

Nitric Oxide-generating Coating on Biomedical Implants

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Bacterial infections pose significant concerns for biomedical surfaces, particularly implants, due to their prolonged exposure to environments that support bacterial growth.¹ Antibacterial coatings can help prevent these infections, as they create a protective barrier on the implants' surface, inhibiting the growth of harmful bacteria and minimising the risk of post-surgery complications. Nitric oxide (NO) is a promising antibacterial agent with significant potential in the biomedical field.² To deliver NO, platforms can be functionalized with NO donors and various internal or external factors can be used to trigger its release. Although this strategy can cater to the NO requirements at targeted sites, the capacity to continuously produce NO after the donors have been consumed limits its applicability.³ An attractive approach to overcome this limitation involves catalytically generating NO from naturally occurring molecules in the human body, such as S-Nitrosothiols (RSNOs). Previously, we have established that polymeric amines are capable of generating NO from RSNOs through a nucleophilic reaction.⁴ Therefore, we developed polymeric amine-coated metal surfaces to generate NO for antibacterial applications (Figure 1). The metal surface was first pre-coated with a monolayer of self-assembled molecules to ensure covalent bonding with the polymeric amine. The concentration of the latter determined the amount of NO generated, and our study suggested that polymer concentration as low as 2.5 μM could generate 10 μM NO from S-Nitrosogluthathione (GSNO) in 6 hours. The surface coating was characterised using Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscope (SEM), while the NO generation was quantified using the Griess Assay and an electrochemical sensor. This coating has the potential to not only exhibit antibacterial properties, but to be therapeutic for certain diseases like glaucoma.⁵

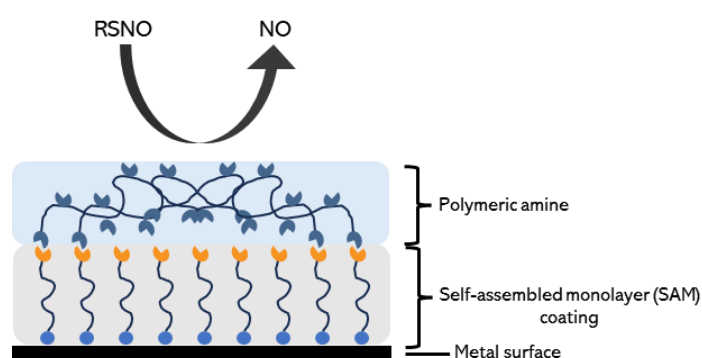


Figure 1: Schematic diagram of NO-generating polymeric amine coating on metal surface.

References:

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- ⁵ Erdinest, N.; et al. *Vision* **2021**, *5*, 29.