

## ABSTRAK

### Identifikasi Peptida Aktif Anti-Butyrylcholinesterase dari Gonad Landak Laut (*Echinometra mathaei*) Untuk Terapi Penyakit Alzheimer

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## ABSTRAK

Butyrylcholinesterase merupakan jenis enzim kolinesterase yang berperan menonaktifkan neurotransmitter asetilkolin, dan merupakan target terapi yang layak pada penyakit Alzheimer secara *in vitro* dan *in silico*. Inhibitor butyrylcholinesterase potensial ditargetkan ke otak dan dikembangkan dari peptida aktif gonad landak laut echinodermata Pantai Sepanjang, Yogyakarta *Echinometra mathaei*. Eksperimen untuk protein total, pita protein, purifikasi, aktivitas penghambatan BChE *in vitro*, identitas peptida aktif, dan evaluasi *in silico*, masing-masing dilakukan oleh uji Bradford, SDS-PAGE, kromatografi penukar anion, butyrylcholinesterase inhibitor screening, LC-HRMS, dan metode *molecular docking*. Studi SDS-PAGE dan protein total menunjukkan bahwa keseluruhan dari gonadnya bersifat protein. Analisis LC-HRMS terhadap sampel yang diidentifikasi mengungkapkan variasi jumlah asam amino yang terdiri dari 5-38 asam amino. Berdasarkan hasil, sampel bertindak sebagai penghambat signifikan enzim tersebut. Data *in silico* untuk senyawa yang teridentifikasi juga mengkonfirmasi hasil eksperimen. Sekuens peptida GPAKPGVK dan TPKKVTK mempunyai afinitas tertinggi terhadap enzim tersebut. Penelitian lebih lanjut diperlukan sintesis untuk menentukan apakah kedua peptida tersebut bisa menjadi kandidat terapi untuk penyakit Alzheimer.

**Kata kunci:** inhibitor butyrylcholinesterase; *Echinometra mathaei*; penyakit Alzheimer; peptida aktif

## ABSTRACT

### Identification of Anti-Butyrylcholinesterase Active Peptides from Sea Urchin (*Echinometra mathaei*) Gonads for Alzheimer's Disease Therapy

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## ABSTRACT

Butyrylcholinesterase is a type of cholinesterase enzyme that plays a role in deactivating the neurotransmitter acetylcholine and is a viable therapeutic target in Alzheimer's disease in vitro and in silico. The potential butyrylcholinesterase inhibitor is targeted to the brain and was developed from the active peptide of the gonad of the Echinoderm, sea urchin Pantai Panjang, Yogyakarta *Echinometra mathaei*. Experiments for total protein, protein bands, purification, in vitro BChE inhibitory activity, active peptide identity, and in silico evaluation, were performed by Bradford assay, SDS-PAGE, anion exchange chromatography, butyrylcholinesterase inhibitor screening, LC-HRMS, and molecular docking method, respectively. SDS-PAGE and total protein studies showed that the entire gonad was proteinaceous. LC-HRMS analysis of the identified samples revealed variations in the number of amino acids they comprised, ranging from 5 to 38. Based on the results, the sample acted as a significant inhibitor of the enzyme. In silico data for the identified compounds, also confirmed the experimental results. The sequence of peptides GPAKPGVK and TPKKVTK have the highest affinity for this enzyme. Further studies on the synthesis of active peptides are needed to determine whether both of the peptides may be therapeutic candidates for Alzheimer's disease.

**Keywords:** butyrylcholinesterase inhibitors; *Echinometra mathaei*; Alzheimer's disease; active peptide