# Engineering Conductive Vascular Grafts with S-PEDOT for Next Generation Vascular Prostheses

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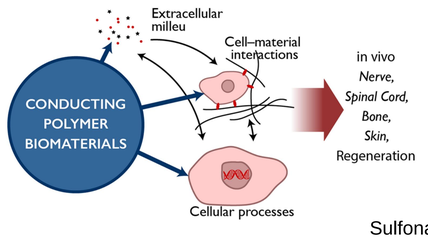
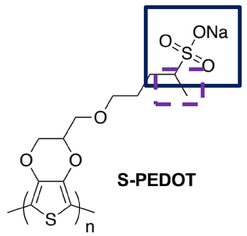
## Introduction

- Cardiovascular diseases are a leading cause of mortality and morbidity worldwide [**1**], often necessitating the replacement of damaged blood vessels with prosthetic vascular grafts.
- Conventional vascular grafts suffer from limitations such as poor long-term patency [**2**] and the inability to provide real-time information about graft performance.

Atherosclerosis | Neointimal Hyperplasia | Calcification

- Conductive polymers have been shown to promote tissue regeneration [**3**] and modulate vascular cell phenotype [**4**].



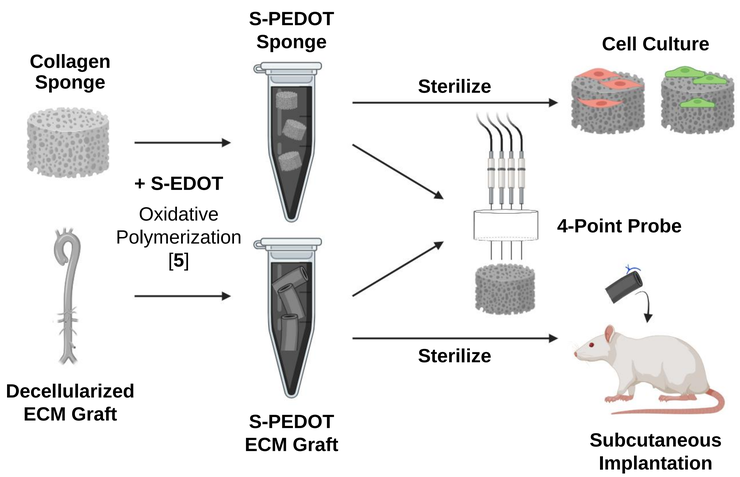




Sulfonated poly(3,4-ethylenedioxythiophene)

**Goal:** Develop a novel generation of vascular grafts that are biocompatible AND electrically conductive.

**HYPOTHESIS:** Vascular grafts coated with S-PEDOT will demonstrate increased conductivity and support healthy vascular cell phenotype

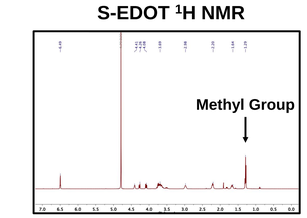
## Methods

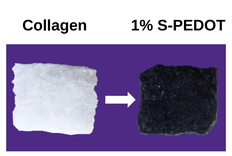


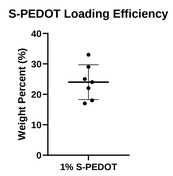

Approved by Northwestern IACUC

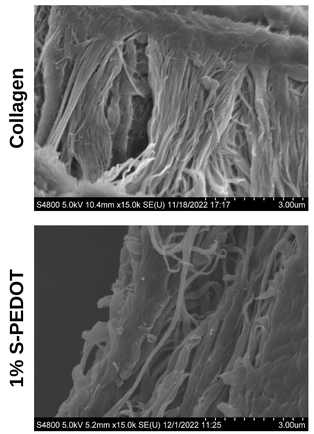
## Results

1. S-PEDOT can be polymerized *in situ* to coat collagen sponges and decellularized aortas.

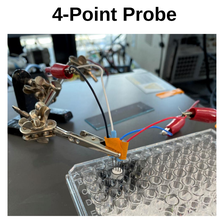


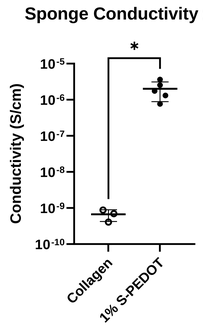



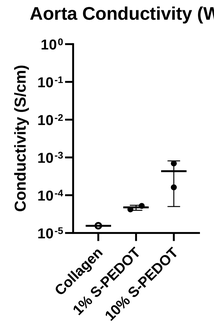



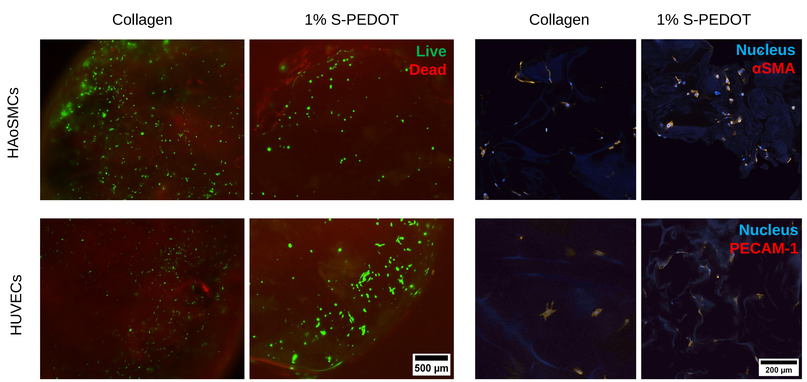

2. S-PEDOT-modified collagen sponges and aortas demonstrate increased conductivity.



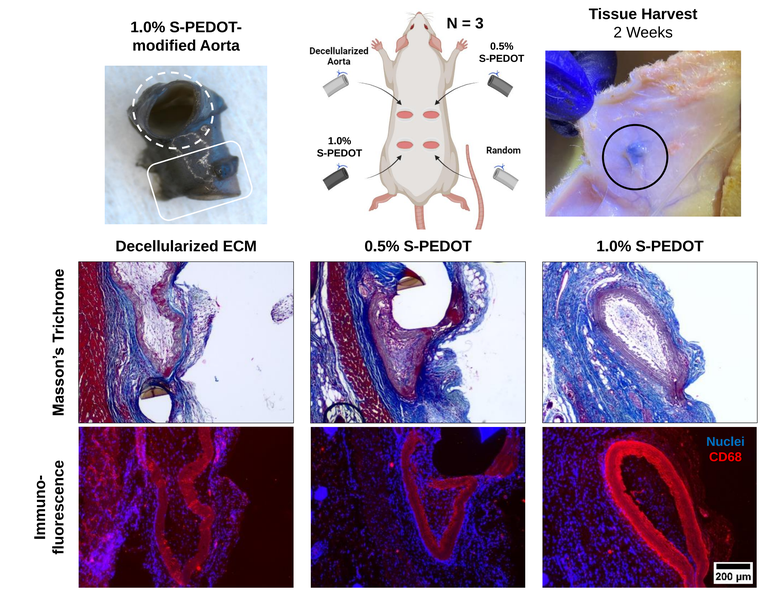




3. Human aortic smooth muscle cells (HAoSMCs) and human umbilical vein endothelial cells (HUVECs) adhere and survive on S-PEDOT-modified collagen sponges.



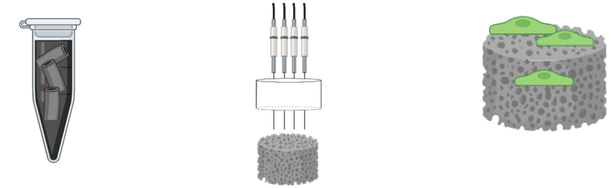

## Results

4. S-PEDOT-modified aortas implanted subcutaneously show nuclear infiltration but no infection, seroma, or delayed wound healing.




## Conclusions

**Feasible** | **Conductive** | **Biocompatible**



**IMPACT**: These bioelectronic vascular grafts will pave the way for smart vascular prostheses with built-in bio-sensing capabilities, addressing the shortcomings of current vascular graft technologies.

## Acknowledgements & Funding

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