CRYOPRESERVATION OF MESENCHYMAL STROMAL AND SPERM CELLS ENCAPSULATED IN ALGINATE MICROCAPSULES
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Cryopreservation is an attractive approach for the long-term storage of cells in alginate microcapsules, since alginate microencapsulation became widely applied for cell and tissue transplantation, cell delivery and three-dimensional cell culture. Alginate microcapsules can be also applied in IVF as containers for single sperm cells cryopreservation. The main goal, which should be achieved during cryopreservation is the full recovery of cell function on thawing with the preservation of microcapsules integrity.

The aim of this study was to investigate the viability and functions of human mesenchymal stromal cells (MSC) and spermatozoa after cryopreservation in alginate microcapsules (AMC).

MSC from human adult bone marrow were expanded in vitro and encapsulated into AMC. Cryopreservation was carried out under protection of 5% and 10% Me2SO using three different freezing protocols: uncontrolled rapid freezing, slow 2-step controlled freezing and slow 3-step controlled freezing with initiation of ice formation. MSC survival within AMC was assessed by FDA/EB staining, metabolic activity by alamar blue assay and differentiation capacity of encapsulated MSC was observed after the addition of adipogenic, osteogenic or chondrogenic induction stimuli.

Single motile human spermatozoa were injected to AMC and cryopreserved by slow freezing under protection of glycerol. Sperm cells survival was assessed by PI staining and hypo-osmotic swelling test.

It was obtained that rapid freezing resulted in dramatic decrease of encapsulated MSC viability. Slow freezing allowed preserving viability of both MSC and sperm cells. MSC cryopreserved within AMC using slow programmable freezing maintained their ability to adipogenic, osteogenic and chondrogenic differentiation.