Generation of Hepatic Stellate Cells from Human Pluripotent Stem for in vitro liver fibrosis studies

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Organisation

Name of the organisation Vrije Universiteit Brussel (VUB)
Department Basic (bio-) Medical Sciences
Country Belgium
Geographical Area Brussels Region

Partners and collaborations

Katholieke Universiteit Leuven (KUL)

SCOPE OF THE METHOD

The Method relates to	Human health
The Method is situated in	Basic Research, Translational - Applied Research
Type of method	In vitro - Ex vivo
Specify the type of cells/tissues/organs	Non-tumor liver tissue, Non-tumor cirrhotic liver tissue

DESCRIPTION

Method keywords

Pluripotent stem cells
Hepatic stellate cells
organoids
Liver spheroids
In vitro liver model
Non-parenchymal cells
HepaRG

Scientific area keywords

Liver fibrosis
Disease modelling
Toxicity assessment
hepatocytes

Method description

We established a protocol to efficiently generate hepatic stellate cells (HSCs) from human pluripotent stem cells (PSCs). Our procedure generated complex *in vitro* spheroid cultures that better mimic the complexity of the liver as well as liver function. In co-culture, iPSC-HSCs promote maintenance of hepatocyte metabolic functionality while being able to respond to hepatocyte-mediated toxicity, activating and promoting intra-spheroid fibrogenesis, one of the main drug-associated adverse liver outcomes. iPSC-HSCs display functional and phenotypic features of human primary cultured HSCs, indicating that they may be a highly suitable cell source of human HSCs for culture-based studies.

Lab equipment

- Incubator,
- Cell culture hood,
- Flow cytometer,
- Laser Scanning Confocal microscope.

Method status

Published in peer reviewed journal

PROS, CONS & FUTURE POTENTIAL

Advantages

- Protocol is highly robust,
- Yields 70%–80% iPSC-HSCs,
- Highly reproducible.

Challenges

In 2D the responsive of iPSC-HSCs to external signals is rather limited. Thus far, the method has been used successfully in 3 different institutes using 3 different hESC/hIPSC cell lines, but more should be tested.

Modifications

Higher throughput and better quality control for the different stages of hiPSC to HSC differentiations.

Future & Other applications

Can be used for several applications, such as developmental studies, fibrosis modeling, drug screening, liver spheroid generation, and, eventually, regenerative medicine.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

References

Coll, Mar et al. Generation of Hepatic Stellate Cells from Human Pluripotent Stem Cells Enables In Vitro Modeling of Liver Fibrosis. Cell Stem Cell, Volume 23, Issue 1, 101 - 113.e7

Links

Liver cell biology research group

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