The living chamber, an innovative and customizable 3D in vitro model for bone implant evaluation

Commonly used acronym: *Living chamber*

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Organisation

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SCOPE OF THE METHOD

The Method relates to	Animal health, Human health, Other: In vitro modelling, replacing animal models
The Method is situated in	Basic Research, Translational - Applied Research
Type of method	In vitro - Ex vivo
Specify the type of cells/tissues/organs	Immortalized human bone-marrow derived mesenchymal stem cells

DESCRIPTION

Method keywords

bone-cartilage unit
3D in vitro model
3D printing
3D Cell culture
3D model
differentiation
mesenchymal stem cell
bone model

Scientific area keywords

in vitro 3D modelling
Bone tissue engineering
3D organoid models
differentiation
organ-on-chip

3D culture

Method description

A proprietary designed lab-scale bioreactor containing a substrate for adherent cells and customized conditions, enabling the differentiation of MSCs into osteogenic lineage. The cell-substrate interaction can be assessed after prolonged 3D cell culture. Customizable and tunable to the experimental needs and cells, for example for testing bone-implants for bone-related studies (testing implant coatings, implant materials, etc.) in healthy and diseased conditions.

Lab equipment

Standard lab-scale *in vitro* Eukaryotic cell culture equipment, materials and facilities.

Method status

Internally validated

PROS, CONS & FUTURE POTENTIAL

Advantages

3D-environment representing better the *in vivo* situation. Results obtained in the Living Chamber in a perfusion set-up are superior compared to cells cultured and differentiated either onto TCP support or even 3D support. Allows the use of human cells with relevant physiological function instead of xenogeneic (i.e. animal origin) cells . Bioreactors are customizable to the needs and the intended use (size, functionalities, (parallel) testing needs). Approach enables *in vitro* prioritization and thus avoids iterative animal testing in so far possible.

Challenges

Cell donor variability is not controllable in this methods, similarly at what is observed for other established methods. While this reflects a clinical reality, for the sake of reproducibility the initial testing may be done using immortalized modified MSC lines, allowing a robust evaluation of the tested parameters before initiating testing with primary cells.

Modifications

Modification can easily be done as the bioreactor and cell support is customizable to the desired experimental needs.

Future & Other applications

Cartilage repair research, in vitro cell expansion, organoid culture, production of biologicals, etc.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

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