SPECTRAL EVALUATION OF BIOMATERIALS FROM JUVENILE DENTIN OF VARIOUS DEGREE OF DEMINERALIZATION USING RAMAN SPECTROSCOPY

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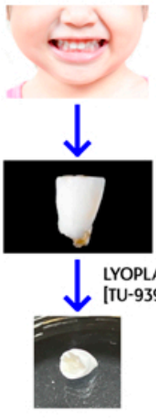
INTRODUCTION

Osteoplastic materials serve as a biocompatible matrix for building bone tissue during its regeneration and must be completely replaced by the patient's own tissue. Allogeneic analogues of bone tissue are considered to be the most accessible source of biomaterials-substitutes that contain biologically active cellular structures. Dentin can be used as a graft, as it contains structural proteins of bone tissue, has low antigenicity and high osteoinductivity.
Assessment of the degree of demineralization of biomaterials from juvenile dentin is an urgent task, because the biocompatibility of the graft directly affects its engraftability and the subsequent formation of its own bone tissue.

MATERIALS AND METHODS OF RESEARCH

The objects of research were dentin obtained from healthy juvenile teeth pre-mechanically treated.
Each sample was cut into 2 equal parts nd further divided into two groups, according to the stages of their processing:
1 – biomaterials from juvenile dentin demineralized in hydrochloric acid of 1.2N degree of normality;
2 – biomaterials from juvenile dentin demineralized in hydrochloric acid of 1.8N degree of normality.



Demineralization was carried out in a hydrochloric acid solution using the "LIOPLAST" technology [TU-9398-001-01963143-2004]

The main method of analyzing biomaterials from juvenile dentin was the Raman spectroscopy method. The analysis of the spectra was carried out in the MagicPlotPro software environment, as well as using the discriminant analysis method in the IBM SPSS Statistics software environment.
The averaging of the spectra was carried out in the Mathematica 8 mathematical software package.

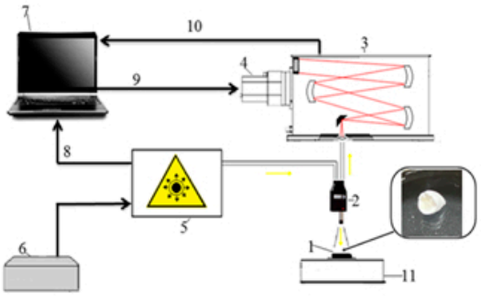


Figure 1. Experimental stand: 1 - object under study; 2 - RPB-785 Raman probe; 3 - Shamrock sr-303i spectrometr; 4 - bulit-in cooled camera DV420A-OE; 5 - LuxxMaster Raman Boxx-785.0 RB-04 laser module; 6 - laser module power supply; 7 - computer; 8,9,10 - information electrical cabels; 11 - cordinate table

RESULTS OF RESEARCH

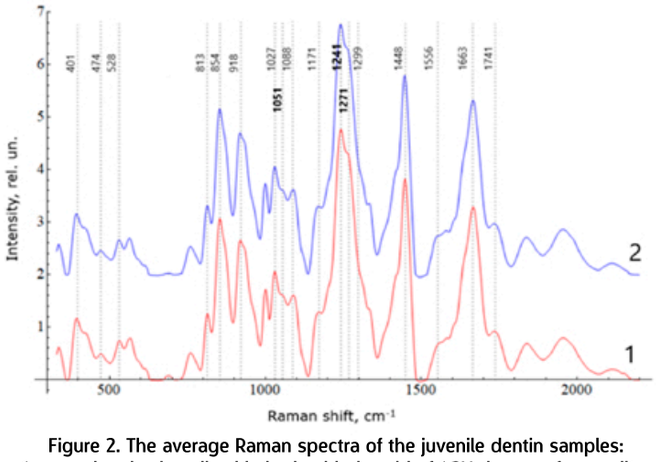


Figure 2. The average Raman spectra of the juvenile dentin samples:
1 - samples demineralized in hydrochloric acid of 1.2N degree of normality;
2 - samples demineralized in hydrochloric acid of 1.8N degree of normality;

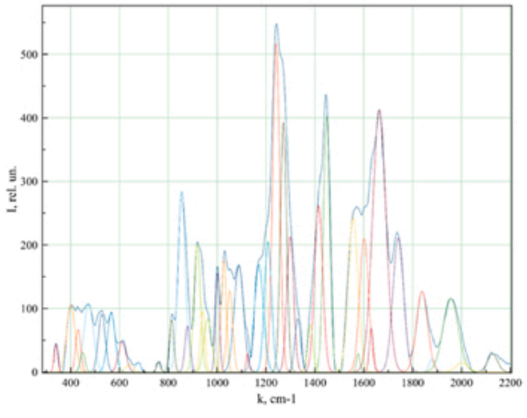


Figure 3. Spectral contour decomposition of the samples of juvenile dentin

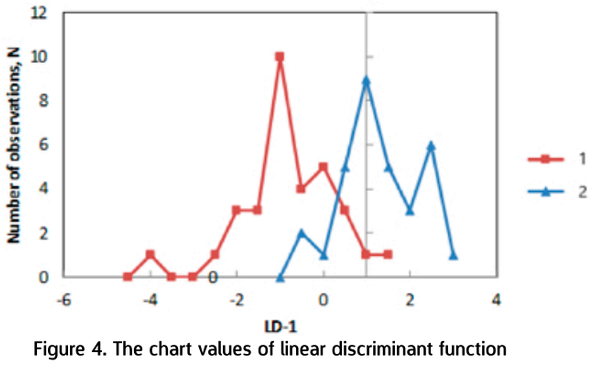


Figure 4. The chart values of linear discriminant function

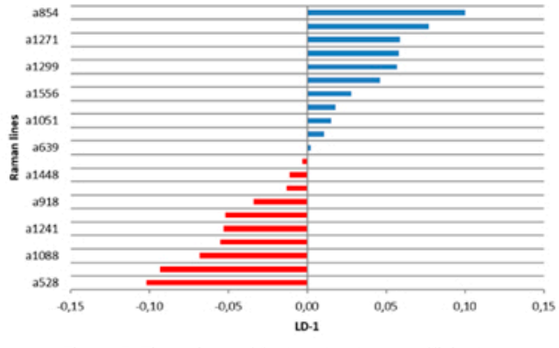


Figure 5. The values of factor structure coefficients

CONCLUSION

As a result of the conducted studies, spectral differences of biomaterials from juvenile dentin demineralized in hydrochloric acid of varying degrees of normality were established. It is shown that demineralization of 1.2N with hydrochloric acid solution allows to preserve a larger number of organic components compared to demineralization of 1.8N with hydrochloric acid solution, as evidenced by an increase in the intensity of the lines 918 cm^{-1} (Proline, hydroxyproline), 1171 cm^{-1} (Tyrosine (collagen type I)), 1271 cm^{-1} (Collagen (amide III)), 1663 cm^{-1} (Proteins, including collagen I).