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Biography

Uri-Galili, completed his PhD in immunology in 1977 at the Hebrew-University School of Medicine and post-doctorate in 1979 in the Karolinska Institute. In 1984 he discovered the natural anti-Gal antibody. He served as professor at UCSF, MCP-Hahnneman, Rush University and UMass Medical-Schools.

Accelerated Scar-Free Healing Of Skin Incisions And Wounds By α-Gal Nanoparticles

Abstract:

Healing of skin-incisions and wounds is achieved by fibrosis and scar formation and is orchestrated by pro-reparative macrophages migrating into injury-sites. In contrast, injuries in urodeles (salamander, newt and axolotl) and in mouse-neonates heal by skin-regeneration with pro-regenerative macrophages restoring the original structure. Here, we describe a novel immunologically driven approach for rapid recruitment of pro-regenerative macrophages into skin-injuries of adult-mammals by application of α-gal nanoparticles. In adult-mice and pigs, this treatment decreases healing-time by 40-50%, reduces morbidity, and results in scar-free regeneration and reappearance of skin appendages. α-Gal nanoparticles are biodegradable small liposomes (~300nm) which present a carbohydrate-antigen called "α-gal epitope". α-Gal nanoparticles bind the abundant natural anti-Gal antibody which constitutes ~1% of human-immunoglobulins. Administration of α-gal nanoparticles into skin injuries of anti-Gal producing mice and pigs results in binding of anti-Gal to these nanoparticles and activation of the complement-system. The resulting complement-cleavage chemotactic peptides induce rapid and extensive recruitment of macrophages which phagocytose the anti-Gal coated α-gal nanoparticles. These processes further induce polarization of recruited macrophages into pro-regenerative macrophages that orchestrate restoration of the normal skin structure, including appearance of skin appendages. This healing in anti-Gal producing mice takes 6-days and after 30-days the skin displays normal structure, hair-shafts formation, and no chronic granulation. In contrast, in saline treated wounds healing takes 12-15 days and results in fibrosis and scar formation. These findings support α-gal nanoparticle therapy as a translational, immunomodulatory approach for accelerated scar-free wound healing and surgical incision repair, with planned evaluation in human studies.