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Mitochondrial activity in ICM cells of human blastocyst

Masaya Yamanaka¹, Shu Hashimoto¹, Takayuki Yamochi¹, Hiroshi Matsumoto², Yoshiharu Nakaoka¹, Yoshiharu Morimoto³

¹ IVF Namba Clinic, Japan,

² IVF Osaka Clinic, Japan

³ HORAC Gland Front Osaka Clinic, Japan,

Objective

We compared the oxygen consumption rates (OCRs) of the TE located near the ICM (ICM side) and of the TE far from the ICM (TE side) of human blastocyst.

Materials and Methods

Thirty-four vitrified-warmed blastocysts which reached the expanded stage with a tightly packed ICM and TE consisting of cohesive epithelium on day 5 were included in the analysis. Informed consents were obtained from all patients. OCRs were measured using a scanning electrochemical microscopy (Clino corp., Japan) at one point of ICM side and at two points of TE sides 8 h after warming. Mitochondria with cytochrome c oxidase (CCO) activities of blastocysts were selectively stained and observed by a transmission electron microscope.

Results and Discussion

There was no difference in the OCR between the ICM (5.2 fmol/s) and TE sides (5.3 fmol/s) of blastocysts, suggesting a low OCR in the ICM. The proportion of mitochondria with high CCO activity in ICM cells (6.1%) was lower than in TE cells (32.2%). Cells in the ICM retain a pluripotent status, indicating a relatively dormant state, and depending on anaerobic metabolism. The TE cells contained elongated mitochondria with high CCO activity whereas the mitochondria in ICM cells were spherical with low CCO activity. Taken together, the undifferentiated state of ICM cells appears to be associated with low levels of mitochondrial activity.