ROLE Of VITAMIN K2 IN ALUMINIUM CHLORIDE ASSOCIATED COGNITIVE IMPAIRMENT IN MICE

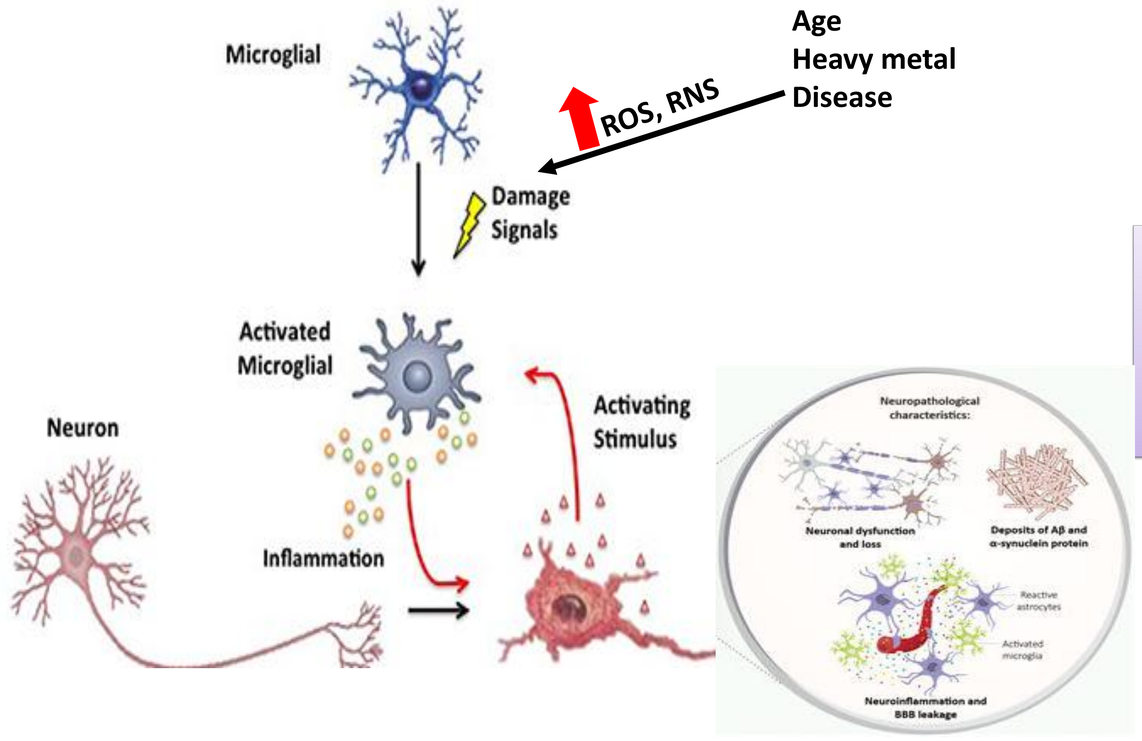
Kaberi Chatterjee[1], Papiya Mitra Mazumder[1], Sugato Banerjee[2]

[1] Birla Institute of Technoogy, Mesra

[2] National Institute of Pharmaceutical Education and Research (NIPER) Kolkata

Email: chatterjee0718/@gmail.com

Background: Latest research shows that Aluminium toxicity may lead to cognitive impairment via neurodegeneration. Neurodegeneration is a common adverse effect of aging along with lifestyle and heavy metal toxicity. Literature revels that Aluminium Chloride mediated cognitive impairment is an established animal model of Alzheimer's Disease (AD). Vitamin K2 (Menaquinones) helps to improve bone-health and prevent coronary calcification. When ingested in adequate amounts, it can decrease the oxidative stress and inflammation.
Aims and Objective: The objective is to do a preliminary determination of the use of Vitamin K2 as curative agent against Aluminium Chloride associated cognitive impairment.
Method: Swiss albino mice were treated with Aluminium Chloride for 3 weeks to induce Neurodegeneration in one group where another group receive vitamin K2 aling with aluminiym chloride for 3 weeks. Numerous behavioural investigations, including the Elevated Plus Maze (EPM), Passive Avoidance Test (PAT), Morris Water Maze (MWM), and Novel Object Recognition (NOR), were carried out after the dosing regimen to examine the change in cognition. Histopathological study of hippocampal area were prepared for all the animal groups using H & E staining.
Results: Vitamin K2 treatment on Aluminium Chloride administered animals led to significant decrease ($p<0.001$) in transfer latency and increase ($p<0.05$) in step down latency compared to only Aluminium Chloride treated animals. Additionally, the Vitamin K2 + Aluminium Chloride treatment group's duration spent in a particular zone in the MWM test and preference for novel item in the NOR test was considerably higher (p 0.001) compared to the animals in the disease control group (Aluminium Chloride treated only).
Discussion and Conclusion: Administration of Vitamin K2 may improve mice's cognition by reversing the cognitive damage brought on by aluminium chloride, according to neurobehavioural and histological slides. The findings imply that vitamin K2 may offer protection against neurodegeneration brought on by AD.
Keywords: Aluminium Chloride, Neurodegeneration, Cognitive impairment, Vitamin K2

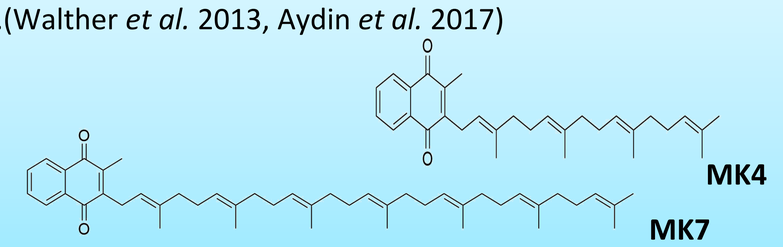


Vitamin K2

Vitamin K discovered in **1938** by Danish scientist **Henrik Dam**, who named it koagulations vitamin.

Vitamin K
- Polyquinone [K1]
- Menaquinone (MK4, MK7) [K2]
- Menadione [K3]

Vitamin K2 is mainly available in two forms- **MK4** and **MK7**
The difference between the MK4 and the MK7 is the isopreniod side chain.(Walther *et al.* 2013, Aydin *et al.* 2017)



Plan of Work

Aluminium Chloride group
Aluminium Chloride 150mg/kg for 21 Days

Aluminium Chloride + Vitamin K2 group
Aluminium Chloride150mg/kg for 21 days + Vitamin K2 100 mcg /Kg for 21 days

Control Group
Normal water / Saline

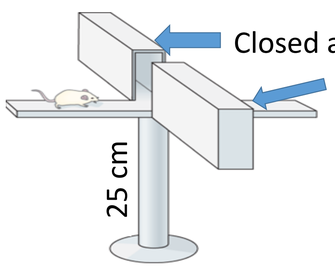
Behavioral Studies
- Elevated Plus Maze (EPM)
- Passive Avoidance Test (PAT)
- Morris Water Maze (MWM)
- Novel Object Recognition (NOR)

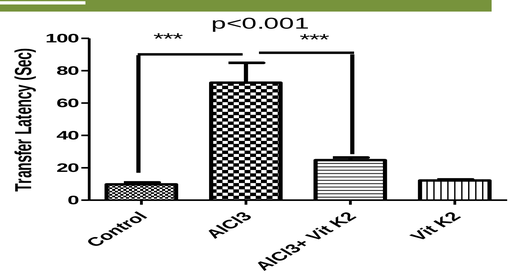
Vitamin K2 group
Vitamin K2100 mcg /Kg for 21 days

Histopathological slides of Hippocampal area

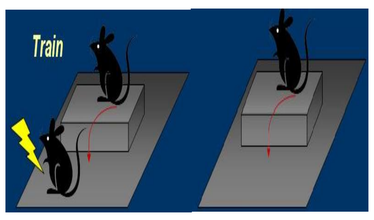
Methodology and Results

Elevated Plus Maze





Passive Avoidance



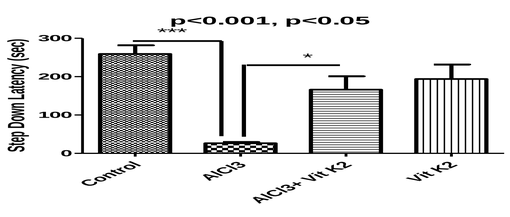
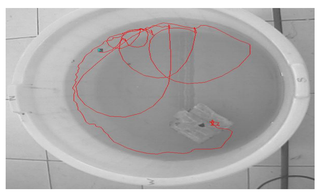
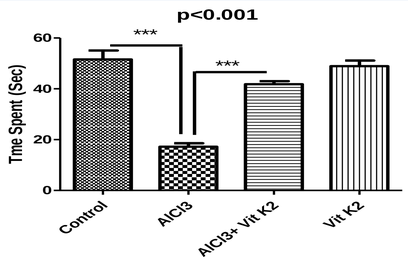


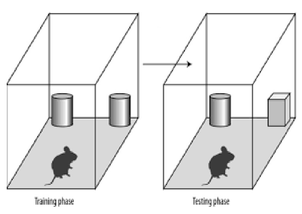
Fig: A and B: Effect of Aluminium Chloride on transfer latency and step down latency
Aluminium Chloride administered animals led to **significant increase ($p<0.001$) in transfer latency** and **decrease ($p<0.001$) in step down latency which recovered after Vitamin K2 co-administration ($p<0.001$) ($p<0.05$)** All values are expressed as Mean ± SEM. $p<0.05$ is considered statistically significant.

Morris Water Maze





Novel Object Recognition



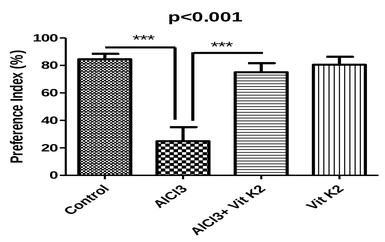
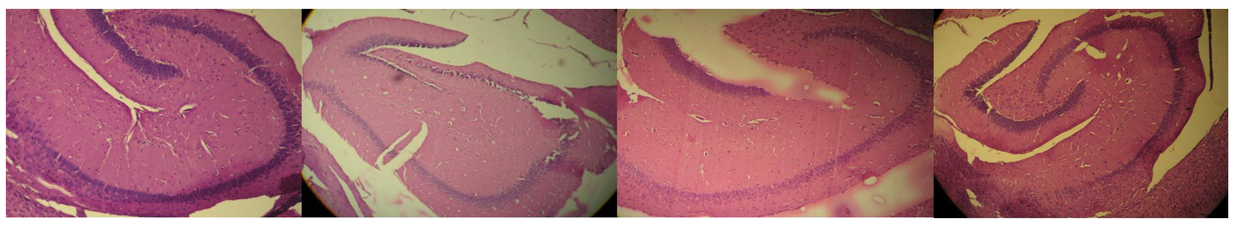


Fig: C and D: Effect of Aluminium Chloride on time spent in target quadrant and preference index
Time spent in the **target quadrant in MWM test** and **preference for novel object was significantly higher ($p<0.001$)** for Vitamin K2 + Aluminium Chloride induced animals compared to animals solely on Aluminium Chloride . All values are expressed as Mean ± SEM. $p<0.05$ is considered statistically significant.

Histopathology of Hippocampal Sections



Control | $AlCl_3$ | $AlCl_3$+Vit K2 | Vit K2

Conclusion and Discussion

Neurobehavioural and histopathological slides show that administration of Vitamin K2 may reverse the Aluminium Chloride associated cognitive decline in mice. This suggests that Vitamin K2 may prevent the Aluminium Chloride associated cognitive decline in mice.

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