



NADH

**All you should know
about
NADH (Coenzyme1)**

**An informational
brochure for doctors
and therapists**

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1. What is NADH?

The most promising natural substance in our body is NADH, which stands for nicotinamide adenine dinucleotide hydride. NADH is the biological form of hydrogen. It reacts with the oxygen present in every living cell, thus producing energy and water. The more NADH a cell has available, the more energy it can produce, the better it functions and the longer the cell (and the entire organism) lives.

Though NADH is present in our foods, we take in only marginal amounts of it from our daily diet. Most of the NADH is destroyed during the cooking process. The situation would not be greatly improved even if our diet consisted mostly of raw meat and fish, as the NADH present in these foods is degraded within seconds by the acid environment produced by the gastric juices in the stomach.

Is it possible to increase the amount of NADH in the cell by adding NADH from outside? The answer is yes. This suggests that we can increase the energy levels in our cells. Due to this fact, the cells can produce more of all the components essential for life, and thus they will function better and live longer. This is feasible by supplementation with NADH in order to boost the hydrogen taken in by the human body.

The amount of NADH a cell contains depends on the amount of energy it requires. The heart and the brain need the most energy of all our organs, thus these organs benefit the most from an external supply of NADH. All other organs, particularly the lungs, the liver and the kidneys, also get more energy from NADH and function better. Biological hydrogen is the fuel for cellular energy production and nutritional supplementation can provide our body with more NADH.

2. Physiological functions of NADH

NADH fulfils numerous physiological functions in our body. More than a thousand metabolic processes are catalyzed by NADH.

The 7 most important physiological functions are described below.

2.1. NADH increases energy in heart cells
More NADH in the cell leads to more ATP. Due to this fact, the cell has more energy, functions better and lives longer.

2.2. NADH repairs altered DNA and regenerates damaged cells

NADH protects the cells from radioactive exposure, environmental toxins, drugs, chemicals and other toxic compounds.

2.3. NADH is one of the most potent antioxidants
Dr. Richard Passwater, biochemist and expert on antioxidants in the USA, writes in the foreword of the book *NADH—The Energizing Coenzyme* that: “While there is no such thing as a singularly ‘most important’ compound in the body, or even a ‘most important antioxidant’, NADH comes as close as a single compound can. NADH is both the primary coenzyme that drives reduction and oxidation reactions in cellular metabolism and the most powerful antioxidant.”

2.4. NADH lowers cholesterol and high blood pressure

This effect of NADH was proven by a study performed at Georgetown University in Washington, D.C. It was a double-blind placebo-controlled study in which 1 group of rats received 1 NADH tablet per day for 8 weeks. The other group of rats obtained an identical tablet containing no NADH. After 2 months of 5 mg NADH per day the total cholesterol and the LDL-cholesterol levels declined by about 30%.

The cholesterol-lowering effect of NADH was confirmed by the Numico N.V. corporation (Netherlands), the producer of

the baby food Milupa. In addition to this effect the scientists at Numico found that NADH strengthens the muscles of the heart and of the aorta. Furthermore the Georgetown study revealed that a daily dose of 5 mg of NADH for 12 weeks lowers blood pressure by 10% on average.

A number of patients who were taking NADH tablets for a number of weeks reported a normalization of their elevated blood pressure.

2.5. NADH strengthens the immune system

The immune system is composed of the cellular and the humoral system. The first is based on the activity of specific white blood cells: T-lymphocytes, B-lymphocytes and macrophages. Macrophages are responsible for the direct elimination of bacteria, viruses and other foreign bodies. They take them in and degrade them—a process comparable to eating and digestion, which is why they are called phagocytes. The second system is based on antibodies that circulate in the blood.

A study performed at the University of Berlin demonstrated that NADH stimulated the synthesis of Interleukin-6 dosages in relation to a multiple of their normal concentration. A number of scientific publications indicate a protective effect that Interleukin-6 has on nerve cells that have been damaged in various ways. In certain neurodegenerative diseases, such as Alzheimer's disease, Parkinson's and multiple sclerosis, the concentration of Interleukin-6 is considerably reduced. This could mean that NADH may be a useful tool in overcoming this shortage of Interleukin-6.

2.6. NADH stimulates production of dopamine and serotonin

Dopamine also has a substantial influence on sexual behaviour, particularly on libido. Furthermore, dopamine lowers the secretion of prolactin and reduces appetite. The higher the dopamine level, the lower the appetite. This effect may have some importance for overweight people, as NADH can be taken as a dietary supplement. The positive influence of dopamine on the secretion of human growth hormone should also be mentioned; this hormone plays a key role in the regeneration of cells and tissues.

The dopamine increasing effect of NADH was demonstrated in isolated nerve cells. If these cells are incubated with NADH, a 6-fold dosage-dependent elevation of dopamine is observed. These findings were confirmed by studies at the University of Paris. French scientists injected NADH into rats daily. They then determined the concentration of dopamine and noradrenalin in specific areas of the brain, both before administration and 4 weeks after the daily injections began. After 4 weeks, they found a 40% increase of dopamine and noradrenalin levels in specific brain areas.

NADH also leads to an increase in blood dopamine levels in healthy individuals. This was shown with professional athletes who took NADH (5 mg per day) for 4 weeks. The dopamine level increased by an average of 50% in all athletes.

2.7. NADH stimulates nitric oxide (NO) production and improves blood flow into the organs, particularly into the heart and the brain

Nitric oxide has the features of a neurotransmitter. In this function it influences the immune system and inhibits the aggregation of the blood platelets, which seal damaged blood vessels and stop bleeding. One of the most important biological functions of nitric oxide is its ability to relax and dilate blood vessels. Due to this phenomenon, all organs get more blood, and more blood means more oxygen, more nutrients and better functioning of the cells. Professor Malinski from Ohio University found that NADH can stimulate the formation of NO in the cells in a dose-dependent manner. They found that NADH promotes NO production more than any other substance.

The blood-vessel-relaxing effects of NO, induced by NADH, has medical relevance for angina, asthma and migraines. The reproductive organs of men and women also benefit from the greater blood supply triggered by NADH.

3. Health problems for which NADH has been scientifically proven to be beneficial

3.1. NADH and chronic fatigue syndrome (CFS)

Chronic fatigue syndrome (CFS) is characterized by extreme exhaustion and the inability to work. In Europe, CFS is better known as myalgic encephalomyelitis (ME). This disease is characterized by various symptoms and complaints not necessarily related. Worldwide a few hundred million people suffer from CFS. The US Centers for Disease Control (CDC) has defined the criteria for chronic fatigue syndrome as follows:

- Fatigue lasting 6 months
- Mild fever or chills
- Sore throat
- Painful lymph nodes
- Muscle weakness
- Muscle pain
- Joint pain
- Fatigue that lasts 24 hours after exercising
- Headaches
- Short-term memory problems (forgetfulness)
- Depression
- Sleep disturbance

These symptoms have to persist for at least 6 months in order to comply with the definition of CFS. The CDC did not state whether all, or how many, of the symptoms have to be present in order to fulfill the definition.

Most of the symptoms characteristic of chronic fatigue syndrome could also be caused by other chronic diseases, such as cancer, heart failure, immunodeficiency and rheumatoid arthritis, among many others. All of these diseases have to be excluded before a definitive diagnosis of chronic fatigue syndrome can be made. A variety of blood tests are required in order to find out what might be the cause of the debilitating fatigue. Using a special method of computer tomography, scientists at a research center in the US found that patients with CFS exhibit a lower level of ATP (adenosine triphosphate) in their muscle tissue than healthy control subjects. This

finding explains the muscle weakness and the tiredness that it triggers—a complaint reported by many CFS patients.

Based on this report, and our own observation that NADH increases ATP production in cells, a study with CFS patients was performed to investigate the efficacy of NADH for CFS symptoms. A double-blind, placebo-controlled cross-over study was performed at Georgetown University, in Washington, D.C. CFS patients received 2 tablets of NADH (a total of 10 mg) per day or a placebo for 4 weeks. This first treatment was followed by a 4-week wash-out phase, during which neither group received tablets. Then the NADH group received the placebo and the placebo group received the NADH tablets. The result showed that 31% of the patients exhibited an improvement in their symptoms after 4 weeks of treatment. After 6 months of NADH supplementation, 82% reported relief from their symptoms.

Therapeutic recommendation for chronic fatigue syndrome:

3 tablets Cellergie® NADH Supplement 2 times per day. 3 tablets in the morning on an empty stomach with half a glass of water and 3 tablets in the afternoon about 2 hours after lunch. After intake of the tablets one should wait 30 minutes before eating.



3.2. NADH and depression

Depression is the most frequent disease of the nervous system. About 8 million people in Germany suffer from depression; the worldwide figure is 340 million and the incidence of depression is increasing considerably. Depression is becoming a global epidemic. The economic damage caused by depressive diseases has been estimated at \$40–77 billion in the United States. So-called “burn-out syndrome” is another term for a depression caused by physical and mental exhaustion.

The main symptoms of depression are:

- Lack of enterprise
- Feelings that life is futile
- Lack of interest
- Reduced libido
- Lack of enjoyment
- Constipation
- Lack of concentration
- General pessimism

- Reduced performance
- Self-reproach
- Loss of sleep
- Anxiety
- Loss of appetite
- Suicidal tendencies
- Low drive
- Hypochondria

Certain neurotransmitters such as adrenaline, dopamine and serotonin play a key role as the biochemical cause in the development of depression. The level of these neurotransmitters is generally low in the brain of depressed people. Because of this their biological functions are diminished as well. The most important functions of noradrenalin, dopamine and serotonin are listed below.

HIGH LEVELS LEAD TO:	LOW LEVELS LEAD TO:
High blood pressure	Low blood pressure
High pulse rate	Lower pulse rate
Muscle cramps	Slack posture
Sleeplessness	Lack of initiative
Agitated behavior	Fatigue and apathy
Restlessness	Slow movements (hypokinesia)
Involuntary choreic movements	Physical fatigue
Compulsive movements	Leaned posture
Emotional hyperactivity	Weariness
Tonic muscle cramps	Sleep disturbances
Tendency to anorexia	Slack posture
Elevated appetite	Inactivity
Weight gain	Introversion
Sleepiness	
Depressed mood	
Diarrhea	
Slowing of cognitive performance	
Loss of drive	

NADH stimulates the biosynthesis of these neurotransmitters. Since depressed people have a deficit of noradrenalin, dopamine and serotonin in the brain, it appeared a reasonable approach to treat patients suffering from depression with NADH to improve their symptoms.

From 1990 to 1992, 205 depressed patients were treated with NADH at our clinic in Vienna in an open-label clinical study.

The patients received NADH (10 mg per day) either intravenously, intramuscularly, or in tablet form, for a period of 6 months. At the end of the study period, 93% of the patients experienced an improvement of their symptoms (up to 44% in the depression rating scale). A number of patients observed an alleviation of their mood after only 5 days of NADH treatment; others improved after 4 weeks. No side effects were reported. In the meantime, a few thousand patients suffering from depression, the majority of them in the United States, have been taking NADH tablets for an even longer period of time. They all reported beneficial effects on their physical and mental exhaustion.

Therapeutic recommendation for depression: 2–4 sublingual tablets containing 20 mg NADH per day (Cellergie® NADH Direct).



Patients taking standard (“classical”) anti-depressive medications should continue with these drugs. NADH exhibits no side effects nor any interaction with antidepressants. If the patient experiences an improvement of his/her health condition after intake of the NADH tablets he/she should discontinue the “classical” antidepressant and not the NADH tablets.

3.3. NADH and menopause

During menopause the formation of the sex hormones in the reproductive glands, particularly estrogen, declines. The drop in estrogen levels may cause some or all of the following complaints:


- Hot flashes
- Profuse sweating
- Sleep disturbances
- Dizziness
- Mood swings and irritability
- Nervousness and anxiety
- Loss of sex drive

The classic therapy for menopause symptoms is the substitution of estrogen deficiency using synthetic sex hormones. Hormone replacement therapy (HRT) has been used for decades and has been shown to improve the condition and well-being of women experiencing menopause. However HRT has come under increased scrutiny as retrospective analyses revealed that

women taking HRT regularly had a higher risk of developing breast cancer.


But why do the ovaries terminate hormone production during aging? The answer appears simple: the hormone-producing cells lack ATP, the energy in the cells needed for making hormones. My approach for treatment of menopause symptoms is derived from the assumption that an energy deficiency in the ovaries triggers a hormone deficiency. As NADH increases ATP energy production in the cells of the body, this coenzyme should induce an increase in hormone production in the ovaries and, due to this effect, mitigate the common complaints of menopause.

Based on these considerations, a clinical study was performed in Austria and Switzerland involving 49 women, 45–65 years of age, who had stopped taking HRT or phytohormones for at least a month, and who had symptoms of menopause (hot flashes, fatigue, sleep disturbances and mood swings). They were given NADH (10 mg per day) for 3 months. All of them experienced relief from their menopause symptoms, in particular in the strength of hot flashes, depressive moods, sleeping disturbances, drive and nervousness. These findings were confirmed by a smaller study performed by a gynecologist in Austria with women exhibiting menopause symptoms. He treated his patients with NADH tablets for 1 month. Most of the women reported an increased libido.

 **Therapeutic recommendation for menopause symptoms:** 3 tablets Cellergie® NADH Supplements per day. 2 tablets in the morning on an empty stomach and 1 tablet 2 hours after lunch.

3.4. NADH and obesity

Based on anecdotal observations of weight with people taking NADH, we performed a retrospective meta-analysis of the effects of NADH with chronic fatigue syndrome (CFS) patients. We evaluated the body weight of the CFS patients before and after the NADH treatment period. The results showed a significant loss in weight with an average weight reduction of 5 pounds (2.3 kg) in just 4 weeks of taking NADH (a daily dose of 10 mg). This weight-reducing effect of NADH was confirmed in a further study. Obese people, exhibiting a BMI (body mass index) greater than 30, lost 5–6 pounds (2.3–2.7 kg) over 3 months by taking NADH.


Therapeutic recommendation for obesity: 4 tablets Cellergie® NADH Supplement per day. 2 tablets in the morning on an empty stomach and 2 tablets 2 hours after lunch. 

3.5. NADH and diabetes

The reason for the elevated blood sugar in diabetes is a lack of insulin. This hormone exhibits a variety of biological effects. It promotes the intake of sugar (glucose), amino acids and fatty acids into the cell. It also inhibits the degradation of glycogen, the “sugar pool” of our body, as well as that of proteins and fats. Insulin triggers the transportation of glucose from the blood into the cells, which is urgently needed as the cell needs to make NADH out of glucose. NADH, as the fuel for energy production in the cell, will then generate ATP. If the organism suffers from an insulin deficiency, less glucose is transported into the cells and the sugar level in the blood increases.

According to new research findings, it appears that type 2 diabetes is caused by faulty functioning of the mitochondria, the power plants of the cell. If the mitochondria are damaged, energy production in the cell declines. This also happens in the beta-cells of the pancreas, which then produce less or no insulin. Numerous factors are regarded as being causes for the dysfunction of mitochondria with type 2 diabetes, particularly elevated cholesterol and triglyceride concentrations in the blood. However, cholesterol-lowering drugs can also induce damage in the function of mitochondria.

NADH tablets have been taken by many people on a regular basis and I have received feedback from a number of them about the normalization of their blood sugar levels. A colleague of mine has been treating type 2 diabetic patients with NADH in his clinic in the US, and many of his diabetic patients are now taking only NADH tablets in lieu of their standard anti-diabetic medication. I have recommended taking NADH to a number of my patients with type 2 diabetes. After 3–4 months the blood sugar as well as the hemoglobin HbA1C were within the normal range. Some of these patients showed me a report from the university clinic stating that they no longer needed to take any anti-diabetic medications anymore.

Therapeutic recommendation for diabetes: 2 tablets Cellergie® NADH supplement twice a day. 

3.6. NADH and Alzheimer's dementia

Dementia can be defined as the loss of intellectual functions such as logical thinking, calculating, reading, memory and the ability to concentrate, as well as comprehending and reacting to optical and acoustic signals, to name just a few. The inability to process information and to set actions based on this, as well as to maintain basic personal hygiene, are symptoms of cognitive impairment. The clinical appearance of Alzheimer's dementia is reflected by the loss of memory, worsening of intellectual capabilities and impairment of daily social activities. Symptoms of the disease include difficulties in learning and a decline in judgment, disorientation in terms of time and place and the loss of communication skills.

A simple method to examine cognitive performance is to use the mini-mental state examination (MMSE). This rating scale allows the determining of the cognitive abilities of a person in less than 5 minutes. It can be performed by anybody.

The MMSE is performed using the questions listed below:

Orientation

1. What is the year? (1 point)
2. What is the season? (1 point)
3. What is the date? (1 point)
4. What is the day of the week? (1 point)
5. What is the month? (1 point)
6. In which country are we? (1 point)
7. In which state are we? (1 point)
8. In which city? (1 point)
9. Where are we now? (1 point)
10. In which street? (1 point)

Registration

11. Examiner names 3 objects.
12. Examiner asks patient to repeat all 3. (1 point for each correct answer)

Attention and calculation

13. Serial sevens. (1 point for each correct answer)
Alternative: spell a word with 5 letters (e.g. world) or count numbers backwards (e.g. 99 to 94).
(maximum 5 points)

Recall

14. Examiner asks the patient to name the 3 objects from task 11. (maximum 3 points)

Comprehension, speech and activity

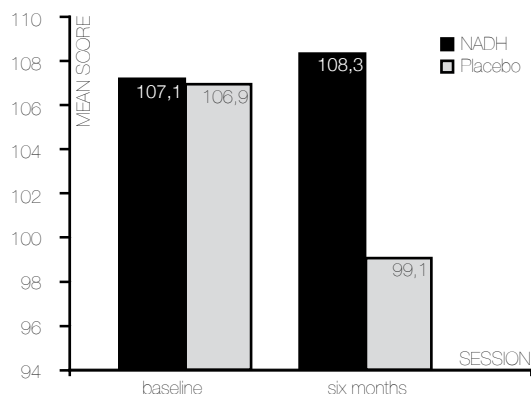
15. Examiner points to a pencil and a watch. The patient has to name them as the examiner points.
(maximum 2 points)
16. Examiner has the patient repeat "No ifs, ands, or buts." (maximum 1 point)
17. The patient has to follow a 3-stage command such as: "Take the paper in your right hand. Fold the paper in half. Put the paper on the floor."
(maximum 3 points)
18. Have the patient read and obey the following: "Close your eyes." (Write in large letters.) (1 point)
19. Have the patient write a sentence of his or her own choice. (The sentence should contain a subject and an object and should make sense. Ignore spelling errors when scoring.) (1 point)
20. Examiner draws 2 intersecting pentagons about 5 cm in size and has the patient copy them. (Give 1 point if all sides and angles are preserved and if the intersecting sides form a quadrangle.) (1 point)

The maximum score of 30 points indicates normal brain performance. If an examinee scores less than 24 points this may be the first sign of reduced cognitive function. With this low score, the cause for the disturbance should be elucidated as it may indicate the onset of Alzheimer's dementia.

The human brain uses about one third of all the energy produced by the body. Hence an energy deficit can be regarded as plausible cause of cognitive impairments. If an ATP deficit is actually the cause of Alzheimer's dementia, then using NADH as a fuel for cellular ATP production should have a positive influence on symptoms. Following on from this premise, a double-blind, placebo-controlled clinical trial with Alzheimer's patients was organized at Georgetown University in Washington, D.C. Patients received 2 tablets of NADH (a total of 10 mg) per day. 17 patients completed the 6-month study. Their cognitive capabilities were tested using the Mattis Dementia Rating Scale (MDRS) as well as part of the CogScreen Test battery, which both represent commonly used measures. The

MDRS showed an improvement in cognitive performance, with patients scoring 108.5 points after treatment with NADH, compared to 107 points at the beginning of the study. In patients taking a placebo, cognitive performance declined to 99 points after 6 months. Further significant improvements were observed with a verbal fluency test as well as the Fuld Object Memory Evaluation.

MATTIS DEMENTIA RATING SCALE (MDRS) TOTAL SCORE; N=24 (p<0.05)



Results of the cognitive performance test, measured using the Mattis Dementia Rating Scale, of Alzheimer's patients before and then 6 months after treatment with NADH. Based on these 2 independent studies, we can conclude that Alzheimer's patients' cognitive performance improves significantly after 6 months of treatment with NADH.

Therapeutic recommendations for Alzheimer's dementia and other cognitive impairments: 2 tablets of Cellergie® NADH Direct twice per day. 2 tablets in the morning and 2 tablets in the afternoon. Let the tablets dissolve under the tongue.

3.7. NADH and Parkinson's disease

Parkinson's disease is characterized by 3 key symptoms: tremor (shaking), rigidity and akinesia (immobility). It has to be emphasized however that not every instance of tremor or reduced mobility should be diagnosed as Parkinson's disease. NADH was used for the first time in 1987 as an IV infusion by my late father, Professor Walter Birkmayer, with a patient

suffering from Parkinson's disease. The patient had difficulties in getting up from his seat and could walk only in small, tripping steps. After the NADH infusion the patient jumped up from his seat and could walk normally. Within 1 year 480 Parkinson patients were taking NADH tablets. 85% of these patients experienced an improvement of up to 10 to 60% of their disability within 2–4 weeks of treatment.

Therapeutic recommendations for Parkinson's disease: Start with 1 NADH tablet (Cellergie® NADH Supplement) and observe the effect for a few days. If an improvement is not observed, increase the NADH dose to 2 tablets per day for a week. If an improvement is observed, then increase the daily dosage to 3 tablets per day. 2 tablets should be taken in the morning on an empty stomach with a glass of water and the patient should wait 20 minutes before eating. The 3rd tablet should be taken in the early afternoon at around 3 pm.

3.8. NADH and multiple sclerosis (MS)

The causes for the development of multiple sclerosis have not yet been explained. What we know is that the cells of the central nervous system (CNS), particularly the myelin forming ones, die off. If the myelin sheet of nerve cells gets damaged the cells do not function properly anymore. This leads to those symptoms that are characteristic for MS.

The main symptoms of MS are:

- Tiredness
- Movement disabilities
- Muscle cramps
- Vision impairment
- Problems in coordination
- Altered sensibility
- Speech problems
- Problems with bladder and gut

Tiredness and fatigue are the major complaints reported by almost all MS patients. This symptom reflects an energy deficiency. A lack of energy represents biochemically a low ATP level in the body.

Based on this observation, Professor András Guseo, Head of the Department of Neurology at the St. George Hospital in Székesfehérvár in Hungary, performed a study on the effect of

NADH in his MS patients. 63% of the patients felt significantly better after being treated with NADH. This was particularly the case for vitality, tiredness, mobility, relaxation and the duration of the “good phases” between the periods of fatigue. 38% of the patients reported increased vitality and reduced tiredness. 10% of the patients had better mobility. 28% of the patients reported days without any periods of fatigue. These phases were extended under NADH therapy.

✦ **Therapeutic recommendations for multiple sclerosis (MS):**
2 to 3 NADH tablets (Cellergie® NADH Supplement) per day. 2 tablets should be taken in the morning on an empty stomach with a glass of water and the patient should wait 20 minutes before eating. The 3rd tablet should be taken in the early afternoon at around 3 pm.

Patients suffering from extreme fatigue should take 4 to 6 NADH tablets (Cellergie® NADH Supplement) per day during the first 2 months.

3.9. NADH and stroke

Triggers for a stroke could be a rupture of, or blockage in, a blood vessel in the brain. If the blood supply for a certain brain area is reduced, the brain lacks oxygen and nutrients. No nutrients also means no NADH and hence no fuel for ATP energy production in this brain area. Without energy, the tissue becomes damaged and will eventually die. When this happens, the functions controlled by this particular brain area desist. Depending on which part of the brain – left or right side – is afflicted, the contralateral side of the body shows the symptoms of hemiplegia (paralysis) or aphasia (impairment of the ability to use or understand words). In many cases, difficulties in speech and alterations in the sensitivity of the body are the first signs of a developing stroke.

The areas in the brain adjacent to the infarction zone do not function properly after a stroke, because they do not get enough blood, and because of this they receive no signals from the neighboring nerve cells. If these damaged but still living nerve cells receive NADH they can produce more energy and can regenerate. After a short period of time this area should become fully functional again. Depending on the extension of the infarction area the regeneration can occur within a few days or may take a couple of months.

Because NADH increases cellular energy it has been used with a number of stroke patients. The course of the stroke has shown remarkable improvements under NADH treatment in several cases.

In one case, an 84-year-old woman who had suffered a stroke in June 2003 developed hemiplegia and motor aphasia. 2 weeks after the stroke, she started taking NADH, 4 tablets (40 mg) (Cellergie® NADH Direct) per day. After 2 weeks she could get out of bed, walk and speak. The neurologist in the clinic admitted that the patient was considerably better physically as well as mentally after the NADH treatment than she had been a month before the stroke. She continues to take 2 NADH tablets (Cellergie® NADH Direct) per day. According to her grandson, who was an assistant doctor at the clinic where the patient had been hospitalized, she is still doing better with NADH than before the stroke.

Therapeutic recommendations for stroke:

1. Acute stroke: 2 NADH tablets (Cellergie® NADH Direct) 2 times per day. 2 tablets in the morning and 2 tablets after lunch
2. After rehabilitation and for prevention: 1 NADH tablet (Cellergie® NADH Direct) 2 times per day. 1 tablet in the morning and 1 tablet after lunch.

3.10. NADH and cancer

Cancer develops by chronic exposure to physical and psychic influences. The most important promoters for the induction of cancer are listed below.

Promoters for the development of cancer :

- Free radicals
- Pesticides/herbicides
- X-rays and cosmic rays
- Industrial toxins
- Ionizing radiation
- Smoking
- Nuclear radiation
- Polluted water
- UV light
- Immune-suppressive drugs
- Electromagnetic fields

- Cytostatics
- Overhead power lines
- Mercury (amalgam dental fillings)

As can be seen above, there are physical and chemical promoters, both of which have the capability to produce free radicals. Free radicals are extremely reactive atoms or molecules with an unpaired electron. Due to this high reactivity, they attack nucleic acids, lipids (fats), and proteins and can change the structures of these cell components considerably. If promoters can be inactivated, the development of cancer could be blocked or at least inhibited. The best free radical scavengers are antioxidants: substances that act against oxidation.

Naturally occurring biological antioxidants, which occur in living cells, include vitamins A, C, and E, as well as selenium, glutathione, NADH and certain enzymes. The strength of an antioxidant depends on its capacity to prevent oxidation. The counterpart of oxidation is reduction—a substance with a high reduction power is a strong antioxidant. NADH exhibits the strongest reduction potential of any biological substance. Hence NADH represents the most potent antioxidant. Dr. Richard Passwater, an expert on antioxidants, wrote in the preface of the book *NADH—The Energizing Coenzyme*: “While there is no such thing as the ‘most important’ compound in the body or even a ‘most important antioxidant’ NADH comes as close as a single compound can.”

NADH functions in a 3-fold way as protector against cancer formation:

1. NADH is an essential factor for DNA repair.
2. NADH is the strongest biological antioxidant.
3. NADH increases ATP energy in the cell.


On the basis of these functions, I started to treat cancer patients in 2001 by giving them NADH in tablet form. The table below summarizes the results observed in a variety cancer patients treated with NADH.

Type of cancer	Number of cases	Outcome
Prostate	17	10 TR or 7 TF
Mammary	5	3 TR or 2 TF
Glioblastoma	2	1 TR, 1 TF
Non-Hodgkin's	3	2 TR, 1 TF

Type of cancer	Number of cases	Outcome
Small-cell lung	3	1 TR, 2 TF
Colon	4	1 TR, 3 TF
Gastric	1	1 TR
Pancreas	1	1 TR

TR = tumor regression; TF = tumor free

Based on the positive results with NADH in the treatment of cancer patients I was invited by 2 American colleagues to summarize my experience using NADH in their book *Phytopharmaceuticals in Cancer Prevention*. In my contribution, entitled “NADH in Cancer Prevention and Therapy,” I explain the various biochemical mechanisms and points of action of NADH in the growth control of cancer cells and report on those cancer patients of mine who have been successfully treated with NADH.

Therapeutic recommendations for cancer: At the beginning of the therapy I recommend 4 tablets (Cellergie® NADH Supplement) 2 times a day. As soon as the tumor regresses the dosage can be reduced to 3 NADH tablets twice a day. If the tumor has disappeared I recommend taking 2 NADH tablets 2 times per day for a period of 1 to 2 years as a preventive care. 

4. NADH for healthy people

4.1. NADH to increase physical energy

In collaboration with a university in the former Czechoslovakia, a study was conducted among competitive-level cyclists. They took 10 mg of NADH per day, and performance-specific parameters—vital capacity, oxygen uptake, lactate levels in blood and reaction time—were measured before and after 1 month of NADH intake. It was found that oxygen uptake was faster and greater, lactate levels fell, and the reaction time was significantly quicker than at the beginning of the study.

A further study was performed by Dr. Bill Misner, the coach of several top American athletes. He gave them NADH in a dose of 10 mg per day for 60 days. All athletes improved in their sprint performance (cycling for 5 minutes or running 1 mile), and in duration performance all the athletes also showed better performance levels.

To confirm these preliminary findings, a study was conducted

by the Department of Sports Medicine at the University of Freiburg in Germany. The study was a double-blind, placebo-controlled, cross-over study. One group of highly conditioned athletes took NADH (3 tablets, 10 mg each per day) for 4 weeks. This was followed by a 6-week washout period. After this resting phase, the athletes received placebo tablets for 4 weeks. The second group started with placebo tablets for the first 4 weeks, and then continued with the NADH tablets for 4 weeks after the 6-week washout period. The following parameters were investigated: maximum aerobic capacity, oxygen uptake, carbon dioxide exhalation, lactate levels in blood and catecholamine levels in blood. Tests were performed at the beginning and at the end of each treatment period.

After NADH supplementation, the following effects were observed:

- In the metabolic energetic area, oxygen consumption was reduced and there was an increase in the respirator coefficient.
- The exhalation of carbon dioxide was diminished as was the lactate level. The lactate-lowering effect of NADH has enormous practical consequences for athletes. By taking NADH regularly, they could theoretically exercise much longer under aerobic conditions in the muscles, leading to greater exercise duration.
- In the metabolic-regulative domain, a reduction of potassium levels was observed. This could be explained by the higher demand through the defined exercise work.
- The plasma concentration of creatine was also lower with NADH. During endurance exercise, activity of the enzyme creatine kinase (CK) is higher than in the resting state. This increase is caused by leaky muscle tissue damaged by excessive use of the muscles during training. Under NADH treatment, the elevation of CK activity is much smaller than without NADH. This may be indirect evidence for the protective effect of NADH against cell damage.
- Among indicators for systemic stress, a decline of the “stress” hormones noradrenalin and adrenocorticotrophic hormone (ACTH) was seen.

The reduction of the time for oxygen uptake by cells after

NADH indicates an improved utilization of oxygen, which points to a higher availability of NADH and, because of this, a greater ATP level in the cells. The increase of ATP in the cells was about 7% on average. In conjunction with the lower lactate levels, this means that athletes can exercise for a longer period of time in the aerobic phase. This leads to better endurance and performance, particularly for marathon runners.

Researchers at the University of Jyväskylä, in Finland, also examined the efficacy of NADH in improving physical performance in a placebo-controlled study. The results confirmed the findings of the University of Freiburg’s study. The lactate level in the blood, measured after an aerobic running test, was significantly lower after intake of NADH than after intake of the placebo. The jumping force was also higher and the reaction times were faster after taking NADH.

Some readers may be wondering: Is NADH doping? We sent this question to the Medical and Scientific Director of the IOC (International Olympic Committee), and the answer was concise and clear: “NADH is not on the list of prohibited substances.”

Directions for the use of NADH for increasing physical energy: 3 NADH tablets (Cellergie® NADH Supplement) per day. 2 tablets in the morning on an empty stomach and 1 tablet in the afternoon, 2 hours after lunch.

4.2. NADH to increase mental performance

NADH helps students. The number of students afflicted by a decline and impairment of their attention has risen dramatically in the last decade. The ability to focus on a certain subject for a longer period of time in class has almost vanished, to the distress of many teachers. This impairment is now referred to as Attention Deficit/Hyperactivity Disorder (ADHD). It is related to adrenaline and dopamine pools in the brain—if levels of these hormones are exhausted, reduced attention is the consequence. We have observed that NADH helps students to focus and work over a longer period of time and, because of this, improve their cognitive performance.

Directions for using NADH to improve mental performance: 2 NADH tablets (Cellergie® NADH Direct) per day. 1 tablet in the morning and 1 tablet after lunch.



4.3. NADH for sleep deprivation

More than 50% of the Western population suffers from sleep deprivation. The consequences of sleep deficits are summarized in the table below:

- Cognitive impairment
- Reduced alertness
- Slower reaction times
- A 6-fold increase in accidents
- Responsible for 24% of all fatal accidents
- Responsible for 10,000 air traffic incidents in the USA per year
- Responsible for catastrophes such as Chernobyl and the Exxon Valdez

The sleep deficit of the population causes enormous economic damage not only because of the big “environmental” accidents, such as the Chernobyl disaster, but because it leads to errors that occur during the daily production of consumer goods. For this reason researchers at Cornell University in New York have conducted a double-blind, placebo-controlled study to prove the efficacy of NADH lozenges on cognitive performance impaired by sleep deprivation. The study protocol is summarized below:

Participants were kept awake for 24 hours controlled by EEG. The subjects of the control group received a placebo. The subjects of the study group were given NADH (20 mg). In the morning, after a full night’s sleep, and on the 2nd day, after 24 hours of sleep deprivation, the subjects had to perform cognitive tests such as visual perception, mathematical task solution skills and reaction-time tests. 24 hours of sleep deprivation leads to a decline in attention, concentration, reaction time to optical stimuli, visual perception as well as mathematical-task solution skills. The beneficial effects of NADH on these capabilities after 24 hours of sleep deprivation were impressive:

- Total problem-solving skill was significantly better with NADH compared to the placebo.
- Visual perception was better with NADH, both in total and in terms of speed.
- Mathematical problem-solving was better under NADH (better even than after a full night’s sleep).

The conclusion of this study showed that if one takes 2 NADH tablets after 24 hours without sleep the cognitive performance is 4 times better in the morning than after a full night’s sleep.

Directions for the use of NADH to overcome cognitive impairment caused by sleep deprivation: 2 to 4 NADH tablets (Cellergie® NADH Direct) per day depending on the severity of the sleep deprivation and the cognitive tiredness. 2 NADH tablets in the morning and 2 tablets in the afternoon.

4.4. NADH for jet lag

Jet lag is a constellation of symptoms that occur after flying across time zones. The symptoms include general malaise and fatigue, disrupted sleep, gastrointestinal distress and impaired cognitive performance. It affects not only pilots and flight-crew members, but a large number of frequent travelers, such as managers, soldiers and international athletes.

The positive effect of sublingual NADH tablets was demonstrated at the Department of Neurology at Georgetown University in Washington, D.C. by a double-blind placebo-controlled cross-over study. 36 healthy women and men participated in the study. They were flown from the West Coast (San Diego, California) overnight to the East Coast (Washington, D.C.) with a stopover in Phoenix, Arizona, on regular commercial airline flights. The condition and the cognitive performance of the subjects were examined by performing certain tasks of a validated test battery used by the American Association of Airline Pilots and NASA.

The results were as follows: subjects taking NADH lozenges showed significantly better test results in terms of cognitive performance and sleepiness than subjects taking the placebo.

Directions for the use NADH as a countermeasure for jet lag: 2 NADH tablets (Cellergie® NADH Direct) after landing in the new time zone and 1 NADH tablet 4 hours later.

4.5. NADH as libido enhancer in men and women

Due to hectic lifestyles people use up more energy than they have available. The consequence is that their “battery” is

empty and they can suffer from “burn-out syndrome.” In many cases this condition also causes sexual dysfunctions, such as loss of sexual desire as well as erection problems. This problem is aggravated by people taking cholesterol-lowering medication. These drugs are scientifically proven to lower the biosynthesis of testosterone and estrogen and therefore sexual potency in men and libido in women. Many women (more than 50% in Germany) suffer from loss of libido, not only during and after menopause, but also at a younger age. The center for sexual desire is not localized in the genital region in men and women, but in the brain—more precisely in the hypothalamus. Sexual arousal is triggered by dopamine. Low levels of dopamine in the hypothalamus induce a depressive mood, leading to inactivity and the loss of sex drive. NADH is scientifically proven to stimulate dopamine biosynthesis and consequently libido in men and women. In addition NADH increases the production of nitric oxide (NO) causing an increase in blood flow to the genitals.

★ **Directions for the use of NADH as a countermeasure for sexual dysfunction:** Take 2 x 2 NADH capsules (Cellergie® NADH ASTARTE) per day. 2 capsules in the morning and 2 capsules in the afternoon.

4.6. NADH—the only substance with a scientifically proven anti-aging effect

People want to live longer without getting older and their quality of life should, of course, remain outstanding. The term “anti-aging” has been created to fulfill a desire in our society. The central question is: Do substances exist that can keep cells alive for a longer period of time? The answer is, yes there are, namely ATP (adenosine triphosphate) the molecule in the cell that stores energy. If the ATP level falls below a certain critical threshold, the cell dies. The more ATP a cell has available, the better it can function and the longer it can live. Hence the decisive question is: Can we increase the ATP level in a cell? The answer is, yes we can using NADH. This was proven by studies at the University of Graz. When isolated heart cells are incubated with NADH an increase of the ATP concentration in the cell was detected. These cells exhibit a better viability and live longer. This life-prolonging effect of NADH was also found in human red blood cells.

★ **Directions for the use of NADH for anti-aging:** 3 NADH tablets (Cellergie® NADH Supplement). 2 tablets in the morning on an empty stomach and 1 tablet in the afternoon, about 2 hours after lunch.

5. NADH for skin problems

5.1. NADH Skin Serum—a unique cosmetic

NADH Skin Serum is an innovative and unique product based on a patent-protected formula. It contains only 1 single active ingredient, namely NADH, in a very specific form, which allows this substance to penetrate the skin. In the dermis NADH produces energy and water. This is all that the skin needs to stay vital, rosy and wrinkle-free. In addition NADH exhibits all the other physiological functions described in the previous sections. It regenerates damaged cells caused by sun exposure, allergic reactions or other intolerated or toxic substances.

NADH Skin Serum differs from other cosmetic products, because of a number of advantages:

- Only 1 ingredient (NADH)
- Only 1 carrier (pure lecithin)
- NADH is transported through the skin
- NADH enters the cells
- NADH produces energy and water in the cells
- NADH repairs damaged skin cells
- After application of the NADH Cell Serum any other cosmetic products can be used

The positive effect of the NADH Skin Serum for the reduction of wrinkles has been proven by the Department of Dermatology of the University of Freiburg. A similar positive effect has been documented by standardized, computer-assisted photography with telangiectasia (“spider veins”), showing a significant reduction.

Other cosmetics have:

- Numerous ingredients
- 2 or more carriers (oil in water or water in oil)
- Ingredients that act mainly on the skin’s surface
- Effects of the various ingredients that have not been proven scientifically

- Different cosmetic products that can cause side-effects or adverse reactions on the skin

A beneficial effect of the NADH Serum was observed with the following skin problems: telangiectasia, varicosis, ageing spots, ageing skin, impure skin, vitiligo, rosacea and acne. With the application of the NADH serum the dermis is energized, which gives it a smoother and rosier appearance. The NADH Serum exhibits a healing effect with diabetic ulcers. In 2 to 4 weeks the ulcers were closed with a layer of epithelial cells. Because of this, the threat of infection was removed.

★ **Directions for use:** Apply 3–4 spray shots onto the affected skin area and rub into the skin until the skin is dry.

6. NADH application in dentistry

NADH Skin Serum was also successfully used for the therapy of gum problems. A considerably reduced healing time was observed after surgical interventions (e.g. tooth extraction). Inflammation or bleeding of the gums disappeared within a few days. The immune defense against infections in the mouth and the oral mucosa respectively is improved by the NADH Serum. Cellergie® NADH Dental vitalizes healthy and affected gums. NADH makes the gums more resistant to inflammation and keeps them vital for longer. NADH improves physical and mental performance and increases the energy production in the gums and other tissues.

Cellergie® NADH Dental is not toxic, even at a concentration of 500 mg per kg body weight. 1 spray dosage of the Cellergie® NADH Dental Spray contains 16 mg NADH.

★ **Directions for use:** After brushing the teeth apply 3 spray shots onto the affected gum area and rub into the gum either with the tongue or a finger for 1–2 minutes.

7. How safe is NADH?

As prerequisite for clinical trials, the health authorities request extensive scientific documentation about the chemistry, pharmacology and toxicology of the drug's substance and its active ingredient. The investigations requested by the health authorities regarding acute, subacute and chronic toxicity were performed in an independent, internationally renowned laboratory in Great Britain.

The maximum tolerated intravenously applied dose of NADH was found to be 500 mg per kg of body weight. For a person weighing 70 kg this amounts to 35,000 mg (in words: thirty five thousand milligrams) or 35 g NADH. This corresponds to 5 tablespoons.

The effects of the long-term application of higher dosages of NADH were also investigated. For this study, rats were fed 1 tablet of 5 mg NADH per day for 6 months. The organs of the animals did not show alterations either macroscopically or microscopically. If the NADH dose of 5 mg for a rat weighing 330 g is transposed to a man weighing 70 kg it comes to 1,050 mg NADH (in words: one thousand fifty milligrams), which does not lead to the damage of organs after a month-long application.

NADH does not exhibit any side effects. The NADH product I have developed has been on the market as a dietary supplement in Europe and the USA for years. Since that time many people have been taking this particular NADH product on a daily basis. As of yet no adverse reactions have been reported. Potential side effects have to be documented in all clinical studies. Such studies have been performed on human volunteers according to GCP (Good Clinical Practice) guidelines:

- Georgetown University in Washington
- Cornell University in New York
- Lennox Hill Hospital (NISMAT Institute) in New York
- Department of Neurology, University of Zagreb
- Institute for Sports Medicine, University of Freiburg
- Birkmayer Institute for Parkinson's Therapy, Vienna
- 1st Military University, Guangzhou Hospital, Guangzhou
- Institute for Medical Chemistry, University of Graz
- Institute for Physiology, University of Graz

In all these studies no side effects have been observed. Also no interactions with the most commonly used drugs, such as antihypertensive, anti-depressive and antihistaminic medications, have been observed.

8. NADH products and plagiarism

Since the energy increasing effect of NADH has become public a number of companies have started to market their own NADH products as dietary supplements. These ersatz products can be divided into 2 groups:

1. Products which contain NADH in an unstable form.
2. Products in which NADH is produced according to the patented formula.

In products in group 1 the concentration of NADH is low after a few weeks as NADH is rapidly degraded, hence the consumer does not observe any effect and deduces from this that all NADH products are ineffective. These ersatz products represent a cheating of consumers as the NADH concentration printed on the label is much higher than the actual NADH concentration in the tablet itself.

In addition, in relation to all ersatz NADH products presently on the market, not a single scientific study has been performed. These companies abuse the results of our studies with NADH for their marketing activities. These companies make their customers believe that their ersatz NADH product is identical to our patented NADH formula and therefore has the same effect.

Products in group 2 infringe our patents. A number of lawsuits are in progress against these companies. In spite of this, these companies continue to sell their products and make profits until they have been pleaded legally. This also holds for the product ENADA-NADH, which I originally developed. The companies selling these ENADA products in Europe and the USA have no license anymore as the license agreement was terminated several years ago. These companies and their distributors, including doctors and therapists, selling ENADA-NADH make themselves liable to prosecution because their suppliers no longer have distribution rights.

The only NADH products authorized by Professor Birkmayer are the Cellergie® NADH products.

9. Reports about NADH effects by doctors and consumers

- Happy with results.
- Effective.
- Feel more alive and energetic. Sleep actually much better! This product is a miracle!
- Have more energy. Do not fatigue as easily. I am impressed so far with the product. I am taking it for Parkinson's and depression. I really feel much better.
- Very impressed.
- I have much more energy and don't need naps during the day.
- Great product!! Huge potential!!
- Great supplement!
- Feel so much better.
- Good product.
- Improves my depression.
- It greatly helped memory and depression. Wonderful. Only thing that works.
- My husband is 75 and I am 66. We almost feel like teenagers again. Thank you.
- It has increased my quality of life. I cannot live without it!
- Doctor's office said they were getting good results. I do believe it is helping my alertness.
- Eliminated my long-term chronic fatigue, depression and mental fuzziness.
- I love this supplement. It has really helped.
- Amazing results. Great product.
- Wonderful product!
- Also helps my son with his ADHD.
- Highly recommended.
- Gave me a great deal of energy.
- It is helpful.
- Results better than expected.
- Good product.
- I feel like walking in the evenings. I've more energy!
- This is the biggest improvement I have had since I got EBV. I also can concentrate better as my mind does not wander.

Thank you!

- Very satisfied with this product.
- Every benefit mentioned in Atkin's book has been realized.
- I have had CFS for years and this is the only help I found.
- Noticeable stamina.
- I also hope to loose weight with it.
- It is terrific.
- I find my mental outlook has improved and feel a lot more energy.
- I have only been taking it for 2 weeks but I definitely notice more energy.
- It took 2 months of taking this product, but my "brain fog" is gone! This has been a blessing to me!
- Taking 2 a day has given me better focus.
- I have felt horrible for years with such incredible fatigue that I can't work, and I don't leave the house too often as most any activity is such a hassle for me that I don't even enjoy fun activities. I received my NADH order last week, and I took it immediately. I didn't want to wait until morning! I noticed a difference within 10 minutes when I got up to follow my husband around the backyard while he performed chores. I no longer felt like I was living in a "dead body" since that is usually how I describe how it feels. I have been taking this for approximately 1 week, and I went out to run errands twice this week. Not only was I ABLE to do these simple activities, but I actually ENJOYED grocery shopping and the like. Being able to do things and, on top of that, enjoying things are ideas from many years past, and I'm so THRILLED to see that I might be able to get my life back after all!! I still get pretty tired since my stamina is so low after years of such limited activity and the weight gain that goes with that, but that type of fatigue should improve with my increased activity level thanks to ENADA. I know I sound like a commercial, but I essentially lost the life that I had enjoyed for 35 years about 5 years ago, and IT IS SO, SO GOOD TO SEE A FUTURE WHERE I MAY GET MY LIFE BACK!!!!!! I have tried so many things, and nothing has even remotely come close to this.
- Product ranking 9–10. When my supply runs out then my symptoms return to being very severe over a period of around 4–5 days.
- These pills are a God send! They have changed my energy level. I take 3 only when I know I'm not up to a task and they really work!!
- I take 10 mg first thing every day on an empty stomach,

and I may yet try a higher dose. After a couple of weeks, I noticed my day-to-day energy level was better. I'm learning to pace myself, and I still have spells, but this supplement seems to help. I've tried a lot of different supplements.

- After increasing my dosage to 20 mg a day, the results were amazing. I've experienced a consistent increase in a steady and solid type of energy and alertness. Probably the most effective supplement I've ever tried.

10. About the author

Professor George D. Birkmayer, MD/PhD
Born January 30, 1941, Vienna, Austria
Son of Professor Walther Birkmayer, MD
(discoverer of the L-DOPA therapy for Parkinson's disease)



*Professor Jörg Birkmayer,
MD/PhD*

Professor Georg Birkmayer, MD/PhD, developer of stabilized NADH, was the first to identify the importance of NADH in cellular development and energy transmissions for all bodily functions and organs. He founded the Menuco Corporation in 1995 and is a world-renowned biochemical researcher and is the Medical Director of the Birkmayer Institute for Parkinson's Therapy, which has treated thousands of patients suffering from Parkinson's disease, after having studied the biochemical connections between Parkinson's and NADH.

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1984–2005 Secretary General of the International Academy
of Tumor Marker Oncology
1992–present Chairman & CEO, Menuco Corporation
1996–present Visiting Professor at the University of
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2000 Fellow of the American College of Nutrition
2003 Visiting Professor at the University of Xi'an
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About this brochure

If you could take a natural substance that occurs in every single cell to increase your overall energy, would you? If you could take a natural substance that boosts the immune system and protects your cells from damage, would you? If you could take a natural substance that enhances your cognitive capability and improves your memory, would you? Most people would answer, "Of course." This book will inform you about this substance, what it is, what its biological functions are, and how this substance improves physical and mental performance in healthy individuals and helps with ailments caused by an energy deficiency. The biological form of hydrogen occurring in our body reacts with the oxygen present in every living cell to produce essential energy. Most people get a sufficient supply of oxygen for energy production from the air they breathe. The limiting factor in our body is hydrogen—hydrogen is absolutely necessary for the energy production in our cells. Thus, the biological form of hydrogen is the secret of our life energy. This brochure will inform you about NADH, the biological hydrogen, its functions that are essential for life, and its multiple energizing effects, working not only with athletes but also with people experiencing health problems such as chronic fatigue or Alzheimer's disease.

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