



**“CAROL DAVILA” UNIVERSITY
OF MEDICINE AND PHARMACY BUCHAREST**
Faculty of Dentistry
Dental Medicine in English



DISCIPLINE GRID

1. Programme:

1.1.	CAROL DAVILA UNIVERSITY OF MEDICINE AND PHARMACY BUCHAREST
1.2.	FACULTY OF DENTISTRY / 1st DEPARTMENT
1.3.	DIVISION: BIOCHEMISTRY
1.4.	STUDY DOMAIN: Health, sectoral regulated within European Union
1.5.	STUDY LEVEL: LICENCE
1.6.	STUDY PROGRAMME: DENTAL MEDICINE IN ENGLISH

2. Discipline:

2.1.	DISCIPLINE NAME: Biochemistry of oral cavity						
2.2.	LOCATION: Faculty of Medicine, 8 Eroii Sanitari Blvd., Ground Floor, Sector 5, Bucharest						
2.3.	Lectures tenure: Maria Greabu – Prof., Daniela Miricescu (B.S.Chem, MSc.Chem, PhD) - Lecturer						
2.4.	Practical classes tenure: Daniela Miricescu (B.S.Chem, MSc.Chem, PhD) - Lecturer						
2.5. Study year	I	2.6. Semester	II	2.7. Evaluation	Exam	2.8. Type of discipline	CD/SD

3. Estimated total time (hours/semester)

No. hours/week	4	out of which	Lectures: 2	Laboratory session: 2
Total hours out of learning schedule	56	out of which	Lectures: 28	Laboratory sessions: 28

Time distribution	hours
Textbook study, lecture support, bibliography and notes	10
Supplementary documentation activity in the library, on online platforms	10
Practical activity support material, homework, portfolio and essays	15
Tutorial activity	-
Examinations	5
Other activities	4
Total hours of individual study	44
Total hours per semester	100
Credits	4

4. Preconditions

4.1. curriculum	Organic chemistry knowledge
4.2. proficiencies	-

5. Conditions

5.1. for lecture activity	The course takes place in the "Prof. Dr. Dan Theodorescu" Amphitheatre of the Faculty of Dentistry equipped with a projection system. Interactive exposure of the material according to the analytical program, using multimedia resources, PowerPoint presentations, educational films.
5.2. for laboratory activity	Laboratories have facilities specific to practical activities. Each student must complete his/her practical workbook with the obtained results. At each laboratory session there is a seminar on the subject of the lecture, the practical laboratory session is performed, and students present a report.

6. Accumulated skills

6.1. Proficiencies (<i>knowledge and abilities</i>)	<p>I. Knowledge (cognitive dimension) - acquiring a minimum of practical knowledge of laboratory techniques, the principle and use of devices and utensils used in the laboratory, acquiring extra craftsmanship, the ability to interpret the obtained results and to establish the relationship between biological constants and the etiopathogenesis of oral and systemic diseases.</p> <p>II. Abilities (functional dimension) - Acquiring the ability to use biological fluids, knowledge of the properties and use of materials used in dentistry.</p>
6.2. Transversal skills (<i>role, professional and personal development</i>)	<p>III. Role skills</p> <ul style="list-style-type: none"> ● Concern for professional development ● Ability to work effectively in a team <p>IV. Professional and personal development skills</p> <ul style="list-style-type: none"> ● Ability to use and correlate assimilated notions in a new context ● Development of basic biomedical scientific language ● Ability to apply theoretical notions in medical practice <p>Ability to establish interdisciplinary correlations</p>

7. Objectives (based on the grid of acquired specific skills)

7.1. General Objective	Presentation of the fundamental aspects of biochemistry to understand the biochemical processes in the human body. Acquisition of fundamental knowledge on physiological and pathological processes in the oral cavity and their relationship with systemic diseases. Knowledge of the most modern biochemistry laboratory techniques used in medical practice and scientific research.
7.2. Specific Objectives	<ul style="list-style-type: none"> • Knowledge and understanding of the metabolic processes carried out in the oral and dental tissues with the perspective of modernizing the therapeutic procedures, considering that modern stomatology benefits more and more from the new scientific research in the field of biochemistry • Knowledge of the most modern techniques and methods of investigating the oral and dental tissues • Stimulating the ability to implement the interdisciplinary approach and the knowledge gained in the dental practice • Acquisition of knowledge for understanding the biochemical mechanisms in the oral cavity at the molecular level, and also, their relationship with systemic diseases

- Ability to implement and integrate the acquired biochemical knowledge in clinical disciplines and in medical practice
- Maintaining interest in progress in dentistry biomedical research

8. Content

8.1.2. Lecture	No. hrs/topic	Teaching method	Obs.
1. The object of oral biochemistry. The framework of the definition of oral health. Tooth biochemistry	2	<p>*Interactive exposure of the material according to the analytical program, using multimedia resources, PowerPoint presentations, educational films</p> <p>*Lecture, systematic presentation, conversation, biochemistry-clinical aspects correlations</p> <p>*Exemplification, problematization, debate</p> <p>*The content of the course is dynamic, permanently correlated with similar courses from the Faculties of Dentistry in the country and abroad with which we collaborate and according to the latest discoveries in the field</p>	<p>*At the end of each course, there are discussions with the students regarding the presented material</p> <p>*The most interesting aspects that need to be further detailed are highlighted</p> <p>*The focus in on the aspects specific for dentistry</p> <p>*Encouraging the students to participate in the research activity of the discipline</p>
2. Biochemistry of dental pulp I: Carbohydrate metabolism: anaerobic glycolysis, aerobic degradation of glucose, Krebs cycle, pentose phosphate pathway, glycogen metabolism	2		
3. Biochemistry of dental pulp II: Lipid metabolism: cholesterol biosynthesis, fatty acids and triglycerides metabolism	2		
4. Dental plaque biochemistry I: composition, formation, metabolic processes in the plaque	2		

5. Dental plaque biochemistry II: carbohydrate, amino acids and protein catabolism	2		
6. Dental plaque biochemistry III: dental tartar and anti-plaque substances	2		
7. Dental caries: molecular mechanism in cariogenesis, fluoride prophylaxis	2		
8. Periodontal biochemistry I: the chemical composition of the periodontium, scleroproteins, glycoproteins and proteoglycans (structures and roles). Salivary glycoproteins - clinical significance	2		
9. Periodontal biochemistry II: biochemical processes in periodontium, molecular mechanism in periodontal disease	2		
10. Salivary biochemistry I: composition of saliva- a dynamic process, factors influencing the composition of saliva	2		
11. Salivary biochemistry II: properties and functions of saliva	2		
12. Factors influencing the integrity of oral structures	2		
13. Oxidative stress and oral pathology: reactive oxygen species, antioxidants, oxidative stress-common biochemical mechanism of systemic and oral diseases	2		
14. The biochemistry of taste	2		

8.2.2. Laboratory Session	No. hrs/topic	Teaching method	Obs.
1. Biochemistry of oral cavity I: Materials used in dentistry (A): metals, alloys, polymers. Structure, composition, properties	2	<ul style="list-style-type: none"> * At each laboratory session there is a seminar about the lecture, the practical laboratory session is performed, and students present a paper. * Presentation of papers by students, competitions * Practical and theoretical applications (biological tests, chemical and biochemical techniques) * Interactive programmed education * Use of multimedia 	<ul style="list-style-type: none"> * At each laboratory session the focus is on: <ul style="list-style-type: none"> -presentation of the analysed biochemical parameter, highlighting the specific aspects of dentistry -principle of determination -effective execution of the experiment -processing the obtained results -normal values -discussion and interpretation of the results of the experiment

		resources, didactic films, presentations of analysis bulletins and their discussion with students, practical demonstrations	from the perspective of the biochemical mechanisms involved -the importance of determining the biochemical parameter and the clinical significance
2. Biochemistry of oral cavity II: Materials used in dentistry (B): dental cements, composite diacrylic resins, ceramic materials. Structure, composition, properties	2		
3. Blood glucose and glycated hemoglobin: clinical significance and relationship with oral conditions. Periodontal disease, the 6th complication of diabetes	2		
4. Determination of cholesterol, triglycerides, HDL, LDL. The relationship metabolic syndrome- periodontal disease	2		
5. Practical highlighting of molecular processes in cariogenesis	2		
6. Determination of salivary parameters I: glucose, ketone bodies, total protein, nitrites, hemoglobin, ascorbate	2		
7. Determination of salivary parameters II: uric acid-the most important antioxidant of saliva and thiocyanate ion dosing in smokers and non-smokers	2		
8. Determination of salivary parameters III: quantitative determination of salivary cortisol using ELISA technique. Clinical significance in oral diseases	2		
9. Effects of diet on salivary pH	2		
10. Salivary biomarkers in periodontal disease	2		
11. Salivary biomarkers in premalignant oral disorders	2		
12. Salivary biomarkers in malignant oral disorders	2		
13. Mechanisms of cigarette smoke toxicity on oral cavity	2		
14. Exemplification of the molecular mechanisms involved in the taste sensation	2		

8.3. Bibliography for lectures and laboratory/practical sessions

1. Battino, M., Greabu, ., *Oxidative Damage and Antioxidant Protection : the science of biology and medicine in health and disease*, Chapter: *Oxidative stress in oral cavity: interplay between reactive oxygen species and antioxidants in health, inflammation and cancer*, Wiley & Sons Publishing House, Edited by D Armstrong, 2016
2. Carranza, F.A., Newman, M.G., *Clinical Periodontology*, 12th edition, W.B. Saunders Company, USA, 2015
3. Devlin, T.M., *Textbook of Biochemistry with Clinical Correlations*, John Wiley & Sons, 8th Edition, 2019
4. Fejerskov, O., Nyvad, B., Kidd, E., *Dental Caries: The Disease and its Clinical Management*, Third Edition, John Wiley & Sons, 2015
5. Ferrier, D., *Lippincott Illustrated Reviews: Biochemistry*, Seventh Edition, Lippincott Williams and Wilkins, 2017
6. Granger, D.A., Taylor, M.K., *Salivary Bioscience: Foundations of Interdisciplinary Saliva Research and Applications*, 1st ed., Springer, 2020
7. Greabu, M., Calenic, B., *Salivary Biomarkers of Oxidative Stress Associated with Periodontal Diseases*, In: *Studies on Periodontal Disease*, D. Ekuni et al. (eds.), Springer Science, New York, 2014
8. Levine, M., *Topics in Dental Biochemistry*, Springer, 2016
9. Lieberman, M.A., Peet, A., *Marks' Basic Medical Biochemistry, A clinical approach*, 5th edition, Wolters Kluwer, 2018
10. Ligtenberg, A.J.M., Veerman, E.C.I., *Saliva: Secretion and Functions (Monographs in Oral Science Book 24)* 1st Edition, S. Karger; 2014
11. Lopez-Jornet, P., *Saliva and Oral Diseases*, Printed Edition of the Special Issue Published in Journal of Clinical Medicine, MDPI AG, 2021
12. Marshall, W.J., Lapsley, M., Day, A., Ayling, R., *Clinical Biochemistry: Metabolic and Clinical Aspects*, 3rd Edition, Elsevier, 2014
13. Miricescu, D., Greabu, M., Ripszky Totan, A., Meleşcanu-Imre, M., Ştefani, C., Stănescu-Spînu, I.I., Spînu, T.C., *Saliva as a new diagnostic fluid for oral and systemic diseases. Current views and directions*, Lambert Academic Publishing, 2021
14. Murray, R.K., Bender, D.A., Botham, K.L., Kennelly, P.J., Rodwell, V.W., Weil, P.A., *Harper's Illustrated Biochemistry*, 31st Edition, Lange, 2018
15. Totan, A., Greabu, M., ., Meleşcanu-Imre, M., Miricescu, D., Totan, C., Spînu, T., Stănescu, I.I., *Reactive Oxygen Species-Double Faced Companions*, Lambert Academic Publishing, 2019
16. Tvarijonavičiute, A., Martínez-Subiela, S., López-Jornet, P., Lamy, E., *Saliva in Health and Disease The Present and Future of a Unique Sample for Diagnosis*, Springer, 2020
17. Zohoori, F.V., Duckworth, R.M., *The impact of Nutrition and Diet on Oral Health*, Karger, 2019

Journals

Journal of Dental Research

Materials

Journal of Oral Pathology and Medicine

International Journal of Molecular Sciences

9. Corroborating the contents of the discipline with the expectations of epistemic community representatives, professional associations and employers in the fields representative for the program

The biochemistry course for the students at the Faculty of Dentistry aims to provide a holistic and systematized approach to the set of knowledge accumulated by modern biochemistry, an extremely dynamic fundamental science. It helps to understand normal and pathological biological phenomena and, therefore, plays a central role in the study of medicine and medical practice. The course offers students the classic, fundamental notions of biochemistry, modern biochemistry techniques and the significance of their knowledge for those who practice dentistry. The course tries to create a perspective image on the functioning of the human body, in normal and pathological conditions, by synthesizing data belonging to other fundamental sciences, such as chemistry, anatomy, physiology, cell biology, embryology, histology. Biochemistry contributes to the achievement of the

two major goals of medicine: 1. understanding and maintaining health and 2. treatment and monitoring of its effectiveness, providing theoretical support (description of mechanisms, control methods, signaling pathways) and practical support (laboratory tests to determine specific biochemical markers). Dentists need to change their mindset about their responsibility to maintain the overall health and detect systemic and oral conditions. The biochemistry course aims to support future dentists to meet this challenge. The content of the course is dynamic, permanently correlated with similar courses from the Faculties of Dentistry in the country and abroad with which we collaborate and according to the latest discoveries in the field.

10.Evaluation

10.1 Evaluation			
Activity type	Evaluation Criteria	Methods of evaluation	% out of final grade
Lecture	<p>A. Knowledge for mark 5:</p> <ul style="list-style-type: none"> -Attendance to the course, accuracy, correctness, degree of assimilation and understanding are taken into consideration - Participation in the written exam is conditioned by passing the practical exam (minimum mark 5) - molecular mechanisms in cariogenesis, fluoride prophylaxis; composition of saliva- a dynamic process, factors influencing the composition of saliva, properties and functions of saliva. <p>B. Additional knowledge for mark 10</p> <ul style="list-style-type: none"> -Attendance to the course, accuracy, correctness, degree of assimilation and understanding and the ability to correlate and apply the acquired knowledge are taken into consideration - Periodontal biochemistry; biochemistry of dental pulp; oxidative stress and oral pathology; biochemistry of dental plaque; salivary biochemistry; biochemistry of taste 	<p>The written exam consists of 80 multiple choice questions; 35 correct answers represent mark 5. 75 correct answers represent mark 10.</p>	70%
Laboratory Sessions	<p>A. Knowledge for mark 5:</p> <p>Periodic evaluation of the student through seminars and tests during the semester (1 test paper)</p> <ul style="list-style-type: none"> - The presentation of papers in seminars and participation in student scientific sessions are appreciated - Determination of salivary parameters; Practical highlighting of molecular processes in cariogenesis <p>B. Additional knowledge for mark 10:</p> <ul style="list-style-type: none"> - Knowledge of the principles of all the methods of determination presented in the laboratory sessions work -The correct interpretation of laboratory test results - Salivary biomarkers in periodontal disease, premalignant and malignant oral disorders, cigarette smoke oral toxicity 	<p>Practical assessment</p> <p>The semestrial test papers consist of 9 written questions (2-3 are essay questions) with different degrees of difficulty</p> <p>The practical exam is an oral exam</p>	30% (20% semestrial test paper + 10% practical exam)

Minimum performance standards

Knowledge and understanding of the basic notions of biochemistry (theoretical and practical) from the analytical program, knowledge of normal values and the importance of determining the biochemical parameters in blood and saliva.
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Date:
24.11.2023

Chair of Biochemistry Division,
Prof. Dr. Alexandra Ripszky Totan

Date of the approval in Department Board:

Department director,
Prof. Dr. Marina Imre