SYNTHESIS AND CHARACTERIZATION OF COLLAGEN-CHITOSAN SCAFFOLDS

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Introduction. The tissue engineering is focus in living cells, signaling molecules and polymer scaffolds. The scaffolds provide a suitable environment for cells to adhere, proliferate and differentiate; also serve to fill the spaces between cells and controlled release of signal molecules.[1] Chitosan (Chi) is used as scaffold due to its properties as biocompatible and biodegradable. It also provides antimicrobial activity, ability to form films and porous structure, as well as chemical versatility.[2] Collagen (Col) is an important component of the dermis which provides adequate conditions for the fibroblast growth. The aim of this work was synthesized and characterized materials based on porcine collagen type I and biological-chemical chitosan.

Methods. Chi was prepared by heterogeneous *N*-deacetylation of chitin obtained by biological-chemical process[3] and characterized by HNMR, molecular weight by viscosimetry. Chi was employed for the preparation of composites with Col by thermally triggered and glutaraldehyde (GA) crosslinking methods.[4] Two ratios of Chi and Col (Chi:Col) were employed 1:1 and 1:2 (wt/wt). Porous size (SEM), ATR-FTIR, yield, swelling, erosion and solubility in Dulbecco's modified Eagle medium were determined for selecting suitable conditions for preparation of Chi/Col.

Results. Chi presented low molecular weight (107.68 to 208.84 kDa) with acetylation degree of 5.09%. Chi/Col prepared by thermally triggered method was white, brittle, and fragile with heterogeneous porous structure and agglomeration of Chi along the Col chains. The porous observed in the ratio Chi:Col 1:1 (wt/wt) were in a range of 20.6 µm to 133µm (Fig. 1). In the ATR-FTIR spectrum (Fig 2) was observed the ionic bond formation between the amino group of Chi and carboxy glycine and prolyne aminoacids of the polypeptide chains of the collagen alpha helix.[5]

The GA crosslinking produced and sponge like structure. These materials presented heterogeneous pore formation and a tangled fibrous nanostructure. The pore size for the ratio 2:1 was from 14 µm to 116µm while for the 1:1 was 25.6 to 100µm. The ATR-FTIR spectra of the Col-GA-Chi materials showed decreases in the band of the amino group of Chi and the mainly bands of collagen (Fig. 2). This indicates that the modification was carried out in the amine group of collagen aminoacids.[6]

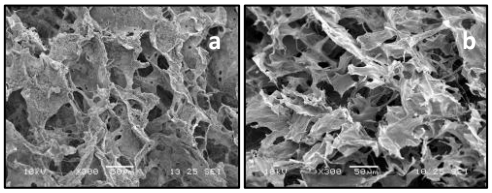

Fig.1 SEM of Chi/Col material in ratio 1:1(wt/wt). a) Thermally triggered and b) GA croslinking (300x).

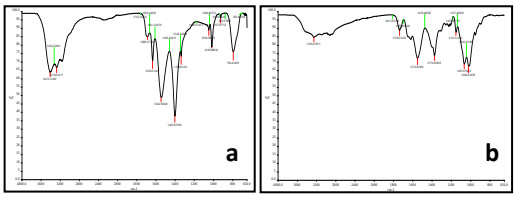

Fig.2. ATR-FTIR spectra of Chi/Col composites. a)thermally triggered method and b) GA crosslinking.

Chi/Col prepared by thermally triggered method displayed lower erosion than those prepared by GA crosslinking, 15.23±1.81% and 64.52±2.05%, respectively.

Conclusions. The composites of Chi/Col prepared by thermally triggered method presented pores with suitable size for cell adhesion as fibroblast, as well as a sponge structure which has greater potential to be used as scaffold.

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