

DISERTASI

ANALISIS PENGARUH *HUMAN WHARTON JELLY- MESENCHYMAL STEM CELL* TERHADAP *Y MAZE TEST*, EKSPRESI GEN *CALPAIN*, *GLYCOGEN SYNTHASE KINASE 3 BETA*, DAN *APOLIPOPROTEIN-4* PADA ALZHEIMER

**Suatu eksperimental murni laboratorium
Pada tikus putih (*Rattus norvegicus*)**



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ABSTRAK

ANALISIS PENGARUH *HUMAN WHARTON JELLY- MESENCHYMAL STEM CELL* TERHADAP *Y MAZE TEST*, EKSPRESI GEN *CALPAIN*, *GLYCOGEN SYNTHASE KINASE 3 BETA*, DAN *APOLIPOPROTEIN-4* PADA ALZHEIMER

Nita Afriani

Peningkatan angka harapan hidup global telah meningkatkan prevalensi penyakit Alzheimer, yang ditandai oleh akumulasi plak $A\beta$ dan *neurofibrillary tangles (NFT)*, menyebabkan kerusakan neuron dan gangguan kognitif. *Mesenchymal Stem Cells* dari *Wharton's Jelly (hWJ-MSC)* menunjukkan potensi terapeutik dalam memperbaiki patologi Alzheimer melalui neurogenesis dan efek antiapoptosis. Namun, pengaruhnya pada regulasi sinyal kalsium, khususnya protein *calpain*, *GSK3 β* , dan *ApoE4*, belum banyak diteliti. Penelitian ini bertujuan mengevaluasi potensi *hWJ-MSC* dalam memodulasi ekspresi gen *calpain*, *GSK3 β* , dan *ApoE4* pada model tikus Alzheimer. Tikus Wistar jantan dibagi menjadi tiga kelompok: kontrol, $AlCl_3$, dan $AlCl_3+hWJ-MSC$. Uji *Y-maze* menilai memori spasial, dan jaringan otak dianalisis menggunakan pewarnaan *Congo Red*, sintesis *cDNA*, dan *real-time PCR*. Hasil menunjukkan penilaian *Y-maze* berturut-turut 66.33 ± 17.96 , 41.52 ± 32.77 , 62.35 ± 37.34 . Pewarnaan *Congo red* menunjukkan plak $A\beta$ lebih banyak ditemukan pada kelompok kontrol positif dibandingkan kelompok perlakuan. Ekspresi *calpain* meningkat pada kelompok $AlCl_3$ tetapi tidak menurun signifikan dengan *hWJ-MSC*. Ekspresi *GSK3 β* meningkat signifikan pada kelompok *hWJ-MSC* dibanding kontrol dan $AlCl_3$. Ekspresi *ApoE4* meningkat signifikan pada kelompok $AlCl_3$ dan menurun pada kelompok *hWJ-MSC*. Kesimpulan penelitian ini menunjukkan terdapat pengaruh pemberian *hWJ-MSC* terhadap penilaian *Y maze*, ekspresi gen *Calpain*, *GSK3 β* , dan *ApoE4*. Uji statistik menunjukkan perbedaan bermakna signifikan hanya pada gen *GSK3 β* dan *ApoE4* ($p < 0,05$).

Kata Kunci: *Y maze test*, *Congo Red*, *Calpain*, *GSK3 β* , *ApoE4*, *IL-6*, Alzheimer, *hWJ-MSC*.

ABSTRACT

ANALYSIS OF THE EFFECTS OF HUMAN WHARTON JELLY - MESENCHYMAL STEM CELLS ON Y MAZE TEST, CALPAIN GENE EXPRESSION, GLYCOGEN SYNTHASE KINASE 3 BETA, AND APOLIPOPROTEIN-4 IN ALZHEIMER'S DISEASE

Nita Afriani

The global increase in life expectancy has led to a higher prevalence of Alzheimer's disease characterized by the accumulation of A β plaques and neurofibrillary tangles (NFT), causing neuronal damage and cognitive impairment. Mesenchymal Stem Cells from Wharton's Jelly (hWJ-MSC) show therapeutic potential in ameliorating Alzheimer's pathology through neurogenesis and antiapoptotic effects. However, their influence on calcium signaling regulation, particularly the proteins calpain, GSK3 β , and ApoE4, has not been extensively studied. This research aims to evaluate the potential of hWJ-MSC in modulating the expression of calpain, GSK3 β , and ApoE4 genes in an Alzheimer's rat model. Male Wistar rats were divided into three groups: control, AlCl₃, and AlCl₃+hWJ-MSC. The Y-maze test assessed spatial memory, and brain tissues were analyzed using Congo Red staining, cDNA synthesis, and real-time PCR. Results showed Y-maze assessments of 66.33 $\pm$ 17.96, 41.52 $\pm$ 32.77, and 62.35 $\pm$ 37.34, respectively. Congo red staining showed A β plaques in positives control greater than treatment groups. Calpain expression increased in the AlCl₃ group but did not significantly decrease with hWJ-MSC treatment. GSK3 β and IL-6 expression significantly increased in the hWJ-MSC group compared to the control and AlCl₃ groups. ApoE4 expression significantly increased in the AlCl₃ group and decreased in the hWJ-MSC group. The conclusion of this study indicates that there are effects of hWJ-MSC's treatment in Y maze scores, expression of Calpain, GSK3 β and ApoE4. Statistical analysis showed significant differences only in the genes GSK3 β and ApoE4 ($p < 0.05$).

Keywords: Y maze test, Congo Red, Calpain, GSK3 β , ApoE4, IL-6, Alzheimer's, hWJ-MSC.

