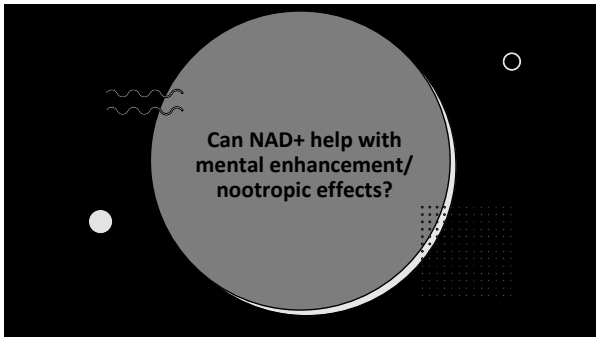
INTERNATIONAL
IV NUTRITIONAL THERAPY
GLOBAL PHYSICIAN EDUCATION

NAD+ Mental and Physical Performance

Advanced NAD IV

IIVNTP



Mental Enhancement

- NADH boost production of Nitric Oxide
- NADH increase mitochondrial activity. Low levels are correlated with brain fog and slow mental processing.
- NADH stimulates production of dopamine, norepinephrine and serotonin.

Birkmayer J.G., Vrecko C., Volc D., Birkmayer W. "Nicotinamide adenine dinucleotide (NADH)–a new therapeutic approach to Parkinson's disease. Comparison of oral and parenteral application."*Acta Neurologica Scandinavia* Suppl. 1993;146:32-5.

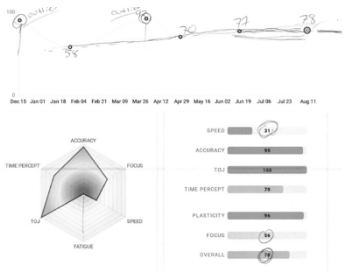
Mental Enhancement

- Boost energy and stamina
- Boost cerebral blood flow
- Increase ATP synthesis in the brain
- Improves alertness and clarity

Birkmayer J.G., Vrecko C., Volc D., Birkmayer W. "Nicotinamide adenine dinucleotide (NADH)–a new therapeutic approach to Parkinson's disease. Comparison of oral and parenteral application."*Acta Neurologica Scandinavia* Suppl. 1993;146:32-5.

Mental Enhancement

No documentation of IQ improving or task improvement in research



Redox Dysregulation in Schizophrenia Revealed by in vivo NAD+/NADH Measurement. Sang-Young Kim, Bruce M. Cohen,[3] Xi Chen,[1]Scott E. Lukas, Ann K. Shinn,[2]A. Cagri Yuksel,Tao Li,Fei Du,and Dost Öngür

Abstract

Balance between the redox pair of nicotinamide adenine dinucleotides (oxidized NAD+ and reduced NADH), reflects the oxidative state of cells and the ability of biological systems to carry out energy production. A growing body of evidence suggests that an "immuno-oxidative" pathway including oxidative stress, mitochondrial dysfunction, neuroinflammation, and cell-mediated immune response may contribute to disruptions in brain activity in schizophrenia (SZ). The aim of this study is to assess possible redox imbalance in SZ patients by using a novel in vivo ^{31}P MRS technique. The participants included 40 healthy controls, 21 chronic SZ, 13 first-episode (FE) SZ, and 18 FE bipolar disorder (BD) patients (as a psychiatric control group). All participants initially underwent structural imaging at a 3 Tesla (3 T) and ^{31}P MRS measurements were performed on a 4 T MR scanner. NAD+ and NADH components were determined by nonlinear least-square fitting of the model simulated spectra; these incorporated prior chemical shift and coupling constant information to in vivo resonances obtained from ^{31}P MRS experiments. We found a significant reduction in the NAD+/NADH ratio in chronically ill SZ patients compared to a matched healthy control group, and in FE SZ patients compared to both a matched FE BD patient group and a matched healthy control group. These findings provide evidence for redox imbalance in the brain in all phases of SZ, potentially reflecting oxidative stress

Schizophr Bull. 2017 Jan; 43(1): 197–204.Published online 2016 Sep 24. doi: 10.1093/schbul/sbw129.PMCID: PMC5216857
PMID: 27665001

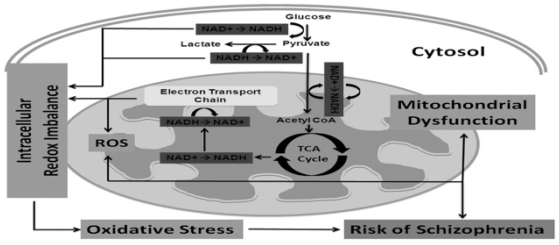


Diagram of metabolic pathways involving NAD+ and NADH redox reactions. Oxidative stress can induce redox imbalance in either cytosolic and/or mitochondria compartment, leading to mitochondrial dysfunction. The elevated NADH levels in patients with schizophrenia (SZ) can arise from either abnormal elevation in glycolysis in the cytosol, or disruption/inefficiency in the electron transport chain (ETC) of mitochondria, or both.

Summary:

using a noninvasive MR-based in vivo NAD assay, we provide direct evidence of redox abnormalities in a common and severe psychiatric disorder**.** We also find that FE SZ patients had more severe redox abnormalities compared with chronic patients, suggesting an active process in early stages of illness. This is partially improved in chronic illness, perhaps as a result of medication treatment. RR is influenced by multiple cellular signaling events and may constitute a metabolic integrator for local metabolic status within brain cells. **The redox state is a key parameter in biological systems and oxidative stress may have widespread downstream effects on the brain, including on synaptic function and plasticity, as well as energy homeostasis. Therefore, our work provides new insights into the pathophysiology of SZ, as well as a biomarker for tracking the impact of treatment interventions.**

Mental Enhancement

Dosing options:

- Best oral is NAD: Nasal Spray, Sublingual Lozenge or IV IM pulsed 1-2 times per week.
- Take ongoing NR + NMN or just NR alone as oral dosing for ongoing use.
- Remember Niacin does block methylation so if you are not getting enough methylation support you could notice fatigue, depression or fogginess.

Mental Enhancement

Dosing options:

- IM dosing 50-100 mg
- IV 50 – 300 mg given along or best in nutrient bag or piggybacked with a nutrient bag.

Metnal Enhancement

1. Consider rehydration
2. Infusing Phosphatidlcholine prior to nutrient/NAD infusion
3. Infusing Alpha lipoic Acid and NAC to enchance detoxification and improve anti-oxidant activity prior to NAD/nutriets.
4. Consider heavy metal toxicity and chelation

References

NAD+ metabolism: pathophysiologic mechanisms and therapeutic potential
Na Xie,#1 Lu Zhang,#2 Wei Gao,#1 Canhua Huang,1,3 Peter Ernst Huber,4 Xiaobo Zhou,5 Changlong Li,6 Guobo Shen,2 and Bingwen Zou1,4,

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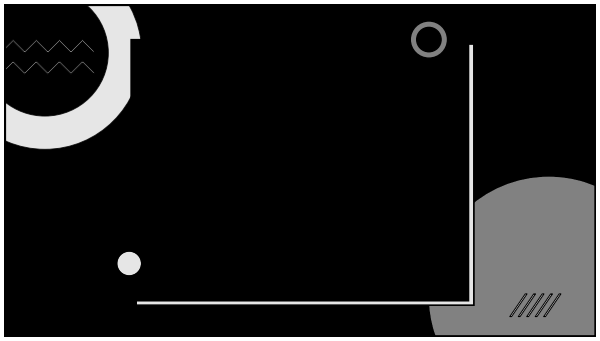

Physical Performance

- Small study showed improvements of
  - 10-20% reaction times who took 5 mg orally NADH daily before breakfast each morning.
  - Up to 10% increases in VO2 max

Birkmayer, I.G.D., & Vank, P. "Reduced coenzyme 1 (NADH) improves psychometric and physical performance in athletes." White Paper Report, New York; Menuco Corp., 1996.

Acute nicotinamide riboside supplementation improves redox homeostasis and exercise performance in old individuals: a double-blind cross-over study

C. F. Dolopikou, I. A. Kourtzidis, N. V. Margaritelis, I. S. Vrabas, I. Koidou, A. Kyparos, A. A. Theodorou, V. Paschalis & Michalis G. Nikolaidis

European Journal of Nutrition **59**, 505–515(2020)

1314 Accesses | **23** Citations | **20** Altmetric | Metrics

Conclusions: NR supplementation improved concentric, isometric peak and fatigue. No improvement in VO2 max. This was seen in the older population but not the young.

Stabilized NADH improves the physical and mental performance in highly conditioned athletes

Subjects received 30 mg/day over a period of four weeks. Neither side-effects nor changes in all clinical chemical and hematological parameters were observed. No drop-outs did occur. Changes in the training condition or well-being have not been found in the diary. Under NADH, a reduced uptake of oxygen and 6.2% (base is 0.07; 42.8 vs. 40.2ml/kg/min) could ascertain this treatment effect. This reduction of oxygen consumption could also be found by using the RQ in the aerobic transition phase (VO_2 values around 3000ml). If the individual vales for VCO_2 and VO_2 per breath stroke are inserted in a scattergram and evaluated, a coefficient could be calculated which differs in the subjects taking NADH, than in the subjects taking placebo. An O_2 sparring effect of 5.9% was found under supplementation with NADH. The heart frequency and lactate level in the blood were identical between the placebo and the NADH group. However, in

3-2010

The Effect of Antioxidant Supplementation on Fatigue During Exercise: Potential Role for NAD+(H)

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Nutrients **2010**, *2*, 481; doi:10.3390/nu2040481

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Correction

Correction: Mach, J., *et al*. The Effect of Antioxidant Supplementation on Fatigue during Exercise: Potential Role for NAD+(H). *Nutrients* 2010, *2*, 319-329

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We have found an error in our manuscript published in *Nutrients* [1]. On page 322 in the methods (section 2.3) it states "0.36 mg" of pycnogenol is contained in one dose of the lactoway (antioxidant) supplement. This should in fact read "36 mg" of pycnogenol. This is purely a typographical error and does not impact on the results or conclusions drawn from this work. However we do apologise for any inconvenience caused to the readers.

References

1. Mach, J.; Midgley, A.W.; Dank, S.; Grant, R.S.; Bentley, D.J. The Effect of Antioxidant Supplementation on Fatigue during Exercise: Potential Role for NAD+(H). *Nutrients* **2010**, *2*, 319-329.

Nutrients **2010**, *2*, 309-329; doi:10.3390/nu2030309

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Article

The Effect of Antioxidant Supplementation on Fatigue during Exercise: Potential Role for NAD^+(H)

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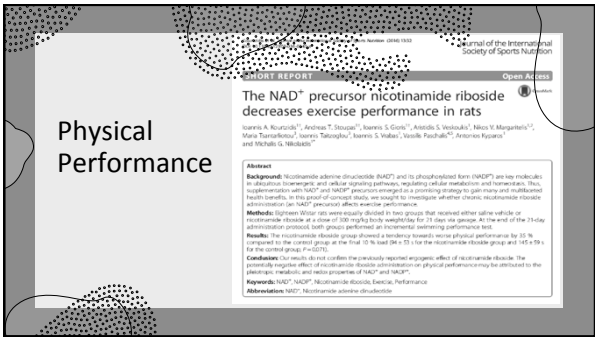
Abstract: This study compared serum pyridine levels (NAD^+/NADH) in trained (n = 6) and untrained (n = 7) subjects after continuous progressive exercise at 50%, 70% then 85% of physical work capacity until fatigue (TTF) after consuming a placebo or antioxidant (AO) cocktail (Lactivus®). An increase of 17% in TTF was observed in AO as compared to placebo (p = 0.032). This was accompanied by a significant increase in serum NAD^+ levels (p = 0.037) in the AO supplemented group post exercise. The increases in NAD^+ and improved endurance reflect lower oxidative stress-induced suppression of aerobic respiration.

Keywords: NAD^+; NADH; exercise; oxidative stress; antioxidant



Physical Performance

Journal of the International Society of Sports Nutrition

SHORT REPORT

Open Access

The NAD^+ precursor nicotinamide riboside decreases exercise performance in rats

Ioannis A. Kourtzidis[1†], Andreas T. Stoupis[1†], Ioannis S. Gioris[1†], Aristidis S. Veskoukis[1], Nikos V. Margaritelis[1,2], Maria Tsantarliotou[3], Ioanna Taitzoglou[3], Ioannis S. Vlabas[1], Vassilis Paschalis[4*], Antonios Kyparos[1] and Michalis G. Nikolaidis[1*]

Abstract

Background: Nicotinamide adenine dinucleotide (NAD$^+$) and its phosphorylated form (NADP$^+$) are key molecules in oxidative bioenergetic and cellular signaling pathways, regulating cellular metabolism and homeostasis. Thus, supplementation with NAD$^+$ and NADP$^+$ precursors emerged as a promising strategy to gain many and multifaceted health benefits. In this proof-of-concept study, we sought to investigate whether chronic nicotinamide riboside administration (an NAD$^+$ precursor) affects exercise performance.

Methods: Eighteen Wistar rats were equally divided in two groups that received either saline vehicle or nicotinamide riboside at a dose of 300 mg/kg body weight/day for 21 days via gavage. At the end of the 21-day administration protocol, both groups performed an incremental swimming performance test.

Results: The nicotinamide riboside group showed a tendency towards worse physical performance by 35 % compared to the control group at the final 05 % load (94 ± 15 s for the nicotinamide riboside group and 145 ± 59 s for the control group, $P = 0.071$).

Conclusion: Our results do not confirm the previously reported ergogenic effect of nicotinamide riboside. The potentially negative effect of nicotinamide riboside administration on physical performance may be attributed to the pleiotropic, metabolic and redox properties of NAD$^+$ and NADP$^+$.

Keywords: NAD$^+$, NADP$^+$, Nicotinamide riboside, Exercise, Performance

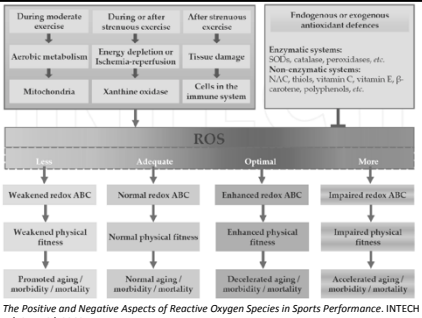
Abbreviation: NAD$^+$, Nicotinamide adenine dinucleotide

Reactive Oxygen Species (ROS)

- Excess production reduces athletic performance
- Different intensities of exercise cause different outputs of ROS.
- The body has a "allostatic buffering system" or homeostatic buffering system to prevent radical change.
- A balance exists with too low ROS and too high ROS.
- Some oxidative stress is an important signaling mechanism for muscle remodeling which is helpful for exercise. Thus caution in pushing long term excessive antioxidants.

Reactive Oxygen Species (ROS)

- Chemical species containing oxygen ie. (peroxides, superoxide hydroxyl radical, singlet oxygen).
- If ROS becomes high we know that the cause damage to cell structures.
- Sources or ROS:
  - Exogenous (pollutants, smoke, xenobiotics, or radiation)
  - Endogenous are produced primarily by mitochondria function in the electron transport chain. Too much ROS causes damage to mitochondria.
- Superoxides are not very reactive alone but can initiate lipid peroxidation.



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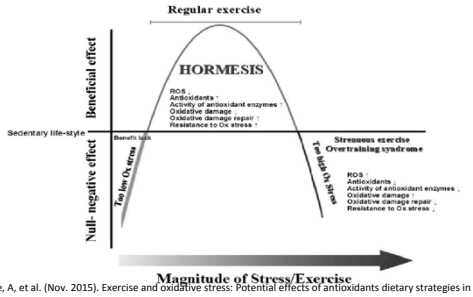

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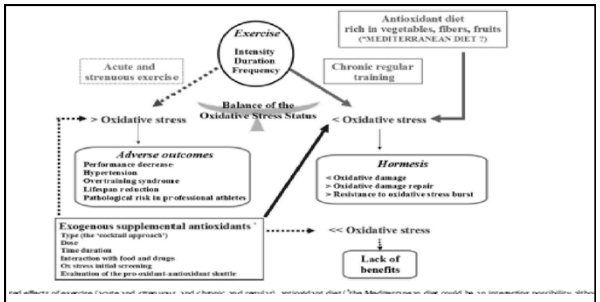

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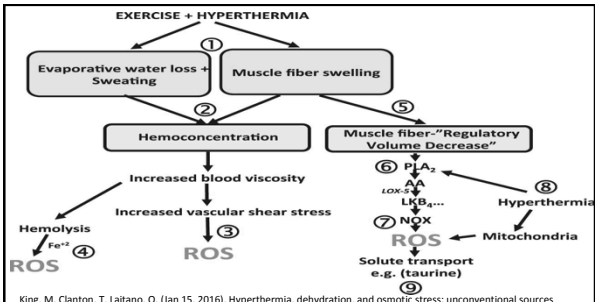

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Mental and Performance Support NAD+

- As you can see research is limited to oral supplementation at mostly low dosages.
- High dosages may be detrimental to performance
- Further research needed.
- We have found NAD+ works best in this area mixed with other nutrients.