

Nitric Oxide Releasing Devices

Novel 3D Printable Nitric Oxide Releasing Polymer Ink

Devices such as stents, catheters, and medical bandages are often coated or impregnated with nitric oxide. The nitric oxide provides many benefits including pro-angiogenic, anti-inflammatory, anti-thrombotic, and potent bactericidal actions. Unfortunately, coating and impregnating materials with nitric oxide has a host of challenges. Coating creates a thin layer that limits the amount of nitric oxide that can be delivered. Impregnation with nitric oxide requires an organic solvent to swell the polymer that causes changes of the mechanical and surface properties of the original device. Researchers at Virginia Commonwealth University (VCU) have developed an approach to create novel 3D printable nitric oxide releasing polymer ink that overcomes these challenges.

The technology

This unique approach to nitric oxide integration utilizes nitric oxide donors in either liquid or powder form be integrated into a polymer ink base. Additionally, a range of nitric oxide from 2-5% can be loaded into the polymer base allowing for the ink to be easily tailored to the specific requirements of different medical devices. Utilizing a 3D printable ink allows devices to be made in complex geometries in a range of sizes from a 1/16 of an inch diameter and greater. In addition, by combining inks with multiple nitric oxide concentrations, there is the ability to print a device that releases varied nitric oxide concentrations over time, greatly reducing the risk of nitric oxide toxicity and increasing the overall effectiveness of the printed device. The devices shown in the schematic below represents a printed nitric oxide tube, with darker layers representing the novel ink with higher concentrations of nitric oxide. This unique characteristic, which is by product of the ability to 3D print nitric oxide releasing polymer ink, allows for numerous medical devices to be created with high precision and efficacy.



Figure 1. Schematic image of a 3D printed nitric oxide release polymer tube. Each layer contains a different nitric oxide concentration with darker layers representing a greater nitric oxide concentration from 2-5%. Devices printed range from a 1/16 of an inch diameter and greater.

Benefits

- » Tailorable release of nitric oxide
- » Printable Ink
- » Direct incorporation of nitric oxide into polymeric device

Applications

- » Medical device development

Patent status:

Patent pending; U.S. and foreign rights are available.

License status:

This technology is available for licensing to industry for further development and commercialization.

Category:

Medical Devices

VCU Tech #:

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External resources:

[Li et al.](#)

[US 2021-0301135 A1](#)

Contact us about this technology

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