

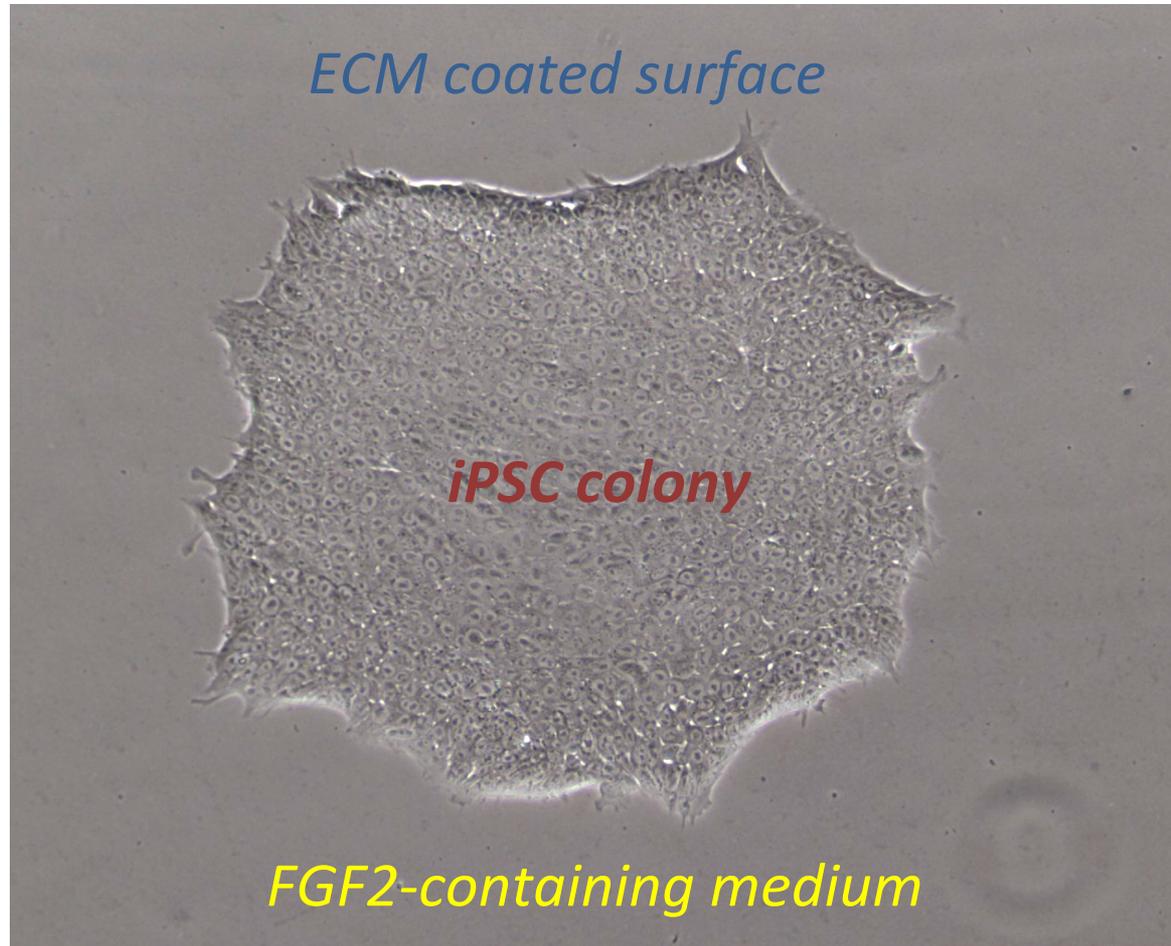


# induced Pluripotent Stem Cell- derived cardiomyocytes

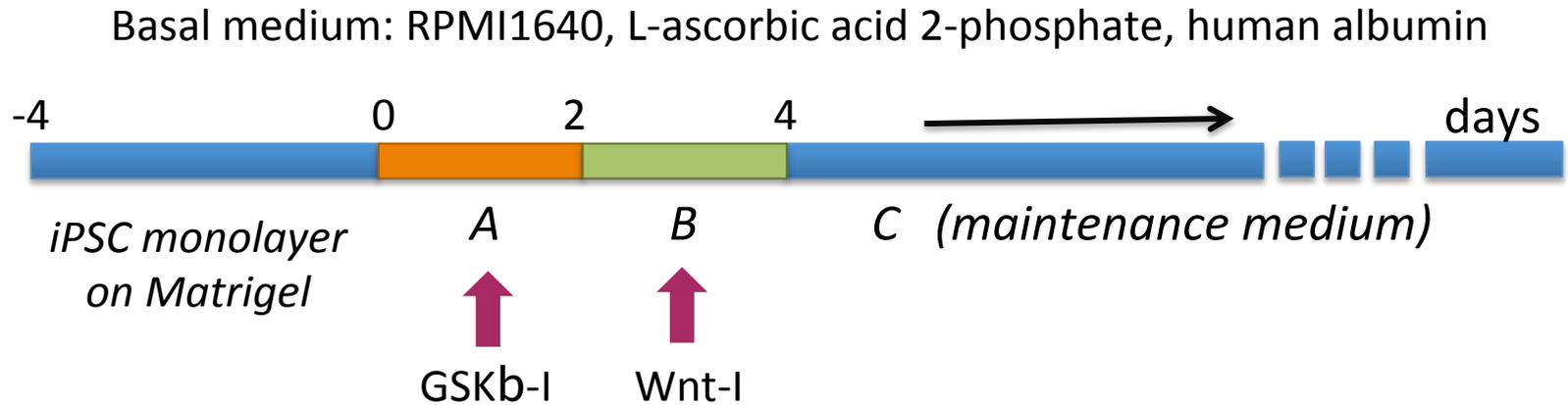


Patrizia Dell'Era  
*Cellular Fate Reprogramming Unit*  
University of Brescia

# human iPSC culture

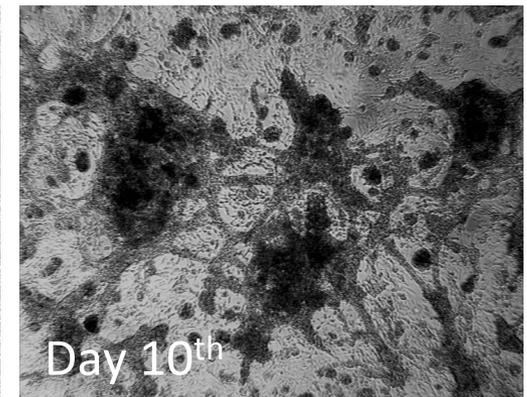
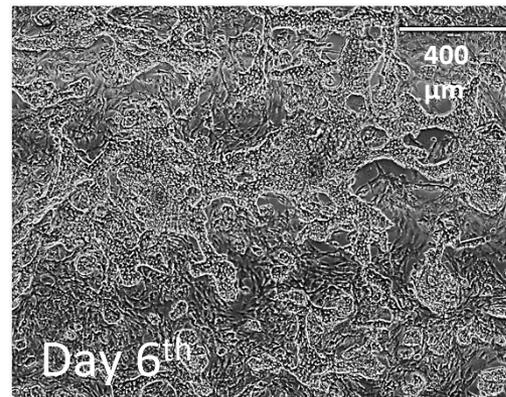
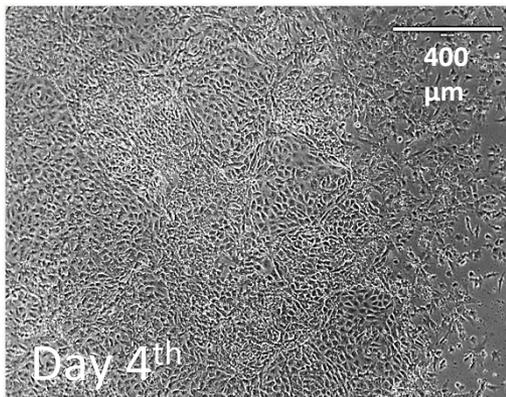


# The protocol we are currently using

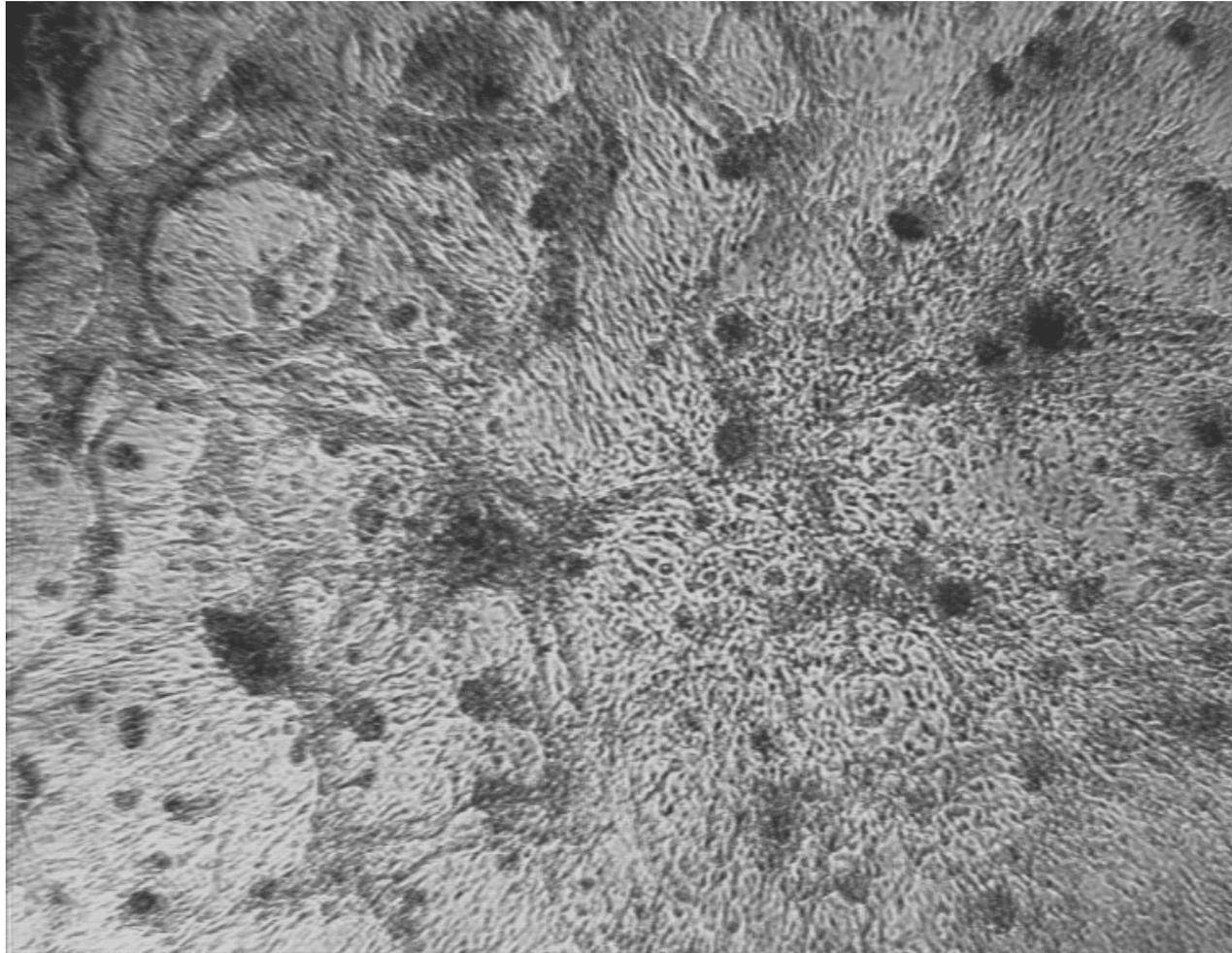


## PSC Cardiomyocyte Differentiation Kit Prototype

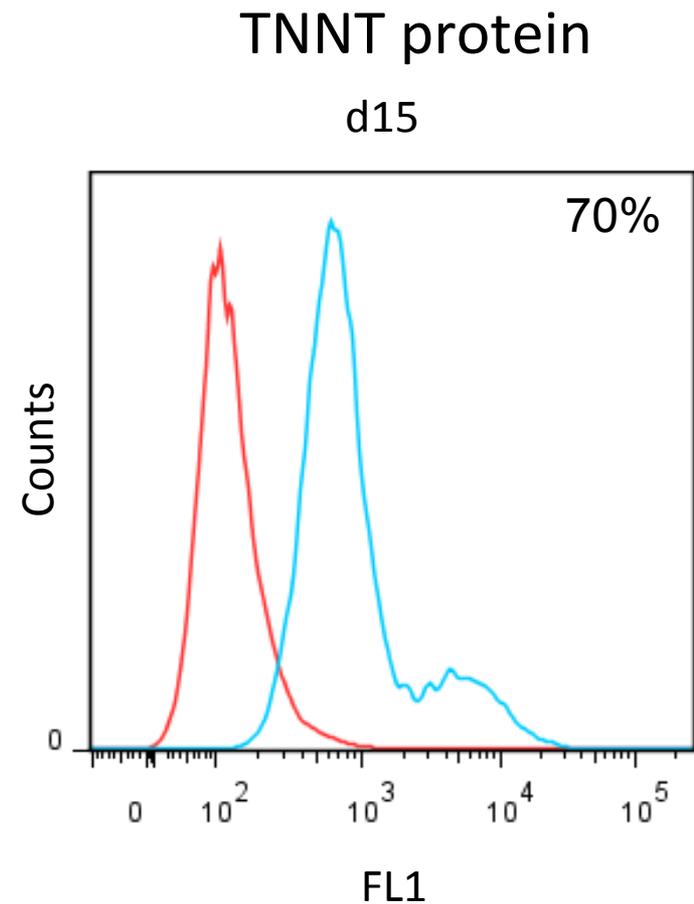
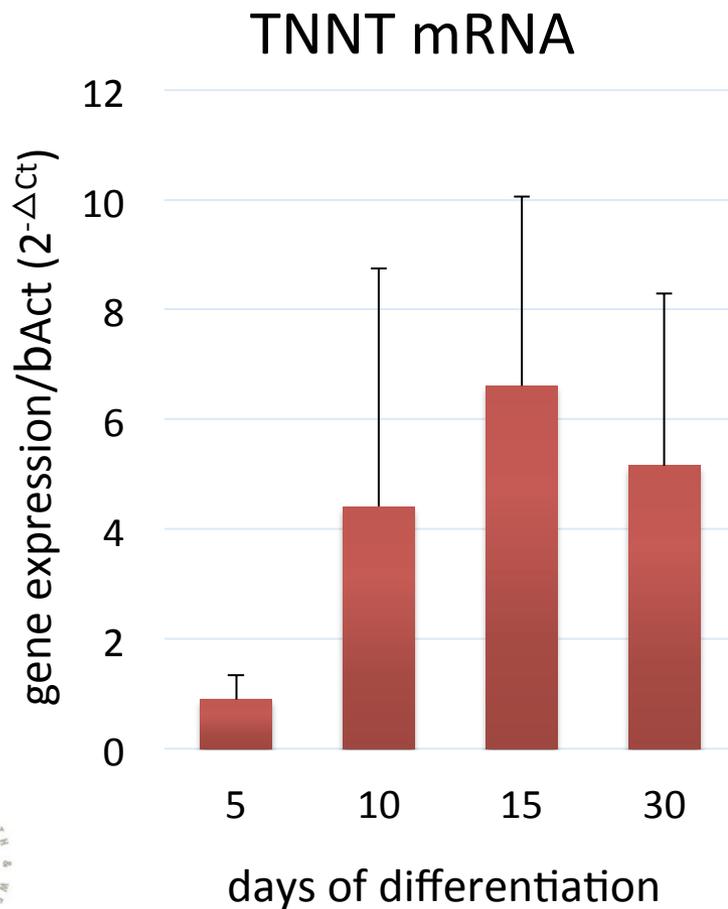
**gibco**  
Life Technologies



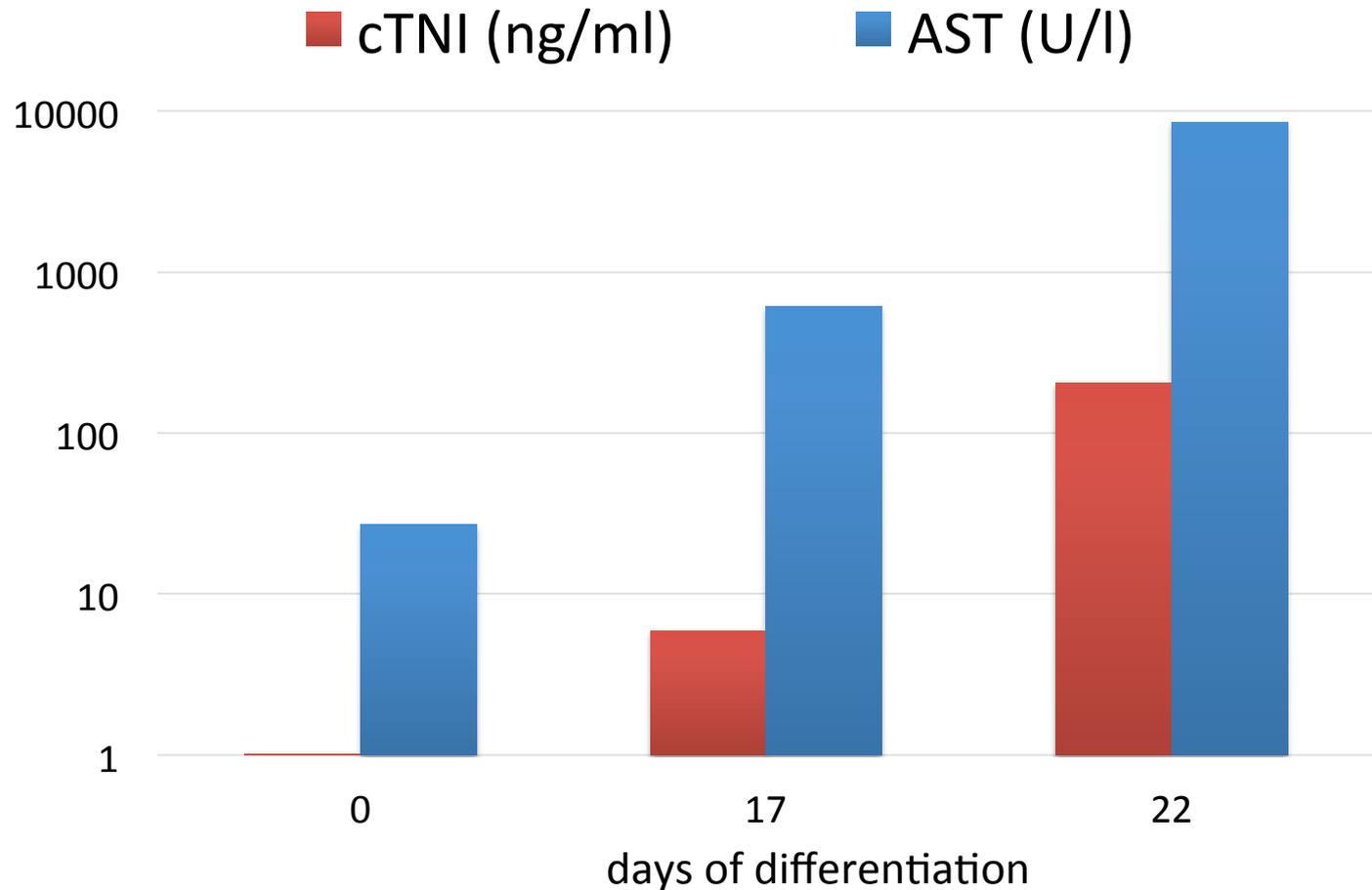
# iPSC-derived cardiomyocyte differentiation



# iPSC-derived cardiomyocyte: *quantification of differentiation*



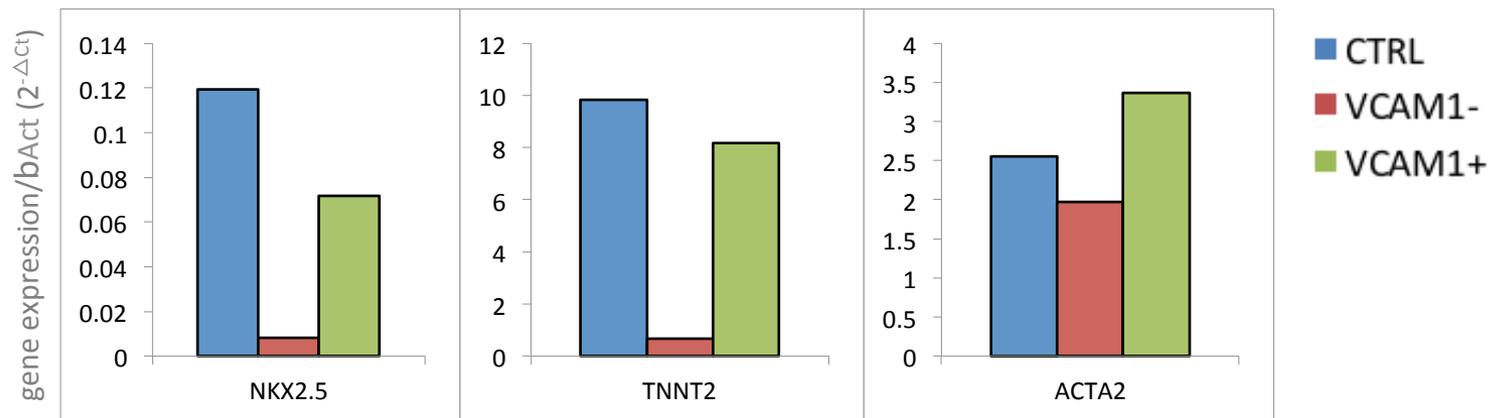
# iPSC-derived cardiomyocyte: *quantification of differentiation*



# iPSC-derived cardiomyocyte: *isolation*

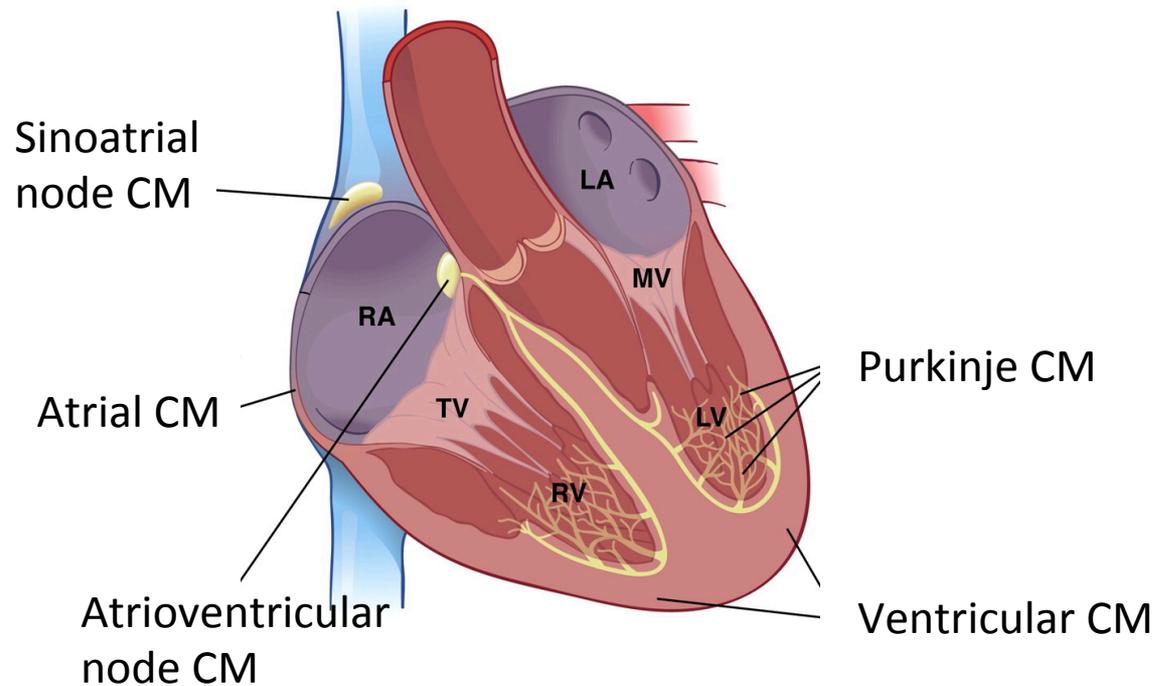
FLOW CYTOMETRY	d15
TNNT	70%
VCAM1 (CD106)	27.3%
SIRPA (CD172)	20%
CD106/CD172	7%

## VCAM1 sorting at day 15



# Questions

- What type of cardiomyocyte is emerging from differentiation?



# Questions

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- What type of cardiomyocyte is emerging from differentiation?
  - Which is the age of these cells?

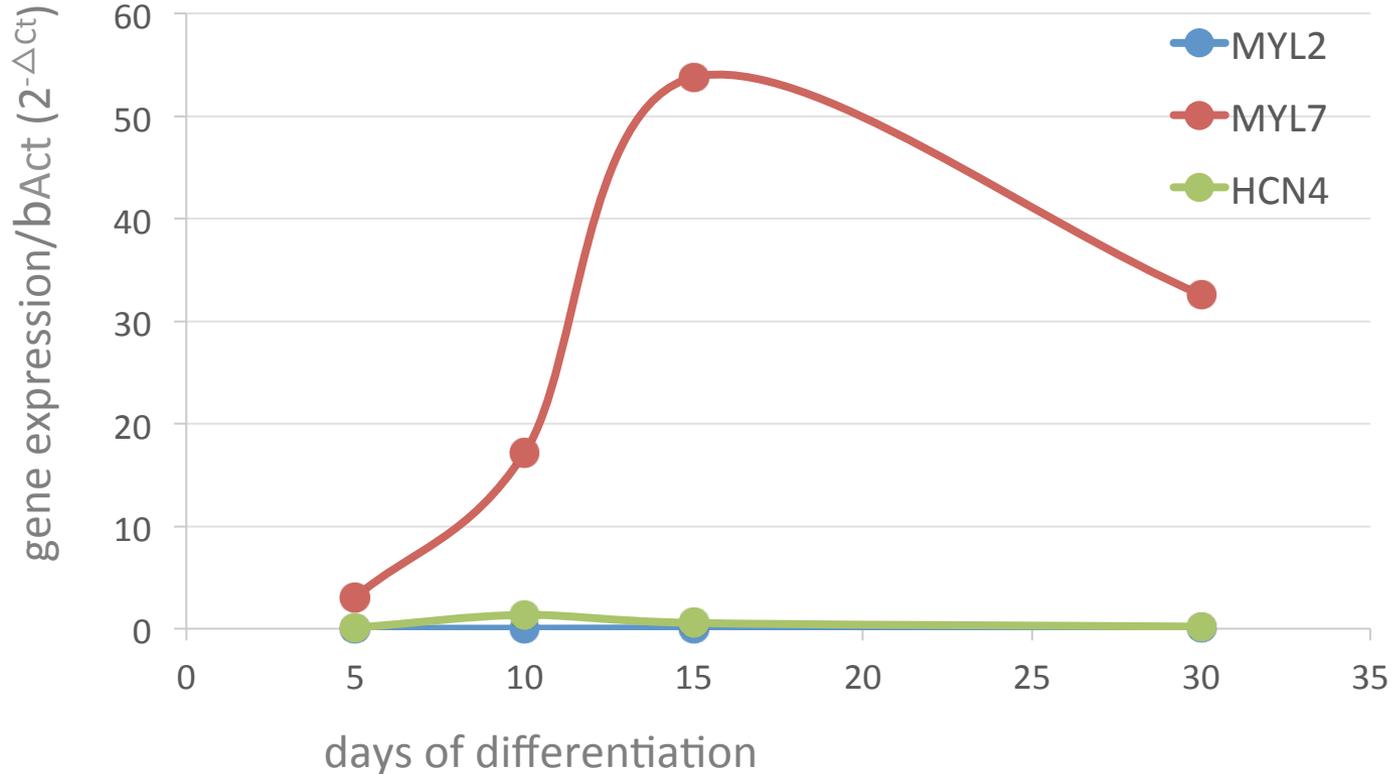


# iPSC-derived cardiomyocyte: *type*

*MYL7: embryonal/atrial myosin light chain*

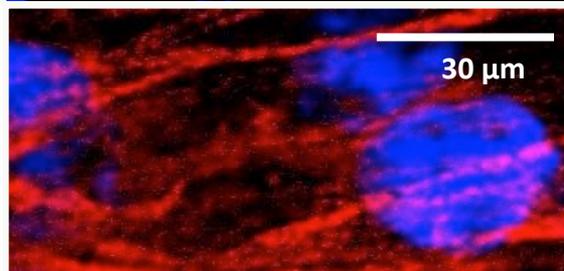
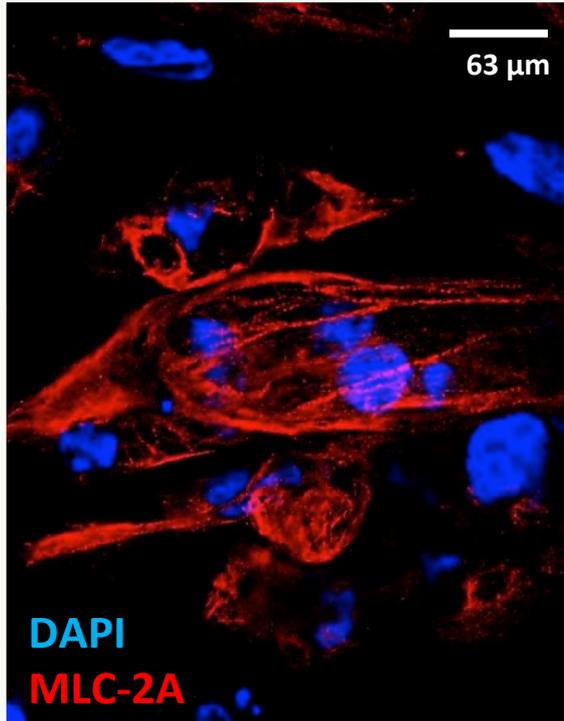
*MYL2: ventricular myosin light chain*

*HCN4: nodal marker*

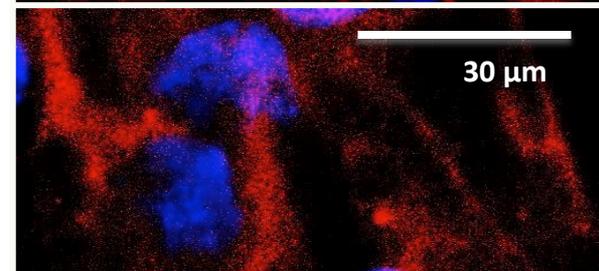
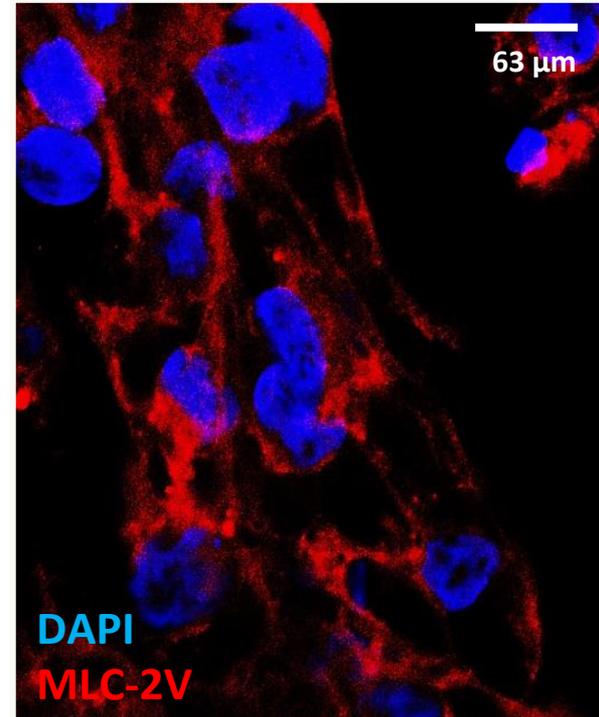


# iPSC-derived cardiomyocyte: *type*

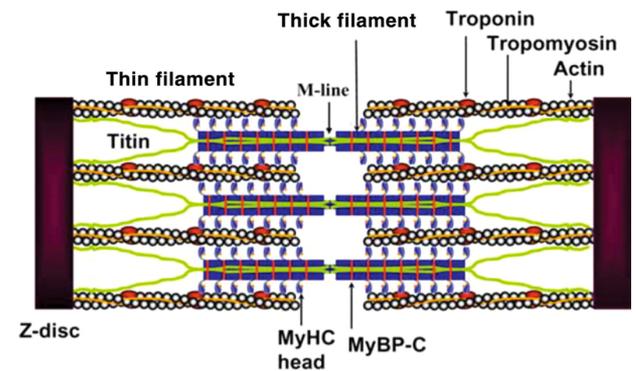
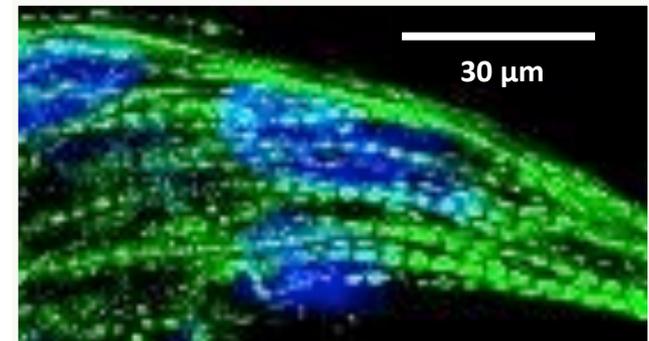
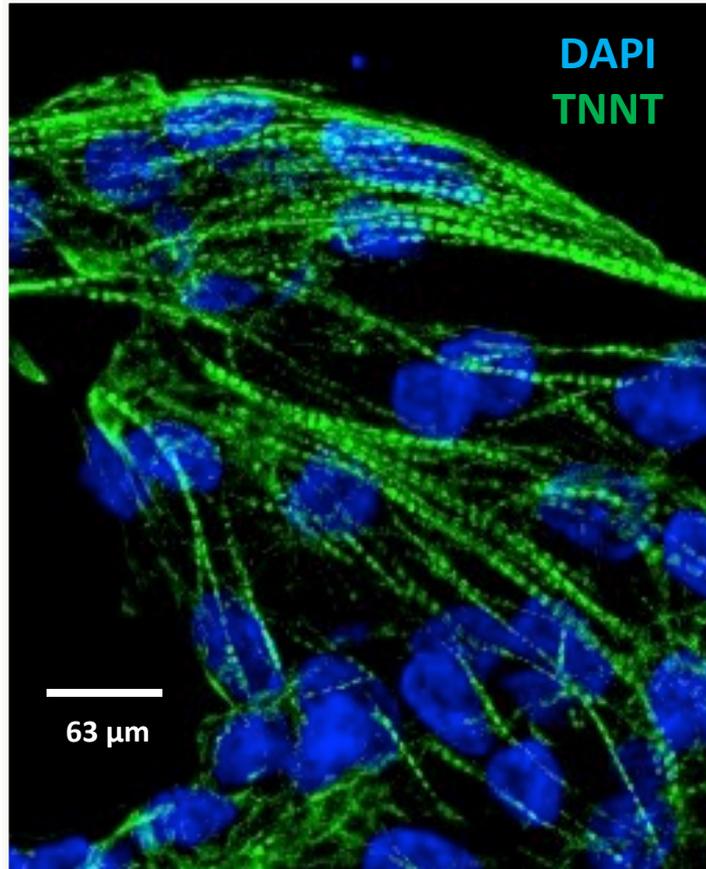
*Embryonal/Atrial myosin light chain*



*Ventricular myosin light chain*

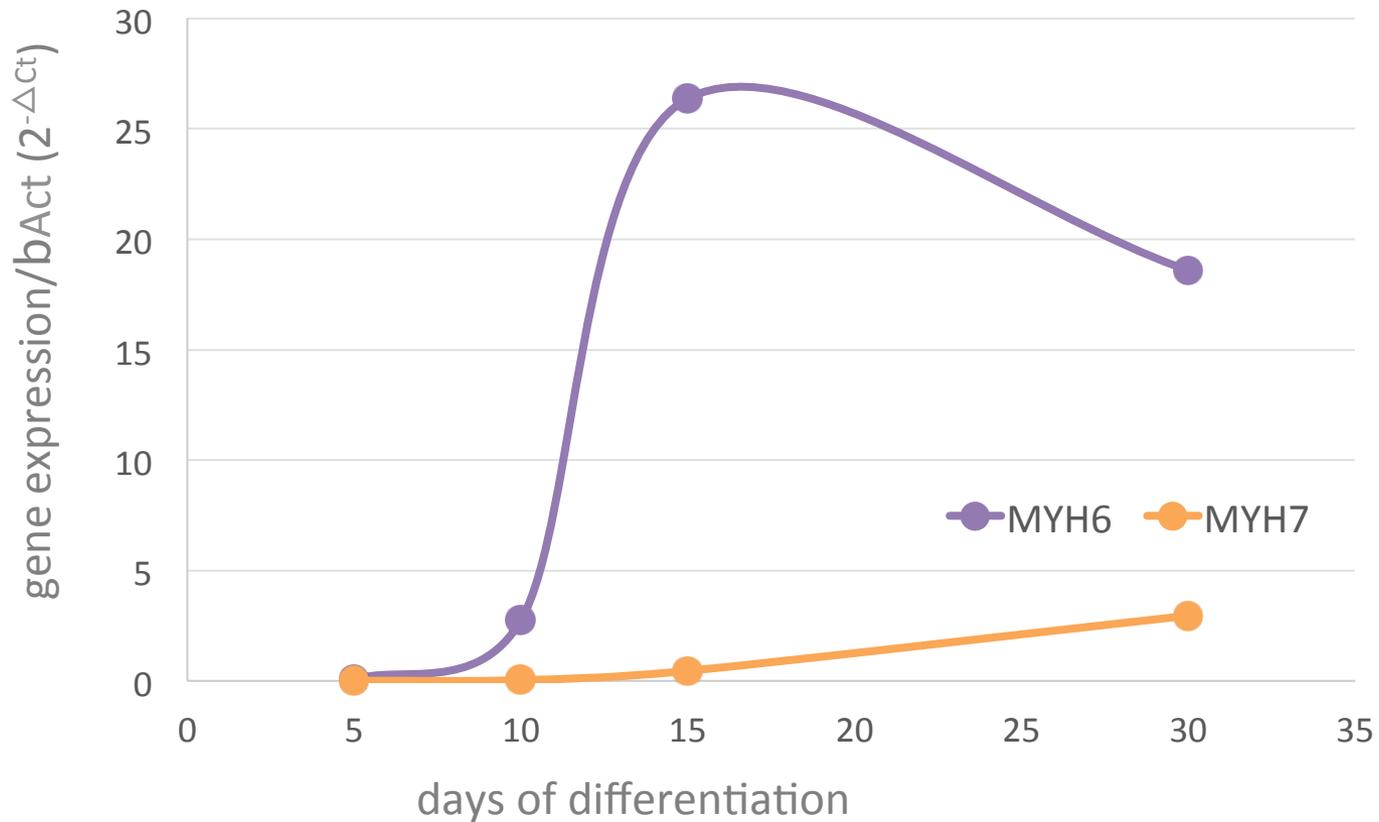


# iPSC-derived cardiomyocyte: *age*



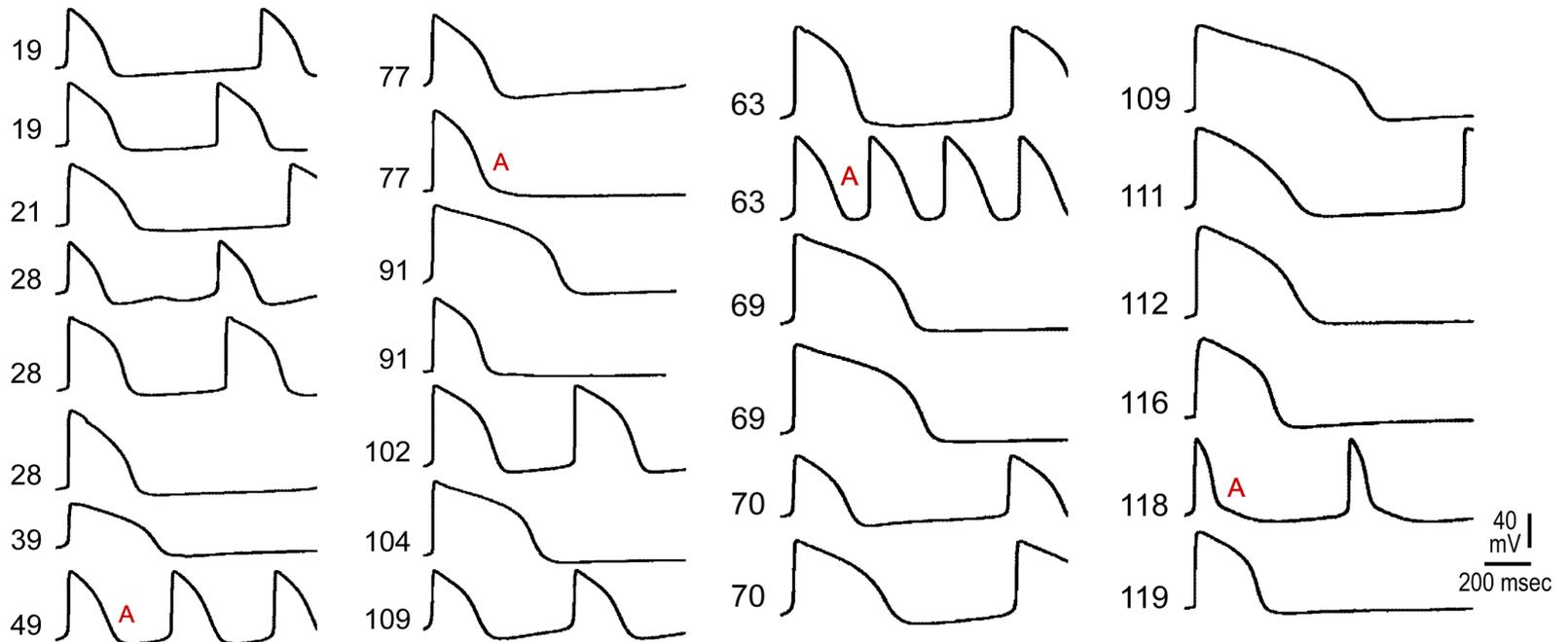
# iPSC-derived cardiomyocyte: *age*

*MYH6: embryonal myosin heavy chain*  
*MYH7: adult myosin heavy chain*



# iPSC-derived cardiomyocyte

*age*



# Strategies to enhance CM maturation

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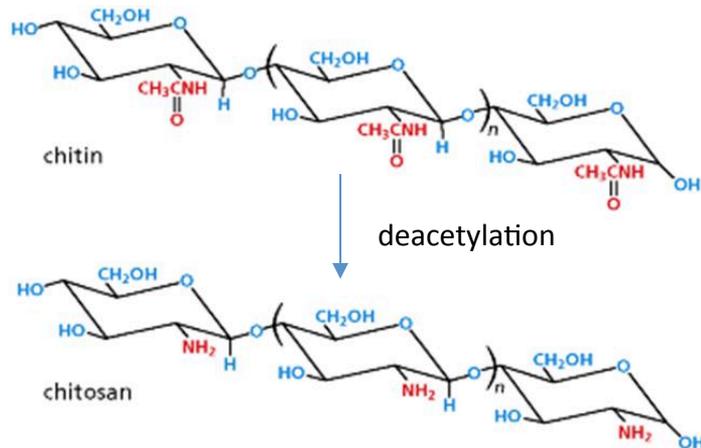
1. Long term culture
2. Substrate stiffness
3. Cell patterning
4. Contraction stress
5. Electrical stimulation



# Electrodeposited scaffold

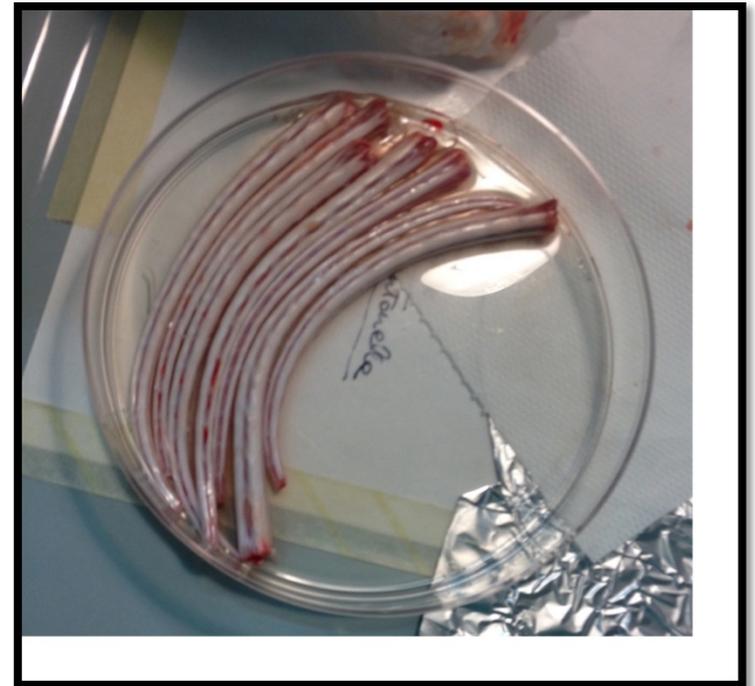
## Chitosan

(derived from shrimp's shell)

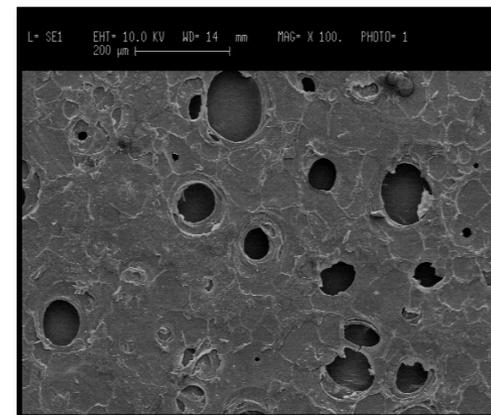
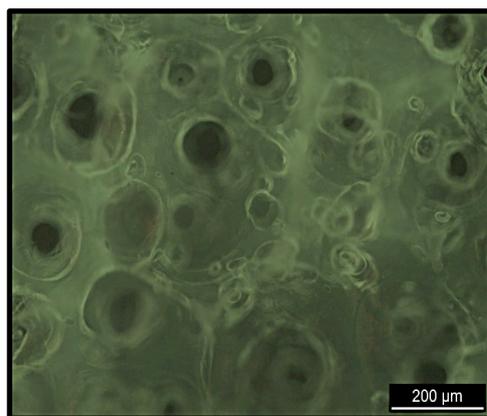
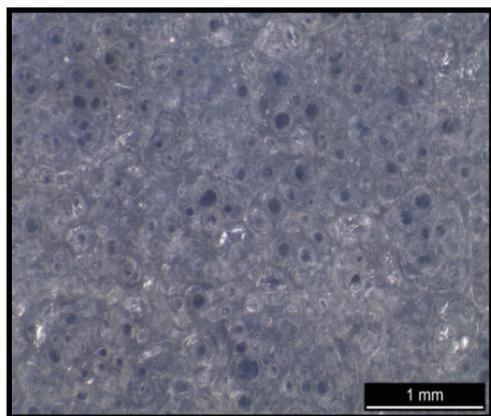


## Collagen

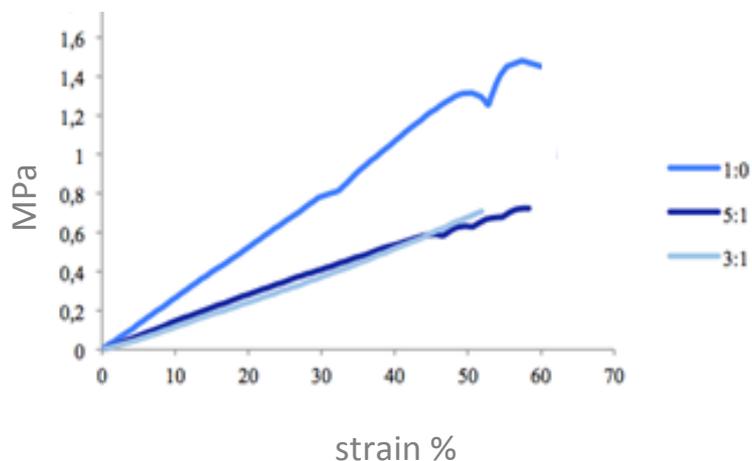
(extracted from rat tails)



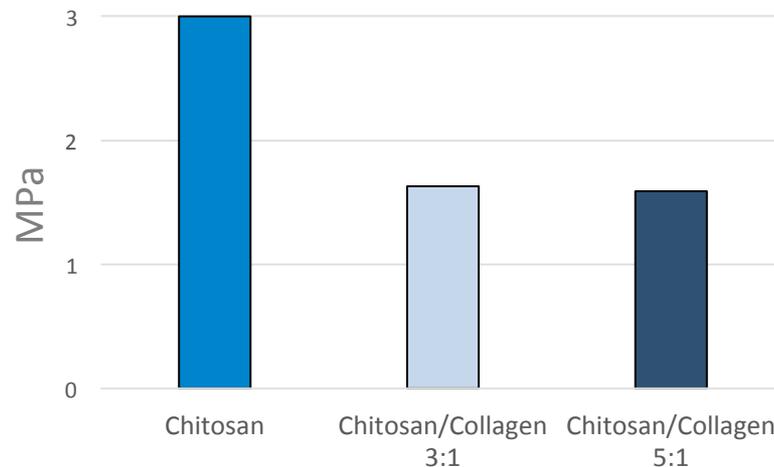
# Chitosan collagen scaffold characterization



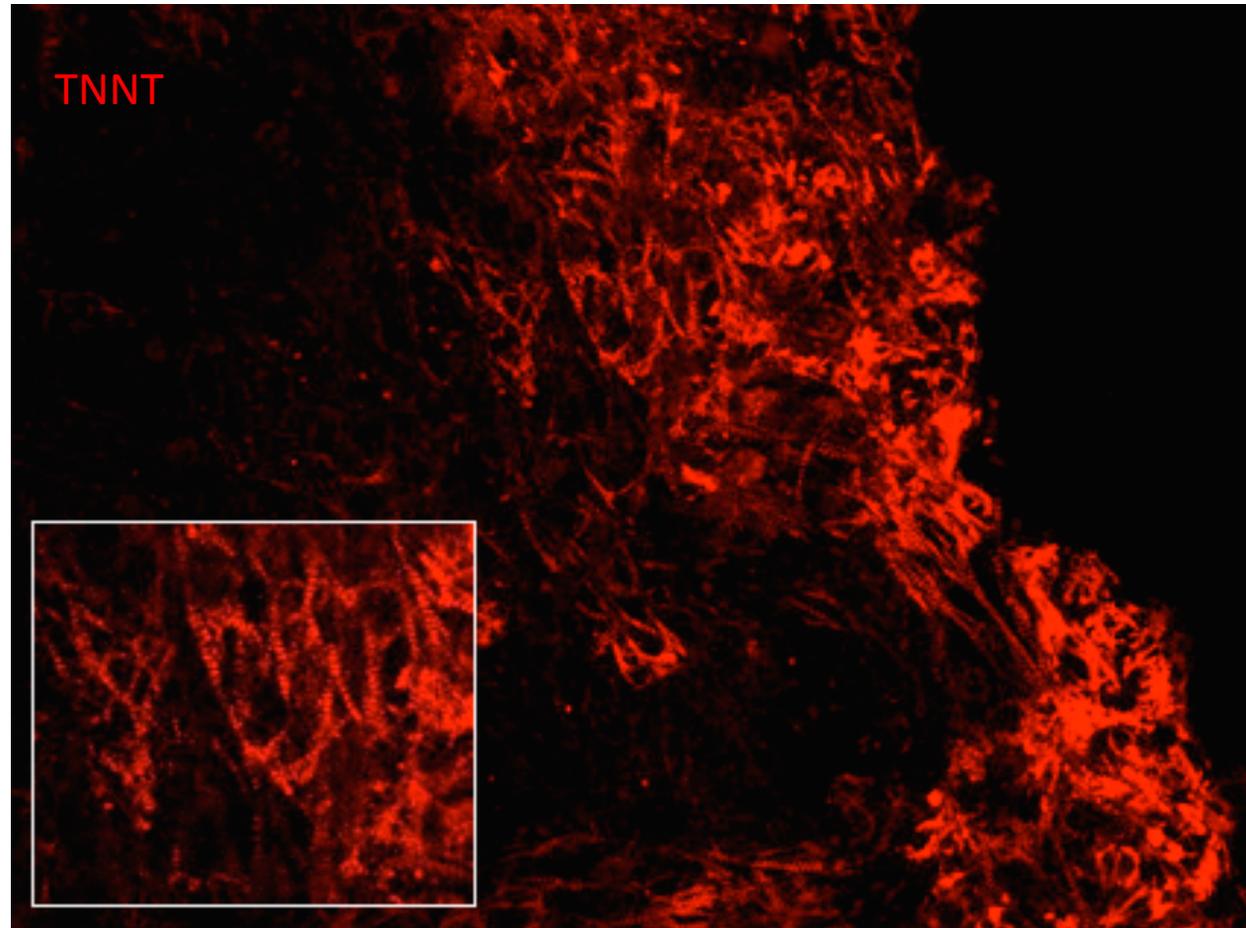
Stress and strain graph



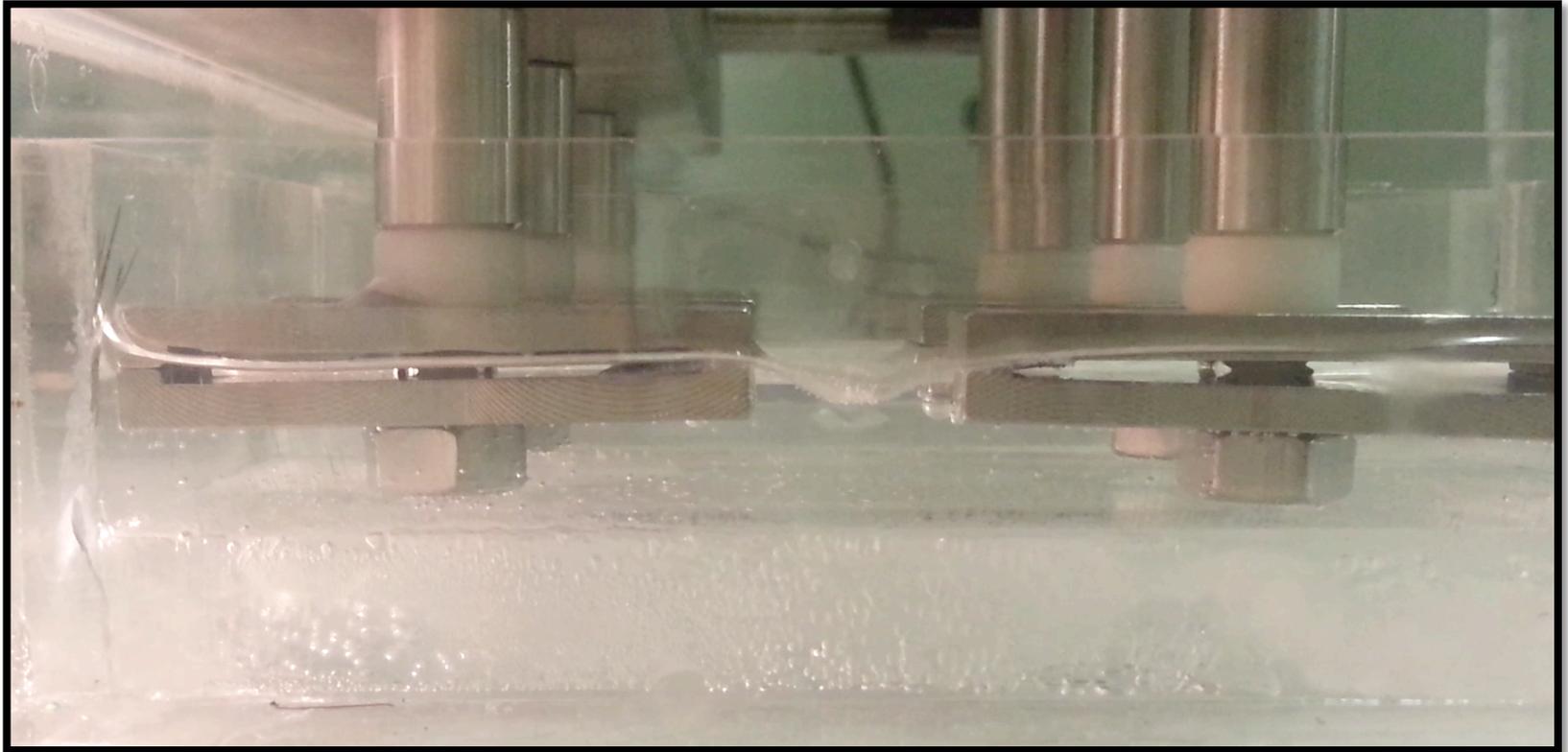
Young's moduli



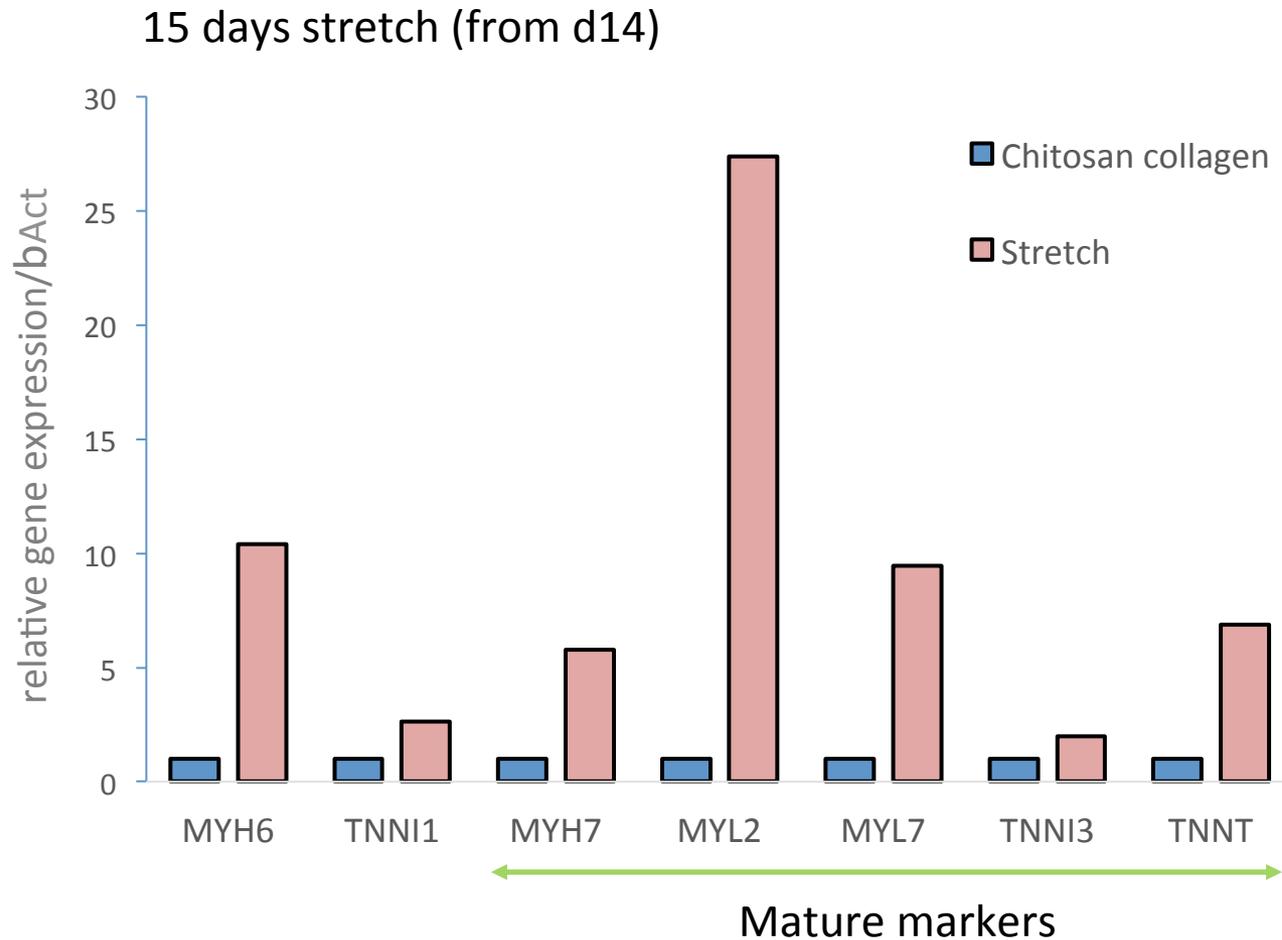
# iPSC-derived cardiomyocytes on chitosan/collagen scaffold



# Stretch-mediated cardiomyocyte maturation



# Stretch-mediated cardiomyocyte maturation



# In conclusion

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- ✓ It is now relatively easy to obtain iPSC-derived cardiomyocytes
- ✓ iPSC-derived cardiomyocytes are closely related to fetal/embryonal cardiomyocytes
- ✓ Studies and applications of iPSC-derived cardiomyocytes implies their functional maturation



# UniBS Collaborators



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Antonella Consiglio

*Faculty of Engineering*  
Emilio Sardini  
Mauro Serpelloni  
Danilo Febbrari



*Er Xia*



*Elisabetta Crescini*



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*IBEC Barcelona*

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Elisa Di Pasquale  
*Istituto clinico Humanitas*  
*Rozzano, Milano*

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Giulia Campostrini  
*Dipartimento di Bioscienze*  
*Università di Milano*

Luigi De Nardo  
Lina Altomare  
*Dipartimento "G. Natta"*  
*Politecnico di Milano*

Rosanna Verardi  
  
*Spedali Civili*  
*Brescia*

## Funding



fondazione  
cariplo



Thanks for your attention!



obrigado

Dank U

Merci

mahalo

Köszi

спасибо

Grazie

Thank  
you

mauruuru

Takk

Gracias

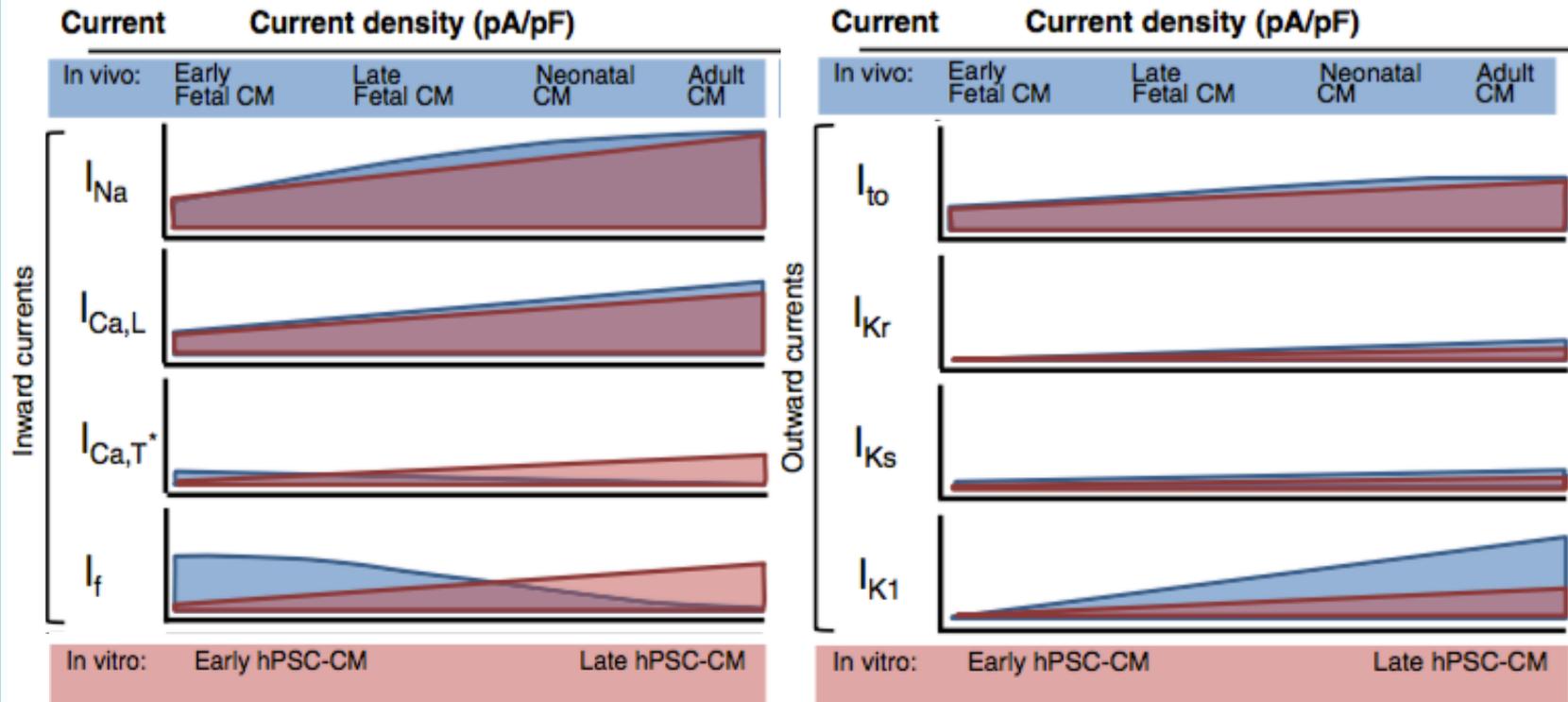
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Děkuju

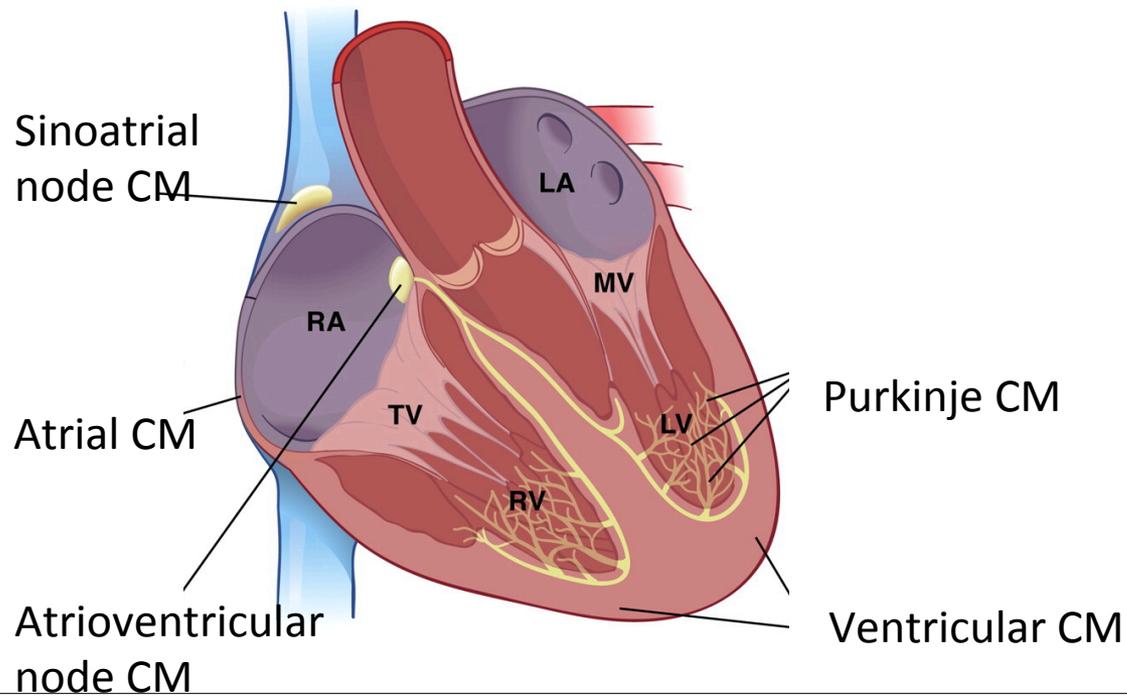
danke

Kiitos

# iPSC-derived cardiomyocyte age



# Type of cardiomyocyte



# hPSC-derived cardiomyocytes

