multidrug-resistant and pandrug-resistant strains. The high prevalence of antimicrobial resistance among Gram-negative bacteria and microorganisms recovered from polymicrobial associations is of particular concern. The observed variability in antimicrobial susceptibility profiles highlights the limitations of an exclusively empirical approach to antibacterial therapy in the absence of local microbiological data.

Regular and systematic surveillance of the etiological structure of wound infections and the antimicrobial susceptibility of their causative agents is therefore essential. Further research should focus on monitoring temporal changes in resistance patterns and developing optimized approaches to antimicrobial treatment. Expansion of such investigations is an important prerequisite for establishing an effective antimicrobial stewardship strategy, improving the management of combat-related wounds, and limiting the further spread of antimicrobial resistance in military healthcare.

https://doi.org/10.30970/apmicro.2026.69

Kryvtsova M.[1], Kostenko Y.[1], Sklar I.[1], Salamon I.[2], Scaboi J.[3], Mandula R.[1], Hoblik Y.[1], Voloshin M.[1]

ORAL MICROBIOME IN INFLAMMATORY PERIODONTAL DISEASES AND DEVELOPMENT OF PLANT-BASED CORRECTIVE ORAL CARE PRODUCTS

[1]State University "Uzhhorod National University",
16 Universytets'ka St, Uzhhorod, 88000, Ukraine
[2]University of Presov, 01 17th November St., Presov, 081 16, Slovakia.
[3]University of Nyíregyháza, 31/b Sóstói St., Nyíregyháza, 4400, Hungary
e-mail: maryna.krivcova@uzhnu.edu.ua

Abstract. The study investigated the characteristics of the oral microbiota under various pathological conditions and evaluated the antimicrobial and antibiofilm activity of plant-derived essential oils. Complex aerobic–anaerobic microbial associations dominated by periodontal pathogens and opportunistic microorganisms were identified. Species-specific differences in the activity of essential oils against the studied microorganisms were established. The highest antimicrobial and antibiofilm activity was demonstrated by essential oils of *Thymus vulgaris* and *Origanum vulgare*. *Achillea millefolium* essential oil exhibited broad-spectrum antimicrobial activity against Gram-positive and Gram-negative microorganisms, as well as fungi of the genus *Candida*. The highest activity against anaerobic periodontal pathogens was observed for essential oils of *Pinus sylvestris*, *Eucalyptus globulus*, and *Anethum graveolens*. The findings support the potential use of essential oils as natural components of oral care products aimed at modulating the oral microbiota.
Keywords: oral microbiome, microbiome-associated markers, antimicrobial activity, essential oils.

The study of the oral microbiome is one of the promising areas of modern microbiology and dentistry, as it provides an opportunity not only to deepen our understanding of the mechanisms underlying various diseases of infectious and non-infectious origin but also to establish a scientific basis for the development of effective approaches to the correction of inflammatory diseases of the oral mucosa and periodontal tissues.

During 2016–2026, we investigated the composition and structure of the oral microbiota under various pathological conditions at the clinical departments of the Educational and Scientific Institute of Dentistry and Laboratory Medicine of Uzhhorod National University and at the University Dental Clinic. Microbiome-associated markers of the course of inflammatory periodontal diseases were identified using both conventional culture-based methods, including isolation and identification of anaerobic periodontal pathogens, and metagenomic analysis.

To identify promising natural antimicrobial agents, essential oils obtained from wild and cultivated plants were investigated, including *Eucalyptus globulus* Labill., *Lavandula angustifolia* Mill., *Origanum vulgare* L., *Mentha piperita* L., *Matricaria recutita* L., *Salvia officinalis* L., *Anethum graveolens* L., *Thymus serpyllum* L., *Pimpinella anisum* L., *Carum carvi* L., *Achillea millefolium* L., *Coriandrum sativum* L., and *Pinus sylvestris* L. The essential oils were produced by Calendula (Slovakia). Microbial susceptibility to the essential oils was determined using the agar well diffusion method, as well as by establishing the minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC).

It was established that inflammatory processes of various etiologies in the oral cavity are associated with the formation of complex aerobic–anaerobic microbial communities, with individual periodontal pathogens and opportunistic microorganisms predominating. These findings indicate a significant role of microbial imbalance in the maintenance and progression of inflammatory processes.

A comprehensive screening of isolated cultures for susceptibility to antimicrobial agents was performed, revealing species-specific antimicrobial effects depending on both the microorganism and the nature of the tested substance. Particular attention was paid to essential oils as natural multicomponent complexes exhibiting a broad spectrum of biological activities, including antimicrobial, antibiofilm, antioxidant, and deodorizing effects. These properties make essential oils promising active components of oral care products.

The assessment of antimicrobial and antibiofilm activity demonstrated that *Thymus vulgaris* L. and *Origanum vulgare* L. essential oils exhibited the highest activity among the tested oils. *Achillea millefolium* L. essential oil also demonstrated pronounced antimicrobial activity against a broad range of test cultures, including Gram-positive and Gram-negative microorganisms and microscopic fungi of the genus *Candida*.

The highest activity against anaerobic periodontal pathogens was observed for essential oils of *Pinus sylvestris* L., *Eucalyptus globulus* Labill., and *Anethum graveolens* L., indicating their potential for further investigation as natural components of products targeting the anaerobic component of dysbiotic oral microbial communities.

Based on the obtained results, formulations of oral care products were developed for the differentiated modulation of predominant members of oral microbial communities. The developed formulations contain plant-derived components with demonstrated antimicrobial activity, providing a basis for their further preclinical and clinical evaluation.

https://doi.org/10.30970/apmicro.2026.70

Limanskaya O.[1], Biloivan O.[1], Balak O.[2], Limanskii A.[3]

TWO-QUARTET G-QUADRUPLEXES IN *MYCOBACTERIUM BOVIS RPOB* AND *RPOC* GENES ASSOCIATED WITH RIFAMPICIN RESISTANCE

[1]National Scientific Center "Institute of Experimental and Clinical Veterinary Medicine"
83 Hryhoriia Skovorody St., Kharkiv, 61023, Ukraine
[2]Kharkiv National Medical University, 4 Nauka Ave., Kharkiv, 61022, Ukraine
[3]Institute of Physiological Active Compounds, 58 Nauka Ave., Kharkiv, 61072, Ukraine
e-mail: olgaliman@ukr.net

Abstract. Three putative G-quadruplexes (G4s) from two quartets were identified in the sense strand of the *rpoB* and *rpoC* genes of *Mycobacterium bovis*, which causes zoonotic tuberculosis, as well as two G4s in their antisense strands. Their 3D models were designed with atomic resolution. All