

**Study program:** Integrated Academic Studies in Dental Medicine

**Course title:** Clinical Genetics in Dental Medicine

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**Course status:** elective

**ECTS Credits:** 3

**Condition:** -

**Course aim**

The basic aims of the elective course *Clinical Genetics in Dental Medicine* are to familiarize dentistry students with the possibilities of applying clinical genetics in dental medicine. Acquiring knowledge about the possibilities of applying new genetics technologies in dental medicine and clinical practice. Acquiring knowledge about the importance of team and multidisciplinary approach in everyday work. Acquiring knowledge about the importance of clinical recognition, diagnosis and treatment of hereditary diseases, including rare hereditary diseases as well as hereditary diseases that have clinical manifestations in dental medicine. Introduction to the novelty and teamwork in a multidisciplinary approach Clinical Genetics - Dental Medicine.

**Expected outcome of the course:**

While attending classes, students should acquire all the necessary knowledge in the field of etiology, pathogenesis, clinical imaging and therapies for inherited diseases that have repercussions on the oral region and teeth. Acquiring knowledge about the specificities of the population with hereditary diseases. Special attention was paid to the importance of preventive medical measures and procedures, as well as to the proper differential diagnosis and additional diagnosis of the most common hereditary diseases and conditions that are of importance for dental medicine. Acquiring knowledge of modern genetics technologies with potential applications in dental medicine, including prevention measures. Acquiring knowledge of the correct approach and communication with the patient with hereditary disease as well as with members of patient's family. Specificity of anamnesis, physical examination and specificity of therapy. Particularities of physicians' work in outpatients with patients with hereditary disease.

**Course description**

*Theoretical education*

- The importance of recognizing hereditary diseases in dental medicine.
- Classical genetics and new genetic concepts in dental medicine. Molecular genetics methods relevant for dental medicine. Importance and possibilities of implementation of "OMICs" in dental medicine - genomics, proteomics, transcriptomics, interactomics, metabolomics.
- The place and role of dental medicine in the concept of personalized medicine.
- Importance of knowledge of dysmorphology in dental medicine.
- Genetic diagnostics in dental medicine.
- The influence of genetic factors on behavior that is relevant to dental medicine.
- The link between genetics and dental medicine in access to people with special needs.
- Diseases with low incidence (rare diseases) in dental medicine
- Phenotype and behavior affecting dentist work
- Genetic information in dental medicine.
- Craniofacial and dental genetics.
- Genes that affect craniofacial and dental development.
- Etiology of a complex phenotype that increases the risk of craniofacial and dental disorders. Craniofacial and dental genetics.
- Genetic diseases that have repercussions to the diseases of the teeth, upper and lower jaws, muscles of the orofacial system.
- Inherited diseases in dental medicine and expected complications including complications of anesthesia.
- Inherited coagulation disorders and their importance in dental medicine.
- Genetic aspect of pathology of enamel, dentin, cement and dental pulp. Genetic aspect of tooth decay.
- Genetic aspect of tooth damage: abrasion, erosion, bruxism, tooth fracture.
- Genetic aspect of upper and lower jaw position pathology. Genetic aspect of defect of tooth enamel.
- Genetic aspect of malignant diseases of the orofacial region.
- Therapy and prevention of hereditary diseases. Genetic aspect of upper and lower jaw position pathology. Genetic aspect of defect of tooth enamel.
- Craniofacial and dental genetics.

- Genetic aspect of malignant diseases of the orofacial region.
- Therapy and prevention of hereditary diseases

**Practical education**

- Medical history (taking anamnesis with reference to the importance of taking a genetic history). Getting to know the basic symbols of genealogy (each student takes his or her own genealogy)
- Dysmorphological examination
- Case reports of hereditary diseases.
- Diseases due to chromosomal anomalies and association with dental medicine: chromosome trisomies.
- Chromosomal anomaly diseases and association with dental medicine: Chromosome monosomies.
- Diseases due to sub-microscopic structural chromosomal disorders
- Introduction to the possibilities of classical cytogenetics in dentistry
- Acquaintance with the possibilities of molecular genetics in dentistry
- Family Planning and Genetic Information Cabinet - work overview
- Familiarity with prenatal diagnostics
- Preimplantation genetic testing
- Genomics in dental medicine - presentation of the work.
- Syndromes in which there is a repercussion on articulation, maxilla and mandible, occlusion, interciliary relationship, muscles of mastication, craniomandibular joint, muscles of the orofacial system, on the position of the upper and lower jaws - case reports
- Genetic aspect of dental disease - case reports
- Coagulation disorders - case reports.
- cleft lip, jaw and palate - case approaches; the connection between clinical genetics and dental medicine.
- Familiarity with the concept that the dental practitioner has the need to monitor genetic achievement and be part of the medical team in personalized medicine.
- Genetic aspect of gingival hyperplasia. Contribution of genetic factors to altered tooth shape and oligodontics.
- Genetic aspect of cleft lip, jaw and palate - case reports.
- Genetic aspect of disorders with repercussion on the orofacial region - importance for dental medicine
- Informed patient consent - familiarization with protocol
- The importance of teamwork and multidisciplinary work in genetics and dental medicine - presentation of the work.
- Emergency conditions related to hereditary diseases and dental medical.
- Therapeutic approach to hereditary diseases
- Prevention of hereditary diseases

**Literature**

*Compulsory*

1. Turnpenny P, Ellard S. Emery's Elements of Medical Genetics, 15<sup>th</sup> Edition. Elsevier, 2017.
2. Slavkin HC. From phenotype to genotype: enter genomics and transformation of primary health care around the world. *J Dent Res* 2014;93(7 Suppl):3S-6S.
3. Hart PS, Hart TC. Invited commentary: The need for human genetics and genomics in dental school curricula. *Mol Genet Genomic Med* 2016;4(2):123-125. doi:10.1002/mgg3.216.
4. Talwar D, Tseng TS, Foster M, Xu L, Chen LS. Genetics/genomics education for nongenetic health professionals: a systematic literature review. *Genet Med* 2017;19(7):725-32. doi: 10.1038/gim.2016.156.
5. Crellin E, McClaren B, Niselle A, Best S, Gaff C, Metcalfe S. Preparing Medical Specialist to Practice Genomic Medicine: Education an Essential Part of Broader Strategy. *Front Genet* 2019;10:789. doi: 10.3389/fgene.2019.00789.

*Additional:*

1. Firth H, Hurst J. Oxford Desk Reference Clinical Genetic and Genomics, 2nd Ed. Oxford University Press 2017.
2. Nussbaum RL, McInnes RR, Willard HF. Thompson and Thompson Genetics in Medicine, 8<sup>th</sup> Ed. Elsevier Science Health Science 2015.
3. Gupta M, Jyoti B, Srivastava R, Pachauri A. Human genetics in oral medicine: A review, DOI: 10.4103/0972-1363.141860
4. Divaris K. The Era of the Genome and Dental Medicine. *J Dent Res* 2019;98(9):949-55. doi: 10.1177/0022034519845674.
5. Jonsson L, Magnusson TE, Thordarson A, Jonsson T, Geller F, Feenstra B, Melbye M, Nohr EA, Vucic S, Dharmo B, Rivadeneira F. Rare and common variants conferring risk of tooth agenesis. *Journal of dental research*. 2018 May;97(5):515-22.
6. MacArthur J, Bowler E, Cerezo M, Gil L, Hall P, Hastings E, Junkins H, McMahon A, Milano A, Morales J, Pendlington ZM. The new NHGRI-EBI Catalog of published genome-wide association studies (GWAS Catalog). *Nucleic acids research*. 2016 Nov 28;45(D1):D896-901.

**Number of active classes**  
Teaching methods

**Theoretical classes: 15**

**Practical classes: 30**

Lectures. Practical classes: history, genealogy, dysmorphological examination of patients with hereditary diseases, differential diagnostic and therapeutic considerations in clinical genetics and dental medicine, with case reports of hereditary diseases. Presentation of work of cytogenetic laboratory Overview of the work of the Molecular Genetics Cabinet. View the work of the Family Planning Cabinet. Review of the work of the Medical Genetics Service.

**Student activity assessment (maximally 100 points)**

<b>Pre-exam activities</b>	<b>points</b>	<b>Final exam</b>	<b>points</b>
Lectures	20	Written	20
Practices	30	Oral	30
Colloquium		.....	
Essay			