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Abstract

Gastroretentive Electrospun Nanofibers Used in Gastric Wall Wound Healing †

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Gastric cancer is the third leading cause of death by cancer worldwide [1]. Among all the stomach cancer types, 90% correspond to gastric adenocarcinoma. In most of these epithelial tumors, a close association to *Helicobacter pylori* infection has been found [2]. Consequently, most of the associated therapies, namely, surgery for tumor resection and antibiotic therapy for the eradication of bacteria, usually result in the pathological healing of gastric tissues and long recovery times. This inevitably led to a significant hospitalization stay, postoperative changes in biomechanical properties of the gastric wall and difficulties in bacteria eradication [3].

Hence, the demand for innovative solutions led to the development of tissue-engineered electrospun nanofibers (eNFs) as gastric wall substitutes capable of promoting the healing of the gastric wall. In fact, eNFs with a thickness of up to 1mm provide support for cell proliferation, as well as a high surface area for the efficient delivery of proteins or antibiotic agents.

Electrospinning, being a versatile and low-cost technique, was used here to obtain an interconnected network of eNFs, composed of blended polycaprolactone (PCL)/gelatin, and crosslinked polyvinyl alcohol (PVA)/chitosan using 1,4-butanediol diglycidyl ether (BDDGE) as the crosslinking agent [4–6].

Hybrid eNF performance was evaluated regarding biodegradation, mucoadhesion, mechanical properties and as a drug delivery system. Considering the peristaltic movements of the stomach during the digestive process, PCL allowed to increase the tensile strength and elasticity of the whole hybrid structure. Additionally, to simulate the protein release-controlled delivery of therapeutic agents through the PCL/gelatin eNFs, protein bovine serum albumin (BSA) was successfully released with an efficiency of over 60% during the first 24 h. The inclusion of PVA/chitosan eNFs also increased the mucoadhesive properties of the membrane. Finally, the degradation profile of eNFs proved to be compatible for long-term applications (over one month).

Overall, hybrid eNFs demonstrated biodegradability and a mucoadhesive capacity, as well as promising mechanical characteristics and suitable antibiotic delivery properties to work as gastric wall substitutes.

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