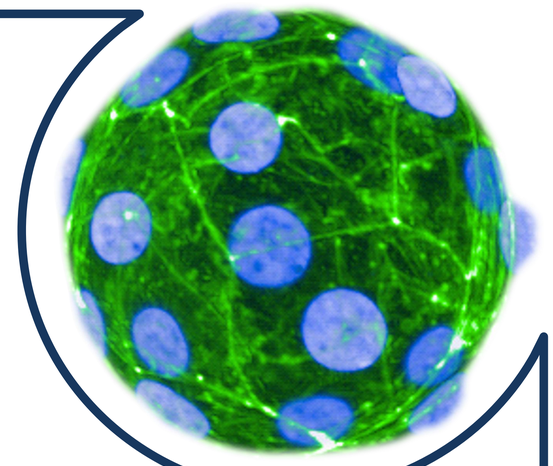
# 3D macroporous microgel scaffolds to expand and differentiate stem cells


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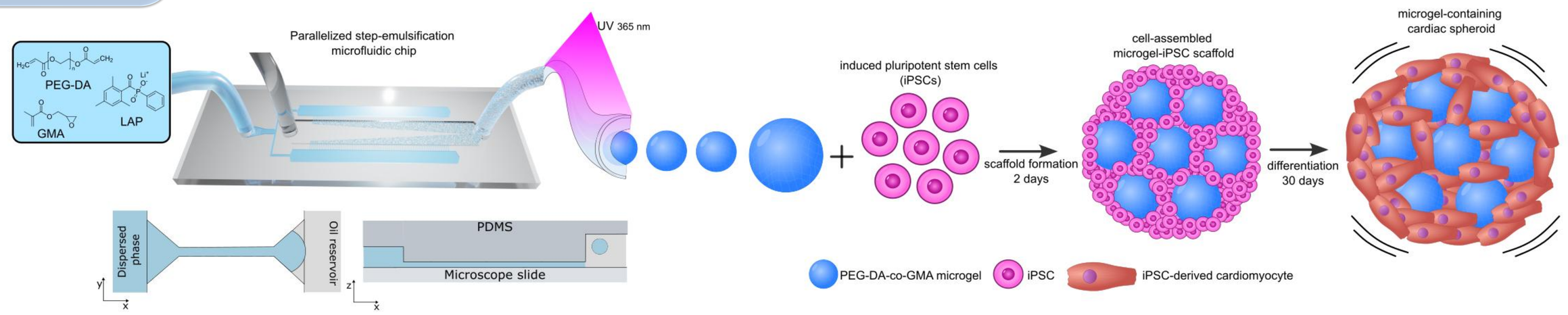




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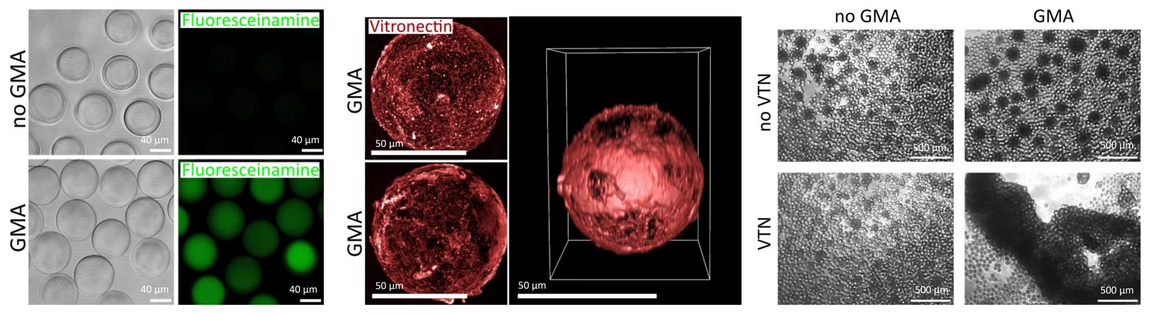

## Introduction



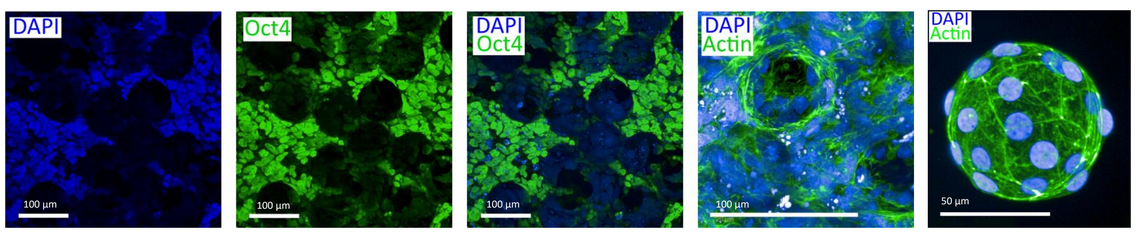

- PEG-DA microgels enable cell-assembled iPSC-microgel scaffolds, which allow for stem cell expansion and spheroid differentiation

## Vitronectin-coated microgels

- Microgels were produced via parallelized step emulsification, depicting a diameter of 80 µm
- Microgels were functionalized with Glycidyl methacrylate (GMA)
- GMA allowed for Vitronectin coating via amine-epoxy coupling

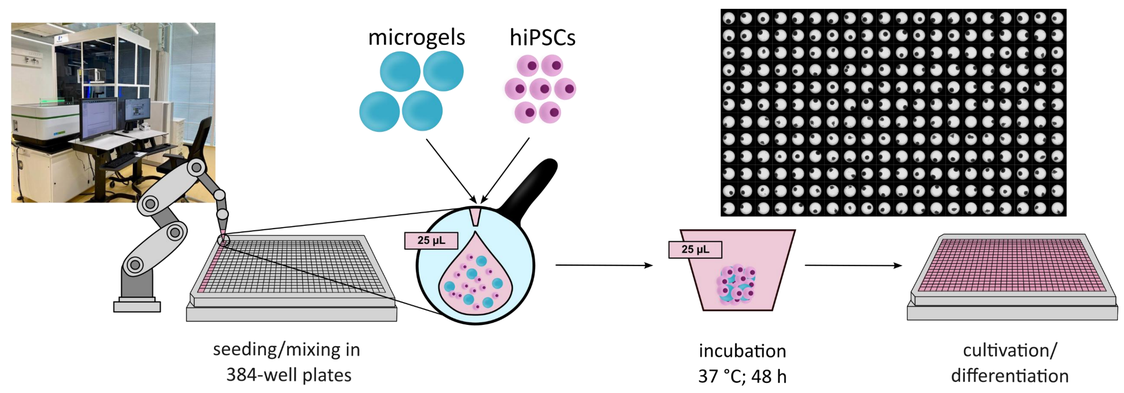


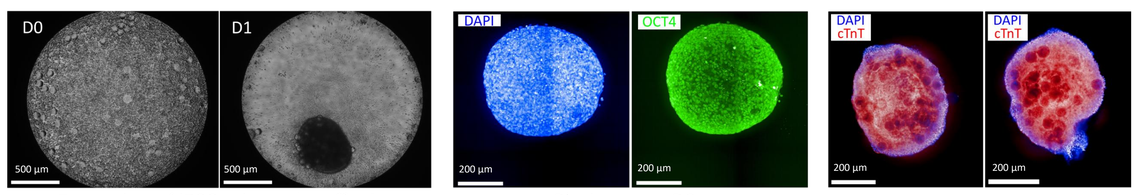

- Induced pluripotent stem cells (iPSCs) cultured with microgels exhibited Oct4 expression after 4 days, indicating maintenance of pluripotency
- Actin filament formation around the microgels demonstrates cell-material interaction




## Automated high-throughput production of iPSC-microgel cardiac spheroids

- The microgel-containing cardiac spheroids can be produced automated in a 384-well plate format
- The material and method are readily automation compatible
- No centrifugation step is needed, due to the cell-guided self-assembly of the scaffolds → complete automation possible

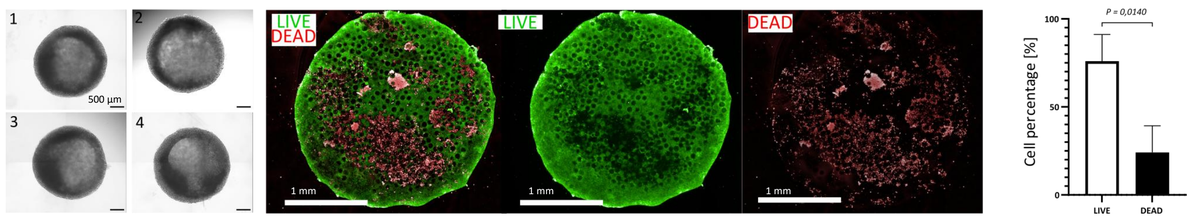


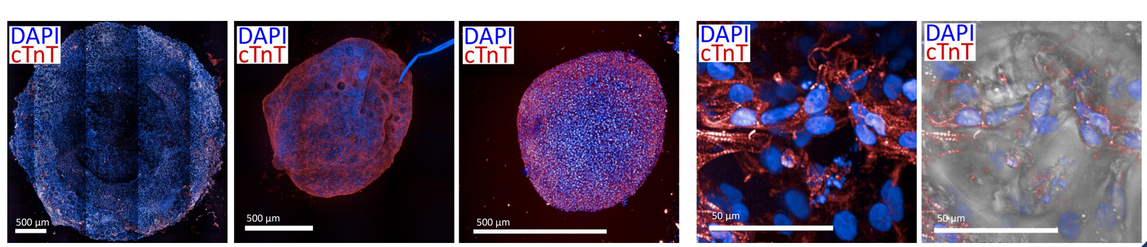

Formation of iPSC-microgel scaffold | Pluripotency D2 | cTnT expression and microgel distribution inside D30 scaffold

## Microgel-containing cardiac spheroids in different sizes

- Cell-guided assembly of iPSC-microgel scaffolds allows for the formation of stable mm-scale constructs, which are reproducible in shape and size
- The constructs have a viability of ~76 % at day 2 of culture




- Methods were developed to allow for the production of iPSC-microgel scaffolds in different scales: 24-well plate (Ø ~ 3 mm), 96-well plate (Ø ~ 0.8 mm), 384-well plate (Ø ~ 0.5 mm)
- Scaffolds of all scales were successfully differentiated into functional, uniform beating cardiac spheroids (cardiac Troponin T (cTnT) expression) without necrotic core formation (microgels enhance oxygen and nutrient diffusion in the spheroid)




## Conclusion

- This material and method propose an animal-free way for the reproducible production of cardiac spheroids
- It therefore poses a huge potential for drug screening and disease modelling in high-throughput settings

## References and Acknowledgements


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