

Associative and Initiative Connections of the Pathogenic and Opportunistic Microflora in the Development of Inflammatory Diseases of the Oral Mucosa in Young People

**Irina Nikolaevna Usmanova,
Larisa Pavlovna Gerasimova,
Marsel Maratovich Tuigunov,
Irina Alexandrovna Galimova,
Rauza Fazylovna Kusnarizanova,
Irek Raminovich Usmanov,**

*Federal State Institution of Higher Education Bashkir State Medical University,
450008, Russian Federation, Republic of Bashkortostan, Ufa, Lenina Str. 3*

Abstract:

Data on the effects of pathogenic and opportunistic microflora in the development of inflammatory diseases of the oral mucosa in persons of young able-bodied age are presented. The role of Porphyromonas gingivalis, Fusobacterium nucleatum, Aggregatibacter actinomycetemcomitans, Treponema denticola and yeast-like fungi of the genus Candida in their development has been established, which makes it possible to use them as markers. The revealed features of clinical manifestations of the pathology of the oral mucosa are directly interrelated with pathogenicity of these microorganisms, in particular adhesiveness, colonization and cytotoxicity. Traditional methods of microbiological research and PCR diagnostics were used. Modern complex clinical and laboratory methods of investigation make it possible to determine the triggering mechanisms for the development of inflammatory diseases of the oral mucosa necessary for improving the effectiveness of therapeutic and prophylactic measures.

Keywords: mucous membrane of the oral cavity, periodontium, young persons, colonization, Porphyromonas gingivalis, Fusobacterium nucleatum, Aggregatibacter actinomycetemcomitans, Treponema denticola yeast-like fungi of the genus Candida.

INTRODUCTION:

During the recent decade, the problem of diagnosis and treatment of the pathology of the oral mucosa and periodontium has been given considerable attention by domestic and foreign researchers [1, 2, 3, 4, 5, 6, 7, 8]. High prevalence of the pathology of the mucous membrane and inflammatory periodontal diseases is caused by the effect of immunosuppressive environmental factors on the human body, as well as the widespread and not always justified use of antiseptics and antibacterial drugs, the presence of somatic pathology.

According to WHO (2015) based on the latest results of epidemiological studies, clinically intact periodontium occurs on average from 2 to 10% of cases, while chronic inflammatory periodontal diseases are diagnosed in 95% of cases. The prevalence of inflammatory periodontal diseases in persons of young able-bodied age reaches on average 98.5% of cases [1, 2, 3, 4, 5]. One of the largest studies on the epidemiology of the diseases of oral mucous membrane was conducted in 1977 by doctor T. Axell et al. (Sweden). It included oral examination of 20,333 people over the age of 15 years with a high prevalence of leukoplakia (49.07%), geographical tongue (8.45%), lichen ruber planus (1.85%), oral candidiasis in 18.1%, aphthous stomatitis in 15.7%, and herpes in 14.3% of cases [9]. Gileva O.S. (2012) when examining people aged from 20 to 34 years diagnosed lichen ruber planus (LRP) in 31.5% of cases, chronic recurrent aphthous stomatitis in 17.5% of cases, and leukoplakia in 5.15% of cases. Kharitonova M.P. et al. (2012) in the survey of residents of the Sverdlovsk region [9] diagnosed LRP in 14.5%, chronic recurrent aphthous stomatitis in 6.9% of cases, leukoplakia in 6.2% of cases.

Development of the pathology of the oral cavity and initial forms of the inflammatory process in the tissues of the periodontium is caused by various risk factors. In particular, not only representatives of pathogenic but also representatives of opportunistic microflora can cause primary tissue damage as they

produce proteases, toxins and metabolic products during their life activity [1, 2, 3, 4, 5, 6, 10, 11, 12]

Wide prevalence of oral cavity pathology and inflammatory periodontal diseases caused an urgency of the study, the goal of which was to research associative links between pathogenic and opportunistic microflora that promoted initiation of inflammatory diseases of the oral mucosa and periodontal tissues in persons of young able-bodied age.

MATERIAL AND METHODS

A complex dental examination of 424 young people aged from 21 to 44 years was made. It included 266 people with chronic generalized catarrhal gingivitis (CGCG) and oral cavity pathology - I clinical group, 110 patients with chronic generalized periodontitis of mild severity (CGPMS) and oral cavity pathology - II clinical group, and 48 people with clinically intact periodontium (CIP) and oral cavity pathology – the control group. In the diagnosis of oral cavity pathology and inflammatory periodontal diseases, assessment of their severity and prevalence we used the STEPS approach (WHO recommendations, 2013). In order to determine pathogenic and opportunistic microflora, we conducted microscopic examination of the oral fluid. Detection of opportunistic microorganisms, including yeast-like fungi of the genus Candida, was carried out by traditional methods, the study of Porphyromonas gingivalis, P.endodenalis, Treponema denticola, Aggregatibacter actinomycetemcomitans, Fusobacterium nucleatum, Tannerella forsythia was carried out by using PCR diagnostics (Litech Scientific Production Company LLC, Russia).

Statistical processing of the received data was carried out by parametric and nonparametric methods by using the package of applied software Statistica 7.0 and Biostat, Excel 2007 spreadsheets. The level of significance was $p \leq 0.05$.

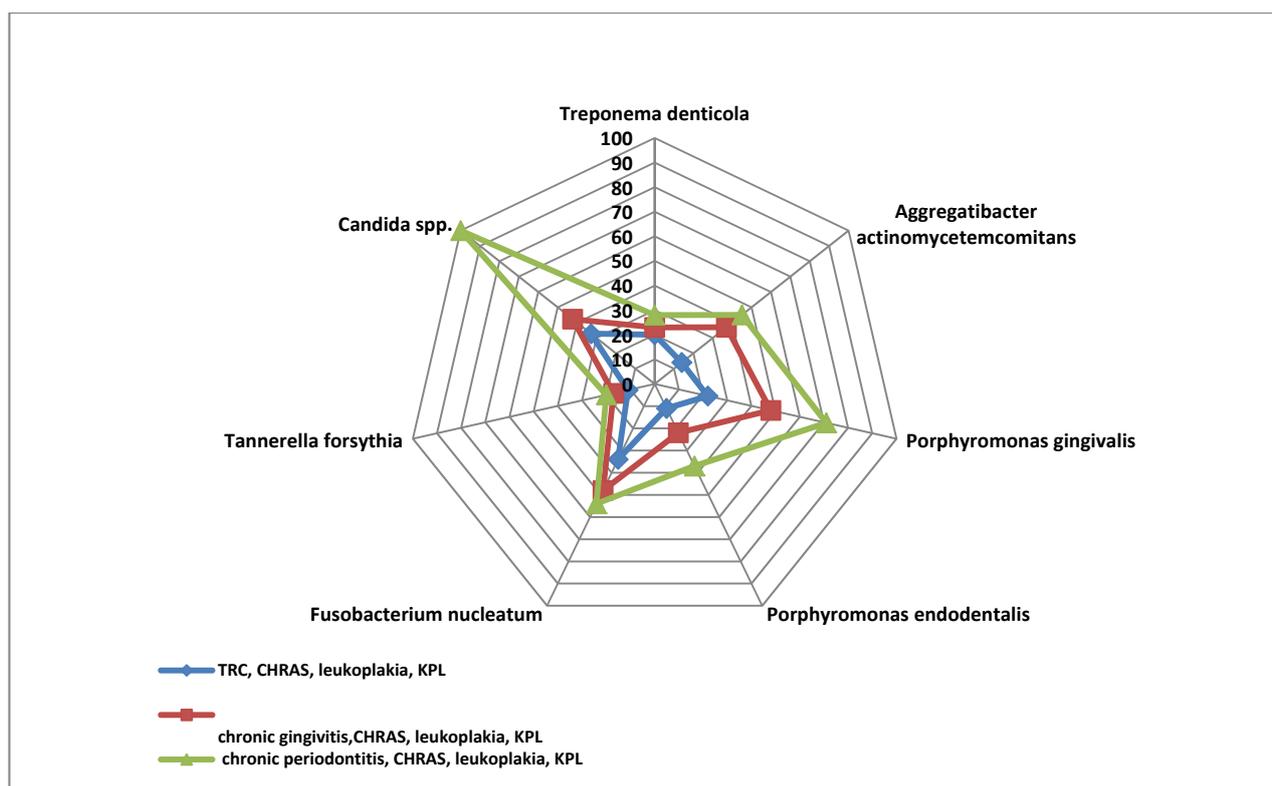


Figure 1. The ratio of identified representatives of pathogenic and opportunistic microflora of the oral cavity

RESULTS AND DISCUSSION

As a result of complex microbiological studies in young people suffering from oral cavity pathology (recurrent aphthous stomatitis, leukoplakia, LRP) and periodontal diseases the following microorganisms were detected: periodontal pathogenic Porphyromonas gingivalis, P. endodontalis, Treponema denticola, Aggregatibacter actinomycetemcomitans, Fusobacterium nucleatum, Tannerella forsythia in 19%, 32.85% and 42.85% of patients, respectively. Yeast-like fungi of the genus Candida were found on average in 10^2 to 10^5 CFU/mL in 35.42%, 52.98% and in 100% of the surveyed persons. Lactobacilli (Lactobacillus acidophilus, L. fermentum, L. brevis, L. casei) were found at a high frequency on average in 67.6% of cases. At this time, their occurrence was significantly higher in the pathology of oral mucosa and chronic gingivitis, chronic periodontitis than in clinically intact periodontium of the oral cavity ($P \leq 0.05$). Main inhabitants of the bacterial flora of the oral cavity included gram-positive cocci of Streptococcus genus (Str. Mitis, Str. Sangius) on average in 91.4% of cases, gram-negative cocci (Neisseria genus) in 65% of cases, which made it possible to assume their interrelation in initiating of inflammatory processes of the oral mucosa and periodontium (Fig. 1).

The analysis of associative connections between periodontal pathogenic bacterial species and opportunistic microflora showed significant excess of periodontal pathogens in oral fluid samples in chronic gingivitis of the oral mucosa compared to clinically intact periodontium ($\chi^2 = 12.99$, $p = 0.0003$), while an oral mucosa in case of chronic periodontitis and clinically intact periodontium did not differ significantly ($\chi^2 = 2.10$, $p = 0.147$). For yeast-like fungi of the genus Candida, significant excess was found in chronic gingivitis of the oral mucosa and oral mucosa in case of clinically intact periodontium ($\chi^2 = 13.03$, $p = 0.0003$), while for chronic periodontitis of the oral mucosa and oral mucosa - in case of clinically intact periodontium ($\chi^2 = 11.43$, $p = 0.001$).

Thus, the results of the comprehensive microbiological study made it possible to establish investigative relationship of associative links between the obligate and opportunistic microflora, which facilitated initiation of the oral mucosa pathology and inflammatory periodontal diseases in persons of young able-bodied age.

CONCLUSION

1. The presence of periodontal pathogenic bacterial species - Porphyromonas gingivalis, Fusobacterium nucleatum, Aggregatibacter actinomycetemcomitans, Treponema denticola, yeast-like fungi of the genus Candida and lactobacilli - can serve as markers for predicting the risk and development of oral cavity pathology and inflammatory periodontal diseases in persons of young able-bodied age.

2. Identification of associative links between periodontal pathogenic and opportunistic microflora with the use of microbiological monitoring allows not only to diagnose oral cavity and periodontal tissues' pathologies in their early manifestations, but also to predict their further development, and to monitor the effectiveness of the therapeutic measures being carried out with the selection of the most effective medical and prophylactic therapy in young people.

REFERENCES

- [1] Bulkina N.V. Sovremennyye aspekty etiologii i patogeneza vospalitel'nykh zabolevaniy parodonty. Osobennosti klinicheskikh proyavleniy refrakternogo parodontita [Modern aspects of the etiology and pathogenesis of inflammatory periodontal diseases. Features of clinical manifestations of refractory periodontitis]. Fundamental studies, 2012; 2: 416 - 420.
- [2] Gileva O.S. Struktura, faktory riska i klinicheskiye osobennosti zabolevaniy slizistoy obolochki polosti rta (po dannym lechebno-konsul'tativnogo priyema) [Structure, risk factors and clinical features of diseases of the mucous membrane of the oral cavity (according to the medical-consultative method)]. Perm Medical Journal, 2012; 6: 18-24.
- [3] Orekhova L.Yu., Kudryavtseva T.V., Chemina N.R., Tachalov V.V. and Loboda E.S. Problemy stomatologicheskogo zdorov'ya u lits molodogo

- vozhraza (obzor literatury) [Problems of dental health in young people (literature review)]. Parodontology, 2014; 2 (71): 3-5.
- [4] Martynova E.A., Makeeva I.M. and Rozhnova E.V. Polost' rta kak lokal'naya ekologicheskaya sistema [Oral cavity as a local ecological system]. Stomatology. 2008; 87 (3): 68-75.
- [5] Rabinovich O.F., Rabinovich I.M. and Abramova E.S. Proyavleniya disbakterioza i kandidoza pri razlichnykh zabolvaniyakh slizistoy obolochki polosti rta [Manifestations of dysbacteriosis and candidiasis in various diseases of the oral mucosa]. Clinical dentistry. 2011; 3 (59): 48-51.
- [6] Usmanova I.N. Stomatologicheskiy status lits molodogo vozrasta, prozhivayushchikh v regione s neblagopriyatnymi faktorami okruzhayushchey sredy [Dental status of young people living in a region with unfavorable environmental factors]. J. Fundamental Research, 2013; 12: 546-549.
- [7] Usmanova I.N., Gerasimova L.P., Kabirova M.F., Khusnarizanova R.F., Usmanov I.R. and Minyakina G.F. Sposob differentsial'noy diagnostiki keratoticheskikh protsessov slizistoy obolochki rta, odnosyashchikhsya k "belym proyavleniyam" [The method of differential diagnosis of keratotic processes of the oral mucosa related to "white manifestations"]. Inventions. Useful models. 2015; 7.
- [8] Axell, T. A Prevalence Study of Oral Mucosal Lesions in an Adult Swedish Population. Odontol Revy, 1976; 27(36)
- [9] Kharitonova M.P., Khalilaeva E.V. and Yurieva L.I. Osobennosti struktury zabolvayemosti slizistoy obolochki polosti rta u zhiteley Sverdlovskoy oblasti [Features of the structure of morbidity of the oral mucosa in residents of the Sverdlovsk region]. Maestro dentistry, 2012; 2 (46).
- [10] Gerasimova L.P., Usmanova I.N., Al-Kofish M.A.M., Tuygunov M.M. and Usmanov I.R. Analiz mikrobnogo sostava biotopov polosti rta u lits molodogo vozrasta v zavisimosti ot stomatologicheskogo statusa [Analysis of the microbial composition of the oral biotopes in young people depending on the dental status]. Parodontology, 2017; 3 (84): 73-78.
- [11] Usmanova I.N., Tuygunov M.M., Gerasimova L.P., Kabirova M.F., Gubaidullin A.G., Gerasimova A.A. and Khusnarizanova R.F. Rol' uslovno-patogennoy i patogennoy mikroflory polosti rta v razvitiy vospalitel'nykh zabolvaniy parodonta i slizistoy polosti rta (obzor literatury) [The role of opportunistic and pathogenic microflora of the oral cavity in the development of inflammatory periodontal diseases and oral mucosa (literature review)]. Bulletin of the South Ural State University. Series "Education, Healthcare, Physical Culture". Chelyabinsk, 2015; 15(2): 37-44.
- [12] Mineoka, T., Mineoka, S., Awano, T., et al., Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia in subgingival plaque. J.Periodontol., 2008; 79(4): 670-676.