ORAL COMMUNICATIONS

ENHANCING IN VITRO FOLLICULOGENESIS THROUGH OVARIAN TISSUE-ENDOTHELIAL CELL CO-CULTURE: 3D MAPPING OF NEO-CAPILLARY GROWTH AND MATURATION

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In vitro folliculogenesis remains constrained by the inability of current culture systems to faithfully recapitulate the ovarian microenvironment. In vivo, follicle activation and early growth occur in close association with the ovarian vasculature, which provides metabolic support and delivers angiocrine signals critical for follicular survival and development. By contrast, existing ovarian tissue models lack a functional vascular component, limiting follicular progression and long-term tissue functionality. While endothelial cells have been used to induce angiogenesis in various engineered tissues, their spatial integration and mapping within intact ovarian tissue to reconstruct a vascular niche has not yet been explored. This study evaluated whether endothelial cell co-culture could promote neo-vascularization within ovarian tissue and improve follicular progression.

Bovine ovarian cortical strips were cultured for 7 days alone or with human umbilical vein endothelial cells in a medium supporting both cell types. De novo vascularization was assessed by qualitative and quantitative 3D confocal microscopy after lectin and dextran staining, while follicle growth and viability were assessed by fluorescent live/dead staining.

Endothelial cells infiltrated the ovarian tissue, forming de novo capillary networks with a polarized distribution. Capillary length progressively decreased, likely due to branching. Newly formed vessels showed an immature phenotype after 7 days, indicating an early stage of vascular remodeling. Co-cultured tissues displayed a significantly higher proportion of growing secondary follicles compared with controls, whereas follicle viability remained unchanged.

Reconstructing a functional vascular network within ovarian tissue in vitro may enhance follicle growth and improve in vitro folliculogenesis. Autologous endothelial cell approaches could also limit ischemia-reperfusion damage after ovarian tissue transplantation, advancing fertility preservation in cancer patients.

References

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2. Man L et al. Sci Rep 2017; 7(1): p. 8203.