

Review of Two, Double-Blind, Placebo-Controlled Studies of Physiological Changes on Subjects Undergoing Muscular Stress While Taking Dietary Supplement (NION™) with Conclusions and Hypotheses for Mitochondrial Function

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Received March 17, 2023

Abstract

Objective: The purpose of this review is to investigate two small human trials conducted at Montana State University Human Performance Lab measuring physiological changes in healthy subjects undergoing extreme exercise stress. The lone variable was adding dietary supplement branded as NION™ to the subjects' diets for seven days prior to testing. NION is a crystalline mineral electrolyte with a strong negative electrochemical potential. Subjects' physiological changes were documented and evaluated to develop a hypothesis as to the likely changes in the subjects' mitochondrial function as driven by adding 3 grams of NION to their diet. These results serve as preliminary data for further studies.

Methods: Data was examined from two human trials conducted by Dan Heil, Ph.D., a leading researcher in human performance metrics. The studies were noted as Heil 1 and Heil 2. The trials reviewed and documented for publication in the International Journal of Applied Exercise Physiology.

Both trials collected a wide range of physiological data on healthy subjects working at various levels and ultimately to exhaustion. The physiological data was compared and found to be consistent in both trials. The physiological data was then analyzed to determine whether a proposed underlying mechanism of action can be derived to explain the consistent change in physiological functions between subjects taking NION and subjects taking a placebo.

Results: Subjects taking NION showed consistent improved muscle output as evidenced by decreased muscle fatigue, increased time to exhaustion, increased total work performed to exhaustion and lower perceived exertion throughout the trial. Those measures are direct indications of higher ATP production in muscle tissue indicating an increase in mitochondrial function. Also consistent with improved ATP production is improved cardiovascular function and lower blood pressure with NION consumption. However, those indications may not be solely associated with improved mitochondrial function.

Subjects taking NION also showed improved lactate clearance which is highly correlated with improved mitochondrial function. Higher blood plasma and higher urine pH levels also associated with NION consumption are less direct indications of improved mitochondrial function.

There are four biomarkers indicating improved metabolic efficiency associated with NION consumption. Those are: (1) increased VO_{2max} at maximum exercise levels; (2) lower VO_2 consumption at a set exercise level; (3) Increased CO_2 clearance; and (4) lower ventilation rates with higher muscle output. Those four biomarkers support a hypothesis of improved mitochondrial function with NION consumption.

Of particular importance is the increased VO_{2max} . Improvements in VO_{2max} are noted by leading researchers as the most powerful biomarker of longevity.¹

Conclusions: Data supports a hypothesis that consuming NION for a period of seven days likely improves mitochondrial function in healthy adults in test conditions that demand high mitochondrial output.

Of additional significance are improvements in cardiovascular and respiratory functions associated with NION consumption. Declining mitochondrial function, declining cardiovascular function, and declining respiratory function are all strongly correlated with measures of aging.

Further research with direct measures of mitochondrial output, biogenesis, or other mitochondrial functions under various conditions for various age groups and ethnicities would be appropriate next steps in understanding the physiological impacts of NION.

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¹ Attia, Peter MD. Outlive: The Science & Art of Longevity. Penguin Random House. 2023.