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Development of a nanocomposite with antibiofilm activity and permissive for delivery of mesenchymal stem cells

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Wound healing is often affected by bacterial infection; indiscriminate use of antibiotics has generated multi-drug resistant bacteria, complicating infection prevention and treatment. However, an alternative to antibiotics resistance is the use of silver nanoparticles (AgNPs). Covering the wounds is then crucial to avoid infections, and it also prevents loss of water. Radioesterilized Pig Skin (RPS) has been successfully used for wound covering while Mesenchymal Stem Cells (MSC) possess wound healing properties. For these reasons, RPS-AgNPs nanocomposites with antibiofilm activity and permissive for delivery of MSC were developed as intended materials for wound healing treatment. We synthesized spherical (TEM; 10 nm diameter), and stable (DLS; -38 ± 8 mV) AgNPs that presented better bactericide effects than antibiotics against Gram-positive (G+; 21.3 folds) and Gram-negative (G-; 16.2 folds) bacteria tested by minimum inhibitory concentration. RPS was impregnated with different AgNPs concentrations and these nanocomposites were characterized by SEM and EDX. Nanocomposites presented antibiofilm properties at AgNPs concentrations equal to 250 ppm and 1000 ppm for G+ and G- bacteria, respectively, in colony biofilm model and Kirby-Bauer assays. MSC were isolated from adipose tissue, characterized by flow cytometry and seeded on the nanocomposites. MSC survived on nanocomposites impregnated with 250 ppm AgNPs solutions, as indicated by calcein assays, with; cell viability reductions of 35% in comparison to control+. MSC could proliferate on nanocomposites with low doses of AgNPs. Thus, developed constructs (nanocomposites-MSC) possesses appropriate properties to promote skin wound, prevent bacterial growth and, potentially, avoid water loss, and consequently to contribute to restore damaged tissue.

Biography

Roberto Sánchez has studied Biology and obtained his PhD in 2011 from Universidad Nacional Autónoma de México. In 2011, he has joined the Instituto Nacional de Rehabilitación LGII as Young Researcher in the field of Tissue Engineering. He was appointed as the Head of Researcher of Biotechnology laboratory at INR LGII in 2016. He has published 14 scientific articles.

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