

ORAL MICROBIOLOGY PROGRAM 2022-2023

1. Oral ecosystem.

Seminar (1h)

Conditionings of ecological occurrences in the oral cavity: environment, age, factors contributing to bacterial growth, mechanisms of oral colonization. Acquisition of oral microbiota. Oral microbiota: oral mucosa, tongue, saliva, gingival crevice. Dental plaque: formation, distribution, composition – supragingival plaque, subgingival plaque, calculus. The importance of oral microbiota in systemic infections.

Practical (3h):

Sampling of oral environments by swabbing (buccal mucosa, oral vestibule, tongue) or by dental probes (supragingival dental plaque, gingival crevice)
Preparation of Gram-stained smears from oral samples collected from different oral environments
Cultivation of collected oral samples on the enriched/selective culture media
Sampling of saliva - measurement of pH, culture on MRS agar

2. Microbiology of dental caries and dentoalveolar infections

Seminar (1h)

Dental caries multifactorial etiology: host factors, diet, microorganisms. Microbiology of dental caries: importance of dental plaque and caries-related species: oral streptococci, lactobacilli, *Actinomyces*, *Scardovia wiggsiae*. Specific and non-specific dental plaque hypothesis. Ecological plaque hypothesis (EPH). Types of dental caries - location, specific microbiota in localized oral area. Dental caries risk determination by microbiological testing. Prophylaxis and treatment of dental caries. Antimicrobial activity of anti-caries compounds. Dental caries complications: dentine and dental pulp infections –purulent and gangrenous (necrotic) pulpitis, periapical abscesses, alveolar abscesses, osteomyelitis of the jaws. Complication after tooth extraction: dry and infected socket.

Practical (2h):

Microscopic evaluation of smears from dental caries foci.
Evaluation of oral culture results from different oral environments
Caries risk assessment – analysis of MRS culture results

3. Microbiology of periodontal diseases and their complications

Mouth and its defense mechanisms. Gingivitis and periodontitis – classification, differences. Importance of microbiota in periodontitis, role of periodontopathogens and their virulence factors important in the course of periodontitis (Socransky classification). Immunopathology of periodontitis. Aggressive periodontitis, acute ulcerative-necrotizing gingivitis and periodontitis. Importance of classical microbiological testing and molecular testing in identification of periodontopathogens. Periodontal abscesses (definition, classification). Rational therapy of periodontal infections (antibiotics' indications). Dental implants infections. Complication of periodontitis: pericoronitis, Ludwig's angina, cavernous sinus thrombosis; Lemierre disease.

Practical (4h):

Microbiological diagnosis of anaerobes
Students' oral presentations.

4. Blood and CNS infections

Seminar (2h)

Bacteremia, sepsis, focal infections (abscesses), infective endocarditis, organ complications - predisposing factors, clinical sequela, causative agents, prophylaxis. Routes of infections' spread within oral cavity, head and neck. Catheter –related infections. Meningitis and encephalitis. Blood and cerebrospinal fluid (CSF) collection and transport for culture. Rules of antimicrobial therapy of meningitis and sepsis

Practical (2h):

Demonstration of devices and media for blood and CSF collection.
Evaluation of Gram-stained smears from blood and CSF.

5. Oral mucosal and salivary gland infections. Other oral infections

Seminar (1h):

Oral mycoses: pseudomembranous (thrush), erythematous, hyperplastic candidiasis, systemic fungal infections. Scheme of diagnosis and therapy of fungal infections. Viral infections: HIV-1, HIV-2, VZV, EBV, HHV-5, HHV-8, *Paramyxoviridae* (Parainfluenza, Mumps, Measles, RSV), enteroviruses (*Picornaviridae*): CoxsackieA. Angular cheilitis. Denture stomatitis. Bacterial infections: actinomycosis, diphtheria, tuberculosis, pertussis (whooping cough). Oral symptoms in the course of gonorrhoea (*Neisseria gonorrhoeae*) and syphilis (*Treponema pallidum*). Atrophic rhinitis (*Klebsiella ozaenae*) and scleroma (*Klebsiella rhinoscleromatis*). Microbiological testing of above mentioned infections and therapy of orofacial actinomycosis.

Practical (3h):

Evaluation of yeasts' morphology in Gram – stained smears, on Sabouraud agar and in slide microculture
Identification of *C. albicans* and non-*albicans* species by germ- tube test .Antifungal susceptibility testing (Candifast)
Observation of *Actinomyces*, *Corynebacterium*, *Mycobacterium*, *Klebsiella* in smears and in culture.

6. Respiratory tract infections (RTI).

Seminar (1h):

Infections caused by streptococci, staphylococci, *Haemophilus influenzae*. Upper respiratory tract infections (of external ear, middle ear, paranasal sinusitis) and lower respiratory tract infections (of larynx, trachea, bronchi and lungs). Other etiological agent of RTI. Microbiological diagnosis of RTI: samples, culture, identification and therapy (antibiogram)

Practical (3h):

Evaluation of Gram-stained smears from sputum and saliva (microscopic differentiation). Observation of staphylococci, streptococci, *Haemophilus* in culture from respiratory samples – discussion about their microbiological diagnosis.

Interpretation of microbiological reports for respiratory samples.

Studying of hygienic handwashing quality by fingerprinting.

7. Rules of infection control. Disinfection and sterilization in dentistry

Seminar (1h):

Cross – infections, hospital - acquired, endo-, exogenous infections; source, reservoir, spread, route of infection (mode of entry). Differentiation between colonization, carrier-state and infection. Clinical forms of dental clinic –acquired and hospital-acquired infections. Surveillance and infection control in hospital settings. Specificity of infection control in dentistry. Etiological agents of cross-infections, characteristics of microorganisms (the most common resistant phenotypes (alert pathogens) among those causing infection of head and neck. Chemotherapy in dentistry (recommendations). Methods of effective decontamination (definition, classification, practical application). Disinfection (classification): physical (thermal, UV radiation), chemical, gaseous (ethylene oxide or formaldehyde). The principles of disinfectants' selection. Disinfectants and antiseptic agents with application in dentistry. Sterilisation (classification): high – temperature (moist heat – autoclave); low-temperature (plasma, gas –ethylene oxide), chemical– alcohols, aldehydes, halogens, potassium perborate), mechanical: (filtration). Sterilisation control: physical, chemical and biological indicators. Control of air, surface contamination (open agar plates, environmental swabs).

Practical (3h):

Discussion about disinfection and sterilization rules in dental settings

Demonstration of different indicators used in sterilization control.

Reading of fingerprinting results on bloody agar – improvement in hygienic handwashing

Demonstration of (multi)resistant phenotypes for Gram-positive and Gram-negative bacteria (use of antibiogram)

Clinical interpretation of microbiological reports revealed from dental samples

Practical make-ups (student is obliged to have the protocol corresponding with the missed class; passed class test is required before making up a practical class).

Recommended textbooks:

1. Oral Microbiology – P.D. Marsh, M.V. Martin, 2016, 6th ed, ISBN: ISBN 9780702061066
2. Essential Microbiology for Dentistry- L. Samaranyake, 2006, 3rd ed, ISBN: 9780443100796 and the new ones
3. Notes on Medical Microbiology – K.N. Ward, K.C. McCartney, B. Thakker, 2008, 2nd ed, ISBN 9780443102844