DETAILED ASSESSMENT OF DONOR XENOMATERIAL BY RAMAN SPECTROSCOPY

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The search for new ways to obtain biocompatible materials from supporting connective tissues with a given set of physicochemical and mechanical properties possessing osteoinductive properties is an urgent task of modern biotechnology and tissue engineering.

Dental tissues are promising and available sources for these purposes, and can be used in dentistry, traumatology and orthopaedics, and oral and maxillofacial surgery [1]. The mineral component obtained by demineralisation of mammalian dental tissues is used to fill defects after injuries and trauma, to regulate metabolic processes, has pronounced regenerative properties [2]. Also the given material can be used as a component of toothpastes and various professional dental compositions for prevention of caries and destructive processes of enamel of a tooth as a mineral component of dental tissues along with hexagonal crystal structure of hydroxyapatite contains an amorphous phase. Therefore, there is a need to assess the quality of xenogeneic bone-plastic materials from animal dental tissues.

The aim of the work was to assess in detail the donor xenogeneic material obtained from molars and incisors that have undergone primary treatment and demineralisation using Raman spectroscopy.

Objects of research were groups of samples of xenomaterials made on technology "Lioplast"® at identical degree of demineralization of 1.8n, from teeth of a cow. Samples have been divided into 2 main groups according to the type of donor xenomaterials: 1 group - molars and 2 group - incisors.

As the main method of xenomaterials research we used the method of Raman spectroscopy implemented by high resolution digital spectrometer AndorShamrockSR-303i with built-in cooled chamber DV420A-OE, providing spectral resolution of 0.15 nm, and fiber-optic probe for Raman spectroscopy RPB785, combined with a laser module LuxxMaster LML-785. 0RB-04 (up to 500 mW, wavelength 785 nm) [3,4].

The spectra were taken at three different points and averaged using the Wolframmathematica software package.

An extended detailed analysis of Raman spectra of examined xenomaterial samples obtained from molars and incisors has shown that the most pronounced spectral changes after demineralization process are observed in samples from molars and manifested by PO_4^{3-} and CO32- concentration changes in comparison with incisors as indicated by changes on the lines 1071 cm^{-1} (C-O flat valence), 956 cm^{-1} (P-O symmetric valence) respectively. The results obtained may indicate that enamel hydroxyapatite has a highly crystalline calcium phosphate structure, which makes incisor enamel denser and slower to dissolve when exposed to acids. Studies have shown that both incisors and molars can be used for xenomaterials. However, when using donor material from molars, it must be taken into account that the demineralisation process will occur faster than with incisors.

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