



DSMOB

Department of Medical,
Oral, and Biotechnological
Sciences

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DEPARTMENT

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Biotechnological Sciences

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CELL BIOLOGY

MICROBIOLOGY

PATHOLOGY

**NANOMATERIALS
NANOTECHNOLOGY**

**MAIN RESEARCH
FIELDS**



REGENERATIVE MEDICINE

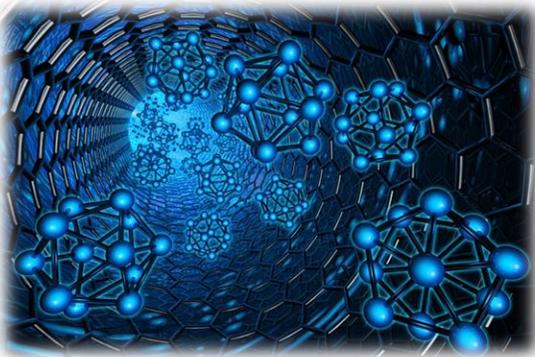
**BIostatISTICS
AND
SCIENTIFIC LANGUAGE SUPPORT**

INNOVATION TECHNOLOGY

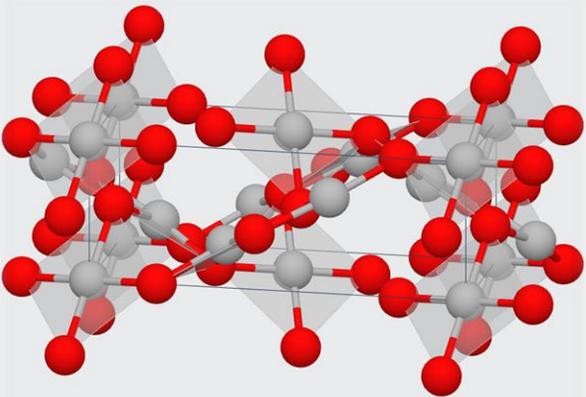
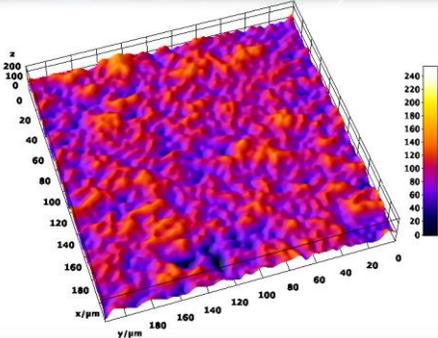
NANOMATERIALS NANOTECHNOLOGY

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- ✓ **SYNTHESIS OF NANOMATERIALS, PHYSICAL, CHEMICAL AND TOPOGRAPHICAL CHARACTERIZATION**
- ✓ **BIOCOMPATIBILITY**
- ✓ **BIOMEDICAL APPLICATIONS**
- ✓ **DENTAL APPLICATIONS**
- ✓ **AGRIFOOD APPLICATIONS**



TEAM LEADERS

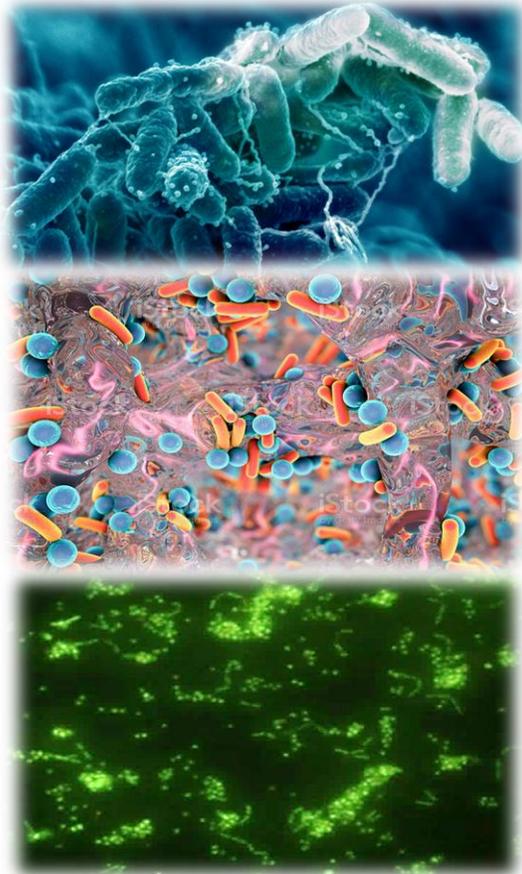
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METHODS

Nanomaterial synthesis and characterizations; nuclear magnetic resonance spectroscopy (NMR); mass spectrometry (MS); UV–vis diffuse reflectance spectroscopy (DRS); scanning electron microscope (SEM) equipped with energy-dispersive x-ray (EDX) analyses; transmission electron microscopy (TEM); zeta potential analyses; Duckworth-Lewis-Stern method (DLS) and x-ray crystallography (XRD); atomic force microscopy (ATM) and electrochemical methods; organic synthesis of molecules for nanocomposite and drug delivery.



- ✓ **BIOFILM**
- ✓ **ANAEROBIC MICROORGANISMS**
- ✓ **ANTIMICROBIAL THERAPY**
- ✓ **INNOVATIVE THERAPY FOR MDR MICROORGANISMS**
- ✓ **ANTIMICROBIAL BIOMATERIALS**
- ✓ **SKIN CARE**
- ✓ **MOUTH MICROBIOTA**
- ✓ **INTESTINAL MICROBIOTA**
- ✓ **CYSTIC FIBROSIS LUNG INFECTIONS**
- ✓ **DISCOVERY OF NEW ANTIBACTERIAL AND ANTIBIOFILM AGENTS**
- ✓ **IN VITRO AND IN VIVO ASSESSMENT OF BACTERIAL VIRULENCE**

TEAM LEADERS

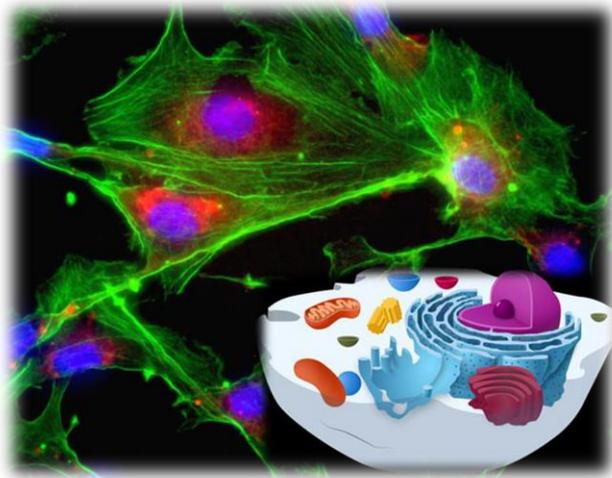
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TECHNICAL SKILLS

Genotypic and phenotypic characterization of microorganisms; antimicrobial susceptibility testing (MIC, MBC, post-antibiotic effect, checkerboard tests, time-kill kinetics, competition assays); biofilm formation; confocal and electron microscopy; toxicity testing (*Galleria mellonella*, human cell lines); cell culture; *in vitro* and *in vivo* biofilm models (multi-species Lubbock chronic wound biofilm model; mouse model of cystic fibrosis lung infection); molecular biology (qPCR, RT-PCR, bacterial DNA quantification, gene expression)



- ✓ **HUMAN PRIMARY CELLS (BIO-BANK)**
- ✓ **STEM CELLS (REGENERATIVE MEDICINE)**
- ✓ **CANCER CELLS (PATHOLOGY)**
- ✓ **IMMUNE CELLS**

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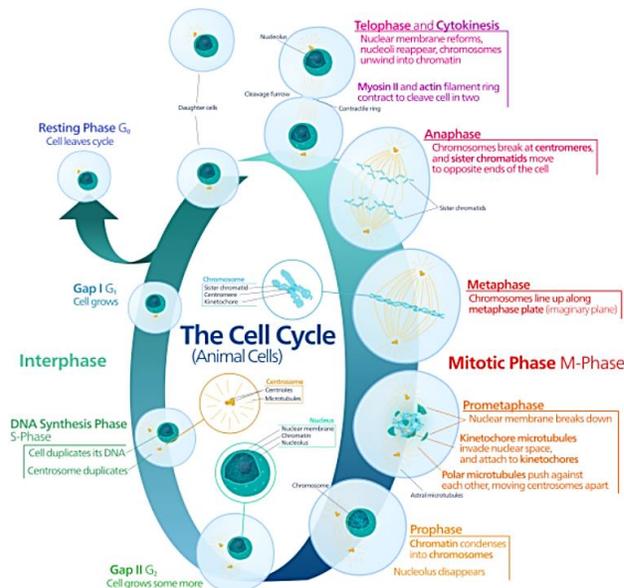
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METHODS

Isolation and characterization of primary cells; mouth and perinatal human primary cells (HUVECs, osteoblasts, osteoclasts, fibroblasts, etc.); perinatal stem cells; stem cell differentiation; mesenchymal stem cells; mouth stem cells; cell cultures; structure and function studies (fluorescence microscopy, phase-contrast microscopy, confocal microscopy, TEM, SEM, cytometry); cell proliferation; cytotoxicity studies; cell cycle; cell signalling; molecular biology; genetics and epigenetics; biochemistry; 3D in vitro culture systems.



PATHOLOGY (I)

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- ✓ **PULMONARY PATHOLOGY (CYSTIC FIBROSIS)**
- ✓ **CANCER (THYROID, COLORECTAL, BREAST, OVARIAN, PROSTATE, LUNG, PANCREAS, MELANOMA)**
- ✓ **ONCOHEMATOLOGY**
- ✓ **GASTROINTESTINAL DISEASES**
- ✓ **MICROBIOTA-ASSOCIATED DISEASES**
- ✓ **NEURODEGENERATIVE DISORDERS**
- ✓ **MACULAR DISEASES**
- ✓ **DIABETIC RETINOPATHY**
- ✓ **CARDIOVASCULAR COMPLICATIONS OF IR AND DIABETES**
- ✓ **CONGENITAL RARE DISEASES (GELATINOUS DROP-LIKE CORNEAL DYSTROPHY AND CONGENITAL TUFTING ENTEROPATHY)**

METHODS

In vivo models of inflammation, cancer growth and infection; small scale in vitro immune assays; long-read RNA sequencing; multicolor flow cytometry; isolation of blood- and tissue- derived immune cells; bioinformatics analysis of human cancer datasets; organ-on-chip cultures; in vitro immune cell migration; bronchial epithelial cell differentiation under air-liquid interface (ALI); miRNAs; micro- macro-vascular endothelial cell isolation and immortalization; immunocytochemistry; confocal microscopy; immunohistochemistry; CRISPR/CAS9 gene editing; GFP and fluorescence-based technologies; high-resolution confocal microscopy; live cell imaging; retro-lentivirus-based gene expression/inhibition techniques; molecular cloning and site-specific mutagenesis; 3D in vitro models of cell growth and invasion; protein-protein interactions; proteomics and biochemistry; in vivo tumorigenesis; research for molecular markers; role of purine compounds (mainly ATP, adenosine, guanosine and guanine) in neurodegenerative disorders, cancer and stem cell differentiation; quantitative mass spectrometry; liquid chromatography evaluation of purine-metabolizing enzymes as diagnostic biomarkers in breast cancer; purine metabolite levels; retinal detachment, diabetic retinopathy, vitreous-macular interface, macular pucker, macular hole, vitreous-macular traction; biomolecular characterization of solid cancers: pancreatic, prostatic, breast, gynecological and melanoma, mutational analysis of BRCA 1-2 and homologous recombination genes of the cancers listed above; biomolecular characterization of neuroendocrine lung malignancies; liquid biopsy characterization of additional resistance-inducing mutations at the time of cancer progression; solid cancer biobanking; bioinformatics for mutation assessment using new generation sequencing with dedicated panels in human cancers; liquid biopsy, procedures and analyses by NGS for solid malignancy characterization; characterization of biomarkers as a function of immune treatment; sensitive PCR-based methods for the detection of mutations in circulating free DNA/RNA.

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- 
- ✓ PERIODONTAL DISEASE
 - ✓ DENTAL IMAGING
 - ✓ REHABILITATION
 - ✓ ANESTHESIA
 - ✓ HUMAN AND CLINICAL NUTRITION
 - ✓ SPORT NUTRITION
 - ✓ METABOLIC DISEASES
 - ✓ FUNCTIONAL FOODS
 - ✓ NUTRACEUTICS

METHODS

Restorative dentistry; adhesive and minimally invasive dentistry; endodontics; occlusal postural disorders; biomechanical properties of dental restorative materials; scanning electron microscopy; in vitro wear testing; three-point flexural strength; microtensile bond strength testing; shear bond strength testing; dental clinical research; qualitative surface analysis of dental materials by means of scanning electron microscope; in vitro tribological and mechanical tests performed with the aim of assessing and improving the properties of new prototypes; clinical validation of new devices and techniques within the field of restorative dentistry; application of cone beam CT for dental and maxillofacial imaging, CT low-dose protocols, MRI for clinical neuroimaging, CT for chest imaging; x-rays, computed tomography, cone beam computed tomography, magnetic resonance imaging, dental imaging, computer-aided quantification; rehabilitation: breast cancer rehabilitation; virtual reality and telerehabilitation; neurocognitive exercises; fibromyalgia posture and gunction; chronic low back pain; mesotherapy; quantitative mass spectrometry; liquid chromatography; lung, cardiac and diaphragm ultrasounds; hemodynamic monitoring; fluid therapy; anesthesia; intensive care; antioxidants; nutrition; metabolic diseases; body composition.



- ✓ **BIOMATERIALS**
- ✓ **DENTAL BIOMATERIALS**
- ✓ **BONE REGENERATION**
- ✓ **VASCULARIZATION**
- ✓ **ENGINEERING BIO-SCAFFOLD**
- ✓ **MOUTH REGENERATIVE MEDICINE**
- ✓ **ESTHETIC DENTISTRY**



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METHODS

Stem cells; mouth mesenchymal stem cells; tissue engineering; co-culture systems; three-dimensional cultures; microfluidity; stem cells; histology; tissue-engineered grafts; mouth and perinatal human primary cells (HUVECs, osteoblasts, osteoclasts, fibroblasts, etc.); fluorescence microscopy, phase-contrast microscopy, confocal microscopy, TEM, SEM, cytometry, cell signalling; collagen use as bioscaffold; composite resins; veneers; research and development of innovative and sustainable biomaterials.

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- ✓ **PHOTOBIO-MODULATION**
- ✓ **AIR-PLASMA TECHNOLOGY**
- ✓ **ORGAN-ON-CHIP CULTURES**
- ✓ **BIOREACTOR**
- ✓ **DEVELOPMENT OF INNOVATIVE ISOLATOR FOR PERINATAL TISSUES AND CELL PROCESSING FOR TRANSLATIONAL AND PERSONALIZED MEDICINE**
- ✓ **ARTIFICIAL INTELLIGENCE**

METHODS

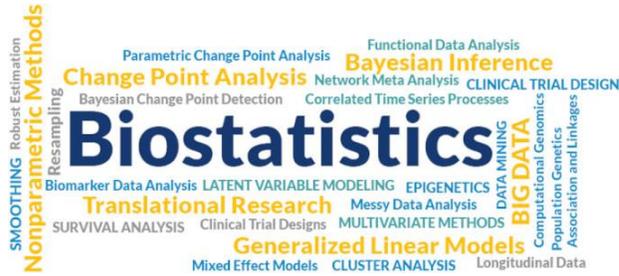
Cell cultures; 3D cell cultures; LED; LASER; wound healing; immunohistochemistry; SEM; TEM; vascularization; primary cell cultures in GMP; application of artificial intelligence.



BIostatISTICS AND SCIENTIFIC LANGUAGE SUPPORT

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- ✓ PUBLIC HEALTH
- ✓ BIostatISTICS
- ✓ MACHINE LEARNING
- ✓ STATISTICAL LEARNING
- ✓ ENGLISH LINGUISTICS
- ✓ ENGLISH FOR ACADEMIC PURPOSES
- ✓ MEDICAL ENGLISH
- ✓ ENGLISH LEARNING AND LANGUAGE DEVELOPMENT

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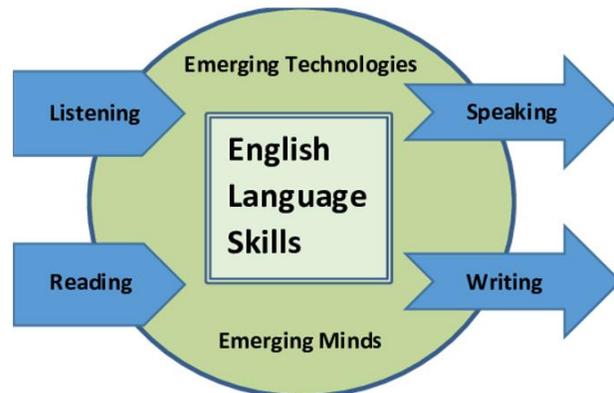
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METHODS

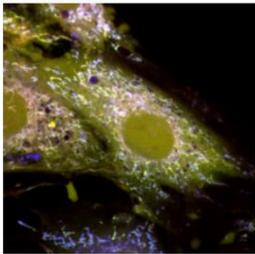
Planning and design of experimental and observational studies and data analyses; sample size calculations; statistical models for the identification of prognostic factors and disease determinants; development and validation of questionnaires and scales for assessment and diagnostics; analyses of geographical distribution of diseases; machine and statistical learning techniques; network analyses for omics data; repeatability and reproducibility analyses.

Translation studies, text and discourse analysis, doctor-patient interactions also in multicultural settings, English for specific purposes.

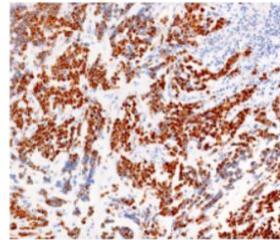




CLINICAL RESEARCH CENTER



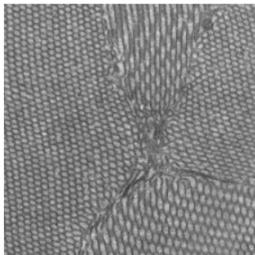
Optical Microscopy



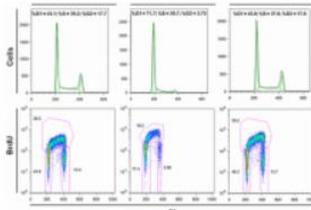
Molecular pathology



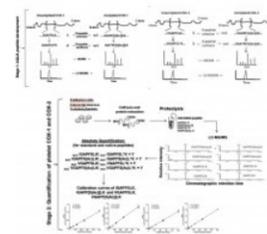
Genomics



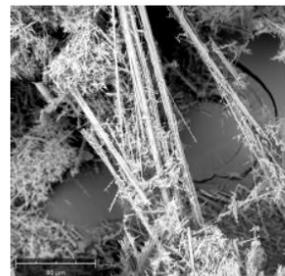
Transmission Electron Microscopy



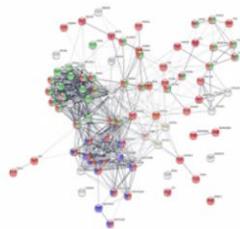
Flow Cytometry



Mass Spectrometry for precision pharmacology



Scanning Electron Microscopy and EDXA



Proteomics and Metabolomics



Animal care



Cryo-Cell Service

Forensic Sciences



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START,
GO!

