Metal-phenolic network coatings for therapeutic nitric oxide delivery

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Interventional devices such as guide catheters, ventricular assist devices, and glaucoma drainage implants, are regularly used to improve patient outcomes and quality of life. While effective, these devices can sometimes pose a risk to patients by causing infections and/or inflammations.[1] To avoid these issues, antibiotics can be prescribed as a prophylactic measure. However, the use of antibiotics is also associated with serious side effects as well as further compounding the increase in antibiotic resistance. As such alternative strategies are being considered, for example using nitric oxide (NO). NO is a signalling molecule involved in various pathological and physiological processes including the immune, cardiac, and nervous systems.[2] The application of NO is highly dependent on the dose. Doses ranging from pM to nM have been shown to improve cell survival and proliferation.[3] On the other hand, concentrations in the μM to mM range have been shown to induce cell apoptosis, thus demonstrating potential for antibacterial and antiviral applications.[4] Importantly, NO has a short half-life, which therefore requires NO to be delivered at target sites to increase therapeutic benefit.[5] This project aims to develop a metal-phenolic network (MPN)-based nanocoating on polyvinyl chloride (PVC) medical tubing to release NO, specifically by promoting the catalytic release of the endogenous NO donor *S*-nitrosoglutathione (GSNO). This coating with phenolic hydroxyl groups will not only provide antioxidant and anti-inflammatory properties, but also antibacterial via the inclusion of metal ions. Hence, this MPN-coated material can be a promising strategy to reduce medical device-associated infections.

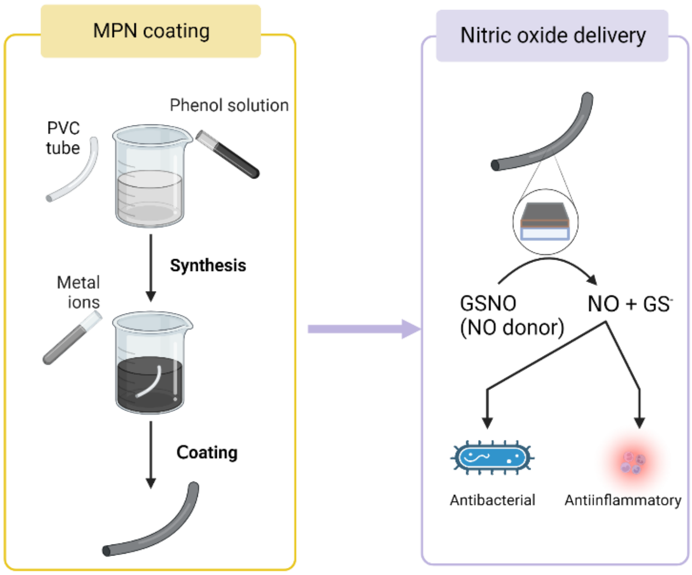

Figure 1: Schematic of MPN-based nanocoatings for therapeutic NO generation

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