LIGHT AND ELECTRON MICROSCOPY UNVEIL MORPHOLOGICAL CHANGES IN ART-DERIVED HUMAN OOCYTES CULTURED IN WEIGHTLESSNESS CONDITION

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Abstract Body

The effects of weightlessness on human oocyte maturation and competence to fertilization have not been investigated up to now. Our aim was to study, by light and transmission electron microscopy (LM and TEM) the morphology of human oocytes under simulated microgravity. As preliminary results we reported here in data on fifteen metaphase II (MII) oocytes, obtained from patients undergoing ART treatments. Ten oocytes were grown on simulated microgravity (~0*g*) through Random Positioning Machine (RPM) and prepared for LM and TEM examination after 24 hours of culture. Five oocytes were kept as controls. Both groups contained enclosed and free cumulus oocytes. By LM, shape of both oocyte groups looks like well rounded. However, a small percentage of microgravity-cultured oocytes (20%) showed an irregular contour. Organelles (mitochondria, mitochondria-smooth endoplasmic reticulum aggregates, and mitochondria-vesicle – MV- complexes) were uniformly distributed in all TEM examined samples. Mitochondria were typically rounded and provided with peripheral, arched cristae in all but one oocyte, where dumb-bell shaped or crescent-shaped (dividing?) mitochondria were also found. In addition, MV complexes appeared enlarged in numerous microgravity-cultured oocytes (66%). In most samples, cortical granules (CGs) were uniformly distributed, just beneath the oolemma. CGs located in the inner ooplasm were also found in 20% of microgravity-grown oocytes. One oocyte presumably underwent activation during microgravity exposure, appearing as a two-cell egg, completely devoid of CGs. Finally, we did not evidenced ultrastructural differences between cumulus-enclosed and cumulus-free oocytes. In conclusion, a certain proportion of human MII ART oocytes in RPM showed significant alteration in both shape as well as in the morphology of sub-cellular organelles. However, abnormal features - possibly induced by microgravity - such as organelle clustering, presence of irregularly shaped mitochondria, presence of abnormally large MV complexes, CG relocation in the inner ooplasm and oocyte activation - deserve to be further investigated.

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