

INTISARI

Latar Belakang:

Penuaan berkontribusi pada penurunan fungsi memori spasial melalui gangguan plastisitas sinaps di *hippocampus*. Gangguan plastisitas sinaps menyebabkan perubahan ekspresi *mTOR* dan *Homer1a* serta dishomeostasis Ca^{2+} yang menyebabkan gangguan transmisi sinaptik. Disregulasi jalur ini pada proses penuaan dikaitkan dengan adanya degenerasi sel piramidal CA1 *hippocampus*. Nutrisi seperti asupan protein dapat mempengaruhi kondisi ini. Asupan protein nabati dapat menurunkan risiko demensia melalui aktivasi jalur *mTOR*.

Tujuan:

Penelitian ini bertujuan untuk mengevaluasi pemberian protein nabati berasal dari kacang-kacangan terhadap fungsi memori spasial pada tikus penuaan awal.

Metode:

Penelitian menggunakan tikus wistar yang dibagi menjadi kelompok kontrol dan tiga kelompok intervensi dengan variasi dosis D1 (0,315 g/tikus); D2 (0,630 g/tikus); D3 (0,945 g/tikus). Evaluasi fungsi memori spasial dilakukan menggunakan *Morris Water Maze* (MWM), sementara mekanisme molekuler dianalisis melalui pengujian ekspresi *mTOR* dan *Homer1a* melalui qPCR, serta seluler *hippocampus* dinilai berdasarkan persentase rasio sel piramidal yang mengalami apoptosis di area CA1.

Hasil:

Protein nabati mampu mencegah penurunan fungsi memori spasial seiring bertambahnya usia tikus bahkan pada dosis rendah 0,315 g/tikus. Ekspresi *mTOR* pada pemberian protein nabati D1 menunjukkan perbedaan signifikan dengan kontrol sebesar 1,76 kali lipat dibandingkan kontrol ($p < 0,05$). Ekspresi *Homer1a* tidak menunjukkan fungsi memori spasial. Hasil analisis histologi dengan pemberian protein nabati diketahui mampu mencegah peningkatan apoptosis pada sel piramidal CA1 *hippocampus* mulai dari dosis 1 ($p > 0,05$).

Kesimpulan:

Intervensi protein nabati memodulasi jalur *mTOR* dan *Homer1a* untuk mempertahankan plastisitas sinaps dan menurunkan persentase apoptosis sel piramidal CA1, sehingga berkontribusi pada pencegahan penurunan fungsi memori spasial pada penuaan awal

Kata kunci:

mTOR, *hippocampus*, *Homer1a*, , memori spasial, penuaan awal, protein nabati

ABSTRACT

Background:

Aging contributes to a decline in spatial memory function through impaired synaptic plasticity in the hippocampus. Impaired synaptic plasticity causes changes in mTOR and Homer1a expression and Ca²⁺ dyshomeostasis, which leads to impaired synaptic transmission. Disregulation of this pathway in the aging process is associated with morphological degeneration of CA1 hippocampal pyramidal cells. Nutrients such as protein intake can influence this condition. Plant protein intake can reduce the risk of dementia through activation of the mTOR pathway.

Objective:

This study aims to evaluate the administration of plant-based protein derived from nuts on spatial memory function in early-aging rats.

Methods:

The study used Wistar rats divided into a control group and three intervention groups with varying doses of D1 (0.315 g/rat); D2 (0.630 g/rat); D3 (0.945 g/rat). Spatial memory function was evaluated using the Morris Water Maze (MWM), while molecular mechanisms were analyzed through testing mTOR and Homer1a expression via qPCR, and hippocampal cells were assessed based on the percentage of pyramidal cells undergoing apoptosis in the CA1 area.

Result:

Plant protein was able to prevent the decline in spatial memory function with increasing age in rats, even at a low dose of 0.315 g/rat. mTOR expression in D1 plant protein administration showed a significant difference from the control, which was 1.76 times higher than the control ($p < 0.05$). Homer1a expression did not show spatial memory function. Histological analysis results with plant protein administration were found to prevent an increase in apoptosis in CA1 hippocampal pyramidal cells starting from dose 1 ($p > 0.05$).

Conclusion:

Plant protein intervention modulates the mTOR and Homer1a pathways to maintain synaptic plasticity and reduce the percentage of CA1 pyramidal cell apoptosis, thereby contributing to the prevention of spatial memory decline in early aging.

Keyword:

Early aging, mTOR, hippocampus, Homer1a, plant protein, spatial memory