Storing MSCs in alginate core-shell capsules at ambient temperature: investigating viability and metabolic state

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Human mesenchymal stromal cells (MSCs) are a promising cell type for tissue engineering and regenerative medicine. To realize the potential of MSCs it is necessary to create effective ways to store these cells. Storage at ambient temperatures may simplify transportation and overcome disadvantages of cryopreservation. Here we studied efficacy of human bone marrow MSCs storage at 22°C in α-MEM with 10% (v/v) fetal bovine serum in five different forms: monolayer, suspension, encapsulated in alginate microspheres (AMS), and core-shell alginate capsules with the addition of fresh porcine blood plasma or human amniotic membrane (hAM) extract. 2.5% (w/v) low-viscosity alginate was used for the AMS and capsules production. Viability (Trypan Blue, FDA/EthD dual staining) and metabolic activity (Alamar blue) were assessed on day 1, 3, 5 and 7 of storage. Cell cycle was studied with the Premo™ FUCCI Cell Cycle Sensor. Viability after 7 days of storage was 32.8±2.5% in monolayer, 58.3±1.9% in suspension, 84.2±3.6% in AMS, 87.3±2.8% in capsules with hAM extract, and 83.1±1.3% with porcine blood plasma. The metabolic activity of cells in AMS comprised 55.0±1.3%, in capsules with hAM extract - 58.1±1.2%, and in capsules with porcine blood plasma 64.0±0.3% from storage start level at 7th day of storage, respectively. Metabolic activity in monolayer and suspension decreased sharply and was 27.4±1.0% and 16.75±0.3% on the 7th day. Cell cycle analysis showed that MSCs were completely arrested in G1 phase 2 days after encapsulation. Conclusion: encapsulation techniques provide effective storage of MSCs at ambient temperature for transportation and further use.

Acknowledgement: This study was supported by National Research Foundation of Ukraine (project № 2021.01/0276).

References: not provided.