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## $\beta$ -Amyloid Accumulation in the Human Brain After One Night of Sleep Deprivation

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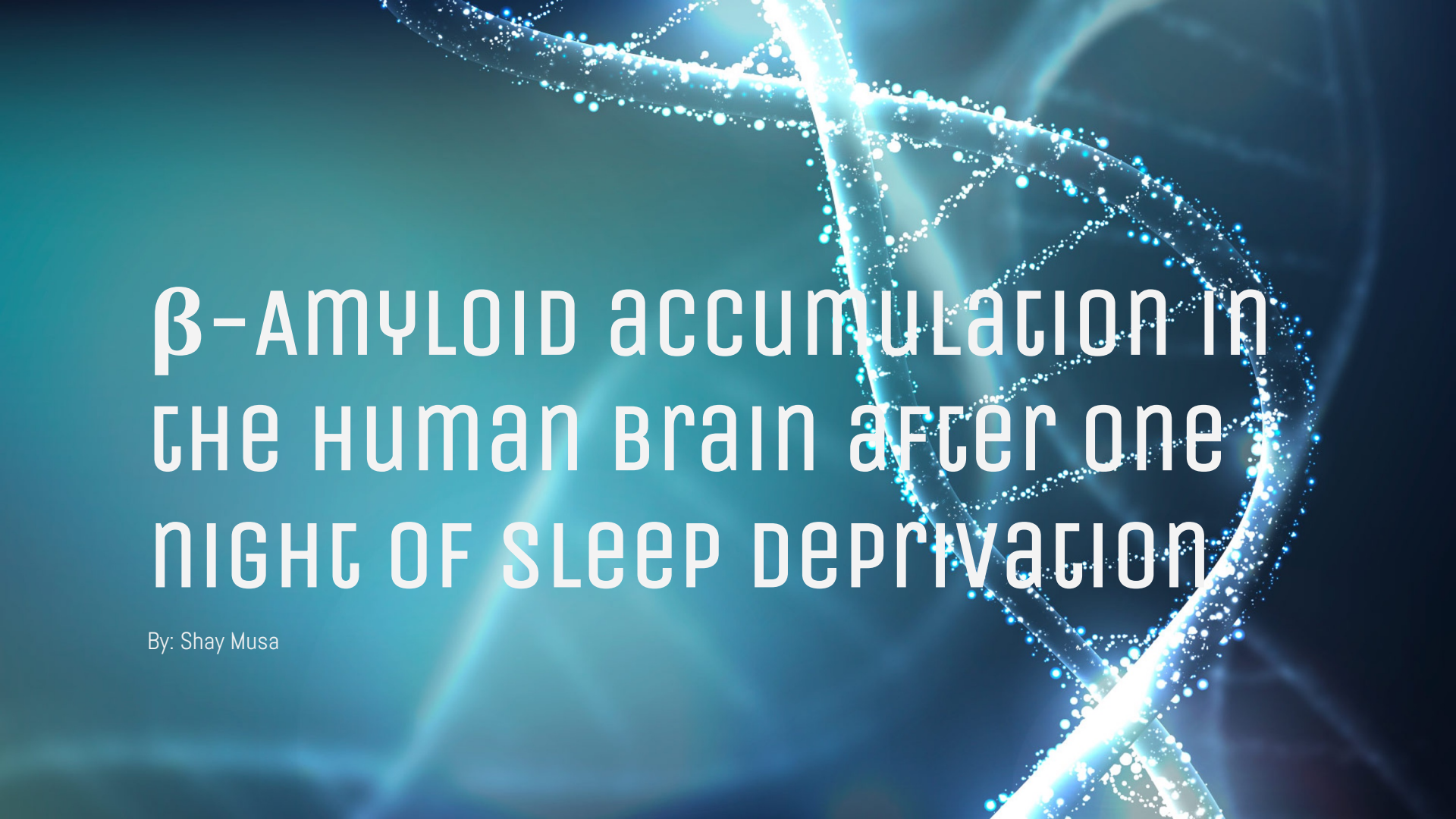
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# $\beta$ -AMYLOID accumulation in the human brain after one night of sleep deprivation

By: Shay Musa




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01

BACKGROUND



## BETA - AMYLOID

Beta - amyloid is a metabolic waste product and is located in the interstitial fluid of the brain and spinal cord. Studies have shown a positive correlation between sleep deprivation and beta - amyloid accumulation. This relation is noted to be directional, meaning increased beta - amyloid can also lead to sleep deprivation. Beta - amyloid impairs brain function and is a risk factor for Alzheimer's disease.

Studies on beta - amyloid are geared towards preventing accumulation which could promote healthy brain aging and possibly prevent Alzheimer's disease (note not cure or reverse).



# BETA - AMYLOID

In rodent's it has been shown that beta - amyloid clears during sleep via what is known as the glymphatics system.

The glymphatic system works by eliminating soluble proteins, including  $A\beta$ , protein- $\alpha$  synuclein, and metabolites from the Central Nervous System (CNS); transporting cerebrospinal fluid (CSF) through the brain; and distributing macromolecules across the brain

Beta - amyloid levels have been measured to be highest before sleep and lowest after.



02

METHODS






# METHODOLOGY

Amyloid - beta burden (ABB) levels were measured using positron emission tomography (PET) after one night of sleep deprivation. This was done using 8F-florbetaben (FBB) which is PET radiotracer.

Levels were measured in 20 healthy individuals as a control from ages 22 - 72 years old. There were 10 male and 10 female subjects. Levels were compared to their baseline ABB levels after rested sleep during a time known as rested wakefulness (RW).

Their second hypothesis was in individuals with a history of poor sleep, there would be higher levels of ABB in their hippocampus, precuneus, and medial pre-frontal cortex.





03  
RESULTS



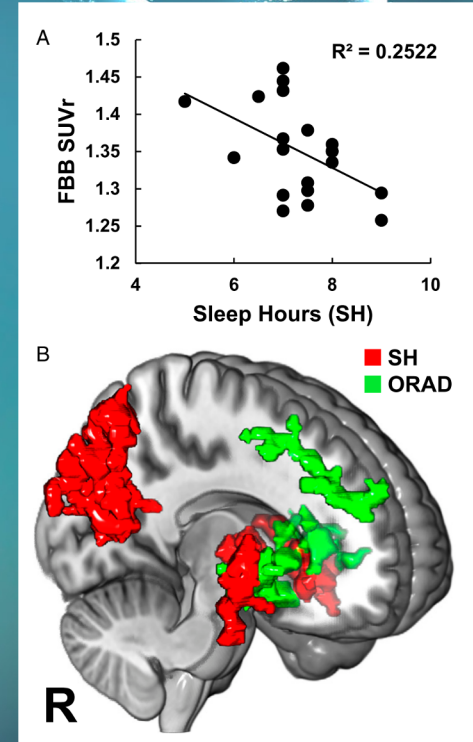
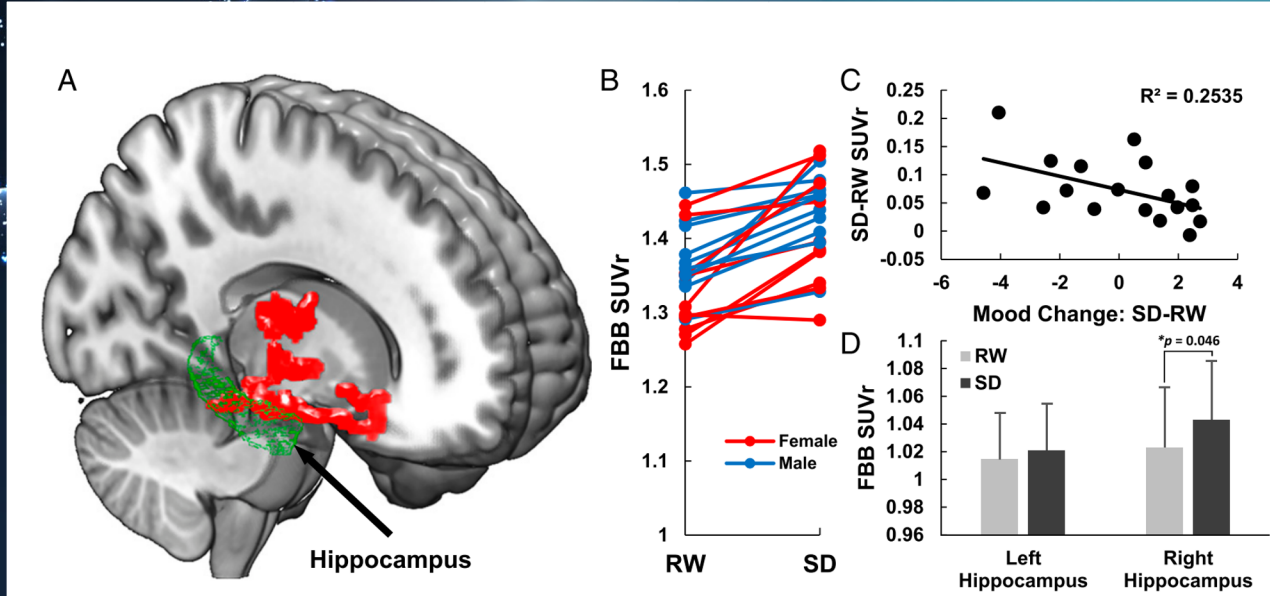
## RESULTS

Amyloid - beta changes varied significantly between individuals and was not attributed to age or sex.

Sleep deprivation negatively affected mood. Effects of SD on mood were correlated with increases in ABB in the right hippocampal cluster.

The study showed that long term susceptibility of the brain to increased amyloid beta burden with less sleep. This was shown with average hours slept being inversely proportional to FBB (indicator of ABB).

# RESULTS







04

DISCUSSION



# DISCUSSION

An increase in Amyloid - beta levels have been attributed to decreased glymphatic system clearance during sleep. However, it has not been proven and therefore we can not rule out that amyloid - beta accumulation may be attributed to synthesis of amyloid - beta from lack of sleep.

Limitations of this experiment should be cautioned included limitations within methodology and limited sensitivity of the PET radiotracer to soluble amyloid beta.

DISCUSSION QUESTIONS AND  
FINAL THOUGHTS

01

DO YOU THINK THAT SLEEPING LONGER COULD POTENTIALLY DECREASE RISK OF AD? HOW WOULD GENETICS PLAY A ROLE IN THIS?

03

WHAT WERE SOME POTENTIAL LIMITATIONS TO THIS STUDY AND HOW DO YOU THINK THEY COULD BE IMPROVED IN LATER STUDIES?

02

WHAT DO YOU THINK THE NEXT STEP OF THIS RESEARCH WOULD BE?

04

WHAT DO YOU THINK ABOUT THE GLYMPHATIC SYSTEM AND WHAT THIS POTENTIALLY SAYS ABOUT THE ROLE AND IMPORTANCE OF SLEEP?





# THANKS

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