

FULL TEXT LINKS

[> J Alzheimers Dis. 2022;90\(2\):917-928. doi: 10.3233/JAD-220307.](#)

# Gamma Frequency Inhibits the Secretion and Aggregation of Amyloid- $\beta$ and Decreases the Phosphorylation of mTOR and Tau Proteins in vitro

Yuan-Han Yang<sup>1 2 3 4</sup>, Sun-Wung Hsieh<sup>1 3 5 6</sup>, Hsi-Wen Chang<sup>7</sup>, Jia-Li Sung<sup>8</sup>,  
Chih-Pin Chuu<sup>9</sup>, Chen-Wen Yen<sup>2 3 8 10</sup>, Tzyh-Chyuan Hour<sup>3 7 11</sup>

Affiliations

PMID: 36189589 DOI: [10.3233/JAD-220307](#)

## Abstract

**Background:** Alzheimer's disease (AD) was the main cause of dementia in an aging society; unfortunately, there is no effective treatment for AD now. Meditation has been reported to thicken the cerebral cortex, and gamma wave at a frequency of 40 hertz (Hz) was recorded during the meditation process from the brain. Previous study showed that non-invasive scintillation gamma frequency oscillation increased the space in recognition and memory of auditory cortex hippocampal gyrus in AD mice model. However, the AD-related molecular change by exposure of 40 Hz gamma frequency in brain cells was still unclear.

**Objective:** We investigated the AD-related molecular change by exposure of 40 Hz gamma frequency in SH-SY5Y cells.

**Methods:** We designed the light and sound generators at 40 Hz gamma frequency for this study. SH-SY5Y cells were exposed to sound or light of 40 Hz gamma frequency, respectively. The concentrations of amyloid- $\beta$ 40 (A $\beta$ 40) and amyloid- $\beta$ 42 (A $\beta$ 42) were quantified by enzyme-linked immunosorbent assay. The protein levels were examined by Western blotting. The aggregation of A $\beta$ 42 was examined by thioflavin T assay.

**Results:** Our results showed that the secretion of A $\beta$ , phosphorylation of AKT, mTOR, and tau, and aggregation of A $\beta$ 42 were significantly inhibited by 40 Hz gamma frequency in SH-SY5Y cells. The phosphorylation of 4E-BP1, downstream of mTOR, was induced by 40 Hz gamma frequency in SH-SY5Y cells.

**Conclusion:** Our study showed 40 Hz gamma frequency involved in the inhibition of secretion and aggregation of A $\beta$  and inhibition of p-Tau protein expression through the mTOR/4E-BP1/Tau signaling pathway.

**Keywords:** Alzheimer disease; amyloid- $\beta$ ; gamma frequency; mTOR; tau.

[PubMed Disclaimer](#)

## Related information

[MedGen](#)[PubChem Compound \(MeSH Keyword\)](#)

## LinkOut - more resources

Full Text Sources

[IOS Press](#)

Medical

[MedlinePlus Health Information](#)

**Miscellaneous**

[NCI CPTAC Assay Portal](#)