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Physical-chemical properties and tissue response to biopolymer implants based on hyaluronic acid-concentration and degree of cross-linking effect

Oliveira MRM, Oliveira Junior OB, Barud HGO and Pretel H
BioSmart Nanotechnology, Brazil

Differences in the rate of crosslinking of hyaluronic acid (HA) gels can alter their properties and compromise their biological performance and biodegradation. The objective of this study was to perform the morpho-physicochemical characterization and to evaluate the histopathological response and biodegradation of AH indicated for dermal filling: experimental 12.5% (E12) and RennovaFill (RF) and tissue lifting: experimental 15% (E15) and RennovaLift (RL). The characterization was performed by scanning electron microscopy (SEM), X-ray dispersive (EDX) and Fourier transform infrared spectroscopy (FT-IR) and oscillatory dynamic rheometry. To evaluate the histopathological response and biodegradation, 0.1mL of each HA was implanted in the dorsal subdermal level of 25 male Hostman rats, randomly distributed in 5 groups (n=5), according to the time of implantation of AH: 7, 14, 30, 60 and 120 days. Slides were stained with hematoxylin and eosin (H/E) and Masson trichrome and analyzed by an experienced examiner (HP), calibrated and blinded for the AH used. Ordinal regression was used to evaluate the probability of histopathological tissue response and biodegradation of HA for $p < 0.05$. Results: The null hypothesis (H0) was rejected because both the morpho-physicochemically characterization and the histopathological analysis showed significant differences between the tested HAs. It can be concluded that: (1) HA with the same clinical indication differ in the morpho-physicochemical characteristics, in the inflammatory response, and in the biodegradation pattern. (2) The level of inflammatory response was inversely proportional to the concentration of HA in the gel and to its degree of cross-linking. (3) All HA tested stimulated the same level of formation of fibroblasts and collagen fibers at the end of the study, and (4) RF presented the best biological and physiochemistry performance.

morgana_rmo@hotmail.com