Antibacterial composite: Just add silver to a biopolymer to increase cytotoxicity

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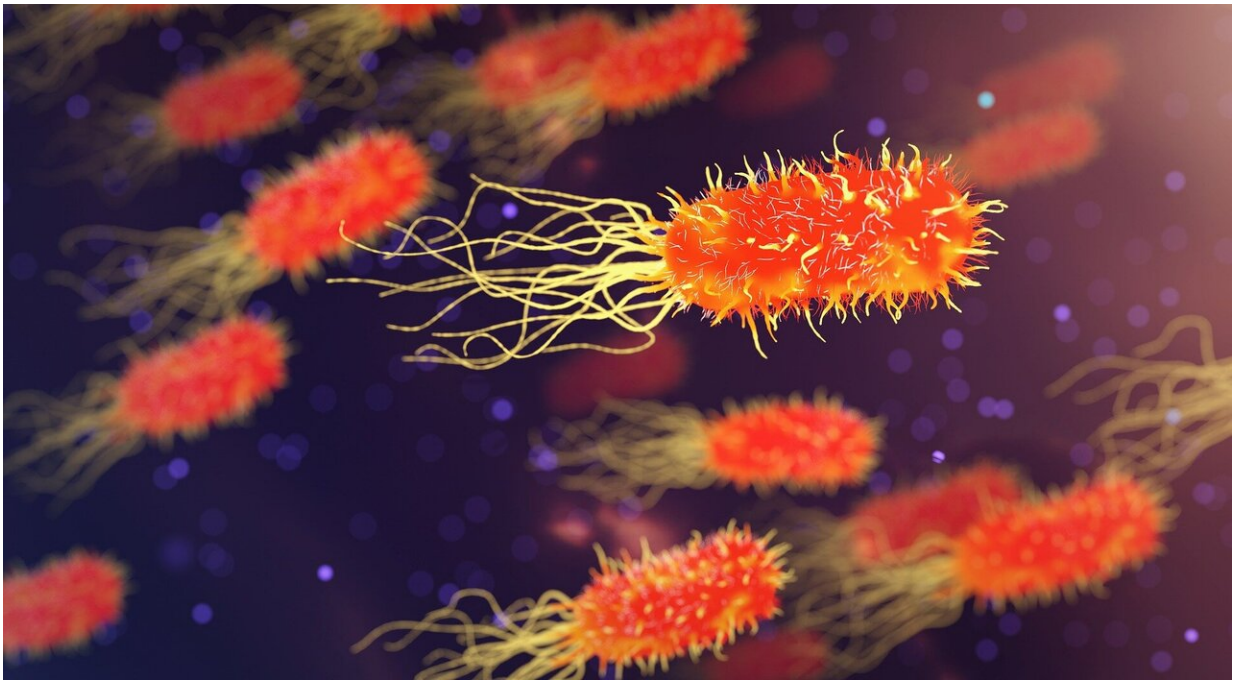

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A natural biopolymer, bacterial cellulose, is synthesized by the microbe Gluconacetobacter hansenii. Researchers are intrigued by its properties but one that it lacks in the native state is antibacterial activity and that is something could be useful for a wide range of healthcare and other applications, if only it could be engineered into this natural material.

Now, a team from Russia, has created a composite of bacterial cellulose with silver nanoparticles, which endows the biopolymer with the requisite antibacterial activity. The team describes details in the *International Journal of Nanotechnology* where they report on antimicrobial activity and cytotoxicity. Tatiana Gromovykh of the I.M. Sechenov First Moscow State Medical University is the corresponding and first-named author on the paper.

Metal-vapor synthesis was used to embedded nanoparticles of silver metal with diameters of between in 8 and 12 nanometres in the biopolymer. Biological testing showed the composite to be active against three important types of potentially pathogenic bacteria, Escherichia coli, Staphylococcus aureus, and acid resistant Bacillus coagulans. It had no fungicidal effect against Aspergillus niger nor Candida albicans, however. The findings hint at applications as an antibacterial, but not antifungal, coating for medical devices.

However, additional tests in a different sphere showed that the same composite material had activity in reducing the viability of human melanoma cells and mesenchymal stem cells in laboratory cultures pointing to potential in a novel approach to treating tumors arising from skin cancer. The team suggests that a scaffold with an antitumour effect might one day be fabricated from their composite with this aim.

More information: T.I. Gromovykh et al. Creation of composites of bacterial cellulose and silver nanoparticles: evaluation of antimicrobial activity and cytotoxicity, *International Journal of Nanotechnology* (2020). DOI: 10.1504/IJNT.2019.106615

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