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Poster abstract submission

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Poster title

Efficacy of a daptomycin-loaded nanogel in a rat model of methicillin resistant Staphylococcus epidermidis osteomyelitis

Poster abstract

Osteomyelitis caused by methicillin-resistant Staphylococcus epidermidis (MRSE) remains a major therapeutic challenge due to rising antimicrobial resistance, poor antibiotic penetration into bone tissues, and the limitations of current long-term systemic treatments.
In this context, NanoReviv© is developing innovative lipid-based nanocarriers to enhance the pharmacokinetic and pharmacodynamic properties of existing antimicrobial agents.
Here, the in vivo efficacy of daptomycin-loaded nanogel (Staph-Ex) was investigated in an experimental rat model of MRSE osteomyelitis.
A clinical strain of MRSE was intramedullary inoculated into the proximal tibia of rats under deep anesthesia/analgesia. Following a 3-day infection period, rats received a single local (intra-tibial) application of the nanogel (versus vehicle). Quantitative bone cultures were performed after cryocrushing throughout the 21-day post-infection period. Infected bone homogenates were also analyzed to investigate residual daptomycin concentration (pharmacokinetic analyses are ongoing).
The bacterial load in bones was 6.4 ± 0.3 Log10 CFU/g at the start of treatment. Four days after local application (7-days post-infection), the mean tibial bacterial load was significantly reduced in animals receiving Staph-Ex, compared to controls (2.5 ± 1.2 Log10 CFU/g vs 5.7 ± 0.6 Log10 CFU/g, respectively, $p<0.0001$). At 14 and 21-days post infection, all tibias were sterilized in animals receiving Staph-Ex, compared to controls (the bacterial load remained stable after 3 weeks of infection: 4.7 ± 0.6 Log10 CFU/g).
In this MRSE osteomyelitis model, a single local administration of nanoparticle-encapsulated daptomycin significantly reduced the bacterial load at day 4 post-treatment and enabled sterilization of all tibias at D14 and D21. These exciting results demonstrate the great potential of this nanoformulation, which could

reduce both the duration of stays and the cost of systemic treatment.

Research topic PK/PD