NO in the hypothalamus and cerebral cortex is intimately connected to the learning process and memory formation.

Nitric Oxide & Cognitive Enhancement

Diminished blood flow to the brain may contribute to cognitive impairment. Increasing blood flow in the brain increases distribution of oxygen, glucose and nutrients which may decrease the progression of age-related cognitive decline. Increasing Nitric Oxide (NO) levels in the aging brain is essential to both the synaptic and neuronal survival and function, including learning and memory.

Involvement of Nitric Oxide (NO) in learning and the memory process

- NO crosses cell membranes freely and plays a role as a neurotransmitter in the brain
- NO is an unconventional neurotransmitter as it is released as soon as it's formed and diffuses from one neuron to another to act directly on the intracellular components
- NO is neuroprotective against oxidative stress
- Neuroprotective actions of BDNF (Brain Derived Neurotrophic Factor) is thought to be mediated by NO to increase neuronal survival
- NO plays an important role in synaptic plasticity.
- NO in the hypothalamus and cerebral cortex is intimately connected to the learning process and memory formation.

What are some additional benefits of Nitric Oxide?

- Regulates all cardiovascular function/ homeostasis
- Critical to sexual function-vasodilation/ innervates erectile tissue
- Controls the efficiency of mitochondria in the generation of energy
- Helps activate Glucose transporter type 4 (GLUT 4) transport of glucose into cells
- Enhances exercise performance/ endurance
- Supports telomerase activity which protects the genes and supports healthy aging
- Controls stem cells in the process of healthy cell differentiation and regeneration
- Regulates immune system functioning
- Regulates the inflammatory response
- Modifies platelet activation/ aggregation.

What disrupts Nitric Oxide production?

- Physical inactivity
- Inflammatory diets (SAD – Standard American Diet) and decreased consumption of nitrate rich vegetables
- Lack of stomach acid
- Environmental factors such as pollution, heavy metals i.e. mercury, aluminium etc.
- Medications such as PPIs, NSAIDs and antibiotics
- Individual genomics such as decreased activity/expression of Nitric Oxide synthase (NOS) or its co-factors
- MTHFR SNPs affects BH4 metabolism and consequently NO production
- With aging, our production of NO decreases (10- 12% decline per decade). By the age of 40, our NO production through the NOS pathway will have decreased by approximately 50%.

Nitrates

- Nitrates can restore NO homeostasis as an independent source of NO
- Dietary nitrates use alternate pathways, other than the NOS enzymes, to generate NO
- Dietary nitrates are most likely the mechanism of action of the Dietary Approaches to Stop Hypertension (DASH) and Mediterranean diets for health and longevity
- Nitrates are rapidly absorbed in the small intestine and readily distributed through out the body with a circulating half life of 5–8 hours.

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