Title: Synthesis of Gold Nanoparticle Functionalized Porous and Elastic Materials

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Abstract

Porous materials are essential for tissue engineering applications, facilitating cell proliferation, nutrient transfer, and waste removal, which promote tissue regeneration and overall cell function. The emulsion templating method is a cost-effective and flexible approach for creating porous materials with both hydrophilic and hydrophobic properties, making it suitable for various medical applications. This study focuses on synthesizing gold nanoparticles (AuNPs) functionalized porous elastic materials using polymerized medium internal phase emulsion (P-MIPE). Poly (ethylene glycol) diacrylate (PEGDA) serves as a monomer to create a biocompatible, hydrophilic, and elastic matrix. Hyaluronic acid-coated gold nanoparticles (HA-AuNPs) are incorporated to enhance bioactivity and cell attachment to the scaffolds.

The porous material is generated by developing an oil-in-water MIPE containing HA-AuNPs and PEGDA. Thermal polymerization of PEGDA occurs in the internal phase for 24 hours, followed by washing and drying. HA-stabilized AuNPs are synthesized using an in-situ reduction method involving refluxing a gold chloride solution, cooling, and mixing with HA-gallic acid at pH 8.5. The porous scaffold is developed by incorporating HA-AuNPs into the emulsion system, characterized by dynamic light scattering (DLS) with an average particle size of 150 nm and a zeta potential of -32. Hydrophilic P-MIPE materials exhibit improved antioxidant activity after mixing with HA-AuNPs. The composites of P-MIPE-HA-AuNPs will be tested for bone tissue engineering, demonstrating good porosity, elasticity, and swelling due to the emulsion's volume phase composition and the hydrophilic nature of PEGDA.

Reference:

[1] B. Aldemir Dikici and F. Claeyssens (2020) *Front. Bioeng. Biotechnol*., **8**, 875