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Niacine: A Remarkable Healer

PART ONE OF THREE

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Niacin, also known as vitamin B-3 or nicotinic acid, is a water-soluble vitamin. It is an organic compound with the molecular formula $C_6H_5NO_2$. It is a derivative of pyridine, with a carboxyl group (COOH) at the 3 position. Other forms of vitamin B-3 include the corresponding amide, nicotinamide ("niacinamide"), where the carboxyl group has been replaced by a carboxamide group ($CONH_2$), as well as more complex amides and a variety of esters. **The terms niacin, nicotinamide, and vitamin B-3 are often used interchangeably** to refer to any one of this family of molecules; since they have a common biochemical activity.

Niacin is one of five vitamins associated with a pandemic deficiency disease: These are niacin (pellagra); vitamin C (scurvy); thiamin (beriberi); vitamin D (rickets); and vitamin A deficiency, a syndrome which has no common name but is one of the most common symptomatic deficiencies worldwide.

Niacin was first described by Hugo Weidel, in 1873, in his studies of nicotine. The original preparation remains useful: the oxidation of nicotine using nitric acid. Niacin was extracted from livers by Conrad Elvehjem; he later identified the active ingredient which was then referred to as the "pellagra-preventing factor" and the "anti-blacktongue factor."

When the biological significance of nicotinic acid was realized, it was thought appropriate to choose a name to dissociate it from nicotine in order to avoid the perception that vitamins or niacin-rich food contains nicotine, or that cigarettes contain vitamins. You cannot obtain niacin from using tobacco in any form! The resulting name 'niacin' was derived from **ni**cotinic **ac**id + vitam**in.** Niacin is referred to as vitamin B-3 because it was the third of the B vitamins to be discovered.

(Additional information on niacin will be found on page 86 of our *Natural Remedies Encyclopedia.)*

Here is a remarkable article by Doctor Abram Hoffer, M.D., Ph.D., a Canadian research scientist, university professor, and medical doctor. He spent many years researching and treating various diseases with niacin, as well as with a number of other vitamins. I have added bold type to help you locate key portions which may be of special interest to you. ***—vf***

Vitamin B-3: Niacin and Its Amide
by Abram 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, cofounder of Alcoholics Anonymous (Bill Wilson). We met in New York in 1960. Humphry Osmond and I introduced him to the concept of megavitamin 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** and 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 Alcoholics Anonymous 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

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the chemical or medical terms for this vitamin were not appropriate. He wanted to persuade members of Alcoholics Anonymous, especially the doctors in Alcoholics Anonymous, 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 Alcoholics Anonymous 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 Alcoholics Anonymous 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 Alcoholics Anonymous 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 in order 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 cannot 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 nonpregnant females.** Also there is evidence that contraceptive steroids and 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 Ds: **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 primarily concerned in **lowering high cholesterol levels** [3], 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 psychiatric disorders include **children with learning and behavioral disorders**; the **addictions, including alcoholism and drug addiction**; the **schizophrenias**; **and some of the senile states**. Its efficacy for a large number of both mental and physical conditions is an advantage to patients and their doctors who use the vitamin; but it is difficult to be accepted by the medical profession who are 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 on 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**. 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 re-

lieved 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 Wilson conducted the first clinical trial of the use of nicotinic for treating members of Alcoholics Anonymous. [11] He found that twenty 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 for 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 that 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 megadoses 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 which are not directly related to vitamin deficiency diseases, but may have to**

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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 a 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 arthritics 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 and 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. It was worse in her arms, hips, and 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 with a pencil or type, which she used to do. A few months earlier, she had been suicidal. On top of this severe pain and discomfort, she had **no appetite** and was not hungry; **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 **500 mg of niacinamide four times daily** (following the work of W. Kaufman), **500 mg of ascorbic acid four times daily** (as an antistress nutrient and for subclinical scurvy), **250 mg of pyridoxine per day** (found to have antiarthritic properties by Dr. J. Ellis), **220 mg of zinc sulfate per day** (the white areas in her nails indicated she was deficient in zinc), **and 2-3 tablespoons of flaxseed oil** 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 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 **500 mg of inositol niacinate 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 800 IU of vitamin E**. Because she had shown such dramatic improvement, I advised her that 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 that 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, she cannot 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 hands 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 **3 grams of inositol niacinate 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 **3 grams of inositol niacinate daily, 1 gram of ascorbic acid three times, and 2-3 capsules of linseed oil**. 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 **3 grams of niacin daily plus other vitamins, including vitamin C**. By September 1983, he was well; and

when I had last seen him on March 24, 1988, he was still normal.

3. Juvenile Diabetes

Dr. Robert Elliot, Professor of Child Health Research at the 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 anticancer 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; or chemicals is, 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 anticancer treatment. In mice, niacinamide increased the toxicity of irradiation against tumors. Horsman and Aoki 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**.

Max Gerson [18] treated a series of cancer patients with special diets and with some nutrients, including **50 mg of niacin 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, starvation, nutrient deficiency, beriberi, 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 insomnia**. 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**

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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, he 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. He said 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; here 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?

DOSAGE

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 I 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 or suffering from an acute illness of the common cold, 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 1½ 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, one of the natural actions of nicotinic acid 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 disor-***

ders, 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 reactions 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 the jaundice dose occurs, 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, and Mitchell (1989) [22] reported that a 44-year-old man was treated with crystalline nicotinic acid, 6 grams daily; and, after 16 months, he was normal. He then began to take a sustained-release preparation, same dose. Within three days he developed nausea, vomiting, abdominal pain, and dark urine. He had severe hepatic failure and required a liver transplant. Henkin, Johnson, and 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 antistress program.

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