Resolvin D1-loaded nanoliposomes promote M2 macrophage polarization and are effective in the treatment of Osteoarthritis

Brief summary of the project:

Current treatments for Osteoarthritis (OA) emphasize solely on palliative care but do not address the disease's underlying progression. Chronic low-grade inflammation is a major aggressor of the disease, and targeting it is a viable strategy to treat OA. Specialized proresolution mediators (SPMs), like Resolvin D1 (RvD1), are potent ω-3 fatty acids that promote the active clearance of inflammatory factors but have a short *in vivo* half-life due to rapid degradation and clearance. In this study, we have engineered a Resolvin D1 (RvD1)-loaded nanoliposomal formulation (lipo-RvD1) that targets and resolves the OA-associated inflammation. This formulation creates a depot of the RvD1 molecules that allows the controlled release of the molecule for up to 11 days *in vitro*. In the surgically induced mouse model of OA, lipo-RvD1 was able to arrest the progression of cartilage damage, whereas administration of free RvD1 failed to produce sufficient anti-OA efficacy. We found that lipo-RvD1 functions by increasing the proportion of the proresolution M2 macrophages compared to the proinflammatory M1 macrophages in the synovial membrane. Our formulation was able to target and suppress the formation of the osteophytes and showed an analgesic effect, thus emphasizing its ability to treat clinical symptoms of OA. Such controlled-release formulation of RvD1 could represent a patient-compliant treatment for OA.

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