# Joint fluid harbors bacterial clumps after replacement despite pre-surgery antibiotics

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Researchers at Thomas Jefferson University and the National Institutes of Health are building on their research which seeks to understand why joint infections persist despite standards of care designed to stop them. More Americans than ever will receive joint replacements, and with an infection rate of approximately 1 percent, the potential exists for tens of thousands to experience post-operative infection and complications each year.

"In this study, we decided to find out if pre-operative, prophylactic antibiotic concentrations in joint fluid samples from patients were sufficient to prevent *Staphylococcus aureus* and MRSA contamination," said Noreen Hickok, Ph.D., Associate Professor in the Department of Orthopedic Surgery in the Sidney Kimmel Medical College at Thomas Jefferson University. "We found that high concentrations of the preferred antibiotic cefazolin are present in the synovial fluid. But when bacteria are introduced into this environment, the bacteria survive and continue to grow and form clumps."

Importantly, when *Staphylococcus aureus* was introduced into joint fluid, the bacteria was still able to colonize model implant surfaces, i.e. titanium pins, and form biofilms. The persistence of these bacteria in synovial fluid containing antibiotics may be one reason that joint infection is so difficult to cure.

The team's previous research identified these floating biofilm-like clumps of bacteria as a source of antibiotic-resistant joint infections. These biofilm-like clumps arise because bacteria embed themselves in a protective mesh of proteins that resist the penetration of antibiotics. They also found that the bacteria slow their growth, making them even less susceptible to antibiotics, which are designed to target rapidly growing cells like bacteria.

"The next step is to see how we can disperse these mega-clusters of buried bacteria. If we can provide a window for antibiotics to carry out their intended function, we can move towards a clinical model and ultimately cure joint infection," offered Sana Dastgheyb, Ph.D., lead author on this study and researcher at both Thomas Jefferson University and the National Institutes of Health.

**More information:** S.S. Dastgheyb, et al., "Staphylococcal Persistence Due to Biofilm Formation in Synovial Fluid Containing Prophylactic Cefazolin," *Antimicrob. Agents Chemother*, DOI: 10.1128/AAC.04579-14, 2015.

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