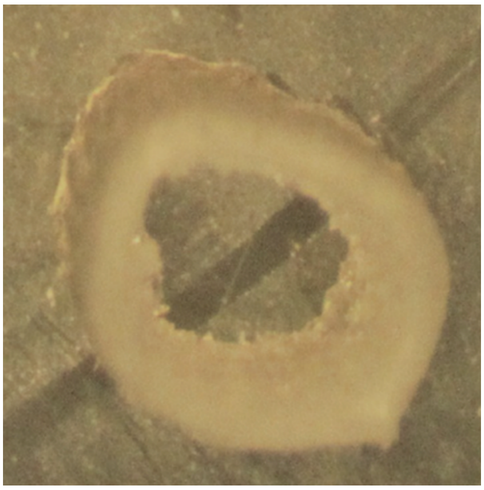
INNOVATION PARTNERSHIPS
UNIVERSITY OF MICHIGAN

Regenerative Vascular Graft

TECHNOLOGY NUMBERS: 2020-279, 2025-103



Accelerate Blue Foundry - 2025 (Life Sciences)

OVERVIEW

This technology is a vascular graft for blood vessel repair and regeneration comprised of a mechanically robust, customizable, biodegradable polymer. As no cell seeding is required, the vascular graft can be offered as an off-the-shelf product, ready for vascular surgeons to use as needed.

DESCRIPTION

The key technical advance enabling these vascular grafts is a new composition and synthesis method that allows scientists and engineers to easily produce high-molecular-weight biodegradable polymers that can be easily modified post-polymerization. The method enables production of specialty copolymers and nanofibers that mimic the natural structure of tissues, significantly enhancing their ability to support cell growth and tissue regeneration. The polymers can be tailored with specific biochemical signaling agents to precisely direct cell behavior or with anti-coagulant compounds to reduce the risk of thrombosis and enhance the rate of biodegradation. The polymers can be processed into highly porous, functional forms such as nanofibers and 3D scaffolds. A recent advance results in polymers exhibiting incredibly tough mechanical properties.

In a proof of concept, 3-month implantation study, the researchers demonstrated that the polymer can be fabricated into small-diameter, biomimetic tubular structures and derivatized with an anticoagulant for use in the regeneration of blood vessels. The scaffolds accommodate endogenous cells and support blood vessel regeneration, dissolving after the new vessel forms.

Technology ID

2020-279

Category

Materials
Life Sciences
Accelerate Blue Foundry - 2025/Life Sciences

Inventor

Peter Ma

Further information

Jeremy Nelson
jernelso@umich.edu

Innovation Partnerships Tech Marketing Team
IPInventions@umich.edu

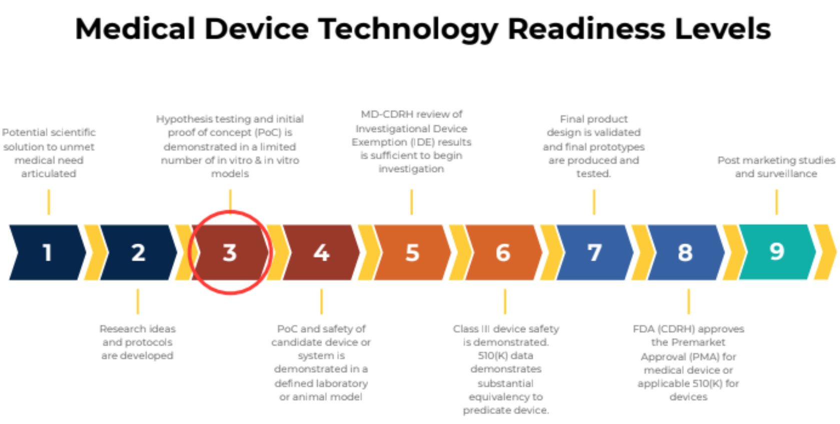
View online

Such regenerated vessels are living tissues and superior to non-degradable grafts for general population. They can grow with the patient – particularly beneficial for pediatric patients so as to avoid multiple replacement surgeries as the child develops.

VALUE PROPOSITION

- **Superior Performance**: Materials exhibit increased toughness, strength, and elasticity compared to standard biodegradable polymers, enabling more robust and resilient tissue engineering scaffolds.
- **Easy Customization**: Enables convenient attachment of biologically active molecules (like growth factor peptides, or anti-coagulants) for targeted tissue regeneration, addressing high-value and specialized medical needs.
- **Vascular Graft**: Biodegradable, non-immunogenic scaffold does not require cell seeding. Can produce blood vessels with inner diameters as small as 2mm. Robust mechanical properties ensure safety under physiological pressures.

TECHNOLOGY READINESS LEVEL



INTELLECTUAL PROPERTY STATUS

Patent applications pending

MARKET OPPORTUNITY

Vascular bypass grafting is a primary treatment for ischemic heart disease and peripheral vascular disease, with more than 1.4 million arterial bypass surgeries carried out annually in the US. However, a substantial number of patients lack appropriate vessels for bypass operations. While vascular grafts made of non-degradable synthetic materials are frequently used, they have different mechanical properties from those of native vessels and are prone to thrombosis. The failure rate of vascular grafts remains high, particularly for those of small diameters (smaller than 6 mm). Synthetic vascular grafts are more problematic for injured or diseased vessel replacement in children because they continue to grow. Because the non-degradable synthetic grafts are of fixed dimensions, multiple replacement surgeries are required as the patient matures.

More broadly, there is significant unmet demand in regenerative medicine, orthopedics, and drug delivery for next-generation implants and scaffolds that combine biological function with mechanical robustness—especially for complex tissue repair such as bone, cartilage, and vascular grafts. These advanced polymers open up new possibilities for high-performance, patient-specific medical devices, drug delivery platforms, and bioactive implants across the $100+ billion global biomaterials and regenerative medicine industries. Market growth is strongly supported by the rapid expansion of tissue engineering and personalized medicine, with industry reports citing double-digit annual growth in demand for sophisticated, functional biomaterials.

REFERENCES

"Biomimetic tubular scaffold with heparin conjugation for rapid degradation in in situ regeneration of a small diameter neoartery"