Establishment of an inflammatory bowel disease-derived colonic organoid model to measure mucin RNA isoform expression and mucosal barrier function

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Organisation

Name of the organisation University of Antwerp (UAntwerpen)

Department Laboratory of Experimental Medicine and Pediatrics (LEMP)

Country Belgium

Geographical Area Flemish Region

Partners and collaborations

University of Antwerp (UAntwerpen)

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	Organoids established from colonic biopsies of IBD patients

DESCRIPTION

Method keywords

inflammation

epithelial barrier function

mucin RNA isoform expression

colonic organoids

inflammatory bowel disease

tight junctions

transwell assays

Scientific area keywords

gut barrier

therapy

cell biology

single-cell RNA seq

mucus barrier

Method description

Human epithelial organoids are first established from colonic biopsies of IBD patients. Differentiation of the organoids (i.e. transition from stem cell to distinct epithelial-type cells) is characterized by monitoring the expression of LGR5, Ki67, MUC1, MUC2 and MUC13. Subsequently, human epithelial organoid cultures (hEpOCs) are challenged with an inflammatory cocktail to reinduce the inflammatory status as described in IBD patients. Thereafter, the organoids are treated with an IBD drug and mucin expression and barrier

function assessed.

Lab equipment

- Incubator,
- Laminar flow hood,
- Microscope,
- Transwell system,
- TEER measurement system,
- RT-qPCR,
- GridION (Nanopore) sequencer.

Method status

Still in development

PROS, CONS & FUTURE POTENTIAL

Advantages

Organoids mimics the mucosal environment and generates a mini 3D gut organ.

Challenges

Establishment and culturing of organoids is very variable and patient dependent.

Modifications

Generation of 2D co-culture organoid model with immune cells will better mimic the inflammatory situation in IBD patients in stead of the challenge with an inflammatory cocktail.

Future & Other applications

This model can be used in other GI pathologies where barrier dysfunction is a key hallmark.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

References

Pleguezuelos-Manzano C, Puschhof J, van den Brink S, Geurts V, Beumer J, Clevers H. Establishment and Culture of Human Intestinal Organoids Derived from Adult Stem Cells. Curr Protoc Immunol [Internet]. 2020 Sep 1;130(1):e106. Available from: https://doi.org/10.1002/cpim.106

Other remarks

Prof. Benedicte De Winter, University of Antwerp, Laboratory of Experimental Medicine and Pediatrics collaborates with Prof Annemieke Smet and is a partner for this method.

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