Three Layered Support Based on Collagen and Carbon Nanotubes Functionalized With Thiamphenicol as Drug Delivery System: A New Concept of Intelligent Wound Dressing

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Thousands of people suffer from skin damage or burns every year, accidents that can cause disability or even death. The present work proposed a new concept of intelligent dressing for tissue regeneration designed to have several functions at the same time, to reduce costs and trauma, being much more efficient than current ones. The dressing consists of three layers, with different functions: the layer that comes into direct contact with the injured skin is based on known for regeneration function, polyethylene glycol (for better adhesion) and fructose (to avoid the possibly unfavorable response of the immune system). The second layer consists of microcapsules incorporating human mesenchymal stromal cell secretomes that together with collagen help the tissue to recover naturally. The third layer is a protective layer, made of collagen with carbon nanotubes functionalized with thiamphenicol (drug). To create this concept support, functionalization, coacervation, assembling, freeze-drying techniques were used. Both the separate components of support and the tri-layered dressing were characterized by modern analysis such as UV-VIS and FT-IR spectroscopy, TEM, SEM and DLS (dynamic light scattering) microscopy and activity for drug delivery systems based on carbon nanotubes with thiamphenicol; the bio-microcapsules were tested by optical microscopy and the collagen supports were characterized by FT-IR, water absorption, contact angle, stability to enzymatic degradation, SEM and optical microscopy. The obtained results showed that the three-layered intelligent dressing met the conditions of stability, absorption, porosity being a good candidate of ideal wound dressing for sever lesions.

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