



The Role of Vitamin D in Cognition, Synaptic Function and Neurological Disease



Jocelyn Medina | Kinesiology Department TTU
 Josh Lawrence | TTUHSC Garrison Institute of Aging, Department of Pharmacology in Neuroscience

Introduction

Vitamin D is an important hormone most known for its function in calcium regulation but also has other contributions to the brain and other tissue. The following evidence suggests that Vitamin D plays a vital role in maintaining normal cognition, memory and synaptic function. A common feature of brain aging is a decrease in synaptic strength. This causes the connection and therefore communication to become dysfunctional due to reduced vesicle trafficking and neurotransmitter release. These changes in cognition appear to be among the earliest to recognize in aging. Vitamin D also facilitated synaptic transmission which influences memory. These studies show a possible mechanism between Vitamin D and cognitive function which, in turn, may be the answer to many neurological diseases.

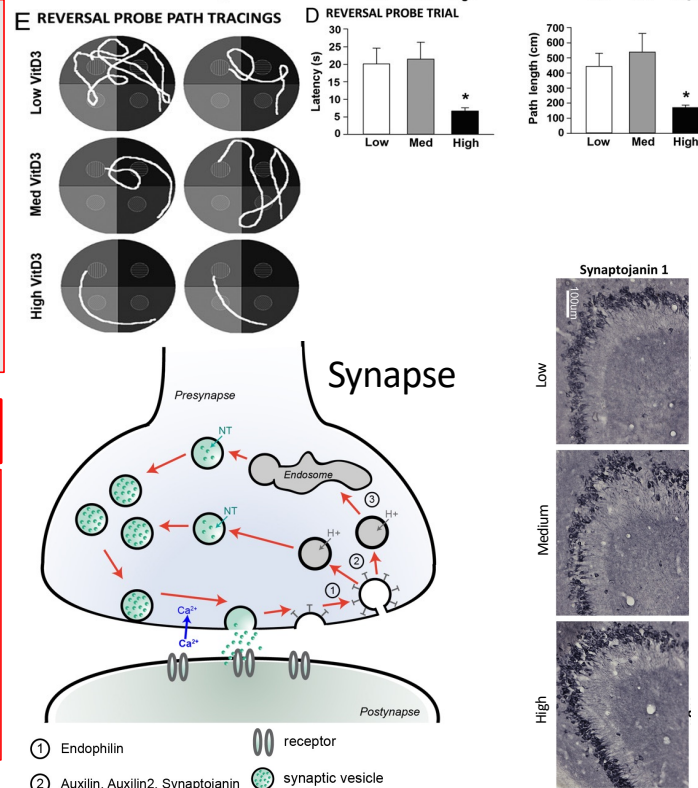
Methodology

Using middle-aged rodents, the range of human vitamin D levels were replicated and implemented. For five to six months, F344 rats were fed diets that contained low, medium and high amounts of Vitamin D. Learning and memory were then tested using the Morris water maze. It was found that rats with high levels of vitamin D significantly outperformed the low and medium diet groups only on maze reversal. The maze reversal is meant to detect more subtle changes in memory. Basic synaptic function was enhanced and can be observed through the increase in protein SynJ1 and strengthening in memory and learning.

MORRIS WATER MAZE PROTOCOL

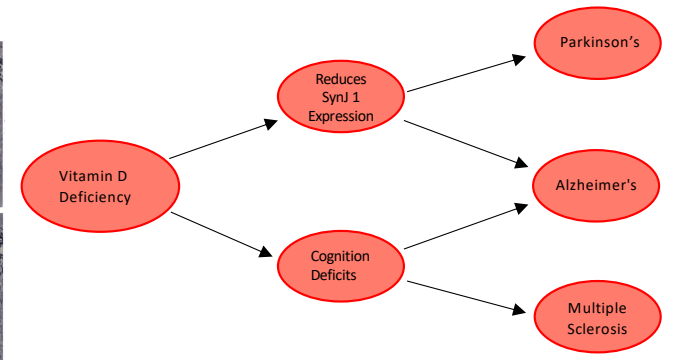


Evidence



Impact

- With this data, it is not irrational to think that an up-regulation in Vitamin D could possibly prevent or reduce the chances of contracting a neurological disease.
- Vitamin D reduces SynJ 1 expression but whether Vitamin D deficiency is the sole source of the consequential diseases is unknown.
- This study allows us to ask further questions and analyze how much vitamin D partakes in diseases such as Alzheimer's, Parkinson's and Multiple Sclerosis.
- Hopefully in the future we will have obtained more knowledge and this study could lead us towards a path with a cure.



Next Phase

- To further this study, I would like to look deeper into the causation of poor cognition, memory, and synaptic function in old age.
- This study is my inspiration into my next studies of Synaptojanin 1 with Dr. Pan of Rutgers.
- I would like to explore further its role with synapses as it is unexplored territory.

References: Latimer et al. Vitamin D prevents cognitive decline and enhances hippocampal synaptic function in aging rats, 2014. Université du Luxembourg. Pitstop in the synapse, 2018