# Mouse in vitro follicle culture bioassay for fundamental and translational research on oocyte developmental capacity

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## SCOPE OF THE METHOD

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|---|---|
| **The Method relates to** | Human health |
| **The Method is situated in** | Basic Research, Translational - Applied Research |
| **Type of method** | In vitro - Ex vivo |
| **This method makes use of** | Animal derived cells / tissues / organs |
| **Species from which cells/tissues/organs are derived** | mouse |
| **Type of cells/tissues/organs** | ovarian follicles |

## DESCRIPTION

### Method keywords

in vitro

oogenesis

folliculogenesis

oocyte maturation

### Scientific area keywords

follicle culture
fertility preservation
in vitro oocyte maturation
assisted reproductive technology
oocyte quality

**Method description**

Follicle Biology Laboratory has developed a well characterized and standardized MOUSE *in vitro* follicle culture (IFC) system. In this system, early stage ovarian follicles are cultured *in vitro* under physiological hormone concentrations up to fertilizable and developmentally competent mature oocytes. The follicle culture bioassay provides unique opportunities to study ovarian physiology and to assess the effects of adverse metabolic, nutritional, toxicological or environmental exposure on epigenetic reprogramming, folliculogenesis and oocyte quality. The IFC system allows identifying molecules and pathways that affect oocyte quality. Furthermore, *in vitro* systems for oocyte maturation (IVM) allow determining windows of sensitivity. Finally, the mouse IFC and IVM systems are a model for translational research in the context of human fertility preservation strategies and optimized IVM protocols in infertile patients.

**Lab equipment**

- Cabinet laminar flow with: hot plate and stereomicroscope equipped with a hot plate ;
- Inverted microscope with 40x objective and ocular scale for measurement ;
- Incubators (5%CO2, normal oxygen).

**Method status**

History of use
Internally validated
Published in peer reviewed journal

**PROS, CONS & FUTURE POTENTIAL**

**Advantages**

- *In vitro* development allows the standardized growth and maturation of high numbers of ovarian follicles at the same developmental stage. This is not achievable *in vivo* in an efficient way.
- The system has already been extensively characterized (published in peer reviewed journals).
- The system has great potential as a bioassay for testing exposure to adverse conditions.

### Challenges

Developmental capacity of the cultured oocytes is still inferior compared to *in vivo* developed counterparts. The system would benefit from further optimization.

### Modifications

We plan a project on the optimization of the IFC system.
Strategy:
- 3D culture system
- Incorporation of extracellular matrix components
- Addition of specific hormones and growth factors that might enhance developmental capacity
- Addition of somatic feeder cells

### Future & Other applications

After optimization the IFC system will result in a bioassay with targeted endpoints for testing of culture media, pharmacological and toxicological compounds and metabolic and nutritional challenges with potential for valorization.

## REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

### References

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Mouse cumulus-oocyte complexes from *in vitro*-cultured preantral follicles suggest an anti-luteinizing role for the EGF cascade in the cumulus cells. Romero S, Sánchez F, Adriaenssens T, Smitz J. Biol Reprod. 2011

**Associated documents**

## PARTNERS AND COLLABORATIONS

### Organisation

**Name of the organisation** Vrije Universiteit Brussel

**Department** Follicle Biology Laboratory

**Country** Belgium

**Geographical Area** Brussels Region