Scientists develop nanosilver-impregnated silk suture against surgical site infection

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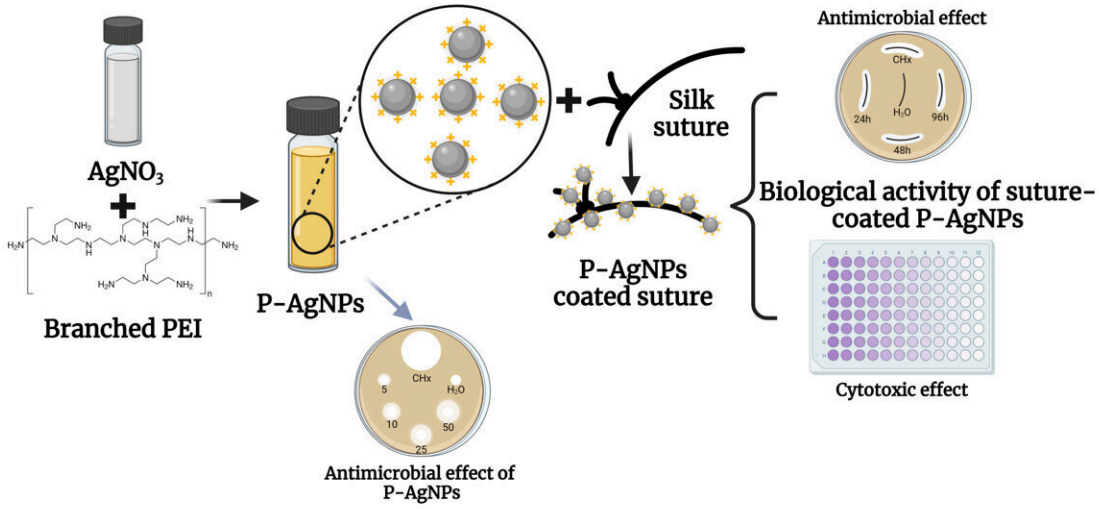

Synthesis of nano-silver using cationic polymer (PEI) and its coating on silk suture—antimicrobial effect. Credit: *ACS Omega* (2024). DOI: 10.1021/acsomega.4c01257

In recent years, the adherence of microorganisms to surfaces or coatings has created major health risks to humans. Among these, microbial

attachment and growth on surgical suture lines accounts for more than 20% of health-related infections in patients.

As a result, extensive research has been conducted to develop strategies for preventing or reducing the formation of bacterial or fungal colonies on sutures.

"Nanosilver has gained significant attention among researchers due to its long-known antimicrobial properties. Its optical and structural characteristics make it an appealing candidate for biomedical applications.

"It can be synthesized using both green and chemical methods, although it typically carries a negative charge, which can compromise its stability and storage capabilities," says Dr. Ravichandran Manisekaran, principal scientist of the Nanostructures and Biomaterials group.

A team of researchers from the National School of Higher Studies (ENES), Leon unit, which is affiliated with the National Autonomous University of Mexico (UNAM), has developed a highly stable colloidal synthesis of positively charged nanosilver using a polymer.

The biological impact of this synthesis was recently published in *ACS Omega*, where its effectiveness in coating silk sutures and inhibiting the growth of microorganisms was detailed by the research team.

Our approach to the production and coating of the suture line is both straightforward and noninvasive, ensuring that the intrinsic properties of the material are not compromised. Upon contact with negatively charged microorganisms, the positively charged nanosilver releases its ions, initiating a sequence of events that culminate in the rapid antimicrobial effect and suppression of growth.

Our methodology proposes a process that yields nanoparticles measuring less than 15 nm in diameter, exhibiting a high degree of cationic charge, and demonstrates the capacity for extended storage of up to 10 months to a year. It is essential to minimize expenses, eliminate hazardous substances and obviate the requirement for post-synthesis treatments.

The effects were assessed against three microorganisms, Candida albicans, Streptococcus mutans and Staphylococcus aureus, which served as model organisms.

The findings of our study not only reveal a novel approach for the production of nanomaterials using polymers as reducing and stabilizing agents to synthesize highly colloidal and cationic charge nanosilver but also demonstrate their potential in the biomedical field for effectively combating bacteria and fungi without causing toxicity to cells. This represents a significant innovation and could lead to new avenues of research in this area.

"Nanosilver is increasingly being incorporated into various everyday applications, ranging from cosmetics to pharmaceuticals. As such, our nanoparticle design and development can potentially be scaled up to combat superbugs in the near future, while simultaneously addressing the ongoing debate regarding the negative aspects of nanomaterials, which has been a topic of discussion among researchers," says Manisekaran.

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More information: Diego Antonio Monroy Caltzonci et al, Antimicrobial and Cytotoxic Effect of Positively Charged Nanosilver-

Coated Silk Sutures, *ACS Omega* (2024). DOI: 10.1021/acsomega.4c01257

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