

# DENTAL TISSUE STUDY AT APICAL PERIODONTITIS

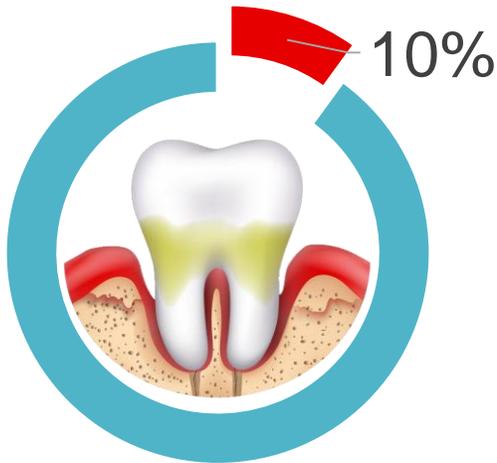
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# the relevance of research

## Prevalence periodontitis

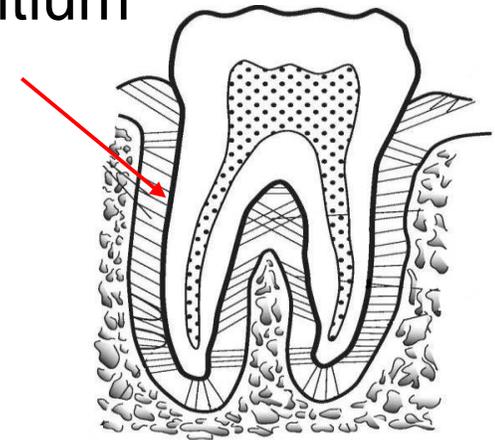


❑ Apical periodontitis is a widespread dental disease that may be asymptomatic in its early stages [1,2].

❑ Periodontium is a connective tissue located in the slit-like space between the cement of the tooth root and the alveoli plate. The *main functions* of the periodontium:

- the retention of the tooth in the alveolus
- the even distribution of pressure on the tooth during the process of chewing food

periodontium



❑ The inflammation in the initial stages of periodontitis can be so small that the patient will not have specific symptoms, and standard diagnostic methods will not allow detection.

# purpose of the study

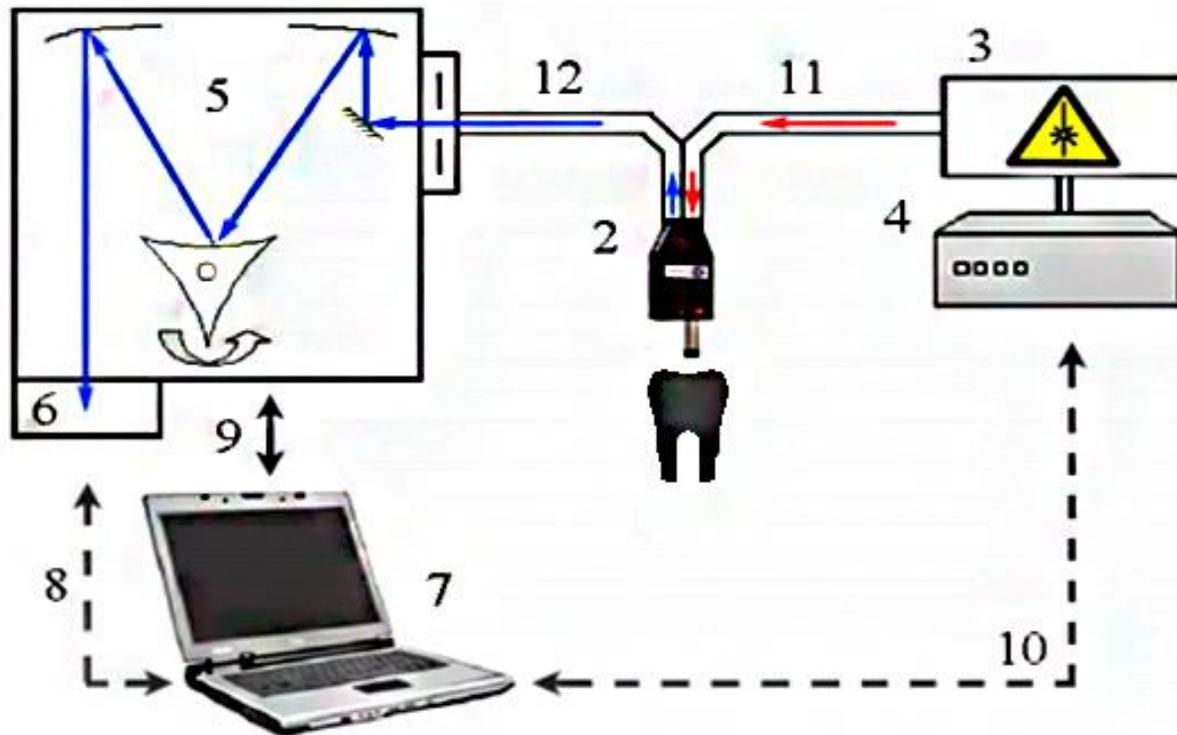
Untimely treatment of periodontitis leads to the development of complications up to the loss of teeth. Therefore, it is very important to detect this disease at an early stage of development.

The Raman spectroscopy method allowing receiving high-resolution spectra of subjects noninvasively and without preparing is currently widely used among the promising optical methods of analysis. This method is used in dentistry for studying the features of dental tissues and their changes during pathological processes.

So, *the purpose of our study* was to study and identify the features of the hard tissues of teeth in patients with periodontitis using Raman spectroscopy.

# methods of research

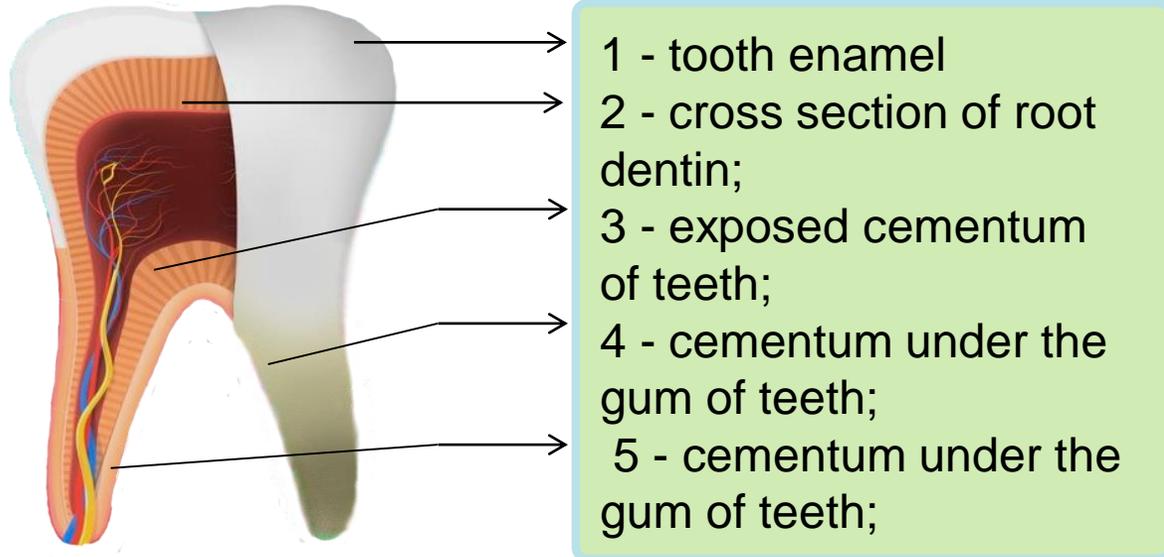
## Raman Spectroscopy experimental stand



- 1 – subject;
- Raman probe RPB785;
- 3 – laser module LuxxMaster Raman Boxx;
- 4 – laser module power source;
- 5 – spectrometer Shamrock sr303i;
- 6 – build-in cooling camera DV420A-OE;
- 7 – computer;
- 8, 9, 10 – command cable;
- 11 – transmitting optical fibre;
- 12 – receiving optical fiber.

# materials of research

## Hard dental tissues



Teeth obtained after tooth extraction in two groups of people: **patients with periodontitis (1)** and a **healthy control group (2)** (teeth removed by orthodontic indications).



The experimental studies were carried out in accordance with ethical standards (extract from the protocol No. 200 of the meeting of the bioethics committee of the Samara State Medical University dated 05/22/2019).



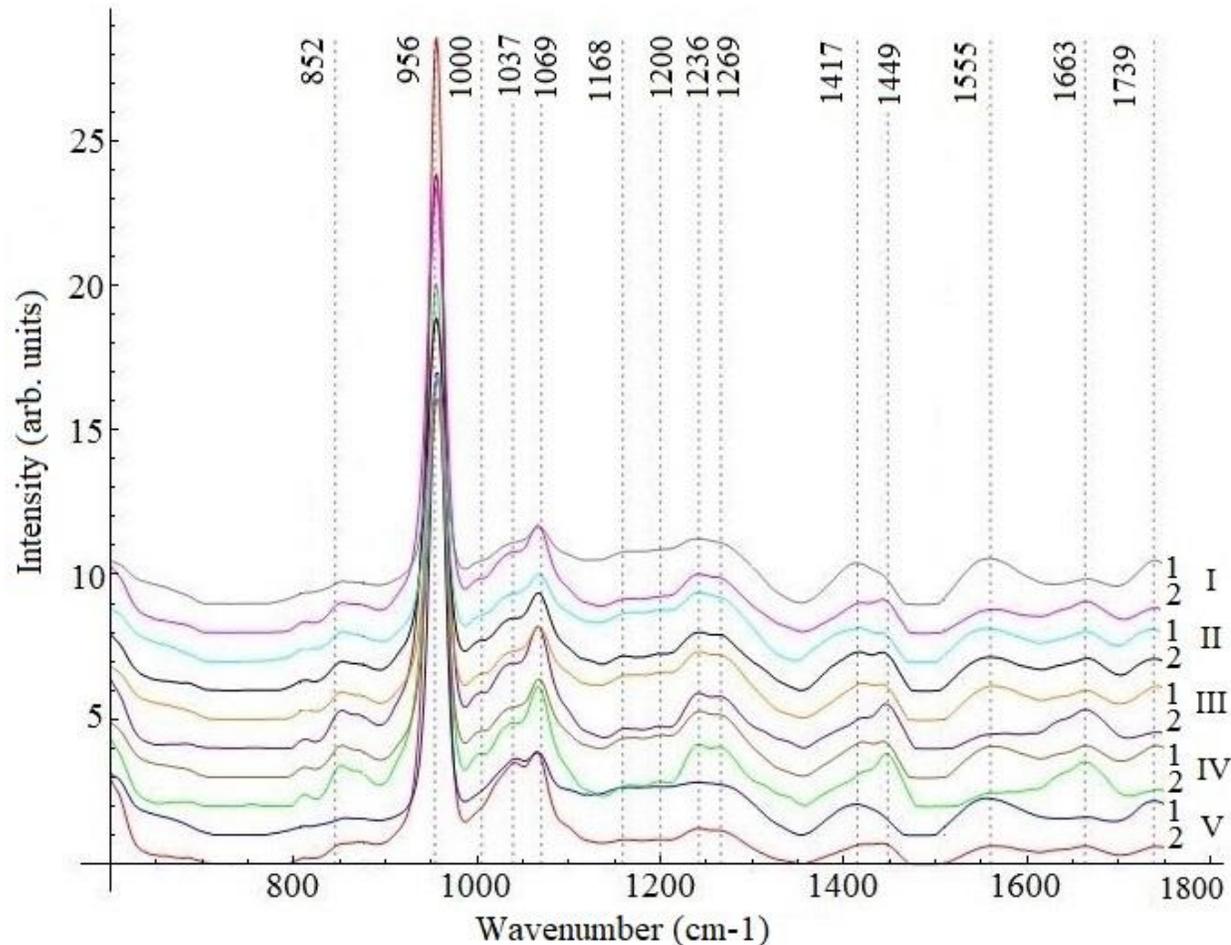
Patients age: 24-45 years



The research samples were processed using the “Almabez Express” solution intended for disinfection and stored in a refrigerator at a temperature of 6 ° C

# results of research

## Raman spectra of hard dental tissues



The averaged Raman spectra of different tissues of teeth: **healthy teeth (1)** and **infected by periodontitis (2)** :

I - cross section of root dentin;

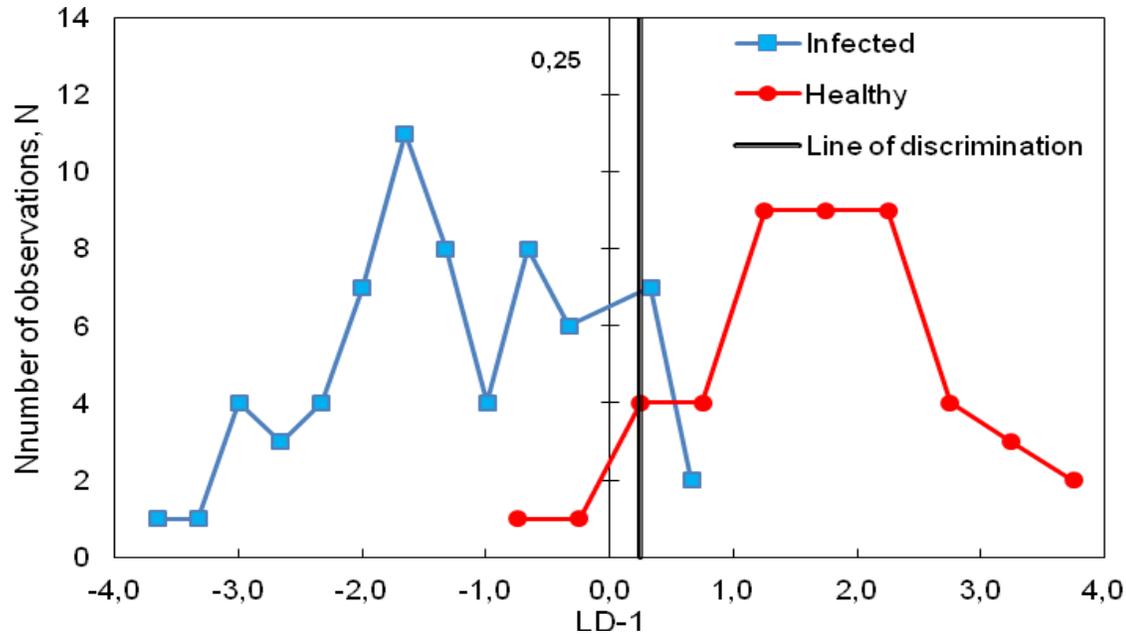
II - exposed cementum of teeth;

III - cementum under the gum of teeth;

IV - cementum under the gum of teeth;

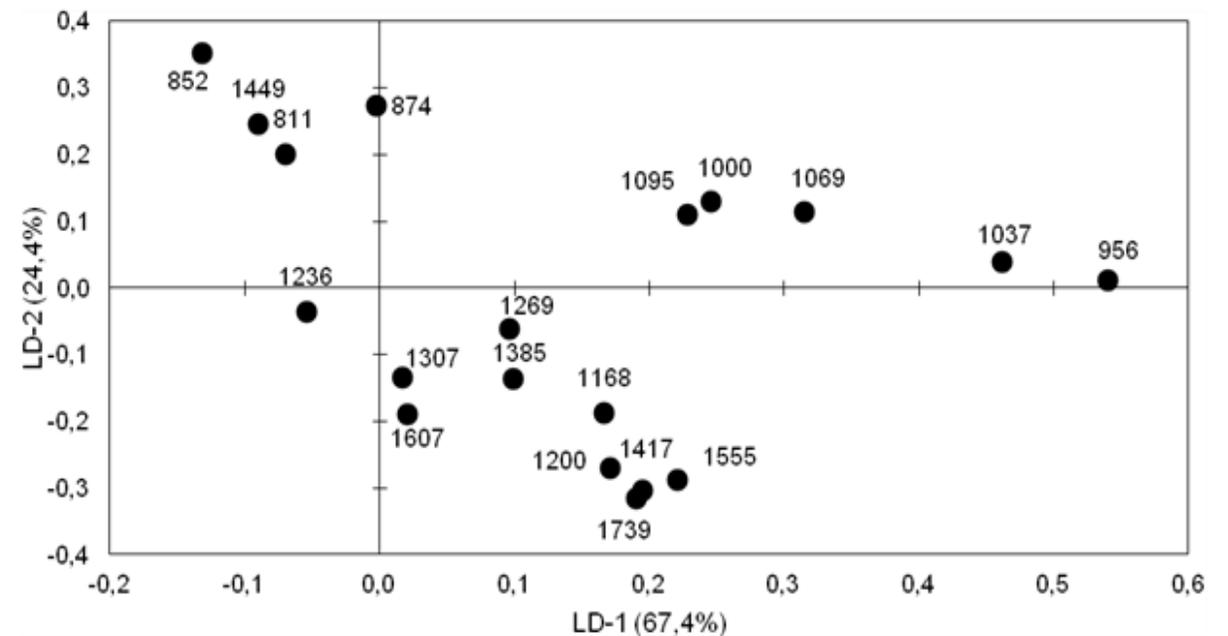
V- tooth enamel

# Chemometric analysis of the Raman spectra of hard dental tissues



The graph of values of normalized coefficients of canonical discriminant functions

The graph of the values of linear discriminant functions of the tooth samples, divided into **healthy** and **infected** groups.



# conclusion

Spectral changes of hard tissues affected by periodontitis were detected at wavenumbers 937  $cm^{-1}$ , 956  $cm^{-1}$ , 1069  $cm^{-1}$ , 1230-1270  $cm^{-1}$ , 1555  $cm^{-1}$ , 1665  $cm^{-1}$  and 1739  $cm^{-1}$ . These changes indicate the destruction of the tooth hard tissues: collagen matrix and hydroxyapatite in periodontitis.

**Thank you for your attention!**