The use of induced pluripotent stem cell-derived cardiomyocytes to study cardiac arrhythmias and cardiomyopathies

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PARTNERS AND COLLABORATIONS

Organisation

Name of the organisation University of Antwerp (UAntwerpen)

Department Center of Medical Genetics

Country Belgium

Geographical Area Flemish Region

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	Induced pluripotent stem cell-derived cardiomyocytes

DESCRIPTION

Method keywords

induced pluripotent stem cells

Disease modeling

Cardiomyocyte

drug screening

CRISPR/Cas

Scientific area keywords

cardiac arrhythmia

cardiomyopathy

Brugada syndrome

Method description

Cardiomyocytes derived from induced pluripotent stem cells (iPSC-CMs) offer an attractive platform for cardiovascular research, including disease modeling, drug toxicity testing and development of regenerative therapies. Patient-specific iPSC-CMs are very useful to study disease pathogenesis and have a huge potential for evaluation of disease prognosis and development of personalized treatment. In our research group we study inherited cardiac arrhythmias (currently with a focus on Brugada syndrome) and cardiomyopathies. We create iPSC-CM models, either patient-derived or using CRISPR/Cas, to evaluate the functional effect of specific genetic variants, assist the search for modifier genes and novel therapeutic targets, and screen for novel drug compounds.

Lab equipment

- Biosafety cabinets ;
- Nucleofector ;
- Patch-clamp equipment ;
- Multi-electrode array (MEA) ;
- Next-generation sequencing (NGS) instruments.

Method status

Still in development

Internally validated

PROS, CONS & FUTURE POTENTIAL

Advantages

Human model mimicking the native cardiomyocyte environment, patient-based disease model recapitulating full genomic background.

Challenges

Relative immaturity of the cells, variability of the phenotype of the final iPSC-CM model

Modifications

Improved protocols for more standardized differentiation and maturation of the cardiomyocytes.

Future & Other applications

iPSC-CMs can as well be used for drug cardiotoxicity screening and regenerative therapies after further improvements and validation.

REFERENCES, ASSOCIATED DOCUMENTS AND OTHER INFORMATION

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