BioReMed

INTERNATIONAL CONFERENCE ON
BIOMATERIALS AND REGENERATIVE MEDICINE

October, 16-18th, 2025
Oradea
ROMANIA

SRB
Societatea Română de Biomateriale

ABSTRACT BOOK

WELCOME

Dear Colleagues,

It is our great pleasure to invite you to attend the International Conference on Biomaterials & Regenerative Medicine BioREMED’2025, on October 16-18, 2025. The conference will take place in Oradea, one of the major Romanian cities.

The aim of this event is to bring together scientists from biomaterials and tissue engineering research with clinicians from medical fields who use in clinical practice the implants and prostheses made from various biomaterials.

Clinicians from different specialties (dentistry, orthopedics, neurosurgery, ophthalmology, cardiovascular surgery, general and aesthetic surgery) are invited to attend the conference in order to present their results on the clinical performance of current medical devices and debates on the translation of biomaterials and tissue engineering research into clinical practice.

Round table discussions intended to promote interdisciplinary research projects will be organized.

We look forward to seeing you all in Oradea!

Yours sincerely,

Conference Presidents

Prof. Bodog Florian

Prof. Antoniac Iulian

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BIOREMED 2025 - CONFERENCE INFORMATION

Topics

- Regenerative Medicine
- Metallic Biomaterials
- Bioceramics
- Polymers
- Composite Biomaterials
- Natural biomaterials
- Biocompatibility
- Biomechanics
- Biotribology
- Surface Engineering
- Adhesion
- Clinical aspects
- Biomaterials Application in Clinical Practice
- Modelling and Simulation
- Interactions cells-biomaterials
- Tissue Engineering
- Molecular Biology
- Bioengineering
- Medical Engineering
- Standards
- Medical Ethics
- Dental biomaterials
- Surgical Techniques

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PROGRAM

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MEDICAL ORTOVIT

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October 16th

16.00-20.00 Participant registration

October 17th

09.00-09.30 Opening Ceremony

09.30-11.00 Plenary Session A

09.30-10.15
PS.1. Development drug delivery system with biomaterials for capsule drug forms
Gultekin GOLLER
Istanbul Technical University, Türkiye
10.15-11.00
PS.2. Recent advances in polymeric membrane materials for biomedical applications
Stefan Ioan VOICU
National University of Science and Technology Politehnica Bucharest, Romania

11.00-11.30 Coffee break

11.30-13.30 Scientific Sessions A

11.30-11.50
K1. Synergistic Physical / Chemical / Biologic Effects in Medical Microfluidic Devices
Cătălin POPA
Technical University of Cluj-Napoca, Romania

11.50-12.10
K2. Green Hydrothermal Assisted Sol-Gel Synthesis of Bioactive Glasses for Regenerative Medicine
Nermin DEMİRKOL
Kocaeli University, Türkiye

12.10-12.30
K3. Updates on Metallic Nanoparticles Applications in Bioremediation, Biomedicine and Biosensing
Simona CAVALU
Faculty of Medicine and Pharmacy, University of Oradea, Romania

12.30-12.50
K4. Thermophysical Properties of Dental and Biomedical Materials
Marian MICULESCU
National University of Science and Technology POLITEHNICA of Bucharest, Romania

12.50-13.00
O1. Crown ethers-functionalized polymeric membranes for biomedical applications
Madalina OPREA, Andreea Madalina Pandele, Adrian Ionut Nicoara, Iulian Vasile Antoniac, Stefan Ioan Voicu
National University of Science and Technology Politehnica Bucharest, Romania

13.00-13.10
O2. Self-adaptable microneedles patch for pain management
Florina ILIESCU, Amarachi R. Osi, Georgeta L. Gheorghiu, Ciprian Iliescu
National University of Science and Technology Politehnica Bucharest, Romania

13.10-13.20
O3. Nanomaterials employed in biosensing and biofuel cells with applications in biomedical field
Luminita FRITEA, Florin Banica, Traian Costea, Liviu Moldovan, Simona Cavalu, Andrew J. Gross, Karine Gorgy, Alan Le Goff, Serge Cosnier
University of Oradea, Romania

13.20-13.30 Discussions & Conclusions of Scientific Session A

13.30-15.00 Lunch

15.00-17.00 Scientific Sessions B

15.00-15.20
K5. Artificial Intelligence in Dentistry between Trend and Necessity
Horia MANOLEA
University of Medicine and Pharmacy of Craiova, Romania

15.20-15.40
K6. The Assessment of Ceramic Dental Materials during the Treatment of Severe Adult Cleft Palate
Anca PORUMB
University of Oradea, Romania

15.40-16.00
K7. Biomedical Potential of MgB_2
Dan BATALU
National University of Science and Technology POLITEHNICA of Bucharest, Romania

16.00-16.20
K8. Iron-based Alloys for Medical Applications: Results and Perspectives on the use of Biodegradable Materials in Modern Implantology
Nicanor CIMPOESU
Gheorghe Asachi Technical University of Iasi, Romania

16.20-16.30
O4. Natural extract in oral medicine
Iulia MUNTEAN, Alexandra Roi, Rusu Laura-Cristina
Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

16.30-16.40
O5. Enhancing Clear Aligner Therapy Outcomes Through Advanced Materials and Features
Stelian-Mihai-Sever PETRESCU, Radu Mircea Pisc, Horia Octavian Manolea
University of Medicine and Pharmacy, Craiova, Romania

16.40-17.00 Discussions & Conclusions of the Scientific Session B

17.00-17.30 Coffee break

17.30-19.30 Scientific Sessions C

17.30-17.50
K9. Metal-on-Metal – an Unfairly Rejected Couple
Dan Cristian GRECU
University of Medicine and Pharmacy Craiova, Romania

17.50-18.10
K10. Current uses and Future Prospects of Various Stent Types in Surgical Practice
Sebastian GRADINARU
Titu Maiorescu University, Faculty of Medicine, Bucharest, Romania

18.10-18.30
K11. Chitosan Tamponade in the Management of Acute Postpartum Hemorrhage
Alin BODOG
University of Oradea, Faculty of Medicine and Pharmacy, Oradea, Romania

18.30-18.40
O6. Biomaterials in Pediatric Orthopedics: The Importance of Elastic Nails and the Use of Plates, Locked Nails, and Kirschner Wires
Alexandru Nicolae PIRVAN, Felicia Manole, Aurel Mohan, Alexia Manole
University of Oradea, Romania
18.40-18.50

O7. Artificial Ovary: Biomaterial Scaffolds and Cellular Strategies for Ovarian Tissue Engineering
Anca HUNIADI, Murvai Viorela Romina, Goman Marius, Zaha Ioana, Ștefan Liana, Sorian Andreea, Florea Mihai, Naghyi Petronela, Kiss Magdalena, Murvai Gelu Florin, Galiș Radu
University of Oradea, Romania

18.50-19.00
O8. Biologic Therapies for Gonadal Rejuvenation Using Platelet-Rich Plasma and Stem Cells: An Evidence-Based Synthesis of Ovarian and Testicular Regeneration
Viorela – Romina MURVAI, Huniadi Anca, Goman Marius, Zaha Ioana, Ștefan Liana, Sorian Andreea, Florea Mihai, Naghyi Petronela, Kiss Magdalena, Murvai Gelu Florin, Galiș Radu
University of Oradea, Romania

19.00-19.10
O9. The use of Hem-o-lok ® Polymer - Ligation System and of the one-way threads in minimal invasive reconstructive urological surgery

Bogdan-Ovidiu Feciche, Mihail-Claudius Berechet, Calin-David Buzlea, Simona Mîrț, Vlad Barbos, Silvestru Alexandru Big
University of Oradea, Romania

19.10-19.30 Discussions & Conclusions of the Scientific Session C

19.30-20.30 SRB General Assembly

October 18th

09.00-10.30 Plenary Session B

09.00-09.45
PS.3. Microphysiological systems for drug screening
Ciprian ILIESCU
National University of Science and Technology Politehnica Bucharest, Romania

09.45-10.30
PS.4. Current and Emerging Antibacterial Strategies to Control Periprosthetic Joint Infection
Julietta RAU
Institute of the Structure of Matter of the Italian National Research Council CNR, Rome, Italy

10.30-11.00 Coffee break

11.00-13.00 Scientific Sessions D

11.00-11.20
K12. Customized Polyetheretherketone (PEEK) Cranial Repair System Implants used in Cranioplasty after Severe Traumatic Brain Injury (TBI).
George Aurel MOHAN
University of Oradea, Faculty of Medicine and Pharmacy, Oradea, Romania

11.20-11.40
K13. Interdisciplinary Collaboration between Biomaterials and Neurosurgery in the Framework of Brain IT Project
Vicentiu Mircea SACELEANU
Lucian Blaga University of Sibiu, Romania

11.40-12.00
K14. Biocompatibility of Mg Biodegradable Alloys and their Importance in the Medical Applications and Material Science
Bogdan ISTRATE
Gheorghe Asachi Technical University of Iasi, Romania

12.00-12.20
K15. Biomedical Titanium Alloys: From Traditional Processing to Additive Manufacturing
Madalina Simona BALTATU
Gheorghe Asachi Technical University of Iasi, Romania

12.20-12.30
O10. Social impact and benefits of personalized cranioplasty in post severe TBI decompressive craniectomies - Case report.
Nicu Adrian GHIURAU, Mohan G. Aurel, Vlad S. Valentin, Herciu Alexandru
University of Oradea, Romania

12.30-13.00 Discussions & Conclusions of the Scientific Session D

13.00-14.30 Lunch

14.30-16.30 Scientific Sessions E

14.30-14.50
K16. Comprehensive Prosthetic Planning in Implant Based Oral Rehabilitations
Marius MANOLE
Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

14.50-15.10
K17. Engineering Hydrogels for Oral Healthcare: Design and Progress
Marioara MOLDOVAN
Babeș Bolyai University, Raluca Ripan Institute of Research in Chemistry, Cluj-Napoca, Romania

15.10-15.30
K18. Innovative Biomaterials in Oral Implantology: Advances, Challenges, and Clinical Perspectives
Tareq HAJAJ
Victor Babes University of Medicine and Pharmacy Timisoara, Romania

15.30-15.40
O11. Formation and Characterization of Ti–Al Intermetallic and Oxide Layers on Ti6Al4V for Hydroxyapatite Adhesion Enhancement
Ştefan LAPTOIU, Marian MICULESCU, Diana ENESCU, Iulian ANTONIAC
National University of Science and Technology Politehnica Bucharest, Romania

15.40-15.50
O12. Gemmoderivates for dentistry
Ruxandra-Ilinca MATEI
University of Oradea, Romania

15.50-16.00
O13. Integrating semiconductor-based heterostructures in next-generation optoelectronic devices
Eliseia PETRE, Marian ZAMFIRESCU, Marian MICULESCU, Raluca IVAN, Luiza STINGESCU, Nicu SCARIȘOREANU
National University of Science and Technology Politehnica Bucharest, Romania

16.00-16.30 Discussions & Conclusions of the Scientific Session E

16.30-18.30 Discussions & Conclusions of the **POSTER SESSION**

16.30-18.30 Workshop –**New Technological Approaches in Dental Technique – NTA** *ERASMUS+ Professional and Educational Training Program 2023-1-RO01-KA220-VET-000157812.*

20.00-24.00 Gala Dinner

POSTER SESSION
(e-poster)

P1. Evaluation of the surface properties of three ceramic materials processed via CAD/CAM

Boanca Cristian[1], Antoniac Aurora[2], Kamel Earar[1], Antoniac Iulian[2,3], **Corneschi Iuliana[2]**, Anca Maria Fratila[4,5], Gabriela Mitariu[4]

[1]Dunarea de Jos University of Galati, Romania; [2]National University of Science and Technology POLITEHNICA Bucharest, Romania; [3]Academy of Romanian Scientists, Bucharest, Romania; [4]Lucian Blaga University of Sibiu, Romania; [5]Military Clinical Emergency Hospital of Sibiu, Romania

P2. Comparative evaluation of the surface properties of different inert ceramic-based restorations

Boanca Cristian[1], Miculescu Florin[2], **Popescu Larisa[2]**, Kamel Earar[1], Antoniac Iulian[2,3], Anca Maria Fratila[4,5]

[1]Dunarea de Jos University of Galati, Romania; [2]National University of Science and Technology POLITEHNICA Bucharest, Romania; [3]Academy of Romanian Scientists, Bucharest, Romania; [4]Lucian Blaga University of Sibiu, Romania; [5]Military Clinical Emergency Hospital of Sibiu, Romania

P3. Physical theory of magnetic hyperthermia in cancer treatment

Gheorghe Paltanea[1], Veronica Manescu (Paltanea)[1], Aurora Antoniac[1], Iulian Antoniac[1], Iosif Vasile Nemoianu[1], Costel Paun[2], Aurel Mohan[3]

[1]National University of Science and Technology Politehnica Bucharest, Romania; [2]National Institute for Research and Development in Microtechnologies IMT-Bucharest, Bucharest, Romania; [3]University of Oradea, Romania

P4. Mg-Zn biodegradable alloy as a suitable material for bone defect

Veronica Manescu (Paltanea)[1], Iulian Antoniac[1], Aurora Antoniac[1], Alexandru Streza[1], Sebastian Gradinaru[2], Maria-Cristina Moraru[3], Bogdan Sevastre[3], Marius Manole[4]

[1]National University of Science and Technology Politehnica Bucharest, Romania; [2]Titu Maiorescu University, Bucharest, Romania; [3]University of Agricultural Sciences and Veterinary Medicine (USAMV), Cluj-Napoca, Romania; [4]Iuliu Hatieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania

P5. Experimental Evaluation of the Surface Properties of Ostheosynthesis Screws used in Orthopedic Traumatology

Mihai Alexandru Cordunianu[1] , Iulian Antoniac[2] , Alina Georgiana Cordunianu[3]

[1,2]Titu Maiorescu University, Bucharest, Romania; [2]National University of Science and Technology Politehnica Bucharest, Romania

P6. Self-healing microcapsules loaded with hydroxyapatite for teeth remineralization and repair

<u>Gertrud-Alexandra Paltinean</u>[1], Maria Amalia Taut[2], Ioan Petean[3] Laura Silaghi-Dumitrescu[1], Marioara Moldovan[1], Ioan Ardelean[2]
[1]Raluca Ripan Institute for Research in Chemistry, Babes-Bolyai University, Cluj-Napoca, Romania; [2]Technical University of Cluj-Napoca, Romania; [3]Faculty of Chemistry and Chemical Engineering, Babes-Bolyai University, Cluj-Napoca, Romania.

P7. Nanostructured Zn/Ti–Graphene Hydrogels: A Promising Platform for Photodynamic Therapeutics

<u>Stanca Cuc</u>, Codruța Saroși, Laura Silaghi-Dumitrescu, Miuța Filip, Marioara Moldovan
Babeș Bolyai University, "Raluca Ripan" Institute of Research in Chemistry, Cluj-Napoca, Romania

P8. Degradation of Poly(Lactic Acid) Nanocomposites Reinforced with Inorganic Nanoparticles

<u>Andrei Moldovan</u>[1], Ioan Saroși[1], Stanca Cuc[2], Rami Doukeh[3], Gabriel Furtos[2], Ovidiu Nemeș[1]
[1]Technical University of Cluj-Napoca, Romania; [2]Babes Bolyai University, "Raluca Ripan" Institute of Research in Chemistry, Cluj-Napoca, Romania; [3]Petroleum-Gas University of Ploiesti, Romania

P9. Analysis of Structure and Mechanical Behavior of PLA-Based Polymer Films

<u>Ioan Sarosi</u>[1], Andrei Moldovan[1], Alexandra Paltinean[2], Filip Miuta[2], Rami Doukeh[3], Ovidiu Nemes[1]
[1]Technical University of Cluj-Napoca, Romania; [2] Babes Bolyai University , Raluca Ripan Institute of Research in Chemistry, Cluj-Napoca, Romania; [3]Petroleum-Gas University of Ploiesti, Romania

P10. Materials characterization through computed tomography as a non-destructive technique

Iuliana Corneschi, Aurora Antoniac, **<u>Robert Bololoi</u>**, Larisa Popescu, Iulian Antoniac
National University of Science and Technology POLITEHNICA Bucharest, Romania

P11. The evolution of titanium alloys for medical implant applications

<u>Pruteanu Andrei</u>[1], Mădălina Simona Bălțatu[1], Tofan Mihai[1], Ghiculescu Ion[1], Andrei Victor Sandu[1,2], Vizureanu Petrică[1,2]
[1]Gheorghe Asachi Technical University of Iasi, Romania; [2]Academy of Romanian Scientists, Bucharest, Romania

P12. Titanium Alloys in Implantology: From Ti6Al4V to Next-Generation Biomedical Materials

<u>Tofan Mihai</u>[1], Peruc Alexandru Codruț[1], Ghiculescu Ion[1], Sandu Andrei Victor[1,2], Vizureanu Petrică[1,2]
[1]Gheorghe Asachi Technical University of Iasi, Romania; [2]Academy of Romanian Scientists, Bucharest, Romania

P13. Using Additive manufacturing in obtaining scaffolds from biomaterials for use in dental applications

Volocaru Ioana-Ilinca[1], Munteanu Corneliu[1,2 *], Istrate Bogdan[1], Lupu Fabian[1], Stan Ioana-Alexandra[1], Nastasache Gabriela[1]
[1]Gheorghe Asachi Technical University of Iasi, Romania; [2]Technical Science Academy Romania, Bucharest, Romania

P14. Microstructural and Corrosion Behavior of Mg–Ca–Mn–xGd Biodegradable Alloys for Biomedical Applications

Istrate Bogdan[1], Munteanu Corneliu[1,2 *], **Petrovan Titiana**[1], Fabian Lupu-Cezar[1], Cimpoesu Ramona [1*], Volocaru Ioana[1]
[1]Gheorghe Asachi Technical University of Iasi, Romania; [2]Technical Science Academy Romania, Bucharest, Romania

P15. Evaluation of the Corrosion Behavior of Two Dental Alloys Under Different Oral Exposure Conditions

Anca FRATILA[1], Alberto RICO-CANO[2], Julia MIRZA-ROSCA[2], Adriana SACELEANU[1]
[1]Lucian Blaga University of Sibiu, Romania; [2]University of Las Palmas de Gran Canaria, Spain.

P16. In vitro biocompatibility assay of MRI202S and ZMX100

Alexis Vasilis Sacarelis[1], Iulian Vasile Antoniac[2], Sorin Radu Fleaca[1]
[1]Lucian Blaga University of Sibiu, Romania; [2]National University of Science and Technology POLITEHNICA Bucharest, Romania

P17. Development of a test stand for verifying the wear of friction materials in automobile brake pads

Lupescu Ștefan Constantin, **Severin Traian**, Tămășag Ioan
Stefan cel Mare University of Suceava, Romania

P18. Review of Orthopedic Implants based on Mg-Ca-Zn

Lupescu Ștefan Constantin, Cerlincă Delia Aurora, Tamașag Ioan
Ștefan cel Mare University of Suceava, Romania

P19. Development of new composite biomaterials based on ceramic matrix for bone substitute fabrication

Cîrdei Gh. Cozmina - Maria, Paltanea (Manescu) Veronica, Miculescu Florin, Antoniac Aurora, Corneschi Iuliana, Ciocoiu Robert, Trante Octavian, Antoniac Iulian
National University of Science and Technology Politehnica Bucharest, Romania

P20. Beyond Biocompatibility: Occupational Risk Assessment in Biomaterials and Regenerative Medicine

Oana Roxana Chivu [1], Alina Trifu [2], Andrei Iacob[1] , Marinela Marinescu[1], Larisa Butu[1], Roland Moraru[3], Catalina Enache[1]
[1]National University of Science and Technology POLITEHNICA Bucharest, Romania; [2]National Research-Development Institute for Occupational Safety INCDPM Alexandru Darabont Bucharest, Romania; [3]University of Petroşani, Romania

P21. The use of natural polymers and phospholipids for the controlled release of phytocompounds with therapeutic interest from *Stellaria media* (L.) Vill.

Florina (Miere) Groza[1], **Luminita Fritea[1],** Angela Antonescu[1], Simona Cavalu[1], Simona Ioana Vicas[2]
[1]Faculty of Medicine and Pharmacy, University of Oradea, Romania; [2]Faculty of Environmental Protection, University of Oradea, Romania.

P22. Evaluation of Platelet-Rich Plasma (PRP) Therapy in Knee Arthroplasty: Clinical and Functional Outcomes

Silviu Valentin Vlad[1], Timea Claudia Ghitea[2]
[1]Orthopedic Department, County Clinical Emergency Hospital Oradea, Romania; [2]Pharmacy Department, Faculty of Medicine and Pharmacy, University of Oradea, Romania

P23. SPINCARE TECHNOLOGY IN THE TREATMENT OF ATONIC WOUNDS

Sandor Mircea [1], **Horgos Maur Sebastian** [2], Borza Ioan Lucian [3], Huniadi Anca [4], Cheregi Cornel Dragos [5]
[1]Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, Romania; [2]Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, Romania; [3]Department of Morphological Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, Romania; [4]Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, Romania; [5]Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, Romania

P24. Reducing fixed orthodontic treatment by correctly sequencing the use of TiNb and NiTi archwires

R.M. Pisc[1,2], A.M. Rauten[2], S.M.S. Petrescu [1,2], H.O. Manolea [1,3]
[1]Department of Dental Materials, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, Romania
[2]Department of Orthodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, Romania
[3]Department of Prosthodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, Romania

P25. Knowledge and New Trends in Obtaining Metal Prosthetic Structures – Systematic Review

Popa Cătălin, Radu Rica, Daniel Tirtea, Alina Robu, Miruna Anghel, Petre Marășescu, Horia Manolea
Department of Prosthesis Technology, University of Medicine and Pharmacy of Craiova

PLENARY INVITED SPEAKERS

Julietta RAU

Julietta V. Rau (Dr., PhD) is currently Director of Research, Head of the laboratory and research group at the Institute of the Structure of Matter of the Italian National Research Council (ISM-CNR, Rome, Italy).

She is the author of more than 240 articles in International Journals, about 180 presentations, and 45 Invited, Plenary, and Keynote talks at International Conferences, as well as 3 International Patents. Her current H-index is 47, with over 6200 citations.
https://scholar.google.it/citations?user=orvFyq4AAAAJ&hl=it
https://www.webofscience.com/wos/author/record/E-6598-2017
http://orcid.org/0000-0002-7953-1853

She received several International Awards for her research achievements. She is the CHAIR and organizer of the biennial BioMaH "Biomaterials for Healthcare" International Conference (https://biomah.ism.cnr.it) and a Member of the International Scientific Committees of various International Conferences in the field of Materials Science, Nanoscience, Biomaterials, and Medical devices.

She is an Ambassador for Italy at the European Orthopedic Research Society. She is an Honorary Member of the Romanian Society for Biomaterials. She is currently Associate Editor of the Bioactive Materials journal and Frontiers in Biomaterials Science and also Editorial Board Member of Frontiers in Bioengineering and Biotechnology, Scientific Reports, Coatings MDPI, In Vitro Models, Journal of Advanced Drug Delivery Research, Drug Design Development & Therapy, EC Orthopedics, and The Open Biomedical Engineering Journal.

Her present research interests (https://www.researchgate.net/profile/Julietta_Rau) regard innovative biomaterials for regenerative medicine, orthopedics, and dentistry, among them calcium phosphates and bioactive glasses for tissue engineering applications. She is also developing antibacterial surfaces for orthopedic and dental implants. She is also involved in research projects dedicated to novel imaging approaches for cancer diagnostics and biodegradable alloys and coatings.

Title of the BIOREMED 2025 lecture:

Current and Emerging Antibacterial Strategies to Control Periprosthetic Joint Infection

Gultekin GOLLER

Prof. Dr. Gultekin Goller is a materials science professor who graduated from Istanbul Technical University in 1989 with a B.S. in Metallurgical Engineering. In 1997, he received his Ph.D. in Metallurgical and Materials Engineering from Istanbul Technical University. He attended to the Tribology Group of Cleveland State University in 1995 as a UNIDO fellow for the PhD level studies. He joined the Department of Metallurgical and Materials Engineering at ITU in 1999 as an assistant professor. Professor Goller was promoted to associate professor in 2005 and became a full professor in 2010. His research fields include Modern Armour Sytstems, High Entropy Alloys, Refractory Metals and Alloys (TZM alloys), Ceramic and Composite Materials (ultra-high temperature ceramics and composites, bioactive and bioinert ceramics and composites, polymeric matrix composites), Glass and Glass Ceramics, Biomaterials, Synthesis of High Technology Ceramic Powders, Plasma Spray Coating Process (thermal barrier coatings) and Spark Plasma Sintering (SPS) Technique (Boride, carbide, nitride based monolithic and composite materials), Characterization of Materials (X-Ray and Electron Microscopy). Prof. Dr. Gultekin Goller is the founder of Biomaterials Research and Characterization Laboratory, Laser Cutting and Welding Laboratory, Composite Material Production Laboratory, and Spark Plasma Sintering Laboratories in Istanbul Technical University's Metallurgy and Materials Engineering Department. Prof. Dr. Gultekin Goller has supervised 11 completed and 2 ongoing PhD studies; 36 completed, 1 ongoing graduate studies. As a date of September 2025, his professional and scientific activity comprises: papers, which are cited over 4000 times (h index = 36; As of September), published in science citation index journals (136); papers published in international peer-review periodicals (97); the proceedings of international or national conferences (135); participating in different international or national research projects (49); author of 5 international book chapter; member of the scientific committee of different meetings; head of the organizing committee for different international conferences; member of the International Editorial Board of some journals; and reviewer for different journals. Prof. Dr. Gultekin Goller served as chair of the Metallurgical and Materials Engineering Department between 2010 and 2013 and contributed to the Ministry of Defence R&D Technologies Division, specifically the Material Processes and Technologies Panels, as a university representative from 2010 to 2016. In 2019, Prof. Goller established a company called "GG Materials Technologies" at ITU ARI Teknokent, operating in the field of production and characterization of modern armour systems and advanced materials. Prof. Goller has been acting as an international expert in the accreditation studies of the Materials Science doctoral program of the Romanian Agency for Quality Assurance in Higher Education (ARACIS) since 2021. Prof. Goller has been included in the list of the most influential scientists (top 2%) carried out by Stanford University created according to the calculation of the citation numbers, H-index values, co-authorships and career-long impact factors of the scientists. He has also been honored with the “Pro Scientia et Innovatio” Honor Order from Romania and the title of Doctor Honoris Causa.

Title of the BIOREMED 2025 lecture:
Development drug delivery system with biomaterials for capsule drug forms

Stefan Ioan VOICU

Stefan Ioan Voicu is Professor and Head of the Department of Analytical Chemistry and Environmental Engineering at the Faculty of Chemical Engineering and Biotechnologies, National University of Science and Technology POLITEHNICA Bucharest, and Associate Member of the Academy of Romanian Scientists. He started his career in 2005, with a Bachelor in Organic Chemistry (from 2005), Ph.D. in Polymeric Membranes (from 2008), and Habilitation in Chemical Engineering (from 2016).

He published 15 books and book chapters (Wiley, Springer Nature, Elsevier), > 90 peer-reviewed scientific papers with Hirsch index 42, and a total number of citations 5700+. The main research interests are related to polymeric membranes for biomedical applications, with outstanding contributions in the field of surface functionalization methods for hemodialysis and osseointegration, and polymeric membranes for water purification (the first report in the literature for membranes with self-indicating properties, which change the color of the surface during the filtration process). Except academic activity, Prof. Voicu has also experience in the field of industrial research, being for two years a Research Scientist at Honeywell Automation and Control Solutions, Sensors Laboratory with 3 granted US Patents (US 7,695,993 B2, US 7,867,552 B2, US 7,913,541 B2) developed in the field of metallic surface functionalization for SAW chemical sensors. He served as editor at different prestigious publishing houses, like Elsevier or Springer Nature.

Title of the BIOREMED 2025 lecture:

Recent advances in polymeric membrane materials for biomedical applications

Ciprian ILIESCU

Ciprian Iliescu holds a PhD in Mechanical Technology, Politehnica University of Bucharest (1999), and Habilitation in Chemical Engineering. He is ERA Chair holder and Founding Director of the eBio-hub Center of Excellence at the National University of Science and Technology Politehnica Bucharest.

Dr. Iliescu was PI for numerous national and international grants (budget >5 mil. Euro). His main research interest is bioengineering (microfluidic cell culture, on-chip self-assembled nanoparticles, liquid biopsy, microphysiological systems, point-of-care testing, and transdermal drug delivery). He has 30+ years of research and industrial experience, including 18 in Singapore (at Nanyang Technological University, Institute of Bioengineering and Nanotechnology -IBN- and National University of Singapore). He set up several labs (IBN BioMEMS cleanroom, Micro and Nanofluidics lab at IMT Bucharest, and eBio-hub at NUSTPB). Dr. Iliescu has published in top journals, including Science Translational Medicine, Biomaterials, Trends in Analytical Chemistry, Chemistry of Materials, Sensors and Actuators B: Chemical, Analytical Chemistry, and Labon a Chip. He holds two US and EU patents, and one Romanian patent, and is "Member of Honour" of the Academy of Romanian Scientists.

Title of the BIOREMED 2025 lecture:

Microphysiological systems for drug screening

KEYNOTE SPEAKERS

Nermin DEMIRKOL

Nermin Demirkol received her B.Sc. degree from Dumlupınar University as a ceramic engineer, Türkiye in 2001, and M.Sc. degree from Gebze Institute of Technology, Türkiye in 2004 and Ph.D. degree from the İstanbul Technical University (ITU), Türkiye in 2013. Since 2004, Demirkol has presented and published papers on the production and characterization of ceramic materials in many countries including Belgium, Germany, USA, Japan, Spain, France, England, Sweden, Romania, China, Greece, Hungary. She has many publications in SCI. In 2011, she received a scientific achievement award from Kocaeli University for her SCI publications. In 2014, her biography was published among the World Successful Scientists by the Marquis Who's Who Publication Board in the UK. In 2015, she was listed among the TOP 100 Engineers by the biography center in the UK. She is a board member of the Biomaterials and Tissue Engineering Society (BTES) and the Clay Sciences Society, a member of the Turkish Ceramic Society, the European Ceramic Society ECerS, the Turkish Electron Microscopy Society, the International Society for Ceramics in Medicine ISCM, and the European Society for Biomaterials (ESB). She served as chair, organizing board and scientific board member in many international symposiums and congresses. She continues her studies on the production and characterization of traditional ceramics, bioceramic composites, 3D printing technology, reuse of waste materials in ceramic material production and ceramic glazes. She is involved in many national and international projects as an executive and researcher. She is an Associate Professor at Kocaeli University, Faculty of Fine Arts, Department of Ceramics.

Title of the BIOREMED 2025 lecture:

Green Hydrothermal Assisted Sol-Gel Synthesis of Bioactive Glasses for Regenerative Medicine

Marian MICULESCU

Dr. Marian MICULESCU, Full Professor, specialized in materials science, mechanical, and thermophysical properties of materials. He graduated as valedictorian from the Faculty of Materials Science and Engineering at the University Politehnica of Bucharest in 2003 and obtained his Ph.D. in Materials Science in 2010. He is working in the field of materials science (thermal properties, mechanical properties, materials synthesis and characterization, thermal treatments, and advanced materials) with over 25 years of experience in the domain. During his career, he has participated in postdoctoral stages in Europe and the USA in the field of materials science, nanomaterials, and materials characterization. He is also the head of a research laboratory within the Faculty of Materials Science and Engineering. He published over 70 peer-reviewed research articles, 3 international patents, 7 international book chapters, and presented many communications and more than 50 posters at international conferences. On ISI Web of Knowledge, his h-index is 20. In the past 15 years, has participated in more than 25 national research projects in the field of materials science, engineering, and technology. He received international awards and is a member of several professional associations from Europe.

Title of the BIOREMED 2025 lecture:

Thermophysical Properties of Dental and Biomedical Materials

Dan BATALU

Prof. Nicolae Dan Batalu is Professor of Materials Science and Head of the 3D Printing Laboratory at the Faculty of Materials Science and Engineering, National University of Science and Technology POLITEHNICA Bucharest. His research covers MgB_2-based superconducting materials, biocompatible materials, and additive manufacturing. He is internationally recognized for pioneering the proposal of magnesium diboride (MgB_2) for medical applications, in addition to its established role in superconductivity. Prof. Batalu has authored more than 60 ISI-indexed publications and has received over 50 awards for patented innovations. His group's work on biodegradable materials for medical use and novel 3D printing approaches has advanced both fundamental understanding and practical solutions for healthcare technologies.

Title of the BIOREMED 2025 lecture:

Biomedical Potential of MgB_2

Bogdan ISTRATE

Assoc.Prof. Ph.D Bogdan Istrate (https://istratebogdan.com) is an associate professor at the Technical University "Gh. Asachi" of Iasi, Faculty of Mechanical Engineering. He has developed a scientific research activity over 10 years, materialized by publishing as author/co-author of 176 ISI/BDI scientific papers, of which 91 with ISI impact factor and 85 ISI/BDI Proceedings, and is mentioned in more than 790 ISI/BDI citations (ISI WoS H-index:16; Scopus H-index:17) belonging to journals with important international recognition. From 2013 to present, he has participated with oral/poster presentations in numerous prestigious national and international conferences, both as Keynote/Invited speaker and as Chairman of Poster Session, specialized conferences in the field of biomaterials with international participation (Bioceramics 30 (2018) - Nagoya University - Japan, MTM 2019 - Istanbul Technical University, Turkey, BiomMedD 2016-2020, ROMAT, BRAMAT, BioMah Roma 2022, ITSC 2025, Vancouver etc.). He is a co-author of 1 patent and 6 patent applications sent to OSIM, 4 of them are about patenting chemical compositions of some Mg-Ca systems. Also, in the field of biodegradable materials, Ph.D. Bogdan Istrate has published, as first author, the books "Magnesium-based biodegradable metallic materials" and "Metallographic expertise".

In the framework of research and development projects, he was project leader/responsible for 5 grants in the field of biodegradable materials and a team member of 20 other research project collectives.

Ph.D Istrate Bogdan received several academic rewards, like: 2019 - "Gheorghe Vasilcă" award in the field of advanced materials tribology, offered by the National Institute for Aerospace Research - INCAS Bucharest, 2020- the DIPLOMA OF EXCELLENCE, in the category "Young researcher with the best performance in scientific research", offered by the Technical University "Gheorghe Asachi" of Iasi, and in 2022 he obtained the Medical Ortovit SRB Award 2022 Awarded by the Romanian Society for Biomaterials and the Modtech Excellence Award 2022 Most Performing Young Researcher.

Ph.D Bogdan Istrate developed specialized expertise in plasma jet thermal deposition techniques and advanced skills in microstructural analysis by optical, electron, and X-ray diffraction methods, and has specific knowledge in using Quanta 200 3D SEM Microscope, XPERT Pro MPD X-ray Diffractometer, and Sulzer Metco 9MCE Plasma Jet Deposition Facility.

Title of the BIOREMED 2025 lecture:

Biocompatibility of Mg biodegradable alloys and their importance in the medical applications and material science

Simona BĂLȚATU

Mădălina Simona Bălțatu is a researcher in the field of biomaterials, with a strong focus on titanium alloys for biomedical applications. She obtained her Ph.D. in 2017 with the thesis *"Contributions regarding the improvement of the properties of Ti-Mo alloys for medical applications"*. She successfully completed in 2023 the Advanced Research Postdoctoral Training Program at the "Gheorghe Asachi" Technical University of Iasi, Faculty of Materials Science and Engineering. In 2022, she received the Excellence Award from the same university in the category *"Young researcher with the best performance in scientific research."*

Her research interests include the synthesis, characterization, testing, and expertise of new biomaterials; development of medical devices; surface engineering; implant–tissue interactions; and functionalization strategies. She has authored over 65 scientific papers, of which 46 are indexed in ISI journals with impact factor. Additional achievements include 8 international books, 3 national books, 9 international book chapters, 2 patents, and over 60 awards at invention salons. She has coordinated 5 research projects as Director and has participated as a member in 14 projects. In addition, she is Co-founder of SIMTIT ENGINEERING Spin-off (www.simtit.ro), a company focused on developing and characterizing novel materials for medical applications.

Her editorial activity includes serving as Guest Editor for 13 Special Issues and performing over 300 peer reviews for international journals. She currently holds an H-index of 22. Personal webpage: http://www.afir.org.ro/msb/.

Title of the BIOREMED 2025 lecture:

Biomedical Titanium Alloys: From Traditional Processing to Additive Manufacturing

Nicanor CIMPOEȘU

Nicanor Cimpoesu, Ph.D., Habil. Full Professor, Department of Materials Science, Gheorghe Asachi Technical University of Iasi. Vice Dean of Materials Science and Engineering Faculty, Technical University Gheorghe Asachi from Iasi, Erasmus coordinator of Materials Science and Engineering Faculty, and coordinator of ESIM laboratory (https://esimsim.ro/). Born / Nationality: Romania. Received Ph.D. (Engineering) in 2010, with a thesis investigating the internal friction properties of metallic shape-memory alloys. Achieved habilitation (habilitation degree) in 2018, affirming full professorship, Phd students coordinator since 2019, with 3 doctors confirmed. Authored approximately 235 scientific publications (ResearchGate), garnered about 1412 citations on ResearchGate, and around 1800 citations on Google Scholar. The author has an H factor of 19 in 2025 (WoS), 1716 citations on Google Scholars, and Scopus. Published more than 10 technical content books (like Active Materials for Medical Applications, Corrosion Resistance Enhancement of Materials Surface, Automotive Brake Disc Materials). Coordinated four national and International research projects, like the European Horizon 2020 project CeLaTeBa(SURPF2301300009), focusing on microstructure of materials, biodegradable metallic materials, corrosion resistance, and smart materials. Participated in more than 30 national research projects, including: development of high-entropy alloy-based materials for tooling (PN-II-PT-PCCA-2013-4-1048), fabrication of high-damping thin shape memory films via pulsed laser deposition (PN-II-RU-PD-2011-3-0186). CNATDCU member since 2024, reviewer for different ISI Journals, editor of ASTR journal.

Title of the BIOREMED 2025 lecture:

Iron-based alloys for medical applications: results and perspectives on the use of biodegradable materials in modern implantology

Cătălin POPA

Dr. Cătălin Popa is a Professor in the Department of Materials Science and Engineering, Head of the Biomaterials Research Group at the Technical University of Cluj-Napoca (TUCN). He is an Engineer since 1986 and, after working as a design engineer in several companies, he has become a member of the academic staff of TUCN since 1990. From the very early stages of his career, he worked in the field of Biomaterials, and later, he created the Biomaterials Research Group. Doctor of Engineering since 1997, Professor Popa was awarded a NATO / Royal Society Fellowship at the University of Nottingham (2000). He was a recognized researcher in numerous research projects in the UK, in the IRC in Biomedical Materials, Queen Mary, University of London, and Rutherford Appleton Laboratory, STFC, as well as a director of 29 research grants awarded by Romanian public funding bodies. The Biomaterials Research Group he leads focuses on optimization of medical implants/devices, Tissue Engineering applications, drug delivery systems, and Medical Microfluidics. Fundamental or developmental research for industry, in Romania, Germany, the UK, or Japan, is also a key topic for the group he leads. Prof. Cătălin Popa is a member of the Materials Engineering and Science Commission in the National Commission for the Attestation of Titles, Diplomas and University Certificates (CNATDCU), Romania.

Title of the BIOREMED 2025 lecture:

Synergisic physical/chemical/biologic effects in medical microfluidic devices

Mărioara MOLDOVAN

Marioara Moldovan, Ph.D., Research Professor, Director of "Raluca Ripan" Chemistry Research Institute, Babes Bolyai University, Cluj-Napoca, Romania. Her research activity was focused on the study and development of new technologies for the synthesis and obtaining of nanostructured powders and other precursors for the composite materials (glasses, based monomer organic matrix), hydrogels with active agents (enzymes, peptides, graphitic carbon nitride), and experimental biomaterials with different applications in dentistry and medicine. Dr. Marioara's research also encompasses lecturing and practical training for undergraduate, master's, and PhD students.

The major scientific interests focus on the development of technologies for producing micro- and nanofillers, biomaterials, bioadhesives, and hydrogels for medical applications. These include: a) dental composites for restorative treatments; b) sealants for the prophylaxis of caries in children; c) synthesis and characterization of inorganic materials (e.g., micro- and nanocrystalline powders, bioglasses) as fillers for polymeric composites; d) synthesis of nanofillers by the sol-gel method and stabilization of nanoparticles; e) surface treatment of inorganic particles with coupling agents to improve compatibility with the organic matrix of composites; f) development of biocompatible materials for dental implants; g) biomaterials for skull bone replacement; h) biomaterials for meninges replacement; i) composites capable of forming thin films with adhesive properties, cured under UV or visible light; k) synthesis and formulation of new classes of emerging materials for the treatment of oral tissue disorders using photodynamic therapy.

Her work focuses primarily on the synthesis and characterization of micro- and nanofillers, bioglasses, ceramics, and biodegradable polymers (such as polylactic acid) used in bioadhesives and composite materials, as well as on studying the influence of the inorganic matrix on the physico-chemical and mechanical properties of the hardened adhesives and composite materials.

Title of the BIOREMED 2025 lecture:

Engineering Hydrogels for Oral Healthcare: Design and Progress

Tareq HAJAJ

Dr. Tareq Hajaj is a Senior Specialist in Dentoalveolar Surgery and a Lecturer (Șef de Lucrări) at the "Victor Babeş" University of Medicine and Pharmacy in Timișoara, within the Department of Dental Propedeutics and Materials.
In 2018, he earned his PhD in Medical Sciences following four years of research focused on oral implantology, defending a doctoral thesis entitled "Interdisciplinary Approaches to the Implant–Abutment Interface."
He is the author of several national and international scientific articles and publications. Dr. Hajaj serves as the regional president (Western Romania) of MINEC, an international educational and research organization, and is an active member of the Digital Dentistry Society and the Academy of Dental Materials (USA).
His private clinical practice, *Dental Creation* by Dr. Tareq Hajaj, is based in Timișoara and focuses primarily on oral implantology, surgery, and prosthetic dentistry.

Title of the BIOREMED 2025 lecture:

Innovative Biomaterials in Oral Implantology: Advances, Challenges, and Clinical Perspectives

Marius MANOLE

Marius Manole, DDS, PhD, Associate Professor of Propaedeutic and Esthetic Dentistry, Department of Prosthetics and Dental Materials, Faculty of Dentistry, University of Medicine and Pharmacy „Iuliu Hatieganu” Cluj-Napoca, Vice Dean – Academic, Management and Development, I graduated the Faculty of Dentistry UMF Cluj-Napoca in 2001, holds a PhD in Medicine and a Master degree in implant supported prosthesis and radio-diagnosis course. More than 20 years experience in dental prosthetics, dental esthetics and implant supported prothesis.

Professional and Scientific activities: 1 book published as co–author, more than 40 papers published in extenso, many scientific presentations and papers published as abstracts in the proceedings of international conferences, invited speaker at several national scientific meetings, reviewer for several specialty scientific journals. Also, he was involved in various research projects focused on dental biomaterials. Research interest: prosthetic dentistry, prosthetic on implants, esthetic dentistry, dental biomaterials, digital dentistry.

Title of the BIOREMED 2025 lecture:

Comprehensive Prosthetic Planning in Implant Based Oral Rehabilitations

Horia Octavian MANOLEA

Horia Octavian Manolea is Professor at the Prostheses Technology and Dental Materials Department and currently Chief of the 1st Department of the Faculty of Dentistry from the University of Medicine and Pharmacy, Craiova, Romania. He graduated as valedictorian from the Faculty of Dentistry in 2001, holds a PhD in Medicine, and a Master's degree in implant-supported prosthesis. Research interests include the bioactive materials study, mainly of bone augmentation materials, restorative materials research, implant-supported prosthesis technologies, development of ceramic and metal-ceramic technology, and dental and periodontal structures morphology study. His professional and scientific activity comprises 10 textbooks, more than 80 papers published in scientific journals, of which 50 were published in ISI journals with impact factors, more than 200 papers published in abstract in the proceedings of international or national conferences, and an invited speaker at several national and international scientific meetings, and a reviewer for several specialty scientific journals.

Title of the BIOREMED 2025 lecture:

Artificial intelligence in dentistry between trend and necessity

Anca PORUMB

Porumb Anca – University of Oradea. Graduated from the "Iuliu-Hatieganu" Faculty of Medicine and Pharmacy from Cluj-Napoca in 1998. Primary doctor in General Dentistry. Primary doctor in Orthodontics. Competence in Maxillo-Dental Radiodiagnosis. Private practice in Oradea. Doctor in Medical Sciences, Dentistry, at UMF Iuliu-Hatieganu Cluj-Napoca in 2008. Habilitation thesis in January 2020. University Professor from 2021.

- Vice President of the College of Dentists in Bihor County, Romania
- 2 specializations: General Dentistry and Orthodontics Competence in Maxillo-Dental Radiodiagnosis
- Private practice for 25 years
- Author of several specialized books. Invited as a speaker at a large number of congresses on dental biomaterials and dental imaging topics, with applicability in pedodontics and orthodontics.

Title of the BIOREMED 2025 lecture:

The assessment of ceramic dental materials during the treatment of severe adult cleft palate

Simona CAVALU

Professor Simona Cavalu serves as Full Professor in the Department of Preclinical Sciences, Faculty of Medicine and Pharmacy, University of Oradea, ROMANIA, and Head of Cell Culture Laboratory.
She obtained an International Ph.D. in Sciences from Babes-Bolyai University, Cluj-Napoca, Romania, and has worked as an invited professor at several international institutions, including Istanbul Technical University, Debrecen University (Hungary), and ISM-CNR, Rome, Italy. She is also a member of several Academic Societies: the International Society for Ceramic in Medicine, the Romanian (European) Society of Biomaterials, the Romanian Society of Pure and Applied Biophysics, and the Romanian Society of Medical Physics.
Professor Simona Cavalu's research focuses on bio-nano-materials for orthopaedics, dental and tissue regeneration applications, natural polymeric composites for controlled and targeted drug release, titanium cranioplasty, nanoparticles production and characterization, nanomedicine, animal model (in vivo biocompatibility tests), in vitro biocompatibility tests, natural compounds for different therapeutic strategies, and anticancer research. She also served as an invited lecturer at prestigious international conferences and co-organizer of international meetings, international reviewer, and Editorial Board Member for prestigious, top-ranked international journals in MDPI, Frontiers, Springer, and Elsevier. Her publishing activity comprises more than 220 papers in internationally ranked journals. Included in the Top 2% World Ranking of Scientists based on the Stanford University Scientists List 2024. She has been awarded with various research prizes from international and national organizations: "Daniel Bunea" Award of Romanian Society of Biomaterials 2014, Excellence Award SRB 2015, Best Conference Chairperson EMN Biomaterials Phuket 2016, Gold Medal - National Research Council of Thailand (NRCT) 2018, Special Honour of Invention - Toronto International Society of Innovation & Advanced Skills 2018 (TISIAS), Special Award & Gold Medal - Malaysian Research & Innovation Society, and Special Award & Medal - Association of Polish Inventors and Rationalizers, 2018, as a group member of the invention "Cranial implant with osteointegrating structures and functional coatings".

Title of the BIOREMED 2025 lecture:

Updates on metallic nanoparticles applications in bioremediation, biomedicine, and biosensing

Dan GRECU

University of Medicine and Pharmacy of Craiova, Primary Physician Orthopedics-Traumatology, Doctor of Medical Sciences
• Since 2016 – University Professor, Orthopedics-Traumatology discipline, Faculty of General Medicine, U.M.F. Craiova
• 55 papers published in full in specialized journals as author or co-author.
• 4 courses and monographs.
• 44 scientific papers presented at international congresses and published.
• 10 national or international research projects.
• Multiple specializations and qualifications in medical centers in Europe.
• Organizer of regional (SOTO), national (SOROT), and international (GKS) congresses and conferences.
• Organizer of postgraduate courses.
• Lecturer in multiple advanced training courses for orthopedists and other specialties organized in the Oltenia area.
• Member of multiple competition and examination committees organized in the Oltenia area.
• Member of 8 international, local, and regional professional societies:
• Member of the Romanian College of Physicians since 1992.
• Member of the Romanian Society of Orthopedics and Traumatology since 1992.
• Member of the National Committee of AO Spine Romania from 2006 to 2010.
• Member of the AO Spine International Society since 2006.
• Member of the DUROMEF Society since 1996.
• Member of ESSKA since 2001.
• Member of BioReMed and founder of the Craiova Branch of BioReMed.
• Founding member, coordinator, and currently President of the Oltenia Society of Orthopedics and Traumatology (SOTO) since 2004.

Title of the BIOREMED 2025 lecture:

Metal-on-metal – an unfairly rejected couple

Sebastian GRĂDINARU

Dr. Gradinaru Sebastian is a consulting general surgeon at Ilfov County Emergency Hospital and holds an academic position as an Associate Professor in General Surgery at Titu Maiorescu University, Faculty of Medicine. His specialization in emergency surgery, breast, oncological, upper gastrointestinal, and colorectal surgery has provided him with exposure to innovative technologies and a variety of biomaterials utilized in surgical procedures, such as herniorrhaphy materials, diverse stents for viscera, suture materials, haemostatic sponges, dyes for mapping and sentinel lymph node biopsies, inks for tattooing, and agents that promote healing.

In addition to publishing numerous papers on both fundamental and clinical research, Mr. Gradinaru has authored books and chapters in surgical textbooks. He is responsible for coordinating graduation and doctoral theses and participates actively in the surgical training program within his department.

His training in breast oncoplastic surgery was conducted in Ireland, where he gained experience working with various types of implants, metallic and resorbable clips, cosmetic stitches, and innovative fluorescent dyes.

Title of the BIOREMED 2025 lecture:

Current uses and future prospects of various stent types in surgical practice

Vicențiu SĂCELEANU

Dr. Vicentiu Saceleanu was born in 1968 in Sibiu, Romania, graduated from the Faculty of Medicine and Pharmacy „Iuliu Hațieganu„ Cluj-Napoca, Romania in 1994, received his Ph.D. from Lucian Blaga University (Sibiu, 2011), and since 2011, he has been the head of the Neurosurgical Department (County Hospital - Sibiu). Since 2000, he has been a member of the Romanian Society of Neurosurgery, AOS International, and the Medical College of Sibiu. Additionally, since 2016, he has been a member of the Romanian Society of Biomaterials. He was an Associate Professor at Lucian Blaga University, and since 2017, he has joined the University of Sibiu as a full Professor, directing the Neurosurgical Department. In 2011, Dr. Saceleanu founded the Neurosurgical Circle from Sibiu with 50 active students, participating in over 15 international and national congresses, and coordinating over 20 presentations. Dr. Saceleanu is the author of 3 neurosurgical books, coauthor in 2 books, and has published 194 articles in national and international journals.

SCIENTIFIC ACTIVITY:

- Participation in numerous congresses and courses of Continuing Medical Education in Neurosurgery starting from 1995; participation in the national and international conferences as chairman and speaker: Romanian-German Courses of Neuro-traumatology; Sibiu Medical Days Conference, Chairman at Sibiu Medical Days 2011, 2013; International Seminar Paulo Freire "For a pedagy of the dialogue"; Stroke Conferences with international participation and symposia of Neurology and Psychiatry, Neurophysiology Electrodiagnostic Conference, Congresses and conferences on Neuroprotection and Neuroplasticity, Neurooncology Conference, Symposium "Il metodo Feuerstein", National Symposium of corticosteroids, the Conferences of the Society of Surgery;
- Participation in specialized courses in the field of neurosurgery: Skull Base Surgery Course, Bucharest; Vertebroplasty course, Bucharest.
- Participation in international course Hands on:" Microsurgical and Endovascular Techniques", December 2018, Salzburg.
- Local coordinator of the International Grant: Comparison of Cerebrolysin and Standard Treatment.
- Coordinator of the project Brain Revealed: Innovative Technologies in Neurosurgery Study – 2018-1-RO01-KA203-049317, 01.09.2018 – 31.08.2021.
- Patent: cranial implant with osseointegration structures and functional coatings, International Exhibition of Scientific Research, Innovation, and Invention, 2018.

PUBLISHING ACTIVITY: Editor of the book of Clinical Neurosurgery, 2014; 3 specialty books in the Romanian language, 2014, 1 specialty book in the English language, 2014; 194 articles.

RESEARCH ACTIVITY: Professional training of residents (Neurology, Surgery, Orthopedics, Ophthalmology, Forensic Medicine), since 2011 till present; Founder and coordinator of the Neurosurgery Circle, LBUS, 2013; Development of Syllabus and course description of Neurosurgery discipline within the II Department of V. Papilian Faculty of Medicine Sibiu; Local organizer of 2 Neurosurgery Conferences, 2002, 2009 and one Conference of Neuro-rehabilitation at Ocna-Sibiului, 2007; Organiser of Sibiu Medical Days, 2014; MAIN organizer of the Conference: "Treatment options and methods of rehabilitation in stroke and spinal pathology ", Sibiu, 2014, December 5; Member of the Scientific Commission of the County Clinical Emergency Hospital Sibiu, decision of Sibiu County Council no. 111/23.01.2015; Local main coordinator at the International Grant: Comparison of Cerebrolysin and Standard Treatment Evaluating the Neuroprotective and Neurorehabilitation Outcome in a Randomized, Double –Blind, Controlled Trial on Efficacy and Safety in Patients with Moderate to Severe Traumatic Brain Injury.2014, no.3455/27.02.2014; Development of the research plan for the Neurosurgery discipline for the years 2012-2014 & 2014-2020 "V. Papilian" Faculty of Medicine Sibiu; Member of the Research Group of Ocular Surface, since 2014; Chairman of the Organizing Committee of the 45th edition of the Congress of the Romanian Society of Neurosurgery, Sibiu, October 2019; Manager of the interntional project on Erasmsus Programme - Brain Revealed: Innovative Technologies in Neurosurgery Study – Universitatea Lucian Blaga din Sibiu;

Title of the BIOREMED 2025 lecture:

Interdisciplinary collaboration between biomaterials and neurosurgery in the framework of Brain IT Project

Aurel MOHAN

Professor Dr. Mohan Aurel-George was born in the city of Bucharest on 27.04.1983, and lives in Oradea-Bihor County, graduated from the Oltea Doamna General School in Oradea, after which he graduated from the Mihai Eminescu National College in 2001. He attended the Faculty of Medicine and Pharmacy Oradea, specializing in General Medicine in the period 2002-2008, after which he was a resident doctor in the clinical department of Neurosurgery at the Bihor County Emergency Clinical Hospital between 2009-2015. In 2014, he obtained the title of doctor in medical sciences at the doctoral school of the Carol Davilla University of Medicine and Pharmacy in Bucharest.

He began his university career in 2009, obtaining through a competition the position of university trainer in the Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea. In 2016, he took the exam for the position of Lecturer at the University of Oradea - Faculty of Medicine and Pharmacy, and at the same time, from the position of specialist neurosurgeon, he became the head doctor/coordinator of the operating room at the Bihor County Emergency Clinical Hospital. In 2019, he becomes Associate Professor at the University of Oradea, and in 2021 he takes the primary exam, thus becoming a senior neurosurgeon also at the Oradea Neurosurgery Clinic. In 2022, he takes the exam for the position of Full Professor at Oradea University and is appointed Secretary of State at the Bucharest Ministry of Health, where he begins his work.

Currently, Dr. Mohan Aurel-George leads the residency program at the Oradea Neurosurgery Clinic, as a professor and senior neurosurgeon and is the coordinator of the Bihor County Emergency Clinical Hospital.

Title of the BIOREMED 2025 lecture:

Customized polyetheretherketone (PEEK) cranial repair system implants used in cranioplasty after severe traumatic brain injury (TBI)

Alin BODOG

Dr. Alin Danut Bodog
Associate Professor at the Faculty of Medicine and Pharmacy of Oradea
Primary physician in obstetrics and gynecology, graduated from the Faculty of Medicine and Pharmacy in 2004, confirmed by the Doctorate in Medical Sciences and the National Residency Exam in the specialty of obstetrics and gynecology.
Dr. Bodog Alin is a primary physician, with experience in the public and private health sector. He has skills in obstetrical gynecological ultrasound, hysteroscopy, and gynecological oncology.
Certifications
2009 – New approaches in diagnosis and treatment of ovarian tumors
2010: Bioethics ABC in human reproduction and sexuality (published at the University of Medicine New Paper)
MEMBER IN ORGANIZATIONS
member Kuwait Medical Association
member Romanian Society of Obstetrics and Gynecology
member Romanian Society of Endocrinology and Gynecology
member Romanian Society of Surgery
member Romanian Society of Gynecological Aesthetics

Title of the BIOREMED 2025 lecture:

Chitosan Tamponade in the Management of Acute Postpartum Hemorrhage

PLENARY INVITED SPEAKERS ABSTRACTS

Development drug delivery system with biomaterials for capsule drug forms

Gultekin GOLLER

Istanbul Technical University, Department of Metallurgical and Materials Engineering, 34469 Maslak, Istanbul, Turkey
goller@itu.edu.tr

Capsules are among the most widely used pharmaceutical dosage forms due to their versatility and ability to improve patient compliance. Gelatin-based hard capsules are extensively employed in the industry owing to their mechanical strength and cost-effectiveness. However, they present limitations, such as instability under high temperature and humidity conditions, as well as restrictions related to dietary habits and faith-based preferences due to their animal origin. Consequently, plant-based capsules synthesized from polysaccharides, particularly cellulose, have emerged in recent years as a promising alternative.

This presentation focuses on the extraction of cellulose from agricultural wastes as a raw material for the production of plant-based capsules and on the evaluation of the obtained cellulose in capsule manufacturing. Accordingly, the cellulose extraction process and capsule production methodology will be presented, and the findings of the conducted experimental studies will be discussed. The anticipated outcomes include the development of plant-based capsules with superior mechanical properties compared to gelatin capsules, offering a sustainable alternative for patient groups who prefer to avoid animal-derived products.

Recent advances in polymeric membrane materials for biomedical applications

Stefan Ioan VOICU[1,2]

[1]Department of Analytical Chemistry and Environmental Engineering, Faculty of Chemical Engineering and Biotechnologies, National University of Science and Technology Politehnica Bucharest, Gheorghe Polizu 1-7, 011061 Bucharest, ROMANIA
[2]Academy of Romanian Scientists, Ilfov 3, Bucharest, ROMANIA
stefan.voicu@upb.ro

The field of membrane materials is one of the most dynamic due to the continuous requirements regarding the selectivity and upgrade of the materials developed with the constantly changing needs. Two membrane processes are essential at present, not for development, but for everyday life – desalination and hemodialysis. Another growing biomedical field for polymeric membranes is related to osseointegration – membranes that are usually used at the interface between bone and implant, with primary role to facilitate the integration of implant into the bone. This presentation is focused on the latest developments in the field of membrane materials for hemodialysis, controlled drug delivery, and improved osseointegration. A short introduction to the field of membrane materials will open this fascinating journey, the main subject being the applications of these materials in the biomedical field. Surface treatment or preparation of composite polymeric membranes, in vitro and in vivo tests, and controlled release of antibiotics or anti-inflammatory drugs will be presented and discussed. Some future trends and actual scientific projects will end this presentation.

Microphysiological systems for drug screening

Ciprian ILIESCU[1,2,3]

[1] eBio-hub Research Center, National University of Science and Technology PolitehnicaBucharest; [2] National Institute for Research and Development in Microtechnologies- IMT Bucharest; [3] Academy of Romanian Scientists

The low probability of a drug candidate's clinical success, the time consumed, and the high cost of bringing a drug from concept to market emphasize the need for new approaches to drug discovery. Recent developments in microfluidic technologies, such as organ-on-a-chip, droplet microfluidics, and high-throughput screening, are revealing the potential of these platforms to address some of these challenges, due to the small volume of samples used, short processing time, and improved process control.

The talk is focus on the recent research of the author in the field of microfluidic platforms (so-call "microphysiological systems") for drug screening. A new approach in cell culture model (so-called "constrained spheroids") will be analysed. The perfusion system – "Incubator on a chip" -was further developed for this cell culture model – a microphysiological system that integrates the perfusion of the media with the functions of the classical incubator, offering also the opportunity of real-time monitoring of cell culture. The system was tested using rat hepatocytes for acute and chronic repeat dosing drug safety testing using two model-drugs diclofenac and acetaminophen (APAP). The incubator-on a chip system was further develop for a vascular-liver (co-culture) chip for sensitive detection of nutraceutical metabolites from human pluripotent stem cell derivatives. Moreover, preliminary testing was performed for testing rat "tissue on a chip", in this case tissue slides were inserted in a cage having on top and bottom ultrathin parylene C membranes. A tangential flow over the membranes was assured using a microfluidic structure for metabolites collection and refreshing the culture media. A step forward: "animal-on chip" – drug screening on zebra-fish embryo. The perfusion based microfluidic chip presents a fluidic concentration gradient generator and eight fish tanks of 1.4 mm-diameter (and a depth of 1mm).
Finally, the opportunities and challenges of microfluidic applications in drug discovery will be presented with examples of the use of microfluidics in translational research.

Current and Emerging Antibacterial Strategies to Control Periprosthetic Joint Infection

Julietta V. RAU[1] and Iulian Antoniac[2,3]

[1]*Istituto di Struttura Della Materia, Consiglio Nazionale Delle Ricerche, Via del Fosso del Cavaliere 100, 00133 Rome, Italy; giulietta.rau@artov.ism.cnr.it*

[2]*Faculty of Material Science and Engineering, National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania; iulian.antoniac@upb.ro*

[3]*Academy of Romanian Scientists, 54 Splaiul Independentei, RO-050094 Bucharest, Romania*

Periprosthetic joint infection (PJI) is one of the most significant complications following joint arthroplasty, with serious clinical and economic implications. Biofilm formation on implant surfaces represents the key pathogenic mechanism, creating an environment that shields bacteria from host immunity and systemic antibiotics. Coupled with the rise of multidrug-resistant organisms, PJI presents significant therapeutic challenges.

Conventional strategies such as antibiotic-loaded bone cements, spacers, and beads have long been used to deliver antimicrobial drugs. Although these methods could provide high local concentration, they suffer from drawbacks including inconsistent release kinetics, limited biofilm penetration, and a lack of biodegradability. These limitations highlight the need for next-generation solutions that offer reliable antimicrobial activity while supporting tissue regeneration.

Recent advances in biomaterials research offer promising alternatives. Multifunctional biomimetic materials, bioresorbable metal alloys, and nanocomposites are designed to release antimicrobial metal ions in a controlled manner. Coated bioresorbable metal alloys, such as magnesium or zinc, combine gradual degradation with antibacterial ion release and favorable mechanical properties. Biomimetic scaffolds inspired by bone architecture not only resist bacterial adhesion but also promote osteogenesis and vascularization, addressing infection control and regeneration simultaneously.

Surface modification techniques can reduce bacterial adhesion. For this purpose, antibacterial ion calcium phosphate coatings are being investigated for their ability to create long-lasting antibacterial surfaces without compromising host cell attachment and proliferation.

Preclinical models and early clinical studies indicate that combining antibacterial functionality with biocompatibility is achievable, but large-scale validation remains necessary.

The future of PJI management lies in multifunctional biomaterials that integrate infection prevention with regenerative potential. Next-generation materials capable of simultaneously controlling infection, supporting bone healing, and ensuring long-term implant integration could significantly reduce the PJI and improve the longevity and quality of joint replacements.

KEYNOTE SPEAKERS ABSTRACTS

Synergisic physical/chemical/biologic effects in medical microfluidic devices

Cătălin POPA

Technical University of Cluj-Napoca, ROMANIA

Medical Microfluidics has become, in recent years, a very dynamic domain, both due to advances in Engineering Science and Manufacturing Technology, and to the new demands after the recent pandemic.

Fields such as Capillary Force Microfluidics, using cost–effective devices prone to high–scale production, or 3D printing of microfluidic devices with cheap raw materials, emerged very strongly in recent years.

The applications in this presentation use several types of action upon target components in biologic / biologically inspired fluids, ranging from simple flow effects, to synergistic physical–chemical ones, and refer either to diagnostic, therapy, or theranostic, microfluidic bioreactors, difficult wounds dressing, biosensing, or fast, accurate point-of-care blood analysis, drug testing, etc. Rigid microfluidic devices manufactured through 3D printing, as well as capillary force ones, on paper or thread, with electrodes / chemical agents' integration, were conceived, manufactured, and tested, in view of medical or forensic applications.

Green Hydrothermal Assisted Sol Gel Synthesis of Bioactive Glasses for Regenerative Medicine

Nermin DEMİRKOL

Department of Ceramics, Kocaeli University, Türkiye, nermin.demirkol@kocaeli.edu.tr

Bioactive glasses represent a transformative class of biomaterials capable of stimulating and directing cellular responses for tissue regeneration. In recent years, advances in their composition and fabrication techniques have enabled the development of tailored bioactive glasses with enhanced mechanical properties, degradation rates, and ion release profiles.

This presentation introduces a hydrothermal-assisted sol–gel synthesis route for bioactive glass with a molar composition of $60SiO_2$–$36CaO$–$4P_2O_5$, designed to enhance efficiency and scalability for biomedical applications. By incorporating a hydrothermal system, the sol–gel transition was significantly accelerated, reducing processing time while maintaining material quality. Post-synthesis calcination was employed to remove residual organics and stabilize the structure.

The resulting amorphous glass powders were extensively characterized: XRD confirmed their non-crystalline nature, DTA/TGA provided insights into thermal behavior, and FTIR spectra indicated the formation of a typical silicate network. SEM analysis revealed a homogeneous nanoscale morphology.

Bioactivity was assessed via in vitro testing in simulated body fluid (SBF), where the formation of a hydroxyapatite-like layer on the surface affirmed the material's potential for bone bonding.

This method demonstrates a time-efficient, scalable alternative to conventional synthesis routes and opens new pathways for the development of next-generation bioactive materials in tissue engineering and regenerative medicine.

Updates on metallic nanoparticles applications in bioremediation, biomedicine, and biosensing

Simona CAVALU, Luminita Fritea, Florina Groza

Faculty of Medicine and Pharmacy, University of Oradea, P-ta 1 Decembrie 10, 410087, Oradea, Romania

Introduction. Bio-synthesized Ag, Au and ZnO NPs have received great attention in recent years for their potential to combat infectious diseases by closing the gaps in current antimicrobial formulation techniques, eradicating drugs resistant microorganisms. Recently, we reported the remediation of methylene blue dye from wastewater by using ZnO NPs loaded on nanoclay, the efficiency of removal varied from 90 to 97%. We have also developed FeO NPs as an efficient nanocatalyst for heavy metal adsorption and water treatment, via the chemical route, offering better potential in comparison to other strategies for environmental applications. Size-dependent antibacterial and antidiabetic AgNPs were also synthesized using solvent extraction of *Rosa indica L. Petals*. On the other hand, the antibacterial and antifungal properties of AgNPs were demonstrated to provide a synergic effect towards *E. faecalis* when loaded in CNTs with CHX 2%. This approach clearly suggest that our results are supportive of the near future potential of nanoparticles in clinical endodontics.

Biological and "eco-friendly" production of selenium nanoparticles was also performed and nanostructured surface based on selenium nanoparticles was demonstrated to improve performances of titanium mesh for cranioplasty.

In terms of diagnostic procedure, the modification of graphene surfaces with metal nanoparticles can significantly increase the electrochemical performance of (bio)sensors, especially by enhancing the signal transduction.

Experimental. Different strategies were applied in order to synthesize AgNPs, AuNPs, ZnPNs and FeNPs. Metallic NPs produced from plant extracts are stable and monodispersible when the pH, incubation time, mixing ratio, and temperature are all accurately regulated. Although biological synthesis of MNPs has numerous advantages, a polydispersity of the nanoparticles remains a disadvantage. Optimization of the growth medium composition and parameters such as temperature, pH, salt concentration, incubation period, mixing ratio, redox conditions, irradiation, and aeration are the necessary steps in almost every type of biological process

Results and conclusions. Different routes of synthesis to create metallic nanoparticles of different characteristics and possible applications were employed. Both the functions and roles of MNPs as a drug delivery system, diagnostic agent and other potential theranostic purposes against metabolic disorders, photocatalysis applications, as well as wastewater treatments, are discussed. The advantages and challenges of MNPs owing to their superior surface catalytic activities were highlighted. However, for engineered MNPs to reach their true potential, there are still a number of unanswered questions.

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Thermophysical Properties of Dental and Biomedical Materials

Marian MICULESCU

Faculty of Material Science and Engineering, National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania

The thermophysical properties of biomaterials, such as thermal conductivity, thermal expansion, and thermal diffusivity, play a crucial role in their performance and acceptance in biomedical applications. In dentistry, for example, restorative materials must provide thermal protection to the pulp and mimic the natural heat transfer behavior of enamel and dentine. Despite their relevance, these properties are often absent from manufacturers' quality certificates.

Recent advances in measurement techniques enable the precise determination of thermal constants for ceramics, polymers, and metallic alloys across physiological temperature ranges. Results indicate distinct property profiles across material classes. Yttria-stabilized zirconia (3Y-TZP) ceramics show conductivity of ~0.50 $W \cdot m^{-1} \cdot K^{-1}$, diffusivity ~0.35 $mm^2 \cdot s^{-1}$, and a coefficient of thermal expansion (CTE) near $10 \times 10^{-6}\ K^{-1}$, closely matching natural tooth tissues while metals show higher conductivities and diffusivities: commercially pure titanium (~22.5 $W \cdot m^{-1} \cdot K^{-1}$; ~6.7 $mm^2 \cdot s^{-1}$; CTE ~$8.6 \times 10^{-6}\ K^{-1}$), Ti-6Al-4V (~6.7 $W \cdot m^{-1} \cdot K^{-1}$; ~2.8 $mm^2 \cdot s^{-1}$; CTE ~9–$10 \times 10^{-6} K^{-1}$), and Co–Cr alloys (~10.7 $W \cdot m^{-1} \cdot K^{-1}$; ~2.8 $mm^2 \cdot s^{-1}$; CTE ~$14 \times 10^{-6}\ K^{-1}$). The data underlines that metallic systems dissipate heat rapidly but risk interfacial stress due to expansion mismatch with ceramics and tissues, while zirconia achieves the best balance of conductivity and CTE compatibility.

This presentation emphasizes the importance of accurate thermophysical characterization that provides the foundation for rational selection and design of biomaterials, ensuring patient comfort, structural integrity, and long-term clinical performance.

ARTIFICIAL INTELLIGENCE IN DENTISTRY BETWEEN TREND AND NECESSITY

Horia MANOLEA, Alexandra Roiban, Ioana Mitruț, Cristinel Cirstea, Mircea Șerbănescu, Miruna Anghel, Daniel Tîrtea

Department of Dental Materials, Faculty of Dentistry, University of Medicine and Pharmacy of Craiova, Romania

Artificial Intelligence refers to the development of computer systems that can perform tasks that typically require human intelligence, such as perception, reasoning, and decision-making. Although until now the impact of AI on dentistry has been relatively limited, the current advanced capabilities have led to significant improvements. Notable advancements include automatic disease detection through image analysis, enhanced diagnostic accuracy and precision provided by support systems, simulation and evaluation of future treatment outcomes, prediction of oral disease development and prognosis, automatic detection of oral features through image segmentation, and increased resolution of dental images. In particular, AI is primarily revolutionizing dental medical imaging by enabling tooth detection and numbering, the diagnosis of specific diseases, or facilitating imagistic analyses.

Moreover, artificial intelligence applications are transforming the access to information and allow students to prepare assignments and offer quite accurate responses to a wide range of exam questions which are routinely used in their assessments. Large language models such as Chat GPT may be used also to create educational content to contribute to the quality of dental education, while challenges, risks exist, including bias and inaccuracy in the content created or the risk of overreliance.

The results of a statistical study based on the questionnaire method in which the current AI methods used by students for learning are evaluated, as well as the degree of use of these AI learning systems by both students and teachers, are presented in detail.

AI-based applications will revolutionize dentistry and dental education, they should not be seen as a threat but introduced into current practice to benefit from the advantages of these tools and limit the disadvantages and inappropriate use.

The assessment of ceramic dental materials during the treatment of severe adult cleft palate

Anca PORUMB[1], Florian Bodog[1], Miclaus Zorela[2], Pop Marina Antoneta[2]

[1] *University of Oradea, Faculty of Medicine and Pharmacy, P-ta 1 Decembrie no. 10, Oradea, Romania*
[2] *PhD students, University of Oradea, Faculty of Medicine and Pharmacy, P-ta 1 Decembrie no. 10, Oradea, Romania*

The aim of the present study is to underline the importance of ceramic dental materials during the laborious treatment in the case of an adult with cleavage, in order to obtain the best results.

Experimental.

We treated an 18-year-old patient with cleavage. The materials used in the treatment of an adult patient with severe cleavage need to be chosen very carefully, according to the biological aspects. First of all, is mandatory to choose a proper material for endodontic treatment and use a correct technique. Second, the cement used in order to fix a RPE (rapid palatal expender) has to be glass-ionomer cement [1], because the oral and nasal cavity are still communicating [2]. On the other hand, the dental ceramic material used in the prosthetic treatment has to be a special one, pink-colored in those regions where cleavage is present [3].

The cases with cleavage need a complex treatment, usually during a few years and several steps. They need a good collaboration between doctors of different specialties: maxillofacial surgery, orthodontics, prosthetics, and plastic surgery.

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Biomedical Potential of MgB_2

Dan BATALU

Faculty of Material Science and Engineering, National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania

Almost twenty-five years after the discovery of superconductivity in MgB_2, attention has shifted toward its biomedical potential.

Recent studies highlight a unique combination of properties—antimicrobial, antitumoral, biodegradable, and biocompatible—that make MgB_2 an attractive candidate for medical applications.

These features open opportunities in areas such as antimicrobial coatings, implantable devices, cancer therapies, and controlled biodegradation strategies.

Importantly, MgB_2 is also viewed as eco- and health-friendly, integrating well with natural cycles and supporting sustainable approaches in medicine.

By linking a fundamental discovery in physics with emerging biomedical uses, MgB_2 illustrates how cross-disciplinary materials research can generate innovative solutions for healthcare.

Iron-based alloys for medical applications: results and perspectives on the use of biodegradable materials in modern implantology

Ana-Maria Roman[1], **Nicanor CIMPOEȘU[*,1]**, Gheorghe Bădărău[1], Romeu Chelariu[1], Mihai Axinte[1], Tiberiu Șutic[1], Ramona Cimpoeșu[1]

[1] Materials Science Department, Materials Science and Engineering Faculty, Technical University Gheorghe Asachi from Iasi, Street Prof. dr. doc. D. Mangeron no. 41, 700050, Iasi, Romania, nicanor.cimpoesu@academic.tuiasi.ro

The development of biodegradable metallic materials is a priority direction in the field of biomaterials, with the objective of obtaining temporary implants that provide mechanical support during the healing process and subsequently degrade in a controlled manner [1]. The present study investigates the influence of alloying elements Mg, Ca, Cu, and Ag on the structural, mechanical, and electrochemical behavior of Fe-Mn-Si-based alloys. The effect of bioactive hydroxyapatite-zirconia (HA-ZrO2) coatings obtained by pulsed laser deposition (PLD) on the degradation characteristics of Fe-based alloys was also evaluated. Material characterization was performed using a variety of analytical methods, including scanning electron microscopy (SEM/EDX), X-ray diffraction (XRD), atomic force microscopy (AFM), differential scanning calorimetry (DSC), dynamic mechanical analysis (DMA), and Fourier-transform infrared spectroscopy (FTIR)/nano-FTIR spectroscopy [2]. The electrochemical properties were evaluated through immersion tests in simulated fluids (SBF, HBSS) and by advanced electrochemical methods (EIS, linear and cyclic polarization). The results showed that the addition of Ag accelerates the corrosion rate and improves the antibacterial properties, while the elements Mg and Ca promote uniform degradation and stimulate the deposition of phospho-calcic compounds. The mechano-dynamic behavior and shape memory properties of these alloys confirm their potential for clinical applications, such as coronary stents and temporary orthopedic implants. The study demonstrates that the integration of alloying elements, in conjunction with the application of bioactive coatings, constitutes an effective strategy for optimizing the properties of biodegradable metallic materials.

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METAL-ON-METAL – AN UNFAIRLY REJECTED COUPLE

Dan Cristian GRECU

University of Medicine and Pharmacy Craiova, Romania

For a brief period, *metal-on-metal* (MoM) bearings were the future of hip replacement. They promised less wear, bigger femoral heads with fewer dislocations, and a better option for young, active patients. Surgeons and patients alike embraced them.

Then came the backlash. Reports of adverse local tissue reactions, pseudotumor, and high cobalt and chromium levels triggered alarm. Lawsuits, recalls, and sensational media coverage followed. The entire concept was branded a failure.

But was it really?

The truth is more nuanced. Many failures were linked not to the MoM principle itself, but to poor implant design, incorrect positioning, or indiscriminate patient selection. In the right hands, with the right patient, MoM can still deliver outstanding results. Long-term data from Birmingham Hip Resurfacing, for example, show survival rates over 90% at 15–20 years—results that rival or surpass other bearing couples. Andy Murray had a BHR in 2019. His farewell match was played with this hip!

In my experience of 25 Implanted BHR, after 18 years, I had only one failure of BHR not relatedwith BHR: fracture of the femoral neck due to gender (female) and a light varus position of the head.

The lesson is clear: medicine should not throw out an entire technology because of high-profile failures. MoM is not for everyone, but neither should it be condemned universally. Instead, it deserves careful, evidence-based reconsideration. Also, is a mistake to judge all models of resurfacing prosthesis together. Is the same as judge all cemented metal-poly prosthesis together.

CURRENT USES AND FUTURE PROSPECTS OF VARIOUS STENT TYPES IN SURGICAL PRACTICE

Sebastian GRADINARU

Titu Maiorescu University, Faculty of Medicine, Bucharest, Romania

A stent is a medical device originally designed to reopen or seal off lesions that cause blockages or leaks. In digestive surgery, it plays a crucial role in reopening the gastrointestinal (GI) tract affected by tumors and in sealing leaks after surgery. Among the various materials and types used in stent production, self-expandable metallic stents (SEMS) are the most commonly used. Gastrointestinal stenting is a procedure known for its high safety and success rates, and its clinical applications have expanded beyond its initial purpose. The placement of self-expandable metal stents is the preferred non-surgical method for palliating cancers of the biliopancreatic region and the upper and lower GI tract. Additionally, stenting is now used for treating benign GI strictures, managing GI fistulas, controlling variceal bleeding, and creating GI bypasses or drainage.

In recent years, biodegradable magnesium alloy stents have gained significant attention. They theoretically solve issues related to permanent metal stents, making them a promising area for future development. We believe these stents will be widely used in interventional procedures for various diseases.

The elastic and biodegradable mixed polymer coating on magnesium alloy stents, used to create fully biodegradable stents, demonstrated its ability to slow down degradation and maintain mechanical performance over time. These coated magnesium stents show good flexibility and elasticity, providing sufficient support to resist lesion compression when deployed in vivo.

Using customized radiation stents is advised to optimize normal tissue protection, ensure accurate radiation delivery to the correct location and depth, and enable consistent patient positioning for daily treatments. Combining biliary metallic stent (BMS) placement with radioactive iodine-125 seed strands (RISS) is a safe and effective option for treating patients with malignant hilar obstruction.

Chitosan Tamponade in the Management of Acute Postpartum Hemorrhage

Alin BODOG, Anca Huniadi, Beres Zsolt, Danciu-Bostan Adela, Ivan Teodora, Vancea-Pipa Larisa Evelina, Eloreibi El Rachid

Departmant of Surgical Discipline, Faculty of Medicine and Pharmacy University of Oradea, 1st December Square 10, 410073b Oradea, Romania, alinbodog@gmail.com
Departmant of Obstetrics and Gynecology, Pelican Hospital, Oradea, Romania

Introduction. Postpartum hemorrhage (PPH) affects about 5% of births and is the leading cause of maternal death globally, responsible for around 25% of maternal fatalities [1-2]. Effective management is crucial [3]. Recently, new non-balloon intrauterine devices have been developed for PPH treatment, including Celox® gauze, the chitosan-covered tamponade (CT), and the Jada® System, a vacuum-based device [4].

Experimental. This study is based on a registry including all women who gave birth at a university hospital's perinatal department (over 5,000 deliveries annually) and received CT for postpartum hemorrhage between January 1, 2017, and June 6, 2022. Exclusion criteria were maternal age under 17, CT use solely for vaginal lacerations, or prior/simultaneous interventions like balloon tamponade, artery ligation, embolization, or compression sutures. Data were collected retrospectively from medical records, covering demographics, labor and delivery details, blood loss, infections, postpartum course, and newborn outcomes

Results and Discussion. Over 5.5 years, 270 women (0.92% of deliveries) at a university perinatal centre received CT for postpartum haemorrhage (PPH), with 230 meeting inclusion criteria. CT was effective in 91.3% of cases (210 women), while 8.7% (20 women) required further intervention due to continued bleeding. Placenta previa was the main risk factor for treatment failure, increasing the risk 7.5-fold after adjusting for confounders. Cesarean delivery and placenta accreta spectrum (PAS) did not significantly affect CT outcomes. Other common risk factors, such as maternal age, multiple pregnancies, anemia, and stillbirth, also showed no notable impact on CT effectiveness in this cohort. [5–6].

Conclusions. Chitosan-covered tamponade (CT) effectively controlled postpartum haemorrhage in over 91% of cases. Placenta previa and delayed CT insertion were key factors in treatment failure. Early use of CT is recommended to reduce the need for invasive interventions, and in persistent cases, combining CT with compression sutures may improve outcomes.

Case Report. A 41-year-old primigravida at 38/39 weeks of gestation, with a pregnancy achieved via *in vitro* fertilization (IVF), was admitted for delivery. Delivery was performed via cesarean section. Intraoperatively, the uterus was noted to be atonic and unresponsive to standard pharmacological interventions, including uterotonic agents and hemostatic medications. Given the continued bleeding and failure of the uterus to contract adequately, a chitosan-covered intrauterine tamponade (CT) was inserted, followed by the placement of separate hemostatic sutures. This combined intervention successfully achieved hemostasis. The patient remained hemodynamically and respiratory stable postoperatively. Laboratory results one day postoperative day were as follows: Hemoglobin: 9.6 g/dL, Platelet count: 169,000/μL, Leukocyte count: 14.98×10^3/μL, Fibrinogen: 404 mg/dL under which the decision of eliminating the tamponade was taken. On the second postoperative day, the chitosan tamponade was removed via hysteroscopic intervention without complications. The patient continued to recover well under close monitoring.

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Customized polyetheretherketone (PEEK) cranial repair system implants used in cranioplasty after severe traumatic brain injury (TBI)

Aurel G. MOHAN, Adrian N. Ghiurău, Valentin S. Vlad, Alexandru Herciu

Faculty of Medicine and Pharmacy, University of Oradea, Faculty of Medicine and Pharmacy, Department of Surgical Disciplines, Romania,
mohanaurel@yahoo.com / Tel.: 0040740514636

Cranioplasty represents the surgical procedure to repair a defect of the skull bone. The loss of cranial bone integrity due to a trauma or injury of the head is a contemporary example of tissue failure, which usually requires the permanent or temporary implantation of a bone substituent and may become challenging in case of large defects. Our paper presents a study regarding post-traumatic cranioplasty using polyetheretherketone (PEEK) implants. The aim of this study is to report the using of polyetheretherketone (PEEK) implants in cranioplasty with biomaterials after severe traumatic brain injury, for patients with decompressive craniectomies.

The implant allows the replacement of the bone gaps of the patient's craniofacial skeleton. The implant is modeled and sized to fit the individual anatomy of each patient. The implant is designed with a software, after receiving the patient's CT scan and made of polyetheretherketone (Peek), being supplied as a single component or as multiple components. The implant is attached to the native bone with self-locking plates or fixed using standard cranial fixation systems or using standard titanium screws.

We reviewed a number of 17 cases which were subjected to cranial reconstruction following traumatic brain injury. A total of 17 patients, 11 males and 6 females, aged between 19 and 54 years, underwent elective delayed cranioplasty surgery to achieve morphological and functional rehabilitation of the cranial vault performed during the period from 1st January 2020 to 31st December 2024. All surgeries were performed in accordance with the widely-accepted indications for cranioplasty and all patients were admitted on the Neurosurgical Department of Bihor County Emergency Hospital. Biomaterials implants are a safe and time effective way to reconstruct cranial defects following severe traumatic brain injury. Among the advantages of polyetheretherketone implants is their‘s nonferromagnetic capacity which permits the safe examination in magnetic resonance imaging high field, useful for long-term follow-up. Prefabricated Peek implants were effective for cranioplasty, reducing surgical time, surgical blood loss and technical simplicity. There were no infected implants and none of the patients required a second surgery.

Biomaterials represent a tremendous leap forward in the surgical management of skull deformities. Biomaterials implants are extremly effective for cranioplasty. These implants also contribute in a special way to the social reintegration of these patients, the psychological component having an essential role in their recovery and helping the patients to return to normal activities.

Interdisciplinary collaboration between biomaterials and neurosurgery in the framework of Brain IT Project

Vicențiu Mircea SĂCELEANU

Lucian Blaga University of Sibiu, Romania

The Brain IT Project represents an interdisciplinary collaboration between biomaterials and neurosurgery with the ultimate goal of creating 3D models of the skull and cranial pathologies and simulating operations in a real way, with dimensions and repetitions identical to the real patient.

This method can also be used by senior neurosurgeons when it comes to a more difficult case, which involves significant operative risks, and on which the simulated intervention could be simulated several times, before the examination with the real patient.

During three intensive summer schools, the project tried to include a wide range of neurosurgical pathologies with the aim of exposing both students and medical staff to some of the challenges that neurosurgery has due to its complexity. So that, both through theoretical support and especially through practical support, the students had the opportunity to immerse themselves in traumatic, tumoral, and neurovascular neurosurgical pathology.

From our experience, the materials used in the reproduction of bone tissue were quite easy to achieve, after a few tests. The big challenge was to find materials similar to the brain parenchyma and intracranial soft tissues, whose printing is much more difficult.

Future advances in medical bioengineering will facilitate an easier approach to the brain through molds and devices that simulate various neurosurgical approaches, creating new opportunities in developing the practical skills needed to study the brain.

In our opinion, training in well-equipped simulation centers is the future for training in neurosurgery, being a lower-cost option, with reduced ecological impact, and avoiding medical ethics problems. Laboratory animals and cadaver specimens are often difficult to access in small surgical centers.

Biocompatibility of Mg biodegradable alloys and their importance in the medical applications and material science

Bogdan ISTRATE [1], Corneliu MUNTEANU [1,2]

[1] *"Gheorghe Asachi" Technical University of Iasi, Faculty of Mechanical Engineering, 63 D Mangeron Blvd, Iasi 700050, Romania.*

2 Technical Science Academy Romania, 26 Dacia Blvd, Bucharest 030167, Romania

Previous studies on Mg-based biodegradable alloys of various ternary Mg-Ca-X systems, correlating biodegradation rate with osseointegration, found an increase in biodegradation time with the introduction of Mg-substituted elements. In this way, it was possible to correlate the biodegradation rate at different substitution values in order to reach an optimum for medical uses. Biodegradable magnesium alloys are suitable for ankle, foot, hand, and wrist implants, according to orthopedic implant research. Magnesium absorbs zinc (Zn), a crucial alloying component , and its solid solution reinforcing and age-strengthening capabilities improve the alloy`s mechanical properties. Also, Zn controls gene expression, anti-atherosclerosis, nucleic acid and protein creation, and nervous system function. Zirconium (Zr) is a magnesium grain refiner. In alloys with Zn, RE, Y, and Th, elements cannot be mixed with Al or Mn since these elements produce stable compounds with Zr. Magnesium is often combined with RE elements (Y) in order to improve its creep resistance and high-temperature strength. The excellent solubility enables Yttrium (Y) to dissolve, form solid solutions, and precipitate at grain boundaries. Mn refines microstructures and promotes germination during initial solidification, and improves mechanical properties. Gadolinium (Gd) helps improve alloy strength but reduces ductility.

This presentation will reveal results in terms of biocompatibility (in vitro/in vivo tests) of several Mg-Ca-X (where X= Zn, Zr, Y, Mn, and Gd) alloys. In vitro and in vivo biocompatibility tests show that, at optimal concentrations, the alloys are non-cytotoxic and promote bone integration and remodeling, with moderate inflammatory responses and progressive resorption. Mg-Ca-Mn and Zn-based alloys exhibit the highest biocompatibility. Hydrogen gas release was observed after implantation, which did not significantly affect tissue function, and the material resorption was almost complete after 8 weeks for the biodegradable alloys. Histological and imaging analyses confirm tissue integration, disappearance of inflammatory reactions, and efficient resorption of the biodegradable alloy over time.

Biomedical Titanium Alloys: From Traditional Processing to Additive Manufacturing

Madalina Simona BALTATU[1], Petrica Vizureanu[1,2]

[1] "Gheorghe Asachi" Technical University of Iasi, Faculty of Materials Science and Engineering, 41 "D. Mangeron" Street, 700050, Iasi, Romania, e-mail: madalina-simona.baltatu@academic.tuiasi.ro
[2] Academy of Romanian Scientists, 54 Splaiul Independentei St., Sect. 5, 050094 Bucharest, Romania

Titanium alloys are increasingly explored for biomedical applications due to their excellent biocompatibility and favorable mechanical properties. In this work, titanium-based alloys were processed by two different routes: the conventional method, through melting in an electric arc furnace, and additive manufacturing, using Selective Laser Melting (SLM) technology.

The purpose of the study was to highlight the influence of the processing method on the alloys' microstructure and hardness.

Alloys obtained by conventional melting exhibited relatively coarse grains and a homogeneous structure, typical of slow solidification. In contrast, the SLM-processed alloys showed a much finer microstructure, with features characteristic of rapid solidification, such as cellular growth and oriented textures. Microstructural investigations were performed using optical and electron microscopy, while the phase composition was identified by X-ray diffraction. Vickers hardness tests indicated higher values for alloys obtained by SLM, mainly due to fine grain size and residual internal stresses.

The results underline the potential of both processing routes, each offering distinct advantages depending on the specific requirements of biomedical applications.

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Comprehensive Prosthetic Planning in Implant Based Oral Rehabilitations

Marius MANOLE

Department of Prosthetics and Dental Materials, Faculty of Dentistry,
Iuliu Hatieganu University of Medicine and Pharmacy, 400012 Cluj-Napoca, Romania
**e-mail:marius.manole@umfcluj.ro*

Introduction: Comprehensive oral rehabilitation requires an integrated treatment approach that harmonizes surgical and prosthetic considerations. The evolution of digital technologies, imaging modalities, and implant systems has significantly enhanced clinicians' ability to achieve predictable functional and esthetic outcomes. Nevertheless, the complexity of full-mouth rehabilitation demands precise, prosthetically oriented planning to ensure long-term success.
This presentation aims to emphasize the role of prosthetic-driven implant planning in full-mouth rehabilitation and to demonstrate how a digitally guided workflow contributes to predictable and esthetically pleasing results.
Materials and Methods: Patients requiring extensive oral rehabilitation were assessed both clinically and radiographically. Cone-beam computed tomography (CBCT), diagnostic wax-ups, and virtual planning software were employed to design the definitive prosthetic framework prior to implant placement. Guided surgical protocols were used when indicated, and final restorations were fabricated through CAD/CAM technology. Clinical evaluation focused on functional performance, esthetic integration, and patient satisfaction.
Results and Discussion: Prosthetic-driven planning facilitated accurate implant positioning relative to the final restorative design, minimizing surgical complications and optimizing biomechanical load distribution. The integration of digital planning and guided surgery improved procedural predictability, reduced intraoperative adjustments, and enhanced prosthetic accuracy. Patients reported high satisfaction levels concerning function and esthetics. Limitations included the initial investment in digital technology and the learning curve required for clinical implementation.
Conclusions: Prosthetic-driven implant planning is fundamental to the success of full-mouth rehabilitation. A prosthetic-first, digitally supported workflow - combined with interdisciplinary collaboration - ensures predictable, functional, and esthetic outcomes, ultimately enhancing patient satisfaction and long-term treatment stability.

Engineering Hydrogels for Oral Healthcare: Design and Progress

Marioara MOLDOVAN, Codruța Saroși

Babeș Bolyai University, "Raluca Ripan" Institute of Research in Chemistry, Fântânele 30, Cluj, Romania, mmarioara2004@yahoo.com; codruta.sarosi@gmail.com

Introduction. Hydrogels have attracted significant attention in recent years as promising biomaterials for advancing oral healthcare. Their soft, water-rich structure closely mimics natural tissues, making them ideal candidates for a range of dental and oral applications. Due to their tunable composition, porosity, and responsiveness, hydrogels offer unique advantages for controlled drug delivery, wound healing, antimicrobial protection, and tissue regeneration within the complex environment of the oral cavity.

Experimental. Recent progress in materials science and bioengineering has led to the development of "smart" hydrogels capable of responding to environmental stimuli such as pH, temperature, and enzymatic activity. These dynamic systems enable localized and sustained release of therapeutic agents directly at the site of infection or injury. Our research focuses on advances in polymer chemistry and nanotechnology that have facilitated the incorporation of graphene nanoparticles, bioactive peptides, and natural polymers into hydrogel matrices. The synthesized multifunctional hydrogels are currently being explored for applications in periodontal regeneration, mucosal wound healing, dental implant coatings, and caries prevention. The materials have been characterized comprehensively from both physical and chemical perspectives to assess their structure–property relationships.

Results and Discussion. The engineered hydrogels represent a transformative approach to modern oral healthcare. Their adjustable physical and biological properties make them powerful platforms for next-generation therapies capable of delivering drugs, promoting tissue regeneration, and preventing infections in a targeted and patient-friendly manner. Ongoing innovations in hydrogel design are expected to play a central role in developing personalized and minimally invasive treatments for various oral conditions. Further in vitro and in vivo studies are required to fully evaluate the clinical performance, bioactivity, and long-term stability of the peptide- and nanoparticle-enhanced hydrogel systems.

Conclusion. Despite significant progress, several challenges remain before these materials can be fully integrated into clinical practice. Key issues include improving long-term mechanical stability, achieving controlled degradation rates and ensuring compatibility with the dynamic oral microbiome.

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Innovative Biomaterials in Oral Implantology: Advances, Challenges, and Clinical Perspectives

Tareq HAJAJ

"Victor Babeș" University of Medicine and Pharmacy Timisoara, Romania

The integration of biomaterials into dental medicine and oral implantology has significantly transformed clinical outcomes, offering improved biocompatibility, enhanced osseointegration, and long-term stability of dental restorations and implants.

Recent advancements in material science have led to the development of next-generation biomaterials, including animal and synthetic bone grafts, bioactive ceramics, polymer-based scaffolds, resorbable membranes and surface-modified titanium alloys, each designed to mimic or support natural tissue behavior and promote healing.

By analyzing both the scientific evidence and clinical applications, this talk aims to provide a comprehensive overview of how innovative biomaterials are reshaping modern dental practice.

The future of oral implantology lies at the intersection of biology, materials science, and digital technologies—offering personalized, durable, and minimally invasive treatment solutions.

ORAL PRESENTATION

Crown ethers-functionalized polymeric membranes for biomedical applications

<u>Madalina Oprea</u>[1,2], Andreea Madalina Pandele[1,2], Adrian Ionut Nicoara[3], Iulian Vasile Antoniac[4,5], Stefan Ioan Voicu[1,2,5]

[1] *Department of Analytical Chemistry and Environmental Engineering, Faculty of Chemical Engineering and Biotechnologies, National University of Science and Technology POLITEHNICA Bucharest, 1-7 Gheorghe Polizu, 011061 Bucharest, Romania*

[2] *Advanced Polymers Materials Group, National University of Science and Technology POLITEHNICA Bucharest, 1-7 Gheorghe Polizu, 011061 Bucharest, Romania*

[3] *Department of Science and Engineering of Oxide Materials and Nanomaterials, Faculty of Chemical Engineering and Biotechnologies, National University of Science and Technology POLITEHNICA Bucharest, 1-7 Gheorghe Polizu, 011061 Bucharest, Romania*

[4] *Faculty of Materials Science and Engineering, National University of Science and Technology POLITEHNICA Bucharest, 313 Splaiul Independentei, 060042 Bucharest, Romania*

[5] *Academy of Romanian Scientists, 54 Splaiul Independentei Street, District 5, 050094 Bucharest, Romania*

Introduction: Surface functionalization of polymeric membranes represents a versatile strategy for developing multifunctional materials with applications ranging from industrial processes, such as water purification, to biomedical uses including hemodialysis and tissue engineering [1]. Among available functionalization approaches, covalent immobilization stands out as an effective method, enabling selective binding of functional molecules on the polymer surface, while minimizing leaching into aqueous environments [2].

Experimental: In this context, crown ethers—macrocyclic compounds with high selectivity for metal cations and organic molecules—were covalently immobilized onto polymeric membranes to create crown ether–functionalized hybrid systems for biomedical applications, particularly as coating for dental and orthopedic implants. This functionalization enhances membrane affinity toward biologically relevant ions, in this case, the retention of calcium ions being targeted because a high density of Ca^{2+} at the membranes surface favors biomineralization and consequently enhances implant osseointegration [3].

Results and Discussion: The proposed reaction mechanisms were validated by XPS analysis, and ATR FT-IR spectra confirmed the incorporation of the functionalization agents within the membrane structure. Calcium ion retention was evaluated using ICP-MS, while in vitro biomineralization was assessed through the Taguchi method, complemented by SEM and XRD analyses for results quantification.

Conclusions: The physico-chemical characterization results confirmed the successful functionalization of the membranes with crown ether, providing insights into the interactions between the polymer matrix and the functionalization agents. ICP-MS analysis, Taguchi biomineralization assays, SEM imaging, EDX mapping, and XRD characterization collectively demonstrated that AB15C5-functionalized membranes exhibited enhanced Ca^{2+} ion retention and promoted pronounced calcium phosphate deposition relative to unmodified membranes. These findings underscore the potential of crown ether–polymer hybrid membranes as a platform for the development of next-generation multifunctional biomaterials with promising applications in implantology.

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Self-adaptable microneedles patch for pain management

Florina S. Iliescu[1,2], Amarachi R. Osi[1], Georgeta L. Gheorghiu[1], Ciprian Iliescu[1,2,3]

[1]National University for Science and Technology Politehnica Bucharest, 313 Splaiul Independenței, Bucharest, Romania, florina.iliescu@upb.ro;

[2]National Institute for Research and Development IMT Bucharest, 216 Iancu Nicolae, Voluntari, Romania

[3]Academy of Romanian Scientists, 3 Ilfov, Bucharest, Romania

Introduction.

Microneedles (MN), sub-millimetric sharp protrusions of various materials, were proposed as transdermal drug delivery systems [1] and alternatives to oral drug administration. To overcome the drawbacks of some MN types [2], biocompatible diacrylates [3] were studied. Here we report a 3D printed drug-coated Polyethylene Glycol diacrylate (PEGDA) microneedle patch (MNP). The newly formed patch with an anti-inflammatory drug was applied as a patch and a pock transdermal delivery system and tested *ex vivo* on porcine skin for MN insertion and drug delivery efficacy. The MN effectively pierced the stratum corneum, while allowing intimate adherence to the uneven skin surface, and insertion into the superficial epidermis for drug release.

Experimental.

The MN were obtained via 3D printing (λ=385nm) from PEGDA prepolymer at 6s and 4s curing times, and 100, 80% powers, coated with Diclofenac 1% and tested for morphology, *in vitro* insertion and drug permeation.

Results and Discussion.

The morphology (*Fig. 1*) confirmed the very good MN yield, and adequate architecture for the MN scope. MN withstood thumb pressure force without tip break, effectively pierced and created microchannels into the MNP treated skin model. The compared diffusion rates of Diclofenac showed a significant increase in permeation rate (approx. 15-fold) with applied solid PEGDA MN that facilitated drug diffusion.

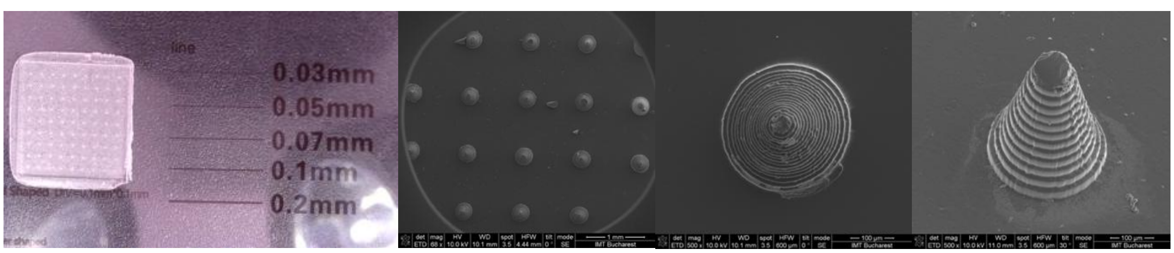

Fig. 1. Microscopic evaluation of the MNP: a. Digital microscopy, b. SEM before MN insertion into the skin model.

Conclusions.

The designed and formed PEGDA MNP enhanced the diclofenac delivery via a mechanically facilitated diffusion, and the results are in line with other similar studies using other types of MN. Moreover, the material biocompatibility enhances the abilities as a new convenient, safe and self-administrated therapeutic modality with controlled release, for treating various local and systemic medical inflammatory conditions. The method showed simple, safe, user friendly and cost efficient.

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Nanomaterials employed in biosensing and biofuel cells with applications in biomedical field

Luminita Fritea[1], Florin Banica[1], Traian Costea[1], Liviu Moldovan[1], Simona Cavalu[1], Andrew J. Gross[2], Karine Gorgy[2], Alan Le Goff[2], Serge Cosnier[2]

[1] University of Oradea, 410087 Oradea, Romania
[2] University Grenoble Alpes-CNRS, 38000 Grenoble, France

Introduction.
Nanomaterials (especially carbon-based nanomaterials and metallic nanoparticles) have been intensively employed in the design of (bio)sensors and biofuel cells due to their excellent properties, such as high surface area, excellent conductivity, effective catalytic properties, and biocompatibility [1, 2]. They have been used for the elaboration of (bio)sensors applied for sensitive detection of some drugs and biomarkers [1-4], and also for the development of freestanding buckypaper (BP) bioelectrodes for bioelectrocatalytic oxidation of glucose [5, 6].
Experimental.
Reduced graphene oxide (RGO) and carbon nanotubes (CNTs) were used for the modification of glassy carbon electrode and screen-printed electrode, respectively; being then covered with gold nanoparticles (AuNPs) obtained by electrodeposition [3, 4]. An aptamer specific for glycosylated hemoglobin (HbA1c) was immobilized on the nanoplatform [4]. The flexible BPs were prepared from suspensions containing CNTs and polynorbornene triblock copolymer [5] and an original Ru(II) complex (RuPEG) [6] for glucose dehydrogenases (GDH) wiring.
Results and Discussion.
For the (bio)sensors elaboration, various parameters have been optimized, and the nanostructured platforms were characterized by electrochemical and microscopic methods. The microscopic images revealed the homogeneous distribution of AuNPs on RGO sheets and CNTs network. The (bio)sensors have been successfully employed for the selective and sensitive determination of nitrazepam (NZ) and HbA1c. Thionine and FAD-GDH were successively co-immobilized on BP bioelectrodes exhibiting an electrocatalytic irreversible oxidation of glucose (onset potential -0.25 V vs. Ag/AgCl). Ru(PEG) complex was used as a redox mediator for FAD-GDH due to quinone moieties (onset potential -0.1 V vs. Ag/AgCl), and also as a surfactant (due to diethylene glycol part) for the preparation of homogenous BP.
Conclusions.
Simple, fast, and cost-effective hybrid nanoplatforms were elaborated for NZ and HbA1c determination, resulting in electrochemical (bio)sensors with good analytical performances. The BP bioelectrodes presented lower potentials and higher current densities for mediated glucose oxidation with increased stability, flexibility, and conductivity.

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Natural extract in oral medicine

Iulia Muntean, Alexandra Roi, Rusu Laura-Cristina

Victor Babes University of Medicine and Pharmacy, Timisoara, Romania

This study aimed to analyze and evaluate the antioxidant and antibacterial properties of a plant-derived essential oil obtained from an aromatic species cultivated in Western Romania. The essential oil was extracted by steam distillation, yielding 0.71% (v/w), and its chemical composition was characterized by GC–MS, which identified 39 compounds representing 98.46% of the total content. The major constituents included phenolic monoterpenes and their methyl ethers, alongside sesquiterpene hydrocarbons. The oil demonstrated strong antibacterial activity, with notable effects against *Candida parapsilosis*, *Candida albicans*, *Streptococcus pyogenes*, and *Staphylococcus aureus*. Antioxidant capacity was assessed using multiple assays, including peroxide and thiobarbituric acid value, DPPH and ABTS radical scavenging, and the β-carotene/linoleic acid bleaching test. The results revealed that the essential oil effectively inhibited both primary and secondary oxidation products, in some cases surpassing the reference antioxidant butylated hydroxyanisole (BHA) with statistically significant differences ($p < 0.05$).

In DPPH and ABTS assays, its radical scavenging activity was significantly higher than that of α-tocopherol and δ-tocopherol ($p < 0.001$). Molecular docking studies suggested that the antimicrobial activity could be associated with inhibition of D-alanine-D-alanine ligase (DDl), with several components exhibiting binding affinities comparable to known inhibitors. Additionally, the oil's main constituents displayed favorable interactions with xanthine oxidase and lipoxygenase, supporting its potential as a source of protein-targeted antioxidant molecules.

These findings indicate that this essential oil represents a promising natural candidate for developing novel antioxidant and antimicrobial agents with potential applications in food preservation, pharmaceutical formulations, and biomedical fields.

Enhancing Clear Aligner Therapy Outcomes Through Advanced Materials and Features

<u>Stelian-Mihai-Sever Petrescu[1]</u>, Radu Mircea Pisc[1], Horia Octavian Manolea[2]

[1]*Department of Orthodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, 200349 Craiova, Romania, mihaipetrescu2702@gmail.com*

[2]*Department of Dental Materials, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, 200349 Craiova, Romania*

Introduction. Clear aligners represent a modern orthodontic solution designed to combine biomechanical efficiency, comfort, and esthetic appeal. Emerging from advances in material science and digital workflows, clear aligners integrate tailored polymer properties, trimline designs, and evidence-based clinical features (e.g., attachments, bite ramps, eruption guides etc.) to facilitate predictable and controlled tooth movement [1].

Experimental. A systematic literature review was conducted via PubMed and Scopus databases. Eligible studies included both in vitro investigations of clear aligner material properties and clinical trials assessing adult patients undergoing clear aligner therapy. Comparative analyses were performed across commercially available clear aligner systems, with emphasis on new multilayer materials and functional features.

Results and Discussion. Multilayer polymer systems, such as polyurethane–elastomer combinations, have demonstrated superior force constancy compared to single-layer thermoplastics, supporting more predictable tooth movement. Studies have shown that clear aligners with optimized trimline designs increase retention and reduce the need for additional auxiliaries [2]. Novel materials offer enhanced tear resistance and reduced staining, improving both durability and esthetics [3]. In addition, evidence-based clinical features incorporated into clear aligner designs assist clinicians in managing complex cases, broadening the therapeutic scope of clear aligner-based orthodontics.

Conclusions. Clear aligner therapy continues to evolve as a viable alternative to fixed orthodontic appliances, particularly for patients who prioritize esthetics and comfort. Continuous improvements in material engineering and design innovations are expected to further expand the effectiveness and reliability of clear aligner-based treatments.

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Biomaterials in Pediatric Orthopedics: The Importance of Elastic Nails and the Use of Plates, Locked Nails, and Kirschner Wires

<u>Pîrvan Alexandru Nicolae</u>, Felicia Manole, Aurel Mohan, Alexia Manole
University of Oradea, Faculty of Medicine and Pharmacy, Oradea, Romania; Clinical County Hospital Bihor, Oradea, Romania. alexandrupirvan88@gmail.com

Introduction. Pediatric orthopedics requires biomaterials adapted to the growing skeleton. Elastic stable intramedullary nailing (ESIN) is widely used for its minimally invasive technique and good outcomes. Plates, locked nails, and Kirschner wires remain valuable alternatives.
Experimental. A review of clinical cases and recent literature compared indications, benefits, and limitations of ESIN, plates, locked nails, and Kirschner wires in children.
Results and Discussion. ESIN ensured stable fixation with limited soft tissue injury and allowed early mobilization, mainly in diaphyseal fractures. Plates enabled anatomical reduction in complex cases but required larger exposure. Locked nails offered strong fixation in older children, while Kirschner wires were useful for temporary or small-bone fixation. Reported complications included irritation at nail entry, implant prominence, and occasional growth disturbances.
Conclusions. The choice of biomaterial must be tailored to patient age, fracture type, and growth. ESIN provides a balance of stability and biological healing, while plates, locked nails, and Kirschner wires remain essential in selected situations.
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Artificial Ovary: Biomaterial Scaffolds and Cellular Strategies for Ovarian Tissue Engineering

Huniadi Anca[1,2], Murvai Viorela Romina[2,3,4], Goman Marius[3,4], Zaha Ioana[1,2], Ștefan Liana[1,4], Sorian Andreea[2], Florea Mihai[3], Naghyi Petronela[2], Kiss Magdalena[2], Murvai Gelu Florin[5], Galiș Radu[6,7]

[1] Department of Surgical Discipline, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania, ancahuniadi@gmail.com; [2] Calla-Infertility Diagnostic and Treatment Center, Constantin A. Rosetti Street, 410103 Oradea, Romania; [3] Doctoral School of Biological and Biomedical Sciences, University of Oradea, 1 University Street, 410087 Oradea, Romania [4] Department of Obstetrics and Gynecology, Emergency County Hospital Bihor, 65 Gheorghe Doja Street, 410169 Oradea, Romania; [5] Department of Orthopaedics and Traumatology, Emergency County Hospital Bihor, 65 Gheorghe Doja Street, 410169 Oradea, Romania; [6] Department of Medical Sciences, Faculty of Medicine and Pharmacy, University of Oradea, 410087 Oradea, Romania; [7] Department of Neonatology, Faculty of Medicine and Pharmacy, University of Oradea, 1 University Street, 410087 Oradea, Romania;

Introduction. The artificial ovary represents a promising strategy in reproductive regenerative medicine, aiming to restore fertility and endocrine function through biomaterial-based tissue engineering [1–3]. By combining natural or synthetic scaffolds, decellularized ovarian matrices, and follicular or stem cell seeding, researchers seek to recreate the native ovarian microenvironment [4,5]. Advances in 3D bioprinting and hydrogel technologies have further enabled precise spatial organization of follicles and stromal cells [2,6]. These bioengineered constructs offer new perspectives for patients facing infertility due to gonadotoxic therapies or premature ovarian insufficiency.

Experimental. A systematic PubMed search was performed for the period January 2020–October 2025, using combined terms such as "artificial ovary," "ovarian tissue engineering," "biomaterials," and "3D bioprinting." From the 146 studies identified, 30 peer-reviewed papers met the inclusion criteria after screening abstracts and full texts. Selected studies included experimental models, systematic reviews, and translational works evaluating scaffold composition, decellularization techniques, and follicular survival within artificial ovary systems.

Results and Discussion. Polymer-based biomaterials, including collagen, fibrin, alginate, and polyethylene glycol, supported in vitro follicle growth and hormone secretion while maintaining extracellular matrix (ECM) structure [1,6,8]. Optimized decellularization protocols employing cryogenic and enzymatic processes preserved ECM integrity and reduced cytotoxic residues [4,5]. .3D bioprinting allowed spatial follicle organization and microvascular guidance within bioengineered scaffolds, advancing functional ovarian reconstruction [2,3,7]. Integration of cellular and acellular strategies enhanced follicular viability and endocrine activity, suggesting translational potential for autologous transplantation [8–10].

Conclusions. Artificial ovary technology is progressing from preclinical feasibility to biomaterial platforms capable of mimicking ovarian physiology [6–10]. Continuous refinement of scaffold architecture, cell–matrix integration, and biofabrication methods will determine its success as a future tool for fertility restoration and gonadal rejuvenation.

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Biologic Therapies for Gonadal Rejuvenation Using Platelet-Rich Plasma and Stem Cells: An Evidence-Based Synthesis of Ovarian and Testicular Regeneration

Murvai Viorela Romina[1,2,3], Huniadi Anca[1,4], Goman Marius[2,3], Zaha Ioana[1,4], Ștefan Liana[3,4], Sorian Andreea[1], Florea Mihai[2], Naghyi Petronela[1], Kiss Magdalena[1], Murvai Gelu Florin[5], Galiș Radu[6,7]

[1] Calla-Infertility Diagnostic and Treatment Center, Constantin A. Rosetti Street, 410103 Oradea, Romania; [2] Doctoral School of Biological and Biomedical Sciences, University of Oradea, 1 University Street, 410087 Oradea, Romania; [3] Department of Obstetrics and Gynecology, Emergency County Hospital Bihor, 65 Gheorghe Doja Street, 410169 Oradea, Romania; [4] Department of Surgical Discipline, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania, ancahuniadi@gmail.com; [5] Department of Orthopaedics and Traumatology, Emergency County Hospital Bihor, 65 Gheorghe Doja Street, 410169 Oradea, Romania; [6] Department of Medical Sciences, Faculty of Medicine and Pharmacy, University of Oradea, 410087 Oradea, Romania; [7] Department of Neonatology, Faculty of Medicine and Pharmacy, University of Oradea, 1 University Street, 410087 Oradea, Romania

Introduction. Regenerative medicine has introduced platelet-rich plasma (PRP) and stem cell–based therapies as novel biological strategies to restore gonadal function in both sexes [1–3]. PRP provides autologous growth factors such as vascular endothelial growth factor (VEGF), platelet-derived growth factor (PDGF), and insulin-like growth factor 1 (IGF-1), promoting angiogenesis and stromal repair. Mesenchymal stem cells (MSCs) and their secretomes contribute paracrine, anti-apoptotic, and immunomodulatory effects [4,5]. Together, these approaches aim to counteract ovarian insufficiency and testicular dysfunction associated with aging, endocrine disorders, or cytotoxic injury.

Experimental. A systematic PubMed search covering January 2019 to October 2025 was performed using combinations of "platelet-rich plasma," "stem cells," "ovarian rejuvenation," and "testicular regeneration." From over 1,200 retrieved records, 138 eligible studies met the inclusion criteria: clinical trials, meta-analyses, and preclinical models evaluating PRP or MSC-based interventions. Data extraction included experimental design, mechanistic outcomes, and endocrine biomarkers relevant to ovarian and testicular recovery.

Results and Discussion. In ovarian applications, intraovarian PRP led to measurable improvements in anti-Müllerian hormone (AMH), antral follicle count, and oocyte yield in women with poor ovarian response or premature ovarian insufficiency [6–8]. MSC-based therapies promoted folliculogenesis, angiogenesis, and endocrine normalization, particularly when combined with PRP or extracellular vesicle–rich secretomes [9,10].
In male models, PRP and MSCs improved spermatogenesis and Leydig cell regeneration, enhancing testosterone secretion after ischemic or toxic injury [11,12]. Mechanisms involve cytokine-mediated angiogenesis and activation of local progenitor cells. Despite encouraging results, protocol standardization and long-term validation are required.

Conclusions. Current evidence confirms that PRP and stem-cell–based therapies can effectively restore hormonal balance, folliculogenesis, and spermatogenesis in gonadal dysfunction [6,9,13]. These biologic strategies demonstrate consistent endocrine recovery and improved reproductive outcomes across multiple clinical and experimental settings [3,8,11]. They represent a promising translational approach in reproductive regenerative medicine and may soon complement conventional fertility and hormone-restoration protocols pending results from large-scale randomized trials [10,12].

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Social impact and benefits of personalized cranioplasty in post severe TBI decompressive craniectomies - Case report.

Ghiurău N. Adrian, Mohan G. Aurel, Vlad S. Valentin, Herciu Alexandru

Faculty of Medicine and Pharmacy, University of Oradea, Faculty of Medicine and Pharmacy, Department of Surgical Disciplines, Romania
ghiurau.adrian@yahoo.com / Tel.: 0040743952768

KeyWords: Cranioplasty, Severe Traumatic Brain Injury, PMMA, PEEK implant, Titanium mesh, Biomaterials.

Cranioplasty is the surgical repair of a bone defect in the skull resulting from a injury or a previous operation, such as decompressive craniectomy. The loss of cranial bone integrity due to a trauma or injury of the head is a contemporary example of tissue failure, which usually requires the permanent or temporary implantation of a bone substituent and may become challenging in case of large defects. Our paper presents a study regarding post-traumatic cranioplasty using titanium mesh, acrylic implants (PMMA) and polyetheretherketone (PEEK) implants, and furthermore a case report involving a young female patient, who suffered a severe brain injury with decompressive craniectomy and after cranioplasty with PPEK implant, also presenting the evolution of the patient and the reintegration in the social life.

The aim of this study is to report the using of different types of implants (titanium, PMMA and PEEK) used in cranioplasty after traumatic brain injury, and to present the multiple benefits of the usage of these implants.

Throughout the history many types of materials were used in performing a cranioplasty. With the biomedical technology evolving, new materials are now available to be used by the neurosurgeons. The implant allows the replacement of the bone gaps of the patient's cranial skeleton. The implant is modeled and sized to fit the individual anatomy of each patient. The implant is designed with a software, after receiving the patient's CT scan and made of polyetheretherketone (PEEK) or polymethyl methacrylate (PMMA), being supplied as a single component or as multiple components. The implant is attached to the native bone with self-locking plates or fixed using standard cranial fixation systems or using standard titanium screws.

We reviewed a number of 32 cases which were subjected to cranial reconstruction following traumatic brain injury. A total of 12 patients, 8 males and 4 females, aged between 23 and 54 years, underwent elective delayed cranioplasty surgery with PEEK implants, 9 patients, 7 males and 2 females received PMMA implants and 11 patients, 7 males and 4 females with titanium mesh, all to achieve morphological and functional rehabilitation of the cranial vault performed during the period from 1st January 2018 to 31st December 2024. All surgeries were performed in accordance with the widely-accepted indications for cranioplasty. Furthermore we will present a clinical case of a young female patient, who suffered a severe brain injury, it was performed a decompressive craniectomy and after recovery the patient returned for personalized cranioplasty with PEEK implant, and the outcome of the procedures was very good, the patient returning to the normal social life and activities before the traumatic incident.

The acrylic material mesh (PMMA), titanium mesh or polyetheretherketone (PEEK) implants were used. Biomaterials implants are a safe and time effective way to reconstruct cranial defects following severe traumatic brain injury. Among the advantages of these materials, such as PMMA and polyetheretherketone implants, is their‘s nonferromagnetic capacity which permits the safe examination in magnetic resonance imaging high field, useful for long-term follow-up. Prefabricated PEEK implants were effective for cranioplasty, reducing surgical time, surgical blood loss and technical simplicity. There were no infected implants and none of the patients required a second surgery. For the particular case in discussion, the results are even more effective because the patient after the cranioplasty was able to return to normal activities and normal social life.

These implants also contribute in a special way to the social reintegration of these patients, the psychological component having an essential role in their recovery. The materials and techniques used in cranioplasty are in a continuous development and evolution.

Formation and Characterization of Ti–Al Intermetallic and Oxide Layers on Ti6Al4V for Hydroxyapatite Adhesion Enhancement

Ştefan LĂPTOIU[1], Marian MICULESCU[1], Diana ENESCU[1], Iulian ANTONIAC[1]

[1]*National University for Science and Technology Politehnica Bucharest, 313 Splaiul Independenței, Bucharest, Romania*

Keywords: Ti–6Al–4V, electrical discharge machining, titanium aluminides, oxide layers, hydroxyapatite adhesion, biomedical implants

Surface modification of titanium alloys remains a key challenge in optimizing biomedical implants for enhanced osseointegration and long-term stability. This work investigates a novel approach for engineering intermediate Ti–Al intermetallic and oxide layers on Ti6Al4V substrates to improve the adhesion of hydroxyapatite (HA) coatings. Aluminum was deposited via electrical discharge machining (EDM) under controlled conditions, followed by thermal and thermochemical treatments to induce the formation of intermetallics ($TiAl_2$, $TiAl_3$) and oxide phases (TiO_2, Al_2O_3). Microstructural and compositional characterization using SEM/EDS and XRD confirmed well-adhered, compositionally graded layers, while microhardness testing revealed surface hardness values exceeding 1000 HV. Adhesion studies highlighted the balance between enhanced mechanical stability and brittleness depending on post-treatment conditions. The results demonstrate that EDM-assisted surface alloying, combined with tailored heat and thermochemical processing, provides a promising pathway to fabricate interlayers with superior structural integrity and biocompatibility, thereby strengthening HA coating performance for advanced orthopedic and dental implants.

Gemmoderivates for dentistry

Ruxandra-Ilinca Matei

Department of Dental Medicine, Faculty of Medicine and Pharmacy, University of Oradea, 1 Decembrie Sq. #10, Oradea, Romania, dr.ruxandramatei@gmail.com

Introduction. Gemmotherapy is a natural therapy that uses extracts obtained from plant tissues in the growth phase (buds, shoots, roots, flower buds). Therefore, it is considered a new, modern phytotherapy that uses embryonic tissues/ in the division phase processed in a fresh state, compared to classical phytotherapy that uses adult plant parts, which have lost the power of regeneration and are generally processed in a dry state. The gemmoderivate (meristem derivate) reacts mainly by stimulating and rebalancing the function of cellular and tissue homeostasis. All plant substances in the meristematic state or in the formation process contain multiple minerals, hormonal substances, amino acids and prosthetic structural elements, as well as oligoelements (trace elements). Here we present some combination of gemmoderivates used in pacients with dental pathology.

Results and Discussion. Gemmotherapy has brought a new pharmaceutical form into therapeutics - the glycerine macerate. Since there is a *phytocomplex* within the plant, two types of solvents were used: ethanol and glycerine. The processing (extraction) of these young parts of the plant is mandatory to be done in the fresh state, immediately after harvesting, in a glycerol-alcohol solvent. These meristems have a specific organotropism including oral components/tissues (e.g.: alveolar bone, gingiva, dental structures, etc.) and can be used in various prescriptions during dental treatment, with encouraging results in clinical practice.

Conclusions. In dentistry it has been found that gemmotherapy can help to obtain faster results or to maintain these results for a long time, supporting the mandatory specific dental treatment. So, we consider the gemmoderivates as veritable natural biomaterials.

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Integrating semiconductor-based heterostructures in next-generation optoelectronic devices

<u>Eliseia PETRE[1,2]</u>, Marian Zamfirescu[2], Marian Miculescu[1], Raluca Ivan[2], Luiza Stingescu[2], Nicu Scarișoreanu[2]

[1]UNSTPB, Splaiul Independenței Street, no. 313, RO-060042, ROMANIA
[2]INFLPR, Atomistilor Street, no. 409, Magurele, RO-077125, ROMANIA
eliseia.petre@inflpr.ro

Keywords: ZnO heterostructures, biomaterials, nanotechnology, medical sensing, bio-optoelectronics, biocompatibility

Progress in (bio)materials for medical applications is mainly driven by nanotechnology, enabling the design of functional devices with enhanced sensitivity and biocompatibility. This work focuses on optimizing ZnO-based heterostructures to exploit their full potential in strong light–matter coupling regimes, achieving two key aims: to gain a fundamental understanding of the physics and to enable the development of miniaturized quantum light sources operable at room temperature. Owing to its wide bandgap, large exciton binding energy, and intrinsic biocompatibility, ZnO is a highly promising material for next-generation optoelectronic devices.

Morphological, structural, and optical characterizations confirmed the high crystalline quality and well-defined interfaces of the multilayer structures. The ability to tune luminescence emission via cavity engineering highlights the versatility of these systems for biomedical diagnostics. The results demonstrate that ZnO-based heterostructures not only sustain optical performance at room temperature but can also have an impact for clinical applications in biosensing and spectroscopy-based medical diagnostics, thereby contributing to the development of innovative, non-invasive technologies with wide-ranging relevance, including but not limited to the medical field.

POSTER PRESENTATION

Evaluation of the surface properties of three ceramic materials processed via CAD/CAM

Boanca Cristian[1], Antoniac Aurora[2], Kamel Earar[1], Antoniac Iulian[2,3], **Corneschi Iuliana[2],** Anca Maria Fratila[4,5], Gabriela Mitariu[4]

[1] Faculty of Medicine, "Dunarea de Jos" University of Galati, Galati, Romania,
[2] Faculty of Material Science and Engineering, National University of Science and Technology POLITEHNICA Bucharest, Bucharest, Romania,
[3]Academy of Romanian Scientists, Bucharest, Romania,
[4] Department of Dental Medicine and Nursing, Faculty of Medicine, Lucian Blaga University of Sibiu, Sibiu, Romania,
[5]Military Clinical Emergency Hospital of Sibiu, Sibiu, Romania

Introduction. The study focuses on the evaluation and comparative analysis of the surface properties of three fixed dental prostheses fabricated using CAD/CAM technology from blocks made of zirconia-reinforced lithium silicate (A1), feldspathic ceramic (A2), and lithium disilicate (A3). Understanding surface characteristics is essential, as they have a significant impact on adhesion, wear resistance, and the overall clinical performance of prosthetic restorations.
Experimental. Fixed dental prostheses were fabricated from CEREC blocks - Celtra Duo for A1 prosthesis, CEREC Blocs for A2 prosthesis, and CEREC Tessera for A3 prosthesis using a CEREC Sirona CAD/CAM system. The materials were characterized using scanning electron microscopy (SEM), computed tomography (CT), and profilometry to assess surface roughness parameters (Ra, Rq, Rsk), as well as contact angle measurements to determine surface free energy and wettability.
Results and Discussion. CT analysis confirmed the dimensional accuracy of the specimens and the absence of structural defects. SEM examination revealed smooth, homogeneous surfaces without porosity and good cohesion between the crystalline and glassy phases. Profilometry indicated that A3 sample exhibited the highest surface roughness (Ra ≈ 2.86 μm), followed by A1 sample (Ra ≈ 1.97 μm) and A2 sample (Ra ≈ 1.91 μm). All samples showed negative skewness values, which are beneficial in reducing friction with opposing teeth. Wettability measurements demonstrated balanced hydrophilicity between the internal and external surfaces, promoting adhesive bonding and limiting bacterial adhesion.
Conclusions. The CAD/CAM fabrication of dental prostheses from inert ceramic blocks ensures high reproducibility and dimensional stability. The evaluated materials exhibit comparable surface characteristics, with slight variations depending on their composition. The type of ceramic material may influence the mechanical performance of the restorations, which will be further explored in future studies.
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Comparative evaluation of the surface properties of different inert ceramic-based restorations

Boanca Cristian[1], Miculescu Florin[2], **Popescu Larisa[2],** Kamel Earar[1], Antoniac Iulian[2,3], Anca Maria Fratila[4,5]

[1]Faculty of Medicine, "Dunarea de Jos" University of Galati, Galati, Romania,
[2] Faculty of Material Science and Engineering, National University of Science and Technology POLITEHNICA Bucharest, 313 Splaiul Independentei, District 6, 060042 Bucharest, Romania
[3]Academy of Romanian Scientists, Bucharest, Romania,
[4]Department of Dental Medicine and Nursing, Faculty of Medicine, Lucian Blaga University of Sibiu, Sibiu, Romania,
[5]Military Clinical Emergency Hospital of Sibiu, Sibiu, Romania

Bioceramics represent a class of biomaterials extensively used in restorative dentistry because of their superior biocompatibility, aesthetics, and chemical stability. This study focuses on comparing the surface and mechanical properties of four types of dental restorations: (1) monolithic yttria-reinforced zirconia, (2) monolithic lithium disilicate, (3) feldspathic porcelain veneered on zirconia, and (4) feldspathic porcelain veneered on a Co–Cr alloy framework. The composition of the material and the efficiency of the restoration play a decisive role in determining their overall functional performance.

Samples were prepared using specific processing techniques: zirconia restorations were fabricated via CAD/CAM milling, lithium disilicate restorations through heat pressing, and layered restorations using the conventional layering and sintering method. The materials were characterized by scanning electron microscopy (SEM), energy-dispersive X-ray spectroscopy (EDS). Also, roughness, wettability and mechanical behavior were investigated. SEM analysis revealed smooth and homogeneous surfaces in the samples made from monolithic yttria-reinforced zirconia and monolithic lithium disilicate, whereas the layered restorations exhibited more irregular and porous morphologies. EDS results confirmed that the CAD/CAM milling and heat-pressing techniques did not modify the elemental composition of the materials. The restorations made from monolithic yttria-reinforced zirconia and monolithic lithium disilicate displayed the lowest surface roughness (Ra < 1 μm) and moderate wettability, while the layered restorations showed higher roughness values and increased hydrophilicity. Mechanical testing demonstrated that the feldspathic porcelain on Co–Cr alloy sample exhibited the highest fracture resistance, followed by feldspathic porcelain on zirconia sample, lithium disilicate sample, and yttria-reinforced zirconia sample. These findings indicate that both material composition and restoration design play a decisive role in determining clinical durability and adhesive performance.

The evaluated bioceramic materials are suitable for fixed dental restorations, offering good aesthetic and mechanical performance. Monolithic restorations are advantageous in terms of surface smoothness and reproducibility, whereas layered designs provide superior mechanical strength.

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Physical theory of magnetic hyperthermia in cancer treatment

Gheorghe Paltanea[1], Veronica Manescu (Paltanea)[1], Aurora Antoniac[1], Iulian Antoniac[1], Iosif Vasile Nemoianu[1], Costel Paun[2], Aurel Mohan[3]

[1]National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania, gheorghe.paltanea@upb.ro
[2]National Institute for Research and Development in Microtechnologies IMT-Bucharest, 126A Erou Iancu Nicolae Street, 077190, Bucharest, Romania
[3]Faculty of Medicine and Pharmacy, University of Oradea, 10 P-ta 1 December Street, RO-410073 Oradea, Romania

Introduction. Magnetic hyperthermia (MHT) has been investigated for more than 30 years as a solution used as a single therapy or combined with others for different tumor assessment in preclinical and clinical studies. It is based on magnetic nanoparticles (MNPs) that are injected into the tumor, and, under the effect of an external alternating magnetic field (AMF), they produce heat with temperatures higher than 42 °C, which determines cancer cell death.

Experimental. To correctly understand and apply the MHT in treating oncological diseases, it is of utmost importance to briefly analyze the physical theory behind this phenomenon. MHT is an electromagnetic energy conversion to heat due to an interaction between MNPs and an external AMF. When a time-variable magnetic field is applied, the MNP magnetic moments align parallel to the field direction. In some cases, minor deviations can occur as a function of material attributes such as chemical composition, crystallinity grade, size, shape, the maximum value of magnetic field strength (H), and temperature (T). It is well known that under the action of a uniform increasing H, an MNP response can be quantified in a variable physical quantity called magnetization (M).

Results and Discussion. When applying an external AMF, superparamagnetic particles have high magnetic saturation values concomitant with a null value of the remanence. It can be observed that superparamagnetic MNPs do not exhibit a hysteresis cycle. In MHT treatments are usually chosen materials with a superparamagnetic behavior at the body temperature of 37°C because, in the absence of an AMF, they are inert and do not heat themselves. When an AMF is applied, the MNPs have a hysteresis cycle, and the heat generated by a particle is given by the hysteresis cycle area (W [J/m^3]), known under the name of specific hysteresis losses. Then the heat dissipation power P [W/m^3], $P = W \cdot f$ is computed, and later the specific absorption rate SAR = P/d, where d represents the MNPs' density.

Conclusions. At the present moment, there is no standard limit for the value of $H \times f$, but it is overall accepted that it must be chosen in good accordance with the medical application, and its value must be established by considering that the body tissue overheating effect due to induced eddy currents has to be avoided. Generally, there are accepted values below the superior limit of 5×10^9 A/(ms), and each research group should perform *in vivo* experiments to see the results

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Mg-Zn biodegradable alloy as a suitable material for bone defects

Veronica Manescu (Paltanea)[1], Iulian Antoniac[1], Aurora Antoniac[1], Alexandru Streza[1], Sebastian Gradinaru[2], Maria-Cristina Moraru[3], Bogdan Sevastre[3], Marius Manole[4]

[1] *National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania, veronica.paltanea@upb.ro*

[2] *Department of Medical-Clinical Discipline, Faculty of Medicine, Titu Maiorescu University, 67A Gheorghe Petrascu, RO-031593, Bucharest*

[3] *University of Agricultural Sciences and Veterinary Medicine (USAMV), 3-5 Calea Manastur, RO-400372, Cluj-Napoca*

[4] *Department of Prosthetics and Dental Materials, Faculty of Dentistry, Iuliu Hatieganu University of Medicine and Pharmacy, 400012 Cluj-Napoca, Romania*

Introduction. Mg-based biomaterials are seen today as one of the most promising candidates for bone defect treatments and hard tissue regeneration. In the framework of a continuously aging population, searching for new and biodegradable materials could be considered of utmost importance. We analyzed two types of Mg-based alloys, Mg-Nd and Mg-Zn, as possible solutions for bone defect restoration to assess the superiority of Mg-Zn.

Experimental. The biomaterial microstructure was investigated based on optical microscopy, SEM coupled with EDS, and X-ray diffraction. In addition, biodegradability was analyzed with the help of an electrochemical investigation, and biocompatibility was assessed in murine animal models.

Results and Discussion. The microstructure investigation showed the main compounds and phases that exist inside each type of alloy. EDS revealed the main chemical composition elements in accordance with the standard biomaterial description. The electrochemical analysis proved a good corrosion resistance for both alloys, with a much more noble character for Mg-Zn. The *in vivo* analyses evidenced good osteointegrative behavior for both materials, with new bone formation and increased regenerative properties.

Conclusions. Both investigated binary alloys could be considered as optimal bone substitutes for small defect treatments, with a much more noble character for Mg-Zn.

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Experimental evaluation of the surface properties of osteosynthesis screws used in orthopedic traumatology

Mihai Alexandru Cordunianu[1], Iulian Antoniac[2], Alina Georgiana Cordunianu[1]

[1] *Faculty of Medicine, Titu Maiorescu University, 67A Gheorghe Petrascu, 031593 Bucharest, Romania*
[2] *National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania*

Introduction. In this presentation, the main objectives were the analysis of four osteosynthesis screws, made from a titanium alloy (Ti6Al4V), and the evaluation of the effects of anodization on their surface properties, each screw having a distinct interference color (gray, blue, purple, and green).

Experimental. The work plan is schematically presented as follows:

• Selection of titanium alloys usable as biomaterials for manufacturing osteosynthesis screws, based on biofunctionality criteria (Ti6Al4V);

• Determination of the surface properties of anodized osteosynthesis screws using SEM-EDS, contact angle, roughness, and surface chemical composition analysis.

Results and discussion. According to analyses performed using scanning electron microscopy (SEM), it is concluded that the duration of anodization is one of the most significant factors influencing both the surface morphology and the thickness of the formed layer [1,2]. The surface chemical composition was determined using energy-dispersive spectroscopy (EDS), quantifying the presence of titanium, aluminum, and vanadium — essential elements of the alloy. The presence of oxygen was also considered, given that the formed layer is titanium dioxide. The results of the roughness investigations based on Rsk and Rku values indicate that an anodized layer thickness of 75–100 µm would generate a surface with fewer undulations, observations that are also supported by SEM analyses.

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Self-healing microcapsules loaded with hydroxyapatite for teeth remineralization and repair

Gertrud-Alexandra Paltinean[1], Maria Amalia Taut[2], Ioan Petean[3], Laura Silaghi-Dumitrescu[1], Marioara Moldovan[1], Ioan Ardelean[2]

[1] Raluca Ripan Institute for Research in Chemistry, Babes-Bolyai University, 30 Fantanele Street,400294 Cluj-Napoca, Romania.

[2] Physics and Chemistry Department, Technical University of Cluj-Napoca, 400394 Cluj-Napoca, Romania; EUT+ Institute of Nanomaterials & Nanotechnologies EUTINN, European University of Technology, European Union.

[3] Faculty of Chemistry and Chemical Engineering, Babes-Bolyai University, 11 Arany Janos Street, 400028 Cluj-Napoca, Romania.

Introduction The development of microcapsules with controlled release of active substances in dentistry represents both a modern innovation and a challenge to conventional dental practices. In this context, microcapsules containing TEGDMA-DHEPT and hydroxyapatite were synthesized using the in-situ polymerization technique within an oil-in-water emulsion [1, 2].

Experimental. Morphological characteristics were examined using mineralogical optical microscopy (MOM) and scanning electron microscopy (SEM). The quantitative determination of the residual monomer TEGDMA was carried out by high-performance liquid chromatography.

Results and Discussion. Microcapsules wall is very soft and sensitive to the contact with other solid substrates facilitating their coalescence. It was observed that hydroxyapatite increases the membrane toughness bringing a more stable state of the microcapsules leading to a better individualization.

Conclusions. Self-healing microcapsules loaded with hydroxyapatite was synthesized and revealed by modern technique such as SEM, MOM and HPLC. These microcapsules can be used for the development of dental composites as dental restorative applications.

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Nanostructured Zn/Ti–Graphene Hydrogels: A Promising Platform for Photodynamic Therapeutics

Stanca Cuc, Codruța Saroși, Laura Silaghi-Dumitrescu, Miuța Filip, Marioara Moldovan

Babeș Bolyai University, "Raluca Ripan" Institute of Research in Chemistry, Fântânele 30, Cluj, Romania, stanca.boboia@ubbcluj.ro

Introduction. Photodynamic therapy (PDT) is a minimally invasive treatment in which a photosensitizer is activated by specific-wavelength light in the presence of oxygen, generating reactive oxygen species (ROS) that induce selective cell death [1]. Hydrogels serve as effective PDT carriers due to their 3D, water-rich, biocompatible structure, enabling encapsulation, protection, and controlled release of photosensitizers at target sites. This approach enhances therapeutic efficiency, reduces systemic side effects, and improves the selectivity, safety, and clinical outcomes of PDT in cancer and other biomedical applications [2].

Experimental. In the present study, two hydrogels were obtained: a graphene hydrogel with graphene-zinc oxide (GO-ZnO) and graphene-titanium oxide (GO-TiO_2). After obtaining them, the structure and physico-chemical properties were investigated. Dry and wet hydrogels are analysed with scanning electron microscopy to capture high-resolution images of porosity, of nanoparticles (graphene with Zn and graphene with TiO_2) inside the hydrogel, and to evaluate how nanomaterials influence hydrogel architecture. The hydrogel is analysed in the Ultraviolet–Visible Spectroscopy (UV-Vis) range to assess optical absorption. Fourier-Transform Infrared Spectroscopy (FTIR) evaluates interactions between the hydrogel matrix and the nanoparticle, analysing the IR range to detect functional groups and chemical interactions.

Results and Discussion. An optimized protocol was developed and provided for the creation of graphene hydrogels with ZnO or TiO_2, including the exact weights of the precursors and a synthesis profile for PDT applications-containing graphene hydrogels: Zinc ions coordinate with oxygen groups in graphene oxide, acting as ionic crosslinkers and providing redox activity for electrochemical responsiveness. TiO_2-containing graphene hydrogels: TiO_2 nanoparticles serve as rigid fillers, reinforcing the 3D graphene framework through strong interfacial interactions, while contributing photocatalytic and UV-responsive properties.

Conclusions. Zn–Graphene hydrogels are best suited for biomedical applications because of their antibacterial, biocompatible, and redox-active properties, while TiO_2–Graphene hydrogels excel in environmental and photocatalytic applications due to their UV responsiveness, photocatalytic activity, and enhanced stability.

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Degradation of Poly(Lactic Acid) Nanocomposites Reinforced with Inorganic Nanoparticles

Andrei Moldovan[1], Ioan Saroși[1], Stanca Cuc[2], Rami Doukeh[3], Gabriel Furtos[2], Ovidiu Nemeș[1]

[1] *Technical University of Cluj-Napoca, Department Environmental Engineering and Sustainable Development Entrepreneurship, 28 Memorandumului, Cluj-Napoca, Romania;* andrei_moldovan@mail.com

[2] *Babes Bolyai University, "Raluca Ripan" Institute of Research in Chemistry, 30 Fantanele, Cluj, Romania*

[3] *Petroleum-Gas University of Ploiesti, Faculty of Petroleum Refining and Petrochemistry, 39 Bucharest Blvd., Ploiesti, Romania*

Introduction. Food packaging made of plastics is valued for the protection it offers products, and polylactic acid (PLA) stands out as a biodegradable option obtained from renewable sources [1]. PLA is used for both liquid and solid foods, but it has limitations such as brittleness and sensitivity to moisture. These drawbacks can be reduced by adding plasticizers, additives, or inorganic nanoparticles (copper, silver, zinc oxide, and titanium dioxide), which enhance flexibility, stability, and antimicrobial properties [2]. However, the use of additives raises challenges related to compatibility with the polymer matrix, long-term stability, and compliance with regulations on the migration of bioactive compounds into food.

Experimental. Three nanocomposite formulations based on polylactic acid (PLA) and the plasticizer Proviplast were developed and analyzed, with copper particles obtained through reactive milling of copper sulfate added to the mixtures. The composites were melt-processed on a plastograph at 180°C, 60 rpm, including a control sample without additives. Were investigated: the absorption of certain food simulants (according to ASTM D570), the migration of elements (by inductively coupled plasma optical emission spectrometry ICP-OES), the morphology (by scanning electron microscopy SEM).

Results and Discussion. Copper nanoparticles in PLA reduce moisture absorption at 2%, but higher concentrations increase permeability due to microvoid formation. ICP-OES results indicate that additives influence migration rates, especially in alcoholic and acidic media. Additionally, the presence of plasticizers (Proviplast) affects the retention of metal elements, as reflected in the varying migration levels of Fe and Zn among the samples. SEM imaging shows that composite samples with Cu nanoparticles exhibit more advanced degradation as the filler content increases

Conclusions. The investigations carried out showed that the composite samples with Cu nanoparticles exhibit more advanced degradation as the filler content increases, which makes these PLA-based composite materials contribute to sustainability through the recycling of active food packaging.

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Analysis of Structure and Mechanical Behavior of PLA-Based Polymer Films

Ioan Sarosi[1], Andrei Moldovan[1], Alexandra Paltinean[2], Filip Miuta[2], Rami Doukeh[3], Ovidiu Nemes[1]

[1] *Department Environmental Engineering and Sustainable Development Entrepreneurship, Technical University of Cluj-Napoca, Cluj-Napoca, Romania*
[2] *Babes Bolyai University - Raluca Ripan Institute of Research in Chemistry, Cluj-Napoca, Romania*
[3] *Faculty of Petroleum Refining and Petrochemistry, Petroleum-Gas University of Ploiesti, Ploiesti, Romania*
ionut_sarosi@yahoo.com

The continuous development of food films and packaging requires the processing of biodegradable materials to meet the growing demand for thinner films with superior barrier properties for food packaging and other applications [1,2]. ***The purpose*** of this study is to obtain composites based on poly lactic acid (PLA) with antimicrobial effects and improvements in the physicochemical properties of pure PLA with applicability in food packaging.

Material and method. Five PLA-based formulations were prepared: a reference PLA/diacetin blend (85/15 wt.%), and four modified systems containing 0.5 wt.% fillers (grape pomace, Ag–GO, TiO_2–GO, or GO) with adjusted PLA content (84.5 wt.%). To investigate the effect of particles in the polymeric matrix, all samples were characterized for their mechanical properties—including tensile strength and hardness—and for their surface morphology using SEM microscopy. Mechanical testing was performed on 15 specimens from each formulation, with tensile strength measured in accordance with the UNE-EN ISO 527-3:2018 standard.

Results. The 0.5% grape-pomace composite showed the best performance, with higher tensile strength (7.38 MPa), maximum load (189.3 N), and elastic modulus (105.12 MPa), enhancing PLA stiffness. Adding 0.5% TiO_2-GO increased elongation at break (248.44 mm) and slightly improved strength, while GO alone boosted modulus (102.38 MPa) but reduced elongation. The Vickers hardness values reveal a clear reinforcing effect of the fillers, with the highest values observed for the TiO_2-GO composite. SEM images indicate that the fillers significantly modified the PLA matrix. Addition of 0.5% grape pomace generated voids (5–50 µm), whereas PLA_0.5% Ag-GO exhibited a porous, layered surface with well-dispersed silver nanoparticles. TiO_2 particles were encapsulated by graphene oxide due to strong interactions during processing.

Conclusions. PLA composites demonstrate application-specific potential depending on the incorporated filler. Even at low concentrations (0.5 wt%), the fillers produced statistically significant improvements in mechanical properties.

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Materials characterization through computed tomography as a non-destructive technique

Iuliana Corneschi, Aurora Antoniac, **Robert Bololoi**, Larisa Popescu, Iulian Antoniac

Faculty of Material Science and Engineering, National University of Science and Technology POLITEHNICA Bucharest, 313 Splaiul Independentei, District 6, 060042 Bucharest, Romania;

Introduction. The investigation of materials using non-invasive techniques represents a major focus of actual research. Among these, digital radiography and computed tomography (CT) are fundamental tools for the structural characterization and identification of materials, with wide-ranging applications in medicine, materials science, and gemology. Among the wide range of materials that can be investigated using non-invasive methods, this study focuses on pearls in order to highlight the versatility of computed tomography (CT) as a structural characterization tool. So, in this paper is the distinction between natural pearls, which form spontaneously within marine or freshwater mollusks, and cultured pearls, produced through human intervention. This distinction has become more and more necessary due to the rapid expansion of the cultured pearl market. Traditionally, such differentiation has been based on radiographic analysis and microscopic observations. In conventional radiographic and tomographic images, low-density regions appear darker, whereas areas reached in elements with higher atomic numbers appear brighter as a result of stronger X-ray absorption [1].

Experimental. In this current study, a pearl used in jewelry manufacturing, initially presumed to be of natural origin, was investigated using X-ray computed tomography (CT) with a Nikon Metrology NV system, model XT H 225. The CT analysis was performed to evaluate the internal morphology and density distribution of the specimen. The acquired images were subsequently compared with reference data and structural patterns reported in scientific literature.

Results and Discussion. CT imaging revealed that the perfectly spherical cultured nucleus was clearly visible due to the presence of a conchiolin layer around it. The contrast of the grayscale tones in the CT images also indicated variations in the density of the material, confirming the presence of a pearl nucleus introduced during the culture process. Compared to reference data in the literature, the analyzed pearl presented all the morphological and structural features associated with cultured pearls. These findings demonstrate the high potential of CT imaging as a diagnostic tool for pearl authentication and provenance determination.

Conclusions. In conclusion, computed tomography is demonstrated to be an effective, noninvasive, and nondestructive technique for determining the internal structure and origin of pearls. The method provides three-dimensional information that is not accessible through traditional radiographic imaging, thereby improving the reliability of gemological evaluations. Furthermore, the results highlight the increasing complexity of the modern cultured pearl market, where advanced imaging techniques are often required to accurately distinguish between natural and cultured specimens.

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The evolution of titanium alloys for medical implant applications

Pruteanu Andrei[1], Mădălina Simona Bălțatu[1], Tofan Mihai[1], Ghiculescu Ion[1], Andrei Victor Sandu[1,2], Vizureanu Petrică[1,2]

[1] "Gheorghe Asachi" Technical University of Iasi, Faculty of Materials Science and Engineering, 41 "D. Mangeron" Street, 700050, Iasi, Romania e-mail: petrica.vizureanu@academic.tuiasi.ro
[2] Academy of Romanian Scientists, 54 Splaiul Independentei St., Sect. 5, 050094 Bucharest, Romania

Keywords: Titanium alloys, metallic biomaterials, biomedical implants, beta-titanium, additive manufacturing, osseointegration.

As the need for safe and durable medical implants continues to increase, researchers have focused more and more on titanium and its alloys because of their good compatibility with the human body, resistance to corrosion, and solid mechanical properties. This paper explores the progress in the development and optimization of metallic biomaterials—especially titanium-based systems—used in the fabrication of orthopedic, dental, and cardiovascular implants. Special emphasis is placed on beta-type and near-beta titanium alloys, which exhibit low elastic modulus, high fatigue resistance, and improved biological response compared to traditional Ti-6Al-4V.

The paper also reviews current methods for alloy synthesis and shaping, including conventional melting and powder metallurgy, as well as cutting-edge additive manufacturing techniques such as Selective Laser Melting (SLM), which enable the design of complex, patient-specific implants. The influence of alloying elements (Mo, Nb, Ta, Zr, etc.) on microstructure and mechanical performance is analyzed through microstructural characterization techniques and mechanical testing protocols.

Additionally, the importance of surface modification and functionalization strategies is discussed in the context of enhancing osseointegration and antibacterial performance. The review concludes with future trends in metallic biomaterials research, including biodegradable alloys and high-entropy materials, poised to meet the evolving requirements of modern regenerative medicine and personalized implantology.

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Titanium Alloys in Implantology: From Ti6Al4V to Next-Generation Biomedical Materials

Tofan Mihai[1], Peruc Alexandru Codruț[1], Ghiculescu Ion[1], Sandu Andrei Victor[1,2], Vizureanu Petrică[1,2]

[1] *"Gheorghe Asachi" Technical University of Iasi, Faculty of Materials Science and Engineering, 41 "D. Mangeron" Street, 700050, Iasi, Romania e-mail: petrica.vizureanu@academic.tuiasi.ro*

[2] *Academy of Romanian Scientists, 54 Splaiul Independentei St., Sect. 5, 050094 Bucharest, Romania*

Keywords: Titanium alloys; Ti6Al4V; implantology; biocompatibility; osseointegration; additive manufacturing; β-titanium.

Titanium and its alloys have become the gold standard in implantology, owing to their outstanding combination of biocompatibility, corrosion resistance, and favorable mechanical properties. Among them, the α+β alloy Ti6Al4V is the most extensively used in dental and orthopedic implants, representing more than 50 years of clinical application. Its balanced strength, relatively low elastic modulus compared to stainless steels and Co–Cr alloys, and stable oxide layer ensure long-term osseointegration and functional reliability.

Nevertheless, concerns have been raised regarding the release of vanadium and aluminum ions, which may induce cytotoxic and neurological effects. Consequently, research efforts are increasingly directed toward developing alternative β-titanium alloys, such as Ti–Mo, Ti–Nb, Ti–Zr, or multi-component systems, designed to further reduce the elastic modulus and enhance biological performance.

This review provides a critical overview of the evolution of titanium alloys for biomedical use, with a particular focus on Ti6Al4V as a benchmark material. The discussion highlights the relationship between alloy composition, microstructure, mechanical response, and biological interaction, as well as surface modifications and additive manufacturing approaches that extend their clinical applicability.

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Using additive manufacturing in obtaining scaffolds from biomaterials for use in dental applications

Volocaru Ioana-Ilinca[1], Munteanu Corneliu[1,2 *], Istrate Bogdan[1], Lupu Fabian[1], Stan Ioana-Alexandra[1], Nastasache Gabriela[1]

[1] *"Gheorghe Asachi" Technical University of Iasi, Faculty of Mechanical Engineering, 63 D Mangeron Blvd, Iasi 700050, Romania.*
[2] *Technical Science Academy Romania, 26 Dacia Blvd, Bucharest 030167, Romania*
[*] *cornelmun@gmail.com*

Despite some clinical applications, maxillofacial bone augmentation, following trauma or bone deficiencies, is still a challenge due to the irregular shape, complex structure, and biological and physical properties. Traumas in the region of the maxillofacial bone led to inadequate functioning, unpleasant appearance, and ultimately a decrease in the patient's quality of life. Current treatment that uses autografts, allografts and synthetic graft materials, in many cases are causing, secondary trauma, inflammation, and lack of biocompability. Traditionally used scaffold fabrication methods, such as solvent casting, gas foaming, phase separation, and fiber bonding, lack precision and can't control cell distribution, leading to inadequate tissue repair. The technology of 3D bioprinting has overcome the shortcomings of conventional scaffolds by using the construction of three-dimensional devices with loaded cells, mimicking *in vivo* environments. This technology, due to its high precision, the ability to create custom shapes, and the capacity to work with a variety of materials, can overcome these challenges by creating biomaterial scaffolds. Medical 3D printing technologies can be classified into the following categories: Fused Deposition Modeling (FDM), Extrusion-based 3D bioprinting, Selective Laser Sintering (SLS) and Selective Laser Melting (SLM), Electron Beam Manufacturing (EBM), Stereolithography (SLA), and Digital Light Processing (DLP). Each type of 3D printing technique has its advantages and limitations, and selecting the suitable 3D bioprinting technique and material is dependent on its intended application and future clinical success. Moreover, current trends show that biomaterials and tissue engineering are becoming a preferred alternative in the treatment and healing of various bone traumas. This paper presents a current state of 3D bioprinting methods together with their advantages and limitations, as well as the suitable materials for each category, with a focus on metals for the production of customized scaffolds with specific applications in maxillofacial medicine.

Microstructural and Corrosion Behavior of Mg–Ca–Mn–xGd Biodegradable Alloys for Biomedical Applications

Istrate Bogdan[1], Munteanu Corneliu[1,2 *], **Petrovan Titiana[1]**, Fabian Lupu-Cezar[1], Cimpoesu Ramona [1*], Volocaru Ioana[1]

[1] *"Gheorghe Asachi" Technical University of Iasi, Faculty of Mechanical Engineering, 63 D Mangeron Blvd, Iasi 700050, Romania.*

[2] *Technical Science Academy Romania, 26 Dacia Blvd, Bucharest 030167, Romania*

**cornelmun@gmail.com*

Biodegradable magnesium alloys have generated significant scientific interest during the last decade as viable materials for medical implants, especially in orthopedic and cardiovascular applications. Magnesium possesses a Young's modulus (40–45 GPa) comparable to that of natural bone (3–20 GPa), thereby reducing the stress-shielding effect often linked to permanent metallic implants. The use of biocompatible alloying elements is crucial for regulating the degradation rate and improving the mechanical properties of these alloys. Calcium is an essential mineral for the human body, normally present in bone tissue as hydroxyapatite (HA). At low temperatures, the maximal solubility of calcium in the magnesium lattice is around 0.8 wt.%. Elevated Ca concentrations in Mg alloys result in a substantial volume proportion of the Mg_2Ca secondary phase, hence undermining corrosion resistance. The inclusion of manganese enhances grain refinement, therefore increasing the overall microstructural properties. Gadolinium provides further benefits by improving mechanical characteristics and degradation resistance, mainly via solid-solution strengthening and the establishment of a stable intermetallic phase (Mg_5Gd) at grain boundaries.

This research aimed to examine the microstructure and electrochemical behavior of a novel experimental Mg-based biodegradable alloy—Mg–0.5%Ca–0.5%Mn—with incremental Gd additions (1.0, 1.5, 2.0, and 3.0 wt.%). The analysis identified a dendritic Mg solid solution, a lamellar Mg_2Ca phase, and rectangular particles of the Mg_5Gd intermetallic complex. Scanning electron microscopy (SEM), optical microscopy (OM), and energy-dispersive spectroscopy (EDS) were utilized to analyze the surface following immersion and electrochemical corrosion assessments. From a corrosion standpoint, all samples demonstrated generalized electro-corrosion, with anodic and cathodic reactions of similar intensity, while the corrosion rate gradually enhanced with increasing Gd concentration.

These alloys have significant promise for use in orthopedic and bone implants. Additional in vitro and in vivo investigations are required to confirm their clinical relevance in the biomedical domain.

Evaluation of the Corrosion Behavior of Two Dental Alloys Under Different Oral Exposure Conditions

Anca FRATILA[1], Alberto RICO-CANO[2], Julia MIRZA-ROSCA[2], Adriana SACELEANU[1]

[1] Department of Dentistry and Nursing, Faculty of Medicine, Lucian Blaga University of Sibiu, Sibiu, Romania, anca.fratila@ulbsibiu.ro

[2] Department of Mechanical Engineering, University of Las Palmas de Gran Canaria, Las Palmas de Gran Canaria, Spain.

Introduction. The biocompatibility of dental alloys can be influenced by corrosion products that arise following exposure to simulated body fluids and variations in corrosion potential during clinical use. Such processes may lead to the release of metallic ions, which in turn can induce localized tissue inflammation or systemic allergic responses. Nickel–chromium (Ni-Cr) alloys are recognized for their high mechanical strength, low thermal expansion, and significant resistance to corrosion. Owing to their biocompatibility and hypoallergenic properties, they are often considered suitable for patients with metal sensitivities. Their robustness and longevity render them particularly useful for posterior dental restorations. Similarly, cobalt–chromium (Co-Cr) alloys demonstrate a favorable strength-to-weight ratio, making them especially appropriate for partial dentures where lightweight prostheses are essential.

Experimental. In this context, Ni-Cr- and Co-Cr–based dental alloys were systematically compared for their potential application in crowns and bridges with respect to corrosion behavior, mechanical performance, and biocompatibility. Commercial alloy samples were exposed to aerated Ringer's solutions under varying potentials, and electrochemical analyses revealed the formation of passive oxide films.

Results and Discussion. These findings were corroborated by microscopic observations. The results indicated that Co-Cr alloys exhibit superior corrosion resistance compared to Ni-Cr alloys, with both materials showing improved resistance at higher potentials. Importantly, both alloys maintained excellent corrosion resistance irrespective of dietary variations or temperature fluctuations, factors known to influence the electrochemical potential of oral prostheses.

Conclusions. Consequently, both Ni-Cr and Co-Cr alloys are recommended for clinical use in patients requiring dental prostheses with metal frameworks.

In vitro biocompatibility assay of MRI202S and ZMX100

Alexis Vasilis SACARELIS[1], Iulian Vasile Antoniac[2], Sorin Radu Fleaca[1]

[1] Lucian Blaga University of Sibiu, Blvd. Victoriei nr.10, Sibiu, Romania,
alexisvasilis.sacarelis@ulbsibiu.ro
[2] National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania

Introduction. Osteochondral lesions require new fixation strategies that avoid secondary surgeries required with conventional metallic implants. Magnesium alloys like MRI202S and ZMX100 are promising due to their osteoconductive properties and gradual biodegradation, aligning with bone healing timelines [1-3].

Experimental. This study examined the in vitro biocompatibility of MRI202S and ZMX100 using mesenchymal stem cells (MSCs) and osteoblasts. Cytotoxicity was evaluated via CCK-8 assays on cells exposed to metal particles, discs, and conditioned media at 24 and 48 hours. Cell adhesion was observed by scanning electron microscopy (SEM), apoptosis and necrosis quantified by flow cytometry, and antimicrobial properties assessed through Kirby-Bauer diffusion assays.

Results and Discussion. MRI202S did not induce marked cytotoxicity in MSCs or osteoblast cultures after 24 or 48 hours, as viability remained above 94%. For ZMX100, a significant, time-dependent reduction in MSC viability was detected, confirming a cumulative cytotoxic effect upon direct contact. SEM results showed diminished cell adhesion and filopodia formation for both materials under direct exposure, likely attributable to hydrogen evolution during corrosion. However, exposure to conditioned media produced no significant viability difference between alloys, reflecting that indirect contact minimized cytotoxicity. Neither alloy displayed antimicrobial activity. Apoptosis and necrosis rates were generally low, affirming both materials' overall biocompatibility in indirect assays.

Conclusion. MRI202S demonstrated excellent biocompatibility and minimal cytotoxic response, supporting its potential as a resorbable orthopedic implant that could avoid the need for implant removal surgery. ZMX100, despite exhibiting biocompatibility in indirect scenarios, requires further refinement to reduce in-contact cytotoxicity, particularly by mitigating hydrogen release effects. The lack of intrinsic antimicrobial activity in both alloys suggests a need for adjunct infection control measures in clinical use. Overall, MRI202S presents a safer biocompatibility profile, while continued optimization of ZMX100 is recommended before clinical applications.

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Development of a test stand for verifying the wear of friction materials in automobile brake pads

Lupescu Ștefan Constantin[1], **Severin Traian[1]**, Tămășag Ioan[1]

[1]*Department of Mechanics and Technologies, Faculty of Mechanical, Automotive, and Robotics Engineering, Ștefan cel Mare University of Suceava, Building B, Universitatii St. No. 13, 720229 Suceava, Romania, contact-author E-mail: severin.traian@usm.ro*

Introduction. In recent years, a common problem in the automotive industry related to the braking system and its pollution is the composition of brake pads and the emission of polluting particles into the air. More and more manufacturers are trying to significantly reduce these particles while achieving the same performance [1]. The friction material of the pads is a complex composite, designed to withstand high thermal and mechanical stresses without compromising the adhesion or physical integrity of the components.[2] During the tests conducted, five types of brake pads, each with a different friction layer composition, were analyzed to evaluate their performance under controlled wear conditions.

Experimental. The purpose of this paper is to build an experimental stand to test 5 sets of brake pads from different manufacturers, which also have different prices. The aim of the analysis was to identify variations in the composition of the friction material, with a focus on the proportion of metallic, ceramic, and organic components, as well as the presence of specific additives. Each formulation of the tested material aimed for a balance between braking efficiency (stable friction coefficient), durability (wear resistance), noise and vibration, as well as environmental impact (asbestos-free and low heavy metal content).

Results and Discussion. For the comparative evaluation of brake pad performance, the test bench that was built was used. It was designed to simulate the operating conditions of a real braking system in a controlled manner, allowing for the measurement of friction material behaviour under constant load regimes. All plate sets were subjected to the same experimental conditions to ensure the comparability of the results. The tests were conducted under the following conditions:

- Constant disc speed: 200rpm;
- Total test duration: 90 minutes;
- Pressure applied to the plates: 100N;

Conclusions. The main objective of this paper is to design and build a testing stand for evaluating brake pad wear, as well as data analysis, with the central focus being the material composition of the friction lining. This stand allows observation of how the materials used influence the behaviour of the plates over time, under controlled conditions relevant to real-world applications.

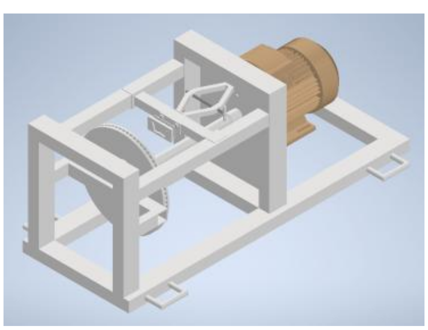

Fig. 1: Experimental stand for testing brake pads

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REVIEW OF ORTHOPEDIC IMPLANTS BASED ON Mg-Ca-Zn

Lupescu Ștefan Constantin, Cerlincă Delia Aurora*, Tamașag Ioan

Department of Mechanics and Technologies, Faculty of Mechanical, Automotive, and Robotics Engineering, Ștefan cel Mare University of Suceava, Building B, Universității St. No. 13, 720229 Suceava, Romania
E-mail: delia@usm.ro

Introduction. This article is a review based on advanced and recognized studies by other researchers worldwide. The article investigates the use of biodegradable alloys based on magnesium (Mg), calcium (Ca), and zinc (Zn) for orthopedic implants, as a viable alternative to conventional materials such as titanium or stainless steel [1]. The authors emphasize the advantages of these low-density alloys and their elastic modulus similar to that of human bone, which reduces the risk of "stress shielding" and stimulates bone regeneration. The addition of Ca and Zn shows us an improvement not only in mechanical properties but also in biocompatibility and corrosion resistance, which are essential aspects in a physiological environment.
Experimental. The study provides a detailed analysis of previous results on the microstructure, mechanical behavior, and degradation rate of these alloys, as well as the use of techniques such as electron microscopy and electrochemical testing. Variations in composition and their influence on the durability of implants in biologically simulated environments are presented. Additionally, the importance of heat treatments and processing issues for optimizing material performance is discussed.
Results and Discussion. The paper highlights the potential of Mg-Ca-Zn as materials for temporary implants, which can be absorbed over time without additional surgical intervention [2]. However, the current challenges related to the precise control of the degradation rate and the possible adverse reactions of the corrosion products are highlighted. In conclusion, the authors regard these promising alloys for orthopedic applications and emphasize the need for further in vivo research and standardization in testing these materials to enable their transition to clinical practice.

Conclusions. The study demonstrates that Mg-Ca-Zn alloys possess significant potential as biodegradable materials for orthopaedic implants, offering unique advantages over conventional metals. Their compatibility with human bone and improved mechanical properties make them suitable for temporary implants that naturally degrade over time, eliminating the need for secondary surgical removal. However, precise control of their degradation rate and mitigation of the potential negative effects of corrosion products remain critical obstacles.

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Development of new composite biomaterials based on ceramic matrix for bone substitute fabrication

<u>Cîrdei Gh. Cozmina - Maria</u>, Paltanea (Manescu) Veronica, Miculescu Florin, Antoniac Aurora, Corneschi Iuliana, Ciocoiu Robert, Trante Octavian, Antoniac Iulian

National University of Science and Technology Politehnica Bucharest, 313 Splaiul Independentei, District 6, RO-060042 Bucharest, Romania, veronica.paltanea@upb.ro

Introduction. This work aims to obtain new ceramic composites that can potentially be used as bone substitutes. Ceramic biomaterials, such as hydroxyapatite or tricalcium phosphate, are used because they form a strong bond with the adjacent bone tissue, which has a similar composition. From a medical perspective, one of the problems associated with the clinical use of bone substitutes is their poor mechanical properties, hardness, and rate of biodegradation. The novelty of this work lies in the development of new composite materials, in which the hydroxyapatite ceramic matrix is reinforced not only with tricalcium phosphate but also with a certain percentage of magnesium oxide.

Experimental. In our analysis, synthetic hydroxyapatite (HAp) from Sigma-Aldrich was used as the matrix for the experimental composites, while beta-tricalcium phosphate (β-TCP) with magnesium oxide (MgO) in various ratios served as the reinforcements. The obtained combined powders underwent cold isostatic pressing and, subsequently, a sinterization at multiple temperatures between 1000°C and 1200°C to improve the material's mechanical properties. The structural characterization of the experimental samples denoted as C1, C2, and C3 was performed by Scanning Electron Microscopy (SEM) and X-ray diffraction (XRD). The sample density, Vickers microhardness (HV), and compression strength were then experimentally determined.

Results and Discussion. The samples demonstrated a higher degree of homogeneity, primarily due to the extensive formation of the glassy phase that occurs at 1200 °C, which promotes the sintering process. Regarding the mechanical properties, the best experimental results were obtained using a decreased percentage of MgO. Reinforcement of hydroxyapatite-based composites with MgO could be considered an adequate modality to increase the mechanical properties and maintain their structure in physiological conditions.

Conclusions. The binary composites investigated can be considered optimal bone substitutes for treating bone defects.

Beyond Biocompatibility: Occupational Risk Assessment in Biomaterials and Regenerative Medicine

<u>Oana Roxana Chivu [1],</u> Alina Trifu [2], Andrei Iacob[1] , Marinela Marinescu[1], Larisa Butu[1], Roland Moraru[3], Catalina Enache[1]

[1]National University of Science and Technology POLITEHNICA Bucharest, 313 Splaiul Independenței, Bucharest, Romania, oana.chivu@upb.ro
[2]National Research-Development Institute for Occupational Safety INCDPM „Alexandru Darabont" Bucharest, 35A Ghencea Blvd., Bucharest, Romania, alinatrifu@yahoo.com
[3]University of Petroşani, Universităţii Str, no. 20, Petroşani, Romania

The rapid development of biomaterials and regenerative medicine has significantly expanded clinical applications in surgery, dentistry, and tissue engineering. Traditionally, the concept of biocompatibility has focused exclusively on the interaction between biomaterials and the patient's biological system. However, less attention has been paid to the occupational safety and health (OSH) of researchers, clinicians, and technical staff who produce, manipulate, and apply these materials in both laboratory and clinical settings. This paper proposes an extension of the concept of biocompatibility by integrating occupational risk assessment into the biomaterials and regenerative medicine field.

Using an extensive literature review and established risk assessment methodologies, we identify and categorize the main occupational hazards associated with biomaterials: chemical risks (nanoparticles, ceramic dusts, polymeric monomers), biological risks (handling of tissues and cell cultures), physical and ergonomic risks (repetitive movements and postural strain during surgical procedures), and psychosocial risks (workload and human error under high-stress conditions).

This study emphasizes the need for prevention strategies that align with both clinical and occupational standards, including advanced ventilation systems, personal protective equipment, ergonomic workplace design, and virtual reality training for safe handling of biomaterials. The study highlights that safety in the biomaterials field must encompass not only patient-material interactions but also the well-being of workers and the protection of the environment. This interdisciplinary approach underscores the importance of integrating OSH principles into biomaterials research and practice, for safer, more sustainable innovations in regenerative medicine.

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The use of natural polymers and phospholipids for the controlled release of phytocompounds with therapeutic interest from *Stellaria media* (L.) Vill.

Florina (Miere) Groza[1], **Luminita Fritea[1]**, Angela Antonescu[1], Simona Cavalu[1], Simona Ioana Vicas[2]

[1] *Faculty of Medicine and Pharmacy, University of Oradea, Sq. 1st. December no.10, 410087, Oradea, Romania;*

[2] *Faculty of Environmental Protection, University of Oradea, 26 Gen. Magheru St., Oradea, Romania.*

Introduction: *Stellaria media (L.) Vill* (SM) is a plant from *Caryophyllaceae* family whose extract is rich in polyphenols. Polyphenols are compounds very sensitive to storage and also to body conditions. Natural polymers such as sodium alginate or phospholipids (phosphatidylcholine (PC), phosphatidylserine (PS)) by hydration can form controlled release and delivery systems, thus increasing the bioavailability of phytocompounds [1,2,3].

Experimental: This study highlights the preparation of two types of controlled release, delivery and protection systems of the SM extract. Sodium alginate microcapsules were formulated by three different methods, using calcium chloride as a 3-D network fixing agent. Method M1 with the SM extract included, method M2 with the SM extract on the surface being added after dehydration to the sodium alginate microcapsules, and a combination of methods M1 and M2 represented method M3. These were subsequently characterized in terms of encapsulation efficiency (EE%), SEM microscopy and *in vitro* release testing in gastric and intestinal fluids [1].

Smaller lipid-based delivery systems were also obtained, namely liposomes with the same extract by using PC and PS, which formed the lipid film that was subsequently hydrated with phosphate buffer solution with or without the included extract. Comparatively, liposomes with included extract (PCE) or (PSE) and without included extract were characterized in terms of EE%, size, Zeta potential, DLS [2].

Results and Discussion: For alginate beads, it was demonstrated that method M1 compared to method M2 was much more efficient because it released a smaller amount of extract into the gastric fluid, and the maximum *in vitro* release of the extract was reached at 4h in the intestinal fluid. Method M3 was obtained by combining methods M1 and M2, which had a great advantage (double inclusion of the extract). The outer layer had a protective role against gastric fluid, and the extract inside was protected and released in a targeted manner at the intestinal level. The method with the best efficiency of extract inclusion (92.47%) was method M1.

Regarding the results obtained for PC, PCE, PS and PSE liposomes, their size was of nanometers order between 400-1000 nm, being characteristic of giant multilamellar liposomes regardless of the formulation. EE% was over 90% for PCE and 85% for PSE. The Zeta potential was negative regardless of the formulation, denoting their good stability.

Conclusions: The formulated biocompatible systems presented a high percentage of EE% of the extract and increased stability. By using them, we obtained an optimized therapeutic result and the protection of the active phytocompounds, increasing the treatment compliance.

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Evaluation of Platelet-Rich Plasma (PRP) Therapy in Knee Arthroplasty: Clinical and Functional Outcomes

Silviu Valentin Vlad[1], Timea Claudia Ghitea[2]

[1] Orthopedic Department, County Clinical Emergency Hospital Oradea, Romania, dr_silviu_vlad@yahoo.com

[2] Pharmacy Department, Faculty of Medicine and Pharmacy, University of Oradea, Romania, timea.ghitea@csud.uoradea.ro

Introduction. This study aimed to evaluate the effectiveness of platelet-rich plasma (PRP) therapy in improving pain, functional recovery, and postoperative outcomes in patients undergoing knee arthroplasty. PRP has been recognized for its regenerative and anti-inflammatory potential, which may contribute to reduced complications and improved joint stability (1-10).

Experimental. A retrospective cohort of 1,045 patients diagnosed with knee arthropathy (ICD-10 codes M17.0 and M17.1) was analyzed between 2018 and 2022. Patients were classified according to the presence or absence of prior PRP treatment. Clinical and biological parameters included pain (VAS), joint function (WOMAC), infection rate, implant decementation, periprosthetic fracture, and prosthesis deterioration. Statistical analysis was performed using SPSS v.20 with a significance level of $p < 0.05$.

Results and Discussion. Patients treated with PRP showed a faster decrease in pain (VAS reduction from 7.1 to 2.9 in 6 months) compared to the non-PRP group (7.0 to 4.3; $p < 0.01$). The incidence of prosthetic infection (5.5% vs. 9.1%) and implant decementation (6.8% vs. 12.4%) was significantly lower in the PRP group. Radiological deterioration of the prosthesis was also reduced (7.6% vs. 13.2%; $p = 0.02$). These findings support the anti-inflammatory and regenerative role of PRP in postoperative recovery and implant longevity.

Table 1. Comparative clinical outcomes in patients with and without PRP treatment after knee arthroplasty.

Parameter	**Without PRP**	**With PRP**	**p-value**
Pain (VAS, 6 months)	4.3 ± 1.1	2.9 ± 0.8	<0.01
Prosthetic infection	9.1%	5.5%	0.04
Implant decementation	12.4%	6.8%	0.03
Radiologic deterioration	13.2%	7.6%	0.02

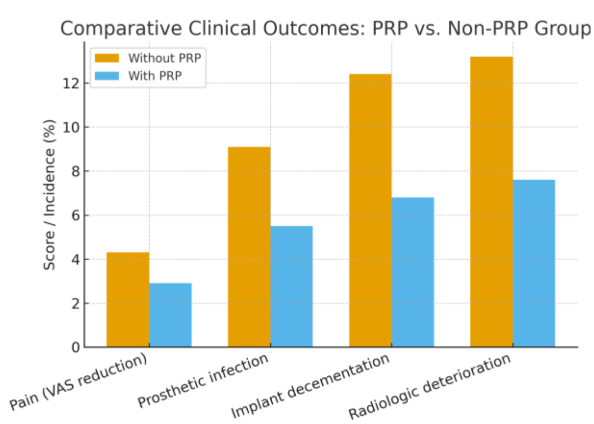

Fig. 1: Comparative clinical outcomes in patients with and without PRP therapy following knee arthroplasty, showing improved pain reduction and reduced complication rates in the PRP group.

Conclusions. PRP therapy significantly reduced postoperative pain and complications in knee arthroplasty, suggesting a protective and regenerative effect on joint tissues and implants. The findings recommend PRP as an adjuvant biological therapy to improve clinical outcomes and recovery quality after knee replacement.

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SPINCARE TECHNOLOGY IN THE TREATMENT OF ATONIC WOUNDS

Sandor Mircea [1], **Horgos Maur Sebastian** [2], Borza Ioan Lucian [3], Huniadi Anca [4], Cheregi Cornel Dragos [5]

[1] *Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania;(drims75@yahoo.com)*

[2] *Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania; (mauhorgos@yahoo.com)*

[3] *Department of Morphological Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania; (borzaioanlucian@yahoo.com)*

[4] *Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania; (ancahuniadi@gmail.com)*

[5] *Department of Surgical Disciplines, Faculty of Medicine and Pharmacy, University of Oradea, 1st December Square 10, 410073 Oradea, Romania; (cornel.cheregi@yahoo.com)*

Introduction. Atonic wounds are a major health problem being frequently encountered in medical practice and associated in chronic pathologies.
Traditional methods of treatment and diagnosis of chronic wounds have proven to be of limited effectiveness. Therefore, there is a need for the development of diagnostic and therapeutic innovations in the care of chronic wounds.[1]
Experimental. The study was conducted in the Surgery Clinic of cf Clinical Hospital Oradea, summing up a total of 10 patients hospitalized with pathologies in which the presence of atonic wounds was associated. After a preliminary preparation of the wound bed through the local toilet, a drainage system with negative pressure (vacuum suction) was installed to evacuate pathological secretions and stimulate wound granulation. Later, modern SPINCARE technology was applied, spraying a skin-like nanofiber matrix on the wound to cover the wounds, opening a new era for personalized and improved healing. This matrix behaves as a temporary substitute for the skin and, as such, provides wounds or skin lesions with an optimal environment for healing. It stays on the wound until the complete healing process is complete and detaches by itself. [2]
Results and Discussion. This matrix provides a transparent physical protective barrier, allowing easy monitoring of the healing process, while reducing the risk of infection.
The matrix serves as a temporary skin layer, until complete healing of the wound, without the need to be replaced, detaches itself when the wound is healed and serves as a physical barrier for bacteria. The results were positive in terms of wound healing and favoring the epithelization stage given that this skin-like polymer, breathable and permeable with excellent porosity for the passage of drainage, also acting as a barrier against microorganisms, thereby reducing the risk of infection. Being adherent on the wound allows free movement, lessens pain and allows for regular showers. Thus, the impact was positive on the healing but also on the psyche of the patients.
Conclusions. Our study by applying spincare nanomed technology highlights the beneficial effect and the importance of implementing new therapies in the treatment of chronic wounds. Rapid healing of these wounds was observed within 21 days of application. The major impact on the mental state and the resumption of daily activities as early as possible as well as a better hygiene, was observed by applying this nano polymer. The Spincare matrix closely conforms to the surface, shape and wound area, matching any wound structure or morphology. Solve both short-term and long-term healing challenges.

Fig. 1*: 1-aspect at admission; 2-appearance after application vacuum therapy (granular stage); 3- first application of polymer; 4- appearance after the first application; 5 – second application of polymer; 6- appearance after the second application of the polymer (21 days after the second application).*

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Reducing fixed orthodontic treatment by correctly sequencing the use of TiNb and NiTi archwires

R.M. Pisc[1,2], A.M. Rauten[2], S.M.S. Petrescu [1,2], H.O. Manolea [1,3]

[1]Department of Dental Materials, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, Romania; [2]Department of Orthodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, Romania; [3]Department of Prosthodontics, Faculty of Dental Medicine, University of Medicine and Pharmacy of Craiova, Romania

radu.pisc@umfcv.ro

Keywords: orthodontic wire, Electrodont, orthodontic scientific simulator, Ti-Nb

Primary objective of the study was to evaluate new materials available based on Ti-Nb comparative to the wildly use wire sequence Ni-Ti, avoiding the variables associated with patients anatomical variables and treatment methods.

Material and methods: We treated in vitro thirty-six cases with different degrees of angulation and height of the canine in vertical and transversal planes, reported to the occlusal plane, on a modified orthodontic scientific simulator. The same orthodontic technique was applied to all cases reproduced on electrodonts using the orthodontic scientific simulator. Afterwards, the wires used to complete each stage were analyzed using electronic microscope in order to discover wire indentations and material stress at brackets contact during orthodontic movement in all groups treated.

Results: On 28 TiNb C wires we found irreversible change in form, remaining deformed after performing the levelling and aligning. This change can be explained by the diagram of hysteresis, frictional forces and the way TiNb is absorbing and discharging the force to dental units. While the wire remained modified, the orthodontic treatment stopped, leaving the canine in higher position in vertical plane, so we could not proceed to next TiNb rectangular arch.

Conclusions: This study provides an in-depth comparative analysis of TiNb and NiTi orthodontic wires in the treatment of Class II severe malocclusions with premolar extractions, utilizing a modified orthodontic scientific simulator. Our findings revealed that while TiNb wires presented as viable alternative to conventional NiTi wires, exhibit significant limitations in the initial phases of treatment. The most notable drawback was the permanent deformation observed in the TiNb round wires during the levelling and aligning stage, leading to compromised tooth movement and treatment delays. This highlights the necessity of modifying clinical protocols when choosing TiNb wires, specifically by replacing TiNb round wire with NiTi round wire in early stages, to ensure consistent and predictable orthodontic forces.

Through this optimization, we achieved a 20% - 40% reduction in overall treatment time, which has important clinical implications. Another critical aspect of this study was the role of friction and deformation patterns.

Our stereomicroscopic evaluation revealed that TiNb wires exhibited scratch-like indentation patterns, in contrast to the gap-like indentations observed in NiTi wires.

Future research should further investigate these properties, particularly in vivo, to determine how the observed deformations and frictional characteristics translate into real-world orthodontic treatments.

Knowledge and New Trends in Obtaining Metal Prosthetic Structures – Systematic Review

<u>Popa Cătălin,</u> Radu Rica, Daniel Tirtea, Alina Robu, Miruna Anghel, Petre Mărășescu, Horia Manolea

Department of Prosthesis Technology, University of Medicine and Pharmacy of Craiova

Introduction. Metallic prosthetic restorations play a key role in dental rehabilitation. Traditionally, these have been fabricated using the lost-wax technique. However, the development of digital tools in stomatology has introduced modern methods like CAD-CAM milling, selective laser sintering (SLS), and selective laser melting (SLM), which primises improved precision and durability. This analysis aims to evaluate differences in mechanical behavior, marginal and internal fit of dental crowns.

Methods. A systematic search of the PubMed/MEDLINE database was conducted up to September 2025, using terms such as "dental," "metal," "crown technology," "lost wax," "CAD-CAM," "laser sintering," and "3D printing." Inclusion criteria were in vitro studies and systematic reviews comparing traditional and digital techniques. Nine relevant studies met the criteria and were analyzed regarding fabrication methods, type of restorations, and key outcomes.

Results. Digital manufacturing techniques demonstrated superior performance in several key areas:

- Marginal and Internal Fit: CAD-CAM and SLS/SLM methods showed significantly improved adaptation compared to classical methods of obtaining dental structures.
- Surface Characteristics: Modern methods produced smoother, more homogeneous surfaces with fewer internal defects.

Conclusions. Modern digital technologies, particularly CAD-CAM milling, provide better marginal fit, higher strength, and superior surface quality compared to conventional lost-wax casting. Additive manufacturing (SLS/SLM) offers a promising alternative with increasing precision. Further clinical studies are necessary to validate these findings in vivo and assess long-term performance.

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