Raman spectroscopy to assess the condition of tooth enamel after treatment of a pathological periodontal pocket

* Samara National Research University, Samara
** Samara State Medical University, Samara

INTRODUCTION
Periodontitis is one of the most insidious and common dental diseases. Developing gradually, in its initial stages it causes neither pain nor severe discomfort. According to the WHO (2002), about 95% of adults and 80% of children in the world have some symptoms of periodontitis. High rates of periodontal disease, according to a WHO scientific panel report, fall between the ages of 20 - 44 (65 - 95%) and 15 - 19 (55 - 89%). Untimely treatment can lead to severe forms of periodontitis and subsequently to tooth loss. Open curettage surgery is a common treatment for periodontitis. However, it is not known what effect this surgery has on the structure of the tooth tissues.

MATERIALS AND METHODS OF RESEARCH

Experimental stand
1 studied subject;
2 Raman probe RPB 785;
3 spectrometer Shamrock sr-303i;
4 cooling camera DV420A-OE;
5 laser module LuxxMaster LML-785.0RB-04;
6 power supply;
7 computer;
8,9,10 information electric cables;
11 coordinate table;

The samples were divided in 2 groups: 1 group – the teeth removed from patients before curettage; 2 group - the teeth removed from the same patients after curettage.

RESULT OF RESEARCH

Figure 1 – The comparison of the spectra of tooth enamel: 1 – before curettage, 2 – after curettage

Figure 2 – Spectral contour decomposition of the samples of enamel

Figure 3 – The chart of values of linear discriminant function

Figure 4 – The values of factor structure coefficients

CONCLUSION
The chemometric analysis of the Raman spectra of teeth enamel before and after curettage was made as a result of the study. Spectral changes of tooth enamel were revealed. It was found that after the procedure of open curettage spectral changes in tooth enamel related to the changes of relative intensity of the lines of 957 cm\(^{-1}\) (P–O symmetric stretch (PO\(_{2}\)) and 1070 cm\(^{-1}\) (C–O in plane stretch (CO\(_{2}\))) occur. These lines are related to the change of mineral composition. There are also changes of intensity of the lines of 1449 cm\(^{-1}\) (Lipids and proteins), 1036 cm\(^{-1}\) (phenylalanine (collagen assignment)), 854 cm\(^{-1}\) (Hydroxyproline v(C–C) stretch) related to the forming of organic matrix.

These spectral changes indicate the restoring of the tooth enamel tissues after this procedure.

The Raman spectroscopy method can be further used for evaluation of tooth tissues after curettage.