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Vitamin B-3: Niacin and Its Amide
by A. Hoffer, M.D., Ph.D.

The first water soluble vitamins were numbered in sequence according to priority of discovery. But after their chemical structure was determined they were given scientific names. The third one to be discovered was the anti-pellagra vitamin before it was shown to be niacin. But the use of the number B-3 did not stay in the literature very long. It was replaced by nicotinic acid and its amide (also known medically as niacin and its amide). The name was changed to remove the similarity to nicotine, a poison.

The term vitamin B-3 was reintroduced by my friend Bill W., co-founder of Alcoholics Anonymous, (Bill Wilson). We met in New York in 1960. Humphry Osmond and I introduced him to the concept of mega vitamin therapy. We described the results we had seen with our schizophrenic patients, some of whom were also alcoholic. We also told him about its many other properties. It was therapeutic for arthritis, for some cases of senility and it lowered cholesterol levels.

Bill was very curious about it and began to take niacin, 3 g daily. Within a few weeks fatigue and depression which had plagued him for years were gone. He gave it to 30 of his close friends in AA and persuaded them to try it. Within 6 months he was convinced that it would be very helpful to alcoholics. Of the thirty, 10 were free of anxiety, tension and depression in one month. Another 10 were well in two months. He decided that the chemical or medical terms for this vitamin were not appropriate. He wanted to persuade members of AA, especially the doctors in AA, that this would be a useful addition to treatment and he needed a term that could be more readily popularized. He asked me the names that had been used. I told him it was originally known as vitamin

B-3. This was the term Bill wanted. In his first report to physicians in AA he called it "The Vitamin B-3 Therapy." Thousands of copies of this extraordinary pamphlet were distributed. Eventually the name came back and today even the most conservative medical journals are using the term vitamin B-3.

Bill became unpopular with the members of the board of AA International. The medical members who had been appointed by Bill, felt that he had no business messing about with treatment using vitamins. They also "knew" vitamin B-3 could not be therapeutic as Bill had found it to be. For this reason Bill provided information to the medical members of AA outside of the National Board, distributing three of his amazing pamphlets. They are now not readily available.

Vitamin B-3 exists as the amide in nature, in nicotinamide adenine dinucleotide (NAD). Pure nicotinamide and niacin are synthetics. Niacin was known as a chemical for about 100 years before it was recognized to be vitamin B-3. It is made from nicotine, a poison produced in the tobacco plant to protect itself against its predators, but in the wonderful economy of nature which does not waste any structures, when the nicotine is simplified by cracking open one of the rings, it becomes the immensely valuable vitamin B-3.

Vitamin B-3 is made in the body from the amino acid tryptophan. On the average 1 mg of vitamin B-3 is made from 60 mg of tryptophan, about 1.5% Since it is made in the body it does not meet the definition of a vitamin; these are defined as substances that can not be made. It should have been classified with the amino acids, but long usage of the term vitamin has given it permanent status as a vitamin. The 1.5% conversion rate is a compromise based upon the conversion of tryptophan to N-methyl nicotinamide and its metabolites in human subjects. I suspect that one day in the far distant future none of the tryptophan will be converted into vitamin B-3 and it then will truly be a vitamin. According to Horwitt [1], the amount converted is not inflexible but varies with patients and conditions. For example, women pregnant in their last three months convert tryptophan to niacin metabolites three times as efficiently as in non-pregnant females. Also there is evidence that contraceptive steroids, estrogens, stimulate tryptophan oxygenase, the enzyme that converts the tryptophan into niacin.

This observation raises some interesting speculations. Women, on average, live longer then men. It has been shown for men that giving

them niacin increases their longevity. [2] Is the increased longevity in women the result of greater conversion of tryptophan into niacin under the stimulus of their increase in estrogen production? Does the same phenomenon explain the decrease in the incidence of coronary disease in women?

The best-known vitamin deficiency disease is pellagra. More accurately it is a tryptophan deficiency disease since tryptophan alone can cure the early stages. Pellagra was endemic in the southern U.S.A. until the beginning of the last world war. It can be described by the four D's: dermatitis, diarrhea, dementia and death. The dementia is a late stage phenomenon. In the early stages it resembles much more the schizophrenias, and can only with difficulty be distinguished from it. The only certain method used by early pellagrologists was to give their patients in the mental hospitals small amounts of nicotinic acid. If they recovered they diagnosed them pellagra, if they did not they diagnosed them schizophrenia. This was good for some of their patients but was not good for psychiatry since it prevented any continuing interest in working with the vitamin for their patients who did not recover fast, but who might have done so had they given them a lot more for a much longer period of time, the way we started doing this in Saskatchewan. I consider it one of the schizophrenic syndromes.

Indications

I have been involved in establishing two of the major uses for vitamin B-3, apart from its role in preventing and treating pellagra. These are its action in lowering high cholesterol levels [3] and in elevating high density lipoprotein cholesterol levels (HDL), and its therapeutic role in the schizophrenias and other psychiatric conditions. It has been found helpful for many other diseases or conditions. These are psychiatric disorders including children with learning and behavioral disorders, the addictions including alcoholism and drug addiction, the schizophrenias, some of the senile states. Its efficacy for a large number of both mental and physical conditions is an advantage to patients and to their doctors who use the vitamin, but is difficult to accept by the medical profession raised on the belief that there must be one drug for each disease, and that when any substance appears to be too effective for many conditions, it must be due entirely to its placebo effect, something like the old snake oils.

I have thought about this for a long time and have within the past year

become convinced that this vitamin is so versatile because it moderates or relieves the body of the pernicious effect of chronic stress. It therefore frees the body to carry on its routine function of repairing itself more efficiently. The current excitement in medicine is the recognition that hyperoxidation, the formation of free radicals, is one of the basic damaging processes in the body. These hyperexcited molecules destroy molecules and damage tissues at the cellular level and at the tissue level.

All living tissue which depends on oxygen for respiration has to protect itself against these free radicals. Plants use one type of antioxidants and animals use another type. Fortunately there is a wide overlap and the same antioxidants such as vitamin C are used by both plants and animals. There is growing recognition that the system adrenaline -> adrenochrome plays a major role in the reactions to stress. I have elaborated this in a further report for this journal. [4]

The catecholamines, of which adrenalin is the best known example, and the aminochromes, of which adrenochrome is the best known example, are intimately involved in stress reactions. Therefore to moderate the influence of stress or to negate it, one must use compounds which prevent these substances from damaging the body. Vitamin B-3 is a specific antidote to adrenalin, and the antioxidants such as vitamin C, Vitamin E, beta carotene, selenium and others protect the body against the effect of the free radicals by removing them more rapidly from the body. Any disease or condition which is stress related ought therefore to respond to the combined use of vitamin B-3 and these antioxidants provided they are all given in optimum doses, whether small or large as in orthomolecular therapy. I will therefore list briefly the many indications for the use of vitamin B-3.

For each condition I will describe one case to illustrate the therapeutic response. For each condition I can refer to hundreds and thousands of case histories and have already in the literature described many of them in detail. [5]

Psychiatric
1) The Schizophrenias. I have reviewed this for this journal. [6]

2) Children with Learning and/or Behavioral Disorders.

In 1960 seven year-old Bruce came to see me with his father. Bruce

had been diagnosed as mentally retarded. He could not read, could not concentrate, and was developing serious behavioral problems such as cutting school without his parents' knowledge. He was being prepared for special classes for the retarded. He excreted large amounts of kryptopyrrole, the first child to be tested. I started him on nicotinamide, one gram tid. Within four months he was well. He graduated from high school, is now married, has been fully employed and has been paying income tax. He is one case out of about 1500 I have seen since 1960.

Current treatment is more complicated as described in this Journal. [7]

3) Organic Confusional States, non-Alzheimers forms of dementia, electroconvulsive therapy-induced memory disturbances.

In 1954 I observed how nicotinic acid relieved a severe case of post ECT amnesia in one month. Since then I have routinely given it in conjunction with ECT to markedly decrease the memory disturbance that may occur during and after this treatment. I would never give any patient ECT without the concomitant use of nicotinic acid. It is very helpful, especially in cardiovascular-induced forms of dementia as it reverses sludging of the red blood cell and permits proper oxygenation of the cells of the body. For further information see Niacin Therapy in Psychiatry. [8]

In September 1992, Mr. C., 76 years-old, requested help with his memory. He was terribly absentminded. If he decided to do something, by the time he arrived where he wanted to do it he had forgotten what it was he wanted to do. His short-term memory was very poor and his long-term memory was beginning to be affected. I started him on a comprehensive vitamin program including niacinamide 1.5 G daily. Within a month he began to improve. I added niacin to his program. By February 1993 he was normal. April 26, 1993, he told me he had been so well he had concluded he no longer needed any niacin and decreased the dose from 3.0 G to 1.5 G daily. He remained on the rest of the program. Soon he noted that his short term memory was failing him again. I advised him to stay on the full dose the rest of his life.

4) An antidote against d-LSD,9,10 and against adrenochrome. [5]

5) Alcoholism.

Bill W. conducted the first clinical trial of the use of nicotinic for treating

members of Alcoholics Anonymous. [11] He found that 20 out of thirty subjects were relieved of their anxiety, tension and fatigue in two months of taking this vitamin, 1 G tid. I found it very useful in treating patients who were both alcoholic and schizophrenic. The first large trial was conducted by David Hawkins who reported a better than 90% recovery rate on about
90 patients. Since then it has been used by many physicians who treat alcoholics. Dr. Russell Smith in Detroit has reported the largest series of patients. [12]

Physical

1. Cardiovascular

Of the two major findings made by my research group in Saskatchewan, the nicotinic acid-cholesterol connection is well known and nicotinic acid is used worldwide as an economical, effective and safe compound for lowering cholesterol and elevating high density cholesterol. As a result of my interest in nicotinic acid, Altschul, Hoffer and Stephen [3] discovered that this vitamin, given in gram doses per day, lowered cholesterol levels. Since then it was found it also elevates high density lipoprotein cholesterol thus bringing the ratio of total over HDL to below 5.

In the National Coronary Study, Canner [2] showed that nicotinic acid decreased mortality and prolonged life. Between 1966 and 1975, five drugs used to lower cholesterol levels were compared to placebo in 8341 men, ages 30 to 64, who had suffered a myocardial infarction at least three months before entering the study. About 6000 were alive at the end of the study. Nine years later, only niacin had decreased the death rate significantly from all causes. Mortality decreased 11% and longevity increased by two years. The death rate from cancer was also decreased.

This was a very fortunate finding because it led to the approval by the FDA of this vitamin in mega doses for cholesterol problems and opened up the use of this vitamin in large doses for other conditions as well. This occurred at a time when the FDA was doing its best not to recognize the value of megavitamin therapy. Its position has not altered over the past four decades.

Our finding opened up the second major wave of interest in vitamins. The first wave started around 1900 when it was shown that these compounds were very effective in small doses in curing vitamin

deficiency diseases and in preventing their occurrence. This was the preventive phase of vitamin use. The second wave recognized that they have therapeutic properties not directly related to vitamin deficiency diseases but may have to be used in large doses. This was the second or present wave wherein vitamins are used in therapy for more than deficiency diseases. Our discovery that nicotinic acid was an hypocholesterolemic compound is credited as the first paper to initiate the second wave and paved the way for orthomolecular medicine which came along several years later.

2. Arthritis

I first observed the beneficial effects of vitamin B-3 in 1953 and 1954. I was then exploring the potential benefits and side effects from this vitamin. Several of the patients who were given this vitamin would report after several months that their arthritis was better. At first this was a surprise since in the psychiatric history I had taken I had not asked about joint pain. This report of improvement happened so often I could not ignore it. A few years later I discovered that Prof. W. Kaufman had studied the use of this vitamin for the arthritides before 1950 and had published two books describing his remarkable results. [13] Since that time this vitamin has been a very important component of the orthomolecular regimen for treating arthritis.

The following case illustrates both the response which can occur and the complexity of the orthomolecular regimen. Patients who are early into their arthritis respond much more effectively and are not left with residual disability.

K.V. came to my office April 15, 1982. She was in a wheelchair pushed by her husband. He was exhausted, depressed, and she was one of the sickest patients I have ever seen. She weighed under 90 pounds. She sat in the chair on her ankles which were crossed beneath her body because she was not able to straighten them out. Her arms were held in front of her, close to her body, and her fingers were permanently deformed and claw-like. She told me she had been deeply depressed for many years because of the severe pain and her major impairment. As she was being wheeled into my office I saw how ill she was and immediately concluded there was nothing I could do for her, and had to decide how I could let her know without sending her even deeper into despair. However I changed my mind when she suddenly said, "Dr. Hoffer, I know no one can ever cure me but if you could only help me

with my pain. The pain in my back is unbearable. I just want to get rid of the pain in my back." I realized then she had a lot of determination and inner strength and that it was worthwhile to try and help her.

She began to suffer from severe pain in her joints in 1952. In 1957 it was diagnosed as arthritis. Until 1962 her condition fluctuated and then she had to go into a wheelchair some part of the day. She was still able to walk although not for long until 1967. In 1969 she depended on the wheelchair most of the time, and by 1973 she was there permanently. For awhile she was able to propel herself with her feet. After that she was permanently dependent on help. For the three years before she saw me she had gotten some home care but most of the care was provided by her husband. He had retired from his job when I first saw them. He provided the nursing care equivalent to four nurses on 8 hour shifts including holiday time. He had to carry her to the bathroom, bathe her, cook and feed her. He was as exhausted as she was but he was able to carry on.

She was severely deformed, especially her hands, suffered continuous pain, worse in her arms, and hips and her back. Her ankles were badly swollen and she had to wear pressure bandages. Her muscles also were very painful most of the day. She was able to feed herself and to crochet with her few useful fingers, but it must have been extremely difficult. She was not able to write nor type which she used to do with a pencil. A few months earlier she had been suicidal. On top of this severe pain and discomfort she had no appetite, was not hungry and a full meal would nauseate her. Her skin was dry, she had patches of eczema, and she had white areas in her nails.

I advised her to eliminate sugar, potatoes, tomatoes and peppers, (about 10% of arthritics have allergic reactions to the solanine family of plants). She was to add niacinamide 500 mg four times daily (following the work of W. Kaufman), ascorbic acid 500 mg four times daily (as an anti-stress nutrient and for subclinical scurvy), pyridoxine 250 mg per day (found to have anti-arthritic properties by Dr. J. Ellis), zinc sulfate 220 mg per day (the white areas in her nails indicated she was deficient in zinc), flaxseed oil 2 tablespoons and cod liver oil 1 tablespoon per day (her skin condition indicated she had a deficiency of omega 3 essential fatty acids). The detailed treatment of arthritis and the references are described in my book. [14]

One month later a new couple came into my room. Her husband was

smiling, relaxed and cheerful as he pushed his wife in in her chair. She was sitting with her legs dangling down, smiling as well. I immediately knew that she was a lot better. I began to ask her about her various symptoms she had had previously. After a few minutes she impatiently broke in to say, "Dr. Hoffer, the pain in my back is all gone." She no longer bled from her bowel, she no longer bruised all over her body, she was more comfortable, the pain in her back was easily controlled with aspirin and was gone from her hips, (it had not helped before). She was cheerful and laughed in my office. Her heart was regular at last. I added inositol niacinate 500 mg four times daily to her program.

She came back June 17, 1982, and had improved even more. She was able to pull herself up from the prone position on her bed for the first time in 15 years, and she was free of depression. I increased her ascorbic acid to 1 gram four times daily and added vitamin E 800 IU. Because she had shown such dramatic improvement I advised her she need no longer come to see me.

September 1, 1982, she called me on the telephone. I asked her how she was getting along. She said she was making even more progress. I then asked her how had she been able to get to the phone. She replied she was able to get around alone in her chair. Then she added she had not called for herself but for her husband. He had been suffering from a cold for a few days, she was nursing him, and she wanted some advice for him.

After another visit October 28, 1983, I wrote to her doctor "Today Mrs. K.V. reported she had stayed on the whole vitamin program very rigorously for 18 months, but since that time had slacked off somewhat. She is regaining a lot of her muscle strength, can now sit in her wheelchair without difficulty, can also wheel herself around in her wheelchair but, of course, can not do anything useful with her hands because her fingers are so awful. She would like to become more independent and perhaps could do so if something could be done about her fingers and also about her hip. I am delighted she has arranged to see a plastic surgeon to see if something can be done to get her hand mobilized once more. I have asked her to continue with the vitamins but because she had difficulty taking so many pills she will take a preparation called Multijet which is available from Portland and contains all the vitamins and minerals and can be dissolved in juice. She will also take inositol niacinate 3 grams daily."

I saw her again March 24, 1988. About 4 of her vertebra had collapsed and she was suffering more pain which was alleviated by Darvon. It had not been possible to treat her hands surgically. She had been able to eat by herself until six months before this last visit. She had been taking small amounts of vitamins. She was able to use a motorized chair. She had been depressed. I wrote to her doctor, "She had gone off the total vitamin program about two or three years ago. It is very difficult for her to swallow and I can understand her reluctance to carry on with this. I have therefore suggested that she take a minimal program which would include inositol niacinate 3 grams daily, ascorbic acid 1 gram three times, linseed oil 2 capsules and cod liver oil 2 capsules. Her spirits are good and I think she is coming along considering the severe deterioration of her body as a result of the arthritis over the past few decades." She was last seen by her doctor in the fall of 1989.

Her husband was referred. I saw him May 18, 1982. He complained of headaches and a sense of pressure about his head present for three years. This followed a series of light strokes. I advised him to take niacin 3 grams daily plus other vitamins including vitamin C. By September 1983 he was well and when seen last March 24, 1988 was still normal.

3. Juvenile Diabetes

Dr. Robert Elliot, Professor of Child Health Research at University of Auckland Medical School is testing 40,000 five-year old children for the presence of specific antibodies that indicate diabetes will develop. Those who have the antibodies will be given nicotinamide. This will prevent the development of diabetes in most the children who are vulnerable. According to the *Rotarian* for March 1993 this project began 8 years ago and has 3200 relatives in the study. Of these, 182 had antibodies and 76 were given nicotinamide. Only 5 have become diabetic compared to 37 that would have been expected. Since 1988 over 20,100 school children have been tested. None have become diabetic compared to 47 from the untested comparable group. A similar study is underway in London, Ontario.

4. Cancer

Recent findings have shown that vitamin B-3 does have anti-cancer properties. This was discussed at a meeting in Texas in 1987, Jacobson and Jacobson. [15] The topic of this international conference was "Niacin, Nutrition, ADP-Ribosylation and Cancer," and was the 8th

conference of this series.

Niacin, niacinamide and nicotinamide adenine dinucleotide (NAD) are interconvertable via a pyridine nucleotide cycle. NAD, the coenzyme, is hydrolyzed or split into niacinamide and adenosine dinucleotide phosphate (ADP-ribose). Niacinamide is converted into niacin, which in turn is once more built into NAD. The enzyme which splits ADP is known as poly (ADP-ribose) polymerase, or poly (ADP) synthetase, or poly (ADP-ribose) transferase. Poly (ADP-ribose) polymerase is activated when strands of deoxyribonucleic acid (DNA) are broken. The enzyme transfers NAD to the ADP-ribose polymer, binding it onto a number of proteins. The poly (ADP-ribose) activated by DNA breaks helps repair the breaks by unwinding the nucleosomal structure of damaged chromatids. It also may increase the activity of DNA ligase. This enzyme cuts damaged ends off strands of DNA and increases the cell's capacity to repair itself. Damage caused by any carcinogenic factor, radiation, chemicals, is thus to a degree neutralized or counteracted.

Jacobson and Jacobson, conference organizers, hypothesized that niacin prevents cancer. They treated two groups of human cells with carcinogens. The group given adequate niacin developed tumors at a rate only 10% of the rate in the group deficient in niacin. Dr. M. Jacobson is quoted as saying, "We know that diet is a major risk factor, that diet has both beneficial and detrimental components. What we cannot assess at this point is the optimal amount of niacin in the diet... The fact that we don't have pellagra does not mean we are getting enough niacin to confer resistance to cancer." About 20 mg per day of niacin will prevent pellagra in people who are not chronic pellagrins. The latter may require 25 times as much niacin to remain free of pellagra.

Vitamin B-3 may increase the therapeutic efficacy of anti-cancer treatment. In mice, niacinamide increased the toxicity of irradiation against tumors. The combination of normobaric carbogen with nicotinamide could be an effective method of enhancing tumor radiosensitivity in clinical radiotherapy where hypoxia limits the outcome of treatment. Chaplin, Horsman and Aoki16 found that nicotinamide was the best drug for increasing radiosensitivity compared to a series of analogues. The vitamin worked because it enhanced blood flow to the tumor. Nicotinamide also enhanced the effect of chemotherapy. They

suggested that niacin may offer some cardioprotection during long-term adriamycin chemotherapy.

Further evidence that vitamin B-3 is involved in cancer is the report by Nakagawa, Miyazaki, Okui, Kato, Moriyama and Fujimura [17] that in animals there is a direct relationship between the activity of nicotinamide methyl transferase and the presence of cancer. Measuring the amount of N-methyl nicotinamide was used to measure the activity of the enzyme. In other words, in animals with cancer there is increased destruction of nicotinamide, thus making less available for the pyridine nucleotide cycle. This finding applied to all tumors except the solid tumors, Lewis lung carcinoma and melanoma B-16.

Gerson [18] treated a series of cancer patients with special diets and with some nutrients including niacin 50 mg 8 to 10 times per day, dicalcium phosphate with vitamin D, vitamins A and D, and liver injections. He found that all the cancer cases were benefited in that they became healthier and in many cases the tumors regressed. In a subsequent report Gerson elaborated on his diet. He now emphasized a high potassium over sodium diet, ascorbic acid, niacin, brewers yeast and lugols iodine. Right after the war there was no ready supply of vitamins as there is today. I would consider the use of these nutrients in combination very original and enterprising. Dr. Gerson was the first physician to emphasize the use of multivitamins and some multiminerals. More details are
in Hoffer. [19]

Additional evidence that vitamin B-3 is therapeutic for cancer arises from the National Coronary Study, Canner. [2]

5. Concentration Camp Survivors

In 1960 I planned to study the effect of nicotinic acid on a large number of aging people living in a sheltered home. A new one had been built. I approached the director of this home, Mr. George Porteous. I arranged to meet him and told him what I would like to do and why. I gave him an outline of its properties, its side effects and why I thought it might be helpful. Mr. Porteous agreed and we started this investigation. A short while after my first contact Mr. Porteous came to my office at University Hospital. He wanted to take nicotinic acid himself, he told me, so that he could discuss the reaction more intelligently with people living in his institution. He wanted to know if it would be safe to do so.

That fall he came again to talk to me and this time he said he wanted to tell me what had happened to him. Then I discovered he had been with the Canadian troops who had sailed to Hong Kong in 1940, had been promptly captured by the Japanese and had survived 44 months in one of their notorious prisoner of war camps.

Twenty-five percent of the Canadian soldiers died in these camps. They suffered from severe malnutrition from starvation and nutrient deficiency. They suffered from beri beri, pellagra, scurvy, infectious diseases, and brutality from the guards.

Porteous, a physical education instructor, had been fit weighing about 190 pounds when he got there. When he returned home he weighed only 2/3rds of that. On the way home in a hospital ship the soldiers were fed and given extra vitamins in the form of rice polishings. There were few vitamins available then in tablets or capsules. He seemingly recovered but had remained very ill. He suffered from both psychological and physical symptoms. He was anxious, fearful and slightly paranoid. Thus, he could never be comfortable sitting in a room unless he sat facing the door. This must have arisen from the fear of the guards. Physically he had severe arthritis. He could not raise his arms above his shoulders. He suffered from heat and cold sensitivity. In the morning he needed his wife's help in getting out of bed and to get started for the day. He had severe insomina. For this he was given barbiturates in the evening and to help awaken him in the morning, he was given amphetamines.

Later I read the growing literature on the Hong Kong veterans and there is no doubt they were severely and permanently damaged. They suffered from a high death rate due to heart disease, crippling arthritis, blindness and a host of other conditions.

Having outlined his background he then told me that two weeks after he started to take nicotinic acid, 1 gram after each meal, he was normal. He was able to raise his arms to their full extension, and he was free of all the symptoms which had plagued him for so long. When I began to prepare my report [20] I obtained his Veterans Administration Chart. It came to me in two cardboard boxes and weighed over ten pounds, but over 95% of it was accumulated before he started on the vitamin. For the ten years after he started on the vitamin there was very little additional material. One could judge the efficacy of the vitamin by weighing the chart paper before and after he started on it. Porteous

remained well as long as he stayed on the vitamin until his death when he was Lieutenant Governor of Saskatchewan. In 1962, after having been well for two years, he went on a holiday to the mountains with his son and he forgot to take his nicotinic acid with him. By the time he returned home almost the entire symptomatology had returned.

Porteous was enthusiastic about nicotinic acid and began to tell all his friends about it. He told his doctor. His doctor cautioned him that he might damage his liver. Porteous replied that if it meant he could stay as well as he was until he died from a liver ailment he would still not go off it. His doctor became an enthusiast as well and within a few years had started over 300 of his patients on the vitamin. He never saw any examples of liver disease from nicotinic acid.

I have treated over 20 prisoners from Japanese camps and from European concentration camps since then with equally good results. I estimated that one year in these camps was equivalent to 4 years of aging, i.e. four years in camp would age a prisoner the equivalent of 16 years of normal living.

George Porteous wanted every prisoner of war from the eastern camps treated as he had been. He was not successful in persuading the Government of Canada that nicotinic acid would be very helpful so he turned to fellow prisoners, both in Canada (Hong Kong Veterans) and to American Ex-Prisoners of War. These American veterans suffered just as much as had the Canadian soldiers since they were treated in exactly the same abysmal way. The ones who started on the vitamin showed the same response. Recently one of these soldiers, a retired officer, wrote to me after being on nicotinic acid 20 years that he felt great, owed it to the vitamin and that when his arteries were examined during a simple operation they were completely normal. He wrote, "About two years ago, I was hit, was bleeding down the neck. The MDs took the opportunity to repair me. They said the arteries under the ears look like they had never been used."

There is an important lesson from the experiences of these veterans and their response to megadoses of nicotinic acid. This is that every human exposed to severe stress and malnutrition for a long enough period of time will develop a permanent need for large amounts of this vitamin and perhaps for several others.

This is happening on a large scale in Africa where the combination of

starvation, malnutrition and brutality is reproducing the conditions suffered by the veterans. Those who survive will be permanently damaged biochemically, and will remain a burden to themselves and to the community where they live. Will society have the good sense to help them recover by making this vitamin available to them in optimum doses?

Doses

The optimum dose range is not as wide as it is for ascorbic acid, but it is wide enough to require different recommendations for different classes of diseases. As is always the case with nutrients, each individual must determine their own optimum level. With nicotinic acid this is done by increasing the dose until the flush (vasodilation) is gone, or is so slight it is not a problem.

One can start with as low a dose as 100 mg taken three times each day after meals and gradually increase it. I usually start with 500 mg each dose and often will start with 1 gram per dose especially for cases of arthritis, for schizophrenics, for alcoholics and for a few elderly patients. However, with elderly patients it is better to start small and work it up slowly.

No person should be given nicotinic acid without explaining to them that they will have a flush which will vary in intensity from none to very severe. If this is explained carefully, and if they are told that in time the flush will not be a problem, they will not mind. The flush may remain too intense for a few patients and the nicotinic acid may have to be replaced by a slow release preparation or by some of the esters, for example, inositol niacinate. The latter is a very good preparation with very little flush and most find it very acceptable even when they were not able to accept the nicotinic acid itself. It is rather expensive but with quantity production the price might come down.

The flush starts in the forehead with a warning tingle. Then it intensifies. The rate of the development of the flush depends upon so many factors it is impossible to predict what course it will follow.

The following factors decrease the intensity of the flush: a cold meal, taking it after a meal, taking aspirin before, using an antihistamine in advance.

The following factors make the flush more intense: a hot meal, a hot

drink, an empty stomach, chewing the tablets and the rate at which the tablets break down in liquid.

From the forehead and face the flush travels down the rest of the body, usually stopping somewhere in the chest but may extend to the toes. With continued use the flush gradually recedes and eventually may be only a tingling sensation in the forehead. If the person stops taking the vitamin for a day or more the sequence of flushing will be re-experienced. Some people never do flush and a few only begin to flush after several years of taking the vitamin. With nicotinamide there should be no flushing but I have found that about 2% will flush. This may be due to rapid conversion of the nicotinamide to nicotinic acid in the body.

When the dose is too high for both forms of the vitamin the patients will suffer from nausea at first, and then if the dose is not reduced it will lead to vomiting. These side effects may be used to determine what is the optimum dose. When they do occur the dose is reduced until it is just below the nausea level. With children the first indication may be loss of appetite. If this does occur the vitamin must be stopped for a few days and then may be resumed at a lower level. Very few can take more than 6 grams per day of the nicotinamide. With nicotinic acid it is possible to go much higher. Many schizophrenics have taken up to 30 grams per day with no difficulty. The dose will alter over time and if on a dose where there were no problems, they may develop in time. Usually this indicates that the patient is getting better and does not need as much. I have divided all patients who might benefit from vitamin B-3 into the following categories.

Category 1. These are people who are well or nearly well, and have no obvious disease. They are interested in maintaining their good health or in improving it. They may be under increased stress. The optimum dose range varies between 0.5 to 3 grams daily. The same doses apply to nicotinamide.

Category 2. Everyone under physiological stress, such as pregnancy and lactation, suffering from acute illness such as the common cold or flu, or other diseases that do not threaten death. All the psychiatric syndromes are included in this group including the schizophrenias and the senile states. It also includes the very large group of people with high blood cholesterol levels or low HDL when it is desired to restore these blood values to normal. The dose range is 1 gram to 10 grams daily. For nicotinamide the range is 1 1/2 g to 6 g.

Nicotinamide does not affect cholesterol levels.

Side Effects
Here are Dr. John Marks' conclusions. [21]

"A tingling or flushing sensation in the skin after relatively large doses (in excess of 75 mg) of nicotinic acid is a rather common phenomenon. It is the result of dilation of the blood vessels that is one of the natural actions of nicotinic acid and one for which it is used therapeutically. Whether this should therefore be regarded as a true adverse reaction is a moot point. The reaction clears regularly after about 20 minutes and is not harmful to the individual. It is very rare for this reaction to occur at less than three times the RDA, even in very sensitive individuals. In most people much larger quantities are required. The related substance nicotinamide only very rarely produces this reaction and in consequence this is the form generally used for vitamin supplementation.

"Doses of 200 mg to 10 g daily of the acid have been used therapeutically to lower blood cholesterol levels under medical control for periods of up to 10 years or more and though some reactions have occurred at these very high dosages, they have rapidly responded to cessation of therapy, and have often cleared even when therapy has been continued.

"In isolated cases, transient liver disorders, rashes, dry skin and excessive pigmentation have been seen. The tolerance to glucose has been reduced in diabetics and patients with peptic ulcers have experienced increased pain. No serious reaction have been reported however even in these high doses. The available evidence suggests that 10 times the RDA is safe (about 100 mg)."

Dr. Marks is cautious about recommending that doses of 100 mg are safe. In my opinion, based upon 40 years of experience with this vitamin the dose ranges I have recommended above are safe. However with the higher doses medical supervision is necessary.

Jaundice is very rare. Fewer that ten cases have been reported in the medical literature. I have seen none in ten years. When jaundice dose occur it is usually an obstructive type and clears when the vitamin is discontinued. I have been able to get schizophrenic patients back on

nicotinic acid after the jaundice cleared and it did not recur.

Four serious cases have been reported, all involving a sustained release preparation. Mullin, Greenson & Mitchell (1989) [22] reported that a 44 year-old man was treated with crystalline nicotinic acid, 6 grams daily, and after 16 months was normal. He then began to take a sustained-release preparation, same dose. Within three days he developed nausea, vomiting, abdominal pain, dark urine. He had severe hepatic failure and required a liver transplant. Henkin, Johnson & Segrest found three patients who developed hepatitis with sustained release nicotinic acid. When this was replaced with crystalline nicotinic acid there was no recurrent liver damage. [23]

Since jaundice in people who have not been taking nicotinic acid is fairly common it is possible there is a random association. The liver function tests may indicate there is a problem when in fact there is not. Nicotinic acid should be stopped for five days before the liver function tests are given. One patient who had no problem with nicotinic acid for lowering cholesterol switched to the slow release preparations and became ill. When he resumed the original nicotinic acid he was well again with no further evidence of liver dysfunction. I have not seen any cases reported anywhere else. I have described much more fully the side effects of this vitamin elsewhere. [24]

Inositol hexaniacinate is an ester of inositol and nicotinic acid. Each inositol molecule contains six nicotinic acid molecules. This ester is broken down slowly in the body. It is as effective as nicotinic acid and is almost free of side effects. There is very little flushing, gastrointestinal distress and other uncommon side effects. Inositol, considered one of the lesser important B vitamins, does have a function in the body as a messenger molecule and may add something to the therapeutic properties of the nicotinic acid.

Conclusion

Vitamin B-3 is a very effective nutrient in treating a large number of psychiatric and medical diseases but its beneficial effect is enhanced when the rest of the orthomolecular program is included. The combination of vitamin B-3 and the antioxidant nutrients is a great anti-stress program.

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