OsteoBiol® by Tecnoss

Solid-state NMR and IR characterization of commercial xenogeneic biomaterials used as bone substitutes

LABORATORY TESTS

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ABSTRACT

Thanks to their similarity to human bone tissue, xenogeneic biomaterials, mainly of bovine and porcine origin, are widely used as bone substitutes in the reconstructive surgery.

As in literature only a few works on commercial xenogeneic materials used for bone repair are available, the Authors decided to perform an elaborate characterization of three commercial xenogeneic biomaterials OsteoBiol® *Gen-Os*® (GO), *Apatos* Spongiosa (AS) and *Apatos Cortical* (AC), all from Tecnoss® srl (Giaveno, Italy) originated from porcine bone. Often used in dental surgery, AS and AC are produced from trabecular and cortical porcine bone, respectively. *Gen-Os*® is made of porcine bone, both cortical (25%) and trabecular (75%).

For the purpose of this study, these three xenogeneic biomaterials were characterized by various analytical methods, such as powder X-ray diffraction (XRD), thermogravimetry (TGA), high-resolution solid-state nuclear magnetic resonance (ssNMR) and infrared spectroscopy (FT-IR), focusing on their structural properties and chemical compositions.

The reported spectroscopic analyses are semi-quantitative and aimed at structural comparison of the examined materials. Moreover, as the samples do not require any chemical pre-treatment, those methods are not invasive and do not interfere with the material structure.

CONCLUSIONS

According to this study, it is evident that the main constituents of the analyzed biomaterials were nanocrystalline apatite mineral with the average crystal sizes similar to those in bone mineral. Moreover, they contain organic collagenous matrix composed mainly of collagenous proteins, but with the amino acid composition different than that in pure collagen type I. This difference in the protein structure may be a consequence of the manufacturing process of the raw bone.

The highest levels of water, organic matrix and apatite mineral were found in GO, AS and AC, respectively. The lowest levels of water, organic matrix and apatite mineral were found in AC, AS and GO, respectively.

The Authors conclude that "*solid-state NMR and FT-IR spectroscopies, applied together and accompanied by elaborate curve fitting analysis, provide valuable information on xenogeneic biomaterials*".

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Material tested

BONE SUBSTITUTE
OsteoBiol® *Gen-Os*®
OsteoBiol® *Apatos*

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