

RECOVERY SLEEP ENHANCES COGNITIVE ABILITIES AND MITIGATES HISTOPATHOLOGICAL ALTERATIONS IN THE CA1 REGION OF SLEEP-DEPRIVED ADULT RATS BY REGULATING INFLAMMATORY PATHWAYS



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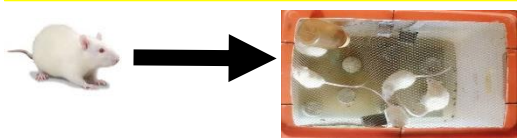
BACKGROUND

Sleep deprivation is recognized as a major health concern, affecting approximately 70 million Americans and 45 million Europeans, leading to impaired daily functioning and health.

AIM

This study assessed the effects of recovery sleep on cognitive abilities and the histoarchitecture of the CA1 region in adult male Wistar rats.

METHODS



Animal Euthanization

- AChE
- TNF- α
- H & E Stain
- Congo Red Stain

Fig. 1

RESULTS

The seven-day recovery group exhibited a significant increase in AChE activity ($p < 0.001$) and a substantial decrease in TNF- α levels ($p < 0.001$) compared to the sleep-deprived group. Additionally, sleep recovery groups showed lower expression of amyloid-beta protein plaques and improved histological changes in the CA1 compared to the group that underwent only sleep deprivation.

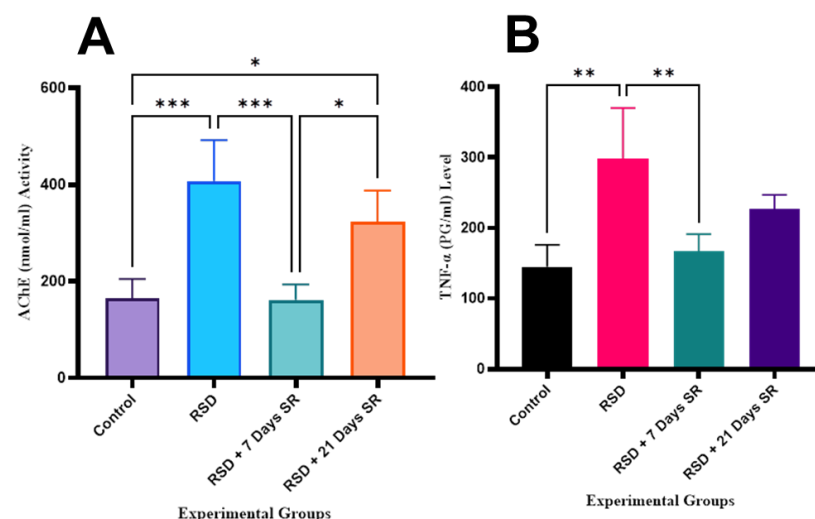


Fig. 2A: Acetylcholinesterase (AChE) Activity Following Sleep Deprivation and Sleep Recovery.

Fig 2B: Tumor Necrosis Factor alpha (TNF- α) Level Following Sleep Deprivation and Sleep Recovery.

$n = 6$, mean $\pm$ SEM, one-way ANOVA. *, **, ***, are statistically different ($p \leq 0.05$). REM Sleep Deprivation (RSD); Sleep Recovery (SR).

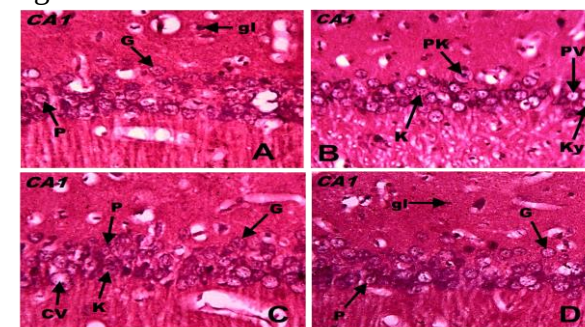


Fig. 3: Photomicrographs of CA1 hippocampal section. (A) Control group. (B) Sleep-deprivation only group. (C) Sleep Deprivation + 7 Days Sleep Recovery. (D) Sleep Deprivation + 21 Days Sleep Recovery. H & E stain x250. Pyramidal cell (p); Granule cells (G); Glial cells (g); Cytoplasmic Vacuolation (CV); Pyknotic cell (Pk); Karyorrhexis (K).

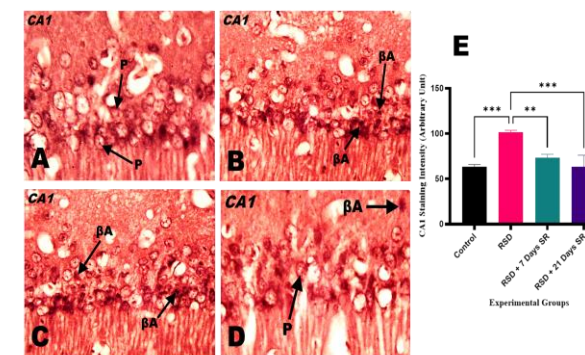


Fig. 4: Photomicrographs of CA1 hippocampal section. (A) Control group. (B) Sleep-deprivation only group. (C) Sleep Deprivation + 7 Days Sleep Recovery. (D) Sleep Deprivation + 21 Days Sleep Recovery. Congo Red stain x250. (E) Mean Gray Value for Beta Amyloid.

CONCLUSION

Recovery sleep significantly reduced the accumulation of beta-amyloid plaques, increased AChE levels, and improved histoarchitectural changes in the CA1 region by reducing TNF- α production and facilitating the clearance of damaged cells.

REFERENCES

Samy, A. L., Hairi, N. N., & Low, W. Y. (2021). Psychosocial stress, sleep deprivation, and its impact on type II diabetes mellitus: Policies, guidelines, and initiatives from Malaysia. *FASEB BioAdvances*, 3(8), 593.

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