

INTISARI

ISOLASI DAN KARAKTERISASI *MESENCHYMAL STEM CELLS* DARI *BONE MARROW OS MANDIBULA KUDA* BERDASARKAN BERBAGAI EKSPRESI GEN DENGAN *REAL-TIME POLYMERASE CHAIN REACTION*

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Mesenchymal Stem Cells (MSCs) merupakan *stem cell* multipoten yang menjanjikan dalam terapi regeneratif. *Mesenchymal Stem Cells* (MSCs) dapat berdiferensiasi menjadi berbagai jenis sel, termasuk osteoblas, adiposit, dan kondrosit. Penelitian tentang MSCs dari *bone marrow* mandibula kuda memiliki prospek dalam kedokteran hewan regeneratif. Penelitian ini bertujuan untuk mengisolasi, karakterisasi, dan mengevaluasi potensi diferensiasi MSCs dari *bone marrow* os mandibula kuda. Isolasi jaringan pada *bone marrow* dilakukan pada laboratorium kultur FKH UGM, dilanjutkan dengan karakterisasi, terdiri dari: Pengecekan morfologi *Bone Marrow-Mesenchymal Stem Cells* (BM-MSCs), CFU assay, dan RT-qPCR untuk *stemness marker* (*NANOG*), *surface marker* (*CD29*), dan *multilineage marker* (*RUNX2*, *SOX9*, dan *PPAR- γ*). Koloni sel yang mengandung lebih dari 50 sel agregat dihitung pada tahap CFU assay. Tahap preservasi trizol dilakukan untuk mempertahankan RNA karena selanjutnya akan dilakukan tahap ekstraksi RNA dan spektrofotometer nanodrop. Deteksi ekspresi gen spesifik dilakukan melalui tahapan *Reverse Transcription-Polymerase Chain Reaction* (RT-PCR) yang dilanjutkan dengan *Real-Time Polymerase Chain Reaction* (qPCR). Identifikasi ekspresi gen yang bervariasi pada BM-MSCs yang diisolasi berdasarkan hasil qPCR. Ekspresi gen diperoleh hasil *NANOG* 12,44%, *CD29* 80,46%, *RUNX2* 262,10%, *SOX9* 19,97%, dan *PPAR- γ* 40,02%. Pola ekspresi ini menunjukkan kecenderungan diferensiasi ke arah osteogenik (gen *RUNX2*) dengan penurunan sifat pluripotensi (gen *NANOG*) serta aktivitas yang lebih rendah pada jalur kondrogenik (gen *SOX9*) dan adipogenik (gen *PPAR- γ*). Ekspresi *CD29* menandakan sel masih bersifat mesenchymal stem cell dengan kemampuan adhesi yang baik. *Bone Marrow-Mesenchymal Stem Cells* (BM-MSCs) dari os mandibula *Equine* sp. memiliki potensi untuk diferensiasi, terutama ke arah osteogenik berdasarkan profil ekspresi gen yang diamati. Penelitian lebih lanjut diperlukan untuk mengkonfirmasi potensi diferensiasi BM-MSCs, serta untuk mengkonfirmasi potensinya melalui uji *in vitro*. Penelitian ini mendukung pemanfaatan BM-MSCs dalam terapi regeneratif tulang pada kuda.

Kata kunci: BM-MSCs, Ekspresi Gen, Horse, Os Mandibula, qPCR.

ABSTRACT

ISOLATION AND CHARACTERIZATION OF MESENCHYMAL STEM CELLS FROM THE HORSE MANDIBLE BONE MARROW BASED ON VARIOUS GENE EXPRESSIONS BY REAL-TIME POLYMERASE CHAIN REACTION

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Mesenchymal Stem Cells (MSCs) are multipotent stem cells that are promising in regenerative therapy. Mesenchymal Stem Cells (MSCs) can differentiate into various types of cells, including osteoblasts, adipocytes, and chondrocytes. Research on MSCs from horse mandibular bone marrow has prospects in regenerative veterinary medicine. This study aims to isolate, characterize, and evaluate the differentiation potential of MSCs from horse mandibular bone marrow. Tissue isolation in bone marrow was carried out in the FKH UGM culture laboratory, followed by characterization, consisting of: Bone Marrow-Mesenchymal Stem Cells (BM-MSCs) morphology check, CFU assay, and RT-qPCR for stemness markers (*NANOG*), surface markers (CD29), and multilineage markers (*RUNX2*, *SOX9*, and *PPAR- γ*). Cell colonies containing more than 50 aggregate cells were counted at the CFU assay stage. The trizol preservation stage is carried out to maintain RNA because the RNA extraction stage and nanodrop spectrophotometer will be carried out next. Detection of specific gene expression is carried out through the Reverse Transcription-Polymerase Chain Reaction (RT-PCR) stage followed by Real-Time Polymerase Chain Reaction (qPCR). Identification of varying gene expression in isolated BM-MSCs based on qPCR results. Gene expression obtained results *NANOG* 12.44%, CD29 80.46%, *RUNX2* 262.10%, *SOX9* 19.97%, and *PPAR- γ* 40.02%. This expression pattern shows a tendency towards osteogenic differentiation (*RUNX2* gene) with decreased pluripotency (*NANOG* gene) and lower activity in the chondrogenic (*SOX9* gene) and adipogenic (*PPAR- γ*) pathways. CD29 expression indicates that cells are still mesenchymal stem cells with good adhesion ability. Bone Marrow-Mesenchymal Stem Cells (BM-MSCs) from horse mandible have the potential for differentiation, especially towards osteogenic based on the observed gene expression profile. Further studies are needed to confirm the differentiation potential of BM-MSCs, as well as to confirm its potential through in vitro assays. This study supports the use of BM-MSCs in bone regenerative therapy in horses.

Keywords: BM-MSCs, Gene Expression, Horse, Mandibular OS, qPCR.