

Miniaturized engineered heart tissues from human induced pluripotent cell-derived co-culture

Windt, Laura; Dostanic, Milica; Stein, Jeroen; Meraviglia, Viviana ; Campostrini, Giulia; Bellin, Milena; Orlova, Valeria; Mastrangeli, Massimo; Sarro, Lina P.M.; van Meer, Berend

Publication date

2020

Document Version

Final published version

Citation (APA)

Windt, L., Dostanic, M., Stein, J., Meraviglia, V., Campostrini, G., Bellin, M., Orlova, V., Mastrangeli, M., Sarro, L. P. M., van Meer, B., & Mummery, C. L. (2020). *Miniaturized engineered heart tissues from human induced pluripotent cell-derived co-culture*. Poster session presented at European Organ-on-Chip Society Conference (EUROoCS Conference 2020).

Important note

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Laura Windt¹, Milica Dostanic², Jeroen Stein¹, Viviana Meraviglia¹, Giulia Campostrini¹, Milena Bellin¹, Valeria Orlova¹, Massimo Mastrangeli², Lina P.M. Sarro², Berend van Meer^{1,3}, Christine L. Mummery^{1,4}

¹ Anatomy and Embryology, LUMC, Leiden, The Netherlands

² Microelectronics, TU Delft, Delft, The Netherlands

³ MESA+ institute, University of Twente, Enschede, The Netherlands

⁴ Applied Stem Cell Technology, University of Twente, Enschede, The Netherlands

1. Introduction | Engineered Heart Tissues (EHTs)

Three-dimensional *in vitro* model of a human heart on-a-chip

- Mimicking the human heart as good as possible
- Personalized medicine
- High throughput research
- Cost effective

Chip

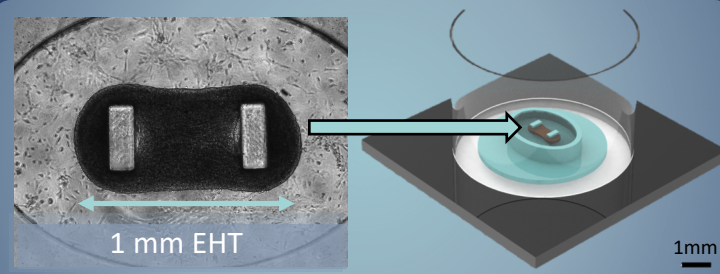
Wafer-scale silicon- and polymer-based fabrication

Cardiac tissue

Human induced pluripotent stem cell (hiPSC) derived:

- 80% Cardiomyocytes
- 20% Cardiac fibroblasts

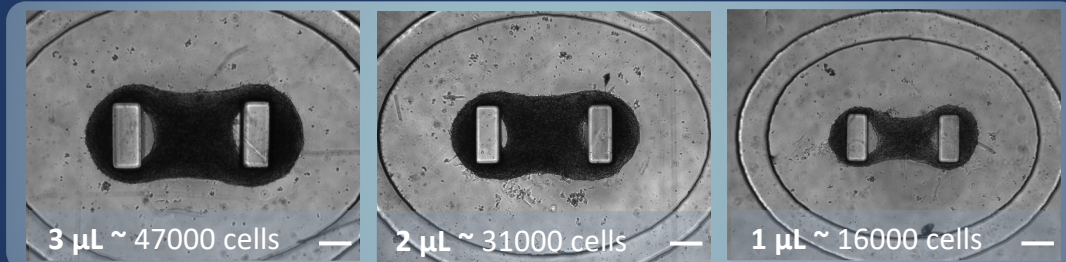
Mixing cells in collagen and matrigel (ECM)



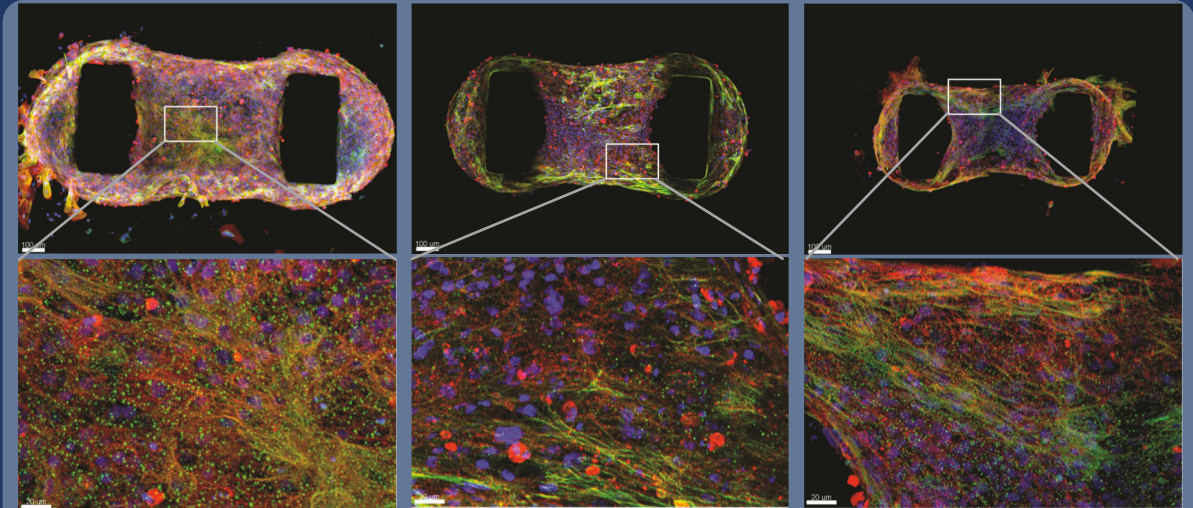
2. Methods | Miniaturized Engineered Heart Tissues

- Anisometrically downscaled
- Research (disease) mechanisms
- Volumes of cell-gel mix: 3, 2 and 1 μ L
- Test drug efficacy

Scale bars: 100 μ m



3. Results | Miniaturized EHTs show physiologically relevant sarcomere organization, contractile properties and drug efficacy

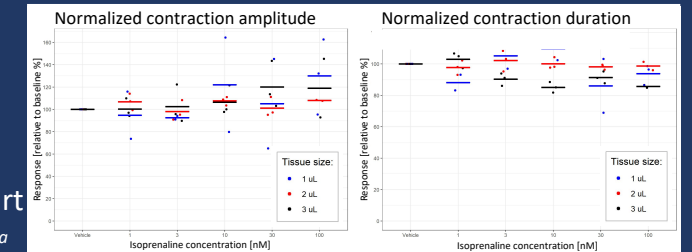


Immunofluorescence images of the three sizes of EHTs for cardiac specific markers: Alpha-actinin (red), Cardiac troponin-T (green), Nuclei: DAPI (blue) Scale bars: 100 and 20 μ m

Drug incubation (day 13):

- Isoprenaline 1-100 nM
- Increased contraction amplitude
- Decreased contraction duration
- Similar effects as in the human heart

Preliminary data



4. Conclusions | Miniaturized Engineered Heart Tissues ...

- ... containing solely hiPSC-derived cells were successfully formed
- ... express cardiac specific markers distributed over the whole tissue
- ... exhibited physiologically relevant contractile responses to Isoprenaline