Poster abstract submission

Approval Status

Not Started

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Academic / research institution

Poster title

Staphylococcus aureus localization in infected human bones

Poster abstract

Staphylococcus aureus is the main cause of difficult-to-treat bone and joint infections (BJIs). Despite harsh therapy combining antibiotic and surgical management, BJIs therapy fails in 20-30%. Underlying mechanism could involve S. aureus biofilm formation, intracellular location, or S. aureus invading small channels ("canaliculi") in the bone. However, evidence from patients remains scarce and qualitative. To address this issue, we imaged bone biopsies from 10 infected human patients, sampled at multiple sites and/or surgeries, using decalcification, vibratome sectioning, and immunohistochemistry. The labelled biopsy sections were automatically imaged using confocal microscopy combined with AI-based bacterial detection (neural network). Analysis of >24,000 S. aureus cells in human bone biopsies revealed diverse niches. This included both intra- and extracellular localizations. Intracellular S. aureus mainly resided in phagocytes in bone marrow or bone-associated soft tissue but only rarely in bone cells (osteoblasts, osteocytes, osteoclasts). Few S. aureus resided in adipocyte in the bone marrow. Most extracellular bacteria were singlets or part of small clusters in the soft tissues, but massive clusters occurred in bone cracks in one patient and in adjacent soft tissue in another. Few bacteria were also found in canaliculi as demonstrated before. Our emerging dataset suggests limited infection of the bone matrix. Thus, bone penetration of antibiotics and immune cells might be less critical than previously assumed. Our data inspire laboratory models mimicking relevant aspects of bone infections as a basis for developing more effective BJI therapies.

Research topic

Microbiology