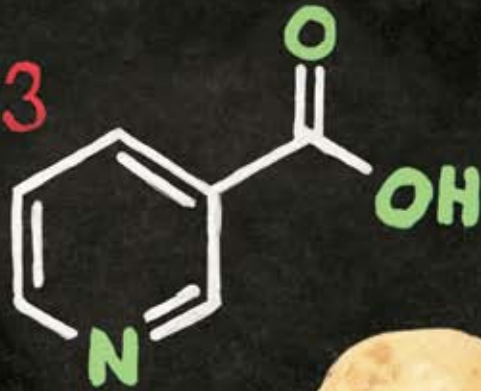


Vitamin B₃



BY MILTON TESKE, M.D.



Vitamin B₃ is essential to life. The cellular machinery that provides life-giving energy to every vital function of every cell in your body depends on it. Vitamin B₃ comes in three different forms all of which end up doing the same thing. They are all used to make NAD, a molecule capable of carrying energy from one enzyme to another. The three forms are: (1) Niacin (also called nicotinic acid), (2) nicotinamide (also called niacinamide), and (3) nicotinamide riboside. (Do not confuse these with nicotine, a very toxic compound found in tobacco.)

Dietary Sources

Although the body can make a small amount of niacin out of the amino acid tryptophan, this pathway is very

inefficient and can only produce trace amounts. So, it is essential to provide sufficient niacin in the diet. Vitamin B₃ is high in most meats and fish. But vegetarian sources can provide all you need. Two tablespoons of peanut butter will provide 30% of your daily requirement. A medium size avocado also will provide about 30%. One large baked potato (with or without the skin) will also provide about 30%. A cup of mushrooms or a cup of green peas will each provide about 20%. Whole wheat and brown rice also have a bunch of B₃, but it is more difficult to absorb from these sources. Today niacin is added to most breakfast cereals and white flour to fortify it to help prevent severe deficiencies (such as seen in pellagra).

Pellagra

Pellagra is a disease characterized by the “4Ds”: diarrhea, dermatitis, dementia and death. A century ago pellagra was an epidemic disease here in America particularly in the poorer areas in the Southern states as well as in prisons, orphanages and mental institutions. There were over 3 million cases with over 100,000 deaths in the U.S. in the early 1900s. These individuals lived on an impoverished diet based primarily on corn or white flour. In 1915 Joseph Goldberger was assigned by the Surgeon General of the United States to study pellagra, and he discovered it was caused by a nutritional deficiency and could be cured or prevented by adding meat or legumes to the diet. Brewer’s yeast also worked.

NAD

NAD stands for *nicotinamide adenosine dinucleotide*, (not to be confused with the North American Division). This is why we need vitamin B₃ — because B₃ is the essential building block needed to build NAD. The position of the atoms that make up vitamin B₃ are in just the right position so that NAD can use them to accept or release high energy electrons. So, NAD can be used as an energy carrier to carry energy from one reaction to another.

Glucose is full of high energy chemical bonds (energy from the sun captured in leaves by photosynthesis). Our cells take in glucose for fuel and they break apart these high energy chemical bonds one at a time in small increments and they capture that energy by moving some of it to NAD which then can carry it to another chemical reaction that needs energy. So, without sufficient niacin we cannot build enough NAD, and

thus our ability to transfer and use this energy will be limited. This limitation will slow down and hinder normal cellular functions. As the deficiency worsens, the symptoms of pellagra appear and eventually death comes as the cells run out of NAD.

But beyond the pellagra level of nutritional deficiency, NAD levels drop significantly as we age, and many age-related deteriorations are directly correlated with NAD deficiencies in our cells.

Epigenetic Modification

There is a group of seven different proteins called **sirtuins** that need NAD. Sirtuins are turned on by NAD and off by a lack of NAD. These sirtuins are regulators that act by flipping a switch on a number of other proteins that control various metabolic activities in the mitochondria. They also flip the switches on some proteins in the nucleus of the cell that wind up or unwind different sections of the DNA so that certain genes can be turned on or turned off. This unwinding and winding up of certain portions of the DNA is called **epigenetics**. It turns out that epigenetics is even more important than genetics. It’s not just what genes you inherited, but which genes you turn on or off that determines the function and health of your cells. The level of NAD in the cell will directly control your cellular metabolism through both directly activating some enzymes as well as epigenetically controlling which enzymes are made.

Cellular Energy

Good levels of NAD (by activating sirtuins) will turn on the machinery to build more new mitochondria (the energy power generators in the cell)

as well as also setting in motion the mechanisms to destroy old minimally functioning mitochondria. So higher levels of NAD will transform an old, weak, low-energy cell into a newer, more youthful, high-energy cell. And this can happen in every cell in your body. But you will need high NAD levels to do it.

NAD and the Brain

Research has found that optimally high healthy levels of NAD have *neuroprotective* effects. Using supplements to stop the decline in NAD levels in the brain, they greatly reduced cognitive deterioration and dementia. They also reduced DNA damage in brain cells. In studies of Parkinson's disease, they were able to preserve motor function and prevent cellular death by using supplements to increase NAD levels. It seems that much of the age-related cognitive decline we see may be related to deactivated sirtuins because of low NAD levels, that are due to low B3 levels.

DNA Repair

The DNA in our cells is constantly subjected to damaging forces and the frequent breaks need to be constantly repaired or we would soon die. Three different sirtuins are extremely vital in the cellular mechanisms for the ongoing protection and repair of this DNA damage. We need our sirtuins to be operating at maximal efficiency as increasing age accelerates the injuries to our DNA. Unfortunately, this is when many experience a decline in their NAD levels resulting in deactivation of their sirtuins. In animal experiments, deactivating the sirtuins

results in all the symptoms of rapid aging and premature death.

Metabolic Syndrome

Because of the role of sirtuins in cellular energy, good NAD levels are essential to living a long and healthy life. But when NAD levels fall, the sirtuin activity is seriously slowed down, and then all of the metabolic syndrome pathologies begin to appear. Because sirtuin activity is so essential for normal glucose metabolism in the mitochondria, we see a slowing down of glucose metabolism and an increase of fat build up and storage. In the liver we see fatty liver disease, which can eventually lead to cirrhosis and liver failure. Fat builds up inside of muscle cells where it should never be, and the result is insulin resistance and type 2 diabetes. This can also cause muscle weakness and fatigue. Fat storage around the abdominal organs results in central obesity. The adipose tissue of central obesity releases inflammatory substances throughout the body promoting many inflammatory diseases such as osteoarthritis. Inflammation in the lining of the blood vessels leads to atherosclerosis and cardiovascular disease. All this because low NAD levels leave your sirtuins deactivated and non-functional.

Restoring NAD Levels

Ideally a perfect diet would provide all of the B3 to keep our NAD levels high. Unfortunately, we don't see that happening today. Most experience the weakening and accelerated aging and deterioration associated with low NAD levels and low sirtuin activity. What about supplementation?

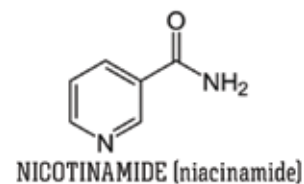
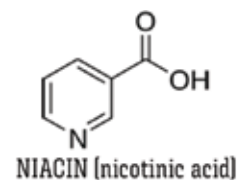
Niacin has been available as a vita-

min supplement for a long time and is not only found in many multivitamins, but it is also used to fortify many cereals and flours. These levels of supplementation are apparently adequate to prevent pellagra but fall short of significantly boosting our NAD levels as we age. Niacin has been tried in higher doses for many of the symptoms we have discussed but it is never well tolerated in high doses because of the hot flushing and itching produced by it. And in very high doses niacin can be very toxic to the liver even causing total liver failure.

Niacinamide is also available as a supplement and does not have the toxicity or flushing side effects of niacin. But unfortunately, niacinamide actually inhibits sirtuin activity. Niacinamide binds to one of the specific sites for NAD thus blocking NAD binding, thus shutting off the sirtuin. So, no benefit to be gained here.

Nicotinamide riboside, a little known, naturally occurring minor vitamin, was only recently (2016) granted GRAS (generally recognized as safe) status by the FDA. No toxic side effects. It has been shown to effec-

The 3 forms of vitamin B3



tively boost NAD levels in cells. If you take a look at its chemical structure you can see why — it is only two steps away from being made into NAD. And there is now a lot of research being done on it. Many are now recommending supplementation with nicotinamide riboside for the purpose of elevating NAD levels and increasing sirtuin activity with all of its many benefits.

Caloric Restriction

For a long time now, it has been well recognized that a cer-

tain level of caloric restriction in the diet is associated with longevity. In every animal species they test they can slow aging and increase the life span by reducing the food intake. One interesting fact has come up in all of this research: NAD levels are always **naturally high** in all these caloric restricted individuals. This could help explain the longevity if you just think about all of the NAD increased sirtuin activity benefits we have discussed here.

We live in a nation of gluttony and obesity which could help to explain our low NAD levels. And so much of the calorie overload is made up of nutritionally empty calories. We could

all benefit from a significantly reduced calorie diet. Most find going to a low-calorie diet leaves them quite hungry. The problem is the concentrated, processed, refined calories (oil, sugar etc.). If the only food eaten were whole plant foods with all of their fiber, we would find that a very satisfying and filling meal can actually be quite low-calorie.

“Cultivate self-control. Keep appetite under the control of reason. Never abuse the stomach by overeating.” CCh 225

“Most people enjoy better health while eating two meals...” CTBH

*“It is possible to eat immoderately, even of wholesome food. It does not follow that because one has discarded the use of hurtful articles of diet, he can eat just as much as he pleases. **Overeating, no matter what the quality of the food, clogs the living machine, and thus hinders it in its work.**”* CTBH 51

In the past we have always interpreted passages like this to refer to obesity and lack of brain circulation due to atherosclerosis and also to shunting of blood due to the overloaded digestive organs. But in light of the increased knowledge we now have on the function of NAD and sirtuins and their interactions in the complexities of the living machinery, we can now see an even deeper and more fundamental way in which overeating clogs every aspect of the living machine and leads to disfunction and disease and eventually death.

Fasting

As we are living in the last few hours of this earth's probation, the call to fasting and prayer as an essential work in

preparation for the filling of the Spirit and the holiness necessary to survive the final crisis is now more urgent than ever. The elimination of every unnecessary and hurtful item from our diets and moving entirely to the simplicity of the original diet is now a matter that should have our attention.

“The true fasting which should be recommended to all, is abstinence from every stimulating kind of food, and the proper use of wholesome, simple food, which God has provided in abundance.” CD 90

May we all be prepared to enter the final crisis with the NAD levels in every neuron of our brains at optimal levels and may every cell be full of vigorous energetic mitochondria. The brain is the only channel through which God communicates with man. God's health message to us is not optional good advice for avoiding certain diseases; it is the essential training necessary to prepare every cell of our body to win in the final conflict with evil, to be filled with His Spirit and to stand victorious on the sea of glass.

True fasting is not a period of temporary starvation — it is a lifestyle whose time has now come.



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