RINGKASAN

Mesenchymal Stem Cells (*MSCs*) dari umbilikus memiliki potensi diferensiasi yang tinggi untuk aplikasi terapi regeneratif, namun karakterisasi *MSCs* umbilikus marmut (*Cavia porcellus*) masih belum diteliti. Hewan ini memiliki kesamaan fisiologis dengan manusia, sehingga berpotensi menjadi model yang relevan dalam penelitian biomedis. Penelitian ini bertujuan mengevaluasi proliferasi dan viabilitas sel pada berbagai konsentrasi serum (0%, 5%, 10%, dan 15%) untuk menentukan kondisi kultur yang optimal; menyusun kurva pertumbuhan, dan mengevaluasi kemampuan diferensiasi *MSCs* umbilikus *C. porcellus* menjadi *osteoblast* dan *adipoblast.*

Penelitian dilaksanakan secara eksperimental menggunakan Rancangan Acak Lengkap (RAL) dengan kultur primer fragmen dan subkultur *MSCs* umbilikus. Variabel terikat pada penelitian mencakup proliferasi, viabilitas, dan kemampuan diferensiasi *MSCs* umbilikus *C. porcellus*. Parameter penelitian meliputi pertambahan jumlah sel dan jumlah sel yang hidup. Parameter diferensiasi adalah reaksi spesifik sel *MSCs* umbilikus terhadap *Oil Red O* (sebagai indikator diferensiasi ke arah *adipoblast*) dan *Alizarin Red* (sebagai indikator diferensiasi ke arah *osteoblast*). Analisis keberhasilan induksi *osteoblast* menggunakan pewarna *Alizarin Red* dan induksi *adipoblast* menggunakan pewarna *Oil Red O*. Data kuantitatif diuji homogenitas dan normalitasnya dilanjutkan dengan uji ANOVA menggunakan *GraphPad Prism* dan analisis regresi menggunakan Excel. Data kualitatif berupa reaksi spesifik terhadap pewarnaan *Alizarin Red* dan *Oil Red O* dianalisis secara deskriptif. Hasil penelitian menunjukkan bahwa eksplan umbilikus *C. porcellus* yang dikultur dalam DMEM *low glucose* dengan suplemen 10% FBS, 5% penicillin/streptomycin, dan 5% L-glutamine pada temperatur 37°C, 5% CO_2 telah membentuk *outgrowth* dan mencapai 80% *confluence* pada hari keempat. Sub kultur hasil *outgrowth* menunjukkan bahwa medium kultur dengan kadar FBS 10% menghasilkan pertumbuhan yang optimal dengan densitas $1{,}98.10^7 \pm 0{,}79.10^7$ sel/mL dan viabilitas 96,83 ± 1,22%. Kurva pertumbuhan sel yang dikultur dengan penambahan 10% FBS menunjukkan adanya pertumbuhan eksponensial pada 2 hari pertama kultur, pertumbuhan melambat hingga akhir periode kultur. Sel-sel umbilikus *C. porcellus* mampu berdiferensiasi menjadi sel-sel *osteoblast* setelah diinduksi selama 14 hari dan menjadi *adipoblast* setelah diinduksi selama 21 hari. Penelitian ini diharapkan memberikan informasi baru tentang karakteristik *MSCs* umbilikus *C. porcellus* yang dapat mendukung pengembangan lebih lanjut di bidang biomedis terutama dalam *MSCs* umbilikus *C. porcellus*.

Kata kunci: adipogenik, *Cavia porcellus*, *in vitro,* mesenkimal stem sel umbilikus, osteogenik

SUMMARY

Umbilical Mesenchymal Stem Cells (UMSCs) have potential for regenerative therapy due to their capacity to differentiate. Yet the characteristics of the UMSCs, especially those from the guinea pig (*Cavia porcellus*), are less studied. This animal shares similarities in physiological and immune responses with humans; therefore, it is a good model for biomedical research. This research was conducted to evaluate the cell proliferation and viability cultured in medium containing different serum concentration (0%, 5%, 10%, and 15%) in searching the optimum serum concentration for UMSCs culture; create the cells growth curve, and evaluate the differentiating capacity of EMSCs into osteoblast and adipoblast.

This research was conducted experimentally on the primary culture of *C. porcellus* umbilical fragments and its subculture, applying the Completely Randomized Design (CRD). The dependent variables were cell proliferation, cell viability, and differentiation capacity of the UMSCs. The research parameters consisted of the number of cells and their viability at the end of the culture. The differentiation capacity of the MSCs was evaluated based on their reactivity to Oil Red O, an indicator of adipogenic differentiation, and to Alizarin Red, an indicator of osteogenic differentiation. The cell density and viability were subjected to normality and homogeneity tests before proceeding to ANOVA using GraphPad Prism and regression analysis using Microsoft Excel. The differentiation capacity of the UMSCs was analysed descriptively.

The results showed that *C. porcellus* umbilical fragments cultured in Low-glucose DMEM medium supplemented by 10% FBS, 5% penicillin/Streptomycin, 5% L-glutamine grew well in vitro at 37°C with 5% CO_2. The cell outgrowth spread surrounding the fragment and reached 80% confluence on the 4th day of culture. The subculture of the outgrowth cells, in various FBS concentrations, revealed that optimum cell growth and viability were achieved in the cells cultured in medium supplemented with 10% FBS. The cell density was $1.98.10^7 \pm 0.79.10^7$ cell/mL, and the cell viability was 96.83±1.22%. The cell growth curve showed that the cells divided exponentially on days 1 and 2 of culture, reached the stationary phase on days 3-4, then declined. The guinea pig UMSCs are capable of differentiating into osteogenic cells after 14 days of induction and osteogenic cells after 21 days of induction. This research provides new informations on the characteristics of *C. porcellus* UMSCs, and contributes to developing future research, especially on *C. porcellus* UMSCs.

Keywords: adipogenic, *Cavia porcellus*, in vitro, osteogenic, umbilical mesenchymal stem cells