Cell transplantation and cardiac recovery

Myocardial regeneration from endogenous cardiac progenitor cells

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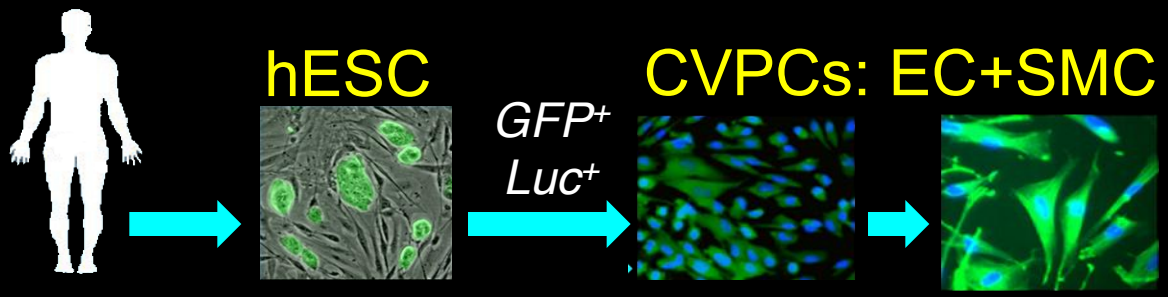
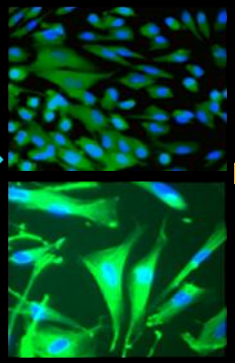
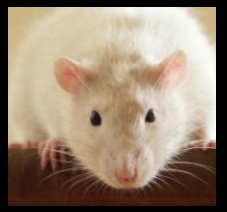
Professor of Medicine, Cardiology
University of Minnesota Medical School

Project Overview



Hill KL, et al. Exp Hemtol
Kaufman Lab

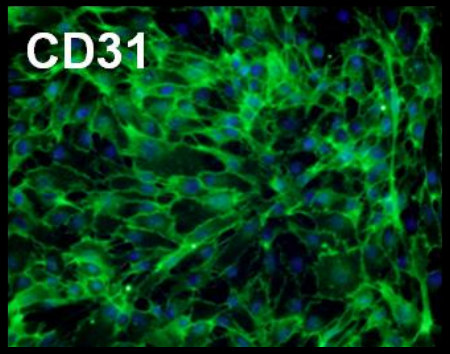


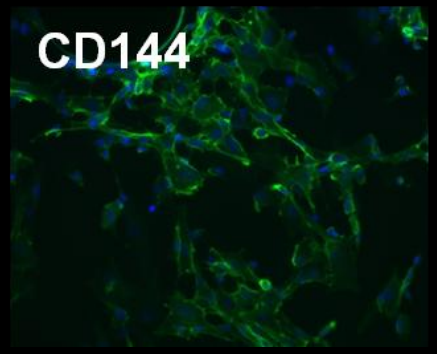


Xiong Q, et al. (2010) Stem Cells; unpublished data
Zhang Lab

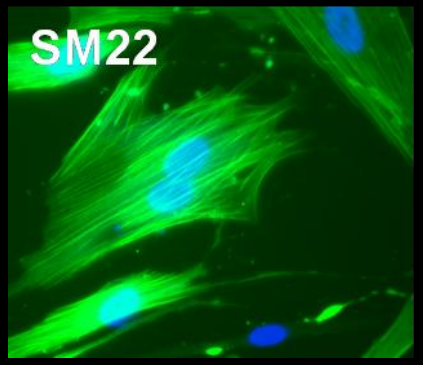
Human ESC-derived CVPCs consist of EC and SMC, and form tube-like structures synergically.

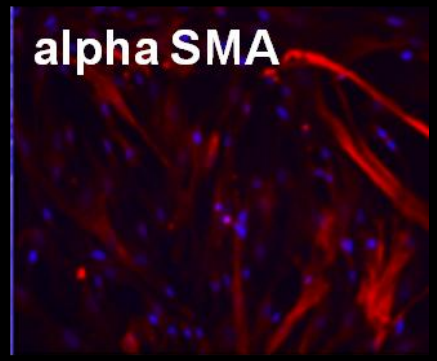
hESC-EC



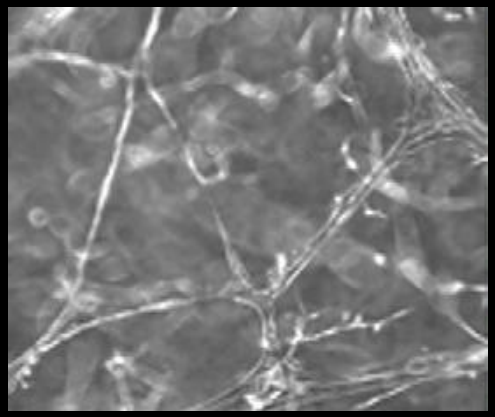


hESC-SMC

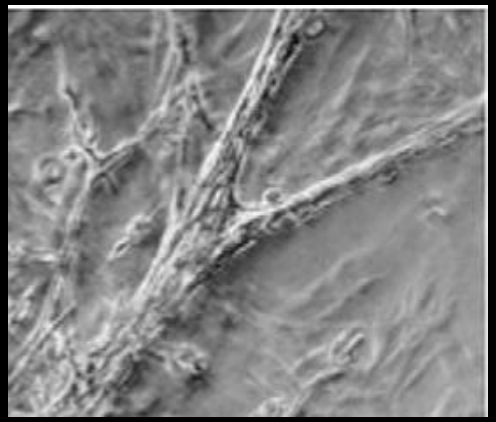


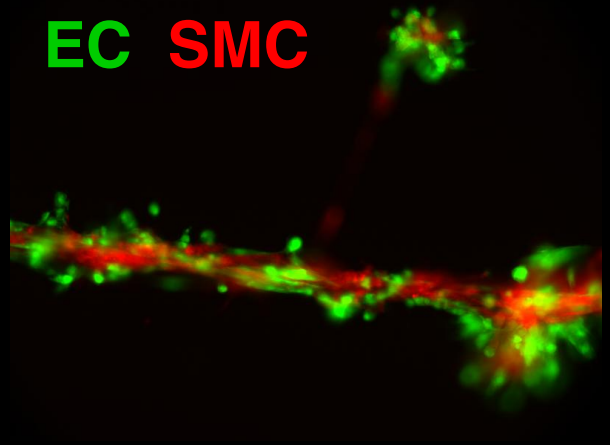


hESC-EC

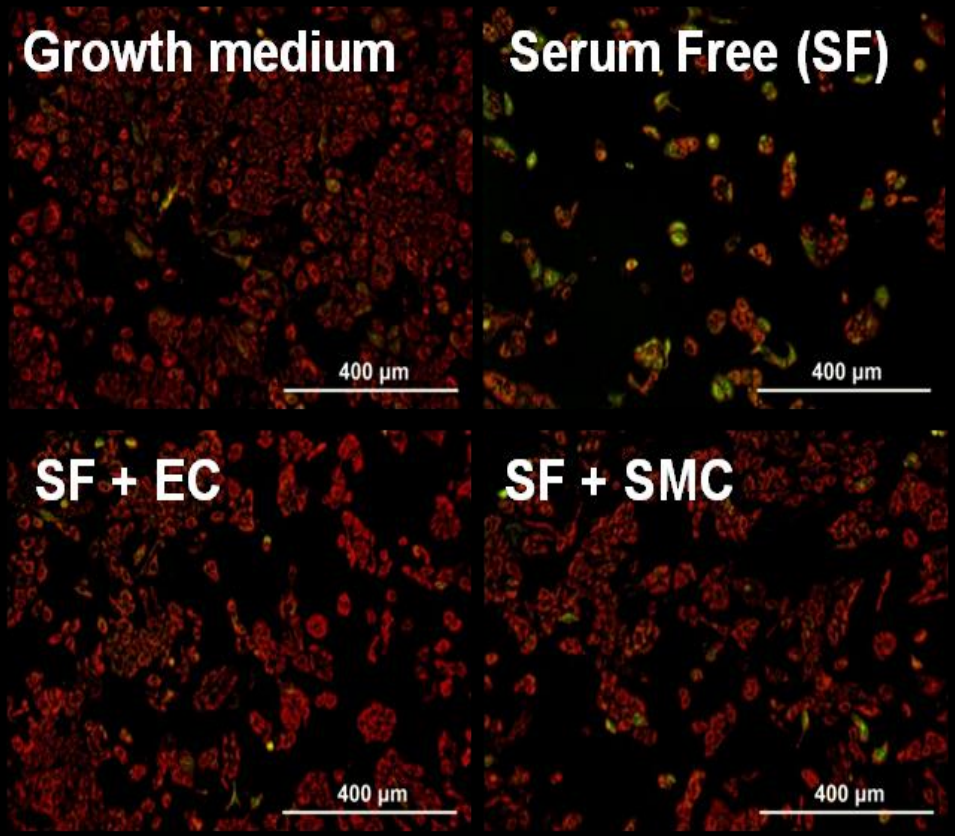


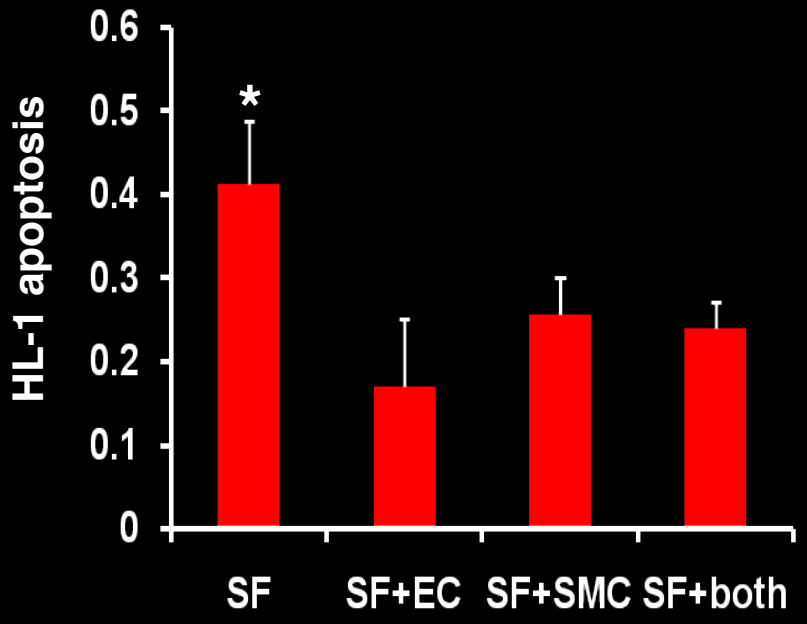
hESC-EC+SMC





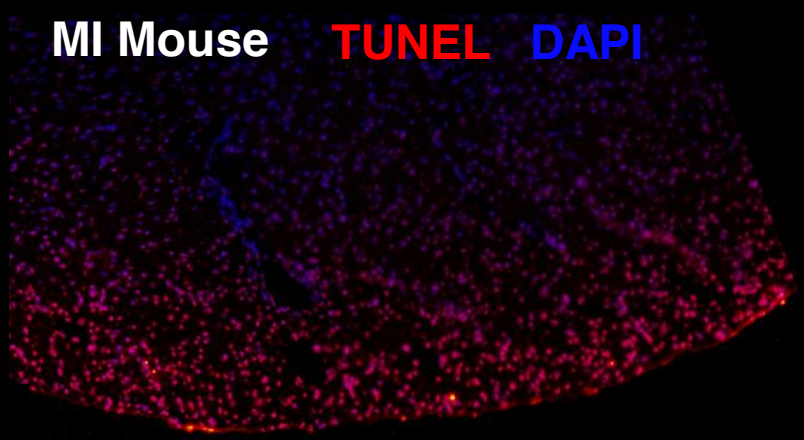
CVPCs inhibited the apoptosis of HL-1 cells that is induced by serum free culture.

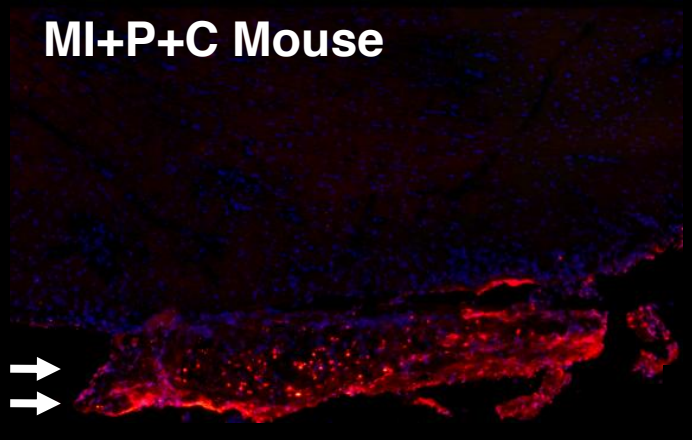


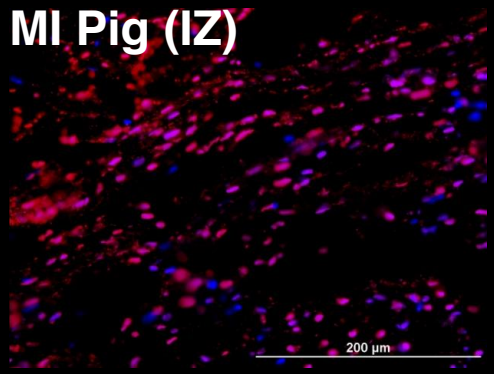


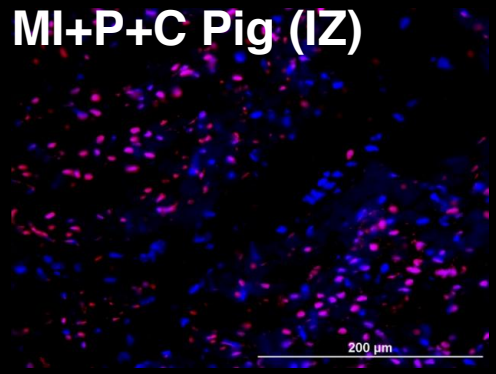
Viable cells Apoptotic cells

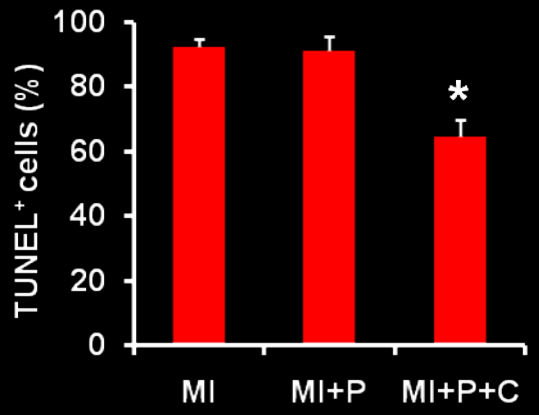
CVPCs inhibited the apoptosis of ischemic cardiomyocytes in vivo (TUNEL staining).





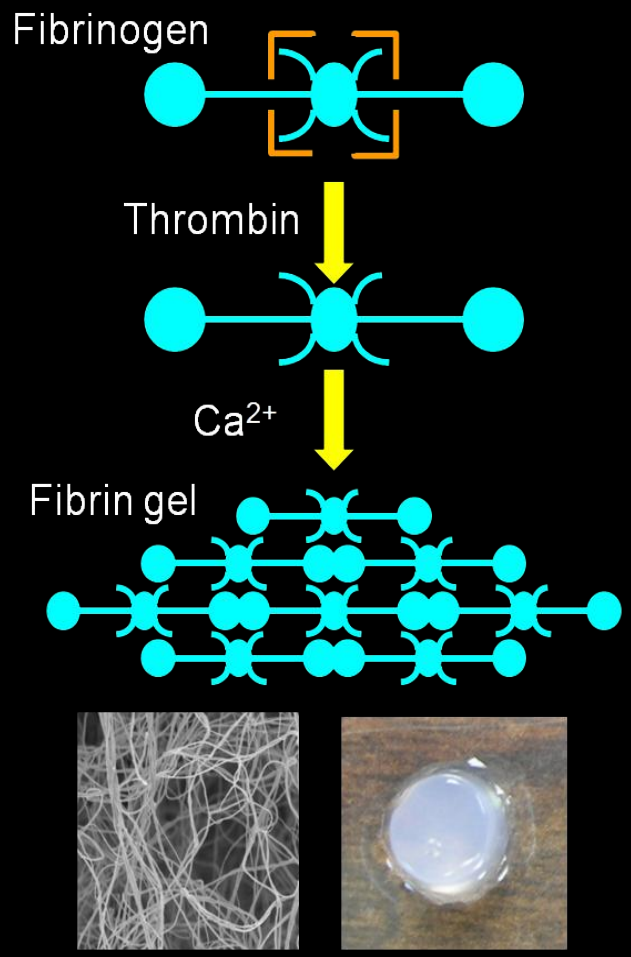


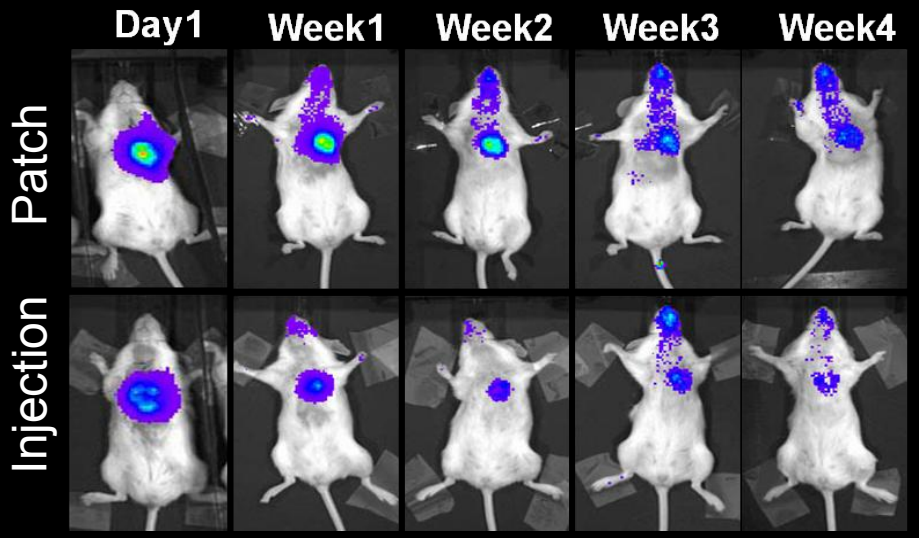


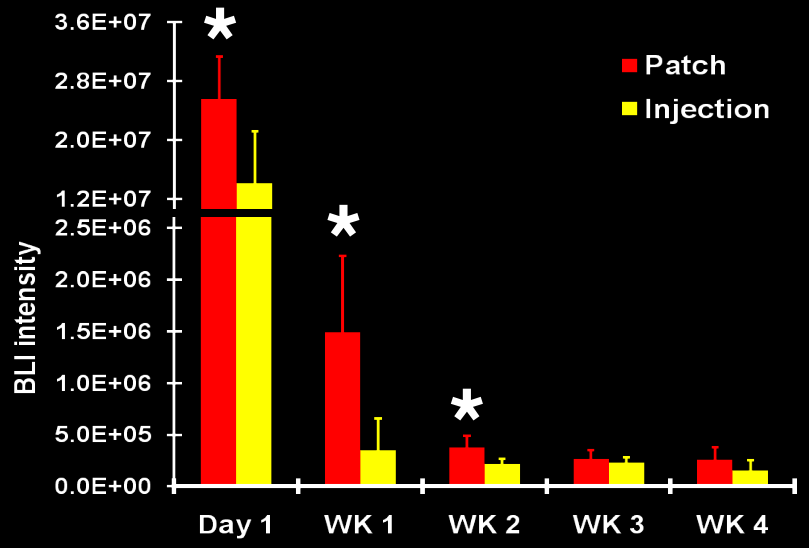


In vivo Mouse Study

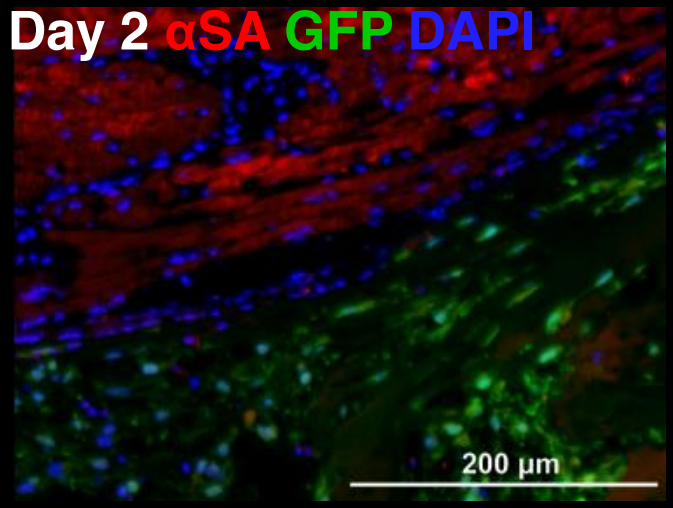
Fibrin patch provided better stem cell retention over time compared to injection method.

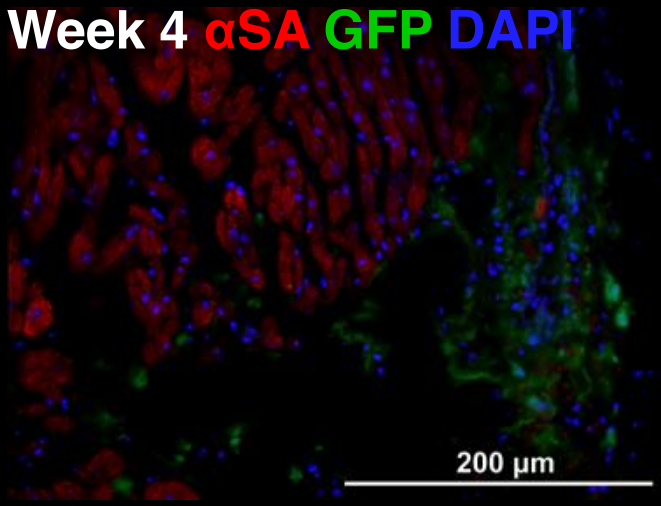


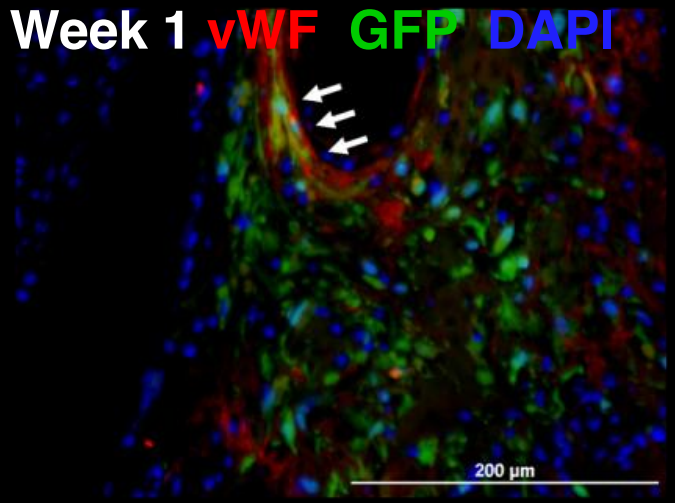


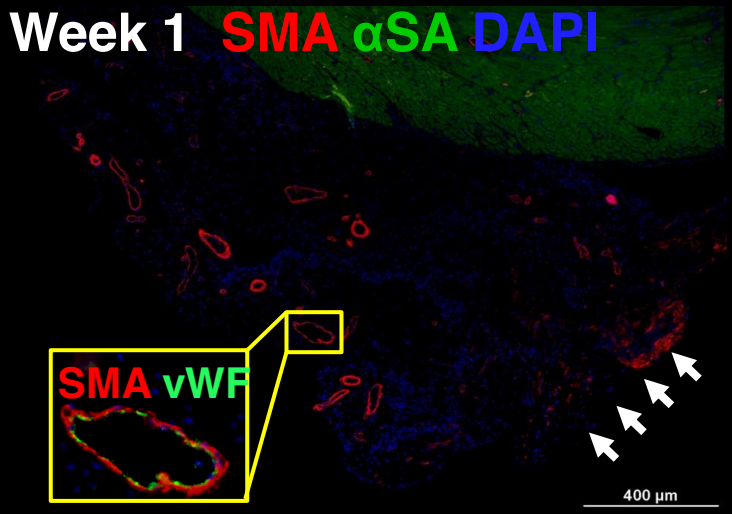


Fibrin patch-based delivery of CVPCs provided substantial cell engraftment.



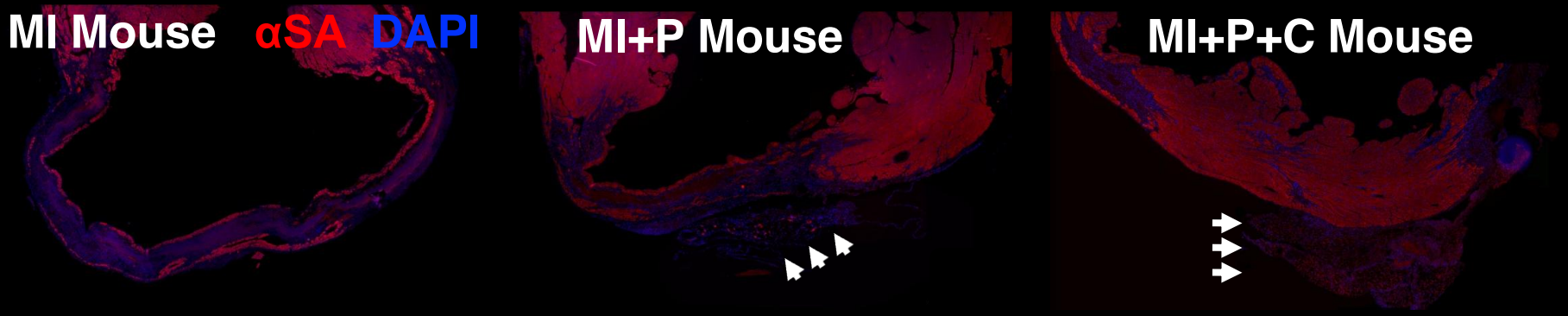


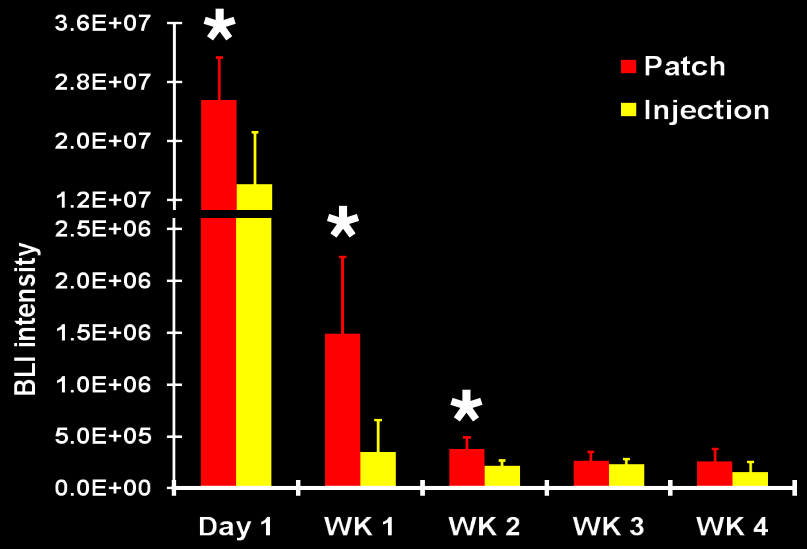


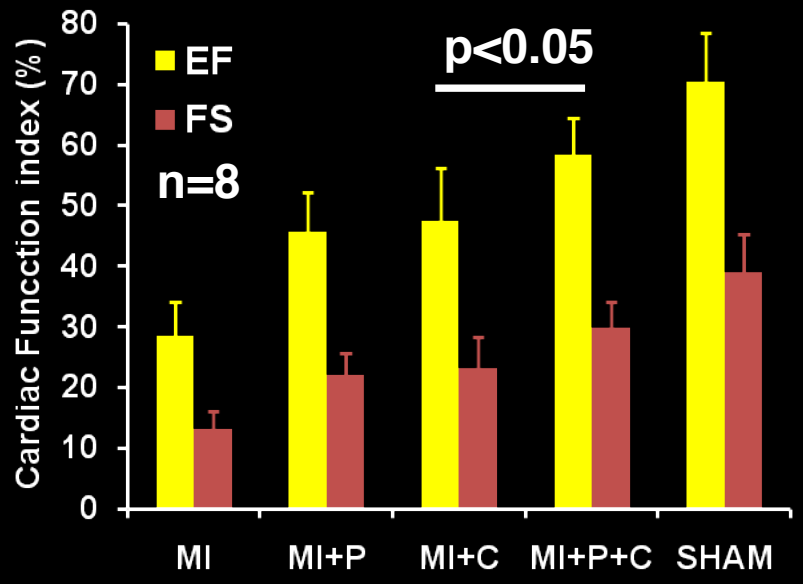


In vivo Mouse Study

CVPC patch transplantation efficiently prevented scar formation and resulted in better cardiac function outcome.

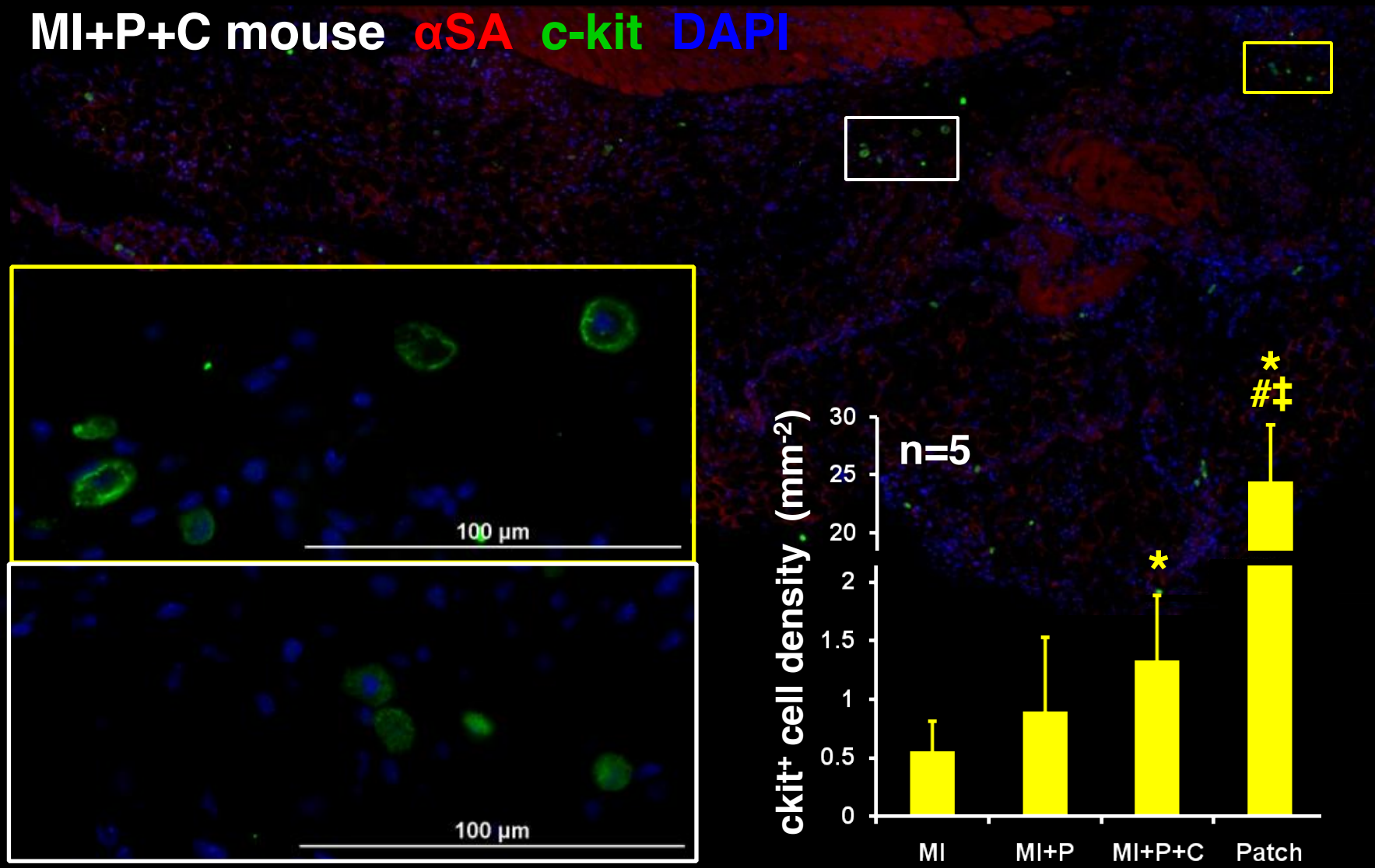






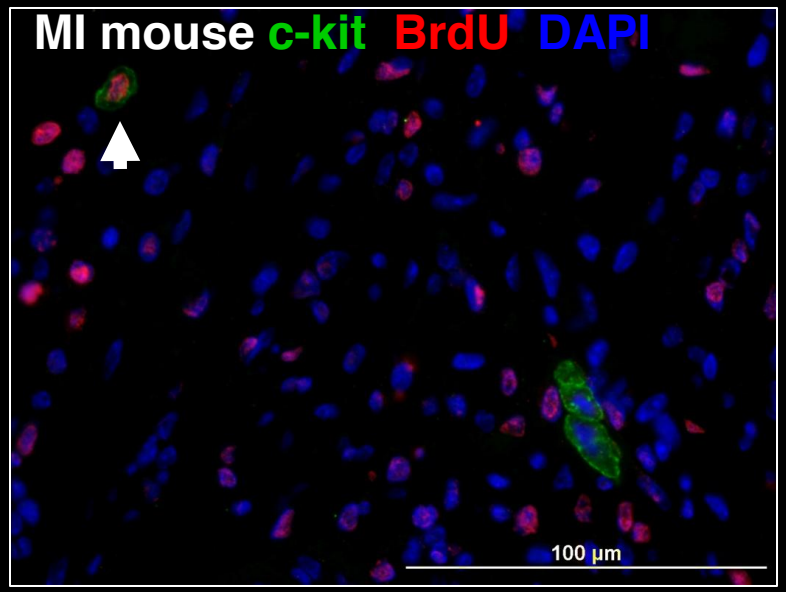
In vivo Mouse Study

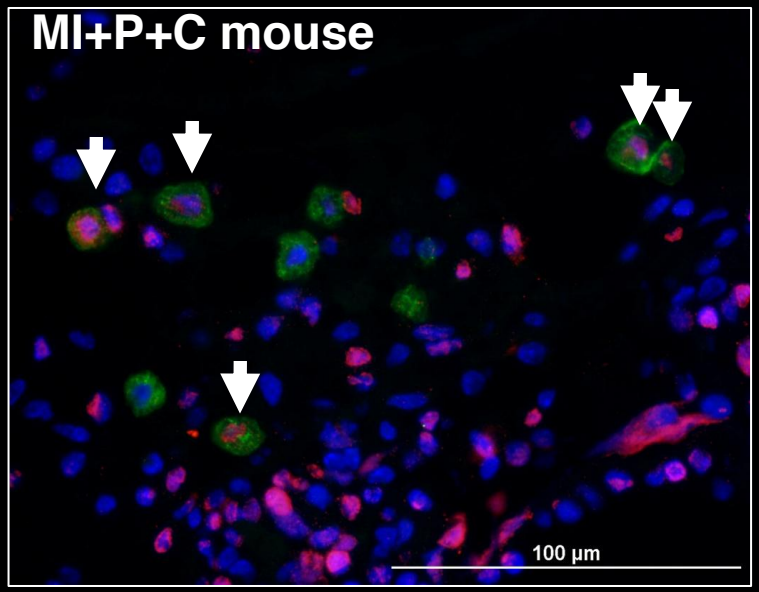
CVPC patch “recruited” endogenous ckit^{+} progenitor cells for repair.

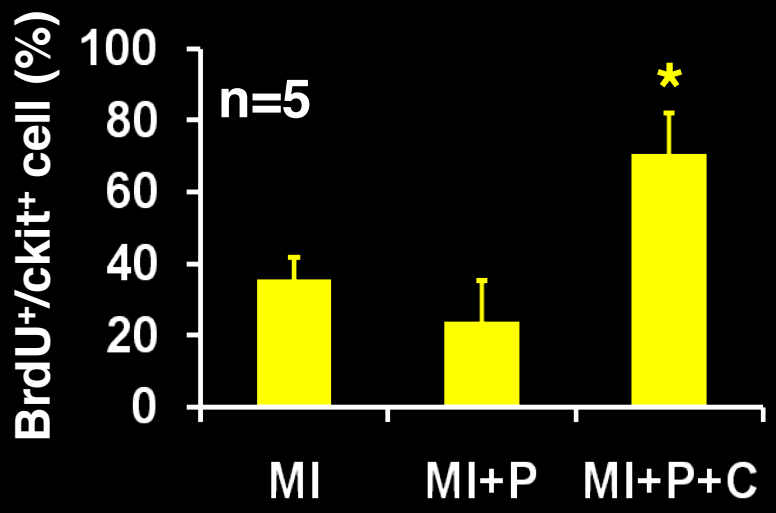


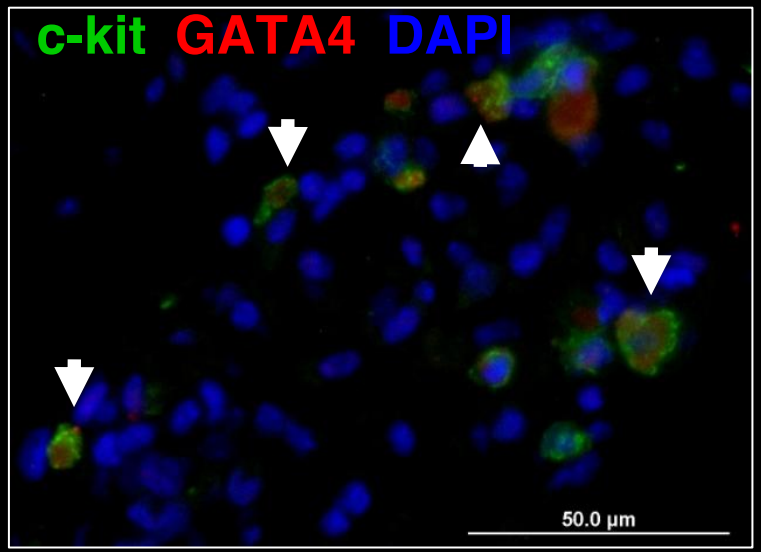
In vivo Mouse Study

CVPC patch “activated” the endogenous ckit^{+} progenitor cells for active proliferation and cardiac commitment.



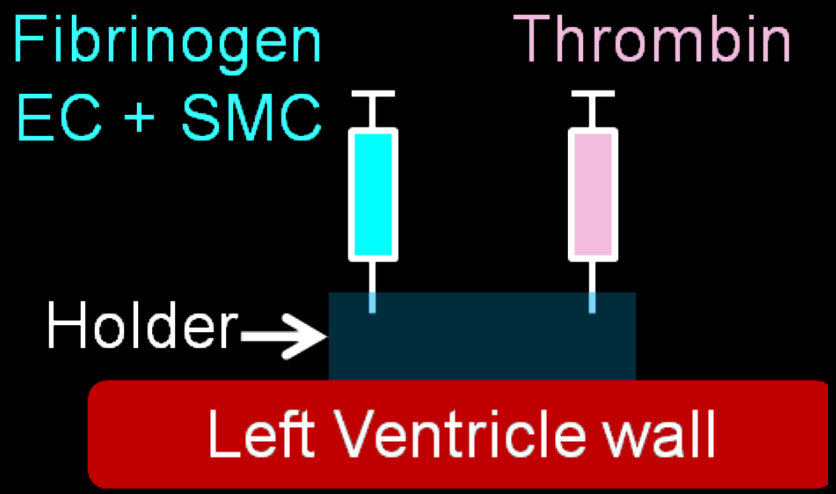


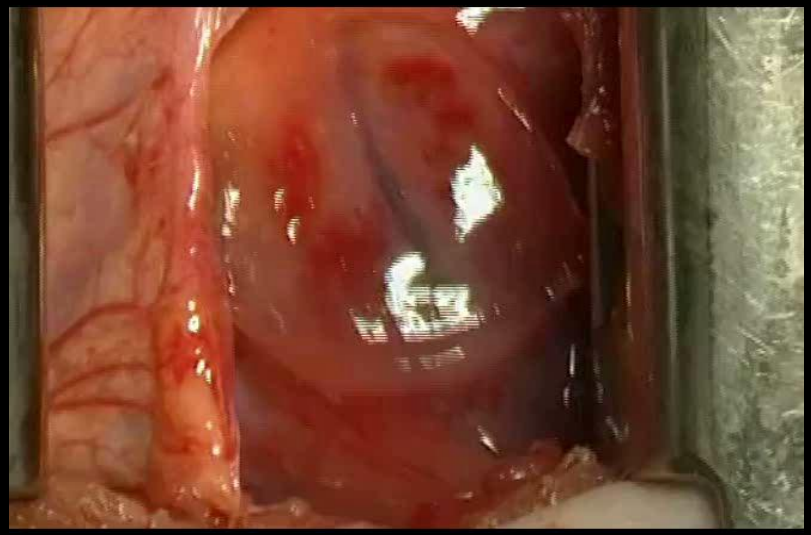




In vivo Swine Study

Fibrin patch was utilized to deliver CVPCs onto swine hearts with ischemia/reperfusion damage.

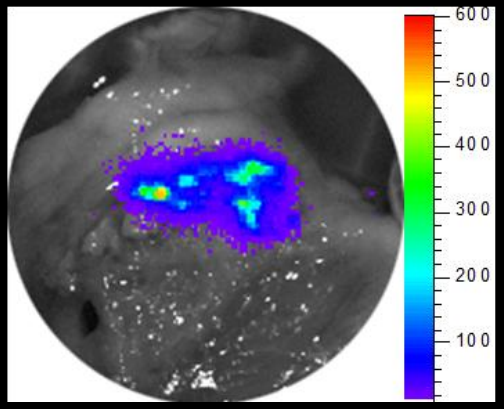




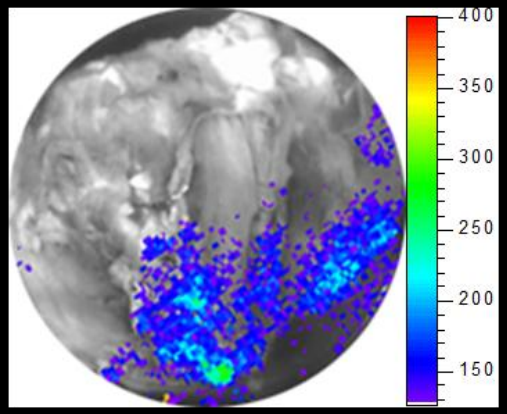
In vivo Swine Study

Fibrin patch-based delivery of CVPCs provided substantial cell engraftment, recruited endogenous ckit^{+} cells and promoted revascularization.

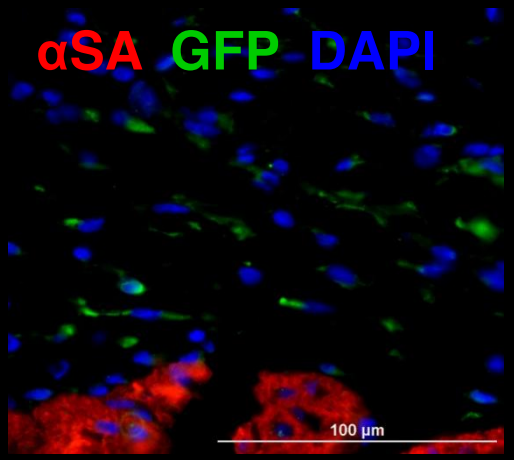
Day 9

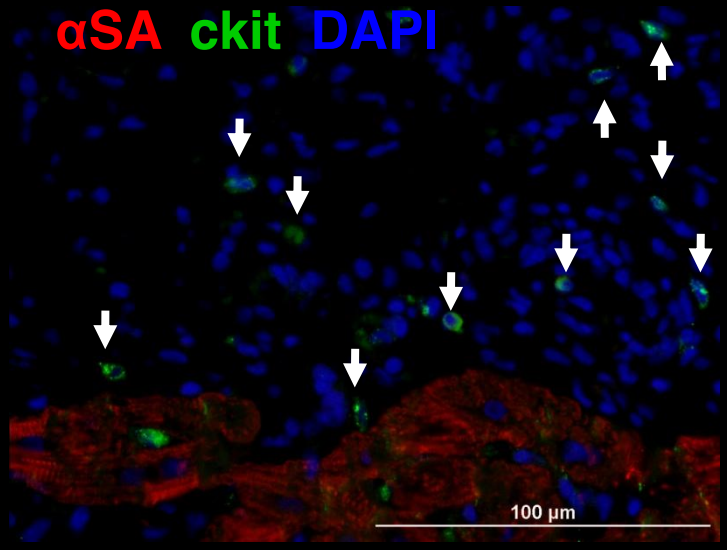


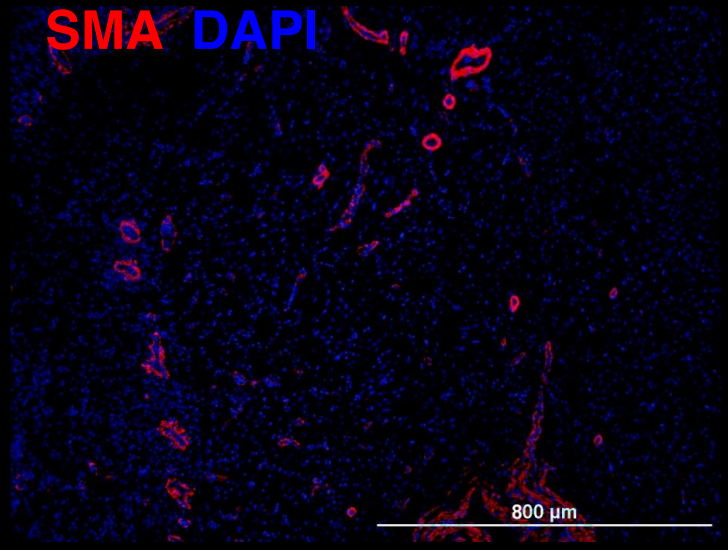
Day 16



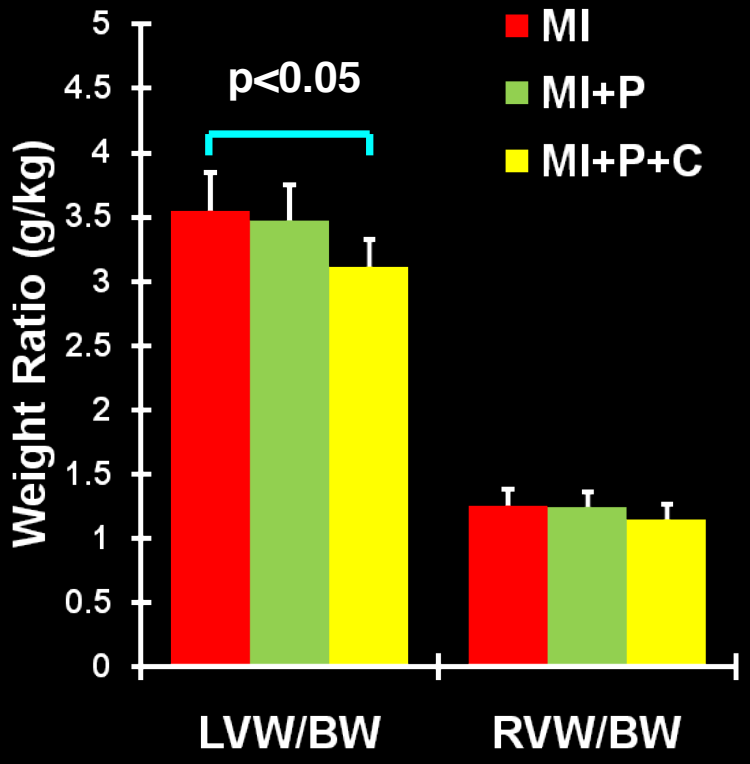
Week 4

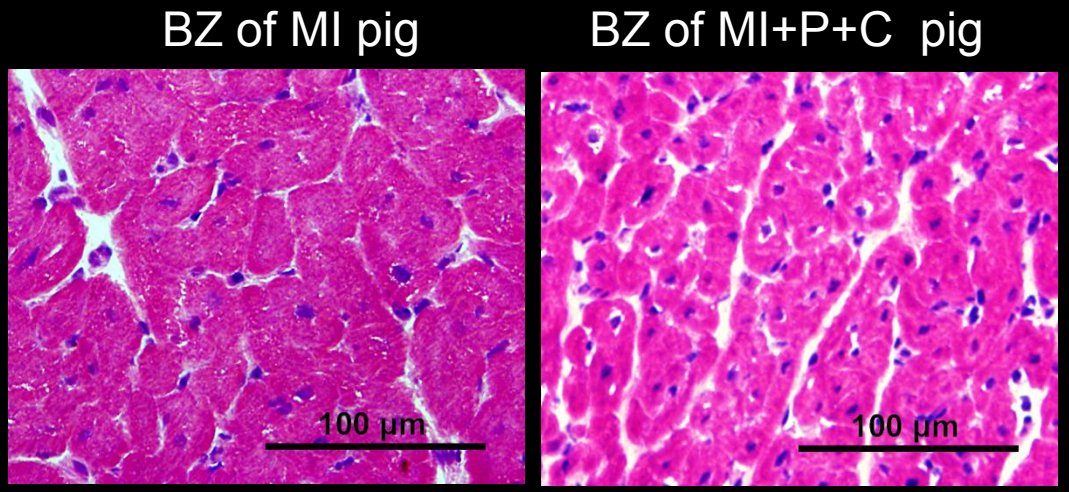


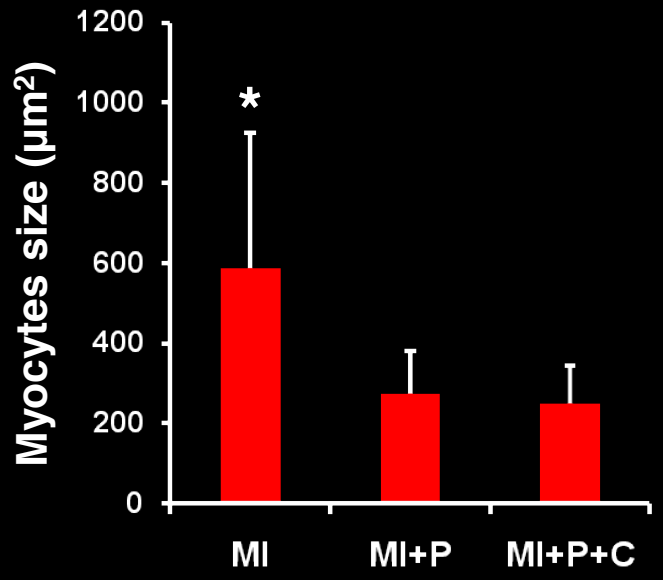




Fibrin patch-based delivery of CVPCs attenuated cardiac hypertrophy.



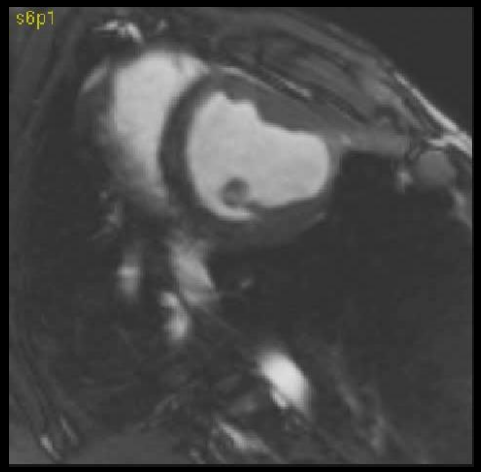




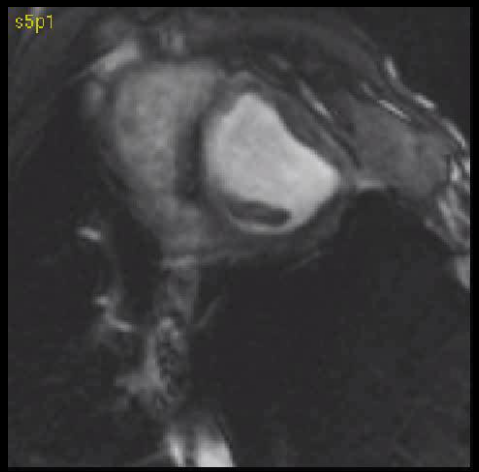
In vivo Swine Study

CVPC patch transplantation resulted in better cardiac function outcome compared to control groups (MI and MI+P, $p<0.05$).

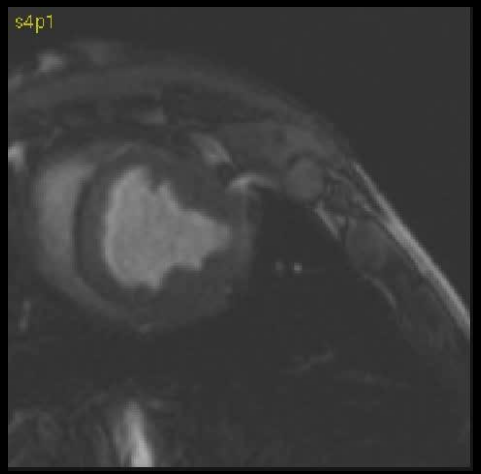
Infarcted (MI) heart



Patch only (MI+P)

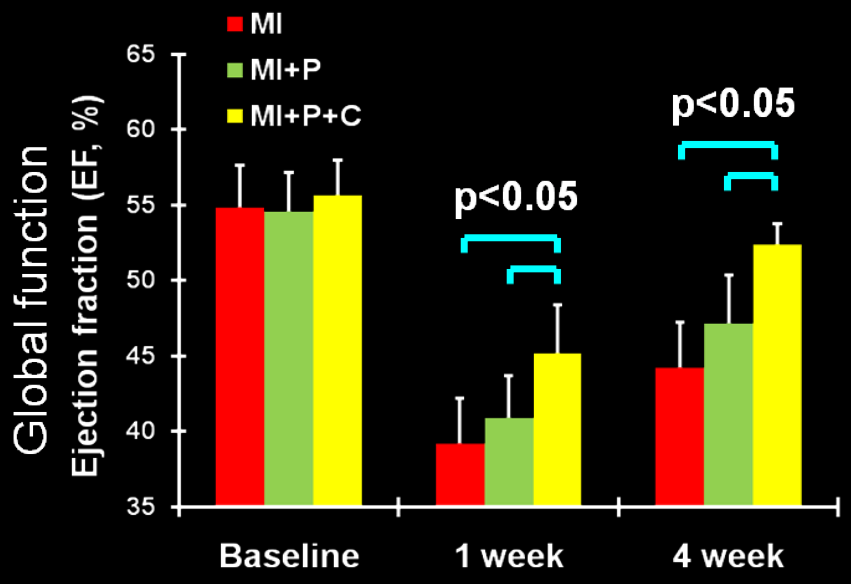


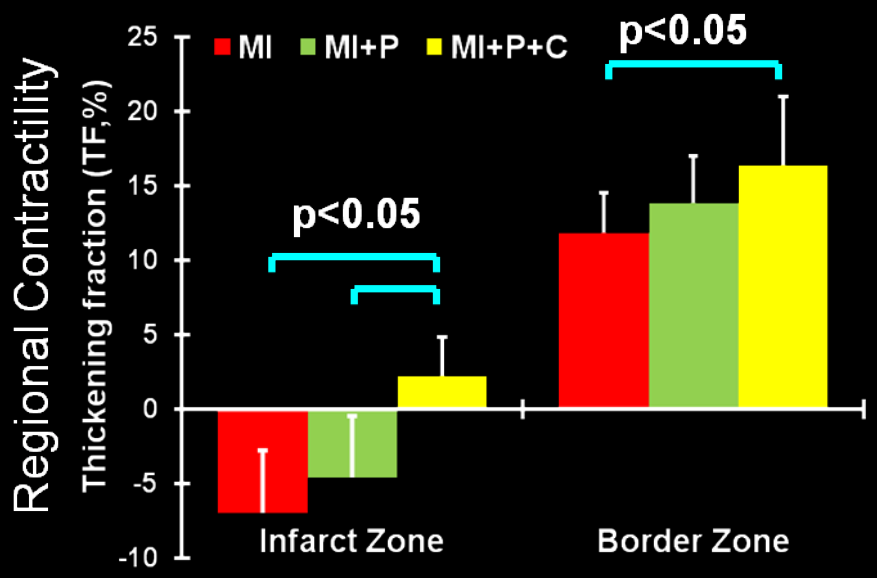
CVPC treated (MI+P+C)



In vivo Swine Study

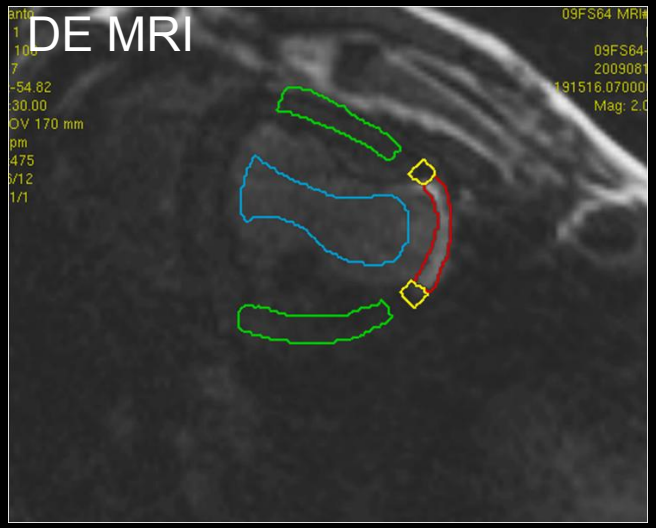
CVPC patch transplantation resulted in better cardiac function outcome compared to control groups (MI and MI+P, $p<0.05$).

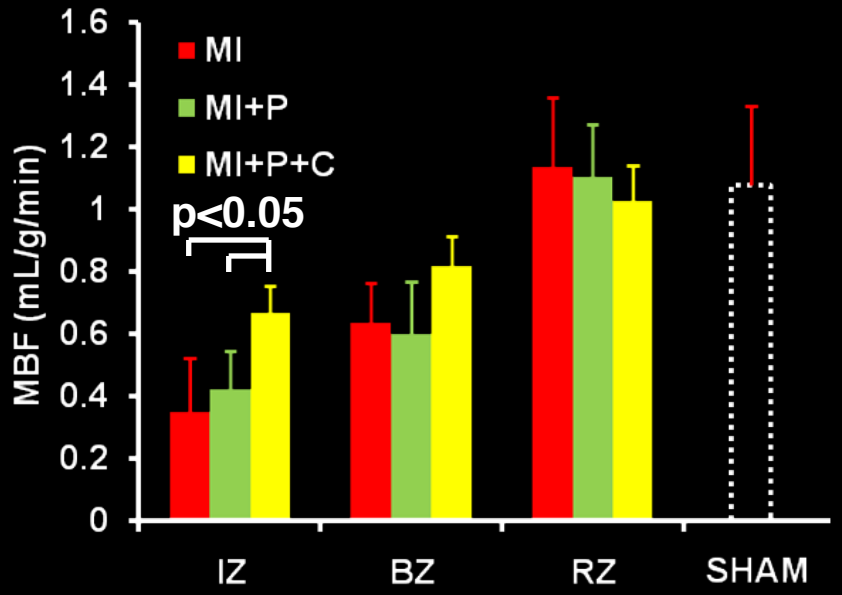




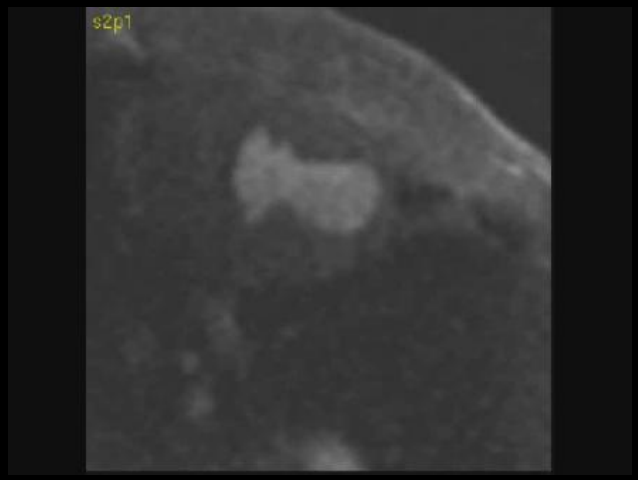
In vivo Swine Study

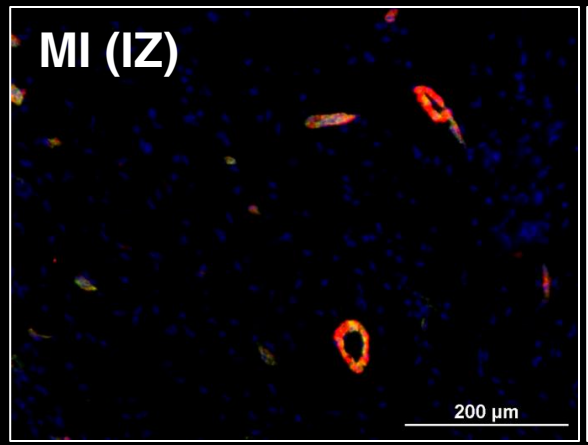
CVPC patch transplantation improved the myocardial perfusion in the IZ and BZ regions as measured by MRI.

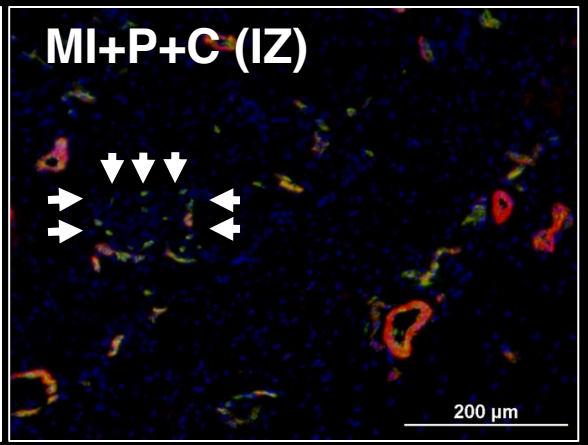




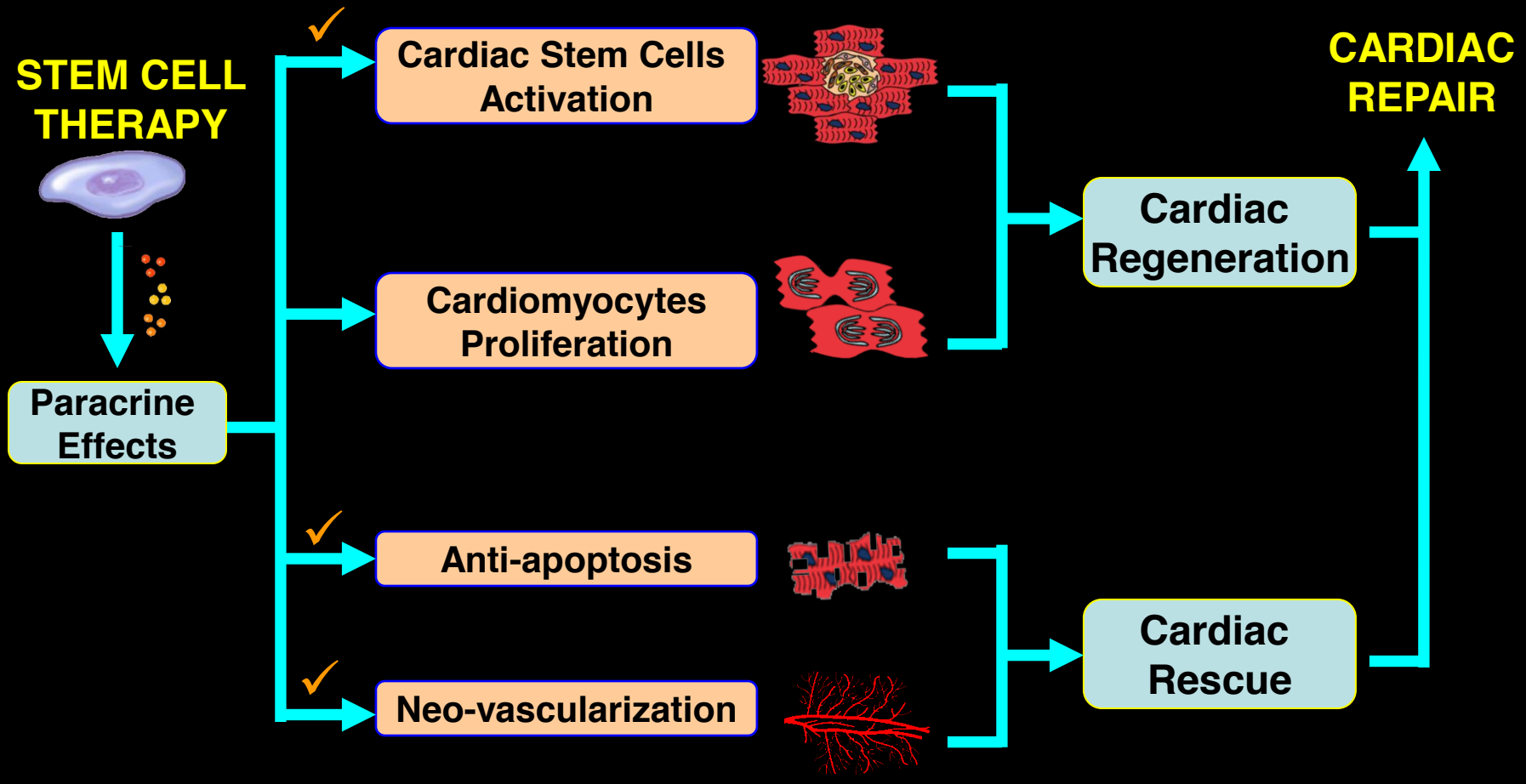
Perfusion MRI







Project Summary



Acknowledgements: