Understanding Sleep Loss
in Alzheimer's Disease
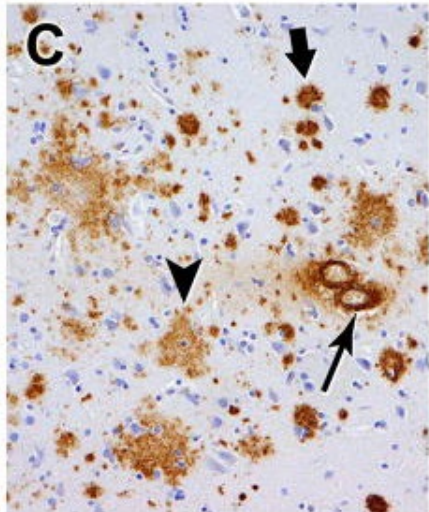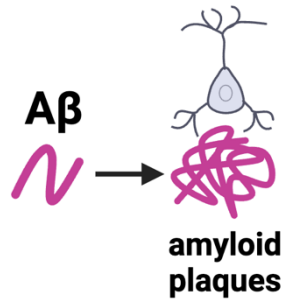
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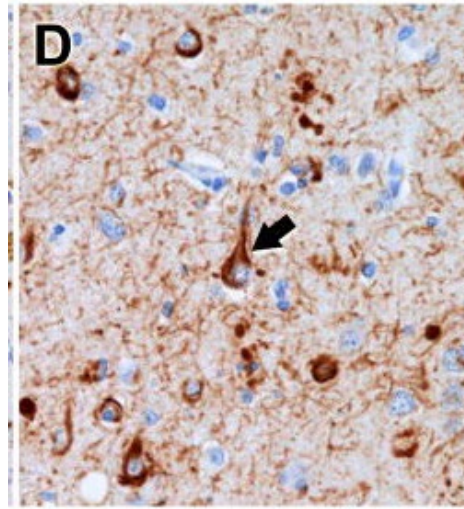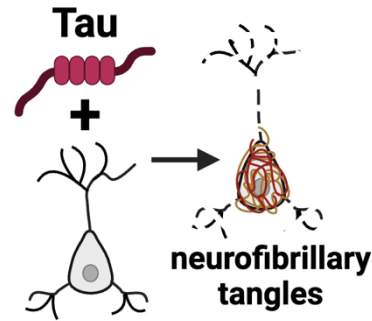
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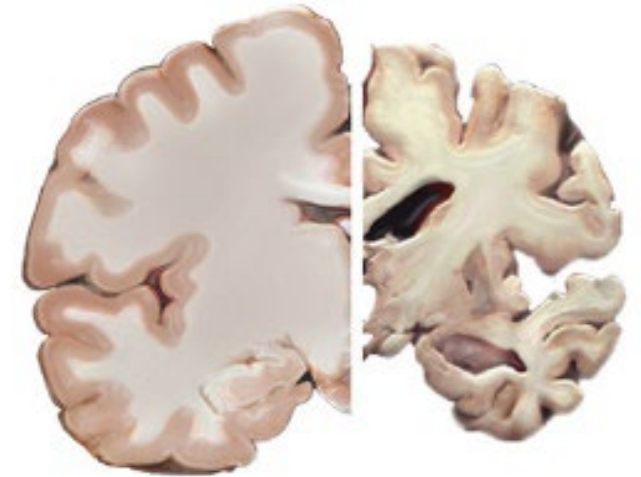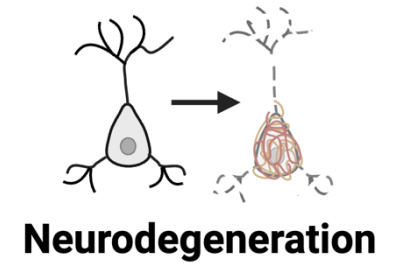
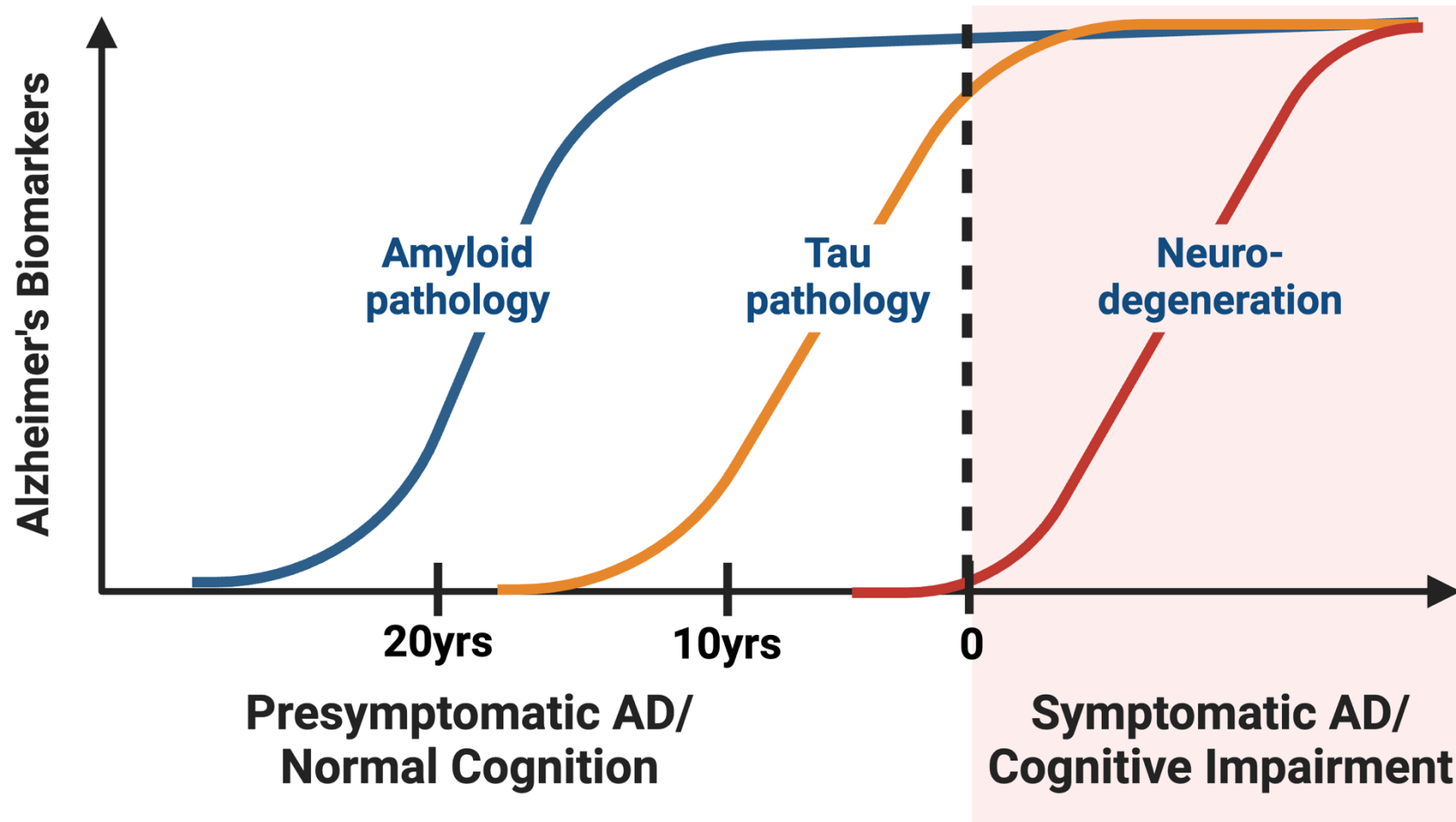# Alzheimer's Disease (AD)

Amyloid plaques

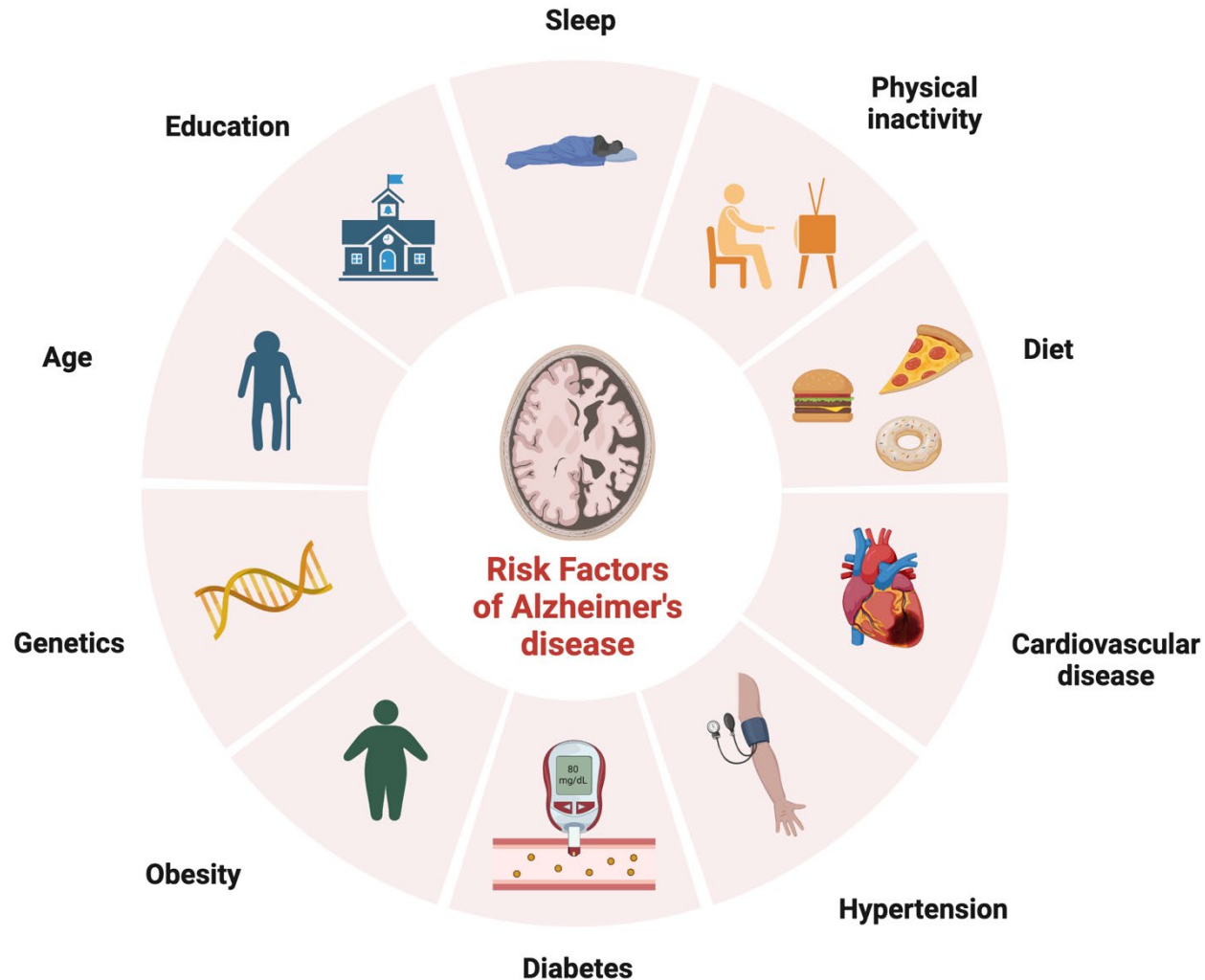## Neurofibrillary tangles

Neurodegeneration
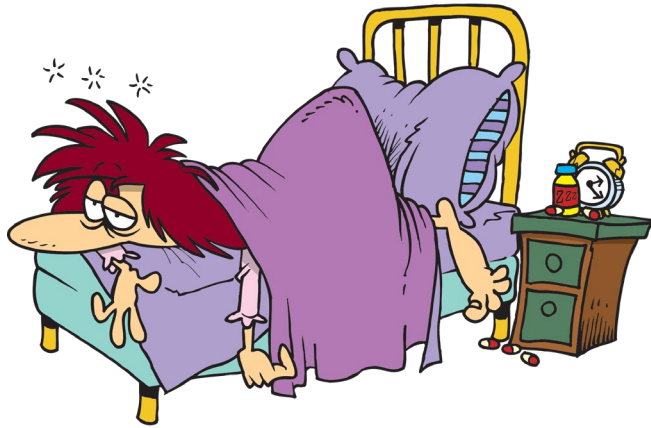
The progression of Alzheimer's Disease (AD)

Modifiable risk factors affect Alzheimer's progression

~45% of dementia cases could be delayed or reduced if we targeted modifiable risk factors

Livingston et al, Lancet, 2024

Bidirectional relationship between sleep and AD

Sleep Impairment

Alzheimer's Disease

Why is sleep important?

Sleep stages: sleep time versus sleep quality?

Awake

- Increased brain activity
- Memory consolidation
- Dreaming
- REM sleep

Vivid Dreaming

REM

N1

The Sleep Cycle

- Heart rate slows
- Breathing slows

Light Sleep

N2

N3

Deep Sleep

- NREM sleep
- Slow wave sleep
- Restorative sleep

EEG/EMG recordings

	NREM	Wake	REM
EEG1			
EEG2			
EMG			
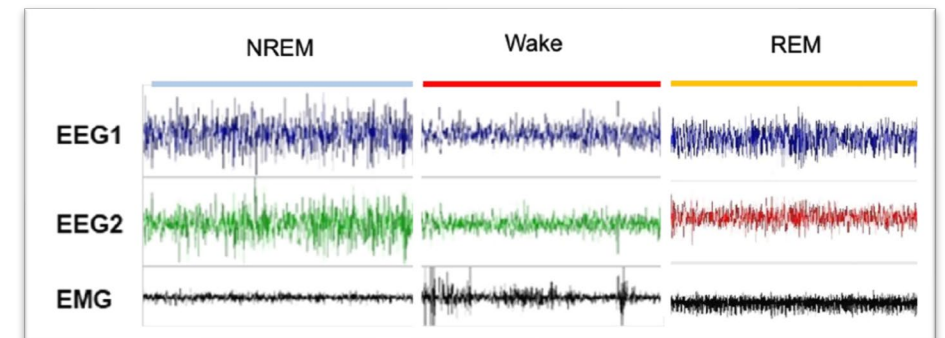
Alzheimer's mouse models to study sleep

Mouse models

Amyloid plaques — Aβ/amyloid model (APP/PS1) — tau model (P301S PS19) — Neurofibrillary tangles Neurodegeneration
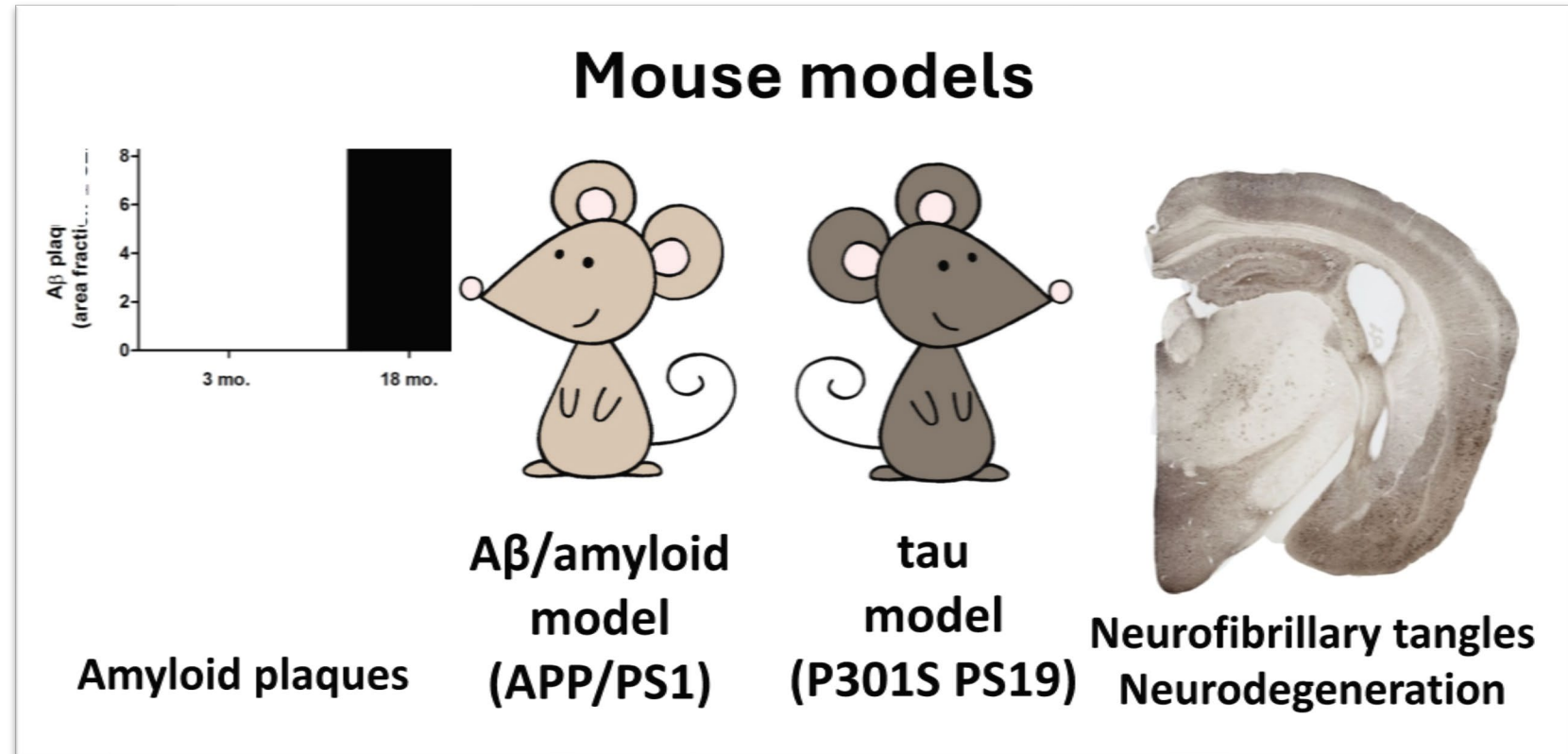
How do plaques or tangles impact total sleep time?
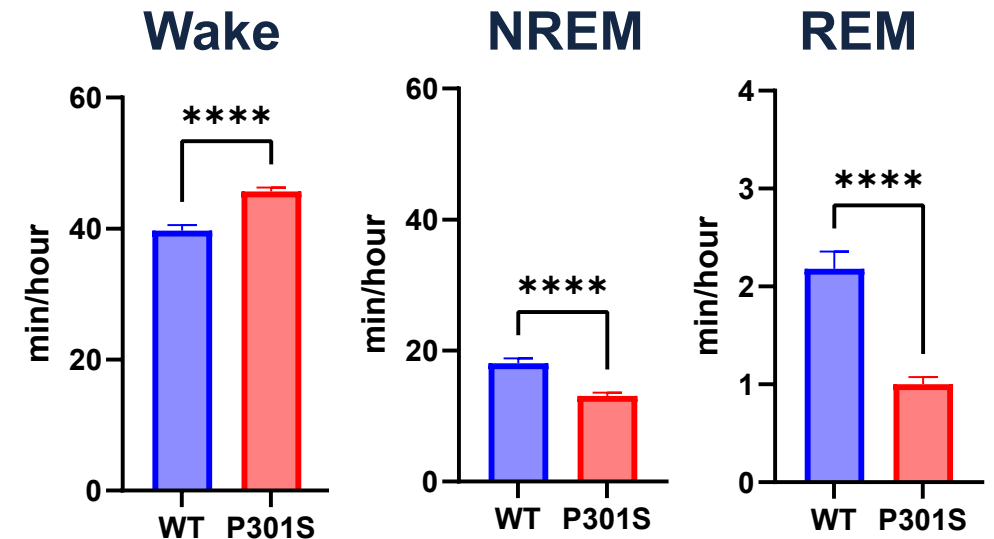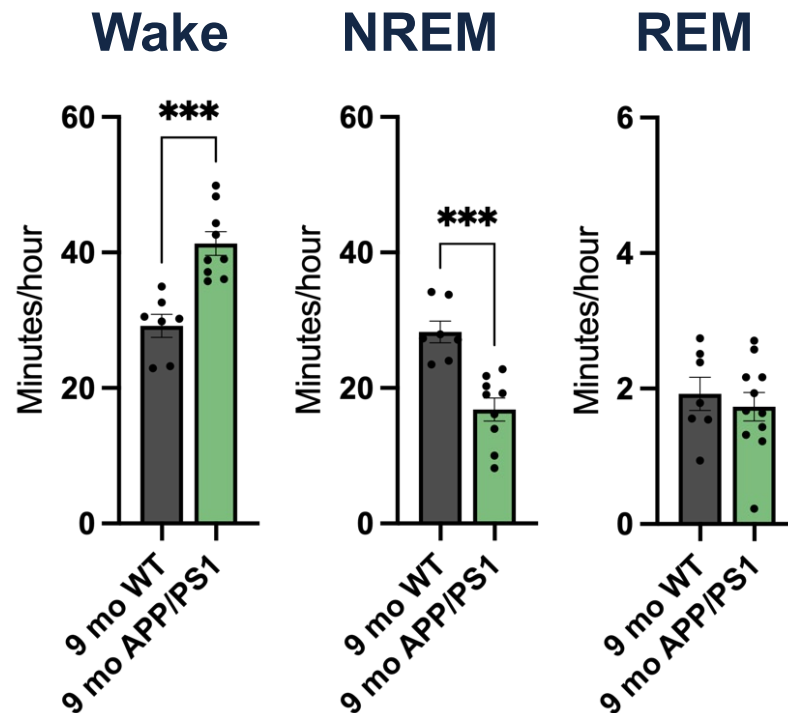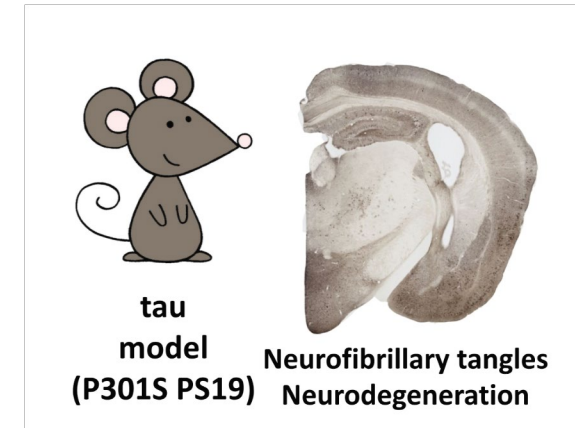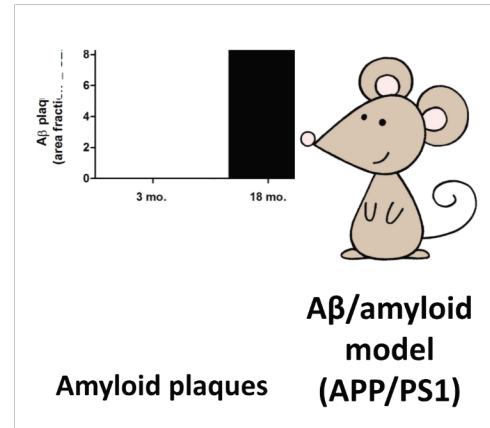
How do plaques or tangles affect sleep quality?

Amyloid plaques — Aβ/amyloid model (APP/PS1)

↓ **Sleep drive**
↓ **Slow wave, restorative sleep**
↑ **sleep fragmentation**
↑ **insomnia**

tau model (P301S PS19) — Neurofibrillary tangles / Neurodegeneration
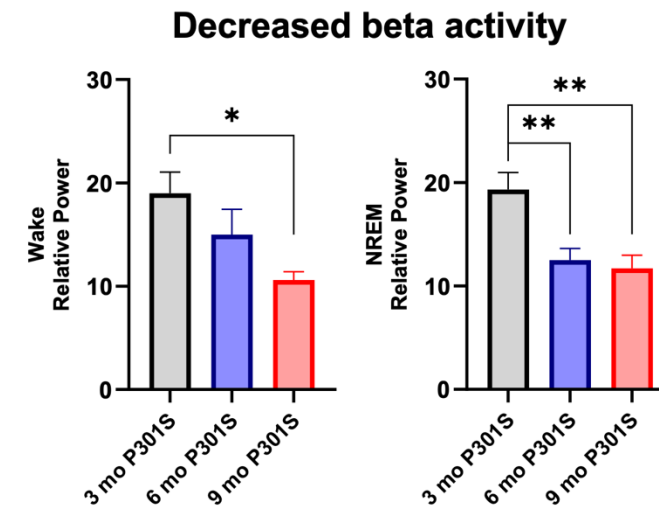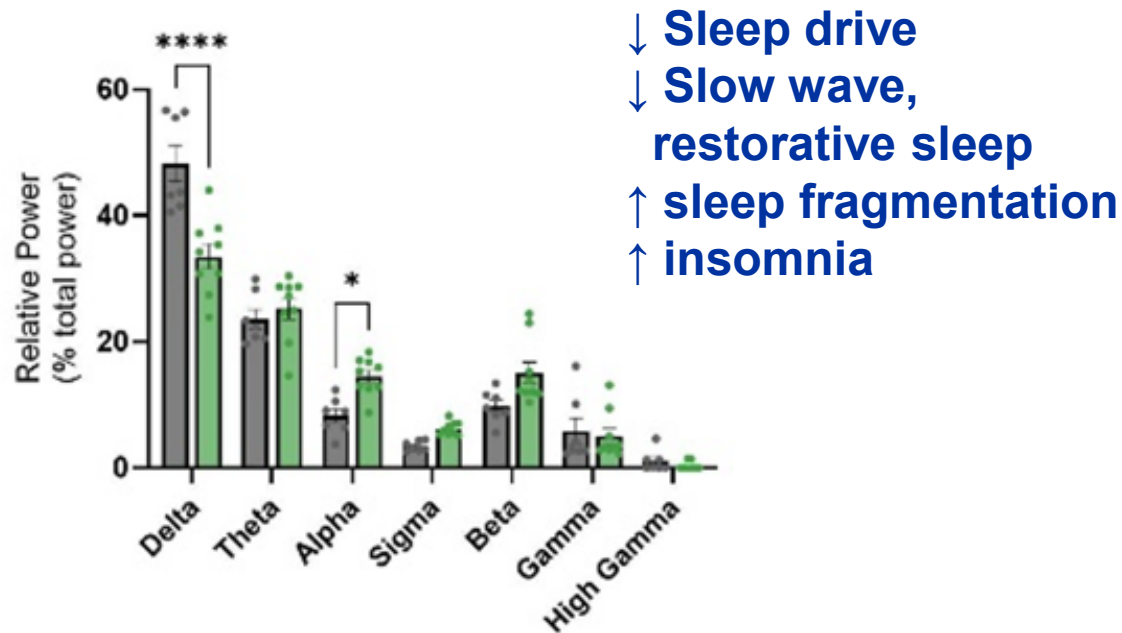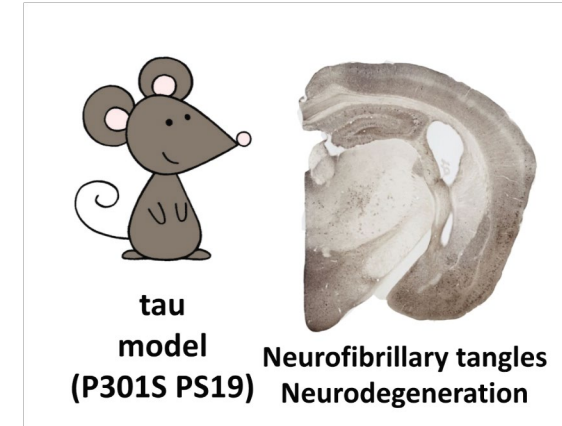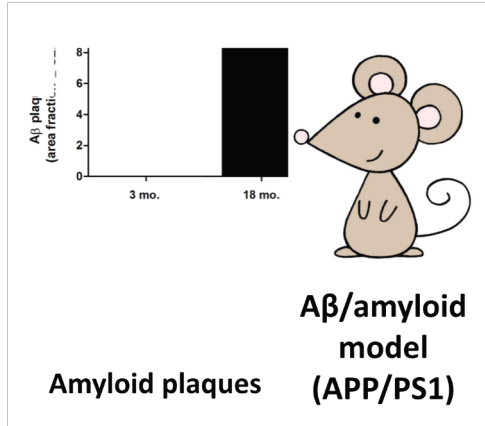
↓ **Inhibition**
↓ **cognitive processing**
↓ **cortical synchrony**

Decreased beta activity

Plaques and tangles impact sleep differently

Acknowledgements

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NIH> National Institute on Aging

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