Artificial ovary prototype mimicking human ovarian tissue architecture

Commonly used acronym: TAO
Created on: 03-09-2021 - Last modified on: 10-09-2021

SCOPE OF THE METHOD

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

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 ± 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


Associated documents

PARTNERS AND COLLABORATIONS

Organisation
Name of the organisation Université Catholique de Louvain (UCL)
Department Gynecology
Country Belgium
Geographical Area Brussels Region