Mellaril, and Prolixin), and occasionally antidepressants (Aventyl and Tofranil). When used appropriately, these drugs are often useful and in times of crises some are absolutely necessary, but it is recognized by all medical authorities that they have limitations, not to mention certain dangers. It is also acknowledged that for many years we have observed improved behavior and functioning in some children treated with drugs alone and/or combined with counseling, special education, behavior modification, etc.

Since beginning the Orthomolecular approach, however, we find that in many cases the need for such drugs has been markedly decreased, if not entirely eliminated. In a number of children, including many in whom all other current accepted methods of therapy have been used for an extended period with minimal or no success, not only have the parents reported lessened hyperactivity, improved behavior and attention span, better motivation but also a remarkable improvement in reading and other academic skills. Moreover, when the

⁴ The word "recovery" needs some qualification when it relates to some medical problems. For example, most persons with diabetes will remain free of symptoms and function normally as long as they take their prescribed dose of insulin daily, make a reasonable effort to stick to the diet recommended for them, and maintain a hygienic life style that allows them, as much as possible, to resist infections and other stresses. If there is a sustained lapse in any of these areas, symptoms and disability are apt to recur. Similar long-term precautions are required for successful treatment of some types of mental illness.

ORTHOMOLECULAR TREATMENT

Orthomolecular or biochemical approach is successful, there has also occurred in a few children such a rapid and total improvement in all areas of functioning, including coordination, that it not only suggests that it may be a more appropriate physiologic treatment, but probably also enhances metabolic functioning in related areas of the nervous system rather than by merely acting as a suppressive agent.

A striking example is that of a nine-year-eight-month boy who was first seen in July, 1972. His depressed mother was distraught because he announced that he would not return to school the following term. He had repeated kindergarten and was retained in the first grade. He had had extensive psychological studies in 1970 and in early 1972 where testing suggested borderline intelligence with perceptual defect. His mother also described his writing as sloppy. He had been tutored extensively, and the family had been counseled. He had also received a course of visual exercises in an attempt to improve his reading skill. Despite the efforts described above, which also included medications, he had remained extremely hyperactive and distractable, and his teacher had complained that his behavior was extremely disruptive in the class and for this reason he was assigned to a first-grade special education class for the fall term. The physical examination was non-contributory, but a five-hour glucose-tolerance test revealed a flat curve indicating some impairment of intestinal absorption. His bone age was delayed about two to three years, and the only other finding in the medical study was "a mildly abnormal electroencephalogram." His dietary proteins were increased, and he was placed on an Orthomolecular regime.

In September he returned to special education first grade, and after several weeks his teacher stated that "his attention span, responsiveness, and cooperation were excellent." His reading improved so that he brought books home, which he had never done before,

and his writing became more legible. His teacher at that time also stated that she could not understand why he had been failed before. In January, 1973 (about five and one half months after beginning Orthomolecular treatment), the mother called and said he had been transferred from the first-grade special education class directly into the third-grade regular class where, to this date, he is functioning acceptably and is proud of his academic accomplishments. This was checked with the school authorities and was confirmed by the school social worker assigned to the Special Education Department.

On the basis of a rather concentrated experience, therefore, it certainly suggests to me that whenever medical treatment is indicated, the Orthomolecular method is the first and safest treatment of choice in children with perceptual and behavioral problems associated with minimal neurological difficulties. It should be emphasized, however, that to date in several of the children the results have been doubtful and in five or six have been definitely negative. In one patient the behavior problem may have worsened while on treatment, but this also occurs not infrequently with drug therapy. At least four patients still require Ritalin and one patient, who also has seizures, obtains better control of his hyperactivity with Librium.

In several very disturbed young children, intensive therapy in the hospital with a combination of relatively large doses of tranquilizer as well as the Orthomolecular treatment was required. In a few, the tranquilizer could gradually be eliminated after several months, and the children have been maintained on vitamins and diet to date. One such child now on the vitamin program alone who, at present, is monitored by a well-trained psychiatrist in another town and in whose management I participate, is said to require an infrequent single dose of tranquilizer only for insomnia. Several children were reported by their mother to have suffered relapse when vitamin

therapy was discontinued, either because of a transient gastroenteritis or some other reason, and to have improved when treatment was resumed, so that in these instances they served as their own control.

There have been several favorable by-products of this treatment:

(a) Many of the children not only exhibited improvement in their function and behavior, but experienced increased vigor and a sense of well being which is important for optimum mental and neurological functioning.

(b) When families come to understand that much of their child's difficulties may represent a biochemical problem, and especially if there occurs a beneficial response which seems to confirm the concept, a sense of depression is lifted from a number of parents in whom, for one reason or another, a guilt complex has been engendered by feeling that parental inadequacy may have been a contributing if not a primary cause. This allows the parents to feel encouraged, and they can become even more adequate in solving whatever child management problems do exist.

(c) Since some of these problems appear to be genetic⁵ or familial in origin, in a few instances the parents were alerted to potential problems in some of the siblings and early treatment was instituted. In a few cases an occasional parent recognized similar difficulties that he or she experienced in childhood and which in a few manifested

with long-term psychological disability of variable degree. When at their request similar diagnostic methods and treatment were made available to them, the parents not only reported improvement, but in a few cases were able to discontinue the tranquilizers which they had been taking for years. In one instance, a 13-year-old girl was referred by an agency and the school because of behavioral and academic difficulties, and because foster home placement was being arranged for. It was learned that the mother, a widow with two other children, was totally disabled by mental illness. She required many long admissions to the state and private hospitals for over a period of seven years. Following the introduction and continued maintenance of Orthomolecular therapy, she made what appears to be a remarkable recovery in two months and is taking care of her family for the first time since her illness began. This led to a request by social workers of several agencies that we participate in the treatment of a number of adults who continued to have serious disability despite their long-term prior treatment for mental illness.⁶ This will be the subject of another report.

In a few instances, while the child's attention span and cognitive powers seem to improve after several weeks, the behavior may become more difficult for a time, but it seems to be more constructive than before. As one mother put it, when her child's behavior worsened for a short time, "at least there is some direction to it now and it isn't as purposeless and senseless as before." In several cases more stringent disciplinary measures took care of the situation, and in a few a tranquilizer was introduced for a short time.

The treatment is safe as the vitamins used are virtually nontoxic. Although there is a biochemical basis for this treatment, it is acknowledged that to

⁵ The word genetic is derived from the term applied to the biologic molecule of heredity called a gene. Each tissue cell contains a central portion called the nucleus which contains particles named chromosomes, of which there are 23 from each parent making a total of 46 chromosomes. Each chromosome contains about 20,000 genes so that there are about one million genes in the human tissue cell and each parent contributes one-half the total genes. Each gene contains a code or blueprint for every inherited trait and feature, such as the color of the eyes, hair, skin, body build, etc. Likewise, there is a separate gene for each enzyme. A defect in a chromosome or gene can occur by change called a mutation such as results from radiation exposure in an atomic blast. A chromosome or gene defect can also be familial and may be transmitted to one or more children in a family, depending on the chance arrangement and combination of the genes obtained from each parent.

⁶ In every case, it was emphasized to the patient and the relative that the writer is not a psychiatrist and that the additional approach we had to offer was primarily a medical one.

date many aspects of this therapy are empirical as much of it is based on experience and observation. However, almost all tranquilizers and stimulants are used clinically on a trial-and-effect basis and frequently with unpredictable results. The fact that there are at least 15 different tranquillizing and antipsychotic agents on the market as well as a number of antidepressants, stimulants, and anticonvulsive drugs indicates that the brain is a very complicated organ whose malfunction does not lend itself easily to adequately controlled studies or definitive medical treatment at the present time. Further research and knowledge as it is gained will allow more effective utilization of Orthomolecular treatment.

The treatment may be somewhat cumbersome, especially for children who cannot swallow tablets or capsules, but this can be overcome with some ingenuity. In some patients, the method of administration and the dosage may require an individualized approach. In some instances injection of some of the vitamins over a period of time has been useful. Treatment should be persistent for at least three to six months, depending on the nature of the problem, before it is considered to be of no value.

Children and adults, regardless of age, who suffer disorders of perception, mood, or thinking often manifest behavior which is disruptive at home, school, and at work. They constantly create unpleasant stimuli for others and eventually become alienated to some degree from their families and peer group, and these disturbed intrafamily relationships, if sustained, can cause severe psychological handicaps not only in the disabled person but in members of the family. A child or person who appears to be otherwise normal, but is unable to achieve or cope because of an unrecognized biochemical disturbance involving brain function, may be accused of laziness or delinquency by the most concerned parent or relative.

It should be recognized, however, that even the strongest and most well-endowed child or adult can develop

psychological problems because of overwhelming stress in the home or environment. If such stress is superimposed on an individual who is biochemically vulnerable because of inherited or acquired enzyme defects, or unmet nutritional needs, the possibility of disabling brain function is increased. It must be emphasized, therefore, that medical treatment may be only one of several modes of therapy required for optimum management. If behavior, mood, and attention span can be stabilized, diagnostic procedures, treatment, and involvement by professionals trained in clinical psychology, speech therapy, education, and social work may be equally important and, in some instances, are mandatory if treatment is to be at all productive. In a severely disturbed child or adult, treatment in a hospital setting may be necessary for relief of disabling behavior, and in these instances the presence of dedicated, well-trained, and intelligent nurses and aides is extremely important in helping to affect a maximum recovery in the shortest possible time.

For the child or adult with problems that have resulted in functional and behavioral disabilities of longstanding, there are at least three basic requirements which must be fulfilled for optimum recovery:

(a) He must have a proper analysis and diagnosis of his problem and receive appropriate treatment.

(b) The patient must be docile. The prognosis may be limited, if the capacity of the central nervous system is restricted by a major structural defect, severe malformation, or progressive neurologic disease.

(c) The patient must relate on a sustained basis with at least one person who is in contact with reality. That person must be stable, concerned, and devoted to the handicapped person's welfare. A patient or client cannot have the total time and service of a professional, but he still requires constant support and intelligent direction until he can achieve control over his

thinking and behavior so that he can subsequently function in a manner appropriate for his age. This means that a parent or spouse, or ideally all concerned members of the family, be instructed in the nature of the disorder, some of the principles of management, and that they learn the requirements for sound interpersonal relationships that help promote recovery. If this cannot be obtained in the family setting, then it must be obtained elsewhere (for example, foster home, etc.), or else the most expert professional treatment is apt to fail.

A team approach, therefore, which includes one or more professionals and the family (or adequate substitute) may be necessary for the effective treatment of those children and adults whose brain function is not only altered by a disturbed biochemical environment but because their brain might also exist in a very complicated and difficult psychological and social environment.

PART II - APRIL, 1974

Some Further Observations and Brief Comments

Some patients and their families who have experienced frustration for many years are overjoyed when Orthomolecular treatment seems to be effective for them. It is, therefore, understandable that in these situations there may occur some extravagant claims for this type of therapy. However, experienced physicians who employ vitamin therapy are agreed that it is not effective in manic-depressive illness, nor does it seem to be very successful in problems accompanied by severe depression and/or compulsions. Several cooperative young adults remained severely disabled despite the addition of vitamin therapy to various combinations of drugs which had been previously prescribed elsewhere. After a sufficient therapeutic trial was considered unsuccessful, wherever possible, "these were referred to psychiatrists experienced in the pharmacological

treatment of mental illness. Two of these patients achieved relief of symptoms and improved behavior when different anti-psychotic agents in appropriate dosage were introduced. On the other hand, some non-psychotic patients who insisted on receiving vitamin therapy seemed to obtain relief from their neurosis or neurasthenia. These may have been placebo effects, but better intestinal absorption with improved nutrition, or possibly more effective blood sugar regulation, might have been primary factors.

Some adolescents and teen-agers whose illness is complicated either by severe family imbalance, intense rebellion and aggression, peer group pressures, compulsive running away, and/or drug use are often resistive to all forms of treatment. For some of these the only recourse is a training school or residential center where, if one is fortunate, appropriate medical and psychologic treatment is also available. Patients whose long-standing illness can be biologically improved or resolved may also require psychological treatment to eliminate residual phobias, hang-ups, and delusional systems. In a few cases treatment was actually sabotaged until an appropriate foster home was found. Transfer to a more appropriate classroom setting was beneficial to some children.

Several school children who attained initial improvement subsequently began to regress for a period of time despite continued treatment. An observant school social worker who investigated these informed me that in a few instances she found that the parents assumed that the "vitamins" would also take over the job of "parenting."

A few teen-agers who showed marked improvement after the first several weeks of treatment, shortly after discharge from the hospital, began to regress because "instant return" to the peer group circle they had once enjoyed was not immediately forthcoming. Among these were some whose illness over a period of months or years gave rise to behavior that alienated them not only from their

ORTHOMOLECULAR TREATMENT

family, but also from the most tolerant of their prior friends and acquaintances. These patients and their parents should be forewarned in advance that a peer relationship which had eroded over an extended period cannot be regained in several days, regardless of how much better the patient feels or how well he relates once more to his family. This may require extraordinary patience and discipline if the youth has succumbed to a lifestyle bordering on marginal or gross delinquency.

In older children, teen-agers, and adults who tolerate stress poorly and who have a history of aggression and paranoia, the use of antipsychotic agents should be persisted in even if vitamin therapy yields improvement. These patients exhibit satisfactory behavior under normal conditions, but when experiencing stress will manifest some evidence of increasing perceptual and paranoid changes, if not depression. Where indicated, we have found frequent monitoring with the Hoffer-Osmond Diagnostic test to be very useful in detecting early changes. In some patients this has allowed sufficient time to effectively adjust treatment before overt symptoms and decompensation set in. This has been especially true in the older intelligent patients who can be taught to achieve insight into the "perceptual" and biological concept of their disorder. These patients are much more apt to be cooperative in maintaining appropriate therapy whether it includes vitamins, drugs, or psychological treatment.

To this time there are at least a dozen overactive children or more under my care in whom Dexedrine or Ritalin (psychic energizers) have given relief of variable degree where vitamin therapy has failed. Two children require both vitamin therapy and Ritalin, and the mothers of these two informed me that when either the vitamins or the Ritalin is discontinued, there is a recurrence of hyperactivity, decreased attention span, etc. When the two are used together, the symptoms are controlled. There are also

a number of children in whom, although improvement was noted, the plateau reached was not satisfactory. In several the addition of Ritalin has enhanced the treatment. In a few, the concomitant use of Dilantin and/or Mellaril seems to have been more effective.

In several patients whose symptoms and laboratory studies meet certain criteria (positive mauve test, etc.), larger doses of Pyridoxine with the addition of appropriate amounts of supplemental zinc and manganese as recommended by Dr. Pfeiffer has been very beneficial. There is also reason to believe that vitamin B6 (Pyridoxine) may be as important for some patients as vitamin B3, especially when intestinal absorption (malabsorption) may be a factor. Furthermore, vitamin B6 also plays an important role in the metabolism of tryptophan, an amino acid from which the body derives nicotinic acid. It is of interest to note that a condition named Hartnup's disease (named after a family in England in which it was first discovered) is a syndrome which includes nervous system and psychological changes (with or without retardation) and skin eruption.¹ This condition- is caused by a primary failure of the intestinal tract to absorb the amino acid tryptophan despite an adequate daily intake, and because there also exists a selective defect in kidney function which relates specifically to tryptophan. This disease, then, constitutes an inborn error in the metabolism of tryptophan which, in turn, leads to inadequate formation of nicotinic acid in the body. As might be expected, treatment with nicotinic acid is beneficial in this disorder, which has also been called "congenital pellagra."

From time to time there are newspaper accounts citing reports of harmful effects from the use of large doses of vitamins. Headlines often lump all vitamins together, and many readers are not aware that most of the reports refer to vitamins A and D which, to the present time, is not relevant to Orthomolecular treatment for brain dysfunction. Unfortunately, this causes much needless anxiety in some

patients. However, since treatment with B-complex vitamins is becoming more prevalent, it would be surprising, indeed, if there were not some increasing mention of individuals who do not tolerate them or who experience some reactions.

Two accounts of possible toxicity have recently been reported. One describes visual disturbance caused by swelling of a small but important circumscribed area of the posterior surface of the inner eye (fovea) in three men taking high doses of nicotinic acid for treatment of high blood cholesterol. (Nicotinic acid will reduce blood cholesterol —nicotinamide does not.) Two of the men were taking other vitamins as well as sedatives. It was reported that no other evidence of eye change was noted, and as soon as the treatment with nicotinic acid was discontinued, the condition was reversed and the eyes became normal. The ophthalmologist who reported these cases also "acknowledged that additional data were required to prove conclusively the cause and effect relationship between the high doses of nicotinic acid and the reported localized change in the eye."

In the past there have been some conflicting reports but no conclusive evidence regarding possible toxicity of •nicotinamide and/or nicotinic acid to the liver. Recently, however, a case was described in which a 35-year-old graduate student who was taking Prolixin and Navane (both antipsychotic drugs) presumably had no problems with 3 grams of nicotinamide daily. However, when he had increased the dose on his own to about 9 grams of nicotinamide a day (because it made him feel better), he began to have episodes of vomiting and other symptoms suggestive of inflammation of the liver (hepatitis). In a control study on the same individual, it was noted when the dose of nicotinamide was increased to 9 grams daily, he developed symptoms again and liver function tests also became positive. When the nicotinamide was discontinued, the liver function tests became

completely normal after 22 days. From the report it would appear that the toxic symptoms occurred when the dose was increased to 9 grams, and that while he was on the 3-gram dosage he apparently had no difficulties. The authors also stated that possible liver damage from other causes prior to his use of nicotinic acid might have made his liver more susceptible to this reaction.

It should be noted that these reports emphasize that these were reversible reactions. It is true, however, that large doses of vitamins may not be tolerated if the patient is suffering from a viral respiratory infection or gastroenteritis. At those times, the treatment can be discontinued or the dose lessened for several days and then resumed without any difficulty. A few patients, both children and adults, do not tolerate the vitamins well even in relatively small doses, and whether these are peculiar reactions of the individual or a true allergic reaction is not known. No long-term side effects or complications have been noted in our experience. One patient who was allergic to citrus fruits was unable to tolerate small amounts. As compared to problems experienced by some patients being treated with antipsychotic agents, tranquilizers, antibiotics, and other pharmaceutical agents including aspirin and insulin, the occasional transient discomfort or "reaction" has been negligible in patients treated here to date. If it is true that there are about 50,000 deaths a year in the United States due to overdose of tranquilizers and related drugs, by contrast the use of B-complex vitamins certainly seems to be benign.

It should be emphasized, however, that wherever possible the patient is best served if he or she is studied and monitored by a physician who is knowledgeable in all relevant areas of diagnosis and treatment including medical and psychological as well as nutritional. Recent medical research in molecular biology reveals the important relationship of the basic nutrients, trace minerals, hormones, and immune bodies

ORTHOMOLECULAR TREATMENT

as well as vitamins and drugs which takes place at the cellular level with many biochemical pathways involved. Since there is no doubt that the idea of biochemical individuality is valid, many variables for biologic disability exists. We are all potentially one enzyme removed from some form of biologic dysfunction, whether it involves the brain or any other organ. One has only to review a modern textbook of physiology or biochemistry to become aware how many isolated or multiple defects can occur along just one metabolic pathway. Some of these defects, as already pointed out, can now be recognized clinically, or can be tested for with available diagnostic and laboratory techniques, and in some of these cases appropriate treatment can often be productive. Some problems seem to be in the process of solution, but unfortunately many still remain to be solved. For some patients and their families, therefore, this means continued frustration and psychic pain, with supportive care as the only means of relief.

For this reason those who treat these problems must be flexible and liberal in their approach. They should maintain a constant awareness of what is new and useful in diagnosis and treatment, whether it comes by way of investigators and scientists who report from prestigious universities and clinics, or from some equally dedicated clinician working in relative isolation who also may present an idea or a technique which seems reasonable and safe and which seems to work for some of his patients.

Though some professional groups do not "sanction" the Orthomolecular treatment, it is of interest to note that many recent articles, reports, and editorial comments in established professional journals are leaning towards, if not urging, a biological approach to therapy. To mention a few, in a recent issue of "The Schizophrenia Bulletin" (an official publication of the National Institute of Mental Health), an editorial comment states: "It is possible, however, that some subgroups of

schizophrenic patients do respond to this treatment (megavitamin)." There has been some recent work which suggests that 50 mg of vitamin B6 (Pyridoxine) be administered daily to prevent depression in women caused by contraceptive pills. The role of wheat gluten as a possible contributing cause to mental illness in some patients has been described. The role of food additives in overactive children has recently been publicized. Hypoglycemia as a factor in hyperactivity has also been described by a group from Columbia University. The use of L-tryptophan (the precursor of nicotinic acid and indoleamines) in the treatment of mania is under investigation. The fact that **Time** magazine recently saw fit to publish an excellent four-page essay titled "Exploring the Frontiers of the Mind" describing some of the biological principles and problems relating to brain function indicates that this information is also reaching the public in greater numbers.

These are all portents of things to come in the field of mental health; namely, that most serious disturbances of brain function are biological problems first, and if these can be recognized and resolved early, many of the psychological complications, which can range from mild to catastrophic, might then be avoided. Furthermore, it will be increasingly difficult for physicians and allied professionals to remain adamant or inflexible in those situations where currently conventional methods of treatment fail. The clinician who is eclectic as well as knowledgeable need not now be on the defensive when employing these additional medical approaches to treatment.

Regardless of the attitude or philosophy of the professional, many acceptable treatment methods employed at present will probably appear to be crude and naive in 10 or 15 years. Nevertheless, in resistant problems one owes it to the patient to utilize what is available now, if it is reasonable and safe.

Anxiety is stressful. Sustained anxiety is painful and, when compounded by

confusion, it becomes intolerable. It is hoped that by sharing this **information it** might be possible to eliminate some of the confusion.

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