UNIVERSITY OF NOVI SAD
FACULTY OF MEDICINE

Study program: Integrated Academic Studies in Dental Medicine

Course title: Dental Materials

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Course status: compulsory

ECTS Credits: 3

Condition: -

Course aim

To introduce students with basic knowledge of characteristics of dental materials and basic principlesof their clinical application.

Expected outcome of the course:

Students will acquire basic knowledge about the characteristics and clinical aplication of dental materials. They will be trained to select the adequate dental material with special emphasis on the identification of biocompatible materials that will not be harmful to the patient.

Training of methods and techniques of application of dental materials with special emphasis on working-time, setting time, consistency, mixing procedure.

Course description

Theoretical education

1. Standards for dental materials. EU directive, CE Mark, ISO standards, GCP, GMP standard. Biocompatibility of dental materials. The terms: medical devices, dental materials, biomaterials, toxicity, biocompatibility. Tests for evaluation of biocompatibility of dental materials. 2. Physical properties of dental materials. Materials loading, Tensile, compressive and shear stresses, torsion loads. Fracture stress-strength, strain. Diagram of stress and strain. (modulus of elasticity, elastic limit, yield stress, ductility). 3. Fatigue stress. Fracture toughness and impact strength..(Brinnel, Vickers, Knuph and Rockwell rest). Viscosity, viscoelasticity, flow and “relaxation” of the material by flow. 4. Thermal properties of the material. Thermal conductivity, thermal diffusivity, coefficient of thermal expansion. Adhesion. Intermolecular forces. Influence of intermolecular forces on the physical properties of the material. 5. Color, hue, chrome and brightness Color spectrum and human eye sensitivity. Coeficient of the reflexion, absorption, transmission, translucency, fluoresces, Refractory index. Structure of dental ceramics. Cristal structure, amorph structure. 6. Chemical reactions while setting of dental materials.Neutralization as a basic chemical reaction in the process of cement solidification. Chelation as the main reaction in the process of solidification of zinc-oxide-eugenol paste, EBA and polycarboxilate cements. Polymerization as a basic reaction in solidification of acrylic, composites and elastic impression materials or in combination with the neutralization and chelation of polycarboxylate and glass-ionomer cement. Corrosion of dental materials. Electrochemical aspects of corrosion, forming of microgalvanic current , galvanic corrosion, browning, decay and passivation of metals. Electrolysis compensation. 7. Nanostructured biomaterials in dentistry. Composition, characteristics and clinical application. 8. Materials for application in dental restoration manufacturing using modern technologies and computer –guided systems. Acquiring practical knowledge about types of material and their application. 9. Composition and seting reaction of dental cements, composites and compomers. Dental composites and compomers, classification, phisical and chemical properties. Adhesive systems. Bonding of dental composites to dental tissue. 10. Dental amalgam. Requirements, classification, amalgamation, clinical characteristics, the process of clinical work with amalgam , method of packaging, dosage and the factors that affect the quality of amalgam fillings. Materials for endodontic procedure. 11. Elastic impression materials. Thermoplastics, Zinc-oxide-eugenol paste. Characteristics, use, disadvantages. Disinfectants. Elastic impression materials. Reversible and irreversible hydrocolloids. Elastomers: Silicone (condensing, addition, polyethers and polysulfides. Cements . Classification, characteristics . Zinc phosphate cements, Zinc oxide eugenol cements, silicophosphate cements, polycarboxylate and glass ionomer cements.thermoplastic materials, ZOE pastes. 12. Material for making working models. White, hard and improved hard gypsum. Characteristics, composition, method of acquisition, properties. Other materials for making working model (resin cements). Materials for dental devices models. Waxes for modeling an synthetic resinsfor dental devices models. 13. Investment materials-refractory materials. Low temperature and high temperature refractory materials. Bonding, termal and hygroscopic expansion of refractory materials. Acrylic resins. Requirements, classification, composition, characteristics, dimensional change, porosity, materials for lining (conditioners and liners). 14. Dental alloys. Classification, distribution alloys: standards, the content of precious metal, the chemical composition. Requirements for dental alloys. Different types of alloys used in dental practice. Ceramic materials. Requirements, classification, composition. Properties of ceramic materials in metal - ceramic and ceramic systems. Machine-processable ceramics. Materials for processing and polishing. Cutting instruments, design, abrasive effect. Natural or artificial abrasive materials. Material for sandblasting and polishing (mechanical and electrolytic). 15. Materials in implantology. Types of material and their application. Tuissue response to different types of dental materials.

Practical education

1. Examination of physical properties of dental materials . Tensile, compressive and shear stresses, torsion loads. Fracture stress-strength, strain. Diagram of stress and strain. 2. Examination of physical properties of dental materials. Investigation of fatigue, fracture toughness and impact *strength*, viscosity and viscoelasticity. 3. Nonelastic impression materials. Practical work with nonelastic impression materials (thermoplastic materials, zinc oxide eugeniol pastes, disinfection of the impressions). 4. Elastomeric impression materials . Practical work with hydrocolloids, silicones and polyether. 5 .Materials for working models (dental casts). Practical work with materials for dental casts. Materials for modeling of dental devices, wax and resin. Practical work. 6. Refractory mass – investment material. Practical work with low temperature and high temperature investment material. Dental alloys. Principles of work with dental alloys. 7. Acrylic materials for denture base. Practical work with acrylic material for denture base. 8. Acrylic materials for direct relining of the dentures (hard and soft acrylic reliners). Practical work with acrylic materials for direct and indirect relining of the denture. 9. Dental cements. Practical work with different types of dental cement. 10. Practical work with materials for application in dental restoration manufacturing using modern technology and computer –guided systems. Acquiring practical knowledge about the types of material and their application. 11. Materials in implantology. Acquiring practical knowledge about types of material and their application. 12. Dental amalgam. Practical work with dental amalgam. 13. Composite materials. Practical work with bonding systems, composite materials for dental fillings and sealants. 14. The materials in endodontics. Practical work with materials which are used in endodontics. Materials for temporary filling. Practical work with materials for temporary fillings. 15. Nanostructured biomaterials in dentistry. Introduction to clinical application.

Literature

Compulsory

1. McCabe JF, Walls AWG. Applied dental materials. Blackwell Munksgaard , 2008.

Number of active classes	**Theoretical:** 30	**Practice:** 15

Teaching methods

Theoretical and practical

Student activity assessment (maximally 100 points)

Pre-exam activities	**points**	**Final exam**	**points**
Lectures	20	Written	60
Practices	15	Oral	
Colloquium	5	.....	
Essay			