

# Artificial ovary prototype mimicking human ovarian tissue architecture

*Commonly used acronym: TAO*

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## SCOPE OF THE METHOD

|   |   |
|---|---|
| <b>The Method relates to</b>                    | Human health  |
| <b>The Method is situated in</b>                | Basic Research, Education and training,<br>Translational - Applied Research |
| <b>Type of method</b>                           | In vitro - Ex vivo  |
| <b>This method makes use of</b>                 | Human derived cells / tissues / organs                                      |
| <b>Specify the type of cells/tissues/organs</b> | Ovarian preantral follicles   |

## DESCRIPTION

### Method keywords

Fibrin matrix

Isolated follicles

Artificial ovary

Ovarian cells

## **Scientific area keywords**

Human ovarian tissue

fertility preservation

Cryopreservation

Transplantation

## **Method description**

We aimed to optimize fibrin matrix composition in order to mimic human ovarian tissue architecture for human ovarian follicle encapsulation and grafting.

Ultrastructure of fresh human ovarian cortex in age-related women (n = 3) and different fibrin formulations (F12.5/T1, F30/T50, F50/T50, F75/T75), rheology of fibrin matrices and histology of isolated and encapsulated human ovarian follicles in these matrices. Fresh human ovarian cortex showed a highly fibrous and structurally inhomogeneous architecture in three age-related patients, but the mean  $\pm$  SD of fiber thickness (61.3 to 72.4 nm) was comparable between patients. When the fiber thickness of four different fibrin formulations was compared with human ovarian cortex, F50/T50 and F75/T75 showed similar fiber diameters to native tissue, while F12.5/T1 was significantly different (p value < 0.01). In addition, increased concentrations of fibrin exhibited enhanced storage modulus with F50/T50, resembling physiological ovarian rigidity. Excluding F12.5/T1 from further analysis, only three remaining fibrin matrices (F30/T50, F50/T50, F75/T75) were histologically investigated. For this, frozen-thawed fragments of human ovarian tissue collected from 22 patients were used to isolate ovarian follicles and encapsulate them in the three fibrin formulations. All three yielded similar follicle recovery and loss rates soon after encapsulation. Therefore, based on fiber thickness, porosity, and rigidity, we selected F50/T50 as the fibrin formulation that best mimics native tissue. Of all the different fibrin matrix concentrations tested, F50/T50 emerged as the combination of choice in terms of ultrastructure and rigidity, most closely resembling human ovarian

cortex.

### **Lab equipment**

- Tissue chopper;
- Stereomicroscope;
- Biosafety cabinet;
- Incubator;
- Inverted microscope.

### **Method status**

Published in peer reviewed journal

### **PROS, CONS & FUTURE POTENTIAL**

#### **Advantages**

*In vitro* culture of human follicles

#### **Challenges**

- Fibrin matrix degradation;
- Poor visibility of the follicles inside the gel.

#### **Modifications**

Yes, fibrin composition (slower degradation rate, higher transparency)

#### **Future & Other applications**

*In vitro* culture of ovarian cells

## REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

### References

Chiti, M.C., Dolmans, MM., Mortiaux, L. et al. A novel fibrin-based artificial ovary prototype resembling human ovarian tissue in terms of architecture and rigidity. *J Assist Reprod Genet* 35, 41–48 (2018). <https://doi.org/10.1007/s10815-017-1091-3>

### Associated documents

## PARTNERS AND COLLABORATIONS

### Organisation

**Name of the organisation** Université Catholique de Louvain (UCL)

**Department** Gynecology

**Country** Belgium

**Geographical Area** Brussels Region

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