

## Mouse in-vitro spermatogenesis on alginate-based 3D biprinted constructs

**Commonly used acronym:** IVS

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### Organisation

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## SCOPE OF THE METHOD

<b>The Method relates to</b>	Animal health, Human health
<b>The Method is situated in</b>	Basic Research
<b>Type of method</b>	In chemico
<b>Species from which cells/tissues/organs are derived</b>	Mouse
<b>Type of cells/tissues/organs</b>	Testis

## DESCRIPTION

### Method keywords

3D in vitro model  
3D bioprinting  
organoid culture  
microscaffolds  
extrusion-based 3D printing

### Scientific area keywords

fertility preservation  
reprotoxicity  
preclinical  
Drug discovery  
drug development  
testicular physiology

### Method description

Studying spermatogenesis *in situ* has led to the understanding that the 3D reorganization of testicular cells into an interstitial and tubular compartment is of enormous importance for germ cell differentiation. We will rely on 3D bioprinting technology which gives control over cell deposition and scaffold design, to recreate the compartmentalization of the testis *in vitro*. Testicular constructs will be produced by culturing epithelial testicular cell fractions in the macropores of bioprinted interstitial cell-laden scaffolds. We expect these biomimetic scaffolds will also support differentiation of human germ cells.

### **Lab equipment**

Extrusion-based 3D printer;  
Air compressor;  
Hydrogel;  
Fluorescence activated cell sorter or magnetic activated cell sorter;  
Fluorescence microscope.

### **Method status**

Still in development  
Published in peer reviewed journal

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

### **Advantages**

Allows manipulation of cell suspensions before culture to help understand the many mechanisms controlling testicular physiology and spermatogenesis, but also to discover new clinical targets.

### **Challenges**

Requires high cell concentrations ;  
Lack of bioactivity or biocompatibility of the hydrogel ;  
Uncertainty related to the medium ingredients that drive testicular morphogenesis and spermatogenesis.

### **Modifications**

Use of higher cell concentrations ;  
Use of alternative hydrogels ;  
Optimisation culture medium.

### **Future & Other applications**

Tool to study testicular physiology through cell manipulation or gene editing ;  
*In vitro* derived sperm of prepubertal cancer patients and adult non-obstructive patients can be used to generate offspring through assisted reproduction ;  
Cell therapy ;  
Following the incorporation into multi-organs microfluidic devices, the constructs can serve as a high-throughput screening assay in preclinical tests.

## **REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION**

### **References**

Baert, Y., Dvorakova-Hortova, K., Margaryan, H. & Goossens, E. (2019) Mouse *in vitro* spermatogenesis on alginate-based bioprinted scaffolds. *Biofabrication* 11, 035011  
Richer, G., Hobbs, R., Loveland, Kate., Goossens, E., Baert, Y. (2021) Long-term maintenance and meiotic entry of early germ cells in murine testicular organoids

functionalized by 3D printed scaffolds at the air-medium interface cultivation. *Frontiers in Physiology* 12, 757565

### **Associated documents**

[Baert\\_2019\\_Biofabrication.pdf](#)

[Richer et al. 2021.pdf](#)

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