

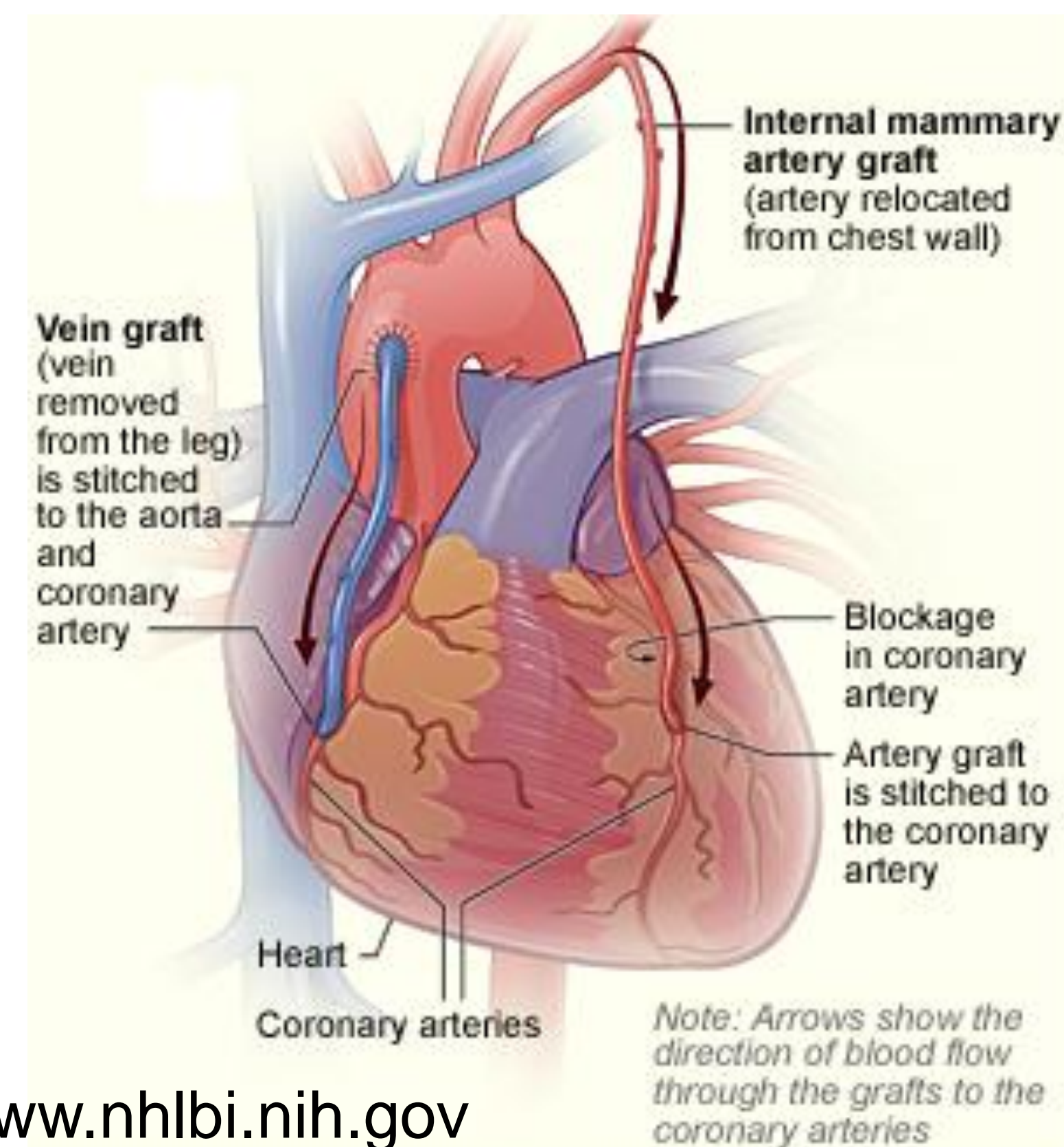
In vitro Characterization of Mesenchymal Stem Cells

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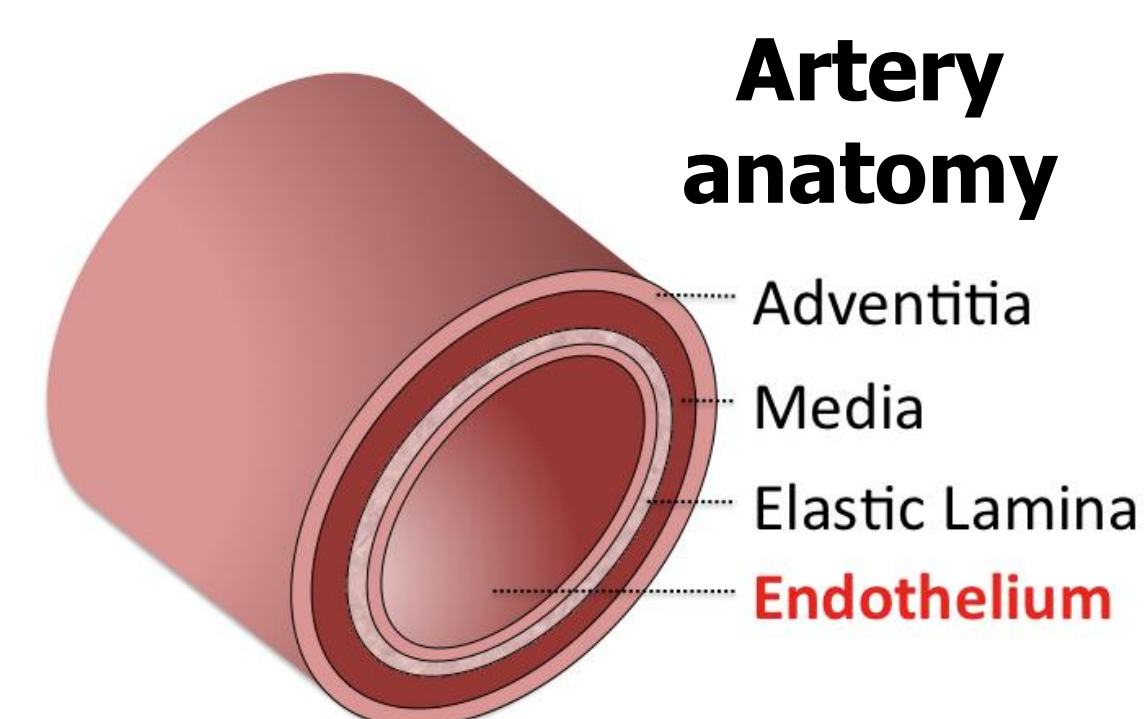
Motivation

→ Over 300,000 coronary artery bypass graft surgeries are performed each year



<http://www.nhlbi.nih.gov>

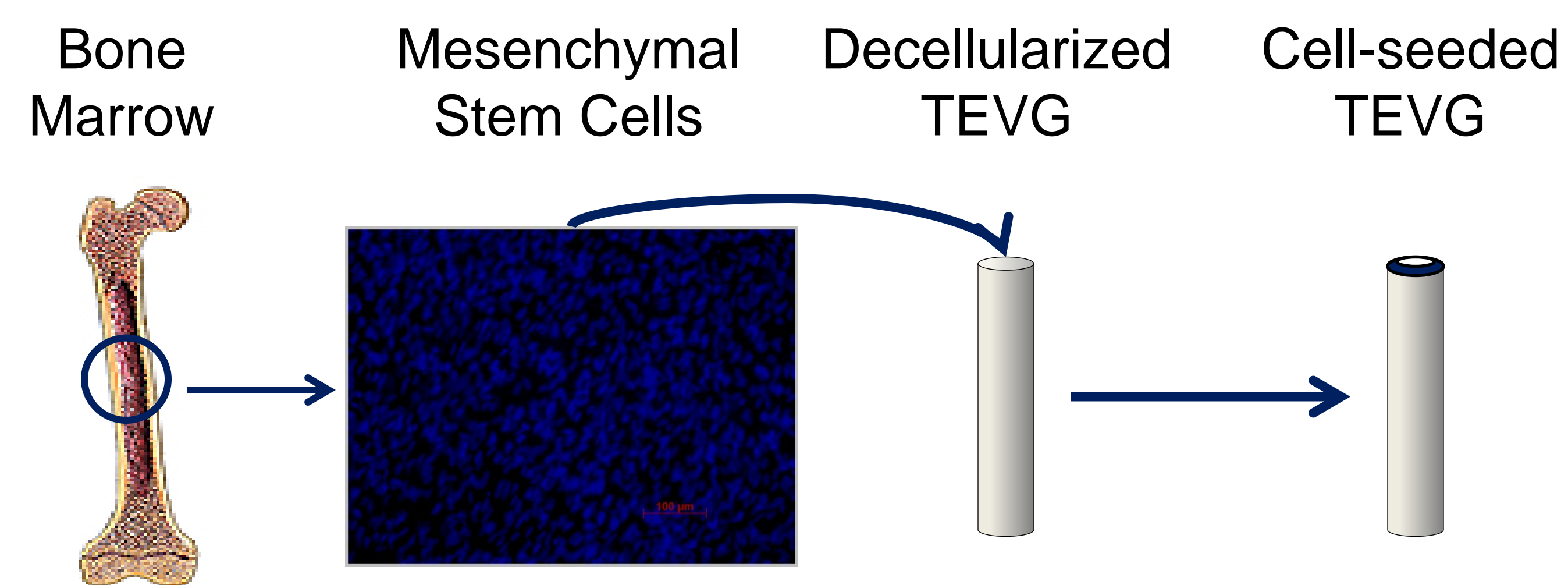
→ Tissue engineered vascular grafts (TEVG) are a viable alternative to native blood vessels



Artery anatomy

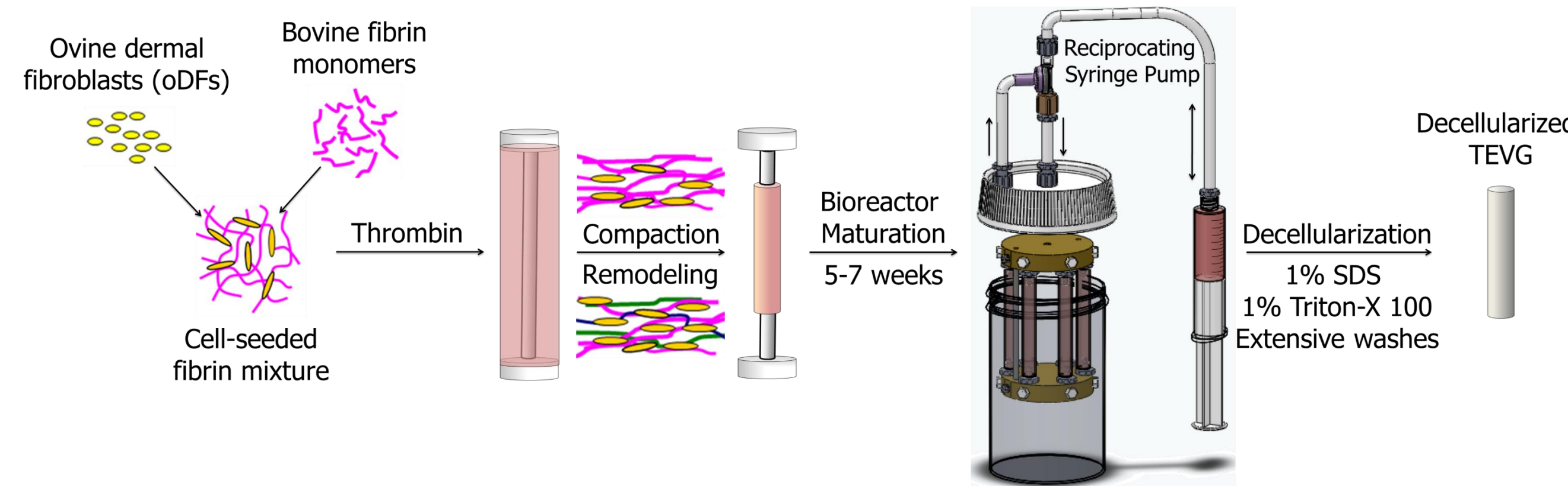
→ An intact layer of endothelial cells reduces clotting on the luminal surface

To reduce possibility of an immune response
→ Remove cellular material (decellularize)

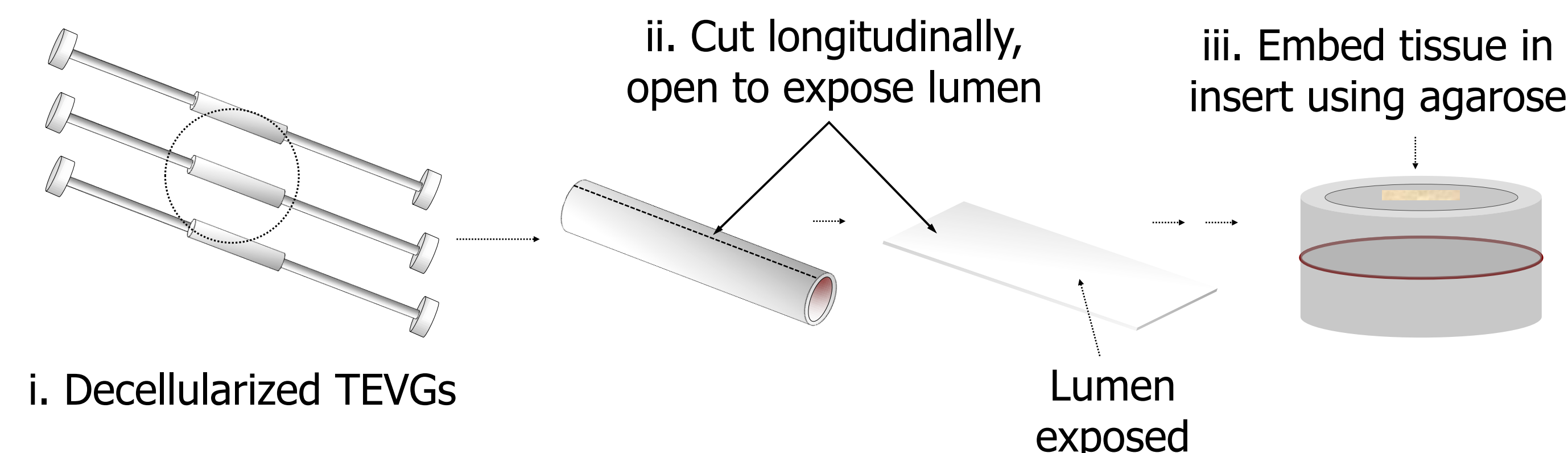


<http://www.nlm.nih.gov/medlineplus>

Graft Fabrication

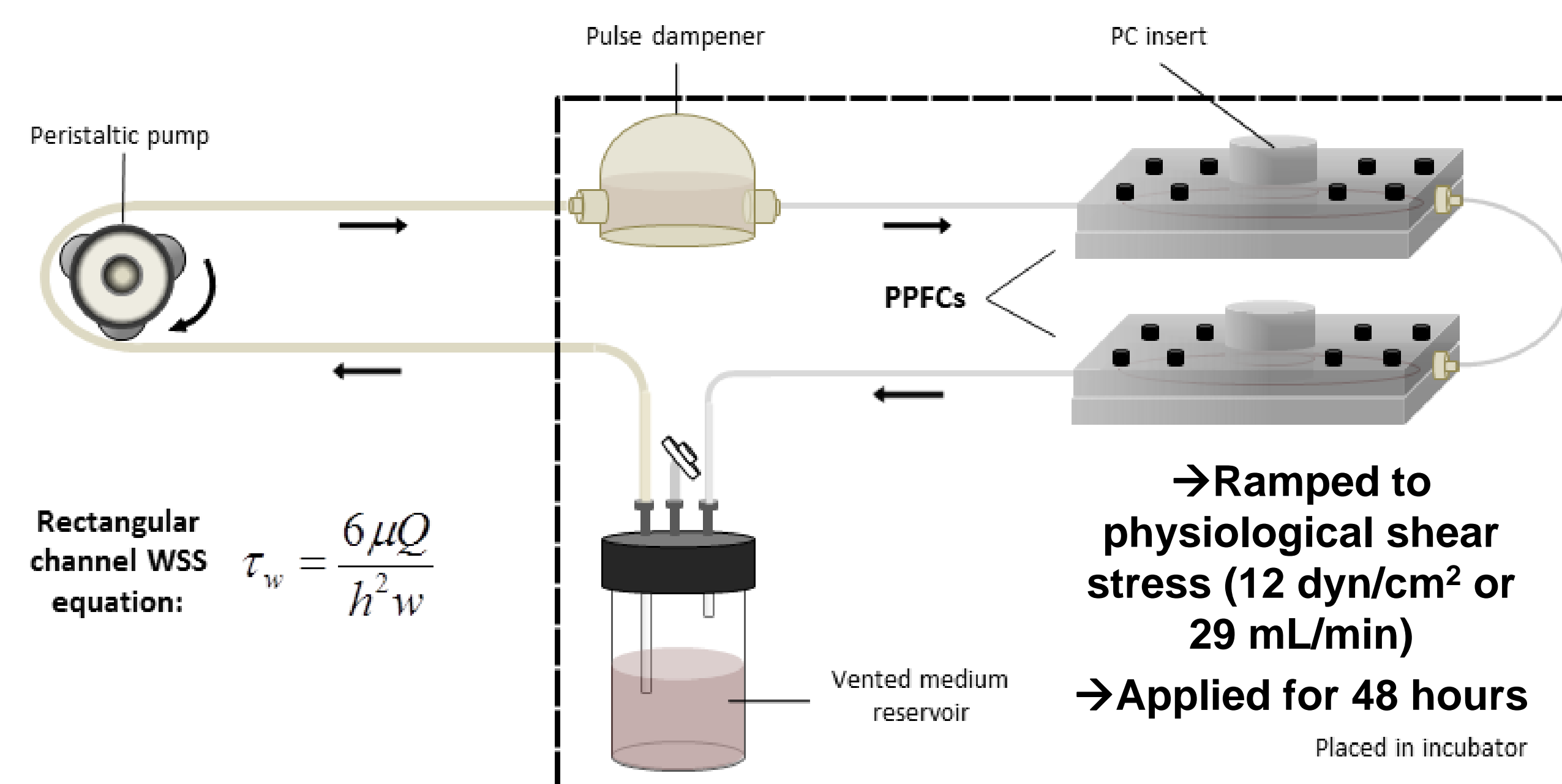


Cell Seeding

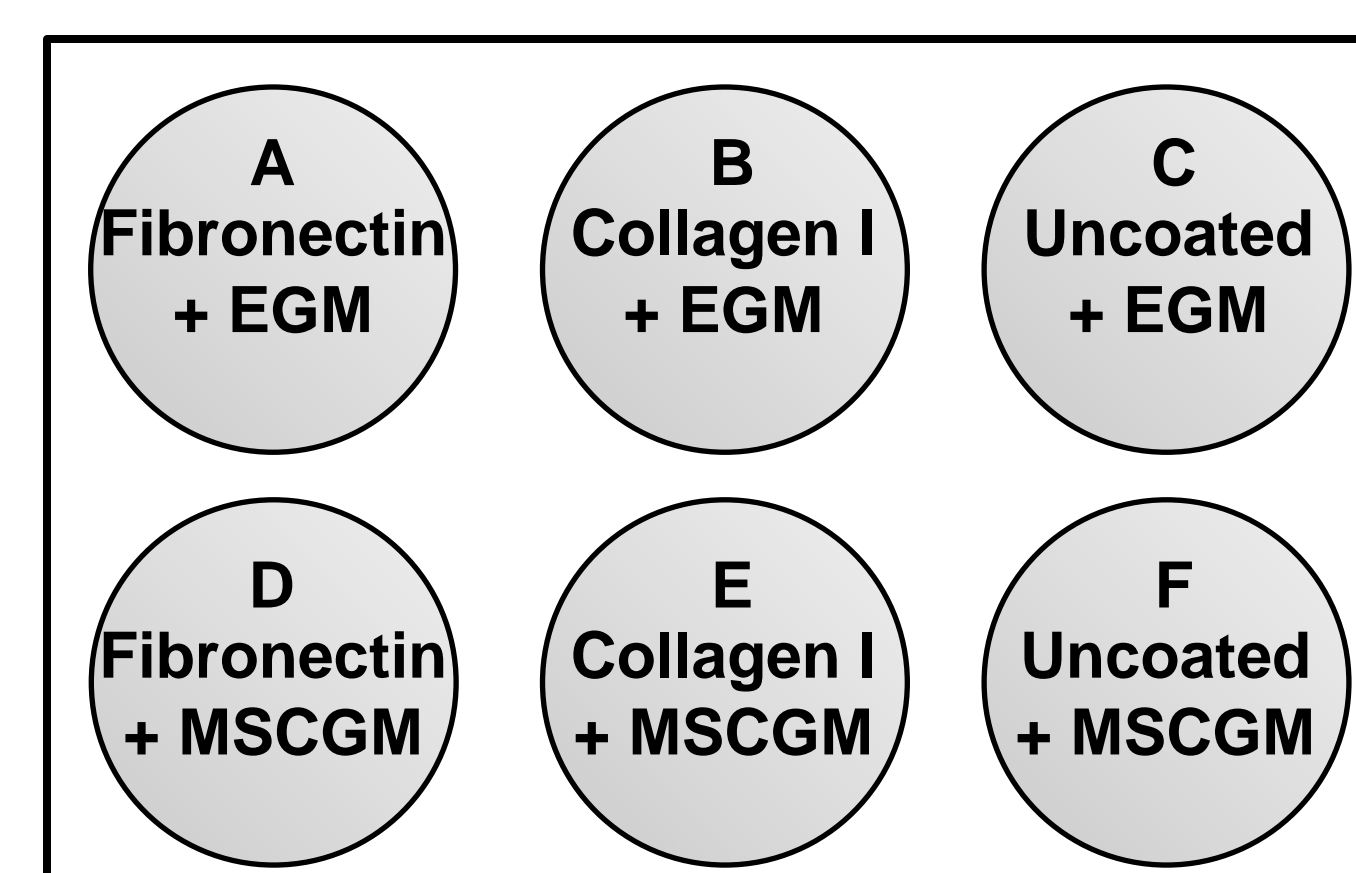


→ Coat tissue with fibronectin for 4 hours at 37°C
→ Ovine mesenchymal stem cells seeded at 2.5 million cells/mL (0.5 mL per embedded sample)

Applied Fluid Shear Stress



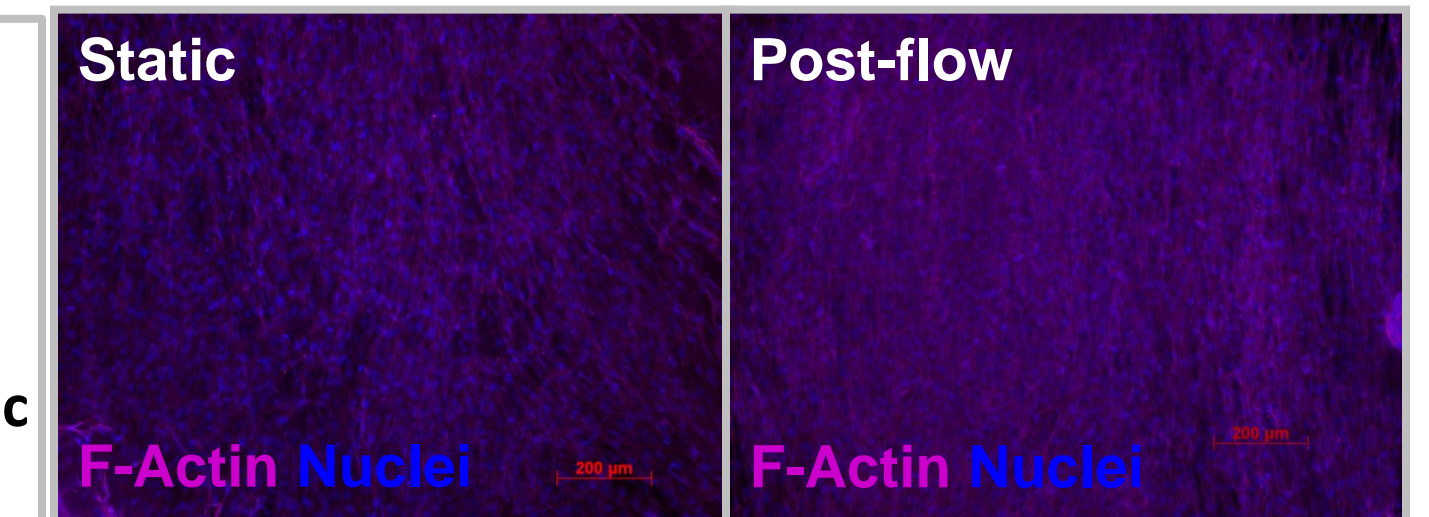
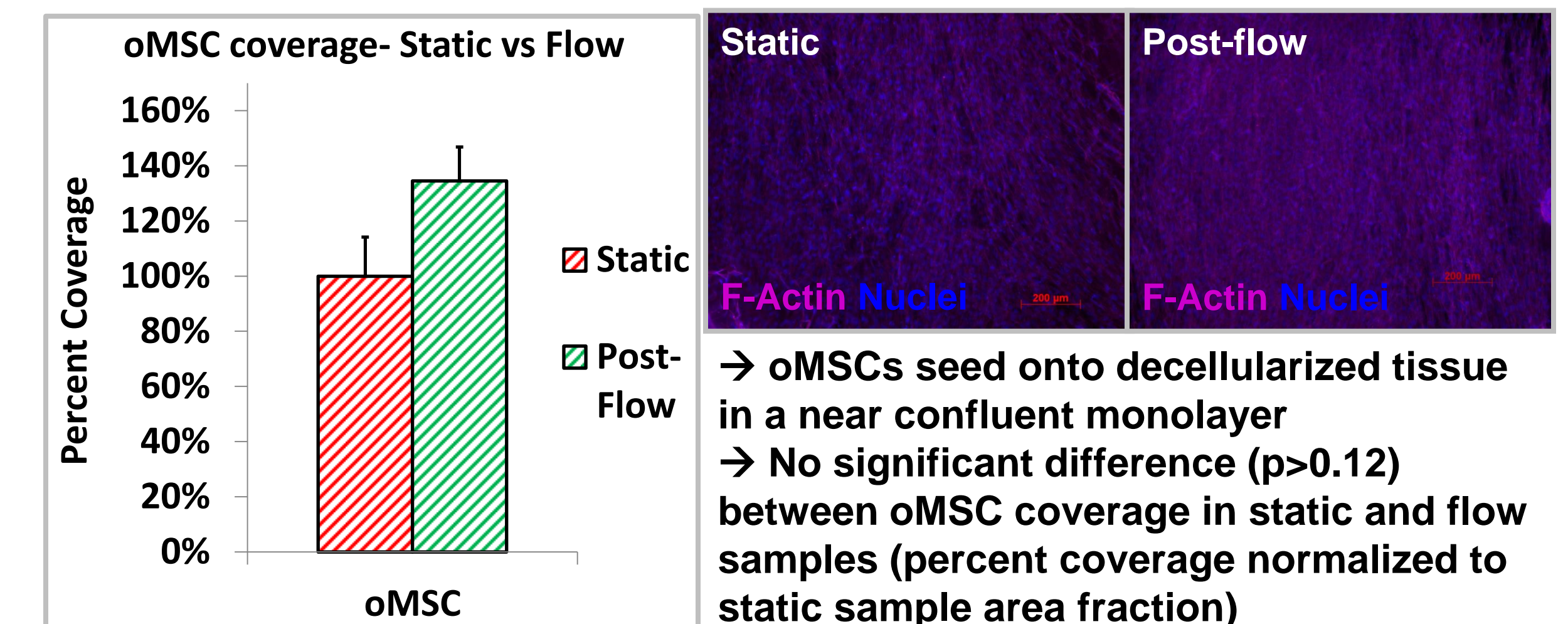
Applied Chemical and Chemo-mechanical Stimuli



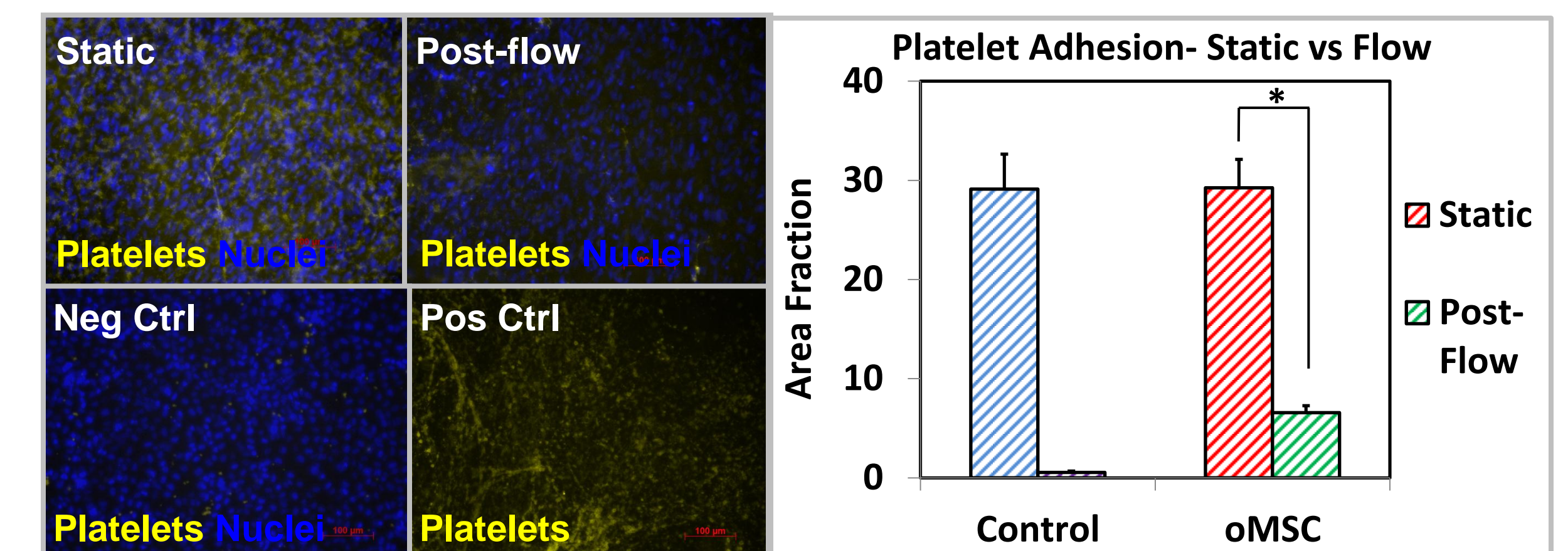
EGM → Endothelial Cell Growth Medium

MSCGM → Mesenchymal Stem Cell Growth Medium

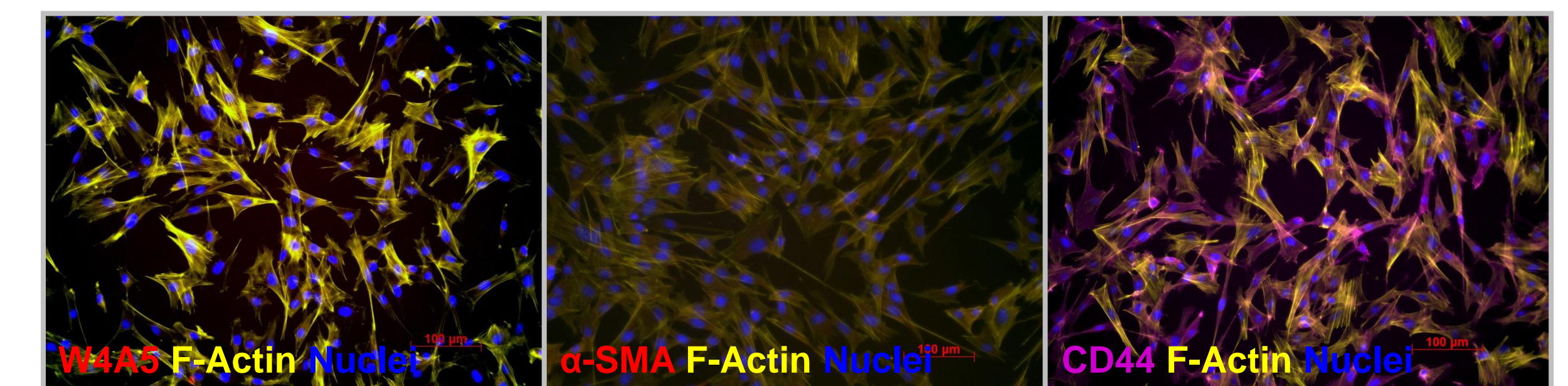
Results



→ oMSCs seed onto decellularized tissue in a near confluent monolayer
→ No significant difference (p>0.12) between oMSC coverage in static and flow samples (percent coverage normalized to static sample area fraction)



Significant difference (p<0.002) in platelet adhesion between static and flow samples



Conclusion

→ oMSCs are **retained** after 48 hours of constant applied fluid shear stress
→ Platelet adhesion of oMSCs seeded on decellularized tissue **decreases** after samples are exposed to fluid shear stress

Future Work

→ Continue to verify functional endothelial phenotype
→ Compare immunogenicity of mesenchymal stem cells and endothelial cells

Acknowledgements

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