# 4EBAT

EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES CONGRESS

3-6 NOVEMBER 2022 ANTALYA

abstract book

This Congress is supported by TUBITAK with 2223-B Support Program for Scientific Activities

# FOREWORD

## 4th EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES (EBAT) CONGRESS

Dear Participants and Colloquies,

We are proud and glad to organize our fourth congress on behalf of the Organizing Committee and Turkish Chemists Society under the title of **4th EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES (EBAT) CONGRESS**. As will be remembered, we organized our first EBAT Congress in 2018, the second in 2019, and our third in 2021. The fourth of EBAT congress was held from 03- 06 November 2022 in Antalya, Türkiye.

This congress was organized by Ege University, Bilecik Şeyh Edebali University, Çukurova University and Tokat Osmangazi University and Karadeniz Technical University.

The purpose of the 4th EBAT congress is to bring together both academic and industrial researchers from around the world who are interested in many disciplines related to biochemistry such as protein purification and technologies, industrial enzyme applications, molecular biochemistry, bioengineering, bionanotechnology, bioinformatics, biophysics, bioanalytics, biosorption, biochemistry of natural products, biomaterials, bioprinting, and biological activity assignment.

The Congress will focus on industrial applications of biochemistry-related disciplines such as food, drug, agriculture, dye, textile, bioremediation, and cosmetics. Additionally, fundamental research is also welcomed.

Altogether, the 4th EBAT Congress will provide a dynamic exchange opportunity for ideas and experiences between scientists taking the needs and expectations of the industry into consideration. A panel of worldwide known key speakers will take part, providing an exciting atmosphere to discover the state-of-the-art advancement in biochemistry.

This year we had participant from Algeria, Azerbaijan, Germany, England, Sweden, Slovenia, Italy, Spain, India, and Türkiye. Eleven invited speakers and more than three hundered researchers have contributed with their presentations, discussions and active participations about every part of the conference. We shared our own experiences and perspectives over the various topics via different findings and solutions.

Part of the abstract submissions of our convention participants will be provided with the opportunity to present a full-text article in the journals Molecular Catalysis" and "Hacettepe Journal of Biology and Chemistry with the choice of the authors.

On behalf of the organizing committee, we would like to thank you all for joining us and contributing to the success of the EBAT 2022. We also greatly acknowledge also our distinguished companies starting with **our Main Sponsor Dr. Zeydanlı, ETKA, Gen Plaza, Metrohm, Redoks, Terra, Ba-Bi NanoTek, SEM, Türklab, Medsantek, Vortex, Arılab, Atabay, Chromascience and Vivamus Tarım** for their support as sponsor.

Apart from these, we especially thank to Local Organizing Committee and our graduate students who have spent their energy for the success of this meeting. We want to thank Mirage Park Resort (Göynük, Kemer, Antalya/Turkey) for their excellent services.

Best wishes

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November 2022

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# 4th EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES (EBAT) CONGRESS

# SCIENTIFIC PROGRAMME

# SCIENTIFIC PROGRAMME

## November 03, 2022 Thursday

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|---|---|---|
| **13:00-17:00** | **Registration** | ***Registration Desk*** |
| **17:00-17:30** | **Mirage I** | |
| | **Opening Ceremony** | |
| | **Session 1 – Chair: Prof. Azmi TELEFONCU** | ***Mirage I*** |
| **17:30-18:05** | **Invited Speaker (IS1) Prof. Wolfgang FRITZSCHE** | |
| | "Bioanalytics Using Plasmonic Nanostructures" | |
| **18:05-18:20** | **Oral Presentation (OP1) Özge UĞURLU** | |
| | Development and Characterization of FosB Transcription Factor-Specific DNA Aptamers | |
| **18:20-18:30** | **Metanol Sensörü Tanıtımı (Güvenilir İçki Testi) : Ba-Bi NanoTek** | |
| **18:30-19:10** | **Workshop (Metrohm) Phoenix I**<br>The Multi-user Experience via Remote Connection with Methrohm DropSens Multix | **Workshop (TERRA) Phoenix II**<br>- SpatialOMx-New Approach on OMx Analysis with ESI-qTOF & MALDI Imaging on One Single Instrument Platform<br>- Benefits of Synthesizing Peptides with Microwave Energy and Application Areas of Peptides |
| **19:10** | **Dinner** | |

## November 04, 2022 Friday

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|---|---|---|
| | **Session 2 – Chair: Prof. David Mark SHORE** | ***Mirage I*** |
| **09:00-09:35** | **Invited Speaker (IS2) Prof. Sandra CITI** | |
| | "Mechanoregulation for Epithelial Homeostasis" | |
| **09:35-09:50** | **Oral Presentation (OP02) Emel Başak Gencer AKÇOK** | |
| | Investigation of Combined Autophagy Pathway Modulation and HDAC Inhibition and the Effect of PTEN Silencing on Cisplatin Resistant Cholangiocarcinoma Cells | |
| **09:50-10:05** | **Oral Presentation (OP03) Duygu DURSUNOĞLU** | |
| | A Poor Prognostic Factor in Pancreatic Cancer: Insulin-Like Growth Factor Receptor (IGF-IR) is Inhibited by Juglone | |
| **10:05-10:20** | **Oral Presentation (OP04) Ozan YEŞİLTEPE** | |
| | Development of Bioactive Wound Dressing Materials Based on Cellulose Acetate Nanofibers | |
| **10:20-10:35** | **Oral Presentation (OP05) Zeynep Güner YILMAZ** | |
| | Single-Walled Carbon Nanotube Doped Pectin Hydrogels for Biomedical Applications | |
| **10:35-10:55** | **Coffee Break** | |
| | **Session 3 – Chair: Prof. Sandra CITI** | ***Mirage I*** |
| **10:55-11:30** | **Invited Speaker (IS3) Prof. David Mark SHORE** | |
| | "Ribosome Biogenesis and Cellular Proteostasis" | |
| **10:30-11:45** | **Oral Presentation (OP06) Burak DAĞDELEN** | |
| | Editing of R555W Mutation in the TGFBI Gene Related to GCD1 in Peripheral Blood Mononuclear Cells using CRISPR/CAS9 Technology | |

# November 04, 2022 Friday

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|---|---|
| **11:45-12:00** | **Oral Presentation (OP07) Burak DERKUŞ**<br>Biomolecular Differences in Normal and Pathological Cerebral Organoids |
| **12:00-12:15** | **Oral Presentation (OP08) Fatma AYDINOĞLU**<br>Inhibition of Pathogenicity of Maize Fungal Pathogen Fusarium verticillioides by Targeting CYP51 Gene Based on Host-Induced Gene Silencing Approach |
| **12:15-12:30** | **Oral Presentation (OP09) Gosia Poczopko**<br>Small Molecule Effectors Of The MYC/MAX Oncogene |
| **12:30-14:00** | **Lunch** |
| **Session 4 – Chair: Prof. Hüseyin ŞEKER** | ***Mirage I*** |
| **14:00-14:35** | **Invited Speaker (IS4) Prof. İbrahim Tarık ÖZBOLAT**<br>"3D Bioprinting of Living Tissues and Organs" |
| **14:35-14:50** | **Oral Presentation (OP10) Banu KOCAAĞA**<br>Evaluation of Pectin-Based Sustained-Release, Hemostatic, Shear Thinning Hydrogels for Wound Healing Applications with In Vitro, In Silico, and In Vivo Approaches |
| **14:50-15:05** | **Oral Presentation (OP11) Barış GÜLİÇLİ**<br>In silico Modeling of Shear Stress and Pressure Applied to Cells at Different Nozzle Diameters and Printing Speeds in 3D Bioprinting |
| **15:05-15:20** | **Oral Presentation (OP12) Ahu Arslan YILDIZ**<br>A New Generation Hydrocolloid Bioink for 3D Bioprinting |
| **15:20-15:45** | **Coffee Break** |
| **Session 5 – Chair: Prof. Bekir SALİH** | ***Mirage I*** |
| **15:45-16:20** | **Invited Speaker (IS5) Assist.Prof. Hasan DEMİRCİ**<br>"Time-Resolved Serial Femtosecond X-ray Crystallographic Studies of Ribosome Complexes" |
| **16:20-16:35** | **Oral Presentation (OP13) İsmail EŞ**<br>Xenon Difluoride Dry Etching for the Microfabrication of Solid Microneedles As a Potential Strategy in Transdermal Drug Delivery |
| **16:35-16:50** | **Oral Presentation (OP14) Yeşeren SAYLAN**<br>Biomimetic Plasmonic Sensors for Environmental Monitoring |
| **16:50-17:05** | **Oral Presentation (OP15) Neşe AYŞİT**<br>Neuronal Differentiation and Neurite Orientation on Gold Nanoparticle Decorated, Micro/Nano-channeled PCL/PLGA Film Scaffolds |
| **17:05-17:20** | **Coffee Break** |

| | **Short Oral Presentation**<br>**Chair: Prof. Nagihan Sağlam ERTUNGA**<br>***Mirage I*** | **Short Oral Presentation**<br>**Chair: Prof. Elif ÖZYILMAZ**<br>**Phoenix I** | **Short Oral Presentation**<br>**Chair: Prof. Yakup KOLCUOĞLU**<br>**Phoenix II** |
|---|---|---|---|
| **17:20-17:25** | **(OP37) Abdussamat Güzel**<br>Anti-aging effect of *Echinops pungens* Against Neurodegenerative and Oxidative Stress | **(OP53) Cenk Erdogan**<br>Effect of Conductivite Polymer Coatings Containing Olive Leaf Extract On Biofoulung and Corrosion | **(OP69) Fatma Aydınoğlu**<br>Photodynamic Inactivation (PDI) of Maize-Pathogenic Fungus Fusarium verticillioides with Novel BODIPY Photosensitizer |
| **17:25-17:30** | **(OP38) Ahmet Burak Altınsöz**<br>Anti-adipogenic and Anti-obesogenic Effects of Pterostilbene in 3T3-L1 Preadipocyte Models | **(OP54) Ceyda Ozen**<br>Improving the Mechanical Properties of Fine-Grained Soils by a Biopolymer | **(OP70) Fatmanur Keleş**<br>Protective Effect of Parthenolide on Paclitaxel-Induced Liver Toxicity |

# November 04, 2022 Friday

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| **17:30-17:35** | **(OP39) Ahmet Çetin** | **(OP55) Berivan Arın Öztürmen** | **(OP71) Fevzi Topal** |
| | Simultaneous Administration of Ginkgo biloba Leaves Extract and L-DOPA Protects Against Rotenone-induced Neurotoxicity in SH-SY5Y Cells | Synthesis and α-Glucosidase, Cholinesterases, Tyrosinase Enzyme Inhibition Properties of Silicon(IV), Copper(II), Manganese(III) Phthalocyanines | Terminalia citrina Roxb. Ex. Fleming Determination of Antioxidant Capacity, Phenolic Content and Investigation of Their Effects on Cholinesterase Enzymes |
| **17:35-17:40** | **(OP40) Ahsen İlkyaz Yumuşak** | **(OP56) Alper Akkaya** | **(OP72) Fulya Öz Tuncay** |
| | Immobilization of β-galactosidase onto Tri-component Electrospun Nanofiber Supports and Its Stability Applications | Antimicrobial Peptide Production from Lactic Acid Bacteria | Crataegus prunifolia: Phenolic Profile, Antioxidant and Enzyme Inhibition Properties |
| **17:40-17:45** | **(OP41) Aslı Göçenoğlu Sarıkaya** | **(OP57) Çağla Akkol** | **(OP73) Fulya Özdemir** |
| | Determination of Biological Activities of Lichen Species from Domaniç | Preparation of Graphitic Carbon Nitride/Cobalt Phthalocyanine As Photocatalyst for 4-nitrophenol Photoxidation | Evaluation of Biochemical Parameters of Laccase Enzyme Immobilized on Various Clay Minerals According to Free Enzyme |
| **17:45-17:50** | **(OP42) Aykut Özgür** | **(OP58) Serdar Karakurt** | **(OP74) Gamze Baltacıer** |
| | Green Synthesized Iron Nanoparticles Induced Apoptotic Pathways in Breast Cancer Cell Lines by Inhibition of Heat Shock Proteins | Investigation of the Expressions of AGTR-1 and AGTR-2 that are Involved in Aldosterone Metabolism in Rat Tissues by Immunochemical Methods | An Investigation of Antioxidant Enzyme Activities in Some Barley Varieties Under Drought Stress |
| **17:50-17:55** | **(OP43) Aylin Öner** | **(OP59) Demet Kizil** | **(OP75) Burhan Ateş** |
| | Evaluation of the Phenolic Profiles and Biological Properties of Micromeria graeca and Micromeria myrtifolia from Turkey | Inhibitory Effects of Herbal Extracts on ACHEs Purified from Ricania simulans | The Use of PCL/PEG-Based Electrospun Membranes in Lateral Flow Sistems to Increase the Sensitivity in Analysis of Biological Samples |
| **17:55-18:00** | **(OP44) Bahar İnce** | **(OP60) Didem Mimiroglu** | **(OP76) Hamiyet Köse** |
| | A Lateral Flow Assay in Competitive Format for the Quantitative Detection of Soluble Interleukin 1 Receptor-like 1 | Surface Nanotopography Enhances Cellular Spreading | The Relationship of Zinc Deficiency and Supplementation On Testis and Liver Relaxin Family Peptides, Oxidant System and Testosterone Levels in The Male Offspring of Pregnant Rats Fed with Zinc Deficient Diet |
| **18:00-18:05** | **(OP45) Banu Kocaağa** | **(OP61) Dilek Göktürk** | **(OP77) Hasan İlhan** |
| | Self-Healing and Shape-Fitting Pectin-Zeolite Hydrogels with Controlled Allantoin Delivery | L-Methioninase: A Potential Therapeutic Enzyme in Cancer Treatment | Fluorescence Based Immunoassays Using Quantum Dot Labelled Antibody for Detection of E. Coli |
| **18:05-18:10** | **(OP46) Nur Tarımeri** | **(OP62) Ecem Uzman** | **(OP78) Hilal Fazlı** |
| | A Novel electrochemical Biosensor Design Based on 3-MPDS for Early Detection of AFB1 | An Ultrasensitive Electrochemical Biosensor System for Selective Detection of Aflatoxin B1 In Real Food Samples | Synthesis of New Water Soluble Cu(II) and Mn(III) Phthalocyanines and Investigation of Their Photocatalytic Activities on the Photoxidation of Benzyl Alcohol |
| **18:10-18:15** | **(OP47) Betül Çiçek** | **(OP63) Eda Günay** | **(OP79) İlke Karakaş** |
| | The Combination Levodopa/P-coumaric Acid Attenuates Neurotoxicity in Rotenone-induced SH-SY5Y Cells | Effects of Exogenous Nitric Oxide (SNP) on Drought Tolerance in Two Wheat Varieties | Antimicrobial and Antioxidant Activities of Silver Nanoparticles Synthesized from Plantago lanceolata Leaves |
| **18:15-18:20** | **(OP48) Burcu Özcan** | **(OP64) Elif Burcu Aydın** | **(OP80) İlkyaz Patır** |
| | An Innovative and Low-cost Electrochemical Biosensing System for Detection of Alphafetoprotein Protein: A Potential Biomarker for Ovarian Cancer | Label-free Detection of CYFRA 21-1 Lung Cancer Biomarker Using Gold/Amino-Substituted Poly(pyrrole) Polymer Modified Disposable Electrode | Effect of Synthetic and Natural Polymer Coating on Characteristics and Bioaccessibility of Galangin-loaded Liposomes |
| **18:20-18:25** | **(OP49) Burçak Demirbakan** | **(OP65) Elif Esin Hameş** | **(OP81) İnci Uludağ** |
| | A Highly Sensitive Immunosensor System Based on Benzoquinone for Cardiac Troponin T Detection on ITO-PET Electrode | Oxidation of Bacterial Cellulose for Biodegradable Cartilage-Bone Tissue Engineering Scaffolds | Activation of ITO Surface by Hexamethylene Diisocyanate for the Development of a Disposable Immunosensor: Ultrasensitive and Low-cost Detection of Neuropeptide Y |
| **18:25-18:30** | **(OP50) Büşra Karkar** | **(OP66) Esra Aygün Alçiçek** | **(OP82) İpek Canatar** |
| | The Improvement of Viability of Lactobacillus casei by Freeze-drying Method | Purification of Laccase from Bacillus licheniformis SO8 with Three-Phase Partitioning, Characterization, and Usage in Dye Decolorization | Investigation of the Effect of Bolanthus turcicus Raw Extracts on Head and Neck Cancer Cells |

## November 04, 2022 Friday

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| **18:35-18:40** | **(OP51) Büşra Nur Baygın** | **(OP67) Eylül Gülşen Yılmaz** | **(OP83) İpek Ertuğrul** |
| | Detection of Creatine Kinase by Using a Disposable Immunosensor Based on Indium Tin Oxide Covered Flexible Electrodes | Isolating and Detecting Extracellular Vesicles on Microfluidic Chips and Metamaterial Sensors | Decellularized Skin and Its Biomedical Applications |
| **18:45-18:50** | **(OP52) Canan Sapmaz** | **(OP68) Ezgi Man** | **(OP84) Raziye Ozturk Urek** |
| | Alteration of Cytochrome P450 Enzyme Activities with Caffeine and Cotinine in Rainbow Trout (Oncorhynchus mykiss) | Development of DNA Aptamers for Inhibition of Histone Deacetylase-10 (HDAC10) Activity | Determination of Phenolic Compositions, Antioxidant and Cytotoxic Activities of five Teucrium species from Turkey |
| **19:00-20:00** | **Poster Presentations** | | ***Mirage I*** |
| **20:00-** | **Dinner** | | |

## November 05, 2022 Saturday

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| | **Session 6 – Chair: Prof. Arben MERKOÇİ** | ***Mirage I*** |
| **09:00-09:35** | **Invited Speaker (IS6) Prof. Gregor ANDERLUH** | |
| | "Nanopores for Sensing Applications" | |
| **09:35-09:50** | **Oral Presentation (OP16) Fatih İNCİ** | |
| | Extracellular Vesicles: From Nano-sized Dust to Deciphering Agents for Disease Diagnostics | |
| **09:50-10:05** | **Oral Presentation (OP17) Canan ÖZYURT** | |
| | Development of an Immunochromatographic Test for Sensitive and Selective Detection of Haptoglobin | |
| **10:05-10:20** | **Oral Presentation (OP18) Öznur ÇOPUR** | |
| | Development of Rapid Test Method for Semi-Quantitative Measurement of Total Glycosaminoglycan in Urine | |
| **10:20-10:35** | **Oral Presentation (OP19) Özgecan ERDEM** | |
| | MIP-on-chip Synthesis of BSA Imprinted Nanoparticles | |
| **10:35-10:55** | **Coffee Break** | |
| | **Session7 – Chair: Prof. İbrahim Tarık ÖZBOLAT** | ***Mirage I*** |
| **10:55-11:30** | **Invited Speaker (IS7) Prof. Arben MERKOÇİ** | |
| | "Nanobiosensors: How to Design and Apply these Devices in Diagnostics" | |
| **10:30-11:45** | **Oral Presentation (OP20) Mustafa Kemal SEZGİNTÜRK** | |
| | A Novel Electrochemical Approach to Biosensing Applications: Quartz Tuning Forks as Working Electrodes for Immunosensors | |
| **11:45-12:00** | **Oral Presentation (OP21) Okan ZENGER** | |
| | Preparation of Molecularly Imprinted Nanoparticle Based SPR Sensors for Angiotensin-II Detection from Human Serum | |
| **12:00-12:30** | **Oral Presentation (OP22) Doğan TAŞKENT** | |
| | Teknolojik Girişimcilikte Yol Haritası | |
| **12:30-14:00** | **Lunch** | |
| | **Session 8 – Chair: Prof. Uğur SEZERMAN** | ***Mirage I*** |
| **14:00-14:35** | **Invited Speaker (IS8) Prof. Rita CASADIO** | |
| | "EC Number Annotation: How to Predict the Enzyme Function" | |
| **14:35-14:50** | **Oral Presentation (OP23) Frank HOLLMANN** | |
| | Haloperoxidases: Promising Catalysts for Chemical Synthesis | |

# November 05, 2022 Saturday

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|---|---|
| **14:50-15:05** | **Oral Presentation (OP24) Yunus ENSARİ** |
| | Molecular Cloning, Expression and Characterization of a Thermophilic α-glucuronidase from *Geobacillus kaustaphilus* |
| **15:05-15:20** | **Oral Presentation (OP25) Dilek Çam DERİN** |
| | Detection of 2019-nCoV_N2 of SARS CoV_2 by Lateral Flow Assay |
| **15:35-16:00** | **Coffee Break** |
| **Session 9 – Chair: Prof. Lokman UZUN** | ***Mirage I*** |
| **15:45-16:20** | **Invited Speaker (IS9) Prof. Bekir SALİH** |
| | The Power of Ion Mobility-Mass Spectrometry for Structural Characterization and Conformational Analyses of Therapeutic Drugs |
| **16:20-16:35** | **Oral Presentation (OP26) Esma MENEVŞE** |
| | Determination of Tamoxifen by Liquid Chromatography-Tandem Mass Spectrometer |
| **16:35-16:50** | **Oral Presentation (OP27) Kadriye Büşra KARATAY** |
| | Investigation of Antimicrobial Effects of Organic Antibiotic |
| **16:50-17:05** | **Oral Presentation (OP28) Yeliz YAVUZ ÇEVİK** |
| | Fast screening of pesticides by Raman spectroelectrochemistry based on EC-SERS effect |
| **17:05-17:20** | **Coffee Break** |

| | **Short Oral Presentation Chair 1: Prof. /Chair 2: Prof. *Mirage I*** | **Short Oral Presentation Chair 1: Prof. /Chair 2: Prof. *Phonenix-1*** | **Short Oral Presentation Chair 1: Prof. /Chair 2: Prof. *Phonenix-2*** |
|---|---|---|---|
| **17:20-17:25** | **(OP85) Kübra Karadaş Gedik** | **(OP102) Nazlı Şimşek** | **(OP119) Sinem Tümük** |
| | Curing Of Polyurethane-Acrylate Structures By Nir Light For Biomedical Applications | Electrochemical Sensor Based on a CeO2/AuNPs-P-(L-Lysine) Composite for Simultaneous Determination Dopamine and L-Tyrptophan | Biopoliols Strengthened With Natural Clay Minerals |
| **17:25-17:30** | **(OP86) Kübra Sayarım** | **(OP103) Nazli Ece Varan** | **(OP120) Sümeyye Akbulut** |
| | Silver Nanoparticles from The Brown Algae Cystoseira barbata: An Optimization Study and Their Characterization | Covalent Immobilization of Xylanase on Modified Nickel-Multi-walled Carbon Nanotube Particles for Synthesis of Xylooligosaccarides | Determination of Food Safety of Bacteriocin Producing Lactic Acid Bacteria Isolated from White Cheese |
| **17:30-17:35** | | **(OP104) Nur Melis Kılıç** | **(OP121) Ekrem Köksal** |
| | | Nonsteroidal Anti-inflammatory Drug Removal Using Electrospun Nanofibers for Environmental Biotechnology | Investigation of in Vitro Cytotoxic Effects of Some Secondary Metabolites from Scrophularia subaequiloba |
| **17:35-17:40** | **(OP88) Lale Huseynova** | **(OP105) Ömer Işıldak** | **(OP122) Cemalettin Alp** |
| | The Antioxidant Feature of Udi Hindi Plant | New Potentiometric Biosensor for Total Phenolic Assay | Investigation of The Biological Activities of Different Extracts of Lallemantia canescens (L) Fisch Et. Mey. |
| **17:40-17:45** | **(OP89) Mehmet Melih Tatlısöz** | **(OP106) Ömer Işıldak** | **(OP123) Şeyma Şentürk** |
| | Protein Adsorption on Spherical Nanoparticles with Different Surface Roughness Shapes | A Potentiometric Biosensor for the Determination of Valproic Acid in Human Blood Samples | An Immunosensor Based on QTFs as a Working Electrodes for Kidney Injury Molecule-1 |
| **17:45-17:50** | **(OP90) Melek Çol Ayvaz** | **OP107) Berfin Vural** | **(OP124) Şükran Günaydın** |
| | Comparison of The Biological Activities of Propolis Samples Collected From Different Parts of the Hive | A Disposable and Sensitive Immunosensorfor Detection of HE4 | Evaluation of Thioredoxin Reductase 1-Targeted Anticancer Effect of Evernic Acid on Human Lung Cancer A549 Cell Line |
| **17:50-17:55** | **(OP91) Melike Bilgi Kamaç** | **(OP108) Özge Çağlar** | **(OP125) Tülay Koç Delice** |
| | Point of Care Test for Cancer Antigen 125 | Immobilization of Candida Rugosa Lipase Encapsulated within Quantum Dots-MOF Nanostructure Composites | Determination of Epinephrine by Voltammetric Method Using Carbon Paste Electrode Decorated with Modified CuO Nanoparticles |

# November 05, 2022 Saturday

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|---|---|---|---|
| **17:55-18:00** | **(OP92) Melike Bilgi Kamaç** | **(OP109) Özge Kapusız** | **(OP126) Uğur Durmuş** |
| | Point of Care Test for Ovarian Cancer Biomarker HE4 | Everzol Blue Biosorption Capaity of Organic Wastes | Investigation of Synergistic Anticancer Effects of Sorafenib and Deinoxanthin on Huh7 Hepatocellular Carcinoma Cell Line |
| **18:00-18:05** | **(OP93) Melisa Bilgin** | **(OP110) Rahime Altıntaş** | **(OP127) Ummuhan Çakmak** |
| | Determination of Biofouling Behavior of Dispersed Cells from Biofilms Cultivated in Media at Different pH Values Using a Rapid Spectrophotometric Method Combined with Thermodynamic Analysis | Antioxidant, Anti-Inflammatory and Anti-Aptototic Effects of Black Mulberry (Morus nigra L.) Fruit Against Cisplatin-Induced Kidney Damage in Rats | Evaluation of the Bioactive Constituents, Antioxidant and Enzyme Inhibitory Activities of Rhaphiolepis indica (L.) Lindl. |
| **18:05-18:10** | **(OP94) Meltem Çalışkan** | **(OP111) Pırıl Arısoy** | **(OP128) Umut Mengüllüoğlu** |
| | CA125 Determination by a Disposable Immunosensor | Antimicrobial Activity of Tannic Acid Loaded Discs | Enzymatic Biosensor Based on Dendrimer Modified Surfaces for Detection of Oxidant Species |
| **18:10-18:15** | **(OP95) Meryem Topal** | **(OP112) Kardelen Cemek** | **(OP129) Veyis Karakoç** |
| | Determination of Angelica archangelica's Antioxidant Capacity and Mineral Content | Preparation of Stigmasterol Imprinted Solid Phase Extraction Polymers for Recognition of Stigmasterol from Plant Extracts | Ion imprinted Based Polymeric Iron Chelator for Acute Iron Poisoning |
| **18:15-18:20** | **(OP96) Müge Teker Yıldız** | **(OP113) Resul Adanaş** | **(OP130) Yakup Akkoç** |
| | Effect of Micrococcus luteus Isolated from Marine Habitat on Salt Stress of Some Barley Species | The Investigation of In Vitro Effect of Ascorbic Acid (vitamin C) and Reduced Nicotinamide Adenine Dinucleotide (NADH) on Acetylcholinesterase Enzyme (AChE; EC 3.1.1.7) in Human Plasma | Change of Activity Values of Combi CLEA (GA+GI) and Free (GA+GI) Depending on Ionic Liquid Environment |
| **18:20-18:25** | **(OP97) Münevver Müge Çağal** | **(OP114) Saniye Soylemez** | **(OP131) Yakup Aslan** |
| | Green Synthesis of Silver Nanoparticles Using Marine Red Algae Grateloupia Subpectinata and Their Antibacterial Activity | Combined Architectures of Nanomaterials and Polymers: A New Avenue for the Development of Laccase Biosensors | Immobilization of Aspergillus niger Glucoamylase by Adsorption Method on Carboxylated Multi Walled Carbon Nanotubes |
| **18:25-18:30** | **(OP98) Münevver Tuna Genç** | **(OP115) Seda Ağçam** | **(OP132) Yasemin Subaşı** |
| | NIR-Light-Driven Antibacterial Activity of Green Recycled Thermally Exfoliated Graphene Oxide (TEGO) Combined with ZnO | Investigation of Different Extraction Methods Applied to Olive Leave Grown in Hatay on the Amount of Secoiridoite Component and the Effect of Antioxidant Activity | Nanorelease Systems For Neurodegenerative Diseases Treatment |
| **18:30-18:35** | **(OP99) Münteha Nur Sonuç Karaboğa** | **(OP116) Seda Kılınç** | **(OP133) Yunus Ensari** |
| | Quartz-Tuning Fork-Based Mass Sensitive Immunosensor Design for The Determination of Synuclein Alpha, a Parkinson's Disease Biomarker | Synergistic Anti-apoptotic Effects of L-DOPA and Quinic Acid on Dopaminergic SH-SY5Y Cells in Rotenone-Based Parkinson's Disease Model | Identification and Heterologous Expression of a Novel P450 Monooxygenase from Streptomyces avermitilis |
| **18:35-18:40** | **(OP100) Naci Polat** | **(OP117) Sevgi Donat** | **(OP134) Yusuf Aslan** |
| | Analysis of Glutathione Level in Plasma by Micro-fluidic System | The Effect of Exogenous Glycine-Betaine Application on Some Biochemical Parameters of Two Wheat Varieties Under Short-Term Drought Stress | Constructing A Hybrid Biosensing System to Improve Nanoplasmonic Signals |
| **18:40-18:45** | **(OP101) Nazan Gökşen** | **(OP118) Sinan Kandır** | **(OP135) Ahmad Ali** |
| | Theoretical Approach to the Effect Time of Some Essential Oils | Adipose-Derived Mesenchymal Stem Cells Treatment in Cats with Chronic Kidney Disease: Evaluation of Laboratory Parameters | Natural Products Suppress The Glucose Toxicity During Diabetes |
| **19:00-20:00** | **Poster Presentations** | | ***Mirage I*** |
| **20:00-** | **Dinner** | | |

# November 06, 2022 Sunday

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|---|---|---|
| **Session 10 – Chair: Assist. Prof. Hasan DEMİRCİ** | | ***Mirage I*** |
| **09:00-09:35** | **Invited Speaker (IS10) Prof. Hüseyin ŞEKER** | |
| | "Bioinformatics: The Power of Data and The Things It Empowers" | |
| **09:35-09:50** | **Oral Presentation (OP29) Hichem MOULAHOUM** | |
| | Nanoencapsulation of Artemisia herba alba Extract Prevents Glycoxidation-Related Liver Cell Damages Through Cell Signaling Modulation | |
| **09:50-10:05** | | |
| | | |
| **10:05-10:20** | **Oral Presentation (OP31) Serdar KARAKURT** | |
| | After the metastasis: Inhibitory Properties of Scorpio Venoms on Colony Formation Properties of Human Colorectal Carcinoma Cells | |
| **10:20-10:35** | **Oral Presentation (OP32) Utku KUTOĞLU** | |
| | Provide the Highest Level of Optimization with the Temperature Gradient Feature in PCR Reactions | |
| **10:35-10:55** | **Coffee Break** | |
| **Session 11 – Chair: Prof. Azra BOZCAARMUTLU BÜKEN** | | ***Mirage I*** |
| **10:55-11:30** | **Invited Speaker (IS11) Prof. Uğur SEZERMAN** | |
| | "Applications of Omics Technologies in Personalized Medicine" | |
| **10:30-11:45** | | |
| | | |
| **11:45-12:00** | **Oral Presentation (OP34) Beste TURANLI** | |
| | Comparative Study on Understanding Molecular Signatures of ALL and Philedelphia Positive ALL in Adults | |
| **12:00-12:15** | **Oral Presentation (OP35)** Özge Kozguş Güldü | |
| | Development of Electrospun Nanofibers as a Vascular Graft | |
| **12.15-12.30** | | |
| | | |
| **12:30-13:30** | **Closing Session** | |
| | **Awards for Poster Presentation** | |
| | **Closing Ceremony** | |

*This Congress is supported by TUBITAK with 2223-B Support Program for Scientific Activities

# TITLE OF PRESENTATIONS

## INVITED SPEAKER (IS)

| | | |
|---|---|---|
| IS1 | **Wolfgang Fritzsche** | Bioanalytics Using Plasmonic Nanostructures |
| IS2 | **Sandra Citi** | Mechanoregulation for Epithelial Homeostasis |
| IS3 | **David Mark Shore** | Ribosome Biogenesis and Cellular Proteostasis |
| IS4 | **İbrahim Tarık Özbolat** | 3D Bioprinting of Living Tissues and Organs |
| IS5 | **Hasan Demirci** | Time-Resolved Serial Femtosecond X-ray Crystallographic Studies of Ribosome Complexes |
| IS6 | **Gregor Anderluh** | Nanopores for Sensing Applications |
| IS7 | **Arben Merkoçi** | Nanobiosensors: How to Design and Apply These Devices in Diagnostics |
| IS8 | **Rita Casadio** | EC Number Annotation: How to Predict the Enzyme Function |
| IS9 | **Bekir Salih** | The Power of Ion Mobility-Mass Spectrometry for Structural Characterization and Conformational Analyses of Therapeutic Drugs |
| IS10 | **Hüseyin Şeker** | Bioinformatics: The Power of Data and the Things It Empowers |
| IS11 | **Uğur Sezerman** | Applications of Omics Technologies in Personalized Medicine |

## ORAL PRESENTATION (OP)

| | | |
|---|---|---|
| **OP01** | Özge Uğurlu | Development and Characterization of FosB Transcription Factor-Specific DNA Aptamers |
| **OP02** | Emel Başak Gencer | Investigation of Combined Autophagy Pathway Modulation and HDAC Inhibition and the Effect of PTEN Silencing on Cisplatin Resistant Cholangiocarcinoma Cells |
| **OP03** | Duygu Dursunoğlu | A Poor Prognostic Factor in Pancreatic Cancer: Insulin-Like Growth Factor Receptor (IGF-IR) is Inhibited by Juglone |
| **OP04** | Ozan Yeşiltepe | Development of Bioactive Wound Dressing Materials Based on Cellulose Acetate Nanofibers |
| **OP05** | Zeynep Güner Yılmaz | Single-Walled Carbon Nanotube Doped Pectin Hydrogels for Biomedical Applications |
| **OP06** | Burak Dağdelen | Editing of R555W Mutation in the TGFBI Gene Related to GCD1 in Peripheral Blood Mononuclear Cells using CRISPR/CAS9 Technology |
| **OP07** | Burak Derkus | Biomolecular Differences in Normal and Pathological Cerebral Organoids |
| **OP08** | Fatma Aydınoğlu | Inhibition of Pathogenicity of Maize Fungal Pathogen *Fusarium verticillioides* by Targeting CYP51 Gene Based on Host-Induced Gene Silencing Approach |
| **OP09** | Gosia Poczopko | Small Molecule Effectors Of The MYC/MAX Oncogene |
| **OP10** | Banu Kocaaga | Evaluation of Pectin-Based Sustained-Release, Hemostatic, Shear Thinning Hydrogels for Wound Healing Applications with In Vitro, In Silico, and In Vivo Approaches |
| **OP11** | Barış Güliçli | In silico Modeling of Shear Stress and Pressure Applied to Cells at Different Nozzle Diameters and Printing Speeds in 3D Bioprinting |
| **OP12** | Ahu Arslan Yildiz | A New Generation Hydrocolloid Bioink for 3D Bioprinting |
| **OP13** | Ismail Eş | Xenon Difluoride Dry Etching for the Microfabrication of Solid Microneedles As a Potential Strategy in Transdermal Drug Delivery |
| **OP14** | Yeşeren Saylan | Biomimetic Plasmonic Sensors for Environmental Monitoring |
| **OP15** | Neşe Ayşit | Neuronal Differentiation and Neurite Orientation on Gold Nanoparticle Decorated, Micro/Nano-channeled PCL/PLGA Film Scaffolds |
| **OP16** | Fatih Inci | Extracellular Vesicles: From Nano-sized Dust to Deciphering Agents for Disease Diagnostics |
| **OP17** | Canan Özyurt | Development of an Immunochromatographic Test for Sensitive and Selective Detection of Haptoglobin |
| **OP18** | Öznur Çopur | Development of Rapid Test Method for Semi-Quantitative Measurement of Total Glycosaminoglycan in Urine |
| **OP19** | Özgecan Erdem | MIP-on-chip Synthesis of BSA Imprinted Nanoparticles |
| **OP20** | Mustafa Kemal Sezgintürk | A Novel Electrochemical Approach to Biosensing Applications: Quartz Tuning Forks as Working Electrodes for Immunosensors |
| **OP21** | Okan Zenger | Preparation of Molecularly Imprinted Nanoparticle Based SPR Sensors for Angiotensin-II Detection from Human Serum |
| **OP22** | ATABAY | |
| **OP23** | Frank Hollmann | Haloperoxidases: Promising Catalysts for Chemical Synthesis |
| **OP24** | Yunus Ensari | Molecular Cloning, Expression and Characterization of a Thermophilic α-glucuronidase from *Geobacillus kaustaphilus* |
| **OP25** | Dilek Çam Derin | Detection of 2019-nCoV_N2 of SARS CoV_2 by Lateral Flow Assay |
| **OP26** | Esma Menevşe | Determination of Tamoxifen by Liquid Chromatography-Tandem Mass Spectrometer |

| ORAL PRESENTATION (OP) | | |
|---|---|---|
| **OP27** | Kadriye Büşra Karatay | Investigation of Antimicrobial Effects of Organic Antibiotic |
| **OP28** | Yeliz Yavuz Çevik | Fast screening of pesticides by Raman spectroelectrochemistry based on EC-SERS effect |
| **OP29** | Hichem Moulahoum | Nanoencapsulation of *Artemisia herba alba* Extract Prevents Glycoxidation-Related Liver Cell Damages Through Cell Signaling Modulation |
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| **OP31** | Serdar Karakurt | After the metastasis: Inhibitory Properties of Scorpio Venoms on Colony Formation Properties of Human Colorectal Carcinoma Cells |
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| **OP34** | Beste Turanlı | Comparative Study on Understanding Molecular Signatures of ALL and Philedelphia Positive ALL in Adults |
| **OP35** | Özge Kozguş Güldü | Development of Electrospun Nanofibers as a Vascular Graft |
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| **OP37** | Abdussamat Güzel | Anti-aging effect of *Echinops pungens* Against Neurodegenerative and Oxidative Stress |
| **OP38** | Ahmet Burak Altınsöz | Anti-adipogenic and Anti-obesogenic Effects of Pterostilbene in 3T3-L1 Preadipocyte Models |
| **OP39** | Ahmet Çetin | Simultaneous Administration of Ginkgo biloba Leaves Extract and L-DOPA Protects Against Rotenone-induced Neurotoxicity in SH-SY5Y Cells |
| **OP40** | Ahsen İlkyaz Yumuşak | Immobilization of β-galactosidase onto Tri-component Electrospun Nanofiber Supports and Its Stability Applications |
| **OP41** | Aslı Göçenoğlu Sarıkaya | Determination of Biological Activities of Lichen Species from Domaniç |
| **OP42** | Aykut Özgür | Green Synthesized Iron Nanoparticles Induced Apoptotic Pathways in Breast Cancer Cell Lines by Inhibition of Heat Shock Proteins |
| **OP43** | Aylin Öner | Evaluation of the Phenolic Profiles and Biological Properties of *Micromeria graeca* and *Micromeria myrtifolia* from Turkey |
| **OP44** | Bahar İnce | A Lateral Flow Assay in Competitive Format for the Quantitative Detection of Soluble Interleukin 1 Receptor-like 1 |
| **OP45** | Banu Kocaağa | Self-Healing and Shape-Fitting Pectin-Zeolite Hydrogels with Controlled Allantoin Delivery |
| **OP46** | Nur Tarımeri | A Novel electrochemical Biosensor Design Based on 3-MPDS for Early Detection of AFB1 |
| **OP47** | Betül Çiçek | The Combination Levodopa/P-coumaric Acid Attenuates Neurotoxicity in Rotenone-induced SH-SY5Y Cells |
| **OP48** | Burcu Özcan | An Innovative and Low-cost Electrochemical Biosensing System for Detection of Alphafetoprotein Protein: A Potential Biomarker for Ovarian Cancer |
| **OP49** | Burçak Demirbakan | A Highly Sensitive Immunosensor System Based on Benzoquinone for Cardiac Troponin T Detection on ITO-PET Electrode |
| **OP50** | Büşra Karkar | The Improvement of Viability of *Lactobacillus casei* by Freeze-drying Method |
| **OP51** | Büşra Nur Baygın | Detection of Creatine Kinase by Using a Disposable Immunosensor Based on Indium Tin Oxide Covered Flexible Electrodes |
| **OP52** | Canan Sapmaz | Alteration of Cytochrome P450 Enzyme Activities with Caffeine and Cotinine in Rainbow Trout (Oncorhynchus mykiss) |
| **OP53** | Cenk Erdogan | Effect of Conductivite Polymer Coatings Containing Olive Leaf Extract On Biofoulung and Corrosion |
| **OP54** | Ceyda Ozen | Improving the Mechanical Properties of Fine-Grained Soils by a Biopolymer |
| **OP55** | Berivan Arın Öztürmen | Synthesis and α-Glucosidase, Cholinesterases, Tyrosinase Enzyme Inhibition Properties of Silicon(IV), Copper(II), Manganese(III) Phthalocyanines |
| **OP56** | Alper Akkaya | Antimicrobial Peptide Production from Lactic Acid Bacteria |

| ORAL PRESENTATION (OP) | | |
|---|---|---|
| **OP57** | Çağla Akkol | Preparation of Graphitic Carbon Nitride/Cobalt Phthalocyanine As Photocatalyst for 4-nitrophenol Photoxidation |
| **OP58** | Serdar Karakurt | Investigation of the Expressions of AGTR-1 and AGTR-2 that are Involved in Aldosterone Metabolism in Rat Tissues by Immunochemical Methods |
| **OP59** | Demet Kizil | Inhibitory Effects of Herbal Extracts on ACHEs Purified from *Ricania simulans* |
| **OP60** | Didem Mimiroglu | Surface Nanotopography Enhances Cellular Spreading |
| **OP61** | Dilek Göktürk | L-Methioninase: A Potential Therapeutic Enzyme in Cancer Treatment |
| **OP62** | Ecem Uzman | An Ultrasensitive Electrochemical Biosensor System for Selective Detection of Aflatoxin B1 In Real Food Samples |
| **OP63** | Eda Günay | Effects of Exogenous Nitric Oxide (SNP) on Drought Tolerance in Two Wheat Varieties |
| **OP64** | Elif Burcu Aydın | Label-free Detection of CYFRA 21-1 Lung Cancer Biomarker Using Gold/Amino-Substituted Poly(pyrrole) Polymer Modified Disposable Electrode |
| **OP65** | Elif Esin Hameş | Oxidation of Bacterial Cellulose for Biodegradable Cartilage-Bone Tissue Engineering Scaffolds |
| **OP66** | Esra Aygün Alçiçek | Purification of Laccase from *Bacillus licheniformis* SO8 with Three-Phase Partitioning, Characterization, and Usage in Dye Decolorization |
| **OP67** | Eylül Gülşen Yılmaz | Isolating and Detecting Extracellular Vesicles on Microfluidic Chips and Metamaterial Sensors |
| **OP68** | Ezgi Man | Development of DNA Aptamers for Inhibition of Histone Deacetylase-10 (HDAC10) Activity |
| **OP69** | Fatma Aydınoğlu | Photodynamic Inactivation (PDI) of Maize-Pathogenic Fungus *Fusarium verticillioides* with Novel BODIPY Photosensitizer |
| **OP70** | Fatmanur Keleş | Protective Effect of Parthenolide on Paclitaxel-Induced Liver Toxicity |
| **OP71** | Fevzi Topal | *Terminalia citrina* Roxb. Ex. Fleming Determination of Antioxidant Capacity, Phenolic Content and Investigation of Their Effects on Cholinesterase Enzymes |
| **OP72** | Fulya Öz Tuncay | *Crataegus prunifolia*: Phenolic Profile, Antioxidant and Enzyme Inhibition Properties |
| **OP73** | Fulya Özdemir | Evaluation of Biochemical Parameters of Laccase Enzyme Immobilized on Various Clay Minerals According to Free Enzyme |
| **OP74** | Gamze Baltacıer | An Investigation of Antioxidant Enzyme Activities in Some Barley Varieties Under Drought Stress |
| **OP75** | Burhan Ateş | The Use of PCL/PEG-Based Electrospun Membranes in Lateral Flow Sistems to Increase the Sensitivity in Analysis of Biological Samples |
| **OP76** | Hamiyet Köse | The Relationship of Zinc Deficiency and Supplementation On Testis and Liver Relaxin Family Peptides, Oxidant System and Testosterone Levels in The Male Offspring of Pregnant Rats Fed with Zinc Deficient Diet |
| **OP77** | Hasan İlhan | Fluorescence Based Immunoassays Using Quantum Dot Labelled Antibody for Detection of *E. Coli* |
| **OP78** | Hilal Fazlı | Synthesis of New Water Soluble Cu(II) and Mn(III) Phthalocyanines and Investigation of Their Photocatalytic Activities on the Photoxidation of Benzyl Alcohol |
| **OP79** | İlke Karakaş | Antimicrobial and Antioxidant Activities of Silver Nanoparticles Synthesized from Plantago lanceolata Leaves |
| **OP80** | İlkyaz Patır | Effect of Synthetic and Natural Polymer Coating on Characteristics and Bioaccessibility of Galangin-loaded Liposomes |
| **OP81** | İnci Uludağ | Activation of ITO Surface by Hexamethylene Diisocyanate for the Development of a Disposable Immunosensor: Ultrasensitive and Low-cost Detection of Neuropeptide Y |
| **OP82** | İpek Canatar | Investigation of the Effect of *Bolanthus turcicus* Raw Extracts on Head and Neck Cancer Cells |
| **OP83** | İpek Ertuğrul | Decellularized Skin and Its Biomedical Applications |
| **OP84** | Raziye Ozturk Urek | Determination of Phenolic Compositions, Antioxidant and Cytotoxic Activities of five Teucrium species from Turkey |
| **OP85** | Kübra Karadaş Gedik | Curing Of Polyurethane-Acrylate Structures By Nir Light For Biomedical Applications |

| ORAL PRESENTATION (OP) | | |
|---|---|---|
| **OP86** | Kübra Sayarım | Silver Nanoparticles from The Brown Algae Cystoseira barbata: An Optimization Study and Their Characterization |
| **OP87** | | |
| **OP88** | Lale Huseynova | The Antioxidant Feature of Udi Hindi Plant |
| **OP89** | Mehmet Melih Tatlısöz | Protein Adsorption on Spherical Nanoparticles with Different Surface Roughness Shapes |
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| **OP100** | Naci Polat | Analysis of Glutathione Level in Plasma by Micro-fluidic System |
| **OP101** | Nazan Gökşen | Theoretical Approach to the Effect Time of Some Essential Oils |
| **OP102** | Nazlı Şimşek | Electrochemical Sensor Based on a CeO2/AuNPs-P-(L-Lysine) Composite for Simultaneous Determination Dopamine and L-Tyrptophan |
| **OP103** | Nazli Ece Varan | Covalent Immobilization of Xylanase on Modified Nickel-Multi-walled Carbon Nanotube Particles for Synthesis of Xylooligosaccarides |
| **OP104** | Nur Melis Kılıç | Nonsteroidal Anti-inflammatory Drug Removal Using Electrospun Nanofibers for Environmental Biotechnology |
| **OP105** | Ömer Işıldak | New Potentiometric Biosensor for Total Phenolic Assay |
| **OP106** | Ömer Işıldak | A Potentiometric Biosensor for the Determination of Valproic Acid in Human Blood Samples |
| **OP107** | Berfin Vural | A Disposable and Sensitive Immunosensor for Detection of HE4 |
| **OP108** | Özge Çağlar | Immobilization of Candida Rugosa Lipase Encapsulated within Quantum Dots-MOF Nanostructure Composites |
| **OP109** | Özge Kapusız | Everzol Blue Biosorption Capaity of Organic Wastes |
| **OP110** | Pırıl Arısoy | Antimicrobial Activity of Tannic Acid Loaded Discs |
| **OP111** | Rahime Altıntaş | Antioxidant, Anti-Inflammatory and Anti-Aptototic Effects of Black Mulberry (*Morus nigra* L.) Fruit Against Cisplatin-Induced Kidney Damage in Rats |
| **OP112** | Kardelen Cemek | Preparation of Stigmasterol Imprinted Solid Phase Extraction Polymers for Recognition of Stigmasterol from Plant Extracts |
| **OP113** | Resul Adanaş | The Investigation of In Vitro Effect of Ascorbic Acid (vitamin C) and Reduced Nicotinamide Adenine Dinucleotide (NADH) on Acetylcholinesterase Enzyme (AChE; EC 3.1.1.7) in Human Plasma |
| **OP114** | Saniye Soylemez | Combined Architectures of Nanomaterials and Polymers: A New Avenue for the Development of Laccase Biosensors |

## ORAL PRESENTATION (OP)

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| **OP115** | Seda Ağçam | Investigation of Different Extraction Methods Applied to Olive Leave Grown in Hatay on the Amount of Secoiridoite Component and the Effect of Antioxidant Activity |
| **OP116** | Seda Kılınç | Synergistic Anti-apoptotic Effects of L-DOPA and Quinic Acid on Dopaminergic SH-SY5Y Cells in Rotenone-Based Parkinson's Disease Model |
| **OP117** | Sevgi Donat | The Effect of Exogenous Glycine-Betaine Application on Some Biochemical Parameters of Two Wheat Varieties Under Short-Term Drought Stress |
| **OP118** | Sinan Kandır | Adipose-Derived Mesenchymal Stem Cells Treatment in Cats with Chronic Kidney Disease: Evaluation of Laboratory Parameters |
| **OP119** | Sinem Tümük | Biopoliols Strengthened With Natural Clay Minerals |
| **OP120** | Sümeyye Akbulut | Determination of Food Safety of Bacteriocin Producing Lactic Acid Bacteria Isolated from White Cheese |
| **OP121** | Ekrem Köksal | Investigation of in Vitro Cytotoxic Effects of Some Secondary Metabolites from *Scrophularia subaequiloba* |
| **OP122** | Cemalettin Alp | Investigation of The Biological Activities of Different Extracts of *Lallemantia canescens* (L) Fisch Et. Mey. |
| **OP123** | Şeyma Şentürk | An Immunosensor Based on QTFs as a Working Electrodes for Kidney Injury Molecule-1 |
| **OP124** | Şükran Günaydın | Evaluation of Thioredoxin Reductase 1-Targeted Anticancer Effect of Evernic Acid on Human Lung Cancer A549 Cell Line |
| **OP125** | Tülay Koç Delice | Determination of Epinephrine by Voltammetric Method Using Carbon Paste Electrode Decorated with Modified CuO Nanoparticles |
| **OP126** | Uğur Durmuş | Investigation of Synergistic Anticancer Effects of Sorafenib and Deinoxanthin on Huh7 Hepatocellular Carcinoma Cell Line |
| **OP127** | Ummuhan Çakmak | Evaluation of the Bioactive Constituents, Antioxidant and Enzyme Inhibitory Activities of *Rhaphiolepis indica* (L.) Lindl. |
| **OP128** | Umut Mengüllüoğlu | Enzymatic Biosensor Based on Dendrimer Modified Surfaces for Detection of Oxidant Species |
| **OP129** | Veyis Karakoç | Ion imprinted Based Polymeric Iron Chelator for Acute Iron Poisoning |
| **OP130** | Yakup Akkoç | Change of Activity Values of Combi CLEA (GA+GI) and Free (GA+GI) Depending on Ionic Liquid Environment |
| **OP131** | Yakup Aslan | Immobilization of *Aspergillus niger* Glucoamylase by Adsorption Method on Carboxylated Multi Walled Carbon Nanotubes |
| **OP132** | Yasemin Subaşı | Nanorelease Systems For Neurodegenerative Diseases Treatment |
| **OP133** | Yunus Ensari | Identification and Heterologous Expression of a Novel P450 Monooxygenase from *Streptomyces avermitilis* |
| **OP134** | Yusuf Aslan | Constructing A Hybrid Biosensing System to Improve Nanoplasmonic Signals |
| **OP135** | Ahmad Ali | Natural Products Suppress The Glucose Toxicity During Diabetes |

## POSTER PRESENTATION (PP and OP)

| | | |
|---|---|---|
| **PP01** | Abdussamat Güzel | Evaluation of *Telephium imperati* L. in terms of Antioxidant Activity |
| **PP02** | | |
| **PP03** | Ahmet Cetinkaya | Design and Production of Surface Modified Molecular Imprinted Polymer-Based Electrochemical Sensor with Photopolymerization for the Determination of Molnupiravir |
| **PP04** | Ahmet Cetinkaya | An Electrochemical Sensor Based on a Molecularly Imprinted Polymer for Determination of Antiviral Drug Umifenovir |
| **PP05** | Ali Tuncay Özyılmaz | Investigation of the Anticorrosive and Antifouling Effect of Different Ni Concentrations CrNi Coatings on AISI 316L Steel |
| **PP06** | Alper Akkaya | Coating and Biological Characterization of Implant Surfaces with Vancomycin Loaded PHBV |
| **PP07** | | |
| **PP08** | Anıl Yılmaz | Pectin-Arginine Films for Biomedical Applications |
| **PP09** | Anne-Kathrin Dietel | LSPR-Based Biosensing Enables the Detection of Antibiotic Resistance Genes |

| POSTER PRESENTATION (PP and OP) | | |
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| **PP10** | Ayça Bal Öztürk | Eggshell Incorporated GelMA/KondMA/HyMA/ Biocomposite Scaffolds with Improved Performance for Tissue Engineering Applications |
| **PP11** | Ayşe Başak Çakmen | Preparation and Application of Allantoin Containing Polyurethane/Polycaprolactone Based Antibacterial Wound Dressing Materials by Electrospinning Method |
| **PP12** | Ayşe Dinçer | Green Synthesis of Copper Nanoparticles via *Sambucus nigra* Extract and Investigation on Its Photocatalytic and Antioxidant Activity |
| **PP13** | Ayşegül Tanrıverdi | Silk Fibroin Hydrogel as Corneal Tissue Adhesive: In-Vitro and Ex-Vivo Assessment |
| **PP14** | Azra Bozcaarmutlu Büken | Determination of Antioxidant System and Xenobiotic Metabolizing Enzyme Activities in Rainbow Trout (*Oncorhynchus mykiss*) Treated with Mifepristone |
| **PP15** | Zeynep Yağmur Babaoğlu | Structure- Based Virtual Screening for Finding Novel Microsomal Prostaglandin E Syntase-1 (mPGES-1) Inhibitors |
| **PP16** | Bengi Özkahraman | Development of Chitosan and Methacrylated Poly(vinyl alcohol) with Au Nanoparticles as Wound Dressings |
| **PP17** | Burak Dağdelen | Designing and Constructing of CRISPR/Cas9 Tools to Edit R273H Mutation of TP53 Gene in Pancreatic Cancer |
| **PP18** | Burcu Akar | Synthesis and Characterization of Electrospun PCL-Halloysite Composite for Teicoplanin Delivery |
| **PP19** | Burcu Okutucu | From Waste to Food Packing: A Biobased Hydrogel Films from Pineapple Peel Waste |
| **PP20** | Burcu Okutucu | Textile Application of Bromelain Enzyme Isolated from Pineapple Waste |
| **PP21** | Burhan Bora | Aptamer Based Fluorescent Assay for Allergen Detection in Food Samples |
| **PP22** | Buse Semerci | The Composite Microbeads of Alginate, Carrageenan, Gelatin, and Poly-(Lactic-co-Glycolic Acid): Swelling, Cefaclor Loading and Release |
| **PP23** | Büşra Bakar | Synthesis and Characterization of Amino Functionalized Magnetic Mesoporous Hybrid Nanoflowers as Popular Carrier Support: Its Evaluation for Horseradish Peroxidase Immobilization |
| **PP24** | Ceyda Kula | RNA-based Screening of Antimicrobial Resistance: A Case Study on *Pseudomonas aeruginosa* |
| **PP25** | Ceyda Kula | Investigation of the Inhibition of *Pseudomonas aeruginosa* Type IV Pili Elongation ATPases to Prevent Biofilm Formation |
| **PP26** | Ceyda Ozen | Production of Salicylic Acid and Production Optimization |
| **PP27** | Davut Aksüt | Effect of Amount of Different Types of Borax on Antimicrobial Effects of Vulcanized poly(Epichlorohydrin) Elastomer |
| **PP28** | Dilek Unal | Investigation of In Vitro and In Silico Effects of Brown Algae Extracts on Cholinergic Enzymes Activity |
| **PP29** | Dilek Unal | Effects of *Ulva lactuca* Extracts on Some Properties of Different Plant-Promoting Bacteria |
| **PP30** | Ecenaz Merve Namlı | Cellulose Based PVA and Hypericum Perforatum Additive Composite Wound Healing Hydrojel Production |
| **PP31** | Elif Okutan | Preparation of Carbazole-BODIPY Photosensitizers for Targeted PDT |
| **PP32** | Elif Okutan | BODIPY-Fullerene Photosensitizers for Targeted PDT |
| **PP33** | Elif Ozyilmaz | Newly Synthesized Fluorescent Metal Organic Framework (UiO66-Nap): A Novel Platform for *Candida rugosa* Lipase Immobilization |
| **PP34** | Enes Gültekin | Nucleic Acid Based SARS CoV-2 Detection by Lateral Flow Test |
| **PP35** | Ensar EREL | Investigation of Simultaneous Melatonin and Serotonin Selective Properties of Screen Printed Carbon Electrode Modified with Floruene-Based Poliimid in Electrochemical Sensor Application |
| **PP36** | Esra Başaran | Interference with the Structure and Dynamics of Type 4 Pilins (T4P) |
| **PP37** | Esra Tanrıverdi Eçik | Preparation of Novel Cyclotriphosphazene Derivatives for Biological Applications |
| **PP38** | Fatih Tozoğlu | Advantages of the Microwave Method Used to Obtain Essential Oils |
| **PP39** | Fevzi Topal | Novel Schiff Base Metal Complexes as Cholinesterase Inhibitors |
| **PP40** | Fulya Oz Tuncay | New Piperazine Derivatives: Synthesis, Anti-Tyrosinase Activity and Molecular Docking Studies |
| **PP41** | Funda Kartal | Immobilization of Microbial Lipase by Conformational Engineering Approach and Investigation of Industrial Potential of Immobilized Enzyme |
| **PP42** | Gizem Bayaçlı | Determination of Phenolic Compounds in Avocado (*Persea americana*) and Their Antioxidant Effects on DNA Oxidation System |
| **PP43** | Gözde Aydoğdu Tığ | Development of an Electrochemical Labelled Aptasensor for Determination of Organophosphorous Pesticide Chlorpyrifoa |
| **PP44** | Gül Özyılmaz | Marine Antifouling Properties of Enzyme Modified Polyaniline Coated Stainless Steel Surface |
| **PP45** | Gülderen Karakuş | Thermal and Viscoelastic Peculiarities of Poly(maleic anhydride-alt-vinyl acetate)/Clay Nanoarchitectures |

| POSTER PRESENTATION (PP and OP) | | |
|---|---|---|
| **PP46** | Hamiyet Köse | Determination of ATP, ADP and AMP Concentrations with High Performance Liquid Chromatography |
| **PP47** | Hatice Paluzar | Production of High Quality Biodiesel from Sunflower Acid Oil Obtained by Acidulation of Soap Stock from the Refining Process: Immobilized Pancreatic Lipase for Biodiesel Production |
| **PP48** | Hilal Arikoğlu | Juglone-Selenium Combination Inhibits Epthelial-Mesenchymal Transition, the Critical Step of Metastasis, in Pancreatic Cells |
| **PP49** | Hülya Yağar | Impidimetric Response of GDF-15 Immunobiosensor Designed on Some Gold Electrodes |
| **PP50** | Hüseyin Alkan | Determination of essential oil and aroma content of Satureja hortensis species and investigation of biological activity |
| **PP51** | İbrahim Türkekul | Potentiometric Determination of Antioxidant Activities of Two Edible Wild Mushrooms |
| **PP52** | İbtissem Rahim | Curcumin Alleviates Oxidative Stress and Restores Liver and Pulmonary Damage Induced by Polymicrobial Sepsis in Mice |
| **PP53** | İlke Karakaş | Green Synthesis of Silver Nanoparticles Using *Ocimum basilicum* L. and Investigation of Their Antimicrobial and Antioxidant Activity |
| **PP54** | İlyas Özçiçek | Enhanced Axonal Guidance of DRG Sensory Neurons on Gold Nanorod Modified, Conductive Micro/Nano-channeled PCL/PLGA Scaffolds |
| **PP55** | Kader Kelle | CMC (Carboxymethyl Cellulose) – CHI (Chitosan) Based Hydrogel Beads for Removal of Cibacron Red-238 Dye |
| **PP56** | Karya Akbıyıkoğulları | Pectin-Faujasite Based Hydrogels |
| **PP57** | Kazım Yalçın Arga | Transcriptomics-Based Drug Repurposing Unravels Novel Therapeutic Strategies in AML |
| **PP58** | Kübra Işık | Purification of Glutathione Reductase Enzyme from Scorpion Fish (Scorpaena porcus) Liver Tissue and Investigation of Some Heavy Metal Inhibition Kinetics |
| **PP59** | Kübra Sayarım | Antioxidant Activity of Liposomal Formulation of Ethanol and Aqueous Extracts of *Ulva lactuca* |
| **PP60** | Lale Huseynova | The Selective Transport of Ions and Organic Compounds into the Cells by Positively Charged Channel Forming Polyene Macrolide Antibioticso |
| **PP61** | Merve Goksin Karaaslan Tunc | Effect of the Molecular Weight of Diols on Waterborne Dextran-Based Polyurethane Biometarial |
| **PP62** | Meryem Topal | Metal Complexes of Novel Schiff Base: Evaluation of the Cholinesterase Inhibitory Activities |
| **PP63** | Mesut Işık | Synthesis and Characterization of Novel Triazol-Oksadiazol-Sulfonamid Derivatives: Determination of Their Antidiabetic and Radical Scavenging Activities |
| **PP64** | Metin Ak | Conducting Polymer Design for Optoelectronics and Sensor Applications |
| **PP65** | Mine Aksoy | Synthesis of Quinazoline Derivatives with New Phenolic Moieties; In Vitro and In Silico Evaluations as Alternative Catechol Oxidase Inhibitors |
| **PP66** | Muhammet Aydın | A Label-Free and Disposable Immunosensor for Detection of GM2 Activator Protein, A New Biomarker of Lung Cancer |
| **PP67** | Mustafa Akbulut | Preparation and Characterization of Magnetic Dual Enzyme-Inorganic Hybrid Nanoflowers |
| **PP68** | Münevver Müge Çağal | Antibacterial Activity of Liposomal Formulation of Ethanol Extract of *Codium sp.* |
| **PP69** | Nabila Tounsi | Seeds Aglycone Extracts from *Lepidium sativum* and *Eruca vesicaria Linn.* Modulates Neutrophil Nitro-oxidative Functions *in Vitro* |
| **PP70** | Natavan Bakhshaliyeva | About Biochemical Content of Persimmon Fruits Spread in Sheki - Zakatala Region |
| **PP71** | Nazlı Ece Varan | Immobilization of L-Asparaginase on Magnetic Nanoparticles |
| **PP72** | Nur Deniz Bingül | Colloidal Bacterial Cellulose for UV Protection |
| **PP73** | Nurgül Abul | Investigation of Inhibition Effects of Some Sulfanilamide Derivatives on Horseradish (*Armoracia rusticana)* Peroxidase |
| **PP74** | Nurşah Hüma Tatoğlu | Inhibitory effects of some compounds on ACHEs purified from *Ricania simulans* |
| **PP75** | Ömer İrfan Küfrevioğlu | Affinity Gel Synthesis from p-Aminobenzoic Acid Derivative Compound and Purification of Polyphenol Oxidase from Different Herbal Sources |
| **PP76** | Ömer İrfan Küfrevioğlu | Purification of Lipoxygenase Enzyme from Quinoa (*Chenopodium Quinoa Willd.*) and Investigation of the Inhibition Effects of Some Newly Synthesized Schiff Bases on Enzyme Activity |
| **PP77** | Rukiye Ayrancı | Design of a New Type and Multifunctional Micromotor: Synthesis, Characterization, and Selective Heavy Metal Detection |
| **PP78** | Sena Pişkin | Collagen Based Nanobubbles for Controlled Drug Release |
| **PP79** | Donghong JU | Principles and Biological Functions of Cotranslational Protein Degradation |
| **PP80** | Sezgin Gündüz | Capsaicin Purification From Samandağ (Hatay) Pepper With Affinity Chromatography |
| **PP81** | Soyun Meredov | Antifungal Activity of *Achillea sintenisii* and *Pyrus elaeagnifolia* Pallas Extracts Determination |

| POSTER PRESENTATION (PP and OP) | | |
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| **PP82** | Süeda Kıska | Synthesis of Magnetic Egg White Hybrid Nanoflower |
| **PP83** | Şebnem Gül İlarslan | Preparation of Copper (II) Phthalocyanine Poly(Cresol Red) Composite Electrode for Voltammetric Determination of Antimony |
| **PP84** | Şebnem Selen İşbilir | Determination of Tryptophan Pathway Metabolites in Hardaliye, an Fermented Beverage |
| **PP85** | Zehra Gül Morçimen | Development of an in vitro Gliosis Model and Comparison of Glio-Protective Effects of Various Fibrous Scaffolds |
| **PP86** | Şükrü Beydemir | Biological Evaluation of Triazolo Sulfonamide Substituted Oxime Ether Derivatives as Acetylcholinesterase Inhibitors |
| **PP87** | Şükrü Beydemir | 1,2,3-Triazole Based Sulfonamide Derivatives as Effective Inhibitors of Acetylcholinesterase Enzyme |
| **PP88** | Timuçin Güner | Computational Investigation of Tannin-Proline Interactions on Model Systems |
| **PP89** | Tuğba Taş | Determination of Novel Hsp90 Inhibitors with In Silico Drug Repurposing Approach |
| **PP90** | Ummuhan Cakmak | New Hydrazine Derivatives Containing Piperazine or Benzimidazole: Synthesis, Anti α-Amylase Activity, Molecular Docking and in vitro Cytotoxicity Activity Studies |
| **PP91** | Ümit Hakan Yıldız | NIR-II Emissive Conjugated Polymer Dots for Cell and Tissue Imaging |
| **PP92** | Yakup Kolcuoğlu | Investigation of Tyrosinase Inhibition and Antioxidant Properties of Boron Complexes Containing H, Br and NO2 Substituent Groups |
| **PP93** | Yeliz Koç Erikan | New Antenna Type Conducting Polymer: Synthesis, and Investigation of Electrochemical and Optic Properties |
| **PP94** | | |
| **PP95** | Gamze Dik | Synthesis and Characterization of Near-Infrared (NIR)-Light Triggerable Upconverting Nanoparticles to Enhance Activity of Immobilized L-Asparaginase |
| **PP96** | İdil Karaca Açarı | Development of Aliphatic Polyurethane-Based Materials with Controlled Porosity for Use in Testosterone Hormone Replacement Therapy and Investigation of Release Kinetics |

# INVITED SPEAKERS

# ABSTRACTS

# Bioanalytics Using Plasmonic Nanostructures

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Today, innovative tools for diagnostics and bioanalytics are needed, to be usable outside of dedicated laboratories and with less qualified personnel, at minimal costs.

Plasmonic nanostructures promise to provide sensing capabilities with the potential for ultrasensitive and robust assays in a high parallelization and miniaturization, and without the need for markers. Upon binding of molecules, the localized surface plasmon resonance (LSPR) of these structures is changed, and can be used as sensoric readout [1]. This is possible even on a single nanostructure level, using optical darkfield detection introduced more than 100 years ago [2], as demonstrated for DNA detection [3]. In contrast to SPR, LSPR senses only in a very thin layer (on the scale of the particle diameter), resulting in an efficient background suppression [4].

In order to multiplex this approach, an imaging spectrometer based on a Michelson interferometer has been developed, able to readout a whole array of sensors in one step [5]. On the sensor side, microarrays of gold nanoparticle spots were fabricated using spotting of pre-synthesized gold nanoparticles [6]. Such chemically synthesized particles allow for a cost-efficient generation of highly crystalline particles as nanosensors; by using microfluidic approaches, a higher quality and reproducibility can be achieved [7]. Using this microarray approach, a multiplex DNA-based detection of fungal pathogens involved in sepsis could be demonstrated [8]. DNA-based signal amplification, such as hybridization chain reaction, improves the sensitivity [9]. Beyond DNA detection, LSPR sensing is also applicable for the detection of protein targets, such as CRP [10].

**References**

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2) Angew Chem Int Ed 51, 11208 (2012)
3) J Nanopart Res 15, 1531 (2013)
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5) Analytical and Bioanalytical Chemistry 411, 1537 (2019)
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# Mechanoregulation for Epithelial Homeostasis

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Epithelial tissues line all body surfaces and cavities and play a fundamental role in absorption, secretion, exchange, and protection from pathogens. Epithelial cells are held together by cell-cell junctions, that are important for tissue integrity (adherens junctions) and to provide a paracellular barrier for ions, molecules and pathogens across epithelial sheets (tight junctions). I will review work from our laboratory showing how the major scaffolding protein of tight junctions, ZO-1, is affected in its conformation and accumulation at junctions by force generated by the actomyosin cytoskeleton, impacting on cell behavior, proliferation and barrier function homeostasis. The mechanoregulation of ZO-1 depends on its interaction with cingulin, which tethers ZO-1 to the actomyosin cytoskeleton and thus regulates the mechanical properties of the apicolateral plasma membrane.

**References:**

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2) Vasileva, E., Spadaro, D., Rouaud, F., King,, J.M., Flinois, AS., Shah, J., Sluysmans, S., Jond, L., Turner, J. R., Citi, S. *J. Biol. Chem.* **2022**, *298*, 101797.

# Ribosome Biogenesis and Cellular Proteostasis

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Ribosome biogenesis is a complex and energy-intensive process requiring tight coordination of ribosomal RNA and ribosomal protein production. Given the extremely high level of ribosome production in growing cells, defects in any step in the ribosome assembly process might cause the accumulation of unassembled ("orphan") ribosomal proteins, leading to proteotoxic stress. Indeed, we found that mutations or drugs that interfere with ribosome assembly in yeast elicit a response that we call the ribosome assembly stress response (RASTR). RASTR elicits very specific transcriptional reprogramming, characterised by the activation of the transcription factor Hsf1, which induces the transcription of genes encoding chaperones and proteasome components, and the concurrent down-regulation of ribosomal protein gene transcription through the condensation of their key activator protein Ifh1. Both Hsf1 activation and Ifh1 condensation are driven by the accumulation of orphan ribosomal proteins. Our data support a model in which the levels of newly synthesized ribosomal proteins, imported into the nucleus but not yet assembled into ribosomes, work to continuously balance Hsf1 and Ifh1 activity, thus guarding against proteotoxic stress during ribosome assembly. We speculate that RASTR is an evolutionarily ancient regulatory mechanism that may operate in mammalian cells, where perturbations in ribosome assembly have been linked to a growing number of diseases referred to as "ribosomopathies".

# 3D Bioprinting of Living Tissues and Organs

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3D Bioprinting is a disruptive technology enabling deposition and patterning of living cells in order to manufacture replacement tissues and organs for tissue engineering, regenerative medicine, disease modeling and drug screening purposes. In this talk, Dr. Ozbolat will survey the emerging field of bioprinting and its impact on medical sciences. In the first part of his seminar, he will present a wide range of 3D bioprinting efforts in manufacturing of tissue/organ substitutes performed in his laboratory in the last nine years. In the second part, he will present a new bioprinting technique, called aspiration-assisted bioprinting, for fabrication of various tissue types. Finally, he will demonstrate a new intraoperative bioprinting approach in order to repair composite soft/hard tissues during craniofacial reconstruction on a rat model in a surgical setting.

# Time-Resolved Serial Femtosecond X-ray Crystallographic Studies of Ribosome Complexes

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High-resolution ribosome structures determined by cryo X-ray crystallography have provided important insights into the mechanism of translation. Such studies have thus far relied on large ribosome crystals kept at cryogenic temperatures to reduce radiation damage. Here I will describe the application of serial femtosecond X-ray crystallography (SFX) using an X-ray free-electron laser (XFEL) to obtain diffraction data from ribosome microcrystals in liquid suspension at ambient temperature. 30S ribosomal subunit microcrystals programmed with decoding complexes and bound to either antibiotic compounds or their next-generation derivatives diffracted to beyond 3.4 Å resolution. Our results demonstrate the feasibility of using SFX to better understand the structural mechanisms underpinning the interactions between ribosomes and other substrates such as antibiotics and decoding complexes. We have also determined the structure of large (50S) ribosomal subunit in record-short time by using record-low amount of sample during and XFEL beamtime. This structure is the largest one solved to date by any FEL source to near-atomic resolution (3 MDa). We expect that these results will enable routine structural studies, at near-physiological temperatures, of the large ribosomal subunit bound to clinically-relevant classes of antibiotics targeting it, e.g. macrolides and ketolides, also with the goal of aiding development of the next generation of these classes of antibiotics. Overall, the ability to collect diffraction data at near-physiological temperatures promises to provide new fundamental insights into the structural dynamics of the ribosome and its functional complexes.

# Nanopores for Sensing Applications

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The complex structure, great stability, and diversity of natural pore-forming proteins (PFPs) have inspired their use in various biotechnological applications. A label-free single-molecule nanopore sensing technique is based on the detection of electric current flowing through a biological nanopore inserted into an electrically non-conductive lipid or artificial membrane. When electroosmotic and electrophoretic forces favor the translocation of the analyte molecule through the nanopore, this leads to the occurrence of electrical current blockades. In the optimized system, the blockades are analyte-specific, which allows their discrimination in more complex samples. Protein detection (protein fingerprinting) and amino acid sequence reads are gaining attention now that nanopore DNA sequencing has become a powerful third-generation sequencing method in many laboratories. Recent results highlight peptides translocation, single amino acid differentiation, post-translational modification detection, and assisted protein translocation, which makes nanopore-based protein detection a promising alternative to conventional mass spectrometry. Efficient detection of proteins at single amino acid resolution requires new nanopores with novel dimensions and biochemical properties. Nanopores that stably insert into artificial membranes and enable high-throughput detection of medically relevant proteins are particularly attractive. Our research focuses on pore-forming toxins (PFTs), in particular actinoporins and their homologs, Nep1-like proteins, and larger cholesterol-dependent cytolysins. In addition to traditional genetic approaches, we are also investigating the incorporation of unnatural amino acids into the pore sensing region, which may broaden the potential spectrum of analysis.

# Nanobiosensors: How to Design and Apply These Devices in Diagnostics

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Nowadays health system is requesting more and more efficient diagnostics devices to afford everyday needs all over the world. The demand for point of care devices (POCs) for use at doctor offices or by people in need in any place in the world is increased due to various clinical scenarios including overall emergencies like pandemics. The development of such devices is strongly related to new materials and technologies being nanomaterials and nanotechnology of special role. We study how new nanomaterials such as nanoparticles or graphene can be integrated into simple sensing platforms thanks to their advantageous properties. Beside plastic platforms physical, chemical and mechanical properties of cellulose in both micro and nanofiber-based networks combined with their abundance in nature or easy to prepare and control procedures are making these materials of great interest while looking for cost-efficient and green alternatives for device production technologies. These devices should be REASSURED: Real-time connectivity, Ease of specimen collection, Affordable, Sensitive, Specific, User-friendly, Rapid, Robust, Equipment-free, Delivered to those who need it. How to design simple plastic/paper-based biosensor architectures including wearables through printing or stamping? How to tune their analytical performance upon demand? How one can couple nanomaterials with paper/plastics and what is the benefit? Which are the perspectives to link these simple platforms and detection technologies with mobile communication? I will try to give responses to these questions through various interesting applications related to protein, DNA and even bacteria and viruses with extreme interest for clinical emergency applications. The developed platforms and related technologies are related to ubiquitous methods that would be quite important for democratising diagnosis and improving the evidence-based healthcare coverage all over the world.

# EC Number Annotation: How to Predict the Enzyme Function

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Next-generation sequencing (NGS) technologies made available hundred million chains from different organism while the number of proteins known with atomic details and an experimentally characterized biochemical function is much smaller. Hence, the problem of functional annotation is one of outmost relevance to bridge the gap among poorly and well-characterized sequences.

To tackle this problem, we developed The Bologna ENZyme Web Server (BENZ WS). BENZ annotates four-level Enzyme Commission numbers filtering a target sequence with a combined system of Hidden Markov Models, and modelling protein sequences annotated with the same molecular function, and Pfams, carrying along conserved protein domains. BENZ returns for submitted enzyme sequences an associated four-level EC number being able to annotate both monofunctional and polyfunctional enzymes.

We benchmarked BENZ on the Human Reference Proteomes to assess its performance. The analysis of false positive predictions (namely those proteins lacking an annotated EC number in UniProt but predicted as enzymes by BENZ) allowed us to provide functional annotation to 5,741 enzymes after an independent validation relying on GOtoEC and Pfam/InterPro mapping.

# The Power of Ion Mobility-Mass Spectrometry for Structural Characterization and Conformational Analyses of Therapeutic Drugs

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Therapeutic drug (mAb) is the largest class of biomolecule-based drugs in the pharmaceutical industry. The production and analysis of these drugs are quite difficult due to their complex chemical structures. They have many variants of the same protein due to variable post-translational modifications depends to the production media. Mainly separation techniques coupled mass spectrometry and direct infusion mass spectrometric techniques were used for the detailed therapeutic drug analysis in their intact form and after reduction process using various enzymes and reducing agents. Following these analyses techniques tandem mass spectrometry was used due to analyze the posttranslational modifications and the amino acid sequences changing during the drug productions. In addition, conformational analyzes of therapeutic drugs are carried out using ion mobility technique combined mass spectrometry (IM-MS) based on the separation of ions in the gas phase according to their collision cross-section (CCS) values as a size parameter.[1] In this way, fast and straightforward configured systems were applied to perform full therapeutic drug analyses in their intact form without using any additional separation techniques prior to mass spectrometric analysis. Using IM-MS exactly same masses but different configurations of biomolecules and their fragments could be differentiated from each other effectively. In this study some denaturing agent and specific enzymes were used to define the therapeutic drug fragments using mainly ion mobility-mass spectrometric techniques. Immune globulin G and Bevacizumab therapeutic drug was used as model drug and ion mobility-mass spectrometric technique was used for analysis intact form also digested form of therapeutic drugs. It could be noted that IM-MS had capability to obtain advanced analysis in a short time for therapeutic drugs.

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# Bioinformatics: The Power of Data and The Things It Empowers

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The post-genome era has resulted in the generation of a massive amount of biological data. The recent Covid pandemic has also contributed towards the avalanche of such genome data that also now includes millions of Covid virus-related genome data. The data that has been generated through different genomic platforms including next-generation genome sequencing has been analyzed using Bioinformatics methods for several different purposes such as the understanding of gene variation and expression, the identification of molecular mechanism of diseases, the discovery of personalized drugs, the prediction of protein functions and many more. This talk will therefore focus on genomic databases, data-driven and artificial intelligence-based bioinformatics methods that have been developed and used to tackle challenges in the post-genome era, where real-life examples will also be provided.

# Applications of Omics Technologies in Personalized Medicine

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Advancements in Next generation sequencing technologies together with other omics technologies such as proteomics, metabolomics, glycomics, lipidomics etc. facilitated analysis of individualized disease development mechanisms and identifying individualized therapy candidates.

In this talk I will briefly go over different omics technologies and how they can be exploited to understand the disease aetiology. I will also talk about Machine Learning based data integration methods to integrate information from different omics data types. Applications of several omics data analysis methods will be given for Rare diseases and Cancer.

# ORAL PRESENTATION ABSTRACTS

# Development and Characterization of FosB Transcription Factor-Specific DNA Aptamers

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Many transcription factors are known to play an active role in addiction process.[1] Fos family transcription factors are rapidly and transiently stimulated in certain brain regions after acute administration of drugs of abuse. Drugs of abuse cause accumulation of Fos proteins, particularly in the nucleus accumbens and dorsal striatum, which are important mediators of drug reward and locomotor movements.[2]

In this study, we focused on FosB transcription factor, which predominantly forms a heterodimer with JunD protein, to regulate the transcription of its target genes. Magnetic bead-based SELEX (Systemic Evolution of Ligands by Exponential Enrichment) technology was used to develop single-stranded DNA (ssDNA) aptamers with high affinity for the bZIP domain of FosB. The bZIP domain of FosB protein was heterologously expressed in *Escherichia coli* cells, and then purified by Ni-chelate affinity chromatography. The His-tagged FosB protein was immobilized on cobalt magnetic beads. SELEX was then initiated by incubating the FosB –immobilized magnetic beads with the random ssDNA library. Following nine rounds of SELEX, enriched DNA aptamers were identified by next-generation sequencing (NGS). The enrichment coefficient was calculated, and secondary structures of the selected aptamers were predicted using the Mfold web server. Isothermal titration calorimetry (ITC) was used to characterize the binding affinity of the candidate aptamers. Further characterization studies are planned to identify the inhibitory potential of the aptamers on protein-protein interactions of FosB.

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# Investigation of Combined Autophagy Pathway Modulation and HDAC Inhibition and the Effect of PTEN Silencing on Cisplatin Resistant Cholangiocarcinoma Cells

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Cholangiocarcinoma (CCA) is an aggressive malignancy that originates from biliary duct and accounts for the 10-20% of all liver cancers with a poor prognosis.[1] CCA, similar to other cancers, activate signaling pathways involved in proliferation, self-renewal, evading apoptosis and senescence, and activation of migration and invasion. Histone deacetylase (HDAC) is essential for chromatin remodeling and gene expression. Thus, the dysregulation in the function of HDACs in cancer can lead to the repression of genes mainly involved the regulation of differentiation, angiogenesis, proliferation, migration, and metastasis.[3] Recently, histone deacetylase inhibitors (HDACis) have been presented as attractive anticancer agents. However, their mode of action in CCA is still poorly understood. Depending on the cellular conditions and tissue context, the degradative autophagy process has an important role in many diseases especially in cancer where it can impede or trigger and maintain tumor growth.[4] In CCA, the overexpression of p-AKT, PI3K, and PTEN was associated with better survival in intrahepatic cholangiocarcinoma patients.[5] In this study, our aim is to combine autophagy inhibitors to HDACis so that we could accomplish a strong synergistic effect that may provide a unique approach to target chemoresistant CCA. In order to perform our study, we used TFK-1 and EGI-1 cells and generated cisplatin resistant cell lines. Afterwards, we aim to check the effect of HDAC inhibition and autophagy modulation on chemoresistant CCA cell lines' autophagy flux. We detected the autophagic flux by using Cyto-ID® Autophagy Detection Kit. PTEN is an important player in the PTEN/PI3K/AKT/mTOR autophagic pathway, hence the effect of PTEN knockdown combined with HDACis was assessed by MTT cell viability assay. The intracellular localization of PTEN in response to combination therapy was also detected by immunofluorescence staining and visualized by confocal microscopy. Our results demonstrated a decrease in the induction of autophagy synergistically in cells treated with HDACis and nocodazole alone or in combination. Moreover, the combination of PTEN silencing and Romidepsin had a greater antiproliferative effect than when administered alone. When the sensitive and resistant cells were treated with HDACis and autophagy modulator, and then compared the intracellular PTEN localization, we observed that in resistant cells, PTEN is localized in cytoplasm while in sensitive cells, it is localized in nucleus. In conclusion, our study shows that the fine-tuning of autophagy and HDAC inhibition could specifically target cancerous cells.

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# A Poor Prognostic Factor in Pancreatic Cancer: Insulin-Like Growth Factor Receptor (IGF-IR) is Inhibited by Juglone

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Pancreatic adenocarcinoma is almost impossible to cure due to its natural resistance to conventional chemotherapeutic agents. Juglone is an effective cytotoxic agent on different cancer cell lines. The insulin-like growth factor I receptor (IGF-IR) is overexpressed in pancreatic cancer and is responsible for its hyper-aggressive nature, manifested by highly invasive and metastatic characteristics and therapeutic resistance. This study aims to investigate the effects of juglone on the expressions of IGF-IR, PCNA and PIK3R1 gene, which plays a key role in the PI3K/Akt signaling pathway that mediates the effect of IGF-IR, in PANC-1 pancreatic cancer cell line.

IGF-IR and PCNA protein expressions and PIK3R1 gene expression in cultured cells treated with juglone at 5, 10, 15 and 20 µM doses for 24 h were evaluated by immunofluorescence method and qPCR, respectively.

Our results showed that juglone has significant suppressive effects on IGF-IR, PCNA and PIK3R1 expressions. Thus, we proved that juglone has antiproliferative, anti-invasive and anti-metastatic effects, and also can also break therapeutic resistance by targeting IGF-RI, which is an important biomarker for pancreatic cancer in many respects.

Thus, juglone could be a potential option for the treatment of this devastating cancer as well as preventing its progression.

# Development of Bioactive Wound Dressing Materials Based on Cellulose Acetate Nanofibers

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Induction of active wound healing and regeneration of damaged tissues with skin tissue engineering methods is a basic need. To this end, nanofiber-based scaffolds seem to be one of the most promising materials. Nanofibrous scaffolds for skin tissue engineering and wound healing can be prepared by different methods and electrospinning is the most versatile and preferred technique among nanofiber production techniques.[1] An ideal wound dressing; It is expected to accelerate the healing process, prevent infection, and restore skin structure and function.[2,3] Wound dressings can be divided into four main categories according to the treatment provided as passive, interactive, advanced and bioactive dressings.[4] Among these wound dressing categories, bioactive dressing; It includes drug delivery systems, skin substitutes and biological dressings that play an active role in the healing process by activating or directing cellular responses.[3,5,6]

In this study, cellulose acetate (CA) based electrospun nanofibers were developed as a nanofibrous wound dressing material. Nanofibers were produced via electrospinning technique by using various amount of polymers solutions. Cell culture experiments of nanofibers were performed with human immortalized skin keratinocyte cell line (HaCaT). The effects of nanofibers on viability of HaCaT cell lines were determined by MTT. Lastly, wound healing activity of nanofibers were investigated with the using of culture inserts.

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OP05

# Single-Walled Carbon Nanotube Doped Pectin Hydrogels for Biomedical Applications

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Today, a natural polymer called pectin is widely chosen for biomedical applications for its high water and moisture permeability, biocompatibility, antimicrobial, and anti-inflammatory activities. Pectin forms a porous structure by cross-linking in the presence of a divalent cation. Taking advantage of the high swelling property, loading drug into the pores enables drug release systems.[1] Single-walled carbon nanotubes (SWNT) are beneficial over other materials due to their conductivity, significant specific surface area, and chemical durability. They have a wide range of applications in the biomedical industry. SWNT cytotoxicity, however, presents a challenge for its application in healthcare.[2] In this study, SWNT-doped pectin hydrogels were prepared, and their drug loading and release characteristics were evaluated. In the structure of the films, allantoin exists as the active molecule and calcium chloride is the crosslinker. Drug loading to the carbon nanotube was examined in addition to mixing, absorption, and swelling techniques. Additionally, to characterize the films, DSC, TGA, FTIR analysis, and surface contact angle measurements were carried out. According to the results, the drug-loaded SWNT-added matrices are obtained. Moreover, the study is expanded to include coated SWNTs as additives to assess the effectiveness of the drug loading approach. As a result, this study enhanced the structure of SWNT-doped pectin hydrogels for use as a drug-releasing hydrogel.

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# Editing of R555W Mutation in the *TGFBI* Gene Related to GCD1 in Peripheral Blood Mononuclear Cells Using CRISPR/CAS9 Technology

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The transforming growth factor beta-induced (*TGFBI*) gene encodes the transforming growth factor beta-induced protein (TGFBIp), which consists of 683 amino acid residues. TGFBIp, which is a major component of the extracellular matrix especially in the cornea, plays an important role in maintaining the structural integrity and transparency of the cornea by interacting with different types of collagens and integrins. Mutations in the *TGFBI* gene, especially R124H, R124C, R124L, R555W, R555Q in the exons 4 and 12 lead to different types of granular corneal dystrophies (GCD), characterized by abnormal folding and accumulation of TGFBIp in the cornea. This causes severe visual impairment and loss. The R555W hot spot mutation has been shown to cause granular corneal dystrophy type 1 (GCD1). In this sense, this study aims to edit R555W mutation using CRISPR/Cas9 technique in peripheral blood mononuclear cells (PBMC). In this study, the PBMC was obtained from patients with GCD1 carried R555W mutation determined by PCR-sequence analysis.

Guide RNA (gRNA) and donor DNA (ssODN) were designed to edit R555W mutation in the *TGFBI* gene, using the https://www.benchling.com/ online software program and received commercially. Designed gRNA was also cloned into the plasmid vector (79145, Addgene). Following the cloning step, vectors were transformed into DH5alpha bacteria, an E.coli variant, and then PCR and sequence analysis were performed for confirmation. According to the sequence analysis results, successfully cloned gRNA and also ssODN were transfected by electroporation into PBMCs obtained from GCD1 patients. After transfection, PBMCs were cultured in growth medium supplemented with phytohemoglutinin. 24 hours later from the transfection, PBMCs were observed with a fluorescent microscope and sorted from the FITC channel with the FACS instrument to exclude GFP+ signalling cells from non-GFP+ signaling cells. Real-time PCR reaction was carried out thereby using primers designed specifically for the exon 12 region of the *TGFBI* gene and finally melting curve analysis was performed. The analytic findings of the study have revealed that there were important differences between the CRISPR-applied and non-applied PBMCs to edit the R555W mutation in the *TGFBI* gene using the CRISPR/Cas9 technology, which is a new and promising technology.

Permanent and effective treatment approaches are needed because of very limited treatment of corneal dystrophies and the recurrence of opacities after current treatments or corneal transplants. In conclusion, our study results presents a considerable contribution to gene therapy approaches incorneal dystrophies.

# Biomolecular Differences in Normal and Pathological Cerebral Organoids

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Organoids are micro-anatomic organ-like structures obtained by the use of pluripotent stem cells. Organoids have found many uses such as developmental biology, drug screening, and disease modeling so far. In this work, we aimed to develop neuropathological cerebral organoids to reveal underlying molecular differences in gene and metabolite level. To this aim, normal and bipolar cerebral organoids were obtained, and the molecular differences were assessed by sophisticated and high throughput multi-omics approaches namely transcriptomics and metabolomics. The results showed that a big portion (99%) of transcriptome is preserved between the two group while 662 transcripts were differentially expressed. The differentiated transcripts were found to be related with protein localization, translation, mRNA catabolism, and cell-matrix interaction. Metabolomics study showed that approximately 180 metabolites were differentially produced in pathological organoids and some metabolites were highly expressed (e.g., glycolic acid, methyl malonic acid, lactic acid, AMP, nicotinic acid) while some metabolites were downregulated (e.g., ribonic acid, L-alanine, and citrulline). The difference in biomolecular structure of pathological organoids will enable us to utilize these organoids to establish an in vitro disease model, which can be used to develop treatment methods, develop/screen drugs, and perform tests in the context of personalized medicine. We are utilizing these organoids to establish an in vitro model of gut-brain axis to reveal bifacial interaction of brain tissue and host microbiota.

# Inhibition of Pathogenicity of Maize Fungal Pathogen *Fusarium verticillioides* by Targeting CYP51 Gene Based on Host-Induced Gene Silencing Approach

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Fusarium verticillioides is a devastating plant pathogen with a wide range of hosts, especially of maize (*Zea mays*), causing wilts and root, crown, and stem rots. In addition to disease, *F. verticillioides* produce fumonisin mycotoxins, which are secondary metabolites leading to dangerous effects in humans and animals fed on contaminated plants. Disease management is mostly based on chemical fungicides. However, due to concern about developing tolerance against fungicides and their hazard to the environment, agronomically sustainable and environmentally friendly approaches have been launched to improve. In this context, Host-Induced Gene Silencing (HIGS) strategy which is based on the RNA interference (RNAi) mechanism was developed.[1,2] RNAi is an endogenous gene regulation mechanism in which double-stranded RNA (dsRNA) was processed into small RNAs (sRNAs) which silence the target gene via base complementation. In this context, this study aimed to inhibit the pathogenicity of *F. verticillioides* based on the HIGS approach by using *Nicotiana benthamiana* as a model plant organism. For this aim, the fungal CYP51 gene, which encodes the cytochrome P450 sterol 14α-demethylase, an enzyme essential for sterol biosynthesis and a target of azole fungicides was knock-down to examine its role in pathogenicity. To this end, 370 nucleotide-long gene fragment was amplified from fungal cDNA and cloned into a Brome Mosaic Virus (BMV)-derived vector.[3] Then, the cloned vector firstly was used to transform *Agrobacterium tumefaciens* and then agroinfiltrated to *N. benthamiana* leaves. *F. verticillioides* inoculum was sprayed on agroinfiltrated leaves. Pathogenicity response was observed for two weeks by measuring chlorophyll content and leaf expansion rate compared to the mock-agroinfiltrated group. The silencing level of CYP51 gene was determined by qRT-PCR analysis. Finally, findings illuminate the effectiveness and potential of targeting specific plant pathogens to inhibit plant disease. They are also promising to unravel the sRNA mobility between kingdoms and will contribute to the development of BMV-HIGS strategies for the management of other invasive pathogenic fungi based on RNAi mechanism.

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# Small Molecule Effectors of the MYC/MAX Oncogene

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MYC is a commonly amplified oncogene in human cancers. Inhibition of the obligatory homodimerization of MYC with MAX is one of the possible molecular strategies to suppress downstream transcription of MYC targets. However, intrinsically disordered structure of MYC and the lack of defined binding pockets make development of small molecule inhibitors challenging and gave MYC the label of an “undruggable” target.

Here we present a new biophysical technology, Spectral Shift[1], that enables easy in-solution investigation of MYC/MAX interactions with various molecular partners, reversible and covalent small molecule binders, and a nucleic acid consensus binding sequence. Spectral Shift enables direct binding and competition assays for characterization of Kd and EC50 values, respectively.

Spectral Shift is based on a well-known observation that organic fluorophores react to changes in their chemical microenvironment with slight modifications of their emission spectrum. The method exploits this observation by performing ratiometric measurements at two distinct emission wavelengths of a labeled target molecule in the presence of various concentrations of an unlabeled ligand to derive the affinity constant (Kd) for the interaction. The method is highly robust against sample impurities and aggregates and provides high quality data with minimal assay development time. The Spectral Shift technology is amenable for both, a flexible capillary-based set up, as well as high-throughput, 384 well plate-based screening campaigns.

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# Evaluation of Pectin-Based Sustained-Release, Hemostatic, Shear Thinning Hydrogels for Wound Healing Applications with *In Vitro*, *In Silico*, and *In Vivo* Approaches

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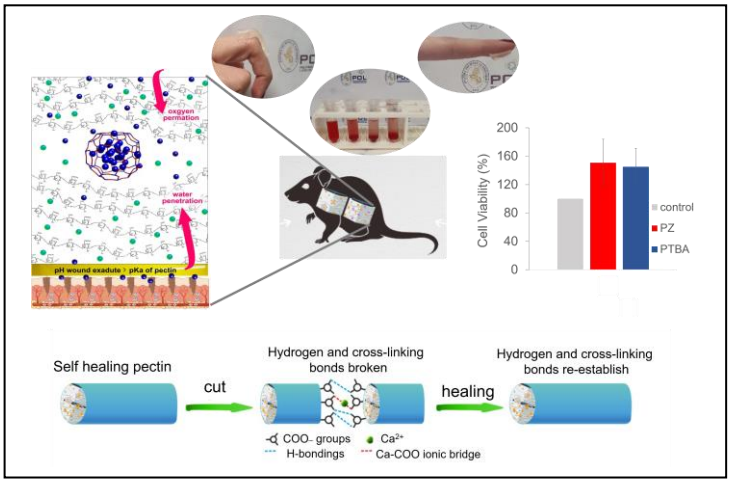
Wound management is a fundamental healthcare concern, which has greatly increased the financial burden on the public, particularly for chronic wounds (such as infected wounds, venous leg ulcers, and diabetic foot ulcers. The aim of this study is to carry out *in vitro, in silico*, and *in vivo* studies to improve and then assess two different pectin-based hydrogels with either zeolite-A or 2-thiobarbituric-acid (TBA) in the form of a wound dressing. We used FTIR, SEM, DSC, contact angle, rheology, swelling, and drug release analysis to identify the conformational, morphological, and structural properties of the hydrogels. We determined that; (*i*) both matrices produce long-term controlled drug release, (*ii*) they have 'self-healing' properties that extend the life of the dressings, (*iii*) they display re-moldable qualities, which can include the ability to dynamically adjust to movement and survive deformation due to body motion at different angles, and (*iv*) they show biocompatible, antibacterial and hemostatic properties. We also pointed out that TBA-added hydrogel has higher mechanical properties. Molecular dynamics simulations were used to reveal the mechanism behind this observation. It is observed that TBA inclusion in the pectin hydrogel increased the number of secondary interactions inside the matrix. Then, these dressings were employed *in vivo* wound healing studies on Sprague Dawley rats with a negative control and positive-control group of Kaltostat®. Finally, the wound healing process was evaluated by histological examination of the skin. As a result, zeolite-added and TBA-added pectin hydrogels improved the closing of the wounds when compared to the Kaltostat® positive control group.

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# *In silico* Modeling of Shear Stress and Pressure Applied to Cells at Different Nozzle Diameters and Printing Speeds in 3D Bioprinting

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Three-dimensional (3D) bioprinting is a production method that enables the conversion of biomaterials, cells and supporting components together into 3D functional living tissues.[1] Extrusion printing, one of the most used 3D printing techniques, uses pneumatic or mechanical power to print continuous material and/or cell beads.[2] One of the major advantages of extrusion-based printing is its ability to produce large volumes of tissues with high cell densities. During production, a significant part of the cells is lost due to shear stress and pressure. An increase in printing speed increases the shear stress applied to the cell, while enlarging the nozzle diameter to compensate for this decreases the printing sensitivity. Therefore, printing speed and nozzle diameter, depending on shear stress, are important parameters to obtain 3D tissues with high cell viability.[3] A previous study has shown that hydrostatic pressure of less than 500 KPa has no significant effect on cell viability and that cell damage in a fluid flow is mainly due to shear stress. When shear stress is applied to cells, they deform due to poor elastic mechanical properties.[4] These values vary also by cell type. Additionally, the printing speed, which provides optimum pressure and shear stress values, varies according to the different bioinks used.[5] In this study, an *in silico* Extrusion Bioprinting model was created for different flow rates and nozzle diameters using computational fluid dynamics (CFD). The module and printing process were simulated using the COMSOL Multiphysics® program. In this simulation, the shear stress and pressure that the cells are exposed to were examined and the optimum compression speed and nozzle diameter corresponding to different bioinks were determined.

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# A New Generation Hydrocolloid Bioink for 3D Bioprinting

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Bioprinting has started to become one of the most promising advanced manufacturing technology in the field of tissue engineering, since it enables fabrication of 3-dimensional (3D) structures by utilizing bioink, which contains synthetic or natural polymers, living cells, extracellular matrix (ECM) components, biochemical factors, proteins, or drugs. The success of the fabricated product to be created by 3D bioprinting mostly depends on the properties of bioink.

During the last decades hydrogel/hydrocolloid materials derived from natural and synthetic polymers are commonly utilized as bioink material with their good gelation ability, viscosity and preferred rheological properties for printing, as well as low toxicity, and biocompatibility. Natural hydrocolloids, that mimic the ECM structure and function, are highly used bioink materials. Polysaccharide-based hydrocolloids are among natural hydrocolloids and are generally used in the food industry, tissue engineering, and drug delivery/release systems due to their gelation ability and low cytotoxicity. The development of new generation hydrocolloid-based bioinks from the seeds of some plants is a promising approach for 3D bioprinting applications. These bioinks have high water retention capacity, antioxidant and anti-inflammatory properties.

Here we report development of a new generation polysaccharide-based bioink for 3D bioprinting applications. The bioink was obtained through "from waste to the bench-top" approach by utilizing quince seed as a source. It was shown that developed bioink demonstrates desirable properties including viscoelasticity, processability, biocompatibility and non-toxicity, as well it is easy to obtain and cost effective as a bioink.

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# Xenon Difluoride Dry Etching for the Microfabrication of Solid Microneedles As a Potential Strategy in Transdermal Drug Delivery

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Transdermal drug delivery (TDD) is a decisive approach where a drug compound diffuses through the skin layers and joins circulation to achieve a therapeutic outcome. TDD approach mainly involves the use of hypodermic needles.[1] Although the injection by hypodermic needles has been the "gold standard" for TDD, microneedle (MN)-mediated TDD is a novel technology in which drug compounds are delivered to the bloodstream via micron-size needles.[2] They are widely preferred as large molecules can be administered easily without inducing pain to the patient while offering faster healing at the injection site. MNs are divided into four sub-categories in which each MN type possesses a different role in TDD. Among all these four categories, solid MNs are the most basic form of MNs. TDD systems using solid MNs consist of a two-step process based on the "poke-and-patch" approach. In the first step, MNs are applied on the skin to create micropores, followed by applying a transdermal drug patch containing the drug formulation.[3] In the present work, we reveal an isotropic $XeF_2$ dry etching process to fabricate silicon-based solid MNs as a potential strategy in transdermal drug delivery. The method employed in this study involved typical photolithographic process, including mask writing, UV exposure and dry etching with $XeF_2$. We have successfully customized the fabrication of the MNs by modifying the CAD designs, photolithographic process, and etching conditions. The proposed study enabled us to achieve a very dense MNs in a single array (up to 1452 MNs/cm$^2$). Geometrical features such as base diameter, height, aspect ratio, radius of curvature and tip angle were assessed using scanning electron microscopy (SEM) and 3D laser scanning microscope. Fabricated MNs were further coated with titanium (Ti) and chromium (Cr) using Magnetron Sputter Coating technique to improve their mechanical strength and surface properties such as roughness. The efficiency of Ti- and Cr-coating was confirmed with Energy-dispersive X-ray Spectroscopy (EDAX). Mechanical failure test of non-coated and coated MNs was conducted using Dynamic Mechanical Analyzer to determine displacement value and explore stress/strain curve. Finally, the penetration efficiency of the MNs was tested on chicken skin. This technique has enabled the fabrication of MNs with distinct shapes and dimensions. The optimized process provides a wide range of solid MN types to be utilized for either epidermis or dermis targeting in TDD studies.

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OP14

# Biomimetic Plasmonic Sensors for Environmental Monitoring

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Molecularly imprinted polymers are easy to prepare, inexpensive, stable, capable of molecular recognition, and can be produced in large quantities with high reusability.[1] Molecular recognition-based detection systems have high attention in many areas due to their high selectivity for different target molecules.[2] Sensors are analytical devices which consist of an analyte, receptor, transducer, and measurable signal.[3] Surface plasmon resonance sensors, which are one of the most common types of optical sensors, create a specific side on a silver or gold surface to recognize the target molecule. In addition, ease of application, low cost, no need for labeling, real-time measurement capabilities, as well as high selectivity are among the most important features of these plasmonic sensors.[4] The sensor applications of molecularly imprinted polymers, specially prepared for use in environmental applications, have attracted the attention of researchers in recent years.[5] Sensitive, accurate, and rapid detection of bacteria from complex matrices still remains a critical challenge. Herein, we designed a molecularly imprinted nanofilm by modifying gold nanoparticles to prepare biomimetic plasmonic sensor for environmentally important bacteria (*Enterococcus faecalis*, one of the most important fecal contaminants found in drinking water) in buffer solutions and water samples. For this aim, the gold nanoparticles are first synthesized and characterized using size and transmission electron microscopy analysis and then used for preparation of imprinted nanofilm-based plasmonic sensor. Following the several characterization studies including atomic force microscopy and contact angle of plasmonic sensors, they used kinetic, selectivity, reusability, and real sample analysis for real-time *Enterococcus faecalis* detection. Consequently, this method holds a great potential to detect other bacteria with high sensitivity and low interference and would be employed as an alternative approach for biomolecule detection at different perspectives ranging from environmental monitoring to medical diagnosis.

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# Neuronal Differentiation and Neurite Orientation on Gold Nanoparticle Decorated, Micro/Nano-channeled PCL/PLGA Film Scaffolds

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Patterned topographic structures have been shown to play a critical role in neuronal guidance and these biomaterials are very important in neural tissue engineering area.[1] Polycaprolactone (PCL) and poly-lactic-glycolic acid (PLGA) are highly biocompatible, biodegradable and FDA-approved biopolymers, and they have been frequently preferred in the field of tissue engineering due to their superior mechanical properties.[2,3] Gold nanoparticles (AuNPs) have wide range biomedical applications due to their unique physical, chemical and biological properties.[4] The aim of this study was the development of conductive and micro/nano-channeled PCL/PLGA film scaffolds and investigation of the behaviors of neural progenitor/stem cells cultured on the designed scaffolds.

In this study, AuNPs with average size 50 nm ($AuNP_{50}$) were synthesized successfully via seeding-growth method.[4] PCL/PLGA films (10:1 ratio) with three different channel widths (500 nm, 1µm and 5µm) were produced using silicon wafer molds which were prepared by e-beam lithography technique. Also, polypyrrole (PPy, 1% v/v) and Au-sputter coating was applied on the films as alternative surface conductivity designs. In addition, poly-L-lysine (PLL, 10% v/v) and pentapeptide-IKVAV (0.2 mg/mL) surface modification were performed for subsequent neural cellular studies. PC12 cells and neural stem cells (NSCs) were cultured on the smooth (S) and micro/nano-grooved (G) scaffolds for 7 days in static and bioreactor conditions.

PCL/PLGA (10:1 ratio) hybrid polymer composition has been shown to increase mechanical strength. PLL/IKVAV surface modification significantly increased the hydrophilicity of the scaffolds. The developed materials did not show any toxic effects on the cells, except for PPy modified scaffolds. According to the static culture results, PCL/PLGA G1 scaffolds optimally promoted axonal guidance within the three different channel widths group. Electrical stimulation significantly increased neural cellular development, differentiation, and neurite outgrowth.

The developed biocompatible, hydrophilic, conductive and micro/nano-channeled film scaffolds promoted neural cellular differentiation and axonal guidance. It has been evaluated that the designed biomaterial may contribute to studies within the scope of neural tissue engineering and may be a potential implant material for nerve injuries.

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# Extracellular Vesicles: From Nano-sized Dust to Deciphering Agents for Disease Diagnostics

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Extracellular vesicles (EVs) are host-derived cargos of information in cell–cell communication, which are secreted dynamically from many types of cells and organisms.[1] EVs were initially defined as artifacts or cell dust [2], but there is a growing evidence for their essential roles as messengers in physiological functions and for their contribution in the development and propagation of many diseases.[3–6] Recent evidence represents EVs as promising biological agents for *both* diagnostic and therapeutic approaches in personalized medicine and precision health.[7–9] However, isolating such nano-sized objects in size-dependent manner is one of the most challenging steps in EV research since conventional methods (ultracentrifugation, size exclusion chromatography or polymer-based isolation) are expensive, prone to loss of different sized EVs; or they potentially lead to accumulate contaminations on the isolated vesicles, hindering the quality of further investigations.[10] In this presentation, Dr. Fatih Inci harmonizes microfluidics and biosensing strategies to isolate and identify EVs from clinically-related specimens, thereby developing a diagnostic and screening scheme for point-of-care (POC) settings, where individuals can easily self-monitor their health status for "precision health" applications.[11] His research perspective always aligns the design and development of platforms with biological and medical clues to diagnose and screen the diseases. Therefore, detecting such tiny EV markers, yet big players will be not only a "game-changer" in medicine, and also find new avenues for precision health and clinical management.

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# Development of an Immunochromatographic Test for Sensitive and Selective Detection of Haptoglobin

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Breast cancer is one of women's most common forms of gynecological malignancy. It has been established via extensive research that elevated levels of haptoglobin are a marker for breast cancer in females.[1] Regular cancer screening in all female family members would have allowed for the early diagnosis of this cancer, which can be handed down from generation to generation. Consequently, creating a reliable, in-situ, and user-friendly approach for tracking the rise of haptoglobin protein is meaningful. With a 20-year track record of commercial success in medical diagnostics and environmental monitoring, interest in immunochromatographic tests shows no signs of slowing down. The Lateral Flow Assay (LFA) technique allows naked-eye detection of even trace levels of important biomarkers.[2] LFA systems are easy to use, quick, and cheap compared to conventional diagnostic procedures. In this study, variations in color intensities were examined at rising haptoglobin concentrations in the nM range using a competitive LFA format. In addition, the selectivity of the developed system was also tested. It has been observed that the LFA design exhibits high selectivity in the detection range measured for haptoglobin. Moreover, the aforementioned immunochromatographic test has been successfully used to analyse haptoglobin levels in serum samples.

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# Development of Rapid Test Method for Semi-Quantitative Measurement of Total Glycosaminoglycan in Urine

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Mucopolysaccharidoses (MPS) is a genetic disease due to defects in lysosomal enzymes that catalyze the breakdown of glycosaminoglycans (GAGs) and are a subset of lysosomal storage diseases (LSD). MPS causes accumulation of GAG in tissues leading to organ dysfunction.[1] [2]One of the most common Dye binding methods is the Dimethyl methylene blue (DMB) assay, a cationic dye that binds to sulfated GAGs and results in an absorbance shift when bound to GAGs, allowing the quantification of GAGs.[3] A fast and easy paper-based semi-quantitative diagnostic test integrated with the existing DMB dye-binding method was developed for the analysis of total GAG in urine for use in MPS preliminary analysis.

For test strip preparation, the papers were incubated in 10 ml alcohol solution at room temperature for 4 hours. They were left to dry overnight at room temperature. Papers were incubated in 10 ml of DMB solution for 5 minutes. They were left to dry overnight at room temperature. Then, urine containing different concentrations of chondroitin sulfate (CS) was dropped onto paper. Optimization and validation studies were carried out.

According to the results obtained from the optimization studies, the paper was selected, and a rapid test system was created. The paper was incubated in ethanol and stained with DMB10x, and no stabilizer was added. Drying at room temperature overnight was found suitable. It can be evaluated semi-quantitatively by eye or with the help of a smartphone. Bilirubin did not cause interference in test strips up to 0.03 mg/ml, ascorbic acid 5 mg/ml, and glucose up to 20 mg/ml. The urine containing 3 different CS concentrations, of which GAG results were determined by manual method, was dropped onto the papers in 4 repetitions and the same tones of color were observed for the repetitions of each. Standard dripped paper containing 5 different concentrations of CS was shown to 5 different people and showed 90% sensitivity and 93.33% selectivity. The lowest detected concentration of CS in urine is 0.04 mg/ml. Linearity is 2 mg/ml was found for the Paper Test System and 0.03 mg/ml for the Spectrophotometric method. A simple, rapid, and cost-effective first paper-based test based on color changes of DMB dye was developed for the semi-quantitative determination of total GAG. This study demonstrated its potential utility as a tool for pre-diagnosing patients at risk for MPS.

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# MIP-on-chip Synthesis of BSA Imprinted Nanoparticles

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Molecularly imprinted polymers (MIPs) are synthetic receptors consisting of specific binding sites for target analytes. MIPs are very versatile that can be prepared in accordance with plentiful targets; hence, they can be used for the detection of analytes.[1] The MIP synthesis is usually accomplished by magnetically stirring or shaking in a closed environment. Such techniques are usually time-consuming and labor-intensive. In current practice, continuous synthesis of MIPs is highly challenging and faces severe limitations.[2] Microfluidics has arisen as an innovative tool in nanoparticle synthesis. The microfluidic platforms need to be revitalized through comprehensive *in situ* analyses to produce MIPs within nanoscale, thereby boosting the surface-to-volume ratio and allowing a more intense interaction with more molecules, at the same time presenting high productivity with great affordability.[3] In this study, we present a spiral micromixer to synthesize MIPs as a one-step process. As a model system, bovine serum albumin (BSA) is interacted with methacrylic acid (MAA) as a functional monomer. Polymer solution and initiator reagent are introduced to the micromixer with varying flow rates. The continuously synthesized nanoparticles are collected every 30 min and characterized by Dynamic Light Scattering (DLS) and Nanoparticle Tracking Analysis (NTA). After determining the optimum conditions, the BSA-imprinted nanoparticles are used to assess the binding of various BSA concentrations onto gold-coated nano-periodic structures. Herein, we synthesize MIPs in a relatively short time (30 min). According to the results, BSA imprinted nanoparticles represent 82% of precision for BSA concentrations from 10 to 50 mM. The repeatability performance is tested using the same concentration of BSA protein in three cycles and showed negligible performance loss in the sensor signal. The results are statistically validated by principal component analysis, and molecular interactions between monomers and protein are also examined by docking analysis. Conclusively, the presented microfluidic method stands out as an advantageous approach due to high-productivity, ease-of-experimental design and continuous production compared to conventional bulk production strategy.

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# A Novel Electrochemical Approach to Biosensing Applications: Quartz Tuning Forks as Working Electrodes for Immunosensors

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Acute myocardial infarction (AMI) is the leading cause of morbidity and death worldwide.[1] Despite significant progress in treating many diseases due to technological advances, existing medical knowledge cannot accurately predict disease risk. Furthermore, it is an illness that is frequently misdiagnosed. Biomarkers linked with acute coronary syndromes and heart failures, such as tumor necrosis factor, creatine kinase-MB isoenzyme, C-reactive protein, interleukin, and troponin can be listed as a complex of three regulatory troponins C, cTnI, and cTnT proteins. These are known as widely used biomarkers to clarify the diagnosis of AMI and play a significant role in everyday clinical practice. The regulatory proteins in the heart and skeletal muscle, cardiac troponin T (cTnT).[2, 3]

In this study, the use of Quartz Tuning Fork (QTF) for electrochemical biosensor applications was investigated for the first time. To detect cTnT, a four-step surface modification was performed to the prepared QTFs' prongs. The surface was investigated in detail using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) methods. The results showed that the QTF-based electrochemical immunosensor had a wide detection range (0.5 fg- 1500 fg/mL) and low limit of detection (LOD) and low limit of quantification (LOQ) at 0.24 fg/mL and 0.81 fg/mL, respectively. The results confirmed that QTFs have unique electrode capacity in point-of-care diagnostic devices. Most importantly, we anticipate that QTF transducers will be widely used as a unique electrode for detecting many biomarkers due to their excellent sensitivity and low cost.

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# Preparation of Molecularly Imprinted Nanoparticle Based SPR Sensors for Angiotensin-II Detection from Human Serum

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Angiotensin II (AngII) is a significant effector peptide of the renin-angiotensin system that serves as a growth factor, regulating cellular growth and fibrosis, besides its role in apoptosis.[1] AngII regulates cardiovascular hemodynamics and structure, cell communication, and impulse propagation.[1,2] AngII is an important biomarker for certain diseases and disorders including influenza, SARS-CoV-2, hypertension, tumors, etc.[1,2] However, AngII presents in biological fluids at very low concentrations and it is not stable. Therefore, spontaneous detection of AngII is a big challenge.[1] Molecular imprinting is a technique that enables the preparation of highly selective synthetic receptors that mimics the natural recognition sites for the molecule of interest.[3] Molecularly imprinted polymers (MIPs) can be used as recognition elements for the preparation of surface plasmon resonance (SPR) sensors. SPR-based sensors enable the determination of chemical and biological compounds in real-time.[3,4] In this study, AngII-imprinted nanoparticle (AngII-MIP) based SPR sensors were developed for the specific detection of AngII in human serum. Poly (2-hydroxyethyl methacrylate)-based (PHEMA-based) AngII-MIP and non-imprinted (NIP) SPR sensors were synthesized and characterized by SEM, TEM, zetasizer, AFM and contact angle measurements. The size of AngII-MIP and NIP nanoparticles was found to be 46.51 nm and 48.97 nm in diameter via zetasizer, respectively. These results are consistent with that of TEM analysis in which particle sizes were measured as approximately 50 nm for both AngII-MIP and NIP. The thickness of AngII-MIP and NIP nanofilms was determined to be less than 100 nm. Aqueous AngII solutions at various concentrations were used in adsorption studies for the real-time detection of AngII. The SPR isotherm parameters were determined accordingly, and the results demonstrated that AngII-MIP SPR sensors were more compatible with the Langmuir isotherm model. Selectivity of the SPR sensor for AngII was evaluated in presence of competitor molecules Angiotensin I and Vasopressin. The detection of AngII in human serum was also investigated, and the limit of detection for the human serum sample was determined as 3 pg/mL. In addition, it was determined that AngII-MIP SPR sensors can be used up to 10 times without significant decrease in adsorption capacity.

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# Haloperoxidases: Promising Catalysts for Chemical Synthesis

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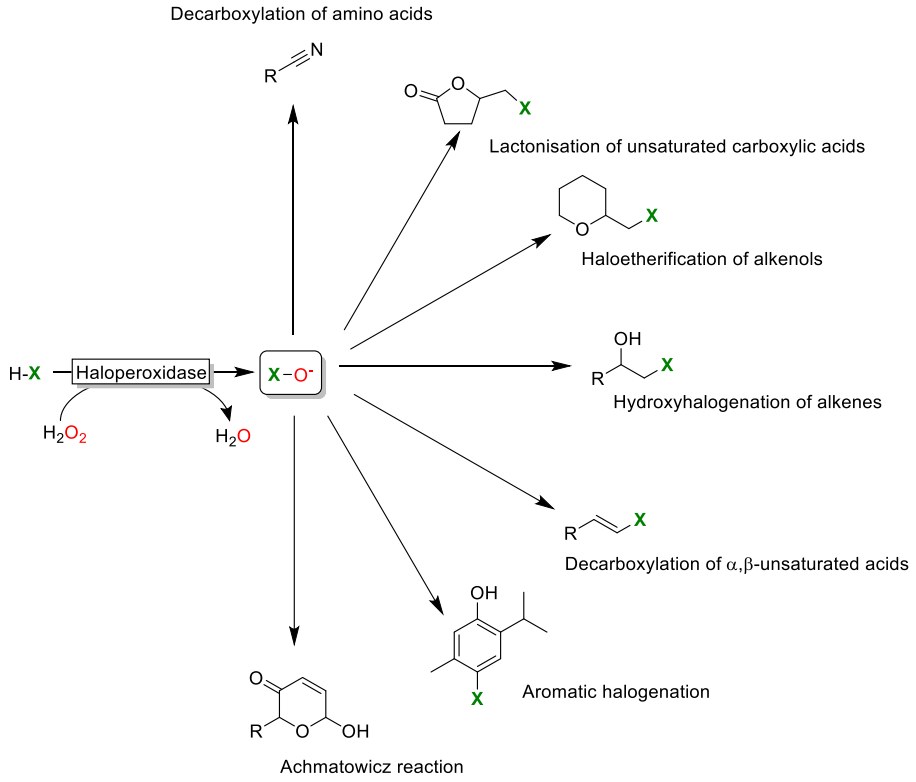
Haloperoxidases catalyse the $H_2O_2$-dependent oxidation of halides to the corresponding hypohalites.[1] The latter generally diffuse out of the enzyme active site, hence, enzyme-induced selectivity is generally not observed. Possibly this explains why this enzyme class has so far been largely ignored by the biocatalysis community.

In this presentation I will report on recent chemoenzymatic transformations performed using haloperoxidases demonstrating that these enzymes exhibit an enormous potential for organic synthesis (Scheme 1).[1]




**Scheme 1.** Synthetic scope of Haloperoxidase-initiated reactions.

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# Molecular Cloning, Expression and Characterization of a Thermophilic α-glucuronidase from *Geobacillus kaustaphilus*

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Lignocellulosic biomass, a renewable biopolymer, is a promising alternative to solve problems based on fossil fuels.[1] Lignocellulosic biomass is the most abundant source on earth and more than 40 million tons of biomass, which is not used as food and feed, has been produced annually.[2] Lignocellulosic biomass is composed of cellulose, hemicellulose and lignin. The biomass pretreatment could be done by physically, chemically, and biologically or with their combination.[3] Enzymatic pretreatment employs mainly cellulases and hemicellulases enzymes. However, including accessory enzymes such as α-glucuronidase, α-galactosidase, mannanase improves overall degredation of lignocellulosic biomass.[2-3] α-glucuronidases catalyze the hydrolysis of α-1,2 glycosidic bond between glucuronic acid and d-xylose.[4]

In this study, the α–glucuronidase enzyme from the thermophilic *Geobacillus kaustophilus* was cloned into pQE30 vector and expressed heterologously in *Escherichia coli*. Later on, biochemical parameters such as optimum temperature, pH and buffer solution was determined for biochemical characterization of the expressed α–glucuronidase. Biochemical characterization revealed that *Geobacillus kaustophilus* α–glucuronidase enzyme showed maximum activity at 75°C in pH 5.0 sodium acetate buffer. These results showed that expressed α–glucuronidase enzyme has acidothermophilic feature.

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# Detection of 2019-nCoV_N2 of SARS CoV_2 by Lateral Flow Assay

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The molecular detection of SARS CoV_2 is the most reliable method in the world and it is performed by real time reverse transcriptase polymerase chain reaction (rRT-PCR ) for the conserved regions of viral genome, which was announced by the World Health Organisation. One of these regions is 2019-nCoV_N2 and this sequence is still used for molecular detection as different base lengths depending on the kit suppliers. Since the rRT-PCR method is expensive and needs well trained personnel, alternative molecular detection tools are needed. Lateral flow assay is a naked eye analysis test used for nucleic acid detection as a molecular assay and commonly developed by gold nanoparticles.

In this study, lateral flow assay platform was designed and prepared for the molecular recognition of 2019-nCoV_N2 region by using gold nanoparticles as label. Assay was prepared according to the principle of hybridization of synthetic oligonucleotides on the membrane. Strip tests are prepared by synthesized colloidal gold nanoparticle/single stranded oligonucleotide conjugate and commercially available nitrocellulose membrane.

Results showed that both the synthetic target sequence and real sample sequence of 2019-nCoV_N2 obtained from the patients were detected by naked eye in a 5 minute with the prepared strip assay. Therefore, the usage of lateral flow assay for the molecular detection of SARS CoV_2 as an alternative and cheap method to rRT-PCR was demonstrated, successfully. It was also hypothesized that this sandwich model can be prepared and used for the detection of polymerase chain reaction products of virus and could be adopted to mutated regions of viral genome as a further goals.

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# Determination of Tamoxifen by Liquid Chromatography-Tandem Mass Spectrometer

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Tamoxifen is developed for the treatment of breast cancer as an orally active and selective estrogen receptor (ER) modulator. It is used widely as an endocrine therapeutic agent for the treatment of ER-positive breast carcinoma.[1] Monitoring the blood levels of drugs is extremely important to control the required dose for effective treatment and to prevent overdose in order to drug-related adverse effects. The aim of this study was to develop a reliable, standardized, and accurate tandem mass spectrometric method (LC-MS/MS) for the determination of tamoxifen for monitoring blood levels during treatment, which is very important in terms of treatment effectiveness.

Mass spectrometric analyzes were performed using a Shimadzu LC-20-AD (Kyoto, Japan) coupled with an ABSCIEX API 3200 triple quadrupole mass spectrometer (USA) equipped with an electrospray ion source (ESI) operating in positive mode. The sample preparation procedure for tamoxifen was briefly as follows: 250 µl of serum and standard, 50 µL of internal standard (sildenafil) and 1000 µl of methanol were taken into an Eppendorf tube. The mixture was vortexed for 30 seconds and centrifuged at 13000 rpm for 10 minutes. The supernatant was transferred to clean glass tubes and evaporated at 28°C under nitrogen gas. The residue was dissolved in 250 µL of methanol: water (50:50,v/v%) mixture, and 40 µL of the supernatant was injected for analysis. Chromatographic separation was performed on a Phenomenex Luna C18 column (4.6×50 mm, 5 µm) with a mobile phase A consisting of 0.1% formic acid in water and mobile phase B consisting of 0.1% formic acid in methanol at a flow rate of 1 mL/min. The validation of the developed method was performed according to CLSI (The Clinical and Laboratory Standards Institute) protocols.

The standard curves for tamoxifen were linear within the range of 2.44-625 ng/mL with a correlation coefficient r: 0.9990. Within-run repeatability %CV values were found to be 5.8 and 2.8, respectively. The intraday imprecision values were %4.9, %5.1 and %5.9 for 625, 39.06 and 2.44 ng/mL concentrations, respectively. The inter-day imprecision values were found as %7.6, %7.4 and %7.5 for 625, 39.06 and 2.44 ng/mL concentrations, respectively. The carryover value was 0.252. The matrix effect values was %-2.57, %0.71, %-5.41 and the recovery values 105.9%, 115.2%, and 111% for 625, 39.06 and 2.44 ng/mL concentrations, respectively. The Limit of Detection (LOD) was 1.22 ng/mL, while the Limit of Quantification (LOQ) value 2.44 ng/mL. The results demonstrate that the method is fit for the purpose to determine the tamoxifen levels. It is a practical, reproducible, simple, and reliable method. Our findings will contribute to the evaluation of the efficacy of the drug by monitoring blood levels during treatment.

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# Investigation of Antimicrobial Effects of Organic Antibiotics

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Some radionuclides used in nuclear medicine can be combined (radiolabeled) with molecules that are selective by cancerous or infected tissues, for the development of targeted drugs, as well as image functionality, and can be directed to these tissues.

Antibiotics have been used for many years in the treatment of infectious diseases. However, as a result of the widespread use of wrong and unnecessary antibiotics in the world and in our country, there is a rapid increase in antibiotic resistance. For this reason, innovative approaches are needed especially against microorganisms with biofilm structure and in the diagnosis and treatment of infectious diseases. One of these innovative approaches is "alternative to today's synthetic antibiotics, isolation of organic antibiotics from cave bacteria and development of innovative agents for imaging the infected area".

The antimicrobial activity of isolated organic cipro (o-CIP) produced by Micrococcus luteus bacteria collected from the “Yarık Dudeni Cave” in Mersin, Turkey. After produced organic antibiotics by isolated bacterial species were determinated, the structural analysis was done by Liquid Chromatography Quadrupole Time-Of-Flight Mass Spectrometry (LC/QTOF/MS) and High Performance Liquid Chromatography (HPLC) Analysis. According to LC/QTOF/MS, there was three organic antibiotics (Levofloxacin, Clindamycin and Ciprofloxacin).

Within the scope of the study, the isolation of organic antibiotics produced by Micrococcus luteus from bacterial media, the isolated organic antibiotics against pathogenic microorganisms (Escherichia coli (ATCC 9637), Staphylococcus aureus (ATCC 29213), Pseudomonas aeruginosa (ATCC 39327), Vancomycin Resistant Enterococci (ATCC MP-1) , SCCmec Type MRSA (ATCC MP-2), Candida albicans (ATCC 10231)), radiolabeling of isolated organic antibiotics, antimicrobial activity of radiolabeled antibiotics on these pathogenic microorganisms were investigated.

Organic antibiotic were radiolabelled demonstrated higher yield than synthetic derivative. Quality control studies were examined using the TLRC method and it was determined that both substances remained stable for 240 minutes. The % binding efficiency of radiolabeled antibiotics on pathogenic microorganisms were determined and compared with each other.

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OP29

# Nanoencapsulation of *Artemisia herba alba* Extract Prevents Glycoxidation-Related Liver Cell Damages Through Cell Signaling Modulation

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The implication of advanced glycation end-products (AGEs) in various age-related diseases is irrefutable. The chronicity of these "glycotoxins" imparts various damages that result in metabolic dysfunction and diseases. Due to the variety of AGEs, their mechanistic implication is relatively understood, however, inflammation and oxidative stress play a key role in AGE-induced disorders.[1-2] Hence, therapeutic approaches mainly focus on the use of anti-inflammatory and antioxidant molecules. The use of natural products such as plant extracts is of high interest in complementary and alternative medicine.[3-4] In the current work, we propose the formulation of phytoniosomes encapsulating *Artemisia herba alba* extract (AHA) for the mitigation of AGEs and their induced cell redox dysregulation in the liver. AHA was extracted using water and analyzed for its components using biochemical and LC-Q-TOF-MS/MS techniques which identified its major phytocomponents. The phytoniosomes were explored for their anti-glycating effect in a bovine serum albumin model after which they were tested *in vitro* over THLE-2 liver cells challenged with AGEs. In parallel, bioinformatic tools and data bases such as Swiss Target Prediction, etc. were used to identify gene and protein targets to create the pharmacology network. Cytoscape was used to generate and analyze the protein-protein interaction (PPI) and phytochemical-protein interaction networks to determine the major processes implicated in AHA's mechanism of action. Data demonstrated that *Artemisia* phytoniosomes had an important anti-AGE effect comparable to reference molecules and were able to restore cell dysfunction through the restoration of TNF-α, IL-6, nitric oxide, and total antioxidant capacity to normal levels. Phytoniosomes were able to protect the cells from apoptosis by decreasing the caspase 3 activity. Bioinformatic tools and Network pharmacology analysis confirmed the induction of the effect via MAPK and AGE-RAGE signaling pathways. The current report highlights the potential of *Artemisia* phytoniosomes as a plausible option in the therapy of AGEs-related diseases.[5-6]

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# After the metastasis: Inhibitory Properties of Scorpio Venoms on Colony Formation Properties of Human Colorectal Carcinoma Cells

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Colorectal cancer, one of the most common types of cancer, is the third leading cause of cancer-related deaths worldwide. Various treatment modalities have been used for the treatment of CRC, including conventional chemotherapy, radiotherapy, and immunotherapy. Due to the serious side effects and inadequacy of these treatment methods, new, alternative or complementary strategies have been emphasized. Thus, the focus has been on promising natural resources such as scorpion venom, which have the potential to be used in the treatment of various types of malignancies.[1] This study aims to determine the effects of scorpion (*Iurus kinzelbachi* and *Scorpio fuscus*) venoms on their colony formation potential on cells. For this purpose, *in vitro* colony formation experiment was carried out on human colon cancer cell lines of venom of scorpions collected from Aydın and Adana-Mersin provinces, respectively. According to the calculated results; the colony formation capacity of DLD-1 and HT-29 cells treated with *Scorpio fuscus* species scorpion venom decreased by 55.81% and 86.42%, respectively. In addition, the colony formation capacity of DLD-1 and HT-29 cells treated with *Iurus kinzelbachi* scorpion venoms decreased by 44.7% and 65.28%, respectively. As a result, scorpion venom aims to obtain alternative and new agents in the treatment of CRC.

**Acknowledgement:** This study was funded by TUBITAK (Grant No: 120Z942).

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# Provide the Highest Level of Optimization with the Temperature Gradient Feature in PCR Reactions

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Optimizing thermal temperatures in PCR reactions increases the speed of the reactions and provides the specificity in PCR reactions. The thermal gradient feature in PCR devices also provides optimization in other temperature steps, mainly annealing temperatures. This feature maximizes accuracy for multi-step PCR protocols and provides repeatability for reliable results. Gradient properties are important in PCR devices and should be preferred for accurate PCR results.

# Comparative Study on Understanding Molecular Signatures of ALL and Philedelphia Positive ALL in Adults

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Acute lymphoblastic leukemia (ALL) is known to be a very heterogeneous disease together with identified various genetic abnormalities that causes the disease to be formed. ALL is also known with its low survival rates. The most commonly seen subtype of ALL is Philadelphia positive ALL (Ph+ALL) which carries BCR/ABL translocation which is considered as high-risk and the most aggressive subtype. Ph+ ALL subtype presents drug resistance phenomenon as an obstacle in the treatment process. Moreover, there has not been novel treatments developed or proposed for the treatment of ALL.

In this study, we aimed to compare the molecular profiles of ALL and Ph+ALL by integrating data from multiple biomolecular levels. We statistically analyzed 8 ALL and 4 Ph+ALL-associated transcriptomic datasets using the R/Bioconductor (www.bioconductor.org) software platform. As a result of this meta-analysis, we found 799 differentially expressed genes (DEGs) for ALL and 295 DEGs for Ph+ALL. We associated DEGs with reporter molecules receptor, transcription factor, miRNA, metabolites in addition to reconstruction of protein-protein interaction networks. We also identified hub proteins according to degree and betweenness centrality. CDKN1A, HSP90AA1, PCNA, PIK3R1, SMARCA4, YWHAB, and YWHAE in ALL; LYN and RANBP9 in Ph+ALL were prominent as hub proteins. In addition, we aimed to find a novel and effective therapeutics by using drug repurposing strategy.

The results elucidated by this project will further use in *in vitro* validation tests and may pave the way for new clinical trials and clinical applications.

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# Development of Electrospun Nanofibers as a Vascular Graft

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Attention has recently increased in the application of electrospun fibers because of their putative capability to create nanoscale platforms toward tissue engineering. To some extent, electrospun fibers are applicable to the extracellular matrix by providing a three-dimensional microenvironment in which cells could easily acquire definite functional shape and maintain the cell-to-cell connection. It is noteworthy to declare that placement in different electrospun substrates with appropriate physicochemical properties enables cells to promote their bioactivities, dynamics growth and differentiation, leading to suitable restorative effects. This review paper aims to highlight the application of biomaterials in engineered vascular grafts by using electrospun nanofibers to promote angiogenesis and neovascularization. [1]

In this study, polycaprolacton (PCL) based electrospun nanofibers were developed as a vascular graft. Nanofibers were produced via electrospinning technique and then modified with heparin and RGD peptide. Cell culture experiments of nanofibers were performed on HUVEC cell line. The effects of nanofibers on the viability of HUVEC were determined by MTT.

**Keywords:** Nanotechnology, nanobiotechnology, vascular graft, nanofiber, wound dressing

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# *Echinops pungens Trautv. var. pungens* Against Oxidative Stress and Neurodegenerative Effects That Accelerate Aging

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The genus Echinops, a member of the Asteraceae family, includes 130 species. There are 17 species in total, including 2 subspecies and 3 varieties, in Turkey.[1] In traditional medicine, Echinops species have been used in the treatment of migraine, diuretics, heart diseases, urinary infections, and hemorrhoids. Besides, *Echinops pungens Trautv. var.* pungens has been used for purposes such as skin care, analgesic, and anti-aging, too.[2-3] The aim of this study was to investigate the anticholinergic effect and antioxidant activities of the extract of the medicinal plant. The antioxidant capacity of the obtained methanol extract were investigated using the DPPH free radical scavenging and the Ferric Reducing Antioxidant Power (FRAP) methods. In addition, the effect on the neurotransmitter acetylcholine hydrolyzed acetylcholinesterase (AChE) of Echinops pungens extract was investigated. In accordance with DPPH and FRAP tests, it was determined that *E. pungens* corresponded to 47.9% DPPH radical scavenging activity at 40 µg/µL concentration and FRAP metal reducing capacity as 0.068 mmol TEAC at 20 µg/µL concentration. The methanol fraction of *E. pungens* was exhibited in vitro the strongest inhibition on AChE with IC50 value of 0.02475 mg/ml. The results showed that it has moderate metal reducing capacity, free radical scavenging, and high anticholinesterase effect. In conclusion, it is thought that *E. pungens* can be used both as an anti-aging and as an alternative natural medicine instead of synthetic drugs used in the treatment of Alzheimer's patients due to its antioxidant and neurodegenerative inhibitory effects.

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# Anti-adipogenic and Anti-obesogenic Effects of Pterostilbene in 3T3-L1 Preadipocyte Models

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Obesity is a chronic metabolic disease caused by an energy imbalance between calorie intake and expenditure. Since obesity is an important risk factor for many diseases, it is critical to evaluate alternative treatment approaches. In this context, studies on the research of natural product-based therapeutics in the fight against obesity are increasing.[1] Pterostilbene (3,5-dimethoxy-40-hydroxy-trans-stilbene; PTS) is a natural phenolic compound and its main source is grapes and blueberries. The research goal of this study is to assess the anti-adipogenic and anti-obesogenic efficacy of Pterostilbene in 3T3-L1 cells. [2,3] The anti-obesogenic and anti-adipogenic effect of Pterostilbene in 3T3-L1 adipocytes were investigated by evaluating cell viability, cell proliferation, lipid accumulation, cell morphology, chromatin condensation, the expression levels of genes linked to the insülin resistance and adipogenesis. For this purpose, Pterostilbene was treated to mature 3T3-L1 adipocytes at different concentrations and half-maximum inhibitory concentrations (IC50) were determined by MTT. Oil-Red-O staining was applied to determine the lipid accumulation. Phase contrast microscopy, Giemsa staining, F-actin staining and DAPI staining were applied to examine the efficacy of Pterostilbene on the morphology of 3T3-L1 adipocyte cells. Expressions of *Adinopectin* and *Glucose transporter-4 (Glut-4)* in relation to insulin resistance were evaluated using immunofluorescent staining and qRT-PCR. Based on the results, 5 and 7.5 µM doses of Pterostilbene were chosen to apply to cells in subsequent experiments. In addition, it was observed that Pterostilbene treatment reduced lipid accumulation in adipocyte differentiation. According to the study result, adipocytes treated with a dose of 7.5 µM on 14 days showed less intense lipid deposition and a more spindle-like morphology. Our data suggest that the Pterostilbene supplementation may help weight control and the anti-adipogenic and anti-obesogenic activity is mediated in part by reducing lipid accumulation and inducing *Glut-4* and *Adiponectin* level.

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# Simultaneous Administration of *Ginkgo biloba* Leaves Extract and L-DOPA Protects Against Rotenone-induced Neurotoxicity in SH-SY5Y Cells

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Parkinson's disease is one of the most common neurodegenerative diseases, occurring in approximately 1% of people over the age of 60. One of the causes of Parkinson's disease is the deficiency of dopaminergic neurons in the nigrostriatal system.[1] Although no cure has yet been found for Parkinson's disease, the most common drug used in its treatment is L-DOPA, the precursor molecule to increase the amount of dopamine in the brain. The extract obtained from the leaves of the *Ginkgo biloba* tree has been reported to be antioxidant and neuroprotective.[2] Jin et al. reported that *Ginkgo biloba* extract develops a convenient drug delivery system for the brain.[2]

In our study, the protective effects of combinations of *Ginkgo biloba* leaves extract (GBLE) prepared by decoction method and L-DOPA against the neurotoxic effect of rotenone on the neuroblastoma cell line (SH-SY5Y) were investigated. The effect of GBLE and L-DOPA separately and together on the viability of Rotenone-induced SH-SY5Y was examined by MTT test. In addition, the results obtained were evaluated with the CompuSyn program and the CI value was calculated. ELISA method was performed to detect the levels of Dopamine and Nitric oxide ($NO^{2-}$/$NO^{3-}$) at the concentrations with the lowest CI value. To evaluate the status of oxidative damage after rotenone applications; catalase (CAT), malondialdehyde (MDA), and superoxide dismutase (SOD) were analyzed spectrophotometrically.

According to the results of MTT; the best agonistic effect (CI: 0.382) was determined as 6,25 µM L-DOPA-3,125 µg/ml GBLE at 24 hours. Relative dopamine levels of L-DOPA/GBLE-applied group (9,143 nmol/L); increased by approximately 47% compared to the control (6,22 nmol/L) and 18% compared to the L-DOPA-treated group (7,41 nmol/L). In addition, L-DOPA/GBLE-applied group, lower NO and MDA levels were detected in the control group and L-DOPA-applied group, and an increase in CAT and SOD activities was determined.

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# Immobilization of β-galactosidase onto Tri-component Electrospun Nanofiber Supports and Its Stability Applications

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β-galactosidase is an enzyme which hydrolyze lactose disaccharide onto glucose and galactose. β-galactosidase is widely used in dairy products but its single use limits lactose hydrolysis processes in the industry.[1] Therefore, enzyme immobilization has attracted interest to improve enzyme stability, durability, and reusability. Latest studies shows that β-galactosidase has been immobilized onto varying materials such as nanofibers, magnetic nanoparticles, cotton *etc*.

In this study, we preferred electrospun nanofibers as a support matrix for enzyme immobilization. Aim of this study is to successfully immobilized β-galactosidase enzyme from *Aspergillus Oryzae* onto unique nanofiber support material obtained by electrospinning process from Polycaprolactone (PCL), Polyethylene oxide (PEO), Polyvinyl alcohol (PVA) polymers. Electrospinning solution was prepared by combining these polymers at 60% PCL, 30% PEO and 10% PVA by volume. Afterward, electrospun fiber parameters such as concentration, voltage, flow rate, and needle-tip collector were optimized during the electrospinning process. Optimized concentration was determined as %10 (w/w), %5 (w/w), %2 (w/w) for PCL/PEO/PVA, respectively. On the other hand, optimum voltage, flow rate and needle tip collector distance were determined as 16 kW, 0.5 mL/h, and 20 cm, respectively. In addition, analysis methods such as FTIR, XRD, SEM, EDX, liquid contact angle, swelling test were used for the characterization of the obtained PCL/PEO/PVA nanofibers before and after immobilization. Average diameter of nanofibers without enzyme determined as 340 nm. Moreover, optimum pH, optimum temperature, storage stability and thermal stability of free and immobilized β-galactosidase were investigated.

As a result, β-galactosidase enzyme was successfully immobilized onto our unique nanofiber support.

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# Determination of Biological Activities of Lichen Species from Domaniç

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Lichens are symbiotic organisms which are especially composed of two distinct individuals such as fungus and alga or cyanobacterium.[1] Research on the potential uses of lichens in pharmaceutics and medicine has grown substantially in recent years. Various biological activities of some lichens and their components are investigated like antitumor, antimicrobial, antiviral, anti-inflammatory, antioxidant, antiprotozoal, antiproliferative and antipirethic. Some of them are used as food nutrition, medicinal additive, and supplements.

They produce secondary metabolites that are specific to lichens. Secondary metabolites identified from lichens include phenolic compounds (e.g. orcinol and β-orcinol), anthraquinones (e.g. parietin), dibenzofurans (e.g. usnic acid), depsides (e.g. gyrophoric acid), depsidones (e.g. norstictic acid), depsones (e.g. picrolichenic acid), γ-lactones (e.g. protolichesterinic acid), and pulvinic acid derivatives (e.g. vulpinic acid).[2] Extracellular products of lichens are insoluble in water and can be extracted into some organic solvents.[3]

Our current study reports the isolation and evaluation of biological activities from lichen species. In this study, three lichen species were collected from Topuk Yaylası, Domaniç (Kütahya) and identified as *Plasmatia*, *Pseudevernia* and *Evernia* sp. They were washed twice with tapped water and dried at room temperature. Then, they were grinded into small particles and secondary metabolites were extracted with different solvents like distilled water, ethanol, acetone and dimethyl sulfoxide (DMSO) under the different conditions. After extraction, supernatant were filtered using Whatman filter paper and stored at 4 $^{o}$C until they were used in the tests. Total phenolic content (TPC), ABTS radical cation scavenging and antimicrobial activity of every extracts by disc diffusion assay were analysed. Also, the results were compared with and within Lichen species.

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# Green Synthesized Iron Nanoparticles Induced Apoptotic Pathways in Breast Cancer Cell Lines by Inhibition of Heat Shock Proteins

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Green synthesized metallic nanoparticles have great potential in treatment of breast cancer[1]. The secondary metabolites of medicinal and edible mushrooms can reduce metal ions in the synthesis of metallic nanoparticles[2]. In this study, iron nanoparticles (FeNPs) were synthesized using crude extract of *Lactarius deliciosus* by microwave-assisted green chemistry method. The synthesized *L. deliciosus*-FeNPs (LD-FeNPs) were characterized by UV-Vis, FTIR, DLS, STEM, and EDS analysis. The synthesized LD-FeNPs inhibited MCF-7 and MDA-MB-231 cell proliferation in a dose-dependent manner. The synthesized LD-FeNPs down-regulated HSP27, HSP70, and HSP90 protein levels and stimulated intrinsic apoptotic pathway in MCF-7 and MDA-MB-231 cell lines. The green synthesized LD-FeNPs may be potential anticancer agents that could induce intrinsic apoptotic pathway in breast cancer cells.

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# Evaluation of the Phenolic Profiles and Biological Properties of *Micromeria graeca* and *Micromeria myrtifolia* from Türkiye

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Plants are potential sources of phytochemicals as natural bioactive compounds. The identification of phytochemicals in the plants and investigations of their applicability in the food, food additive, pharmacognostic, and medical fields are of great importance in evaluating the bioeconomic potential of plants.[1, 2] The aim of this study was to determine the basic phenolic profiles, which are bioactive compounds, antioxidant activities, and cytotoxic capacities of the flavonoid subgroups and phenolic acid extracts of the aerial parts of *Micromeria graeca* and *Micromeria myrtifolia*, which belong to the Lamiaceae family grown in Türkiye. Phenolics in *Micromeria* species were determined in flavonoid subgroups flavone, flavanone, flavonol, flavan-3-ol, and phenolic acids with their acid-base hydrolysis extracts by using RP-HPLC-DAD system. The top three phenolic compounds determined were epigallocatechin, rosmarinic acid and protocatechuic acid in *M. graeca*; and rosmarinic acid, t-cinnamic acid, and epigallocatechin in *M. myrtifolia*. As antioxidant parameters, DPPH$^{\bullet}$, HO$^{\bullet}$, and NO$^{\bullet}$ scavenging activities, metal chelating, reducing power, and also total phenolic, flavonoid and tannin contents were determined by spectroscopic methods in these extracts. The best $IC_{50}$ values (ppm) in *M. graeca* and *M. myrtifolia* extracts were determined for DPPH$^{\bullet}$ (6.30±0.41; 6.58±0.23), HO$^{\bullet}$ (1.15±0.007; 11.03±0.068), NO$^{\bullet}$ (42.61±1.37; 44.08±1.09) scavenging activities, and for metal chelating capacities (40.02±1.28; 48.55±1.10), respectively. Additionally, the best results of reducing power for *M. graeca* and *M. myrtifolia* were detected as 2.64±0.05 and 1.91±0.04 $mg_{VCE}/g_{DWE}$, respectively. The cytotoxic effects of the *Micromeria* extracts against HeLa, ACC-201, and OE-33 cancer cell lines were performed by MTT test in a microplate reader. The most effective $IC_{50}$ values of *Micromeria* extracts were found to be ≤ 30 ppm generally against all investigated cancer cell lines. Considering the cytotoxic effects of the extracts, phenolic acids were more effective than flavonoid subgroups against the HeLa, ACC-201, and OE-33 cancer cell lines. According to the results obtained in the extracts where the best values were determined, the type of cell death was determined by the flow cytometer as apoptotic in parallel with the increases in Caspase-3 and -9 activities in cancer cells. The obtained results confirm that these *Micromeria* species are promising as potential sources of bioactive phenolic compounds.

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# A lateral flow assay in competitive format for the quantitative detection of soluble interleukin 1 receptor-like 1

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Suppression of tumorigenicity 2 (ST2), is a member of the interleukin-1 receptor superfamily. Although the complex biology of the ST2 system has not been fully elucidated, high ST2 levels have been associated with increased mortality rates in both acute and chronic heart failure [1,2]. Although the necessary research on heart failure continues rapidly, tangible treatments have still not been found. For this reason, there is a great need for an easy-to-use, accurate and fast test method to prevent the risk of heart attack and intervene in time. Lateral flow technology has attracted great attention as it is a powerful tool in analyte determination and sample analysis[3]. Lateral flow immunoassays, also known as immunochromatographic tests or strip tests, are immunoassays designed to operate along a single axis. Within this study's scope, a kit that can perform ST2 quantification analysis based on concentration using the competition format in the lateral flow system has been developed for the first time. Also, a new and relatively inexpensive biomolecule based on gold thiol interaction was used to generate the control line. The signals in the test and control lines were amplified by making various optimizations such as pH, buffer type, NC membrane size. The test duration is 10 minutes. In summary, a highly sensitive immunochromatographic analysis was performed for the ST2 antigen, an important heart attack marker. The results show that the produced kit has a high potential for commercial development.

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# Self-Healing and Shape-Fitting Pectin-Zeolite Hydrogels with Controlled Allantoin Delivery

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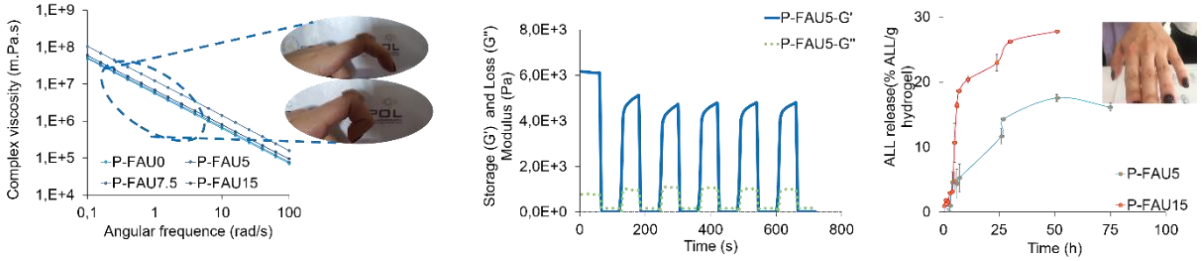
Rheological measurements are frequently used to investigate the gelling or viscoelastic behavior of a system. The structure–function relationship of a hydrogel is commonly established by relating the rheological behavior. It's known that viscosity and the dynamic modulus are directly related to the physical and mechanical properties of a gel [1]. Hydrogels are widely used in the development of drug delivery systems. Zeolites have recently gained prominence in the preparation of hydrogels for biomedical applications because of their ability to selectively adsorb various molecules. This study aims to develop the preparation and characterization of active molecule Allantoin (ALL) loaded pectin-faujasite type zeolite (FAU) based systems. The hydrogels are prepared in various ALL concentrations using the ionotropic gelation method, where $CaCl_2$ is used as the cross-linker. We use TGA, contact angle, rheology, swelling and drug release analysis to identify conformational, morphological and structural properties of the hydrogels. The complex viscosity of the samples decreases linearly with frequency, proving the shear-thinning phenomenon of the hydrogels. This implies that the hydrogels can dynamically adapt to the movement and withstand the deformation of varying movement angles that a body can make. This result and thixotropy analysis confirm the self-healing ability and strong mechanical durability of the hydrogels. The tack test revealed that FAU particles increased the tackiness of the hydrogel. The release studies in tris buffer pH 6.4 mimicking the biological environment, were performed by UV spectrophotometer. The release profile of ALL is strongly affected by initial ALL concentration.

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# A Novel Electrochemical Biosensor Design Based on 3-MPDS for Early Detection of AFB1

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Aflatoxins are fungi of the genus Aspergillus and are secondary fungal metabolites produced by A.flavus, also known as mycotoxins. [1] There are four compounds from this class produced by A. flavus: aflatoxin B1 (AFB1), aflatoxin B2 (AFB2), aflatoxin G1 (AFG1) and aflatoxin G2 (AFG2).[2] These compounds pose a great risk for food contamination as they significantly contaminate the food sources of these animals. AFB1 is the most carcinogenic of aflatoxins. AFB1 has been identified as an immunosuppressive agent. In this study, an ITO-PET (indium tin oxide polyethylene terephthalate ) based biosensor is configured to detect AFB1. The surfaces of the ITO-PET electrode were modified with a 3-Mercaptopropyldimethoxysilane (3-MPDS) agent. Then, NHS was used as a crosslinker. The 3-MPDS concentration, NHS concentration and incubation time, antiAFB1 concentration and incubation time, and AFB1 incubation time were optimized. There were characterization studies conducted. . The linear range of the immunosensor was determined as 0.01 fg / mL - 200 fg / mL and low limit of detection (LOD), and a low limit of quantification (LOQ); 0.0425 fg $mL^{-1}$ and 0.1275 fg $mL^{-1}$, respectively. Electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) were used for immobilization, optimization, and analytical studies. We studied the linear range, repeatability, reproducibility, and regeneration of the proposed biosensor in characterization studies. The storage life of the biosensor was determined. A single frequency technique was used to monitor the interaction between the anti-AFB1 and AFB1**.** Finally, the designed biosensor was applied to real food samples.

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# The Combination Levodopa/P-coumaric Acid Attenuates Neurotoxicity in Rotenone-induced SH-SY5Y Cells

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Levodopa (L-DOPA)is the most useful drug in the symptomatic treatment of Parkinson's disease.[1] It also faces an ongoing challenge to re-invigorate itself with new formulations improving on dose-by-dose motor fluctuations and other therapeutic limitations.

*P*-coumaric acid has antioxidant and antimicrobial properties; therefore, it is a natural alternative instead of synthetic additives, nowadays. Recent studies indicated that *p*-coumaric acid significantly protects neurons against injury.[2] However, the synergistic effect of the combination of L-DOPA and *p*-coumaric acid has not yet been investigated.

In this research, we investigated for the first time the synergistic neuroprotective effect of the combination of L-DOPA and *p*-coumaric acid against rotenone toxicity on dopaminergic SH-SY5Y cells. The values of CI (Combination Index) were calculated using CompuSyn software to identify the synergistic effect of L-DOPA and *p*-coumaric acid. The effect of L-DOPA and *p*-coumaric acid separately and together on the viability of Rotenone-induced SH-SY5Y was examined by XTT test. Levels of nitric oxide ($NO^{2-}$/$NO^{3-}$) and dopamine at the concentrations with the lowest CI value were performed to ELISA. Catalase (CAT), malondialdehyde (MDA) and superoxide dismutase (SOD) activities were examined by spectrophotometric methods to reveal the protective effect of *p*-coumaric acid and L-DOPA against oxidative stress caused by rotenone.

The findings showed that simultaneous administration of L-DOPA and p-coumaric acid increased cell viability by 32% and 17%, respectively, compared to the control and L-DOPA -applied groups. In the calculation made with the CompuSyn program, the best agonistic effect (CI: 0.278) was observed at the concentration of 12.5 µM L-DOPA -6.25 µM p-coumaric acid at 24 hours. At the time and concentration for which the lowest CI value was calculated, in the combination group; It was determined that while dopamine, CAT, and SOD levels increased, NO and MDA concentrations decreased.

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# An Innovative and Low-cost Electrochemical Biosensing System for Detection of Alphafetoprotein Protein: A Potential Biomarker for Ovarian Cancer

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Ovarian cancer is a type of cancer that starts in the ovary. Ovarian cancer is a growth of cells that forms in the ovaries.[1] The cells multiply quickly and can invade and destroy healthy body tissue.[2] Biosensors are fast, sensitive, inexpensive and on-site detection systems that allow analysis.[3] The biosensor system developed for the determination of alphafetoprotein (AFP), a potential biomarker of ovarian cancer, will be very important and useful for this disease. This study presents a sensitive, single-use and low-cost ITO-PET based biosensor for AFP protein determination. ITO-PET (Indium tin oxide-poly ethylene terephthalate) disposable electrode was used as working electrode. In the immobilization step, 3- (Trimethoxysilyl)propyl methacrylate (3-TMSPM) silanizing agent was used for modification of the electrode surface. After the immobilization procedures were studied, all optimum conditions were investigated to obtain a good, stable and high sensitive biosensor system. Electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques were used for investigation of the biosensor capacity, immobilization procedures and optimization studies. For analytical characterization of the designed immunosensor; linear range, reproducibility, repeatability, selectivity and storage capacity of the biosensor were investigated. Finally, the performance of the biosensor in real human serum samples was also evaluated.

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# A Highly Sensitive Immunosensor System Based on Benzoquinone for Cardiac Troponin T Detection on ITO-PET Electrode

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Globally, cardiovascular diseases (CVD), which have been on the rise in recent years and pose a significant danger to human health, lead to the list of chronic illnesses.[1] Contraction of a muscle fiber occurs when troponin T (cTnT) attaches to tropomyosin (a helicald-coiled protein twisted around the actin filaments), therefore attaching the troponin complex to the muscle fiber.[2] In the diagnosis of myocardial injury, the measurement of serum cTnI and cTnT showed better in terms of sensitivity and specificity to the testing of cardiac muscle enzymes. Currently, elevated cardiac troponin concentrations are recognized as standard biochemical biomarkers for the diagnosis of AMI.[3]
This work developed a novel immunosensor on modified ITO-PET (indium tin oxide - polyethylene terephthalate) disposable electrodes. Anti-TnT was immobilized through covalent with benzoquinone on modified ITO-PET electrodes. Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) techniques were employed to characterize and detect the immobilization process. All parameters such as benzoquinone concentration, antibody concentration and antibody incubation time were optimized. Analytical characteristics such as linear determination range, repeatability, reproducibility, regeneration and storage life of biosensors were determined. The linear range of the developed biosensor was 1 fg – 10 pg/mL. The biosensor has exhibited excellent repeatability and reproducibility. The immunosensor was successfully applied to the detection of TnT in human serum.

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# The Improvement of Viability of *Lactobacillus casei* by Freeze-drying Method

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Probiotic bacteria, which have positive effects on host health when taken in sufficient amounts, support the immune system, help gastro-intestinal digestion, provide the creation and use of some vitamins, and also have antimicrobial, antimutagenic, antidiarrheic, and anticarcinogenic effects. Prejudices against using drugs, limit the use of dietary supplement capsules and tablets prepared in drug form. For this reason, the demand for food products (especially dairy products) containing probiotic microorganisms is increasing rapidly around the world. It is of great importance that probiotic bacteria maintain the number of viable cells in the food product. However, many factors in food production, storage, and post-consumption gastrointestinal digestion cause losses in the viability of probiotic bacteria[1]. For this reason, many processes have been proposed to improve the viability of probiotics, such as choosing the appropriate strain, adding prebiotics and sugar substitutes, adjusting the fat content, adding glycerol, inoculation rate, pH adjustment, and encapsulation of the probiotic culture.[1,2]

In the study, probiotic bacteria were encapsulated by freeze-drying (lyophilization) method[3] on the oleaster fruit *Elaeagnus angustifolia* (flour part), which is a natural antioxidant source, to protect the probiotic bacteria against external factors. The encapsulation efficiency of the encapsulated bacteria and the viability of the encapsulated bacteria compared to the free bacteria in the in-vitro gastrointestinal environment were investigated. At the same time, surface analyzes of the formed capsules were performed with FT-IR and SEM. It is thought that new products can be developed by using the obtained oleaster flour-probiotic bacteria capsules as natural additives in food products such as dairy products.

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# Detection of Creatine Kinase by using a disposable immunosensor based on indium tin oxide covered flexible electrodes

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Cardiovascular diseases are the most prevalent cause of human death and take over 17 million lives each year. The early diagnosis of CVDs has critical importance for patient survival.[1] Biosensing technology have opened advantaged platform for detection cardiac disease biomarkers. These advantages count as well- balanced cost, saving time and easy analysing.[2] Electrochemical biosensors are used for detecting cardiac biomarkers while depends on antibody/ antigen affinity which increase sensors specificity.[3] In this study we proposed to detecting creatine kinase which is biomarker of cardiovascular disease with ITO-PET electrode. Binding agent, antibody and antigen concentration and incubation time were optimized and repeatability, regeneration, reproducibility, selectivity, storage, and human serum analysis characterization steps were completed by using methods of electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV). The study suggested high detection range such as between 0.1 pg/mL and 250 pg/mL. The signal that is taken from redox reactions, was transferred to the screen by potentiometric transducer.

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# Alteration of Cytochrome P450 Enzyme Activities with Caffeine and Cotinine in Rainbow Trout (*Oncorhynchus mykiss*)

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Caffeine and cotinine are two chemicals humans are exposed to in their daily lives. Caffeine is found in a wide range of liquids (coffee, tea, and caffeinated soft drinks) as well as a wide range of foods (chocolate, pastries and dairy desserts).[1] Cotinine is the major metabolite of nicotine which is an alkaloid found in tobacco leaves.[2] The studies have showed that caffeine and cotinine are present in aquatic environments.[3,4,5] Individual and combined effects of these chemicals have not been well studied in organisms living in aquatic environments. The aim of this study was to determine the effect of individual and co-administration of caffeine and cotinine on cytochrome P450 system (CYP) in male and female rainbow trout (*Oncorhynchus mykiss*). For this purpose, 48 fish were treated with individually or in combinations of 50 µg/L of caffeine and cotinine for 48 hours. At the end of this time period, liver tissues were taken and microsomes were prepared from each tissue. CYP1A-associated 7-ethoxyresorufin O-deethylase (EROD), CYP2B-associated 7-penthoxyresorufin O-depenthylase (PROD), CYP2E-associated aniline 4-hydroxylase (A4H) and CYP3A-associated erythromycin N-demethylase (ERND) activities were determined in male and female rainbow trout (Oncorhynchus mykiss). EROD activities of female fish treated with caffeine was significantly different from the control group. PROD activities of female fish treated with cotinine was significantly different from the control group. A4H activities of male fish treated with caffeine was significantly different from the control group. ERND activities of male fish in caffeine administration group and cotinine administration group were lower than the control group. But these differences were not significant. In vivo studies indicated that caffeine and cotinine altered the activities of some of cytochrome P450 enzymes. There were gender differences in these alterations. In addition to in vivo studies, in vitro studies were also carried out in the same enzyme activities. CYP3A-associated ERND activity was inhibited with caffeine and cotinine in rainbow trout liver microsomes. In vitro study results indicated the role of CYP3A on the metabolism of both caffeine and cotinine.

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# Effect Of Conductivite Polymer Coatings Containing Olive Leaf Extract On Biofoulung and Corrosion

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Marine biofouling and corrosion are one of the biggest economic problems in the world. Marine structures, ship hulls and propellers are subject to corrosion and biofouling as they are constantly in contact with the sea. Old generation toxic antifouling paints were used to protect these structures. Alternative new generation polymeric coatings have been studied since they are environment friendly, cheaper, easier to apply and have a longer life. Due to their surface properties, conductive polymers have been widely used in coatings. Additions such as nanoparticles are also used to support conductive polymers. In this study, we used olive leaf extract, which is known to have many properties, as a support for conductive polymers. With this study, new generation polymeric coatings will become more common with olive leaf extract, which is less harmful to the marine ecosystem, natural and easily obtainable.

Olive leaf extract is obtained from olive leave with methanol soxhlet. Electrochemical syntesis was carried out in a single cell with a 3-electrode system. The electrulyte was 0.3M oxalic acid and Ag/AgCl and platinum plate (0.69cm$^2$) was used as the reference and counter electrodes, respectively. The surface of 304 stainless steel (2.7cm$^2$) to be coated was cleaned with sponce detergent without touching bare hands and kept in 1/1 (v/v) acetone ethanol solution. Electropolymerization was applied on 304 stainless steel in solutions containing pyrrole, pyrrole + olive leaf extracts at different concentrations (0.02, 0.03, 0.04, 0.05 and 0.06 g/L). All coatings performed were carried out at room conditions on the same day. The coated steels were released into the sea for biofilm formation and corrosion effect in Arsuz, Hatay, Turkey. The steels that were kept in the sea for 5 days were removed and DAPI staining and cyristal violet dye were used to measure the biofilm amount. AP-tafel and impedance techniques were applied to steels kept in sea to examine corrosion performance.

DAPI staining results show that all coatings reduced the amount of biofilm. The best reduction among them is the polypyrrole coating including 0.03g/L olive leaf extract. Crystal violet results and DAPI staining results support each other. AP-Tafel and impedance tests show that the coatings with olive leaf extract have more corrosion resistant than that of the plain polypyrrole coating.

# Improving the Mechanical Properties of Fine-Grained Soils by a Biopolymer

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Increasing population in the world has led to the growth of cities, and this has led to a subsequent increase in demand of residential areas/roadways with improved subsoil engineering properties. In this way, alkaline binder additives such as cement, lime and fly ash has been commonly used in soil improvement. However, considering cement, energy used in the production phase, released high temperature, high emission of dust, toxins and heavy metals as well as the interaction with groundwater after application, it can be stressed that it's not an environmentally friendly solution for stabilization purposes.[1-2] Therefore, stabilization by use of environmental-friendly biopolymers is an option. The use of microorganisms by the method of biomineralization is one of the studies in this field. Biopolymers formed in the biomineralization process are mineral compounds such as $CaSO_4$ (calcium sulfate), $Ca_3(PO_4)_2$ (calcium phosphate), calcium carbonate ($CaCO_3$) formed by calcium ions ($Ca^{2+}$).[3] In this study, it was aimed to increase the strength of building elements and floors with $CaCO_3$ produced from *Bacillus megaterium (ATCC 14581)*. Currently, no studies were encountered in the literature considering optimization of $CaCO_3$ production by *B. megaterium (ATCC 14581)* in soil. Optimum $CaCO_3$ production conditions were determined with the optimization of the medium components, the concentration of the components and the production conditions with the experiments. Microorganism was taken from cultures in which log phase initiation and $CaCO_3$ formation were completed while in broth, and soil samples were prepared. The mechanical properties of the cured samples were evaluated by unconfined pressure tests. Bacterial mineralization products were examined using scanning electron microscopy (SEM). In this way, stress-strain behaviors, soil strength and rigidity values and biopolymer morphologies of specimens were determined. The unconfined compressive strength test results were evaluated taking two-time parameters into consideration, i.e. log phase and $CaCO_3$ formation phase of bacteria.

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# Synthesis and α-Glucosidase, Cholinesterases, Tyrosinase Enzyme Inhibition Properties of Silicon(IV), Copper(II), Manganese(III) Phthalocyanines

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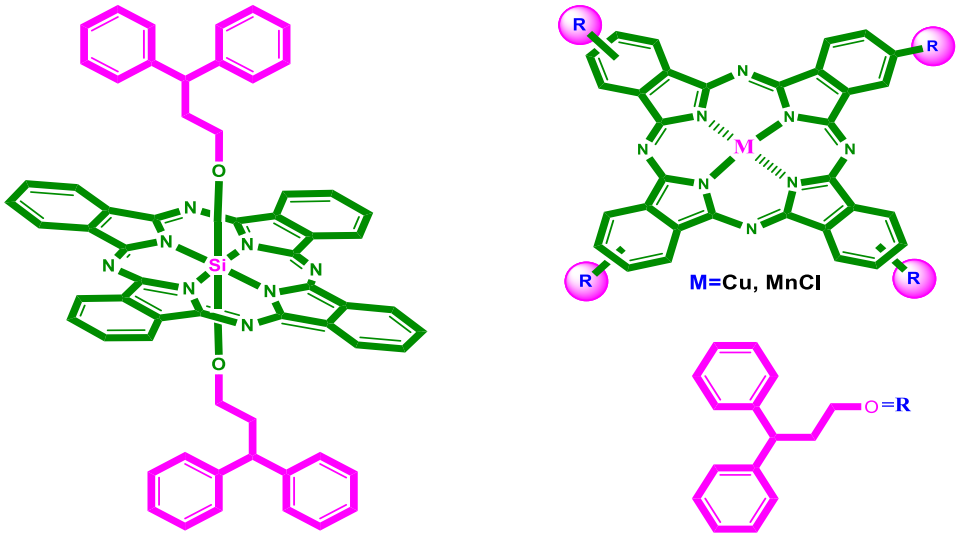
Phthalocyanines are important aromatic macrocyclic compounds because of their highly conjugated electron system, electrochemical, photochemical, photophysical properties.[1] Due to these properties, they have become one of the most preferred compounds in the technological field. In last years, there have been many studies on the biological studies of phthalocyanine. Cholinesterases, which are hydrolase class enzymes, hydrolyze acetylcholine, an important neurotransmitter in the autonomic and somatic nervous system.[2] Acetylcholine is involved in the transmission of nerve impulses from one neuron to another at junctions called synapses.[3] In this work, we have synthesized axially di- (3,3-diphenylpropoxy) substituted silicon) and peripherally tetra-(3,3-diphenylpropoxy) substituted copper(II), manganese(III) phthalocyanines and investigated their enzyme inhibition properties.

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# Antimicrobial Peptide Production from Lactic Acid Bacteria

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Antimicrobial peptides (AMP) evolve as a host defense mechanism against invading microorganisms in most organisms. In addition to antibacterial properties, AMPs are believed to be key players in innate immunity. AMPs are small, thermostable peptides consisting of short chains around 20-60 amino acid residues, but longer chains can also be found.[1] Most AMPs are produced by Gram-positive bacteria, as reported in the BACTIBASE database. A small number of AMPs were also identified from Gram-negative bacteria.[2]

Lactococcus lactis (ATCC 7962, 47MoQuesillo no:140) bacteria in 2 different strains were used to produce AMP from lactic acid bacteria. In order to realize antimicrobial peptide production, peptide production was carried out from 2 different AMP production media, MRS broth, M17 Broth and Tryptic Soy Broth (TSB) media, the formulation of which was determined. pH (3-8) and temperature (24-32 °C) optimizations were carried out in the MRS broth medium, where the production level was the highest. Each optimization parameter was also evaluated based on time (16-26 h, every two hours). After the optimization, after the cells were collected by centrifugation and precipitated by dialysis against deionized water, Gel Filtration Chromatography on Sephadex G75, Ion Exchange Chromatography on DEAE-Sepharose and extraction were performed.[3,4] In addition to the produced AMP, the Identification of the Activity Bands of the AMPs with SDS-PAGE and the Determination of the Activity Spectrum by Determining the Molecular Weight were provided. In order to determine the antimicrobial effect in each production and purification step, antimicrobial activity was determined by agar-disk diffusion method in Nutrient Agar medium by using overnight cultures of Test microorganisms and AMP producer strains.[5,6] As a result of the studies, it was determined that the antimicrobial peptide of Lactococcus lactis bacteria, whose production and optimization studies were carried out, gave the best results at 24h, 30°C and pH 4.

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# Preparation of Graphitic Carbon Nitride/Cobalt Phthalocyanine As Photocatalyst for 4-nitrophenol Photoxidation

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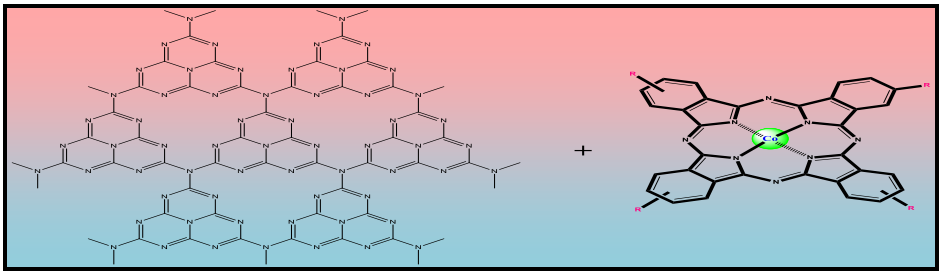
Photocatalysis is one of the promising techniques used in the decomposition reactions of organic pollutants and is the focus of attention day by day. To date, a significant number of photocatalytic materials (such as TiO2, ZnO, CdS, g-C3N4) have been used as photocatalyst in photocatalysis processes. Among these photocatalytic materials, graphitic carbon nitride (g-C3N4) is of interest due to its non-toxic, low cost, thermal stability, environmental friendliness and high photocatalytic performance under UV-Vis light and suitable band gap (2.7 eV). However, limited absorption (450 nm) in the UV-Vis region restricts the use of graphitic carbon nitride in this area. Therefore, the preparation of effective photocatalysts with stable molecules that can interact to graphitic carbon nitride, can be UV-Vis light sensitive, absorb at a higher wavelength, and meets the need for the solution of this problem.[1-2]

Thanks to the 18-π electron system of the phthalocyanine ring, it shows excellent photosensitizing properties since it is a good electron donor (e-donor) molecule. In this work, cobalt phthalocyanine will synthesized and characterized for the preparation of graphitic carbon nitride / phthalocyanine (g-C3N4 / Pc) structures. The conversion of environmental pollutants (4-nitrophenol), one of the important environmental problems, into harmless derivatives and the determination of photocatalytic activities of photocatalysts were another goals of the work. The results showed that it may allow the introduction of new works that include photocatalyst designs that can be applied to industrial wastewater and the development of photocatalytic membranes or filters.



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# Investigation of the Expressions of AGTR-1 and AGTR-2 that are Involved in Aldosterone Metabolism in Rat Tissues by Immunochemical Methods

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Aldosterone is one of the major mineralocorticoid hormones in all mammals and synthesized from zona glomerulosa of adrenal cortex and plays a pivotal role in balancing water via regulation of water and sodium reabsorption so regulates blood pressures. Overproduction of aldosterone, primary aldosteronism, has been linked to increased level of hypertension. Investigating the regulation of genes involved in aldosterone metabolism in aldosterone biosynthesis is important in the diagnosis and treatment of aldosterone-induced hypertension and adrenocortical carcinoma. Therefore, the aim of the present study is to investigate the expression levels of proteins including AGTR-1 and AGTR-2 that are involved in aldosterone metabolism on rat kidney by immunochemical methods. Rats were divided into two experimental groups: Control group and Aldosterone induced group. AGTR-1 and AGTR-2 expressions were investigated on rat kidney by western blotting and immunohistochemistry techniques. The slides are stained with hemotoxylenes and eosin dyes and then examined by light microscopy. Immunoreactive protein bands were quantified by densitometric scanning method using an Image J software package. Statistical analyses were performed SPSS v.23 programme. Overall results showed that induction of aldosterone resulted in significantly increased expression of AGTR-1 and AGTR-2 proteins related to aldosterone biosynthesis in rat kidney tissues.

# Inhibitory effects of herbal extracts on ACHEs purified from *Ricania simulans*

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Acetylcholinesterase (ACHE, EC3.1.1.7) plays an important role in neurotransmission by hydrolyzing the neurotransmitter acetylcholine into choline and acetate and is the target site of many insecticides.[1] Between the various alternatives for insect control, a lot of natural plant products that are nonphytotoxic, biodegradable and ecofriendly engage the attention of scientists worldwide.[2] Purified the acetylcholinesterase from adults and nymphs of *R. simulans* using affinity chromatography edrophonium-Sepharose.[3] The inhibition effects of olive leaf, walnut leaf, walnut green shell and sycamore leaf on *R. simulans* ACHEs were examined and the IC50 values of the inhibitors were calculated.[4] As a result, the IC50 values for adults were 20,3; 34.1; 42.3; 75.2 µg dry matter/mL, respectively and for nymphs 16,2; 58.3; 56.0; 78,5 µg dry matter/mL, respectively. It was determined that olive leaf extract showed a higher inhibition effect on ACHEs in both stages compared to other extracts. While other extracts were more effective on adults according to their $IC_{50}$ values, it was determined that olive leaf extract was more effective on nymphs.

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# Surface Nanotopography Enhances Cellular Spreading

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The extracellular matrix (ECM) provides extensive area to cells for their adhesion, proliferation, migration and differentiation etc.[1] Since many molecules such as laminin, fibronectin, collagen etc in the ECM have nanometer dimension, having nanotopographical surfaces (especially less than 100 nm) are very important for many implant materials to enhance cellular functions.[1,2] For neural cells, many studies assessed the effects of topographies higher than 100 nm, however, there are limited number of studies focusing on topographies less than 100 nm. Thus, evaluating the effect of nanotopographies on neural cell behavior is the purpose of the present study. For this reason, nanopores were obtained on 316L stainless steel (SS) surfaces via anodization. Afterwards, the obtained nanopore structures were transferred onto poly (lactic-co-glycolic acid) (PLGA) surfaces by replica molding. Atomic force microscopy (AFM) were conducted to check whether nanotopographical surfaces were homogenously transferred onto the surfaces. Moreover, X-ray Photoelectron Spectroscopy (XPS) and Fourier-Transform Infrared Spectroscopy (FTIR) analysis were used to check if anodized oxide layer was transferred from the metal surfaces and if there was any left-over solvent. For assessing neural cell morphology and neurite extensions on the nanotopographical surfaces, scanning electron microscopy (SEM) was used. Finally, to evaluate protein adsorption onto the nanotopographical surfaces, protein elution techniques were used.[3] Based on the surface characterization results, nanotopographies were successfully transferred on the polymer surfaces, there were no metal ions coming from the oxide layer of the anodized 316L SS or any left-over solvent. More neural extensions were observed on the nanotopographical surfaces than the control (**$p$<0.01). Finally, the protein adsorption results showed that there was more adsorbed protein on the nanotopographical surfaces than the control (**$p$<0.01). To conclude, the nanotopography were successfully obtained on the surfaces. Moreover, it was observed that the neurite extensions were higher on the nanotopographical surfaces which might be related with the protein adsorptions. So, these nanotopographies could be used for designing materials in neural tissue engineering.[2]

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# L-Methioninase: A Potential Therapeutic Enzyme in Cancer Treatment

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Cancer is one of the leading causes of death in the world. Although a large number of chemotherapy drugs are produced, their use is limited due to their side effects, drug resistance, and low sensitivity. Due to the dependence on the amino acid methionine for the proliferation and invasion and transmethylation reactions, high consumption of methionine is a general metabolic disorder of cancer cells, and this is called as “Hoffman effect”. It has been determined that in methionine-dependent cancer cells, in the presence of methionine deficiency or when homocysteine is substituted for methionine, the growth of cancer cells stops, strong inhibition is observed in mitosis, cell cycle stops in the late S/G2 phase, and cancer cells become more sensitive to chemotherapeutic drugs in this phase. The methionine dependence seen in cancer cells has made methionine amino acid as a therapeutic target. Restriction of dietary methionine has been shown to have a positive effect on cancer inhibition. But the presence of the amino acid methionine in many types of foods limits the effects of a methionine-free diet. Therefore, L-methioninase enzyme has emerged as an important factor as a pharmaceutical agent in reducing the amino acid methionine level in the body fluid. Due to the low Km value of the Pseudomonas putida methionase enzyme, Recombinant Pseudomonas putida originated methioninase enzymes which is produced in E. coli is being widely used in cancer studies.

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# An Ultrasensitive Electrochemical Biosensor System for Selective Detection of Aflatoxin B1 In Real Food Samples

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Aflatoxin B1 is a common foods contaminant such as peanuts and corn and a genotoxic carcinogen in humans.[1] Therefore, AFB1 is a major risk factor for the development of hepatocellular carcinoma, one of the most dangerous types of human cancer.[2] Accordingly, detection of aflatoxins is vital to human health. This study aims to early detection of AFB1 and used working electrode as ITO-PET (Indium tin oxide polyethyleneterephalat) electrode. Firstly, optimization steps of proposed biosensor were researched using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques. Calibration graphic was determined, and the linear range of the biosensor was detected as 0.1-500 fg/ mL. It was completed that characterization steps such as repeatability, reproducibility, storage capacity, regeneration, and single frequency impedance (SFI) for proposed disposable biosensor, after optimization steps. Serum analysis of this disposable biosensor carried out with real food samples.

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# Effects of Exogenous Nitric Oxide (SNP) on Drought Tolerance in Two Wheat Varieties

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The Abiotic stresses are one of the major constraints to crop production worldwide. Drought stress causes negative impacts on plant growth, physiology, and production. It disrupts homeostasis in plants and causes osmotic stress, which affects normal cellular activities.

Drought stress promotes the production of reactive oxygen species (ROS), which can be detrimental effects on proteins, lipids, carbohydrates, and nucleic acids. The antioxidant defense system protects the plant from drought-induced oxidative damage by detoxifying the ROS and by maintaining the balance of ROS generation under drought stress.

Nitric oxide (NO) a reactive nitrogen species, plays an important role in intercellular signaling for the growth and development of plants. This study investigated the effects of sodium nitroprusside (SNP), a NO donor, on wheat and its role in improving its effects on wheat seedlings under moderate and severe drought stresses. This study focused on investigating the effect of foliar application of 0, 100, or 200 µM SNP on two wheat varieties (drought-tolerant cv. NKÜ Lider, drought-sensitive cv. Kenanbey).

Increased SNP concentrations decreased hydrogen peroxide ($H_2O_2$) and superoxide anion ($O_2\cdot^-$) accumulation under drought stress conditions in both varieties. Peroxidase activities increased in NKÜ Lider variety with all SNP concentrations under water scarcity. In contrast to NKÜ Lider variety of POX activities increased with 200 µM SNP under all stress conditions in the Kenanbey variety, significantly. On the other hand, total chlorophyll content (SPAD) gradually increased with increasing SNP concentrations under drought stresses in both varieties.

Our results indicated that exogenous SNP alleviated oxidative damage, accelerated protein synthesis, enhanced photosynthesis rate (SPAD), and increased the POX activities in drought-sensitive cv. Kenanbey than drought-tolerant cv. NKÜ Lider exposed to drought stresses.

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# Label-free detection of CYFRA 21-1 lung cancer biomarker using gold/amino-substituted poly(pyrrole) polymer modified disposable electrode

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Lung cancer is one of the most dangerous cancer among other cancers and it has a high mortality rate. Biological markers are found in biological fluids such as blood, saliva and urine. They are signs of diseases and the level of biomarkers are decreased or increased during the diseases.[1] Cytokeratin 19 fragment 21-1 (CYFRA 21-1) is an important biomarker of lung cancer and most of lung cancer patients have high CYFRA 21-1 levels in their serum. For early diagnosis of lung cancer, the manufacturing of an ultrasensitive, low-complexity and fast analysis path for CYFRA21-1 biomarker is urgently needed.[2]

A label-free immunosensor was designed for sensitive quantification of CYFRA 21-1 in human serum samples. The fabrication process of the biosensor was composed of gold nanoparticles deposition and electropolymerization of amino-substituted poly(pyrrole) polymer. Anti-CYFRA 21-1 antibodies immobilized on the amino-substituted poly(pyrrole) polymer coated ITO electrode through glutaraldehyde crosslinking. The manufacturing process of the suggested sensor was followed employing electrochemical impedance spectroscopy, cyclic voltammetry and scanning electron microscopy analyses. The developed immunosensor could detect CYFRA 21-1 with a linear calibration range from 0.015 pg/mL to 90 pg/mL with the detection limit of 4.6 fg/mL. This biosensor had god repeatability and reproducibility, high sensitivity and ultra-selectivity. The fabricated immunosensor was applied to human serum samples and high recovery rates (95.47-103.99%) in human serum were obtained. Consequently, impedimetric measurements proved that this developed biosensor was suitable tool for CYFRA 21-1 sensing.

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# Oxidation of Bacterial Cellulose for Biodegradable Cartilage-Bone Tissue Engineering Scaffolds

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Bacterial cellulose (BC) is an alternative biomaterial that has been studied extensively in tissue engineering in recent years with its properties such as high purity, high mechanical strength, biocompatibility, high crystallinity, nanofiber structure, porosity, and high water-holding capacity. Porosity, biocompatibility, biodegradability, and mechanical strength are important properties of materials used for scaffolds in tissue engineering. This study aimed to modify BC, which is biodegradable by periodate oxidation, for bone and cartilage scaffolds. BC produced by *Komagataeibacter xylinus* ATCC 700178 strain in Hestrin & Schramm medium with 2% v/v inoculation under static culture conditions at 30°C and 7 days. The harvested BC membranes were purified at high temperatures and alkaline conditions and then mechanically fragmented. The BC periodate oxidation degree was determined at different concentrations (0.05-0.5 M) and times (0.5-12 hours). Oxidized BC was molded, lyophilized, characterized, and its biodegradability was determined in phosphate-buffered saline for 45 days. Then, cell viability of oxidized BC scaffolds modified with chitosan, hydroxyapatite, and hydroxyapatite-boron to form bone and cartilage tissue scaffolds were measured at 1, 4, and 7 days using L929 cell line (n=3). BC membranes in hydrogel form were a white semi-opaque appearance after purification. The degree of oxidation of the fragmented BC samples was between 6.75% and 81%, which increased in line with the increasing concentration and application time of periodate. The biodegradability of the scaffolds prepared using oxidized BC was 14% at 45 days. It was determined that oxidized BC did not show a significant difference in cell viability compared to the control sample and was not cytotoxic. In conclusion, modified BC-based biodegradable scaffolds were produced using hydroxyapatite and hydroxyapatite-boron for bone scaffolds and chitosan for cartilage scaffolds.

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# Purification of Laccase from *Bacillus licheniformis* SO8 with Three-Phase Partitioning, Characterization, and Usage in Dye Decolorization

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Laccase is a versatile enzyme that plays an important role in remediation of various environmental pollutants.[1] Three-phase partitioning (TPP) is a simple, fast, cost-effective, and highly efficient process that can be used in the purification of laccases.[2] In this study, a thermophilic *Bacillus licheniformis* SO8 (GenBank No: MG076978) was isolated from water samples collected from the Nevşehir Kozaklı hot spring. The laccase was purified to 5.65-fold with 102.07 % recovery using the TPP. The molecular mass of the enzyme was calculated as ~38.7 kDa by SDS-PAGE. Optimum pH 9.0 and optimum temperature for laccase were determined as 70°C. The laccase exhibited pH stability over a wide range (pH 3.0–11.0) and a high thermostability, retaining over 65% of its activity after 1 h of incubation at 20-90°C. It was determined that the enzyme remained highly stable in the presence of 1% and 5% concentrations of surfactants, and increased its activity in the presence of $Fe^{2+}$ and $Mn^{2+}$ metal ions. The $K_{m,}$ $V_{max}$, $K_{cat}$ and $K_{cat}/K_m$ values for the( 2,2'-azino-bis 3-ethylbenzothiazoline-6-sulfonic acid) (ABTS) substrate of the *B. licheniformis* SO8 laccase were 110 µM, 19.6 µmol.$L^{-1}$.$dk^{-1}$, 0.048 $s^{-1}$ and 0.44 $s^{-1}$.$mM^{-1}$, respectively. Finally, Acid black 1, Congo red, Methylene blue, Orange, Acid red 27, Reactive black 5 dyes were used to examine the effect of laccase on the color removal of some synthetic dyes and it was determined that the highest dye removal was on Acid Red 27 dye with ~38%. In conclusion, the remarkable properties of the laccase enzyme isolated from *B. licheniformis* SO8 may offer an important opportunity to degrade environmental pollutants, making it an attractive biocatalyst for industrial applications.

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# Isolating and Detecting Extracellular Vesicles on Microfluidic Chips and Metamaterial Sensors

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Acute kidney injury (AKI) is a frequently encountered condition in people as a result of rapid loss of kidney function. AKI is a significant clinical issue at a global scale accounting for 13 million patients and 1.7 million deaths annually.[1] In addition, it occurs in 20–40% of patients with COVID-19, who are admitted to the ICU. In a nutshell, AKI is seen as one of the important health crises that people have to face today and in the future. However, it cannot be diagnosed in a sensitive and urgently manner because of the reliance on levels of serum creatinine and urine output evaluation. In order to overcome the limitations of these conventional strategies, a number of molecular biomarkers have been utilized for the detection and subsequent monitoring of AKI.[2] Extracellular vesicles (EVs)—membrane-bound nano-sized particles carrying pivotal information between cells, have paved the way in disease diagnostics, drug delivery, and theranostics. However, one of the most difficult glitches in the field is to isolate EVs from complex fluids. Even though one of the suitable strategies is membrane filtration, the main difficulties that have been faced include clogging, low recovery, and excessive fouling on the membrane.[3] In our study, we demonstrate a microfluidic device with two integrated filters that are designed to minimize any interference with recovery by combining cross- and dead-end flow on the same platform.[4] As a model, we isolate EVs from Human Embryonic Kidney cells, which are cultivated in various conditions that imitate complex fluids. By switching the flow direction and rate, we refresh the membrane surface to minimize clogging issues and benchmark the platform's performance for multi-time use. Additionally, we modify commercial optical disks into tunable metamaterial sensors for EV detection. Moreover, the sensor detects EVs down to thousands of particles from serum specimens and tissue culture media, and also provides a broad range of detection—four orders of magnitude. The entire protocol is operated with a hand-held optical device that exhibits rapid (15 min), inexpensive (~$1/chip), user-friendly (two steps: sampling and washing), reliable (±10% of gold standard) fashions at the point-of-care settings.

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# Development of DNA Aptamers for Inhibition of Histone Deacetylase-10 (HDAC10) Activity

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Every year over 30,000 patients undergo allogeneic hematopoietic stem cell transplantation (HSCT) for treatment of high risk hematologic malignancy, metabolic disease and immunodeficiency. However, the main complication of allogeneic hematopoietic stem cell transplantation is graft versus host disease (GVHD), which can arise as acute GVHD and chronic GVHD. GVHD does not only limit the success of HSCT, but also it causes morbidity and mortality. Although corticosteroids are used as the first line therapy for chronic GVHD, novel treatment approaches are needed. One potential immunotherapy is using regulator T (Treg) cells.[1]

The transcription factor Foxp3 is crucial for Treg differentiation and immunosuppressive function. Upon acetylation by histone acetyltransferase (HAT), Foxp3 is stabilized and transcriptionally activated. Deacetylation by histone deacetylase (HDAC) causes degradation of Foxp3. Due to their important biological functions, HDACs have been validated in clinical studies as potential drug targets. There are only a few approved HDAC inhibitors. Moreover, most of the available inhibitors are pan-inhibitors with no isoenzyme selectivity.[2]

HDAC10 is one of the HDACs that can be targeted to enhance Treg immunosuppressive effect. In order to meet the demand of isoenzyme specific inhibitors, this study aims to select aptamers to inhibit HDAC10, which removes acetyl groups from FoxP3. In this study, systematic evolution of ligands by exponential enrichment (SELEX) method was used to select DNA aptamers against HDAC10. Binding affinity of aptamer candidates were characterized by using enyzme-linked oligonucleotide assay (ELONA). The $K_d$ value for the selected aptamer was found at low-nanomolar level. Further studies continue to test the inhibitory activity of the aptamer(s) on HDAC10 activity by using HDAC-Glo™ Screening System, as well as in mammalian cell culture.

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# Photodynamic Inactivation (PDI) of Maize-Pathogenic Fungus *Fusarium verticillioides* with Novel BODIPY Photosensitizer

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Extensive usage of fungicides in both clinical and agricultural areas has caused fungi to gain tolerance. An increasing concern against this issue has led to the investigation of alternative approaches. In this context, antimicrobial photodynamic treatment (APDT) is a promising alternative to conventional fungicides. The APDT technique is based on the production of reactive oxygen species (ROS) from a photosensitizer (PS) in the presence of light. ROS mediate local plant cell death resulting in inductive resistance to disease.[1,2] *F. verticillioides* is one of the most destructive pathogens, especially for maize (*Zea mays*), causing vascular wilts and root, crown, and stem rots. In addition, *F. verticillioides* produces mycotoxins which are secondary metabolites that cause serious diseases and deaths in humans and animals fed with mycotoxin-contaminated plants. In this study, the APDT potential of rose bengal and novel-BODIPY photosensitizer was evaluated on the conidia of pathogenic fungal species *F. verticillioides*. The efficacy of APDT with each PS was determined according to minimum inhibitory concentration (MIC) and survival of conidia by comparing PS-treated conidia with non-treated control ones. Cellular ROS production of fungus was detected using the 2',7'-dichlorofluorescin diacetate staining. The effects of the pathogenicity of both PS-treated fungus on maize leaves were also investigated. At the molecular level, the expression of β-Tubulin, sterol 14a-demethylase (CYP51), and mitochondrial cytochrome b (CYTb) genes response to PS treatment were determined by qRT-PCR. As a result, it was observed that the degree of fungal growth inhibition increased with PS concentration. ROS production was elevated due to PS treatment suggesting that reactive oxygen photogenerated by PS caused a local cell death, which inhibited fungal growth and pathogenicity by inducing plant immunity. All these findings offer PSs for APDT as novel fungicides.

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# Protective Effect of Parthenolide on Paclitaxel-Induced Liver Toxicity

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Cancer, which is a universal health problem, is a disease caused by the emergence of problems in the basic cellular mechanisms that regulate the behavior of normal cells such as growth, division, and differentiation.[1] According to the 2020 data of the World Health Organization (WHO), it is estimated that the number of cancer cases, which is 19.3 million, will reach 28.9 million in 2040. For this reason, developing new strategies for the diagnosis and treatment of cancer has become the focus of attention of scientists engaged in cancer research.[2] Chemotherapy, the treatment of cancer with drugs, is one of the most effective and frequently used methods due to the advantage of reaching each cell. However, it has disadvantages such as vomiting, hair loss, and damage to healthy cells.[3] Although paclitaxel (PTX) is a drug that is frequently used in chemotherapy treatment, it has been reported that PTX causes disorders in liver function by examining changes in serum ALT and AST levels, which are markers of liver damage.[4-6] This study aims to investigate the protective effect of parthenolide (PTL) against the oxidative stress caused by paclitaxel, which is used as a chemotherapeutic drug, in liver tissue. For this purpose, liver toxicity was induced by PTX injection except for the control group. 48 male rats were divided into 6 groups (n=8) as follows; control, PTX, sham, and treatment groups (1, 2, and 4 mg/kg PTL).[7] After toxicity was established, treatment groups were treated with PTL at the indicated dose for 14 days. And then, liver tissues were collected by dissection from all animals. The gene expression and enzymatic activity of glutathione pathway enzymes including GPx, GR, and GST in the obtained tissues were examined by Real-Time PCR and spectroscopically, respectively. The results showed that the gene expression and enzyme activity of GPx, GR, and GST decreased significantly in the sham and PTX groups compared to the control group. However, in the treatment groups, it increased and reached the same level as the control group. In conclusion, PTL may be evaluated as a natural agent against hepatotoxicity caused by PTX, which is used as a chemotherapeutic drug, especially in the 4mg/kg group.

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# *Terminalia citrina* Roxb. Ex. Fleming Determination of Antioxidant Capacity, Phenolic Content and Investigation of Their Effects on Cholinesterase Enzymes

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This study was aimed to determine the antioxidant capacity of *Terminalia citrina* roxb. *ex*. fleming belonging to the Combretaceae family.[1] The antioxidant activities of lyophilized water and alcohol extracts of the fruit were evaluated. $DPPH^{\cdot}$ scavenging activity, $ABTS^{\cdot+}$ removal to investigate the antioxidant activities of the samples, reduction capacity of cupric ions ($Cu^{2+}$) by CUPRAC method, $Fe^{3+}$ reduction capacity according to FRAP method, $Fe^{3+}$-$Fe^{2+}$ reduction capacity with potassium ferricyanate reduction method, $DMPD^{\cdot+}$ removal activity, bipyridyl metal chelating activity, total phenolic compound assay, total flavonoid determination, total antioxidant activity methods were used. BHA, BHT, α-tocopherol and trolox were used as reference antioxidants.[2] İn this study, it was determined that the extracts of the samples generally showed a good antioxidant activity. In radical scavenging activities, it showed similar values to the standard antioxidant of trolox, but it gave better results than the trolox standard in the $ABTS^{\cdot+}$ method. In addition, chelating activity was higher than the α-tocopherol and trolox standard. Water and alcohol extracts of the samples showed 89.93 and 93.76 %, respectively, in the lipid peroxidation inhibition. Moreover, the phenolic content of the extracts was determined using LC-HRMS.[3] The amount of syringic acid in the water extract (17.227 mg $g^{-1}$) of the samples and ellagic acid in the alcohol extract (39.940 mg $g^{-1}$) were found to be higher than the other phenolic acids. In the last part of the study, acetylcholinesterase enzyme (AChE), and butyrylcholinesterase enzyme (BChE) enzymes were studied. It was determined that the *Terminalia citrina* roxb. ex. fleming has higher level of antioxidant capacity.

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# *Crataegus prunifolia*: Phenolic Profile, Antioxidant and Enzyme Inhibition Properties

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*Crataegus prunifolia* is a small compact broad headed rounded tree with stout thorns notable for its persistent bright red fruit in autumn.[1] The objective of this study was to analyze the antioxidant and enzyme inhibition activities, and phenolic profiles of this plant using methanol, ethanol, ethyl acetate, hexane and water as solvents.[2] Ethyl acetate extract of *C. prunifolia* displayed highest result in Ferric reducing antioxidant power (1955 mg TE/g), cupric reducing antioxidant capacity (1615 mg TE/g), free radical scavenging (ABTS, 1939 mg TE/g), metal chelating activity (1066 mg EDTAE/g), total antioxidant capacity (3.3 mmol TE/g), phenolic (99 mg GAE/g )and flavonoid (19 mg QE/g) contents.[3] Also this extract was active against α-amylase ($IC_{50}$, 20.0 ± 0.6 µg/mL), α-glucosidase ($IC_{50}$, 225.0 ± 5.3 µg/mL ) and tyrosinase (0.7 ± 0.0 µg/mL).[4] The bioactive compounds of extracts was determined by using liquid chromatography-high resolution mass spectrometry (LC-HRMS). Consequently, our findings suggested that the tested *C. prunifolia* could be presented as a new and valuable source of natural ingredients such as antioxidant and enzyme inhibitors.

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# Evaluation Of Biochemical Parameters Of Laccase Enzyme Immobilized On Various Clay Minerals According To Free Enzyme

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In this study, the immobilization of the laccase enzyme, which has a wide application area in the industry, was examined. For this purpose, commercially obtained laccase enzyme was immobilized on various clays using the physical adsorption method. The effects of pH, temperature, substrate concentration, and storage time on the activity of free and immobilized lacquers were examined. As a result of the studies, the optimum pH and temperature for free laccase were obtained as 5.5 and 40 °C respectively and the optimum pH and temperature for all immobilized enzymes (bentonite, diatomite, and Bardakçı) were 5.5-6.0 and 40 °C respectively. The effects of pH and temperature on the activity of the immobilized laccase showed that the properties of the immobilized enzyme were the same as those of the free enzyme. The resulting kinetic constant values turned out to be quite close to each other. In addition, it was shown that adsorption did not significantly affect the kinetic properties of the enzyme. Only 20%-30% of immobilized laccase activity disappeared in 2 months. $K_M$ values for free enzyme and immobilized enzymes were found as 0.0700 mM, 0.0724 mM, 0.0831 mM and 0.0935 mM and Vmax values were 0.0695, 0.0216, 0.0236 and 0.0233 $mM^{-1}$, respectively. The $K_M$ value of the immobilized enzyme is greater than that of the free enzyme and the Vmax value is smaller. The increase in resistance of the immobilized enzyme to temperature change and storage time indicates that laccase immobilization on clay is beneficial for enzyme immobilization.

# An Investigation of Antioxidant Enzyme Activities in Some Barley Varieties Under Drought Stress

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Barley (*Hordeum vulgare* L.) can adapt to many stress conditions in terms of growing conditions among crop plants and is an important agricultural plant. The growth, photosynthetic yield, metabolic processes, and yield of barley are significantly reduced under abiotic stress factors such as drought, salinity, high and low temperature. Among the abiotic stress factors of barley, responses to drought stress vary at morphological, physiological, molecular, and biochemical levels. Drought stress increases reactive oxygen species (ROS) in the plant. Antioxidant defense system is activated in order to remove the harmful effects caused by excessive ROS production from the plant. The aim of this study is to determine drought stress effects on biochemical parameters [total protein amount, hydrogen peroxide amount ($H_2O_2$), lipid peroxidation amount (TBARS), total chlorophyll content (SPAD), catalase activity (CAT)] in some barley cultivars (Kalaycı-97, Harman and Yaprak). In the measurements made after short-term drought stress in 21d old seedlings, the total protein amount decreased by 32% in Harman variety and increased by 27% in Yaprak variety with drought. On the other hand, it was determined that the amount of $H_2O_2$ increased by 2 times and the amount of TBARS increased by 62% in Kalaycı-97 cultivar. Additionally, CAT activities increased in Kalaycı-97, Harman and Yaprak by 108%, 23% and 140%, respectively. According to these results, Kalaycı-97 variety was determined as drought sensitive and Yaprak variety was determined as drought tolerant.

**Keywords;** Barley, *Hordeum vulgare* L., Drought Stress, Antioxidant Enzymes

# The Use of PCL/PEG-Based Electrospun Membranes in Lateral Flow Systems to Increase the Sensitivity in Analysis of Biological Samples

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Lateral flow systems have emerged as important tools in the qualitative, semi-quantitative and quantitative determination of biomarkers in biological fluids in recent years. The most important expected criteria of these systems can be listed as being affordable, user-friendly, and sensitive to allow precise determination (1). Electrospun nanofibers are widely used in sensors developed for biomedical purposes due to their high surface area/volume ratio, network structure and high porosity (2). In this study, membranes containing PCL/PEG polymers in different ratios were prepared by electrospun and their usability was investigated for coating nitrocellulose membranes in the lateral flow system and increasing the measurement sensitivity in biological samples. Fiber membranes were prepared from a PCL/PEG polymer mixture with a PEG ratio of 10, 20 and 30% by weight of PCL and spun on a nitrocellulose membrane at 14 kV, 20 cm and 0.8 mL/hr conditions. In the SEM examinations, it was determined that the fiber morphologies were smooth in the prepared membranes. In addition, it was determined that the flow rates of the samples increased according to the hydrophilicity of the nanofiber membrane. At the last stage of the study, the usability of the developed lateral flow systems for the detection of glycosylated HBA1c in serum samples was investigated.

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# The Relationship of Zinc Deficiency and Supplementation On Testis and Liver Relaxin Family Peptides, Oxidant System and Testosterone Levels in The Male Offspring of Pregnant Rats Fed with Zinc Deficient Diet

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The testicles are the main endocrine regulators of fetal masculinity and male development and also are regulated during pregnancy. At the beginning of the variations in the puberty period of spermatogonia is the synthesis of proteins formed on the germ cell surfaces. insulin-like peptide 3 (INSL3), insulin-like peptide 7 (INSL7), and Relaxin Family Peptide Receptor-1 (RXFP1) family, which are synthesized in testis, affect the viability, differentiation of Leydig cells and sperm motility. It is thought that oxidant-antioxidant balance may also play a role in fertilization of male. In addition, zinc has versatile effects such as its antioxidant property, it's role in fertility. Based on the idea of knowing the critical roles of zinc in the onset of puberty, investigating the levels of sex hormone testosterone and insulin-like proteins (relaxin family peptides) in testicular tissues and changes in oxidant-antioxidant markers (GSH,MDA) of the male offspring's from female fed a zinc-deficient diet during pregnancy was intended.

The presented study consisted of 4 groups. Group I: The control group consisted of 10 male rats. Offsprings born from the mothers fed with a normal diet were randomly selected and also fed a standard rat diet. Group II: Consisted of 10 male rats fed a zinc-deficient diet. After separation from their mothers, they were fed a zinc-deficient diet (0.650 ppm/g zinc) until the study was terminated (66-70 days). Group III: Consisted of 10 male rats fed a normal diet. Sexually inexperienced male offspring fed standard rat diet until study termination after separation from their mothers. Group IV: Consisted of 10 male rats fed with zinc supplements (5 mg/kg/day intraperitoneal zinc sulfate). Sexually inexperienced male offspring are fed until study termination after separation from their mothers. INSL3, INSL7, Relaxin1, and Testosterone levels in testicular and liver tissue of the groups were analyzed with the Elisa method, and MDA, GSH analyzes were performed by the colorimetric method.

In testicular tissue, INSL3 levels of group 4 were higher than all other groups, and INSL7 levels were significantly higher than group 2 and group 1 ($p<0.05$). RXFP1 levels in group 4 were higher than in group 3 and group 1 ($p<0.05$). RXFP1 levels were found to be higher in group 1 compared to group 2, and testosterone levels in group 4 were significantly higher than in group 2 ($p<0.05$). In liver tissue, INSL3 levels of group 4 and group3 were higher than in group 1 and group 2, and INSL7 levels of group 3 were significantly higher than in group 1 ($p <0.05$). MDA levels are reduced in the zinc supplemented group thus oxidant's effects have been decreased. GSH levels did not change in both tissues and in all groups. We suggest that these findings are important in terms of elucidating the parameters of Zn, INSL3, INSL7, RXFP1, testosterone in prepubertal and pubertal periods starting from the spermatogenesis stage. The zinc supplementation with effects on fertilization at the receptor level has been shown and relaxin peptide family may be a biomarker in the evaluation of fertilization in the future.

# Fluorescence Based Immunoassays Using Quantum Dot Labelled Antibody for Detection of *E. coli*

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In this work, we investigated the possibility of using CdTe quantum dots (QDs) as fluorescent labels in immunoassays for the detection of pathogenic bacteria. These bacteria are Escherichia coli K12. Distinct sized QDs may be stimulated with a single wavelength of light, which will result in varying emission peaks that can be detected concurrently. Target microorganisms were isolated from samples by utilizing particular antibody coated magnetic beads. In order to produce bead–bacteria–QD complexes, the bead–bacteria complexes underwent a reaction with QD–antibody conjugates. This indicates that the conjugated QD molecules still retain their effective fluorescence, while the conjugated antibody molecules remain active and are able to recognize their specific target bacteria in a complex mixture. The intensities of fluorescence emission peaks at 525 nm and 705 nm of the final complexes were assessed for quantitative detection of E. coli K12. For E. coli, the fluorescence intensity (FI) was shown to be a function of the cell number (N). The basic premise of this method could be expanded to detect three or four different species of bacteria at the same time, but this would be contingent on the availability of different types of QD–antibody conjugates, each of which would have a distinct emission peak, as well as antibody-coated magnetic beads that are specific to the individual bacterial species.

# Synthesis of New Water Soluble Cu(II) and Mn(III) Phthalocyanines and Investigation of Their Photocatalytic Activities on the Photoxidation of Benzyl Alcohol

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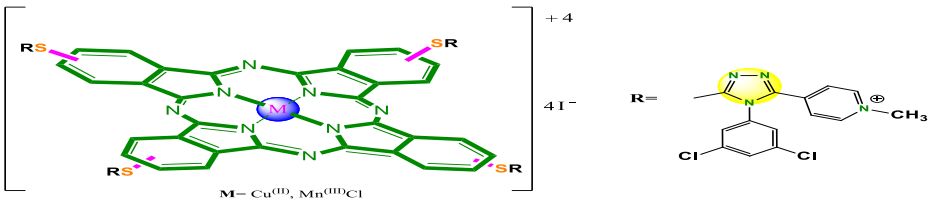
Phthalocyanines are macrocyclic compounds with high aromatic properties usually blue or green in color with a high melting point and carrying 18π-conjugated electron pairs.[1] The resulting substituents provide phthalocyanines with electrochromic, electrical conductivity, photovolvatic, photoconductivity, light absorption, photo-stimulant and even the ability to be used in the treatment of many diseases in the field of medicine.[2]

The selective oxidation of benzyl alcohol is essentially vitalinlife science and extremely useful in industry for preparing many drugs, vitamins and fragrance.[3] The oxidation products of benzyl alcohol are benzaldehyde, benzoic acid and benzoquinone. In terms of industrial use, benzaldehyde has an important role among the oxidation products of benzyl alcohol. Benzaldehyde is commonly used as a precursor for dyes and other organic compounds, ranging from pharmaceuticals to plastic additives (for instance; the aniline dye malachite green is prepared from benzaldehyde and dimethylaniline). Additionally, benzaldehyde is also used in perfumery, cosmetic, food industries to confer flavor and odor. [4]

In this work, 1,2,4-triazol substituted Mn and Cu phthalocyanines were synthesized and characterized as photocatalysts on benzyl alcohol photoxidation. Photocatalytic benzyl alcohol oxidation process makes this work as feasible and time-saving with Mn and Cu phthalocyanines.

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# Antimicrobial and Antioxidant Activities of Silver Nanoparticles Synthesized from *Plantago lanceolata* Leaves

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With the integration of nanotechnological products into all areas of our lives, silver nanoparticles have started to be used actively in various industrial areas. In our study, silver nanoparticle (AgNP) was synthesized by green synthesis method using *Plantago lanceolata* leaves. The characterization of the AgNPs obtained as a result of the reaction was made with Scanning Electron Microscopy (SEM). The antimicrobial effect of the synthesized AgNPs was tested on gram positive and gram negative bacteria and yeast by agar disc diffusion and minimum inhibitory concentration (MIC) method. Antioxidant properties were determined by 2,2-diphenyl-1-picrylhydrazil (DPPH) free radical scavenging and 2,2'-Azino-bis (3-ethylbenzothiazolin-6-sulfonic acid) ($ABTS^{\bullet+}$) cation radical scavenging activity.

As a result, for 3000 ppm concentrations, the highest inhibition zone diameter and MIC values obtained from the plant extract were 12,00 mm and 500 µg $mL^{-1}$, respectively, and the highest inhibition zone diameter and MIC values obtained from AgNP were 23,00 mm and 75 µg $mL^{-1}$, respectively. While the highest inhibition zone diameter for the plant extract was obtained from *Bacillus subtilis* ATCC 6633 strain, the highest inhibition zone diameter for the produced AgNP was obtained from *Acinetobacter baumanii* ATCC 19606. The maximum inhibition values of DPPH free radical scavenging activity at 1000 µg $mL^{-1}$, which is the highest concentration of the extract and nanoparticle, were determined to be 80,94±0,66% and 33,20±0,50%, respectively. For ABTS cation radical scavenging activity, the maximum inhibition values at 1000 µg $mL^{-1}$, which is the highest concentration of the extract and nanoparticle, were 63,89±0,39% and 39,37±0,54%, respectively. It was determined that the synthesized silver nanoparticles showed higher antimicrobial properties compared to the plant extract.

# Effect of Synthetic and Natural Polymer Coating on Characteristics and Bioaccessibility of Galangin-loaded Liposomes

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Galangin (3,5,7-trihydroxyflavone) is a flavonoid that is the main component of *Alpinia officinarum* Hance (*Zingiberaceae*). Due to its structural properties, galangin shows anticancer, antimicrobial, antiinflammatory, antidiabetic, antiviral, and hepatoprotective properties along with the high antioxidant activity.[1] Alongside all its biological activities, the medicinal use of galangin is limited due to its low solubility, low intestinal absorption, low membrane permeability, low bioaccessibility, and therefore low bioavailability.[2] Liposomes have great potential because they can encapsulate both hydrophilic and hydrophobic components, due to their similarity to cell structure and small size, they can easily transfer these components with low bioavailability to target tissues. One of the biggest disadvantages of liposomes, instability to gastrointestinal conditions, can be easily eliminated by surface modifications using polymers. Thus, the active ingredients can easily enter the circulation after the gastrointestinal environment within the liposomes.[3] Starting from this, the galangin-loaded liposomes were developed and the surface was modified with natural and synthetic polymers, and the characteristics and bioaccessibility of galangin-loaded liposomes were compared.

At first, galangin extraction from *Alpinia officinarum* Hance (AO) was performed and the profile of phenolic compounds was determined by HPLC-DAD. The total phenolic content of AO extract was determined by Folin-Ciocalteu method, and total antioxidant capacity was determined ABTS method (UV-Vis Spectrophotometry). Then, galangin-loaded liposomes were developed by Thin-film Hydration method using AO extract and the encapsulation efficiency was determined by HPLC-DAD. The surface of the liposomes was modified by Layer-by-Layer Deposition technique using Chitosan-$PEG_{1500}$ and Chitosan-Sodium alginate. The surface morphology and size (FE-SEM), hydrodynamic diameter, polydispersity index, and zeta potential (Zeta-Sizer) of the obtained liposomes were characterized. The release behavior of liposomes under physiological conditions was determined by the *in vitro* release study, and the bioaccessibility of galangin was determined by the *in vitro* gastrointestinal digestion study. The short-term stability of the liposomes was investigated for 15 days under 2 different temperature conditions.

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# Activation of ITO surface by Hexamethylene diisocyanate for the development of a disposable immunosensor: ultrasensitive and low-cost detection of neuropeptide Y

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Neuropeptide Y (NPY) is among the most prevalent neuropeptides in the human brain, and its blood levels change in neurodegenerative and neuroimmune illnesses. This demonstrates that NPY might be used as a diagnostic and monitoring marker for related illnesses.[1,2] Using a new immobilization approach, an electrochemical immunosensor was developed for the detection of NPY biomarkers. The suggested biosensor system permits precise, specific, cost-effective, and useful biomarker analysis. The indium tin oxide-coated polyethylene terephthalate sheets (ITO-PET) were used for usage as the working electrode. In order to achieve covalent immobilization of antibodies, ITO-PET sheets were treated with hexamethylene diisocyanate (HMDC). Electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) were used to analyze each stage of the biosensors. The NPY biosensor that was suggested has a wide linear detection range (0.01-100 $pgmL^{-1}$), a low limit of detection (LOD) that was determined to be 0.02968 $pgmL^{-1}$. To support the optimization process and investigate the surface morphology, atomic force microscopy (AFM) was utilized. During the process of electrochemical characterization, investigations into repeatability, reproducibility, storage, and Kramer's-Kronig transformation were carried out. Following the analytical tests' completion, the biosensor responses to actual serum samples were analyzed. According to the results, the biosensor demonstrates potential for clinical NPY determination.

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# Investigation of the Effect of *Bolanthus turcicus* Raw Extracts on Head and Neck Cancer Cells

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Head and neck cancer (HNC) is an aggressive and invasive disease. The development of drug-resistance, toxic effects, high recurrence and metastasis rates in the treatment of HNC indicate the need for alternative treatment methods and therapeutic agents. Therefore, it is important to explore new therapeutic agents in addition to existing treatment protocols of head and neck cancer.[1,2] *Bolanthus turcicus (B. turcicus)* is a newly described species of the family Caryophyllaceae.[3] In this study, the potential effect of *B. turcicus* plant on in-vitro HNC cells was investigated. For this purpose, three different extracts (MeOH, Aqueous and EA) were prepared from *B. turcicus* plant samples. The total amount of phenolic and flavonoid substances in the MeOH, Aqueous and EA extracts were determined as 71.12, 34.20, 20.27 mg QE/g and 96.02, 76.17 and 48.71, respectively via Folin-Ciocalteu and Aluminium chloride. Total antioxidant capacity of MeOH, water and EA extracts determined by phosphomolybdenum method found as 51.74, 44.64, 34.93 mg AAE/g. Also, antioxidant activities of MeOH, water and EA extracts determined by FRAP method were found as 137.91, 106.53 and 88.32 µg trolox/mg. Cell proliferation of HNC cells was examined by MTT assay and $IC_{50}$ concentrations of extracts were determined. Annexin V-PI staining showed that early and late apoptosis increased in all cells treated with *B. turcicus* extracts while the viability level and necrosis were decreased. According to scratch-wound healing assay, wound healing was significantly delayed in all cell lines. The expression of apoptosis-associated BAX and BCL-2 genes at mRNA, protein and intracellular levels in cells was determined by quantitative real-time PCR (qRT-PCR), Western blot, and immunofluorescence, respectively. The expression of CASP-3, BAX genes at mRNA level increased while the expression of BCL-2 gene at mRNA level decreased in all cells treated with $IC_{50}$ doses of *B. turcicus* extracts according to quantitative real-time PCR. Moreover, Casp-3 and Bax protein band density increased while Bcl-2 protein band density decreased in SCC-9, FaDu, Hep-2 and Detroit-551 cells treated with $IC_{50}$ doses of *B. turcicus* extracts compared to control cells. According to the immunofluorescent staining analysis data, anti-Casp-3 and anti-Bax antibody fluorescence intensity increased while Bcl-2 antibody fluorescence intensity decreased in all cells treated with extracts compared to control cells.

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# Decellularized Skin and its Biomedical Applications

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Decellularization is one of the recent tissue engineering strategies in which chemical, mechanical and enzymatic techniques are used to remove the cellular content of the tissue without damaging its structural integrity. In this method, the main goal is to construct an ideal scaffold while preserving the extracellular matrix component (ECM), which provides biomechanical support in the tissue[1].

The technological improvements of the decellularization methods brought new opportunities for extracellular matrix (ECM) based biomaterials in tissue repair and organ transplantation in pre-clinic and clinics[2]. Skin tissue decellularization is one of the promising fields that can be directly translated to the clinic. Unlike allogenic acellular dermal grafts, decellularized skin ECM, sole or combined with crucial additives can be easily reprocessed by 3D printers, allowing personalized grafting.

Moreover, these decellularized skin ECM may also be chemically modified, gaining photocrosslinkable hydrogels that may be used as potentially implantable biomaterials for skin tissue engineering application.

In a typical decellularization process for obtaining skin ECM, skin tissues were washed several times with isotonic for 24h. and were stirred at 37°C 150 rpm with Trypsin-EDTA for 24h. Later on, rinsed tissues were washed with ionic and non-inonic detergent cocktail for 24h at 150 rpm and treated with 70% ethanol for 4h. respectively. Finally, tissues were rinsed with distilled water for 24h. and lyophilized for 24h. The efficacy of the decellularization was performed by DNA Quantification as well as total protein, collagen and GAG content analysis. Depending on the final goal, decellularized tissue may ground into powder ECM form or cut into thin sections.

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# Determination of Phenolic Compositions, Antioxidant and Cytotoxic Activities of five *Teucrium* species from Turkey

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Plants are potential sources of natural bioactive compounds and have been used as main resources in the fields of food, food additive, pharmacognostic, cosmetic, and medicine thoughout history.[1, 2] This study was aimed to investigate the phenolic profiles, antioxidant activities, and cytotoxic properties of the flavonoid subgroups and phenolic acid extracts of the aerial parts of the *Teucrium kotschyanum, T. alyssifolium, T. polium, T. chamaedrys* ssp *lydium (hairy), T. chamaedrys* ssp *chamaedrys (hairless)* from Turkey. Phenolic compounds in *Teucrium* species were determined in flavonoid subgroups flavone, flavanone, flavonol, flavan-3-ol and phenolic acid and acid-base hydrolysed extracts by using RP-HPLC-DAD system. Among the phenolic components in the investigated *Teucrium* species, phenolic acids come to the fore in terms of quantity. To this sinapic, t-cinnamic, and p-cumaric acids are the first three phenolic compounds to be prominent in *T. kotschyanum* extracts. The antioxidant properties of *Teucrium* species extracts were examined spectrophotometrically and the best $IC_{50}$ values of $DPPH^{\bullet}$ scavenging (23.21±0.78 ppm) in *T. polium*, $HO^{\bullet}$ scavenging (1.01±0.01 ppm) in *T. chamaedrys* ssp *lydium*, $NO^{\bullet}$ scavenging (12.28±0.91 ppm) in *T. kotschyanum*, and metal chelating (20.10±0.66 ppm) in *T. alyssifolium*. The cytotoxic effects of all investigated *Teucrium* species extracts against HepG2, OE-33, and HeLa cancer cell lines were determined in a microplate reader by using the MTT assay. While more extensive cytotoxic effect was observed against HepG2, the best $IC_{50}$ value was determined around 25 ppm in five extracts. The best $IC_{50}$ values against OE-33 and HeLa cancer cells were detected as 30 and 65 ppm in *T. kotschyanum* extracts, respectively. The death type of cancer cells selected in *Teucrium* extracts, where the best $IC_{50}$ values were obtained to MTT results, was determined by the flow cytometer as apoptotic. To the results of this study, the richness of *Teucrium* species in phenolic components, the importance of their antioxidant properties and their activities against HepG2 and OE-33 cancer cell lines make their potential as natural component sources come to the fore.

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# Curing Of Polyurethane-Acrylate Structures By Nir Light For Biomedical Applications

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Today, photo-polymerization techniques are remarkable applications in the production of polymers with different structural properties and adhesive strength, which offer an alternative solution to the wound closure process. UV light-curable polymeric bioadhesives have advantages such as rapid and controllable polymerization time.[1] However, there are some concern about their toxicity in the biomedical applications. As an alternative, near infrared rays (NIR) offer significant advantages against the difficulties encountered in the biomedical field due to their low toxicity and high tissue penetration.[2-3] The study was carried out in line with this information; It includes the development of polyurethane-acrylate adhesive systems with strong adhesive properties and controllable adhesion process, and the examination of the change in adhesive strength of these polymeric structures using different photo-polymerization techniques.

Polymeric structure was synthesized by the reaction of polyethylene glycol (PEG200) and 2-hydroxyethyl methacrylate with isophorone diisocyanate (IPDI). Synthesized polyurethane-acrylate (PU-PEG200-HEMA-20) materials were structurally characterized using a combination of FTIR, DTA, DSC analysis techniques. The curing properties of the prepared polymers were investigated under UV and NIR light using Irgacure-369 as a photoinitiator. The *in vitro* bonding strength of the adhesives obtained using different photo-polymerization techniques was determined according to ASTM standart (F2255-03)). Our results exhibited that the adhesion value of PU-PEG200-HEMA-20 was 912 ± 56.6 kPa after UV light curing and 1367± 56.2 kPa after NIR light curing. As a result, it was observed that the synthesized PU-PEG200-HEMA-20 adhesive could be cured under both UV light and NIR light. In addition, it was determined that the use of NIR light in the photo-polymerization process caused an increase in the adhesion strength.

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# Silver Nanoparticles from The Brown Algae *Cystoseira barbata*: An Optimization Study and Their Characterization

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*Cystoseira barbata* (Stackhouse) C. Agardh is anedible brown algae with a rich content of polysaccharides such as laminarin, alginate, and fucoidan. It has been observed in the literature that the polysaccharides obtained from this algae have antioxidant, antibacterial, biosorbent and wound healing properties and therefore have a high potential for use in biotechnology.[1] Obtaining nanoparticles from algae extracts by green synthesis method is very advantageous due to the absence of environmentally harmful toxic steps in chemical synthesis.

In this work, an optimization study of silver nanoparticles synthesized at different pH and temperatures was carried out using aqueous extracts of *Cystoseira barbata* collected from Mudanya, Bursa region. In the study carried out to obtain the most optimum nanoparticle, an aqueous extract of algae at a certain concentration was prepared. For temperature-adjusted syntheses, the silver nitrate solution was heated at different temperatures or left at room temperature, and algae extract was added dropwise, and UV spectrums were taken at certain hours while mixing in the magnetic stirrer. For pH variable synthesis, the temperature was fixed and the formation of nanoparticles was investigated by adjusting the solution at different pH. The formation of nanoparticles was confirmed by the appearance of SPR peaks between 400-450 nanometers in the UV spectrum. The size, pdI and zeta potential values of the synthesized nanoparticles were measured with ZetaSizer. Chemical functional group analyzes of the most optimal nanoparticle was performed with FT-IR and morphological characterization was performed with SEM. According to the results obtained, it was found that this synthesis was positively affected by high temperature and basic pH.

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# The Antioxidant Feature Of Udi Hindi Plant

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The main objective of this research is to learn the impact of the benefits of Udi Hindi plant on humans' different diseases. Udi Hindi, one of the medicinal plants, grows in the lands of East Asia. This plant, which is densely found in China, has leaves in every season. This plant is the most powerful antibiotic, antiseptic. It helps to eliminate inflammation and infections in the body. It has a positive effect on the treatment of skin diseases such as burns, cuts, insect bites, and eczema.

The main method utilized during the research is to prepare both extract oil and powder solutions of this plant and use that oil to kill the mold fungi which are dangerous for people. Experiments carried out manifested that this plant is considered one of the best sources of antioxidants which clean the human body from toxic substances and fights against cancer cells.

Ten people with extreme throat ache were invited to the experiment. Here, prepared Udi Hindu powder was poured into the cup of water and mixed thoroughly. Small amount of honey was added to this solution which increased the antioxidant influence of the Udi Hindu as honey is a strong antioxidant. Each person drank that solution 3 times in a day up to one week. None of the people used any medicine during the experiment duration. After even one day of drinking this solution, patients felt better and it alleviated their throat ache.

After 5 days of treatment, all patients got rid of the throat ache. They continued to drink the solution for an additional 2 days. Patients claimed that this natural remedy not only helped them to recover but also boosted their immune system considerably. Ultimately, the result of this experiment showed that the Udi Hindi plant has a stupendous influence on people's life. The second experiment was carried out on the body of the 3 people who had fungi on their feet. The oil solution of this plant reduces the itching dramatically in just 2 days.

In conclusion, it can be stated that the usage of this plant by people is extremely beneficial for them. It helps them to treat different diseases and increase the strength of the immune system.

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# Protein Adsorption on Spherical Nanoparticles with a Surface Roughness

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Protein adsorption on a solid surface is an attractive topic due to vast range of specific application areas, such as drug delivery[1], gene delivery[2], biosensors[3], immunological tests.[4] The characteristics of protein adsorption are greatly vulnerable to the shape of the adsorbent surface. Silica-based spherical nanoparticles are widely employed in the current state-of-the-art[5,6,7]. In the present study, a spherical silica nanoparticle is located at the center of a cylindrical media, which includes various species having a protein with a determined concentration. Initial protein concentration is varied to investigate the effect on protein adsorption mechanisms. Moreover, different nanoparticle diameters are considered, such as D = 10-20-30-40nm. Structures with various shapes are placed upon the surface of the nanoparticle, such as circular, triangular, rectangular to mimic the various roughness topology on the nanoparticle. The height and the width of the nanostructures are varied for comprehensive investigation. A code is developed in COMSOL Multiphysics 5.3a to solve governing equations in the current simulation study. Classical Langmuir approach is incorporated to the code for the modeling of adsorption-desorption kinetics. The obtained results are compared along with the specifications of the structured and smooth surfaces. As a result, compatibility of the surface geometries towards protein retention is systematically evaluated. It is observed that duration of the steady-state adsorption time is significantly shortened for structured surfaces. Moreover, higher amounts of proteins are retained with structured surfaces.

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# Comparison of The Biological Activities of Propolis Samples Collected From Different Parts of the Hive

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Adding new findings to the benefits of propolis, which is one of the biologically highly active honey bee products, to human health increases its popularity. Honeybees collect propolis for purposes such as narrowing the entrance of their hive and airflow isolation. The composition of propolis varies depending on its sources. It has been reported that ethanolic propolis extract has hepatoprotective, antitumor, antioxidant, antimicrobial and anti-inflammatory effects. Most of the studies in which this information was obtained were carried out without knowing the plant(s) from which the sample was taken or the places where the bees collected the material. In this study, it was aimed to separately evaluate the samples collected from the frame, upper and lower parts of the hive in order to investigate how the basic biological activities of the propolis sample accumulated in different parts of the hive. In this context, total phenolic and flavonoid contents and DPPH radical sacevenging activity and chelating potential with $Fe^{2+}$ of the propolis samples collected different parts of the same hives located in Ordu. While the highest phenolic content (244.14 mg GAE/g sample) was calculated for the propolis sample collected from the frame part, the lowest value (189.04 mg GAE/g sample) was recorded in the case of the sample collected from the top of the hive. Similarly, while the highest flavonoid content (214.41 mg KTE/g sample) in propolis samples was calculated for the sample collected from the frame part, the lowest value (137.74 mg KTE/g sample) was recorded this time in the case of the sample collected from the lower part of the hive. When evaluated in terms of DPPH radical scavenging activity, the most effective ($IC_{50}$= 0.015 mg/mL) and lowest value ($IC_{50}$=0.025 mg/mL) showed the same change with the flavonoid content and all values obtained for 3 different samples are more effective than the value calculated for the standard antioxidant ascorbic acid.The chelating potential values, on the other hand, coincide with the order of the total phenolic content values. In addition to all these, it was also revealed that propolis samples have a protective effect comparable to trolox in controlled DNA fragmentation. Thus, the reflection of the position of propolis accumulation in the hive on the biological activity has been revealed.

# Point of Care Test for Cancer Antigen 125

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Cancer antigen 125 (CA125) are FDA-approved biomarker for ovarian cancer diagnosis and monitoring of progression. Therefore, sensitive determination of their levels in blood serum is crucial. In this study, label free CA125 immunosensors were prepared using disposable screen-printed carbon electrodes modified with reduced graphene oxide, polythionine and gold nanoparticles for the sensitive, fast, and practical determination of CA125. DPV, SWV and EIS methods were used for the electrochemical determination of antigens. The application and storage stability of CA125 immunosensors were investigated. CA125 immunosensors showed high selectivity in interfering agents. The reusability of the CA125 immunosensor was tested. For the point of care test, a hand-held device was designed using an electrochemical reader, and the levels of CA125 in blood serum samples at low concentration were measured with the developed immunosensors in short time. These disposable immunosensors can be used in point-of-care tests for rapid and practical determination of CA125 with high selectivity, sensitivity, and repeatability.

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# Point of Care Test for Ovarian Cancer Biomarker HE4

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Human epididymal secretory protein 4 (HE4) is considered a promising biomarker for ovarian cancer and also shows high sensitivity for both early and late-stage diagnosis of ovarian cancer[1]. So, sensitive determination of HE4 levels in blood serum is crucial. In recent study, label free HE4 immunosensors were prepared using disposable screen-printed carbon electrodes modified with reduced graphene oxide, polythionine and gold nanoparticles for the sensitive, fast, and practical determination of HE4. DPV, SWV and EIS methods were used for the electrochemical determination of HE4. The application and storage stability of HE4 immunosensors were investigated. HE4 immunosensors showed high selectivity in antigen mixtures. The reusability of the HE4 immunosensor was tested. For the point of care test, a hand-held device was designed using an electrochemical reader, and the levels of HE4 in blood serum samples at low concentration were measured with the developed immunosensors in short time. These disposable immunosensors can be used in point-of-care tests for rapid and practical determination of HE4 with high selectivity, sensitivity, and repeatability.

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# Determination of Biofouling Behavior of Dispersed Cells from Biofilms Cultivated in Media at Different pH Values Using a Rapid Spectrophotometric Method Combined with Thermodynamic Analysis

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The aim of this study is to determine the biofouling behavior of biofilm-dispersed cells obtained at different pH of the media using their surface free energies (SFEs) measured by a spectrophotometric method. The principle of this method is based on bacterial colloidal stability and is implemented by rapid spectrophotometric measurements.[1] The colloidal stability of a cell suspension depends upon the balance between attractive van der Waals and repulsive electrostatic interactions.[2] Thus, the cells are expected to *scatter* in liquid medium when the lowest attractive van der Waals interaction is observed. Such an interaction can be observed in a liquid medium of which surface tension is close to the SFE of the cells[1], which determines the biofouling behavior of the cells.

In our experiments, *Escherichia coli* ATCC 25404 was used as the model bacterium due its ability to form a mature biofilm with relatively higher amount of biomass. First, *E. coli* biofilms were grown at 37 °C for 24 hours. Then, the spontaneous biofilm dispersion was carried out at 37 °C in media adjusted to pH values of 5.5, 6.4, and 9.0, and the dispersed cells from the biofilms were collected. A series of suspending liquids was prepared with binary mixtures of ethanol and ultrapure water whose surface tensions were previously reported.[3] A trace amount of collected cells was added into each suspending liquid, and centrifuged. Then, the supernatant of each suspending liquid was transferred to polystyrene microplates. Optical density was measured for each well of the microplates and plotted against the surface tensions of the suspending liquid media. The peaks showing the maximum level of cell *scattering* were determined by the third-order polynomial fitting, and hence the SFEs of dispersed cells from the biofilms cultivated at pH values of 5.5, 6.4 and 9.0 were quantified. Using the SFEs of the dispersed cells and model solid substratum surfaces as the thermodynamic parameters, biofouling behaviors of the dispersed cells onto glass, polystyrene and polyethylene surfaces were quantitatively predicted. Our results indicated the highest SFE for the cells dispersed in media at pH of 6.4 (55 $mJ/m^2$), followed by those dispersed in media at pH of 9.0 (50 $mJ/m^2$), and 5.5 (43 $mJ/m^2$), respectively. The highest biofouling on glass and polymer substrates were calculated for the dispersed cells obtained at pH of 5.5 by using a surface thermodynamic model. The present study also has implications for controlling the biofouling of biofilm-dispersed cells obtained at different pH of the media on solid substrates and biomaterials.

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# CA125 Determination by a Disposable Immunosensor

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Several biomarkers have been developed to monitor ovarian cancer development and identify the condition in its early stages. One of the promising biomarkers developed for ovarian cancer is CA125.[1] This study aims to detect the CA125 marker using an ITO-PET electrode. The advantages of the designed biosensor are its low-cost construction, disposable and easy to use. After the optimization steps of the biosensor were completed, characterization studies were carried out. Repeatability, reproducibility, regeneration, storage, and single frequency impedance (SFI) studies have been completed to characterize the proposed biosensor. All experimental studies of the developed biosensor were performed using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques. The proposed immunosensor has a wide linear detection range (0.01 pg/mL–100 pg/mL). The high accuracy of this biosensor was observed for the analysis of five real human serums.

**Acknowledgments**

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# Determination of *Angelica archangelica*'s Antioxidant Capacity and Mineral Content

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Antioxidant molecules, on the other hand, defend the living organism against free radicals and their species. Antioxidants are widely used as molecules that protect against oxidative degradation of foods. The aim of this study was to determine the mineral contents by ICP-MS and the antioxidant capacity of *Angelica archangelica* plant, which is not well known in the literature. For this purpose, ethyl alcohol extracts of the branches and leaves of the plant; different bioanalytical methods such as reducing capacity by $Fe^{3+}$-$Fe^{2+}$ transformation method, $Fe^{3+}$-TPTZ reducing capacity by FRAP method, $Cu^{2+}$-$Cu^{+}$ reducing capacity by CUPRAC method, the ferric ions ($Fe^{2+}$) chelating activity by using bipyridyl reagent, DPPH (1,1-diphenyl-2-picryl-hydrazyl) free radical, DMPD (N,N-dimethyl-p-phenylenediamine), ABTS (2,2'-azino-bis(3-ethylbenzthiazoline-6-sulfonic acid) radical scavenging activities, total antioxidant activity determination according to thiocyanate method, total phenolic and total flavonoid activity were used. As standard, BHT, BHA, α-tocopherol, trolox were used. *A. archangelica* branches and leaves demonstrated 88.13% and 93.90% inhibition of linoleic acid emulsion peroxidation at 20 mg $mL^{-1}$ concentration. Also, it was determined that both leaves and branches of *A. archangelica* plant were dense with P, Mg, Ca and K minerals with ICP-MS device. It is considered that the results of the manuscript will guide the antioxidant studies, medicine, cosmetics, pharmacology and food sector.[1]

**Acknowledgments**
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# Effect of *Micrococcus luteus* Isolated from Marine Habitat on Salt Stress of Some Barley Species

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Salt stress is one of the main abiotic stresses that threaten the environment by negatively affecting sustainable crop production, agricultural productivity, and microbial communities all over the world. However, plant growth promoting rhizobacteria (PGPR) has been very effective and environmentally friendly to increase plant stress resistance against environmental stresses. Our hypothesis was that bacteria isolated from marine habitat should contain bacteria that can improve salt-stressed crops and contribute to sustainable agriculture. Therefore, bacterial strains from the rhizosphere of marine habitat species (*Eryngium maritimum*) collected from the coast of Çanakkale in Turkey were isolated to test whether they have beneficial potential. In this study, the effects of *Micrococcus luteus* (ML) inoculating on sea barley grass (*Hordeum marinum* subsp. *marinum*) and two cultivated barley (*Hordeum vulgare* L. salt-tolerant cv. Ocak, salt-sensitive cv. İnce-04) under salt stress (0, 100, 200, 300 mM NaCl) on physiological (root-shoot length, biomass, dry weight), and biochemical parameters ((chlorophyll content, total protein content, hydrogen peroxide content ($H_2O_2$, spectrophotometric and histochemical staining), lipid peroxidation content (TBARS) and antioxidant enzyme activities (peroxidase activity (POX), catalase activity (CAT))) were determined. Our results showed that root-shoot length, biomass, dry weight and chlorophyll content decreased, while TBARS and $H_2O_2$ content increased with increasing salt stress in İnce-04 variety. According to our results *H. marinum* subsp. *marinum* was less affected by salt stress and were more tolerant salinity compared to other barley varieties. In addition, ML inoculation in the salt-sensitive İnce-04 variety decreased salt sensitivity with increased chlorophyll content, CAT and POX activities. As a result, it showed that after inoculation with PGPR, it reduced the negative effects of salt stress by reducing the production of reactive oxygen species (ROS). These results showed that ML strain can be used as a biofertilizer in barley under salt stress conditions.

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# Green Synthesis of Silver Nanoparticles Using Marine Red Algae *Grateloupia Subpectinata* and Their Antibacterial Activity

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In recent years, the biosynthesis of silver nanoparticles has been an interesting area due to many advantages such as being cost-effective, practical, environmentally friendly, and non-toxic. Plants, fungi, bacteria, and algae are often used in the green synthesis method, which is based on the principle of reducing silver ions to form a nano-sized particle with the help of reducing and stabilizing agents naturally found in biological systems.[1] Silver nanoparticles from algae have a widespread usage area due to their physical, chemical, and electrical properties, and many studies have been carried out in the literature to investigate their antibacterial, antifungal, anticancer and antioxidant properties.

Based on this information, the aim of this study was to produce silver nanoparticles using green synthesis method with the aqueous extracts of marine red algae *Grateloupia subpectinata (Rhodophyta, Halymeniaceae)* and to determine their antibacterial activities. For this purpose, firstly, aqueous extract of algae was prepared. Desired amount of algae was weighed and mixed with distilled water at 60 degrees for 30 minutes, then filtered through filter paper and centrifuged at 4500 rpm for 30 minute. The most optimal nanoparticle was prepared by combining 1mM AgNO3 solution with algae extracts at different rates, under different temperatures and pH. The formation of silver nanoparticles was confirmed by color change (solution turned dark brown) and using the UV-vis spectroscopy method by the appearance of SPR peaks between 400-450 nanometers.[1] The size distribution, pdI value and zeta potential of the formed nanoparticles were determined by ZetaSizer and morphological characterization was done by SEM. Antibacterial activity test was performed on *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922 strains by disk diffusion method. According to the results obtained, it was found that silver nanoparticles obtained from *Grateloupia Subpectinata* aqueous extracts by green synthesis have antibacterial activity against tested bacterial strains.

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# NIR-Light-Driven Antibacterial Activity of Green Recycled Thermally Exfoliated Graphene Oxide (TEGO) Combined with ZnO

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Nowadays, graphene-derived nanocomposite materials have gained attention in antibacterial activity studies due to its non-toxic, stable, large surface area, cost effectiveness and wide band gab energy levels. In addition, killing bacteria by photo-induced inactivation using NIR light and graphene-derived nanocomposite materials has been extensively investigated and effective results have been obtained so far. With NIR irradiation, graphene-based nanocomposite can produce reactive oxygen species (ROS) and generate photodynamic effect on the cell. Herein, thermally exfoliated graphene oxide combined with ZnO and NIR-light-driven antibacterial action of TEGO/ZnO nanocomposite was investigated for the first time on Gram-negative *Escherichia coli (E. coli)* and Gram-positive *Staphylococcus aureus (S. aureus)* through bacterial growth kinetic assay. Thus, the combining TEGO with ZnO could be an effectual approach to improve the photoactivity under NIR light. To the best of our knowledge, there has no reports about the antibacterial activity for the TEGO/ZnO nanocomposite which is type of graphene-derived nanocomposite materials. This work will open the way for the new generation hybrid for antibacterial therapy applications.

# Quartz-Tuning Fork-Based Mass Sensitive Immunosensor Design for The Determination of Synuclein Alpha, a Parkinson's Disease Biomarker

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The Quartz Tuning Fork (QTF) is a quartz-based, self-exciting and self-sensing piezoelectric resonator with a fork-shaped structure. QTFs vibrate at a fixed frequency with an electronic signal. Although it has applications in different areas, it is possible to configure a QTF biosensor system in which mass change can be detected by detecting the shift in the resonance frequency. QTFs are candidates to become popular materials for biosensor field applications due to their small size, inexpensive cost, easy accessibility, and stable single-frequency vibration properties. [1, 2]

α-Synuclein, a relatively small protein of 140 AA, is largely expressed at presynaptic terminals in the brain and therefore modulates the stability of the neuronal membrane. It is hypothesized that high levels of the soluble oligomeric form of α-synuclein may be a pathogenic strain in Parkinson's disease. α-synuclein oligomers have been shown to disrupt membranes and subsequently induce cell death, both in vitro and in animal models. It has been suggested that accumulation of α-synuclein in PD patients can be detected even 7 to 8 years before the onset of motor symptoms. [3,4] Therefore, materials developed for the sensitive detection of this potent biomarker of Parkinson's disease are very important.

This study includes a portable, practical, low-cost immunosensor design based on QTF for the detection of alpha synuclein. The parameters (activation agent, antibody concentration, etc.) in the design stages of the immunosensor were optimized. Morphological analyzes and chemical bond changes of this mass sensitive system were performed with Scanning electron microscopy and FTIR, respectively. As the developed immunosensor is based on QTF, it is the first study presented in the scientific literature and is promising from a clinical perspective for synuclein alpha detection.

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# Analysis of Glutathione Level in Plasma by Micro-fluidic System

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Microfluidic system-based technology called Micro Total Analysis Systems (MTS) or Lab-on-a-chip (LOC) has led to vital developments in fields of chemistry, biology, and biomedicine. LOC devices have been introduced in last couple decades as small smart laboratory instruments for simultaneous analyses from simple flow devices, and their use for various clinical applications inside and outside the hospital is growing.[1]

Oxidative stress plays a common role in the process of many diseases such as cancer, diabetes, atherosclerosis, cardiovascular disease and neurodegenerative disorders.[2] Oxidative stress can be assessed by measuring the parameters showing the increase in free radical production, increase or decrease in the concentration of enzymes and metabolites involved in the antioxidant defense mechanism, and the examination of damaged tissues or the monitoring of metabolites in biological fluids of damaged tissues.[3] Glutathione (GSH), which is soluble in water and contains three amino acids in its structure, is an antioxidant that plays an essential role in the protection of cells against oxidative stress and radiation.[4] Analyses for oxidative stress are important in terms of evaluating oxidant and antioxidant balance as well as disease status and progression. Therefore, the analysis of oxidative stress markers is expected to be low cost, fast, accurate and reproducible.

In this study, we developed a microfluidic platform for the quantification GSH (being one of the oxidative stress parameters) in plasma. In the present system, an optical hardware was designed to allow absorption measurement on the final sample. The microfluidic device was fabricated via PDMS molding. Our results revealed that it is possible to analyze the glutathione level with micro-fluidic system.

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# Theoretical Approach to the Effect Time of Some Essential Oils

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Essential oils are one of the most successful products in the industry, as they are among the most preferred products in traditional medicine as aroma, fragrance, and therapeutic in the cosmetics industry as well as aromatherapy.[1] Although there are many studies on essential oils, there has been no study in the past on associating the physical properties of active substances with vapor pressure properties. Vapor pressure determines the effect time of essential oils. Such a study is important in terms of understanding the preferability of essential oils in places where they are used and sometimes the properties of using them together. In this study, the physical properties of well-known essential oil types were evaluated by evaluating the previous studies and these properties were tried to be associated with the essential oil properties. In the study, a formula was developed by utilizing the properties of essential oils and the formula was tried to be verified over other active species.

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# Electrochemical Sensor Based on a $CeO_2$/AuNPs-P-(L-Lysine) Composite for Simultaneous Determination Dopamine and L-Tyrptophan

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Electroanalytical methods are frequently used in analytical and clinical applications to determine the concentration of biological components in human body fluids. Dopamine (DA) is the most abundant catecholamine neurotransmitter in the brain and plays a key role in the message transmission function of the renal[1], hormonal and cardiovascular systems.[2] Abnormal DA levels can cause many serious diseases such as schizophrenia, muscle stiffness, Huntington's, and Parkinson's diseases.[3] L-Tryptophan (L-Trp) is an essential amino acid of clinical importance in biological samples and in the human body. Insufficiency of L-Trp can lead to metabolic disorders and some neurological diseases, while excessive intake can cause side effects such as dizziness, nausea, and loss of appetite.[4] In conclusion, detecting DA and L-Trp levels in human body fluids is essential for diagnosing the disease.

In this study, a $CeO_2$/AuNPs-P-(L-Lysine) based composite glassy carbon electrode (GCE) was prepared for the simultaneous detection of DA and L-Trp. The composite was characterized by cyclic voltammetry (CV), electrochemical impedance spectroscopy (EIS), and scanning electron microscopy (SEM). CV and EIS analysis results demonstrate that the $CeO_2$/AuNPs-P-(L-Lysine) modified GCE has high conductivity and electrocatalytic activity for DA and L-Trp. Chronoamperometry method was used for analytical determination of DA and L-Trp. It was observed that DA and L-Trp were well separated by their peak potentials and could be detected simultaneously in the binary mixture.

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# Covalent Immobilization of Xylanase on Modified Nickel-Multi-walled Carbon Nanotube Particles for Synthesis of Xylooligosaccarides

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Xylanases (EC 3.2.1.8) catalyze the hydrolysis of xylan being found in the structure of the plant cell wall in nature. Xylooligosaccarides (XOS) are composed of 2-7 xylose units linked by β-1,4 bonds. XOS have been recognized as emergent prebiotics and present nutraceutical properties that stimulate the growth of bifidobacteria in the humanintestine. [1] Thermal stability and reusability are of key factors for the efficient and economical use of enzymes, and particularly of xylanases, in industrial processes. Enzyme immobilization is the most widely used method to improve thermal stability and reusability of enzymes as well as enzyme specificity.[2] In this work, xylanase from *Thermomyces lanuginosus* was covalently immobilized on nickel-multi-walled carbon nanotube particles modified with different silane reagents. The immobilized xylanese preparations were used the synthesis of XOS. Our results showed that the thermal stability of immobilized xylanase preparations significantly increased compared to free xylanase. Furthermore, XOs profiles obtained in the xylan hydrolysis were different depending on the used immobilized xylanase preparation, suggesting that the immobilization can tune the enzyme specificity of xylanase.

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# Nonsteroidal Anti-inflammatory Drug Removal Using Electrospun Nanofibers for Environmental Biotechnology

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Pharmaceutical active compounds often cause environmental pollution in wastewater, drinking water and even groundwater due to the high production and consumption that occurs because of the ever-increasing population. For example, prolonged exposure to diclofenac anti-inflammatory drug (has been associated with vascular risk as well as serious atherothrombotic and gastrointestinal problems. In fact, the negative impact of drug compound on the environment, such as microbial consortia and some aquatic organisms, has been previously published in the literature[1]. Because of the complex structure of this compound, its biodegradation is a serious environmental problem. Thus, increasing interest in the degradation of anti-inflammatory drugs has focused on a sustainable biological alternative as environmentally friendly and robust solutions[2].

In this study, nanotechnology was used for environmental biotechnology applications and nanofibers' usability as a filtration membrane was performed. To obtain the nanofiber, 10% (wt) polycaprolactone and as a co-polymer were mixed and the characterization procedures were carried out. After obtaining nanofiber structures as suitable for immobilization of enzyme, the immobilization was performed, and the nanofiber showed biocatalytic characteristic. Then, the removal of nonsteroidal anti-inflammatory drug (NSAID) was observed by UV-absorbance monitoring. It has been observed that the NSAID undergoes a degradation of approximately 30% in the first 5 minutes, and this degradation continues to decrease in the following period. In the light of this information, it is aimed to create nanofibers with biocatalytic effect to be used in environmental biotechnology applications. Considering the literature, the studies of nanofiber in environmental applications gain great importance.

**Keywords:** Nanobiotechnology; nanotechnology; environmental biotechnology.

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# New Potentiometric Biosensor for Total Phenolic Assay

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In this study, a sensitive, fast and inexpensive new potentiometric determination method based on the determination of Folin-Ciocalteu Reagent (FCR) is proposed to determine the Total Phenolic Content (TPC) in plant extracts. For this purpose, a potentiometric-based all-solid-state-contact polyvinyl chloride (PVC) membrane biosensor was developed. Gallic acid (GA) compound was used as the active component (ionophore) in the developed biosensor and the potentiometric behavior of the biosensor was characterized. The detection limit of the selective biosensor to the FCR was determined as 0.022 mol $L^{-1}$ and showed a linear potential change in the concentration range of 0.031 - 1.0 mol $L^{-1}$ and a fast response time of 40-45 seconds. The developed biosensor was also applied to the plant extracts and the obtained measurement results were found to be in agreement with the spectrometric results in the literature.

# A potentiometric biosensor for the determination of valproic acid in human blood samples

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Epilepsy is a chronic neurological disorder characterized by recurrent seizures and it can occur at all ages. Epilepsy is a long-term illness and is usually treated with anti-epileptic drugs.[1] Valproic acid (VPA; 2-propylpentanoic acid) is one of the most effective and broad–spectrum anti–epileptic drugs used in the epilepsy treatment. Because, valproic acid is an effective and safe anti–epileptic drug, it is one of the most widely used anti epileptics worldwide and its use is increasing day by day. The normal value range of valproic acid in the blood is 50–100 µg/ml. If the level of the drug in the blood is below this range, adequate therapeutic efficacy cannot be achieved. On the contrary, if the drug concentration in bloodstream is increases, which will cause more harm than good.[2] Therefore, it is very important to determine its amount in the blood. In this study, an all–solid–state contact poly(vinyl chloride) (PVC) membrane potentiometric biosensor was developed for the determination of valproic acid in human blood samples. The biosensor exhibits a Nernstian response over a wide concentration range of $1.0\times10^{-6}$ – $1.0\times10^{-1}$ M with the slope of 59.0±3.6 mV/decade, and a lower limit of detection of $9.75\times10^{-7}$ M. The developed biosensor has a fast response time (<10s), good reusability and selectivity, and a wide pH working range. Finally, using the developed biosensor, valproic acid determination in human blood samples was performed with very high recoveries.

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# A Disposable and Sensitive Immunosensor for Detection of HE4

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Ovarian cancer is one of the common causes of cancer-related fatalities in women. A potential and sensitive biomarker for ovarian cancer is the human epididymis protein 4 (HE4).[1] Early detection of ovarian cancer is critical for mortality reduction and long-term disease control because of the strong link between the initial stage and survival. This study includes the sensitive methods to characterize the design of an ITO-PET-based biosensor for the detection of HE4 that is highly, cheap, repeatable, and disposable. After optimization steps, repeatability, reproducibility, regeneration, and single frequency impedance (SFI) studies were completed for the characterization of the proposed biosensor. The presented immunosensor has a wide linear detection range (1fg/mL–3000 pg/mL). The immobilization procedures, optimization steps and characterization studies of the suggested biosensor, such as reproducibility, repeatability, serum analysis, regeneration, and storage capacity, were investigated using electrochemical impedance spectroscopy (EIS) and cyclic voltammetry (CV) techniques. The constructed biosensor was also tried to detect the HE4 protein in real human serum for clinical application.

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# Immobilization of *Candida Rugosa* Lipase Encapsulated within Quantum Dots-MOF Nanostructure Composites

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Metal organic frameworks (MOFs) are a new three-dimensional hybrid structured material class with porous nano-structures formed by the coordination of metal ions and organic ligands. Its high surface area, adjustability of its architecture, chemical stability, and regular π-pillar structures make it is an exceptional material class.[1,2] Zeolitic imidazolate frameworks (ZIFs) are a subclass of MOFs. ZIF-8 is one of the most studied nanoporous materials and has excellent mechanical stability and chemical stability, thanks to stable metal-nitrogen bonds compared to other MOFs.[2,3]

Carbon quantum dots (CQDs) are fluorescent nanomaterials composed of nanocrystals of 2-10 nm size and carbon skeleton and surface groups.[4] It is a fascinating class of carbon nanoparticles due to their low toxicity, high stability, chemical inertness, excellent biocompatibility, light-induced electron transfer and highly tunable photoluminescence behavior, and these properties attract a lot of attention.[4,5] CQDs can be synthesized on a large scale by environmentally friendly methods and have good optical stability.[5] Lipases are the most widely used enzymes in biocatalysis with their properties.[6] Since its three-dimensional active structure is protected by weak non-covalent interactions, its activity may change or its structure may be disrupted by the effect of thermal, pH and chemical agents. Therefore, their use in industry is limited. With their excellent network structures with large pores, chemical stability, interaction of metal ions and organic ligands and their functionality, MOFs provide hope in maintaining the activities and stability of enzymes.[6,7]

In the study, by combining CQDs derived from edible mushroom *Agaricus bisporus* and zeolitic imidazolate frameworks (ZIFs) crystals, a new support material was prepared for encapsulation of *Candida rugosa* lipase. The study aimed to shed light on the activity, thermal and storage stability, and reusability of physically adsorbed or in-situ encapsulated enzyme. The prepared CQDs@ZIF-8 @$CRL_{enc}$ exhibited 3.5-fold improved biocatalytic activity with respect to CQDs@ZIF-8 @$CRL_{ads}$. The structural, morphological, and spectrophotometric analyses were performed using TEM, SEM-EDX, FT-IR, XRD, UV–vis, fluorescence, and confocal microscopy.

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# Everzol Blue Biosorption Capacity of Organic Wastes

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Dye-contaminated water resource caused by textile wastewater are seen as one of the important environmental problems, especially due to their water pollution and their place in the human food chain. In recent years, water pollution has been increasing day by day due to the discharge of large amounts of dye into the water resources of the textile industries. There are various methods to solve water pollution; chemical precipitation, ion exchange, ozonation, coagulation, flocculation, and adsorption. However, these methods have disadvantages such as removal of unpredictable contaminants, high reactive content, expensiveness, and toxic sludge formation. Therefore, biosorption, which is an environmentally friendly, economical, and effective method, offers some advantages such as the use of non-living biomass, the absence of toxicity, the use of naturally occurring biosorbents, and the need for food sources. Algae, bacteria, fungi, lichens, yeasts, and organic wastes were potential biosorbents. The aim of this study is to determine the biosorption removal of Everzol Blue, a textile dye, using organic wastes. As a biosorbent; Lemon, potato, and sunflower seed peels were dried in an oven at 100˚C and their powder form was used. pH (2-8), dye concentration (5-30 ppm), amount of biosorbent (0.5-4 g/L), time (1440 min.) and temperature (25˚C - 50˚C) parameters were examined. Experimental data decreased with increasing pH, increased in mean dye concentration and amount of biosorbent, and yield increased as temperature increased. Optimal conditions in which maximum efficiency was obtained as a result of the experiments and maximum dye removal occurred at pH 2 and 50˚C with20 ppm, and 1 g/L biosorbent dosage after 1440 minutes. The maximum biosorption rates obtained for lemon, orange, and sunflower seed peels were 34.62%, 87.10%, and 91.20%, respectively. The results of the study showed that easily accessible and economical organic wastes (lemon, potato, sunflower seed husk, etc.) can be used for textile dyes in laboratory scales.

# Antimicrobial Activity of Tannic Acid Loaded Discs

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Tannic acid (TA) belongs to the class of hydrolysable tannins, consists of a central glucose unit and ten gallic acid molecules attached to it.[1] It is found in the bark and fruit of many plants. It shows that TA, like many polyphenols, has antimicrobial, antioxidant, anti-allergic, antidiabetic, anti-inflammatory, antimutagenic and anticarcinogenic activities[2]. TA has a wide range of applications, especially in health and food. Many recent studies have shown that TA is an effective drug additive that can be used in modern drug delivery systems due to its specific physicochemical properties[3]. TA shows antimicrobial activity against the growth of a number of pathogenic bacteria and viruses including *Escherichia coli*, *Klebsiella pneumonia*, *Listeria monocytogenes*, *Staphylococcus aureus*, *Helicobacter pylori*, HIV and influenza[1,4]. In this study, TA included polymeric discs were prepared as an antimicrobial material and tested on gram (+) and gram (-) bacteria. TA molecules were loaded via molecular imprinting technology using PHEMA based polymeric discs. TA molecules were loaded with 100 mg, 200 mg and 300 mg concentrations. The synthesized discs were characterized via SEM studies, water uptake ratio, macroporosity and polymerization yield calculations. According to obtained the results the water uptake ratios and the polymerization yields were calculated above 90% and 95% for all TA-discs, respectively. Antimicrobial activity analysis was carried out using agar plug diffusion tests against *S. aureus* and *E. coli*. As expected, when TA content increased within the discs antimicrobial activity is increased against both microorganisms. However antimicrobial activity was higher against *S. aureus* than *E. coli*.

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# Antioxidant, Anti-Inflammatory and Anti-Aptototic Effects of Black Mulberry (*Morus nigra L.*) Fruit Against Cisplatin-Induced Kidney Damage in Rats

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Cisplatin is an antineoplastic agent used in cancer treatment and may cause various side effects such as nephrotoxicity, hepatotoxicity and peripheral neuropathy[1]. In our study, the protective effects of the extract obtained from Black Mulberry (Morus nigra) fruit, which has rich polyphenolic content, high antioxidant and anti-inflammatory activity, on cisplatin-induced kidney toxicity in rats were investigated. 5 groups were formed to observe the effect of cisplatin in methanol extract animal experiments. The extract was applied for 12 days and on the 5th day, cisplatin was administered as a single dose of 7.5 mg/kg intraperitoneally. All groups were sacrificed on the 12th day under anesthesia. Biochemical (anti-inflammatory and anti-apoptotic parameters TNF-α, CAT, SOD, Caspase-3, MDA, TAS, TOS) analyzes in tissue and serum were performed by enzymatic colorimetric, spectrophotometric and ELISA methods, and also histopathological evaluation was performed in tissue. As a result, it was observed that black mulberry has a protective effect against cisplatin-induced kidney tissue damage and oxidative stress, which is thought to be effective in this damage.

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# Preparation of Stigmasterol Imprinted Solid Phase Extraction Polymers for Recognition of Stigmasterol from Plant Extracts

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Stigmasterol is a phytosterol that occurs naturally in plants as free alcohols or as precipitates, particularly in vegetable oils. Stigmasterol is a plant sterol with a structure similar to cholesterol that regulates the physicochemical properties of the cell membrane.[1] Stigmasterol has been isolated from a variety of plants (legumes, seeds, vegetables, and vegetable oils, etc.), and its pharmacological and biological activities have been studied. Recent research has shown that stigmasterol has anti-inflammatory, anti-osteoarthritic, anti-atherogenic, antioxidant, and anti-cancer effects, as well as protective effects such as anti-cancer.[2,3] In this study, Stigmasterol imprinted (Stig-MIPs) and non-imprinted (NIPs) monosize solid phase extraction spheres were synthesized for the separation of Stigmasterol from soybean extracts. Methacrylic acid based monosized Stig-MIPs and NIPs were characterized by scanning electron microscopy (SEM), swelling tests and fourier transform infrared spectroscopy (FTIR). The polymerization yields were found as 97% and 98 % for Stig-MIPs and NIPs respectively. The selectivity of Stig-MIPs and NIPs for stigmasterol was investigated against cholesterol and ergosterol competitor molecules. According to the obtained results, the Stig-MIPs can recognize stigmasterol 3.4 and 2.3 times higher than cholesterol and ergosterol respectively. Stigmasterol recognition from soybean was also achieved using synthesized monosized Stig-MIP and NIP spheres and showed by chromatic analysis. Furthermore, reusability studies showed that Stig-MIPs can be reused ten times without significant reduction in adsorption capacity.

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# The Investiagtion of In Vitro Effect of Ascorbic Acid (Vitamin C) and Reduced Nicotinamide Adenine Dinucleotide (NADH) on Acetylcholinesterase Enzyme (AChE; EC 3.1.1.7) in Human Plasma

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Inhibition of acetylcholinesterase (AChE, EC 3.1.1.7), the key enzyme in the breakdown of acetylcholine, is considered promising drugs for the treatment of neurological disorders such as Alzheimer's disease, myasthenia gravis, and senile dementia. In this study, the effects of ascorbic acid (vitamin C) and reduced nicotinamide adenine dinucleotide (NADH), antioxidant compounds, on acetylcholinesterase (AChE) enzyme activity in human plasma were researched. Ascorbic acid and NADH on AChE activity showed an inhibition effect. $IC_{50}$ values for ascorbic acid and NADH were calculated as 12.74 µM and 49.04 µM, respectively. Type of inhibition and $K_i$ values for ascorbic acid and NADH from the Lineweaver-Burk graph were determined. The type of inhibition for ascorbic acid and NADH was found as non-competitive inhibition. $K_i$ value was calculated as 8.68 µM for ascorbic acid and 24.23 µM for NADH. Also, ascorbic acid showed higher inhibitory activity on AChE activity than NADH. In this study, it was concluded that ascorbic acid and NADH antioxidant compounds, which show an inhibition effect on AChE activity, may have both protective and therapeutic effects against neurological disorders.

# Combined architectures of nanomaterials and polymers: A New avenue for the development of laccase biosensors

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There is need for development of novel architectures able to an efficient biomolecules immobilization with an enhanced analytical performance in the field of advanced biosensors. Because of the unique properties of the nanomaterials they have attracted great attention in the last years for the development of innovative bioplatforms with optimal architectures and suitable structural and electronics characteristics.[1] Conjugated polymers have attracted great attention because of their perfect properties in technological applications.[2] Hence, herein conjugated polymer and nanomaterial modified electrodes were designed and used for catechol sensing. The sensing platform was formed with the modifiying of graphite rod electrode surface with the combination of nanomaterials and conjugated polymers. Then, laccase was immobilized onto the modified surfaces for catechol detection. The chronoamperometric technique was used to record catechol at room temperature under mild stirring conditions by applying a constant potential in buffer solution. The effect of each parameter on biosensor response was reported. Under the optimized conditions, the novel biosensor shows a wide linear range, a low detection limit, and a high sensitivity. Moreover, the applicability of the biosensor was tested on tap water samples with high accuracy results.

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# Investigation of Different Extraction Methods Applied to Olive Leave Grown in Hatay on the Amount of Secoiridoite Component and the Effect of Antioxidant Activity

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It is stated that 90 % of the estimated 500 million olive trees in the world are located in the Mediterranean. There are approximately 16 million trees in Hatay (2020-2021 Yield report). Oleuropein and hydroxytyrosol are the main components of olive leaf extracts, followed by verbascoside, apigenin-7-glucoside, luteolin-7-glucoside and tyrosol. These compounds have been associated with the anti-inflammatory, antioxidant and antibacterial properties associated with olive leaf extracts (Sudjana, A.N. et al., 2009; Fernandez-Prior, A.et.al., 2021)

In this study, maceration and soxlet extraction were carried out with 80% aqueous solutions, as well as pure ethanol and methanol, in order to determine the most effective solvent in terms of the efficiency of the extract to be obtained from olive leaves grown in Hatay. It was aimed to compare the antioxidant properties and also the amounts of secoiridoid components of the 6 different extracts. To this, Total Flavonoid Content (TFC), Total Phenolic Content (TPC), Ferric Antioxidant Reducing Power (FRAP), DPPH radical scavenging activity, ABTS Cation Radical Scavenging activity and the amount of free sulphydryl groups were investigated. Oleuropein, tyrosol and hydroxytyrosol concentrations were determined by HPLC applying double phase as formic acid-water (5:95, v/v, A) and Acetonitrile (ACN)-Phase A (80) : (20, v/v, B). In the light of the data obtained, it was concluded that 80 % aqueous methanol solution made by maceration of the most effective method in general. The effect of ultrasonic bath and sonicator use in extraction was also investigated; so, extraction with 80% methanol was performed in an ultrasonic bath and by ultrasonicator. An increament was observed in antioxidant activity and secoroid compositions when extraction was carried out in ultrasonic bath. When the results were compared, the levels of oleuropein, tyrosol and hydroxytyrosol in the extraction performed in the ultrasonic bath were found to be 36.4%, 43% and 45.6% higher, respectively, than the samples not performed in the ultrasonic bath. Moreover, in general an increase in antioxidant activities was observed. Results are calculated per g of leaf and per g of extract.

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# Synergistic Anti-apoptotic Effects of L-DOPA and Quinic Acid on Dopaminergic SH-SY5Y Cells in Rotenone-Based Parkinson's Disease Model

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Levodopa (L-DOPA) is an indirect dopamine agonist, and it crosses the protective blood-brain barrier, whereas dopamine itself cannot. Thus, L-DOPA is used to increase dopamine concentrations in the treatment of Parkinson's disease (PD)[1]. L-DOPA therapy is used for the management of Parkinson's disease and this therapy is formally approved for use in much of countries.

D-(-)-Quinic acid has been reported to have antioxidant properties. The potential role of D-(-)-Quinic acid in Parkinson's disease has not been evaluated previously but it is known to have a neuroprotective effect on various neurodegenerative diseases[2]. Previous studies demonstrate that L-DOPA has a neuroprotective effect on PD cells, however, the synergistic effect of the combination of L-DOPA and D-(-)-Quinic acid has not yet been investigated.

In this research, we investigated for the first time the synergistic anti-apoptotic effect of the combination of L-DOPA and D-(-)-Quinic acid against rotenone toxicity on dopaminergic SH-SY5Y cells. The values of CI (Combination Index) were calculated using CompuSyn software to identify the synergistic effect of L-DOPA and D-(-)-Quinic acid. Various stages of apoptosis were detected with the Muse® Annexin V & Dead Cell Kit. The amount of dopamine and the expression of *CASP-3, BAX* and *BCL2* in the cells were determined by ELISA. And, the expression of *CASP-3*, *BAX*, and *BCL2* genes was determined by RT-qPCR, and β-actin was used as a reference gene. In addition, Total antioxidant status (TAS) and Total oxidant status (TOS) were determined by Assay Kits. The lactate dehydrogenase (LDH) cytotoxicity assay experiments were conducted using LDH cytotoxicity assay kit.

We found that 3.125 µM L-DOPA and 0.156 µM D-(-)-Quinic acid showed the best synergistic effect (IC50: 0.89) at 24 h incubation. Also, a single administration of L-DOPA and D-(-)-Quinic acid increased the amount of dopamine in the rotenone-induced SH-SY5Y Parkinson's model. The results of the expression levels of *CASP-3, BAX,* and *BCL2* genes both at the gene level and at the protein level; showed that apoptosis was inhibited in a correlated manner. It is clear that D-(-)-Quinic acid highly enhances the neuroprotective and anti-apoptotic effects of L-DOPA when applied together.

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# The Effect of Exogenous Glycine-Betaine Application on Some Biochemical Parameters of Two Wheat Varieties Under Short-Term Drought Stress

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Drought is one of the environmental stress factors limiting crop growth and yield. Wheat (*Triticum aestivum* L.) is the most widely grown food crop worldwide, threatened by global climate change. Glycine-Betaine (GB) is an important osmo-protectant that is naturally synthesized in stressful environments in most crop plants and plays a role in scavenging reactive oxygen species (ROS).

The aim of this study is to investigate the effect of some biochemical (pigment amount, total protein amount and peroxidase activity (POX)) changes caused by the application of exogenous GB to two wheat varieties (drought-sensitive Selçuk, drought-resistant Demir-2000) grown in Turkey. Accordingly, drought stress induced by polyethylene glycol (PEG 6000) solution (15%) was initiated on 5-day-old wheat seedlings sprayed with 5 mM GB at the 24th hour following the application, and leaf sampling was performed at the end of 3 days. Petri experiment was set up in the plant growth chamber with 3 replications.

It was determined that the chlorophyll a/b ratio, which decreased with drought stress, increased with GB application in both cultivars and protected PS II from harmful effects. While the total protein content decreased in Selçuklu variety, it increased in Demir-2000 variety with GB application under drought stress. The increase in POX activities of both varieties indicates suppression of PEG-induced oxidative stress. As a result, it was determined that the application of exogenous GB in drought-sensitive variety improved the damage caused by short-term drought stress at the resistant variety level.

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# Adipose-Derived Mesenchymal Stem Cells Treatment in Cats with Chronic Kidney Disease: Evaluation of Laboratory Parameters

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The lifespan of cats has been prolonged regarding the domestication process. However, the prevalence of chronic diseases also increases with age. Chronic kidney disease (CKD) is more prevalent among the elderly cat population. Symptomatic and palliative treatments have been implemented due to manage life quality. In recent years, adipose-derived mesenchymal stem cells (ADMSCs) have been used as a supportive treatment because of their anti-inflammatory activities. Thus, we aimed to evaluate some clinical laboratory parameters of the ADMSCs treated cats suffering from CKD. Subsequent to general examination, six mixed breeds, sterile, male, 4 to 17 years old cats diagnosed with chronic kidney disease were treated with ADMSCs besides conventional therapy with the informed consent of the patient's owner. The allogenic $1x10^6$ cells per kg ADMSCs were administered (CellPro+, MarStem Cell Tech., Istanbul) by the intravenous route 14 days intervals two times. The total blood and sera were collected before and 24 hours after the treatments and evaluated the red blood cells (RBC), blood urea nitrogen (BUN) and creatine (Crea) levels to screen the efficiency. Whilst the RBC levels were increased ($p<0.05$), BUN and Crea levels were decreased ($p<0.05$) end of the treatments. The well-being of general conditions after ADMSCs therapy overall the cats was observed. To date, there is still no consensus on stem cell therapies for CKDs. In this study, we concluded that ADMSCs have beneficial effects as add-on therapy to manage CKDs in cats. Although, need to conduct long-term monitoring in clinical trials for standardization.

**Keywords:** Cat, Creatinine, Kidney Disease, Stem Cell

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# Biopoliols Strengthened With Natural Clay Minerals

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The synthesis of petroleum-based materials with environmentally friendly, renewable resources has gained importance due to the fact that petroleum reserves are depleted and environmental concerns are increasing. It is known that saturated and unsaturated triglycerides in the structure of vegetable oils can be converted into diol functional groups by many chemical reactions. For this reason, it has been seen that a bio-based polyol can be obtained from vegetable-derived fatty acids such as palmitic, stearic, oleic, linoleic and linolenic acids. The strength parameter of polyurethane foams obtained with bio-polyols obtained when plant sources are used for polyol production lags behind those of petroleum-derived polyols. In this study, a bio-based polyol was synthesized from canola oil and the polyurethane foams obtained with petroleum-based polyols gave TS EN 826 (Compressive strength) 0.080 MPa and TS EN 1607 (tensile strength) 0.080 MPa, while the tensile strength of polyurethane foams obtained with bio-based polyols. strength and compressive strength are less than 0.080 MPa. For this reason, the obtained bio-based polyols are given the necessary strength by containing 5% dolomite, which is a natural clay mineral. Thus, by using a bio-based material instead of a petroleum-based input, the carbon footprint was reduced and an environmentally friendly, sustainable product was obtained with the desired strength.

# Determination of Food Safety of Bacteriocin Producing Lactic Acid Bacteria Isolated from White Cheese

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Since lactic acid bacteria contribute significantly to the nutritional value of products due to their metabolic properties and the metabolites they produce, food technology has been a very important bacterial group in terms of food microbiology for many years. The interest in this group of microorganisms has increased considerably at the point of preventing food spoilage and extending the shelf life of foods. The prolongation of the shelf life of LAB in foods comes from the antimicrobial metabolites they produce such as organic acids, antibiotics, hydrogen peroxide, acetoin, bacteriocin. Bacteriocins are ribosomally synthesized antimicrobial compounds produced by many different bacterial species, including many members of lactic acid bacteria (LAB).[1] Some bacteriocins such as "nisin", which have the most common use in the food industry, are effective against many foodborne pathogens. For this reason, bacteriocins have been used as natural food preservatives in recent years and have come to a very important point in the food industry. The direct addition of bacteriocins and bacteriocin-producing cultures to food has revealed very important results in terms of food safety. As a result of these effects, LAB has been accepted as generally recognized as safe (GRAS).[2] In our current study, our aim is to isolate and identify bacteriocinogenic lactic acid bacteria from white cheese samples, to examine their antimicrobial effects on pathogenic food microorganisms and to evaluate their usability in terms of food safety. For this purpose, 41 bacteria were isolated from white cheese samples collected from different regions of Turkey and these isolates were characterized phenotypically. Then, these isolates were distinguished from each other on a species basis by genomic fingerprint analysis. Antimicrobial properties of the isolates were determined in order to make a preliminary estimation of whether the isolates thought to be different produce bacteriocins. Various gram positive and gram negative food pathogens were used. Specific PCR analysis was performed to determine whether the antimicrobially positive isolates contain certain bacteriocin genes (Plantaricin, Lactococcin, Pediocin, Brevicin, Nisin, Epidermicin, Enterocin). As a result of the analyzes, it was determined that the isolate coded MA33 showed strong antimicrobial effect against *Staphylococcus aureus, Bacillus cereus* and *Escherichia coli*, and this isolate was a strong bacteriocin (nisin and plantaricin) producer. The isolate, which has antimicrobial effect and bacteriocin production potential, which is a very important criterion in terms of food safety, was then genomically identified. As a result of the diagnosis, it was determined that the bacterium was 99% similar to *Staphylococcus hominis*.

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# Investigation of in Vitro Cytotoxic Effects of Some Secondary Metabolites from *Scrophularia subaequiloba*

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The genus *Scrophularia subaequiloba* (Scrophulariaceae), known as the "Munzur Sıracası" in the world, is one of the endemic species in Turkey.[1] Many studies with different species of *Scrophularia* medicinal plant have revealed its various bioactive properties such antioxidant, antiviral, anticancer, antidiabetic, analgesic, diuretic, hepatoprotective, and immunomodulation.[2] In the present study, **5** iridoids S2 (catalpol cinnamic ester), S3 (8-acetylharpagid-6-O-β-glycoside), S4 (harpagid), **1** flavonoid S5 (synaroside), S6 (ajugol), and S7 (aucubin), **1** phenolic acid S8 (p-coumaric acid methyl ester), and **1** saponin glycoside S1 (ilwensisaponin A) were isolated. The structures of these compounds were elucidated by 1D and 2D NMR Spectroscopy. The anticancer powers of all the isolated compounds were tested against A549 (human lung carcinoma), Calu1 (human lung carcinoma), H1650 (human lung carcinoma), A172 (human glioblastoma), C6 (rat glioma), SH-SY5Y (human neuroblastoma), MDA-MB-453 (human breast carcinoma), and SW620 (human colorectal adenocarcinoma) cell lines. Among the isolated compounds, it was determined that S1 exhibited the highest anticancer activity on the above-mentioned cells, and the $IC_{50}$ values on these cell lines were calculated to vary between 10.11 and 45 µM. On the other hand, it has been observed that the $IC_{50}$ values of the 5-FU, which is widely used in different cancer treatments, on these cells have different values in the range of 22 to 187 µM, depending on the cell type, indicating that S1 has a stronger anticancer activity potential than 5-FU. To conclude, the results obtained from this study provided critical preliminary data for investigating the *in vitro* and *in vivo* anticancer action mechanism of the S1 compound, which stands out with its remarkable cytotoxic activity on different cancer cell lines.

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# Investigation of The Biological Activities of Different Extracts of *Lallemantia canescens* (L) Fisch Et. Mey.

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Today, the side effects caused by synthetic drugs, increasing drug prices and the pollution created by the pharmaceutical industry have led to the resurgence of medicinal plants and the increasing interest in natural treatment methods.[1] More than 100,000 secondary metabolites have been isolated from plants and it has been determined that some of these compounds may be bioactive components in other living things.[2] Structures with biological activity likely to be found in plants have prompted scientists to investigate these sources and have enabled plant-derived substances to be defined as drug active ingredients in the treatment of many diseases.[3]

In this study, the activities of *Lallemantia canescens* (L) Fisch Et. Mey. extracts obtained by different extraction techniques against acetylcholinesterase enzyme and Botrytis cinerea fungus were investigated and the activities of these extracts were compared. Extracts whose bioactivity were investigated were prepared by sequential extraction, extraction with alcohol and acid-base extraction. It was determined that the extract rich in alkaloids inhibited the acetylcholinesterase enzyme the most, 45% at 10 µg/mL concentration, and the growth of Botrytis cinerea fungus was completely inhibited at 39.8 µg/mL concentration of the extract rich in phenolic compounds.

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# An Immunosensor Based on QTFs as a Working Electrodes for Kidney Injury Molecule-1

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Kidney injury molecule-1 (KIM-1) is a type I transmembrane glycoprotein and a potential biomarker for detecting tubular damage in major kidney diseases.[1] KIM-1 protein is expressed at low levels in the normal kidney but increase when any damage occurs to the kidney. Immediately after kidney injury, KIM-1 is excreted in the urine by proximal tubular kidney epithelial cells. Therefore, increased KIM-1 protein in the urine has proven to be a sensitive and early diagnostic indicator of kidney damage.[2-4] In this study, it was aimed to develop an electrochemical biosensor system based on a QTF (Quartz Tuning Fork) electrode for KIM-1 determination. The prongs of QTF were modified with 11-Mercaptoundecanoic acid (11-MUA). The electrochemical experiment system includes a typical electrochemical cell with a three-electrode system consisting of an Ag/AgCl reference electrode, a platinum plate-shaped counter electrode, and QTF transducers as the working electrode. All immobilization processes and characterization studies of the immunosensor were analyzed using Cyclic voltammetry (CV) and Electrochemical impedance spectroscopy (EIS). Characterization studies such as storage life, repeatability, and reproducibility of the biosensor were carried out under optimum conditions and finally, the applicability of the proposed biosensor to urine samples was tested. The designed KIM-1 sensor has high capacity for detection of the KIM1 protein at a wide concentration range (0.05-250 fg/mL). The results confirmed that QTFs have unique electrode capacity in point-of-care diagnostic devices.

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# Evaluation of Thioredoxin Reductase 1-Targeted Anticancer Effect of Evernic Acid on Human Lung Cancer A549 Cell Line

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TrxR1 (Thioredoxin reductase 1) is considered a double-edged sword as it maintains redox homeostasis to protect cells against cancer development.[1] However, TrxR1 is overexpressed in many species of cancer, including lung cancer, which is the most commonly diagnosed and leading cancer-related death worldwide.[2,3] In recent years, many studies have been carried out to investigate chemotherapeutic agents obtained from new natural compounds and to determine their target proteins in cancer treatments.[4,5] This research aimed to examine the TrxR1-targeted anticancer effect of lichen secondary metabolite evernic acid on lung cancer (A549) cells. Here, the viability of evernic acid on A549 cells was evaluated by cell proliferation (XTT) assay and the best $IC_{50}$ value for evernic acid was determined as 139.09±2.78 µg/mL at 24 h. The apoptotic effect of evernic acid on A549 cells was examined by flow cytometry analysis using the Annexin V-FITC/PI kit. The results showed that evernic acid induced apoptosis at a low rate. Wound healing assay results revealed that evernic acid significantly suppressed migration at 6, 12, and 24 h in A549 cells ($p<0.0001$). The effects of evernic acid on protein expression and enzymatic activity of TrxR1, the antioxidant system it targets in this anticancer effect on A549 cells, were examined by western blot, and DTNB methods, respectively. The results showed that it considerably reduced enzyme activity ($p<0,0005$), but had no significant effect at the protein level ($p>0,05$). In conclusion, our findings suggest that evernic acid has an anti-migratory effect by targeting TrxR1 in A549 cells and thus may be evaluated as a new chemotherapeutic agent.

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# Determination of Epinephrine by Voltammetric Method Using Carbon Paste Electrode Decorated with Modified CuO Nanoparticles

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Nanomaterials are widely used to modify electrodes in electrochemical sensors and devices due to their unique chemical, surface, and microstructural properties. CuO nanoparticles was used to modify carbon paste electrode in electrochemical sensor applications. Epinephrine (EP) presents in the biological bodily fluid and nerve tissue as an organic cation. Determining EP levels is crucial because it has an effect on the immune system, heart rate, lipolysis, and glycogen metabolism[1-4]. In this study, a new carbon paste electrode decorated with modified CuO nanoparticles and Nafion membrane (CP/CuO/Nafion) was developed for the voltammetric determination of epinephrine (EP). The CP/CuO/Nafion biosensor exhibited linear dynamic range from $1x10^{-7}$M – $1x10^{-5}$ M. The EP concentration ($R2$ = 0.9991) was found to have a good correlation coefficient. The detection limit of the biosensor was calculated as $3.1 \times 10^{-8}$ M. The reproducibility of the biosensor was examined and the relative standard deviation value was calculated as 3.7%. ($n$=9)). Ascorbic acid (AA), dopamine (DA) and uric acid (UA) did not significantly interfere with epinephrine quantification. The good sensitivity, selectivity, stability and short analysis time properties of the developed CP/CuO/Nafion biosensor make it a promising candidate for EP detection.

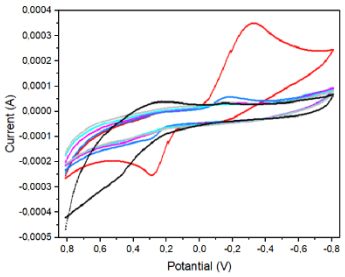


Figure 1: Cyclic voltammograms of the unmodified and modified biosensors: in 50 mM phosphate buffer, pH 7.

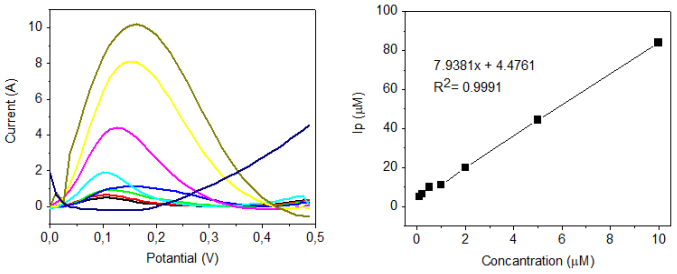


Figure 2: Differential pulse voltammograms of the CP/CuO/ biosensor at different concentration of EP; Inset: plot of peak current as a function of EP concentration

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# Investigation of Synergistic Anticancer Effects of Sorafenib and Deinoxanthin on Huh7 Hepatocellular Carcinoma Cell Line

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Hepatocellular carcinoma (HCC) is the third leading type of cancer death in the world, affecting more than 500,000 known to date. HCC is the primary malignant tumor of the liver and is most common in patients with chronic liver disease or cirrhosis.[1]

Sorafenib is an FDA-approved multikinase inhibitor used in the treatment of hepatocellular carcinoma. Sorafenib, used for patients with advanced HCC who cannot undergo surgery or are unsuitable for treatment with liver transplantation, is diaryl urea that inhibits the Raf/MEK/ERK pathway by inhibiting Raf serine/threonine kinase isoforms.[2]

Deinoxanthin is a pro-apoptotic carotenoid that is highly found in the cell wall of a bacterium called *Deinococcus radiodurans*, which is considered to be the most radiation-resistant living thing in the world. Studies have shown that deinoxanthin induces apoptosis in hepatocellular, colon, and prostate cancer cell lines.[3]

In the study, the synergistic anticancer effect of Sorafenib and deinoxanthin on the Huh7 hepatocellular carcinoma cell line was investigated. Huh7 is a cell line known to be resistant to sorafenib, which was isolated from a liver tumor of a 57-year-old Japanese man in 1982.

The antiproliferative effect of Sorafenib and deinoxanthin separately and in combination on the viability of Huh7 was examined by MTT test. In addition, cytotoxic status was evaluated by examining lactate dehydrogenase levels. Besides that, the MTT results obtained were evaluated with the CompuSyn program, and the CI value, where deinoxanthin and Sorafenib had the highest toxicity at the lowest concentration, was calculated. ELISA and RT-qPCR methods were performed to detect the expression levels of BAX, BCL-2, and CASP-3 at the concentrations with the lowest CI value.

According to the CI values of sorafenib and deinoxanthin combinations; the best agonistic effect was determined at 12.5 µM sorafenib-12.5 µM deinoxanthin at 48 hours. As a result of the findings, the increase in CASP-3 and BAX protein and mRNA levels as well as the decrease in BCL2 level suggest that intrinsic apoptosis is induced.

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# Evaluation of the Bioactive Constituents, Antioxidant and Enzyme Inhibitory Activities of *Rhaphiolepis indica* (L.) Lindl.

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*Rhaphiolepis indica* (L.) Lindl., also known as the Indian hawthorn, is an edible plant belonging to the *Rosaceae* family.[1] The enzyme inhibitory and antioxidant potential of different solvent extracts (methanol, ethanol, ethyl acetate, hexane and water) from *Rhaphiolepis indica* (L.) Lindl. were evaluated.[2] Antioxidant assays included total antioxidant capacity (phosphomolybdenum), metal chelating activity, free radical scavenging (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulphonic acid (ABTS)) and reducing power (cupric reducing antioxidant capacity (CUPRAC) and ferric reducing antioxidant power (FRAP))[3]. Enzyme inhibitory effect were studied against tyrosinase, α-amylase and α-glucosidase.[3],[4] Ethanol extract showed higher phenolic content (39.5 mg GAE/g) and flavonoid content (20.7±0.4 mg QE/g). When the plant extracts were examined in terms of antioxidant properties, it was determined that the best solvent was ethanol. Also ethanol extract presented significant inhibition of tyrosinase ($IC_{50}$, 7.0 ± 0.3 µg/mL), α-amylase ($IC_{50,}$ 2.3 ± 0.2 µg/mL) and α-glucosidase ($IC_{50,}$ 0.3± 0.0 µg/mL ). The bioactive compounds of extracts was detected by using liquid chromatography-high resolution mass spectrometry (LC-HRMS). Results obtained in this work indicate that *Rhaphiolepis indica* (L.) Lindl. may be useful as a source of natural agents for food and pharmaceutical industry.

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# Enzymatic Biosensor Based on Dendrimer Modified Surfaces for Detection of Oxidant Species

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Dendrimers are three-dimensional, symmetrical polymeric macromolecules with dendritic branches and a polyvalent core. These macromolecules feature globular shapes that range in size from 1 to 100 nm and carry charges on their exterior surfaces.[1] These molecules are made up of three primary parts: a multifunctional initiator core that serves as the dendrimer's anchor point during growth; inner layers and inner branches that create generations; and an outer layer with branches that have functionalized structures at their terminals.[2] Dendrimers are tools that modify electrodes to operate as transduction units in electrochemical biosensors. Numerous chemical groups at the dendrimer ends assist in stabilizing biomolecules on the electrode surface. In most cases, ethylenediamine is used to make the polyamidoamine (PAMAM) dendrimers, and the terminal branches of these molecules end with amine, hydroxyl, and carboxyl functional groups.[3] Oxidative stress factors originating from endogenous sources generate reactive oxygen species (ROS). In numerous physiological processes, the intake and usage of oxygen result in the production of reactive oxygen species (ROS), such as hydrogen peroxide ($H_2O_2$), superoxide ($O_2^{\bullet-}$), and hydroxyl radical ($^{\bullet}OH$). In high concentrations, all ROSs are potentially hazardous and poisonous to organisms.[4] In this study, a PAMAM-modified enzyme-based biosensor was constructed. Analyte detection at micromolar levels was accomplished with great selectivity as a consequence of optimization and characterization studies for the developed biosensor.

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# Ion imprinted Based Polymeric Iron Chelator for Acute Iron Poisoning

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The aim of this study is to develop an alternative polymeric chelating agent for rapid and selectively removal with high capacity of iron $Fe^{3+}$ions from the gastrointestinal (GI) tract for the oral treatment of acute iron poisoning. For this purpose, $Fe^{3+}$ imprinted poly(hydroxyethyl methacrylate-N-methacryloyl-(L)- glutamic acid) (HEMA-MAGA) nanoparticles were synthesized by surfactant free emultion polymerization. Molecular imprinting (MIP) technique was used to enhance the selectivity of nanoparticles. Due to being carboxyl and amide groups of the MAGA monomer, it was chosen as a chelating agent for $Fe^{3+}$ ions. Before the synthesizing of $Fe^{3+}$ imprinted polymer, Fe3+ ions were complexed with (N-methacryloyl-(L)-glutamic acid) MAGA and then $Fe^{3+}$ imprinted nanoparticles were synthesized in the presence of this $Fe^{3+}$-MAGA complexes. Poly(HEMA-MAGA) nanoparticles were characterized by infrared spectroscopy (FTIR), atomic force microscopy (AFM). Average particle size and size distribution also determined by zeta sizer. The specific surface area and mead diameter of the $Fe^{3+}$ imprinted poly(HEMA-MAGA) nanoparticles was 895 $m^2.g^{-1}$ and 95.3 nm, respectively. The maximum $Fe^{3+}$ ions binding capacity of the poly(HEMA-MAGA) nanoparticles at pH:4.0 were 206.4 $mg.g^{-1}$ nanoparticles in intestinal mimicking solution(IMS). $Fe^{3+}$ removal performance of the $Fe^{3+}$ imprinted poly(HEMA-MAGA) nanoparticles with presence of other ions, optimum medium pH, temperature and equilibrium binding time were also investigated. $Fe^{3+}$ removal studies were performed in both aqueous solution and intestinal mimicking solution. The results indicate that $Fe^{3+}$ imprinted poly(HEMA-MAGA) nanoparticles is an alternative chelating agent for the selective $Fe^{3+}$ ions removal in a short time and with very high capacity.

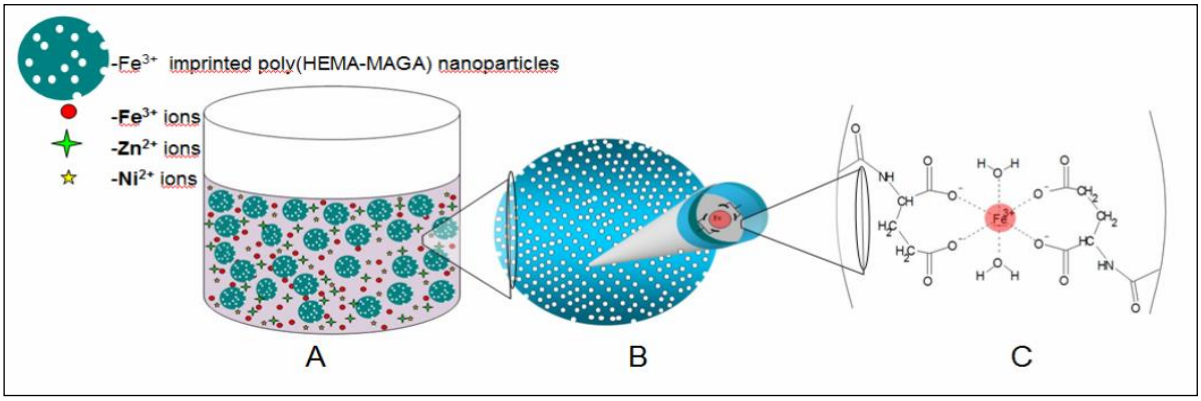


**Figure 1**. Schematic presentation of experiments A) $Fe^{3+}$ binding medium of nanoparticles, which contain competitive ions $Zn^{2+}$ and $Ni^{2+}$ B) A single Fe3+ imprinted nanoparticles with tailored cavities for $Fe^{3+}$ ions C) Complex formation of carboxylic groups and $Fe^{3+}$ ion.

# Change of Activity Values of Combi CLEA (GA+GI) and Free (GA+GI) Depending on Ionic Liquid Environment

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Glucoamylase [EC 3.2.1.3] (GA) can hydrolyse starch in glucose, which can after that be converted to fructose by glucose isomerase [EC 5.3.1.5] (GI). Therefore, both enzymes are essential in the production of high-fructose corn syrup (HFCS) industrially. HCFS is a sugar substitute sweetener.[1,2]

Commercial enzymes have disadvantages such as not being reused, generating waste and not being able to withstand high temperatures in industry. Enzyme immobilization methods have been developed to overcome these problems.

Ionic liquids are called salts with a low melting point and contain 99.99% ions. The most important feature of ionic liquids is that they have almost no vapor pressure, thermal stability, non-flammability, reusability and solubility of different substances[3].

In this study, we immobilized glucoamylase and glucose isomerase enzymes together as combi CLEA to produce fructose syrup in a single step. [Bmim] [Cl], [Bmim] [PF6], [Bmim][AOc],[Amim] [Cl], [Emim] [Cl] and [Dmim] [Cl] Both free (GA+GI) in ionic liquids ) and co-immobilized (GA+GI) hydrolysis of starch was investigated and the maximum activity was observed in 1-butyl-3-methylimidazolium chloride [Bmim][Cl]. It was determined that the hydrolytic activity in [Bmim][Cl] was approximately 2 times higher than the medium using 100 mM pH 7 phosphate buffer.

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# Immobilization of *Aspergillus niger* Glucoamylase by Adsorption Method on Carboxylated Multi Walled Carbon Nanotubes

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The aim of this study was to immobilize Aspergillus niger Glucoamylase (ANG) on Carboxylated Multi Walled Carbon Nanotubes (c-MWCNT) with high immobilization efficiency as possible as. 100% immobilization yield and 118.24% activity yield were obtained by optimizing the parameters affect immobilization efficiency individually. These results are best than previous results obtained other studies. Because, the best previous results are 95% in adsorption and 100% in covalent binding obtained by Sanjay and Sugunan.[1] Characterization of free and immobilized ANGs was also studied. After immobilization, the optimum temperature has reduced from 55-60 $^{o}$C to 50 $^{o}$C while the optimum pH raising from 5.5 to 6.5. After immobilization, the $V_{max}$ value increased from 1464.1 µmol D-glucose / L.min to 1733.1 µmol D-glucose / L.min, while the $K_m$ value decreased from 116.3 g maltodextrin / L to 98.4 g maltodextrin / L. There was no decrease in the initial activity of immobilized ANG during repeated twenty times using and thirty days of storage at +4 $^{o}$C in a refrigerator. Finally, by using the immobilized ANG, all maltodextrin available in the maltodextrin solution at 5% (w/v) concentration has completely converted to glucose after 180 minutes. Consequently, it can be said that the immobilized ANG obtained in this study could be used in industrial production of glucose syrup and other industrial applications.

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# Nanorelease Systems For Neurodegenerative Diseases Treatment

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Resveratrol, which is very effective against antitumor, anti-inflammatory and heart diseases, is used in the treatment of neurodegenerative diseases such as alzheimer and dementia. In addition to these diseases, it is frequently used in the treatment of CORD and diseases with oxidative etiology. [1] The use of resveratrol is limited due to its low solubility in water, instability, short biological half-life, low concentration in the systemic circulation, and accumulation in tissues. [2] Resveratrol is used for treatment by being loaded into non-toxic polymeric nanoparticles in order to increase the stability, controlled drug release, stable drug delivery. [3]

In this study, it is aimed to develop nanopolymer systems for the treatment of neurodegenerative diseases. Accordingly, p(HEMA) nanoparticles were synthesized by emulsion polymerization method and grafted with L-histidine amino acid.[4] In addition to being a biocompatible material, poly(2-hydroxyethylmethacrylate) also contains binding sites for biological molecules through the presence of hydroxyl groups, activation and derivatization with the addition of various ligands. It was then characterized by scanning electron microscopy (SEM) and Fourier Transform Infrared Spectroscopy (FTIR). pH, temperature, concentration and time parameters were investigated during resveratrol binding to histidine graft-p(HEMA) nanoparticles. Resveratrol and his graft-p(HEMA) solutions at different concentrations were used to determine the adsorption kinetics. It has been found that the maximum absorption amount of resveratrol to nanopolymers under optimum absorption conditions is 400mg/g, 90 minutes contact time at 37°C and pH 7.4. Non-toxic nanomaterial systems developed within the scope of the project to be used in the treatment of neurodegenerative diseases are suitable for long-term and controlled release of resveratrol.

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# Identification and Heterologous Expression of a Novel P450 Monooxygenase from *Streptomyces avermitilis*

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Cytochrome P450 monooxygenases take role in many metabolic processes in all life forms.[1] P450 monooxygenase enzymes catalyze diverse range of reactions such as hydroxylation, epoxidation, and alkylation.[2] Due to their catalytic features, P450 enzymes draw attention for biotechnological processes. Up until now, P450s employed in industry have low activity towards industrially important compounds.[3] In order to overcome these limitations, protein engineering has been applied to increase their industrial usage. Beside, identification and expression of novel P450 monooxygenases are crucial for biotransformation of industrially relevant substrates and acquiring novel reaction types and products.

In this study, the P450 monooxygenase enzyme from the *Streptomyces avermitilis* was cloned into pET-28a vector and expressed heterologously in Escherichia coli. In order to increase recombinant P450 monooxygenase expression, several parameters such as expression host, media, IPTG, ALA, iron chloride and so on was optimized. The highest P450 monooxygenase amount was obtained in E. coli Rosetta strain and TB media by addition of 0.5 mM IPTG, 0.5 mM ALA and 0.75 mM FeCl3. Finally, expressed P450 monooxygenase enzyme was purified with NiNTA affinity chromatography and validated with SDS-PAGE and western blot analysis.

**Acknowledgement:** This study was supported by The Scientific and Technological Research Council of Turkey (119Z079)

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# Constructing A Hybrid Biosensing System to Improve Nanoplasmonic Signals

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Optical metamaterials are configurations of artificially structured materials designed to obtain unusual electromagnetic properties. The ability to manipulate a confined electromagnetic field enables metamaterials to detect low concentrations of target analytes. Moreover, integration of fluorescent molecules and plasmonic metals are utilized to enhance fluorescent signals; however, the nanoscale distance relation between the fluorescent emitter and plasmonic metal surface is crucial for the separation of fluorescent enhancement (Purcell effect, enhancement of a spontaneous emitter inside antenna) from fluorescent quenching (FRET, non-radiative energy transfer)[1]. In our study, we integrate fluorescent labeled (FITC) molecules onto a plasmonic metamaterial *via* chemical and polymeric linkers for obtaining a hybrid biosensing system that boosts the device sensitivity and lowers the limit of detection. The metasurface is fabricated *via* physical vapor deposition over nanograting polycarbonate substrates in order to coat titanium (10 nm), silver (30 nm) and, gold (15 nm), respectively.[2] Additionally, the surface modifications for fluorescent labeled molecule binding are arranged *via* short-distance, medium-distance, and long-distance linkers. After the evaluations, the highest plasmonic wavelength shift over FITC labeled molecule binding is obtained from medium-distance linker with 4.45 times signal enhancement over the short-distance modification while simultaneously detecting proteins from physiological buffers and artificial urine samples. All the measurements are collected within 45 min, and the overall cost per assay is <$1.5. Consequently, this study paves the way in designing new arrangements on a metasurface to couple with fluorescence molecules, at the same time enhancing the analytical performance of the sensor.

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# Natural Products Suppress The Glucose Toxicity During Diabetes

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Glucose toxicity is a common phenomenon during Diabetes. It brings about structural alterations of biomolecules and causes damage to cellular components. Natural products like thymoquinone and phycocyanin can be used for the suppression of glucose induced toxicity. We have used several parameters to study the toxic effect of glucose and role of phytochemicals in vitro. Glucose was incubated with serum albumin for several weeks to induce the glucose toxicity. Spectroscopic techniques were used to characterize the toxic products and their suppression by phytochemicals. The structural alterations were analysed using the electrophoretic techniques. The analysis of results indicate that glucose interacts with serum albumin and leads to generation of toxic products collectively known as advanced glycation end products. This interaction also caused structural and functional loss of serum albumin. The presence of thymoquinone and phycocyanin caused the suppression of formation of Glycation products as well as structural alterations. These results indicate that high glucose concentration leads to generation of several toxic products which in turn cause damage to biomolecules especially proteins. Thymoquinone and phycocyanin were found to interfere with these interactions and suppress the glucose induced toxicity.

# POSTER PRESENTATION ABSTRACTS

# Evaluation of *Telephium imperati* L. in terms of Antioxidant Activity

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*Telephium imperati L. subsp. Orientale (Boiss.) Nyman* is a species of *Caryophyllaceae* and is traditionally used in Celikhan for its properties such as healing abscessed acne, eczema, hemorrhoids and inflamed wounds and burns.[1-3] In this study, we evaluated the antioxidant capacity of this medicinal plant. The antioxidant capacity of the obtained methanol extract was investigated using the radical scavenging capacity by ABTS and the metal reduction capacity as CUPRAC methods. In accordance with ABTS and CUPRAC tests, it was determined that *T. imperati* corresponded to 23.8 % ABTS radical scavenging activity at 40 µg/µL concentration and metal reduction capacity as CUPRAC 0.58 mmol TEAC at 40 µg/µL concentration. The results showed that it has moderate metal reducing capacity and free radical scavenging.

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# Design and Production of Surface Modified Molecular Imprinted Polymer-Based Electrochemical Sensor with Photopolymerization for the Determination of Molnupiravir

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Molnupiravir (MOL), an orally active nucleoside analogue antiviral drug, was recently approved by the US FDA for the emergency treatment of adult patients infected with the SARS-CoV-2 (COVID-19) virus and at risk of severe progression.[1] In this study, the development of a molecularly imprinted polymer (MIP) based electrochemical sensor using the photopolymerization method and the more sensitive and selective determination of MOL were described. The polymerization process for the preparation of polymer materials was carried out using MOL and guanine methacrylate (Gu-MA) as template molecule and monomer, respectively. A three-electrode system was used to study the electrochemical responses of the MOL. The linear range and limit of detection of the developed Gu-MA@MIP/GCE sensor were found to be 0.75-25 pM and 0.113 pM, respectively. The polymer materials were characterized by Fourier transform infrared (FTIR) spectroscopy and scanning electron microscopy (SEM). Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) were used for electrochemical characterization. Various parameters such as template: monomer ratio, dropping volume, UV drying time, removal solutions, removal time, and rebinding time were optimized to achieve the highest level of selectivity and sensitivity. The effect of various interferences agents on the MOL peak current was studied for the purpose of selectivity study. In addition, the imprinting factor (IF) was calculated using molecules with similar chemical structures. The prepared Gu-MA@MIP/GCE sensor was showed excellent reproducibility, repeatability, and high sensitivity against the MOL molecule. In addition, the prepared sensor was successfully applied to commercial serum samples and capsule form for MOL determination.

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# An Electrochemical Sensor Based on a Molecularly Imprinted Polymer for Determination of Antiviral Drug Umifenovir

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Umifenovir (UMI, $C_{22}H_{25}BrN_2O_3S$), an oral antiviral drug, was licensed for the treatment and prophylaxis of influenza A and B virus infections in Russia (Arbidol®) in 1993 and China in 2006. There are clinical studies showing that UMI can reduce the proliferation of the SARS virus in vitro. Moreover, the use of UMI for COVID-19 remains unclear.[1] A new electrochemical sensor based on a molecularly imprinted polymer (MIP) film was presented for the detection of an antiviral drug UMI. MIP was prepared by photopolymerization of butyl methacrylate (Bu-MA) and UMI on a glassy carbon electrode (GCE) for the first time, where Bu-MA was used as a functional monomer. UMI was then removed. Thus, imprinted voids complementary to the template in the polymer matrix were created. In this way, the UMI can be specifically recognized and connected by the printed cavities. The developed MIP sensor exhibited a fast electrochemical response, high sensitivity, and selectivity for the detection of UMI in commercial serum and urine samples. In addition, the short preparation time of the proposed sensor, its high repeatability, and no pre-processing provided significant advantages for UMI determination. Under the optimized conditions, the linear range and detection limit were obtained 0.5–7.5 pM and 0.10 pM, respectively. In addition, the sensor showed high repeatability and good stability for the detection of UMI. Finally, the proposed sensor exhibited satisfactory recoveries and excellent detection performance in biological matrices.

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# Investigation of the Anticorrosive and Antifouling Effect of Different Ni Concentrations CrNi Coatings on AISI 316L Steel

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Although there have been many developments in the field of maritime transportation since the first day of humanity's sailing to the ocean with wooden ships, nature still continues to pose many difficulties to the human beings. Biofouling and corrosion are perhaps the most important of these difficulties. Growing organisms as a result of biofouling, increasing the fuel consumption of ships and damage important parts such as propellers, injectors, sensors, and sonar. Corrosion shortens the service life of ships and puts them at great risk in huge oceans. In today's metal ships, it is not possible to deal with these problems separately. Due to some physical changes in the environment caused by the properties of the biofilm and the dissolved oxygen and corrosive ions trapped in the polymeric structure of the biofilm, microbiologically influenced corrosion seriously threatens today's man-made artificial metal surfaces and causes serious technical and material damage to nations and industries.[1]

For this purpose, AISI 316L electrodes were coated with a 10 µm thick CrNi alloy in a CrNi bath with two different Ni concentrations [2] at 33 °C bath temperature. The corrosion performances of the alloys were monitored in 3.5% sodium chloride aqueous solution (ASW) and freshly sampled real sea water (RSW); the biofouling studies were carried out in freshly sampled RSW. In the impedance data obtained, it was observed that the results in the RSW environment and the results in the ASW environment were quite different from each other. While the coated electrodes in the RSW medium showed a successful anticorrosive effect, the high Ni concentration alloy coating in the ASW medium showed a much lower anticorrosive effect than the bare electrode and low Ni concentration electrode. However, this alloy coating showed much better anticorrosion performance in RSW environment than bare metal and low Ni concentration alloy coating. When the fluorescence microscope images were examined after DAPI staining, it was observed that the biofilm formed on the surface of the coated electrodes was less than the biofilm formed on the bare electrode, and the biofilm formed on the surface of the coated electrodes decreased further as the Ni content in the coating increased.

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# Coating and Biological Characterization of Implant Surfaces with Vancomycin Loaded PHBV

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The aim of this work was to develop an antibiotic coating on the surface of a titanium grade 4 plate to determine its antibacterial and surface properties. A promising approach for reducing the occurrences of infections is to provide the surfaces of biomedical devices and dental implants with features that are unfavourable for bacterial attachment and proliferation. Therefore, to combine the antibacterial properties of antibiotic-loaded Poly(3-hydroxybutyrate-co-3-hydroxyvalerate) (PHBV) with titanium, as the base material for implants, in order to obtain biomimetic surfaces with antibacterial activity. The titanium surfaces were linked to both PHBV and hydroxyapatite using electrospinning technique. This attachment was carried out by firstly activating the titanium surfaces with sodium hydroxide. Further functionalization of the activated surfaces were carried out with antibiotic which is vancomycin hydrochloride loaded the titanium surface.[1] The success of the surfaces functionalization as well as the different superficial linkages was confirmed by means of the following characterization methods [2]: contact angle, scanning electron microscopy (SEM), Fourier transform infrared (FTIR) spectroscopy. The antibacterial properties of the titanium treated surfaces were tested by means of an *in vitro* antibacterial assay using a Gram (+) and Gram (–) bacteria. Finally, drug release kinetic models were detected.

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# Pectin-Arginine Films for Biomedical Applications

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Pectin is a polysaccharide that contains methylated ester of d-galacturonic acid units, it is found in almost all plant tissues. Pectin and its composites have recently been investigated as a potential biomaterial for tissue engineering and biomedical applications.[1-3] However, some properties of these materials are not advantageous for every practice. It may also be desirable to further improve some of its features such as structural integrity in water and controlling swelling behavior. For this purpose, pectin–arginine (Pe-AR) films were investigated in this study. Homogeneous films were obtained by physically cross-linking the Pe-AR matrix with calcium ions. According to the water vapor transition results, Pe-AR has almost the same transition rate as pectin films. However, swelling percentages were found to be quite low in the swelling test. In addition, the water contact angle was measured and Pe-AR was found to be more hydrophobic than pectin films. Also, the structure was examined in terms of rheological properties. Besides, it has been observed that the created Pe-AR matrix has hemostatic properties. The anti-hemolytic effect of the films was also detected. As a result, homogeneous, transparent improved Pe-AR films were formed for use as biomaterials.

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# LSPR-Based Biosensing Enables the Detection of Antibiotic Resistance Genes

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The spread of antibiotic-resistant bacteria poses a major threat to human health. However, extensive surveillance strategies which monitor the spread of resistance genes in both clinical and non-clinical environments are currently lacking. In addition, the gold standard for identifying resistant bacterial pathogens are classical, time-consuming culture-dependent assays. Consequently, the development of rapid, simple bioassays is of utmost importance.

Here, we used localized surface plasmon resonance (LSPR) spectroscopy as a suitable tool for the detection of a plasmid-based antibiotic resistance gene, *blaSHV*, which confers resistance against a broad spectrum of β-lactam antibiotics and/or β-lactamase inhibitors. LSPR sensing is based on the characteristic optical properties of noble metal nanoparticles, i.e. their free electron clouds which can resonate when excited by an external light source. Since resonances are dependent on the refractive index of the surrounding medium, molecules that attach to the particles cause a measurable shift in the corresponding plasmon peak, which allows to detect various biomolecules such as DNA in a label-free manner.

By performing limit of detection experiments using a single assay format, DNA target sequences down to 25 nM were detected. Furthermore, the setup also allowed studying the binding kinetics of target DNA molecules to the specific capture sequence in real-time. Strikingly, performing LSPR measurements using a mutational hotspot of the *blaSHV* gene revealed that sequences which only differ in a single nucleotide can be distinguished from the fully complementary sequence. The possibility to distinguish such sequences is of utmost importance in clinical environments, as it allows to identify mutations essential for enzyme function and thus, crucial for the correct treatment with antibiotics. Ongoing work focuses on the transition to a microarray format, which will allow a rapid and simultaneous analysis of a variety of different resistance genes. Taken together, this system provides a robust, and cost-efficient analytical tool for the detection of nucleic acids and will enable the surveillance of antimicrobial resistance determinants.

# Eggshell Incorporated GelMA/KondMA/HyMA/ Biocomposite Scaffolds with Improved Performance for Tissue Engineering Applications

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One of the most important goals of tissue engineering studies is to create substitutes that mimic the natural environment for cells and to ensure efficient nutrient and oxygen delivery to support cell proliferation. This is why the proper choice of constituents in the construction of the biocomposite scaffolds is very important to support the necessary synergy for tissue regeneration.[1,2] Hyaluronic acid (HA) is a linear amino polysaccharide commonly found in the extracellular matrix (ECM) components.[3] Gelatin is a hydrolytic product of collagen, which is the vital protein component of bone, cartilage, connective tissue, and skin and makes the main element of ECMs.[4] Chondroitin sulfate is a critical structural component and a member of the glycosaminoglycans (GAGs) that is mainly located on the surface of the cells or in ECM.[5] But, these biomaterials have the disadvantage of mechanical weakness. In this study, to improve their mechanical stability, methacrylated forms of these polymers (GelMA, KondMA and HyMA) were used and eggshell particles were incorporated gelatin-chondroitin sulfate-hyaluronic acid biocomposite scaffolds. The fabricated biocomposite scaffolds were characterized to explore its potential for use in tissue engineering applications.

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# Preparation and Application of Allantoin Containing Polyurethane/Polycaprolactone Based Antibacterial Wound Dressing Materials by Electrospinning Method

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Wound dressing materials have a very important place in the wound healing process. Due to the differences and diversity in wound types, the use of such materials has now become a necessity. Today, the preparation of wound dressing materials with superior properties that accelerate wound healing has become an important need. Wound dressing materials with many different properties are commercially available. In this context, studies on alternative dressing materials and the development of these materials are very important. The importance of wound dressing materials developed by electrospinning method is increasing day by day. The aim of this study was to prepare wound dressing materials via electrospinning technique using polyurethane, polycaprolactone and crosslinked PEGs, and also to obtain a multifunctional structure with the addition of allantoin known as a wound healer and gentamicin sulfate known as having antibacterial effect into the wound dressing material.

In the scope of this study, three polyurethanes with different tween ratios were synthesized using hexamethylene diisocyanate (HDI), polyethylene glycol (PEG 200), trimethylolpropane ethoxylate (TMPE 1014) under an inert atmosphere at 70°C in a reflux system. 3% allantoin and 1% gentamicin sulfate were added into the mixture prepared with a polyurethane/polycaprolactone ratio of 1:3. The obtained structures were characterized structurally by FTIR, morphologically by SEM and AFM, thermally by TGA, DTA and DSC. The characterized polymers were transformed into a wound dressing material via electrospinning under optimum conditions using the flow velocity parameters as 20 kV and 2 mL/h with 20 cm away. The wound dressing materials were found to be biocompatible against L-929 cells in the cell culture system and allow the cells to adhere.

The biomedical usable nature of the wound dressing material obtained from the study is important in terms of creating a domestic product and providing an accretion value for our country.

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# Green Synthesis of Copper Nanoparticles via *Sambucus nigra* Extract and Investigation on Its Photocatalytic and Antioxidant Activity

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Due to the increasing need in the development of environmental technologies, the use of plants and microorganisms in the biosynthesis of nanoparticles has received great attention.[1,2] The green synthesis of nanoparticles is safe for humans and the environment due to the absence of pollution and also cost effective method without use of tough chemicals. Metallic nanoparticles composed of copper and oxide forms contain various biological properties such as antimicrobial, antioxidant, anticancer, antiviral, antifouling and antiinsect.[3] In this study, the green synthesis of copper nanoparticles (CuNPs) was performed by *Sambucus nigra* extract and studied for their photocatalytic and antioxidant activities. Fourier transforms infrared spectroscopy (FT-IR), X-ray diffraction (XRD), Scanning Electron Microscopy (SEM) and UV–visible spectrophotometry analytical techniques were used to characterize the green synthesized nanoparticles. The photocatalytic activity of the CuNPs was tested in the degradation of methylene blue (MB) in the presence of UV light illumination. The synthesized CuNPs showed good catalytic activity in the reduction of MB. The antioxidant property of CuNPs was tested by scavenging free radicals of 2,2-diphenyl-1-picrylhydrazyl hydrate (DPPH) and inhibited the activity effectively.

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# Silk Fibroin Hydrogel as Corneal Tissue Adhesive: *In-Vitro* and *Ex-Vivo* Assessment

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For ophthalmic surgeons, the optimal closure of ocular incisions is a significant clinical challenge due to a uniform corneal thickness and the apparent lack of regenerative characteristic.[1] Sutures are conventionally used for corneal wound closure. Due to their several disadvantages (ie, technical skill requirements, prolonged operative times, inflammation, infection, and neovascularization with resultant corneal scarring), tissue adhesives are great alternatives to the sutures.[2, 3]

Silk fibroin is an emerging biomaterial that has been under steady research over years by virtue of its various excellent behaviours (ie, biocompatibility, biodegradability, cytocompatibility and mechanical strength). Additionally, it is interesting as an optical biomaterial because of its transparency to visible light.[4] Herein, silk fibroin-based hydrogel corneal tissue adhesives were prepared under the visible light crosslinking. Initially, silk fibroin was isolated. Then the isolated solution was concentrated to three different concentration ratio (22.5 wt%, 15 wt%, and 7.5 wt%) crosslinked in the presence of visible-light photoinitiators (Riboflavin/Sodium persulfate) with differing exposure times. The effect of irradiation time and silk fibroin concentration on the final products were investigated. Swelling, degradation and mechanical strength tests and *in-vitro* and *ex-vivo* burst pressure tests were performed. According to the cell culture studies, tissue adhesives in all groups were found to be non-toxic and could efficiently reinforce cell adhesion and proliferation. It was concluded that the improved tissue adhesives are a potential biomaterial to be used for the treatment of corneal injuries.

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# Determination of Antioxidant System and Xenobiotic Metabolizing Enzyme Activities in Rainbow Trout (*Oncorhynchus mykiss*) Treated with Mifepristone

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Abortion pills are medications used to terminate pregnancy. Mifepristone is one the abortion pills. It is a progesterone receptor antagonist.[1] It is widely used as an abortion pill in some countries. It is not only used to terminate pregnancy but also in the treatment of Cushing's syndrome and some types of tumors.[2,3] It has been measured in aquatic environments due to the widespread usage.[4,5] The effect of mifepristone on aquatic organisms has not been well studied yet. In this study, our aim was to determine the effect of mifepristone on xenobiotic metabolizing enzyme activities and antioxidant system in rainbow trout (*Oncorhynchus mykiss*). For this purpose, 32 rainbow trout were divided into four groups as control, solvent control (DMSO), 100 ng/L treatment group, and 500 ng/L treatment group. Fish were treated with mifepristone at the indicated doses for 96 hours. At the end of this period, fish were killed by decapitation. Livers were removed. Microsomes and cytosols were prepared from liver tissues. In this study, CYP1A-associated 7-ethoxyresorufin O-deethylase and CYP3A-associated erythromycin N-demethylase activities were measured in microsomes. Glutathione S-transferase, catalase and glutathione reductase activities were measured in cytosols. There was no significant difference between control and solvent control in all enzyme activities and mifepristone used at two different doses. The results of this study showed that mifepristone has no acute effect on CYP1A-associated 7-ethoxyresorufin O-deethylase, CYP3A-associated erythromycin N-demethylase, glutathione S-transferase, catalase, and glutathione reductase enzyme activities. It is clear that mifepristone has no toxic effect on antioxidant enzyme activities and xenobiotic metabolizing enzyme activities in fish at these doses and within this administration period.

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# Structure- Based Virtual Screening for Finding Novel Microsomal Prostaglandin E Syntase-1 (mPGES-1) Inhibitors

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Cancer, which is one of the causes of death worldwide, ranks first in dangers at the age of 70 in our country, and nowadays cancer studies have become the center of world research.[1] Inflammation is a reaction that occurs as a result of infection and tissue damage, persists in the event of injury, and occurs to maintain tissue homeostasis under adverse conditions. The ways in which inflammation is effective in tumor formation and progression have been defined.[2] Microsomal prostaglandin E2 synthase 1 (mPGES-1) has been the focus of research for anti-inflammatory drugs because it is overexpressed in inflammation and cancer. In light of this information, in this study, mPGES-1 protein was chosen as the target protein and compounds with an indole scaffold were screened against this target protein as computational.

As a result of virtual screening, indole derivative compounds with the highest affinity to mPGES-1 protein were selected. MMGBSA calculations of these compounds were made, ADME properties were examined and hit compounds were determined. Molecular simulation studies were carried out to determine the stability of hit compound complexes. Protein-ligand RMSD changes, Protein RMSF changes, Ligand-RMSF, interaction fractions, specific interactions more than 10.0% of the simulation period and a timeline of protein-ligand interactions were investigated. These data were compared with the reference. Ultimately, the hit compounds which are including indole scaffold could be potential novel mPGES-1 inhibitors.

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# Development of Chitosan and Methacrylated Poly(vinyl alcohol) with Au Nanoparticles as Wound Dressings

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An ideal wound dressing should have the following characteristics: adequate mechanical property, outstanding biocompatibility, moisture retention, high exudate absorption capacity, reduced inflammation, mimic extracellular matrix, and eco-friendly.[1] The present investigation involves the synthesis of chitosan (CS) and methacrylated poly(vinyl alcohol) (PVA) films containing Au nanoparticles as potential wound dressing materials. Firstly, Au nanoparticles were prepared in the presence of CS and the characterization was done by UV-vis spectrophotometer, FTIR, zeta potential, and particle size.[2] Then, PVA was methacrylated with glycidyl methacrylate and the structure of the polymer was observed by FTIR and $^{1}$H-NMR.[3] Finally, CS, CS/Au nanoparticles, and methacrylated PVA solutions were cast on the petri dishes and were crosslinked under UV light in the presence of Irgacure 2959. The fabricated films were confirmed by FTIR. Moreover, mechanical, swelling, and degradation tests were performed. The cytotoxicity of the films was evaluated by MTT method using assay tests on NIH-3T3 cell line. In conclusion, potential dressing materials have been developed that can be used in wound treatment.

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# Designing and Constructing of CRISPR/Cas9 Tools to Edit R273H Mutation of TP53 Gene in Pancreatic Cancer

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Pancreatic cancer is one of the challenging health problems worldwide causing an average of 227,000 deaths each year. Pancreatic ductal adenocarcinoma (PDAC) is known as the most agressive type. Mutational activation of oncogenes, inactivation of tumor suppressor genes and genome repair genes are associated with PDAC development. The most common mutations among these are mutations occurring in KRAS, TP53, CDKN2A and SMAD4 genes. The *TP53* gene is a tumor supressor gene which is located on the short arm of the 17th chromosome and consists of 11 exons and encodes the p53 protein, known as the guardian of the genome. It controls the cell cycle and induces apoptosis in cells with irreparable DNA damage. The R273H hotspot mutation in the *TP53* gene affects the activation of target genes that play a role in suppressing tumor growth by changing the interaction of p53 protein with its DNA binding sequence. Current treatment approaches such as surgery, radiation and chemotherapy have limited efficacy on the treatment of the disease. It seems possible to provide permanent and effective treatments, by eliminating the genetic mutations that cause development of the disease. RNA-mediated clustered regularly spaced palindromic repeat sequences (CRISPR) and CRISPR-associated protein 9 (Cas9) system (CRISPR/Cas9) functions as a bacterial defense system in nature and has been discovered recently that this natural system could be used as a gene modification method. Currently it is used effectively in many areas.

This study aims to edit R273H mutation in TP53 gene using CRISPR/Cas9 technique in PANC1 pancreatic cancer cell lines. In this sense, single guide RNA (sgRNA) and donor DNA (ssODN) were designed in accordance with the targeted region using the https://www.benchling.com/ online software program and received commercially. R273H mutation site targeted sgRNA was cloned into the plasmid vector (79145, Addgene). Following the cloning step, vectors were transformed into DH5alpha bacteria, an E.coli variant. After transformation, colony PCR and sequence analysis were performed to confirm successfully cloning of sgRNAs. By this study, gRNA cloned plasmid vector and a ssODN as the CRISPR/CAS9 tools has been ready to use for transfection into PANC1 cell to edit R273H in TP53 gene have been constructed.

In conclusion, our study presents a considerable contribution to gene therapy approaches for treatment of pancreatic cancer.

# Synthesis and Characterization of Electrospun PCL-Halloysite Composite for Teicoplanin Delivery

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Electrospinning is the most well-known technique in order to synthesize polymeric nanofiber for drug delivery systems.[1] The usage of biodegradable polymers such as polycaprolactone (PCL) has been extensively preferred in literature for this purpose.[2] Hydrophobic properties of polyesters cause low-drug loading capacity, and so natural silicates can be preferred as the agents which have low-cost and high surface area.[3] Halloysite nanotubes (HNTs) have been widely used such as tissue engineering, catalytic systems as well as drug delivery systems.[4] Teicoplanin is mostly used in the treatment of bone and joint infections.[5] In this study, HNTs were modified with 3-aminopropyltriethoxysilane (APTES) and loaded with teicoplanin in three different concentrations. After that, the HNTs were mixed with PCL solution to create PCL/HNTs-APTES-Teicoplanin nanocomposite by electospinning technique. Release profiles were then examined for both PCL/Teicoplanin and PCL/HNTs-APTES-Teicoplanin nanocomposites. Morphological structure, degree of crystallinity, chemical properties, and drug encapsulation efficiency of the composites were investigated by using scanning electron microscopy (SEM), differential scanning calorimetry (DSC), Fourier transform infrared spectroscopy (FTIR), and UV–VIS spectrophotometry, respectively. In conclusion, PCL/HNTs-APTES-Teicoplanin demonstrated higher drug encapsulation capacity compared with bare polymer. In this case, this situation led to a slower drug release.

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# From Waste to Food Packing: A Biobased Hydrogel Films from Pineapple Peel Waste

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Food waste is growing global problems. There are many reasons of these situation, but the main problem is packing the foods with inappropriate materials. Because packing materials can be reason of degradation and damaged of food and the accumulation of food waste. The packing materials can be plastics, papers, glasses, etc. The petrochemical based plastic packaging materials were most widely used due to their low cost and easy processability. The increasing of plastic wastes can be harmful both for human health and ecological system. Due to the known hazards of petrochemical-based plastic packing, it is very important to develop eco- friendly and biodegradable packaging materials. Biobased polymers are a new alternatives of food packing materials. They are biodegradable, compatible to food contents, non-toxic and low cost. One of the sources of biobased polymers are food wastes. The carbohydrate and protein contents of food waste makes them the monomer of biobased polymers.

In this study, we synthesized biobased food packing material with pineapple wastes. The peels of pineapple were the source of cellulose which is the main component of hydrogel films. Highly stable and elastic hydrogel films were obtained by blending cellulose with polyvinyl alcohol (PVA) and carboxymethyl cellulose (CMC) as crosslinker and glycerol as the plasticizer. Minced meat and fish fillets were packaged with these hydrogel films and microbial load assessments were studied. This study is a good example reduce food waste, recycle a new material and reuse of waste. By using raw, renewable material a low-cost, eco-friendly, innovative product was developed.

# Textile Application of Bromelain Enzyme Isolated from Pineapple Waste

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Bromelain enzyme was isolated using different techniques from pineapple peels obtained free of charge from local markets. Enzyme encapsulation preferred for enhancement of enzyme stability, reusability, cost and case of use. The beads were obtained by dropping the mixture of chitosan and bromelain into tripolyphosphate (TPP). Obtained beads covered with carboxymethyl cellulose (CMC) to enhance the stiffness of beads encapsulated. The best ratio was selected from the prepared beads and used in the modification of the wool fabric.

Surface modification was made to reduce the hydrophobicity of the wool fabric and then treated with glutaraldehyde. Fabrics which are treated with glutaraldehyde and which are not treated with glutaraldehyde were modified with commerical bromelain, commercial bromelain beads, bromelain isolated from waste pineapple peels and bromelain beads isolated from waste pineapple peels. Pilling, strength and weight change tests were performed on the treated fabrics.

In conclusion of this study, it was seen that the bromelain beads isolated from waste pineapple peels can be used as an alternative to toxic chemicals and commercial bromelain used in the textile industry. A low-cost, eco-friendly, high value-added method has been developed.

# Aptamer Based Fluorescent Assay for Allergen Detection in Food Samples

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Food allergy is one of the main global health problems. Since allergic reactions can cause deaths, allergic people must be protected against unintended consumption of allergenic food. For this reason, allergen labeling of packed food is mandatory in most of the countries.[1] Peanut allergy is one of the most frequent and serious allergies, especially in the US and European countries.[2] Seed storage protein Ara h 1 is the major peanut allergen protein. High expression level in the seed, proteolytic stability, thermal and acidic stability are some features that make Ara h 1 a special protein target for the determination of allergen residues in food samples.[3]

In this study, a DNA aptamer selective to allergen protein Ara h 1 was fluorescently labeled and tested for sensing the target protein in food samples. The codon optimized gene encoding Ara h 1 was heterologously expressed in *E. coli,* and then purified by metal-chelate affinity chromatography. Highly purified protein was used as a target for the labeled DNA aptamer in an optimized working buffer. The working buffer was optimized for both high-yield protein extraction from food samples and to enhance fluorescence quenching signal upon protein-aptamer interaction. Preliminary studies in the working buffer resulted in a lineer detection curve between 0.5-20 ppm and a limit of detection of 0.25 ppm. Protein extraction from several food samples available in the local market was performed, and the food extracts were subjected to allergen determination. Regarding the strong variation and complexity of the food samples, each food sample resulted in a different detection curve ranging from 0.5-1 ppm to 5-20 ppm. Considering that the test takes just a few minutes after protein extraction, aptamer based fluorescent quenching assay is highly advantegous over time-consuming ELISA assays. Moreover, simple design of the assay makes it cheaper, more stable and easier to work compared to other antibody-based allergen assays. In conclusion, aptamer-based fluorescent quenching assay has the advantage of being simple, cheap, fast and sensitive for determination of allergen residues in food samples. This assay is yet to be improved to multiplex design to cover other allergen targets.

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# The Composite Microbeads of Alginate, Carrageenan, Gelatin, and Poly-(Lactic-co-Glycolic Acid): Swelling, Cefaclor Loading and Release

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In drug delivery systems, carrier molecules are necessary for the release of the active substance. It is advantageous to use biocompatible and biodegradable polymer nanoparticles as carriers.[1] Since alginate (A), poly(lactic-co-glycolic acid) (PLGA, P), gelatin (G), and carrageenan (C) are polymer molecules with high biodegradability, forming porous gels, and swelling ability[2], they were chosen for this study. The aim of this study was to evaluate different kinetic models in releasing systems with using Cefaclor which is mostly used as a model drug in drug release studies. For this reason, it was embedded to the binary (A-C, A-G) proteins formed with P, A, C and/or G, triple (A-C-G, A-C-P, A-G-P) and quaternary (A-C-G-P) composite microbeads. The composite microsbeads with Cefaclor and drug-free group were synthesized under different conditions. Scanning electron microscopy (SEM) and Fourier Transform Infrared (FTIR) spectrum analysis were used to determine the drug entrapment efficiency. Additionally, the effects of synthesis conditions on swelling, entrapment efficiency, and release kinetics of materials were examined. All release experiments were carried out in simulated gastric fluid without enzymes at body temperature with new solutions in a shaking medium. The comparison of maximum swelling efficiency results for the hydrogel composites were A(981%) > AP(747%) > ACGP(641%) > ACG(618%) > ACP(464%) > AC(442%) > AGP(295%) > AG(157%). The maximum entrapment efficiencies of Cefaclor in microbeads were ACP(93%) > AC(76%) > AP(66%) > ACG = AGP(46%) > AG(40%) > ACGP(39%) > A(36%). The release of Cefaclor from the composite beads did not generally show a burst effect. The selected data fit the first-order release kinetics and the Korsmeyer Peppas and Higuchi drug release models.

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# Synthesis and Characterization of Amino Functionalized Magnetic Mesoporous Hybrid Nanoflowers as Popular Carrier Support: Its Evaluation for Horseradish Peroxidase Immobilization

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Derived from the root part of the horseradish plant, the horseradish peroxidase enzyme (HRP, E.C 1.11.1.7) is a heme-containing oxidoreductase that catalyzes the reduction of hydrogen peroxide by an electron donor. HRP enzyme is widely used in the removal of phenolic compounds from wastewater, dye removal, food processing and biosensors.[1] Free enzymes are unstable to organic solvents, surfactants environmental conditions such as temperature and pH. In addition, enzymes have disadvantages such as storage instability, difficult separation from substrate and product, and non-reusability. While the immobilization process allows to overcome this disadvantage, the advantages of the immobilization process can be improved by choosing the appropriate carrier support. Hybrid nanoflowers (hNFs) and magnetic ($Fe_3O_4$) nanoparticles (MNPs), which are among the popular carrier supports, are of great interest in enzyme immobilization. In addition, recent studies are directed to the use of new carrier support, which is formed by combining these two carriers supports.

In this study, mesoporous magnetic hybrid nanoflowers were synthesized by embedding amino functionalized MNPs into hNFs.[2] HRP enzyme was immobilized on the synthesized mesoporous magnetic nanoflowers using the adsorption method. The morphology and structure of the synthesized and HRP-immobilized mesoporous magnetic nanoflower were determined by scanning electron microscopy, X-ray diffraction, Fourier transform infrared spectrophotometer, and Energy-dispersive X-ray spectroscopy. In addition, optimum pH, optimum temperature, kinetic parameters, thermal stability and operational stability parameters of the immobilized enzyme were investigated and compared to free HRP.

In conclusion, to the best of our knowledge, this study is the first to demonstrate the immobilization of the HRP enzyme into mesoporous magnetic hybrid nanoflowers, which are formed as a result of combining the properties of two different carrier supports.

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# RNA-based Screening of Antimicrobial Resistance: A Case Study on *Pseudomonas aeruginosa*

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Bacterial infections pose a serious threat to human health and result in high mortality rates in patients who have received ineffective empirical therapy, mainly due to resistance to the agents used.[1] Increasing antimicrobial resistance and the lack of new antibiotic candidates highlight the need to optimize current diagnostics and therapy to curb the development and spread of multidrug resistance. In this study, we investigated whether we could reliably predict antimicrobial resistance at RNA level using quantitative gene expression data. As a case study, we considered *Pseudomonas aeruginosa,* an extremely problematic Gram-negative pathogen, which plays a dominant role as an infectious agent in the lungs of cystic fibrosis patients and has become one of the most important human pathogens in nosocomial infections. We examined the transcriptome and antibiotic resistance profiles of 414 drug-resistant clinical *P. aeruginosa* isolates in relation to the four commonly used antimicrobial agents against *Pseudomonas*: tobramycin, ceftazidime, ciprofloxacin, and meropenem.[2] Comparative statistical analyzes of drug-resistant and drug-susceptible profiles revealed drug-specific and common mRNA signatures. We showed that the combined use of expression profiles of mRNA signatures can predict the resistance and susceptibility of clinical *P. aeruginosa* isolates with high sensitivity and predictive power, and machine learning further improves the predictive power of the mRNA signatures. Our research serves to establish RNA-based molecular diagnostic tools to identify the current resistance profiles of this pathogen and paves the way for faster diagnostics for more efficient targeted treatment strategies to also mitigate the future potential for resistance evolution. The introduction of a molecular susceptibility testing system into routine microbiology diagnostics promises to provide earlier and more detailed information on antibiotic resistance profiles of bacterial pathogens, and thus could change the way physicians treat bacterial infections.

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# Investigation of the Inhibition of *Pseudomonas aeruginosa* Type IV Pili Elongation ATPases to Prevent Biofilm Formation

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The increase in the number of resistant bacteria as a result of misuse and overuse of drugs is a worldwide health problem. Identification of molecules targeting bacterial virulence as an alternative to traditional antimicrobials that are losing their effectiveness is an attractive approach to control the rapid spread of pathogens.[1] *Pseudomonas aeruginosa*, which is classified as a critical priority pathogen by the World Health Organization, leads to infections with a wide range of virulence factors it has. *Pseudomonas* infections often result in death, especially in people with cystic fibrosis. The extracellular polymeric materials it secretes (exopolysaccharides), lipopolysaccharides, proteases, lipases, elastases, and type IV pili (T4P) make *P. aeruginosa* a highly flexible pathogen.[2] Specifically, due to its biofilm-forming ability it is extremely difficult to completely eradicate infections associated with this bacterium. Biofilm-forming cells are often resistant to antibiotics, as biofilms are barriers that prevent drugs from entering the cell. Biofilms also enable these bacteria to escape from the defense mechanisms of the host cell by creating micro-conditions for pathogenic bacteria.[3] The virulence factor T4P has been associated with biofilm formation. To this end, several molecules have been investigated for their interaction with the elongation ATPases to interfere with the T4P assembly. This interaction was also expected to eventually alter biofilm formation.This work was supported by the Scientific and Technological Research Council of Turkey (TUBITAK) (Project no: 120M225).

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# Production of Salicylic Acid and Production Optimization

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Salicylic acid (SA, 2-hydroxybenzoic acid) is one of the potent pharmaceutical organic acids that have various applications in the medical field. Salicylic acid is an industrially significant organic acid which derives its name from *Salix* (Latin), meaning a Willow tree since *Salix alba*, White willow is a natural production source of this acid [1]. The willow exhibits anti-inflammatory, anti-rheumatic, antipyretic, antidotic, antigesic, and antiseptic properties [2]. The production of SA can be conducted either by plants, through natural biosynthetic process via two pathways, the isochorismate (IC) pathway and the phenylalanine ammonia-lyase (PAL) pathway, both of which originate from chorismate; by microbes, primarily via chorismic acid an important intermediate of the shikimic acid pathway; or by chemical methods where the current process used is based on the Kolbe Schmitt reaction [3]. There are many other chemical routes for its synthesis. In this study, the production of salicylic acid was subjected to various solvents (HCl, NaOH, purified water) and different hydrolysis steps (boiling and ultrasonication) after homogenization of white willow tree barks. At the same time, optimization was achieved by changing the concentrations and processing times of the solvents used during these processes. In the light of the results obtained, it was found that a basic solution for the production of salicylic acid from the bark of the white willow tree gave the best results, while the boiling process gave the best results. Salicylic acid easily forms complexes with small trace amounts of iron salts and, therefore, can be used as a very useful method for the detection of the compound. for this reason, the amount of salicylic acid in the study was carried out using FeCl3 solution. Due to the formation of the ligand, it forms a purple complex, and the destruction of the ferric complex can be determined at 540 nm[4]. In the following studies, it is deducted to support the trial results with the HPLC process. At the same time, the best results were found in experiments performed depending on the concentration in basic conditions 0,1-0,2-0,3-0,4-0,5 M NaOH solutions were used and a parabolic line was noticed in the product yield. The highest value was found after boiling hydrolysis performed with 0,2M NaOH, and in the future perspective, the effect of concentration on production should be studied in detail. A complete biosynthetic route of SA has not yet been established and with the easy availability of manipulation details, it will be more feasible to employ. Therefore, the present review will be of promising assistance for the future.

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# Effect of Amount of Different Types of Borax on Antimicrobial Effects of Vulcanized poly(Epichlorohydrin) Elastomer

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Among various protection techniques, application of antimicrobial coatings has played a significant role in the prevention of growth as well as accumulation of harmful microbes and bacteria on the substrate surfaces in medical and other industries.[1] Fillers are the components that a top-quality product will need in a manufacturing process in the rubber industry that effect the performance of the final product. The use of filler materials in the rubber industry effected to improve the thermal, curing behavior and mechanical properties of elastomers.[2] In this study, the Effect of Effect of Amount of different types of borax on antimicrobial effects of poly(Epichlorohydrin) elastomer was investigated. Different types of borax compounds as fillers were obtained from Boren Institute (Türkiye). The vulcanization system was based on 2,4,6-trimercapto-s-triazine (TMT), and Diphenyl Guanidine (DPG). The other compounding ingredients were commercially used chemicals in rubber and tyre industries. The formulation was prepared for the preparation of different H55 **BLENDS** containing 0.5 to 10 phr Borax. H55 compounds were prepared by mixing in Thermo-Haake Rheomix OS lab mixer at 25°C at 50 rpm/min for 20 minutes. The rheological analyzes of the prepared blends were carried out with a moving die rheometer at 200°C. Vulcanization was carried out in a pressurized hot press at 200°C and for respective optimum cure times of all the compounds. The antibacterial resistivity of the vulcanized elastomers was studies against *Escherichia Coli*, and *Streptococcus Aureus*.

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# Investigation of In Vitro and In Silico Effects of Brown Algae Extracts on Cholinergic Enzymes Activity

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The biological various active metabolites that inhibit acetylcholine (ACh) and butyrylcholine (BCh) hydrolyzing acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) enzymes have great importance in the development of drugs used in the treatment of Alzheimer's disease (AD). In this current study, the inhibition potentials of the brown algae *Cystoseria crinita* and *Stypopodium schimperi macroalgae* extracts in different solvents against metabolically important cholinergic enzymes (AChE and BChE) in AD formation were analyzed by Ellman method. It was determined that acetone and methanol extracts of *C. crinita* and *S. schimperi* showed an inhibitory effect on the AChE enzyme but had no effect on BChE. On the other hand, the highest inhibition of the AChE enzyme was observed in the acetone extract of *C. crinita*. Brown algae contain a unique secondary compound called phlorotannin. It was determined that the extracts obtained from both algae were rich in total phenolic compounds. The in-silico effect of phloroglucinol, commonly found in these algae, on the AChE enzyme was determined by docking. Our results showed that the functional group (-OH) of the phenol ring of phloroglucinol showed a hydrogen bond interaction with amino acids HIS447 and TYR337 and amino acids GLH202 of the AChE enzyme. In conclusion, phlorotannins in brown algae may be potential new candidate active metabolic enzyme inhibitors that can be used for therapeutic purposes.

# Effects of *Ulva lactuca* Extracts on Some Properties of Different Plant-Promoting Bacteria

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Seaweed is used in medicine, industry, and the food sector due to its secondary metabolites. There are limited studies on the effects of different macroalgae on plant growth-promoting bacteria. This study investigated how *Ulva lactuca* extracts affect these properties in bacteria with plant growth properties. The effect of seaweed extract on indole acetic acid (IAA), cellulase activity, and biofilm formation produced by the microorganism was determined. *U. lactuca* extracts showed increased IAA activity in *Streptomyces* sp. HCl12, *Brevibacillus* sp. S1S24, and *Streptomyces* sp. PRG26. Strains were inoculated on CMC agar, and CMC agar media supplemented with *U. lactuca* by spot inoculation, and it was determined that all test strains had cellulase activity and *U. lactuca* extracts caused an increase in zone diameter. It was observed that strains with biofilm-forming potentials gave different results in the presence of *U. lactuca* extract. It was determined that while the biofilm-forming potentials decreased in *Brevibacillus* sp. S1S24 strains, it increased in *Streptomyces* sp. HCl 12 and PRG26 strains.

# Cellulose Based PVA and *Hypericum Perforatum* Additive Composite Wound Healing Hydrojel Production

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In this study, the contribution of cellulose from hempstalk and polyvinyl alcohol (PVA) composite hydrogels were loaded with hypericum extract, and its effect on *in vitro* wound healing were evaluated. Cellulose obtained from cannabis stalk was combined with PVA and hypericum perforatum extract to obtain a hydrogel structure. Hemp based cellulose was preferred because of its various advantages, such as high durability, moisture holding capacity, and low adverse effects. PVA has been used many times in literature, and its biocompatibility has been shown [1,2]. *Hypericum perforatum* (known as St. John's wort) is a plant species, widely known for its antibacterial and healing properties. *Hypericum perforatum* extract was prepared in methanol and added to the hydrogel at different concentrations[3]. Then, an *in vitro* wound healing scratch model was created using HS2 skin keratinocyte cells, and the wound-healing properties of the hydrogel at different concentrations were investigated. Wound closure was evaluated using ImageJ software on images taken by light microscope at 1, 3, 6, 9, 12 hours after application. When the results were examined, it was determined that 3% (v/v) concentration had significant wound-healing properties compared to that of control group. This study suggests possible use of *hypericum perforatum* loaded hydrogels for the treatment of diabetic wounds and burns on skin.

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# Preparation of Carbazole-BODIPY Photosensitizers for Targeted PDT

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Photodynamic therapy (PDT) is an invasive cancer treatment strategy via generating reactive oxygen species.[1] Light with an appropriate wavelength, photosensitizer and singlet oxygen are the three key fragments of PDT. So far, many compounds as photosensitizer have been studied for the treatment of cancer and their singlet oxygen generation capacities have been investigated. Photosensitizers used in PDT expected to have some properties like low dark toxicity even in high concentrations, absorbing either IR or near-IR region, high molar absorption coefficient, ease to synthesize, easily eliminated from the body etc.[2] Thus, designing a convenient photosensitizer for using in PDT is very crucial.

In this study, we aimed to synthesize, characterize, and investigate the photophysical properties of the Carbazole-BODIPY based triplet photosensitizer bearing targeting unit for PDT. Targeting unit was attached to the carbazole-BODIPY derivative via click reaction. The chemical structures of new Carbazole-BODIPY derivatives were characterized using matrix-assisted laser desorption/ionization time-of-flight mass, $^{1}H$, and $^{13}C$ NMR techniques. The photophysical properties of this novel photosensitizer were investigated via UV-Vis absorption and fluorescence emission spectroscopy. Our results showed that iodine substituted distyryl-carbazole-BODIPY derivative could produce singlet oxygen and it was a potential candidate for in vitro application for PDT.

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# BODIPY-Fullerene Photosensitizers for Targeted PDT

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Among phototheranostics, photodynamic therapy (PDT) is a non-invasive, valid, economical and controllable method that hold many advantages over the conventional methods such as surgery, chemotherapy and radiotherapy for the treatment of various non malignancies and malignancies. [1,2] In PDT, the photosensitizer (PS) can activate upon light irradiation and transfer the triplet state energy to endogenous oxygen for the production of ROS is the key constituent. This phenomenon can achieve irreversible damage of cancer cells without significant side-effects.

In this study, four new heavy atom free glucose-BODIPY-fullerene dyads with amphiphilic structure carrying carbohydrate units as targeting agent and can form nanomicelles with Tween 80 are reported. Glucose-BODIPY-fullerene systems and related nanomicelles have been prepared for efficient singlet oxygen generation upon red light irradiation. *In vitro* anti-tumor effects of the platforms in the presence of light and in darkness have been investigated with K562 human chronic myelogenous leukemia suspension cells. Anti-tumor toxicity upon light irradiation formed singlet oxygen and reactive oxygen species. This study provided an adept application of PDT using nanovehicles fabricated with BODIPY dyes as light harvesting unit and universal spin converter, fullerene, to fight cancer.[3]

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# Newly Synthesized Fluorescent Metal Organic Framework (UiO66-Nap): A Novel Platform for *Candida rugosa* Lipase Immobilization

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Metal-organic frameworks (MOFs) are porous coordination polymers composed of organic ligands and metal nodes. MOFs are used for a variety of applications such as catalysis, electrocatalysis, gas storage and separation, drug delivery, biochemical analysis, and enzyme immobilization, due to their unique properties such as excellent chemical-thermal stability, large surface area, and tunable pore structure.[1,2] Among MOFs, the luminescent MOFs (LMOFs), as fluorescent sensing materials, are of great interest for the rapid and cost-effective detection of targets with high selectivity and sensitivity.[3] Fluorescent probes have been widely used in recent years to detect target molecules due to their advantages such as high selectivity, sensitivity, low-cost instrumentation, fast data collection, and relatively simple handling. Among fluorescence receptors, 1,8-naphthalimide is a favorite fluorophore for fluorescent sensors due to its high quantum efficiency, good photostability, strong fluorescence, and easy modification.[4,5]

Lipase, one of the important industrial biocatalysts, is used to catalyze many significant reactions such as hydrolysis, esterification, transesterification, alcoholysis, and acidolysis.[6] Although free lipases are used in industry, their use is limited due to their poor stability and deterioration of their conformational structure under conditions such as high temperatures. Especially in recent years, the catalytic activity of the enzyme is preserved by immobilizing lipases to materials such as MOF and these disadvantages of the enzyme are eliminated.

In this study, 4-sulfo-1,8-naphthalic anhydride potassium salt was converted to the naphthylimide derivative (Nap-I) by interaction with 3-amino-1-propanol and chlorosulfonyl isocyanate, respectively. Then, the fluorescent material UiO66-Nap was obtained by attaching Nap-I to UiO66-$NH_2$, which is formed by the reaction between 2-aminoterephthalic acid and $ZrCl_4$. The structures of obtained materials were confirmed by spectroscopic techniques such as FT-IR, $^1$H NMR, SEM, and PXRD. The UiO66-Nap which is a fluorescent MOF material was interacted with *Candida rugosa lipase* (CRL) in order to immobilize CRL to UiO66-Nap. Immobilization parameters such as pH, thermal stability and reusability of UiO66-Nap@CRL obtained by immobilization of CRL to UiO66-Nap were investigated.

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# Nucleic Acid Based SARS CoV-2 Detection by Lateral Flow Test

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The Coronavirus disease 2019 (COVID-19) pandemic continues to spread across the world. Thus, there is an urgent need for rapid, simple and accurate tests to diagnose severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection.[1] The mostly used and reliable method is the RT PCR recommended by the WHO. Since the N gene region is the most conserved and specific, it is important molecular diagnosis. Compared to the RT PCR method, rapid diagnostic kits have been used as an alternative method because they are easy to use and the short time to get results. [2] For this purpose, our study aimed to determine one region of N gene specific to SARS-CoV-2 with the Lateral Flow Test (LFT) platform. The LFT platform is designed on the basis of hybridization with sandwich model based on Gold nanoparticles (AuNPs). The designed LFT was especially designed for the conserved region of the N gene. AuNPs were conjugated with oligonucleotides complementary to the N gene. Sequences to hybridize to this conjugation product were plotted as test line on the nitrocellulose membrane. The sample containing the target sequence hybridizes with the sequences in the test and control line according to the principle of capillary flow when applied to the sample pad. A red color formation from of AuNPs can be seen by naked eye. According to the research findings designed LFT recognized the SARS-CoV-2 N gene region specifically and turned out to be an alternative to molecular diagnosis.

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# Investigation of Simultaneous Melatonin and Serotonin Selective Properties of Screen Printed Carbon Electrode Modified with Floruene-Based Poliimid in Electrochemical Sensor Application

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Melatonin and Serotonin are involved in many biological and physiological processes in our body. In addition to its effects on circadian rhythm and endocrine, various studies have shown that melatonin has an antioxidant effect in living organisms and in the laboratory environment. In addition, various studies have shown that it has an antioxidant effect in living organisms and in the laboratory environment.[1] Melatonin regulates body homeostasis by protecting the body against oxidative stress. For this reason, it is being researched with increasing interest all over the world. Serotonin is the most studied neurotransmitter. Serotonin is a key mediator for mood physiology, vascular function, and gastrointestinal digestive disorders. In fact, serotonin levels in blood, serum and plasma can be used as a biochemical marker for depression.[2] Melatonin usually occurs in the presence of serotonin. Therefore, simultaneous determination of both molecules is extremely important for understanding biological systems.[3]

In this study, polyimide films were synthesized from 2,7-Diamino fluorene, promellitic dianhydride used to modification screen-printed carbon electrode (cspe) to elimination of the interferant species for simultaneous determination of melatonin and serotonin. Prepared composite membranes as melatonin and serotonin selective film were characterized by FTIR, DSC, DTA, TGA and SEM techniques Furthermore, melatonin and serotonin selectivity properties of polyimide membrane based electrodes was examined by differential pulse voltammetry (DPV) technique. The voltametric results indicate that the polyimide membrane based electrodes can be used as a sensor for determination of melatonin and serotonin with the good sensitivity, selectivity, rapidly and very high R-Value (Mel:0,9800-Ser:0,9687).

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# Interference with the Structure and Dynamics of Type 4 Pilins (T4P)

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Targeting bacterial virulence is a promising approach for antimicrobial therapy in the fight with increasing resistance to available antibiotics and reduced rate in new antibiotic discovery. Anti-virulence therapy aims to block pathogenesis based on only virulence-associated features rather than killing the pathogens.

In this project, the focus is on the important virulence factor, type 4 pili (T4P), of *P. aeruginosa* and *N. meningitidis*, microorganisms which are in the World Health Organization's list of antimicrobial-resistant pathogenic bacteria, for which novel antimicrobial strategies should urgently be developed.[1] To this end, the pilins PilE of *N. meningitidis* and PilA of *P. aeruginosa*, were targeted to interfere with the assembly of T4P in these two bacteria to prevent infection. The structures of PilE of *N. meningitidis* and PilA of *P. aeruginosa* are available in PDB Using these structures, CavityPlus, PockDrug and DogsiteScorer were used to identify a potential binding pocket. Common druggable binding sites determined by these three tools, were confirmed by DynOmics. Then, ZINC database was used as the drug database for virtual library screening to determine natural products that could inhibit T4P. Two ligands with favorable binding energies were selected as promising molecules for novel therapeutical applications in combination with existing drugs or other virulence factor inhibitors and their binding stabilities with PilA and PilE were evaluated via 30ns molecular dynamic simulations. Unfortunately, the selected ligands moved away from binding pockets during the simulations. Therefore, the selection of the binding pockets was re-evaluated and based on the information which stated that calcium binding enhances T4P stability, further work was carried out to identify and target possible calcium binding sites on the pilins to interfere with the assembly of T4P.

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# Preparation of Novel Cyclotriphosphazene Derivatives for Biological Applications

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Many biochemical, physiological and behavioral processes in organisms are controlled in 24-hour period manner (called circadian rhythm) by circadian clock. Circadian rhythms that play important roles in mammalian physiology, regulate wide range of biological processes covering 20-40 % of all events in the body, including the cycles such as in activity/resting, hunger, body temperature, hormone and metabolite levels.[1] In addition, the pathways in which circadian genes are highly associated with diseases and targeted by many of the currently used drugs and/or biologically active molecules interact with the circadian clock.[2] For this reason, it is very important to determine the effects of drug candidate molecules on the biological clock.

Cyclotriphosphazenes, a class of compounds famous for their many successful biological applications (anti-cancer, ability to bind to DNA, etc.), are inorganic ring systems formed by the consecutive bonding of phosphorus and nitrogen atoms.[3] In our study, we focused on determining the biological activities of cyclotriphosphazene-based compounds and their effects on circadian rhythm. In this context, the cyclotriphosphazene ring was chosen as the main core because of its biocompatible, stable and carrier/directing nature. First, starting compound with hydrophilic character was prepared by functionalization of hexachlorocyclotriphosphazene with triethyleneglycol chains. Due to their pharmaceutical advantages, morpholine derivatives were identified as subunits to be substituted into the parent skeleton. The chemical structures of new cyclotriphosphazene derivatives were characterized using matrix-assisted laser desorption/ionization time-of-flight mass, $^{1}H$, $^{13}C$ and $^{31}P$ NMR techniques. Within the ongoing project, effects of the compounds on cell survival, cell population doubling period, contribution to apoptotic cell death and the effects on circadian clock are evaluated.

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# Advantages of the Microwave Method Used to Obtain Essential Oils

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Essential oils isolated from aromatic plants and having a very different aroma are secondary metabolites commonly found in the stem, leaves, flowers, fruits and some other parts of the plant.[1] Terpenes, which are abundant in essential oils, show very good antioxidant, antibacterial, anti-inflammatory, antiviral and anticancer activities thanks to aromatic and phenolic compounds. It is also known that some enzymes are inhibited by essential oils.[2] Today, many methods such as hydrodistillation (HD), steam distillation (SD), solvent extraction (SE), freeze pressing, solvent-free microwave assisted hydrodistillation (SFM) and supercritical liquid extraction (SFE) are used for the extraction of essential oils.[3] In the SFE method, while solvents are prevented from contaminating the sample,[4] causing the loss of polar components and cell content, not only essential oils but also non-volatile oils are separated and contamination occurs, limiting the usability of the method.[5]

In this study, essential oils were obtained from lavender plant by SFM (solvent-free microwave assisted hydrodistillation) and HD (hydrodistillation) methods. Content analysis and efficiency and radical removal potential of these essential oils were determined. As a result, it has been observed that the SFM method, which has many advantages, can be a suitable method for obtaining essential oil.

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# Novel Schiff Base Metal Complexes as Cholinesterase Inhibitors

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Imines, also called azomethines or Schiff bases, are compounds containing the functional group C=N-, first described by Hugo Schiff in 1864. Schiff bases form an essential class of widely used organic compounds and have several applications in many fields, including analytical, biological, and inorganic chemistry and pharmaceutical targets.[1] Additionally, they have importance in the medical and pharmaceutical fields due to their reported many biological activities, such as analgesic, antibacterial, anticancer, anticonvulsant, antifungal, anti-inflammatory, antiviral, antitubercular, antitumor, antioxidant, antipyretic, antitumor, anti-inflammatory, anthelmintic, antihypertensive, anti-HIV, in vitro cytotoxic, hypnotic and antimicrobial activities.[2] In this work, we reported the design and synthesis of the ligand 5-bromosalicylidene-2-amino-4-chlorophenol and its metal complexes, including Cd(II), Co(II), Cu(II), Fe(II), Hg(II), Mn(II), Ni(II), Pb(II), and Zn(II) in acetate forms at pure EtOH.[3] The newly synthesized complexes were assessed for their inhibitory activities toward cholinesterase enzymes (AChE, acetylcholinesterase and BChE, butyrylcholinesterase).[4] The prepared complexes inhibited the examined enzymes in variable degrees with $IC_{50}$s values: 21.30-30.86 nM for AChE and 52.21-91.46 nM for BChE. Molecular docking studies unveiled the relationship between structural features and inhibitory profiles against the AChE and BChE.

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# New Piperazine Derivatives: Synthesis, Anti-Tyrosinase Activity and Molecular Docking Studies

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Tyrosinase plays a crucial role in melanin biosynthesis since it catalyzes the conversion of mono phenols and/or *o*-diphenols to suitable quinones, which then can be converted to melanins.[1] Melanin, which is biosynthesized by tyrosinase throughout melanogenesis, is the main pigment found in animals' eyes, hair, and skin.[2] Nevertheless, excessive melanin production may cause albinism, skin cancer, irregular hyperpigmentation of the skin, such as melasma, freckles, and senilelentigo, and neurodegeneration, including Parkinson's diseases.[3] As a result, the requirement of designing novel and effective tyrosinase inhibitors is continually increasing. In the present study, a series of new compounds with piperazine skeleton was synthesized and evaluated for their tyrosinase inhibitory potentials. The *in vitro* studies have shown that compounds 10a and 10b bearing 1,2,4, triazole nucleus could be considered potent tyrosinase inhibitors with $IC_{50}$ values of $31.2 \pm 0.7$ and $30.7 \pm 0.2$ µM, respectively. 10b ($K_i$ = 9.54 µM, mixed type inhibition) with the lowest $IC_{50}$ value among derivatives was selected to determine kinetic constants and inhibition types. Additionally, to provide an insight into the inhibition mechanism, molecular docking of newly synthesized compounds was performed at the tyrosinase active site and it was observed that 4b, 5a, 4c, and 10b showed promising inhibitory effect on tyrosinase activity. Based on docking results, ADME predictions and *in vitro* studies, 10b might be considered suitable oral drug candidate for further studies.

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# Immobilization of Microbial Lipase by Conformational Engineering Approach and Investigation of Industrial Potential of Immobilized Enzyme

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Lipases are widely used in industry for the processing of fats and oils, detergents and degreasing formulations, food and beverage processing, synthesis of fine chemicals and pharmaceuticals, paper manufacture and production of cosmetics.[1] Industrial applications require lipases to function at various conditions and therefore development of strategies to improve lipase stability, activity, selectivity is a current research area. To improve lipase catalytic function there are various methods including protein engineering, enzyme immobilization and optimization of reaction conditions.[2,3] In this study immobilization of microbial lipase with its active open conformation was intented. Activation of enzyme during immobilization was accomplished by using interfacial activation mechanism of lipases. Enzyme immobilization was carried out on PVA (poly vinyl alcohol)/silica composite material. Silica source used for composite preparation, enzyme source used for immobilization, the type and amount of crosslinking agent and crosslinking time were determined for optimization of immobilization process. To simulate the medium that leads to lipase conformational change, support surface modulated with aminoacids. Different aminoacids were used for revealing their effect on conformational modulation of lipase. Hydrolytic activities were measured during optimization studies of immobilization. Immobilized enzymes were also used for ester production to evaluate their industrial potential.

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# Determination of Phenolic Compounds in Avocado (*Persea americana*) and Their Antioxidant Effects on DNA Oxidation System

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*Persea americana* (commonly known as avocado, avocado pear, or alligator pear) is native to Mexico and Central America, and a member of the flowering plant family *Lauraceae*. Botanically, avocado fruit is a berry with a single large seed. Avocado fruit is also rich in biochemical content which are potential to use in cosmetics, pharmaceutical and food industries.[1] This fruit contains natural antioxidants such as carotenoids and polyphenols. Avocado fruit is one of few foods containing high levels of antioxidant vitamins (vitamin C and vitamin E). Other pigment bioactive compounds such as chlorophylls and anthocyanins also present in avocado fruits.[2] Recently, the studies of avocado to apply them in functional food or food ingredients have got much attention by many researchers. The aim of this study was to determine antioxidant phenolic compounds in avocado and its antioxidant effect on DNA oxidation system.

Extraction of avocado fruit with methanol-water solvent was carried out. Total phenolic content obtained extract was determined by Folin-Ciocalteu method, total lipid peroxidation was determined by TBARS method and total antioxidant capacity was determined by FRAP method. The phenolic content contained in the extract were quantitatively determined by HPLC-DAD. The damage to DNA bases by Fenton reaction and the amount of the extract to prevent this damage were determined by quantitative analysis of DNA base damage products by GC-MS/MS.[3] It was determined that the oxidative damage in DNA was reduced with the addition of the extract succesfully.

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# Development of an Electrochemical Labelled Aptasensor for Determination of Organophosphorous Pesticide Chlorpyrifos

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Pesticides are substances used to prevent, control, or reduce harmful organisms. They are used to increase yield and quality, especially in agricultural warfare by protecting plants from the negative effects of diseases, insects, and weeds. The excessive use of pesticides, which are used to provide high efficiency in existing agricultural areas, has negative effects on human health and the environment. In recent years, the uncontrolled use of pesticides in wastewater, soil, fruits, and vegetables threatens human health significantly. While long-term use of pesticides causes serious health problems such as cancer, mutations, and congenital malformations, it has been reported that food allergies arising from pesticide residues also cause migraine, asthma, and eczema.[1-3]

In this study, a novel electrochemical aptasensor was designed for the sensitive and specific detection of Chlorpyrifos (Ch) in tomato, broccoli, and wastewater samples. First, a graphene oxide doped poly (3-amino-1,3,4-triazole-5-thiol)-gold nanoparticle composite was synthesized and characterized by various techniques. The obtained composite was fabricated on a screen-printed graphite electrode surface, providing a favorable platform for aptamer immobilization and current signal amplification. The Ch aptamer was grafted to the modified electrode through the formation of Au–S bonds. The immobilized STR aptamer binds specifically Ch, resulting in an obvious decrease in the current signal. Under the optimal experimental conditions, the linear range of the electrochemical aptasensor for Ch detection was 0.001–5.0 nM and the detection limit (LOD) was calculated as 0.33 pM. This strategy is expected to be a novel platform for the rapid and sensitive detection of Ch.

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# Marine Antifouling Properties of Enzyme Modified Polyaniline Coated Stainless Steel Surface

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Materials surfaces and interfaces are always prone to the absorption of molecules, proteins, cells and organisms depending on the diverse application contexts[1]. Marine biofouling can be defined as the undesirable accumulation of microorganisms, algae and animals on structures submerged in seawater[2]. Marine biofouling is a global problem for the shipping industry and marine activities. The damage caused by the biofouling incident was seen 2000 years ago and the struggle to prevent the process started. In ancient times, natural products such as wax, paraffin, pitch, tar and asphalt were used to prevent damage. Enzymes can be used as antifouling agents by a diversity of mechanisms. They can degrade the fouling organism, its adhesive, or produce other biocidal compounds[2]. Antifouling properties of several enzymes such as amylase, protease, glucose oxidase, esterase, cellulose, collagenase, lipase *etc.* were studied in the literature. In this study, it was aimed to investigate of the antifouling properties on enzyme containing polyaniline (PANI) film on stainless Stel (SS 304) in the Mediterranean Sea. To this, SS coupons with dimension of 40x9 mm were coated by PANI film by electropolymerization via CHI660B model digitally controlled electrochemical analyzer using a single-cell three-electrode cyclic voltammetry method in amonium oxalate solution. PANI film was synthesized by adding α-amylase, lipase, chymotrypsin, pectinase, DNAase, glucose oxidase to the synthesis medium, while enzymes were immobilized by entrapment in the polymer matrix. The coupons were placed on a line at regular intervals and placed in a cage and kept in the sea in the Mediterranean (Mersin) for 10 days. The amount of biofilm accumulated on the surfaces of coupons extracted from the sea was determined spectrophotometrically with crystal violet dye.

When the amount of biofilm in the bare SS coupon was accepted as 100%, the amount of biofilm on the PANI coated surface was determined as 68.8%. In addition, biofilm amounts for PANI film containing α-amylase, lipase, chymotrypsin, pectinase, DNAase and glucose oxidase were determined as 48.1%, 38.9%, 51.8%, 56.7%, 59.1% and 64.9%, respectively, compared to the bare coupon. Fluorescence microscope was used after staining with 4',6-Diamidino-2-Phenilindole (DAPI) to visualize microorganisms on the surface of the coated coupons. Coupon surfaces with and without biofilm were also compared by SEM and EDX analysis.

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# Thermal and Viscoelastic Peculiarities of Poly(maleic anhydride-*alt*-vinyl acetate)/Clay Nanoarchitectures

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Polymer/clay nanocomposites have attracted intense research interest in the unique physical and chemical properties resulting from the combined use of organic and inorganic materials in one compound. Nanocomposites have become an attractive class of hybrid materials due to their prospective use in a great variety of applications from industry to health.[1] Poly(maleic anhydride-*alt*-vinyl acetate) [Poly(MA-*alt*-VA)] was synthesized *via* charge transfer complex-radical polymerization as potential dental fillings, adhesives, or bone cement materials. An eco-friendly composite based on natural halloysite nanotube (HNT) enables the design of smart composite materials synergistically for the controlled release of drugs.[2]

Comparative analysis of structure–composition–property relationship of the Poly(MA-*alt*-VA) and its halloysite nanocomposites with varying amount of HNT; exhibited significant increase of the thermal stability of nanocomposites analyzed by Differential Scanning Calorimetry (DSC) and Thermogravimetric Analysis (TGA). All the nanocomposites exhibited improved thermal stability compared to the copolymer. Viscoelastic properties were analyzed by Dynamic Mechanical Analyzer (DMA). The results obtained from the study suggest that these nanocomposites with anhydride functional groups prepared by *in situ* copolymerization on the surface of the nanotubes may be promising as novel potential dental materials.[3]

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# Determination of ATP, ADP and AMP Concentrations with High Performance Liquid Chromatography

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ATP is a universal energy carrier that drives virtually all cellular processes required for life. Several methods have been developed to analyze the levels of ATP in biological materials[1]. In developed or modified methods, researchers pay attention to performing a method that is faster, more reliable, and cheaper. Therefore, the aim of present study is to develop a simple, fast, and accurate based on High-Performance Liquid Chromatography (HPLC) method for the detection and quantification of Adenosine triphosphate (ATP), Adenosine diphosphate (ADP), and adenosine monophosphate (AMP).

The analysis was carried out with HPLC Shimadzu LC-20-AD (Kyoto, Japan). Chromatographic separation was performed on an Inertsil ODS-3V (5µm; 4.6 x 250 mm reverse-phase column) column with an isocratic mobile phase (160 mM KH2PO4:100 mM KCl; pH: 6.5) at a flow rate of 1 mL/min. ATP, ADP, and AMP were measured by UV/VIS, SPD-20A detector at 254 nm wavelength. The autosampler temperature was $4^0$C. The injection volume was 20 µl. The total analysis time was determined as 22 minutes. ATP, ADP, and AMP standards are prepared with solving in ultra-distilled water. ATP, ADP, and AMP peaks were identified according to the corresponding retention times. Concentrations of ATP, ADP, and AMP were calculated and expressed as µM.

Standards were prepared at concentrations of 1, 5, 10, 15, 20, 30, 50, and 60 µM. The method was linear between the concentrations of 1-60 µM. The retention time of ATP; ADP; and AMP was respectively 9,954; 11,298; and 16,709 minutes. According to the standard curve, the value of $r^2$ was 0.999. We think that this practical, simple and reliable method can be used in routine analyzes for the measurement of ATP, ADP, and AMP concentrations.

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# Production of High Quality Biodiesel from Sunflower Acid Oil Obtained by Acidulation of Soap Stock from the Refining Process: Immobilized Pancreatic Lipase for Biodiesel Production

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By-products from the vegetable oil refining industry such as soap stock, acid oil, and fatty acid distillates are suitable for biodiesel production[1, 2, 3]. This study was aimed at the continuous production of high quality biodiesel fuel, which fully satisfies international specifications, from waste acid oil with free fatty acids (FFA) content of >95 wt%. The waste sunflower acid oil was kindly donated by an oil factory in the Thrace region. The acid oil was obtained by liberated by acidulation of soap stock from the refining process applied to edible sunflower oil. The main component of the oil is FFA (>95 wt%), with triglycerides constituting the remainder. Transesterification reaction was performed by immobilized pancreatic lipase. For this, the immobilization by covalent binding of pancreatic lipase in glutaraldehyde activated chitosan was optimized. The amount of immobilized enzyme and the retained activity were found to be 35.69 U/$\mu g$ and 61.8%, respectively, at pH 7.5, and at 37°C. the apparent $K_m$ (5.1 mmol/l), and $V_{max}$ (486 U/mg) values of the immobilized lipase were significantly changed compared to the free lipase. Developed enzyme was then subjected for transesterification of sunflower acid oil to produce biodiesel. A very remarkable better yield of 75.6% was achieved at 1:5 oil/methanol molar ratio after 36 h at 45°C reaction temperature. The fuel characteristics of the produced biodiesel comply with en 14214 and ASTM D6751 standards.

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# Juglone-Selenium Combination Inhibits Epthelial-Mesenchymal Transition, the Critical Step of Metastasis, in Pancreatic Cells

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Chemotherapy is still the most common and primary treatment option in the treatment of pancreatic cancers, because of the fact that metastasis has already occurred at the time of diagnosis, difficulties of the operation due to its location, and the lack of targeted treatment approaches. Moreover, high chemoteuropatic resistance seen in pancreatic cancer makes researches for alternative drug treatments mandatory. Juglone, a natural naphthaquinone found in members of the Juglandaceae family, has various pharmacological effects such as antiviral and antibacterial. It has also been shown to be an effective cytotoxic agent through the production of reactive oxygen species, in studies with cancer cell lines. Juglone's antimetastatic effect on pancreatic cancer cells has been firstly showed in our previous studies. Remarkably, selenium, an important trace element of the cell, was shown that it can lead to inhibit metastasis, strengthens cell-cell attachments and reduction in angiogenesis. We showed that juglone-selenium (J/S) combination has an antimetastatic effect on pancreatic cancer cells by invasion - adhesion assays, qPCR and immunohystochemical analysis of expressions of target genes, involved in cell junctions and matrix organization, previously. In this study, to extend our previous study findings, we investigated the effects of J/S combination on epithelial-mesenchymal transition (EMT) and migration in PANC-1 and BxPC-3 cells. The target genes were; *FOXL1* gene, thought to play a critical role in EMT process which is the important step of the invasion and metastasis stages, and the *Vimentin* (*VIM*) gene, a mesenchymal cell marker. Also, the effects of J/S on migration feature of cancer cells were monitored by wound healing tests. According to our gene expression results, *FOXL1* gene expression decreased significantly at all doses in both cell lines, and *Vimentin* showed a dramatic decrease at all doses in BxPC-3 cells. Additionally, wound healing tests showed that the effects of J/S applications on the migration capacity of both cell lines were significantly reduced dose dependently. This study suggests that the combination of J/S may suppress metastasis by inhibiting EMT besides supporting the results of our previous study on the antimetastatic effect of J/S in pancreatic cancer cells.

# Impidimetric Response of GDF-15 Immunobiosensor Designed on Some Gold Electrodes

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Growth differentiation factor 15 (GDF-15) is a stress responsive member of transforming growing factor-β (TGF-β) cytokine superfamily which is expressed and secreted in conditions such as inflammation, oxidative stress, hypoxia, telomere erosion, and oncogene activation.[1,2] Circulating GDF-15 is known as the potential inflammation biomarker of cardiovascular diseases[3], chronic kidney disease[2], aging[4], mitochondrial disorders as well as some tumors[5]. Also, GDF-15 is elevated in the majority of patients hospitalized with COVID-19.[6]

The development of reliable biosensing platforms plays a key role in the protein determinations in clinically analyses and biotechnological productions. During electrode production or modification, any change on the surface of the electrode will affect its physical and chemical properties. When the electrode stability is ensured by production or modification, the biosensor responses will be more stable, reproducible and sensitive to detect even low concentrations.[7]

The aim of this study is to show the difference among biosensor responses of the same type of screen-printed gold electrodes (SPGEs) produced in different batches (SGE) with a known immobilization method[8].GDF-15 biosensors was designed on surface of various SPGEs with the same brand, which produced in different batches. In addition to SPGEs, the biosensor design with same method was performed on surface of solid gold electrode (SGE). For the design of all GDF-15 biosensor, 1000 ng/mL of Anti-GDF-15 was immobilized onto surface of gold electrodes by using 12-Mercaptododecanoic acid, EDC/NHS couple. Biosensor responses were determined by using 250 pg/mL aliquots of GDF-15. All immobilization steps were characterized by using electrochemical impedance spectroscopy.

It has been seen that even small physical or chemical changes that may occur on the surface during electrode production are reflected as difference in biosensor responses and negatively affect its reproducibility.

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# Determination of essential oil and aroma content of *Satureja hortensis* species and investigation of biological activity

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Medicinal and aromatic plants are at the forefront of product groups that are increasing their importance and popularity in the world. These plants have been widely used in many industrial areas, especially in the pharmaceutical, food, cosmetics and perfume industries.[1] *Satureja* genus is a member of the Ballıbabagiller (Lamiaceae) family and is collected around 700-800 tons for commercial purposes every year in Turkiye. The genus *Satureja*, which has an important place among thyme species and is mostly traded in the Aegean and Mediterranean Regions, is represented by 15 species, 5 of which are endemic.[2]

In this study, essential oil of *S. hortensis* species were prepared, essential oil and aroma content were examined, antioxidant, cytotoxic and enzyme activities were investigated. The essential oil and aroma content of *S. hortensis* were determined by GC-MS/FID device. The antioxidant activity of the species was determined by DPPH free radical scavenging method, ABTS cation radical scavenging activity method and CUPRAC method. The acetyl- and butyrylcholinesterase inhibitory activity of the species was determined using the Ellman method. Toxic and cytotoxic effects of the prepared extracts were determined by MTT method. The major components of the essential oil of the species are carvacrol (61.90%), *o*-cymene (14.82%) and *γ*-terpinene, while the major components of the aroma content are thymol (41.94%), *γ*-terpinene (21.20%) and *o*-cemene (15.68%) was found. The species did not have DPPH free radical scavenging activity, and cation radical scavenging activity was calculated according to ABTS method ($IC_{50}$: 3.18±0.01) and ($A_{0.5}$: 20.39±0.02 µg/mL) CUPRAC method. The acetylcholinesterase enzyme inhibition activity and butyrylcholinesterase enzyme inhibition activity of the species were detected as (%inhibition: 8.12±7.72), (%inhibition: 58.50±0.73), respectively. There was no antityrosinase enzyme inhibition activity, and the antiurease enzyme inhibition activity (%inhibition: 29.05±1.23) was found to be moderate level.

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# Potentiometric Determination of Antioxidant Activities of Two Edible Wild Mushrooms

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The methanolic extracts of dried *Lactarius volemus* and *Sarcodon imbricatum* were analyzed for antioxidant activity in different systems including reducing power, superoxide anion radical, total antioxidant activity, scavenging free radical scavenging and metal chelating activities. Those various antioxidant activities were compared to standard antioxidants such as butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), and a-tocopherol. The percentage inhibition methanolic extracts of dried *Lactarius volemus* and *Sarcodon imbricatum* at 100 mg/mL concentrations on peroxidation in linoleic acid system were 99.6%, 98.8%, respectively, and greater than those 400 mg/mL of a-tocopherol, BHA and BHT (77%, and 97%).

# Curcumin Alleviates Oxidative Stress and Restores Liver and Pulmonary Damage Induced by Polymicrobial Sepsis in Mice

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Sepsis continues to be a major health problem worldwide and is associated with high mortality rates. It is a systemic inflammatory response that follows bacterial infection. Our understanding of sepsis is still incomplete, and specific treatment is lacking. Thus, we investigated the role of oxidative stress and the effect of curcumin on oxidative stress, and pulmonary and liver damage induced by sepsis using a polymicrobial rodent model that mimics human sepsis. Polymicrobial sepsis was induced by cecal ligation and puncture (CLP) in mice, and curcumin (100 $mg.kg^{-1}$) was administered intraperitoneally 30 minutes and 4 hours after the induction of sepsis. The animals were sacrificed twenty-four hours after sepsis, and the lungs and livers were collected for histopathological analysis and evaluation of biochemical markers of oxidative stress [malondialdehyde (MDA) and catalase (CAT)].

Our results revealed that sepsis induced oxidative stress with an increase in pro-oxidant markers (32.9% in the liver and 53.8% in lung MDA) and a decrease in antioxidant markers (26.2% in the liver and 34.7% in lung CAT). This oxidative stress was associated with pulmonary and liver histological damage and leukocyte infiltration.

Curcumin reduced hepatic and pulmonary oxidative stress induced by sepsis, with a decrease in pro-oxidant markers (MDA) and antioxidant restoration (CAT) in parallel to the restoration of liver and lung integrity.

Our results suggest an involvement of oxidative stress in the pathogenesis of sepsis and propose curcumin as a potential antioxidant drug for the treatment of liver and lung dysfunction induced by sepsis.

# Green Synthesis of Silver Nanoparticles Using *Ocimum basilicum* L. and Investigation of Their Antimicrobial and Antioxidant Activity

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In this study, it was aimed to produce and characterize silver nanoparticles (AgNP) by green synthesis method using *Ocimum basilicum* L. plant extract, also known as purple basil, and to compare the antimicrobial and antioxidant activities of nanoparticles produced with plant extract. Characterization of AgNPs was determined by Scanning Electron Microscopy (SEM). Antimicrobial activity studies of AgNPs and plant extracts were performed using agar disc diffusion and minimum inhibitory concentration method, with a total of 7 different bacteria and 1 yeast including *Staphylococcus haemolyticus* ATCC 43252, *Acinetobacter baumanii* ATCC 19606, *Staphylococcus aureus* ATCC 6538P, *Escherichia coli* NRRL B-3704, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 27853, *Proteus vulgaris* ATCC 13315 and *Candida albicans* ATCC 10231. Antioxidant activities were determined by 2,2-diphenyl-1-picrylhydrazil (DPPH) free radical scavenging and 2,2'-Azino-bis (3-ethylbenzothiazolin-6-sulfonic acid) ($ABTS^{\bullet+}$) Cation Removal Activity. Based on our results, we conclude that for 3000 ppm concentrations, the highest inhibition zone diameter and MIC values obtained from the plant extract are 11,00 mm and 500 µg $mL^{-1}$, respectively, and the highest inhibition zone diameter and MIC values obtained from AgNP are 12,00 mm and 250 µg $mL^{-1}$ respectively. The highest inhibition zone diameter for plant extract was obtained from *P. aeruginosa* ATCC 27853 strain, while the highest inhibition zone diameter for AgNP was obtained from *C. albicans* ATCC 10231 yeast strain. In DPPH free radical scavenging activity, the maximum inhibition values at 200 µg $mL^{-1}$, which is the highest concentration of the extract and nanoparticle, were 56,31%±0,73% and 30,71%±1,35%, respectively and the maximum inhibition values for ABTS cation radical scavenging activity at 200 µg $mL^{-1}$, which is the highest concentration of the extract and nanoparticle, were determined to be 55,87±1,38% and 39,56%±1,47%, respectively. Our results reveal that biologically synthesized AgNPs exhibited multifunctional properties and could be used as antimicrobial and antioxidant agents.

# Enhanced Axonal Guidance of DRG Sensory Neurons on Gold Nanorod Modified, Conductive Micro/Nano-channeled PCL/PLGA Scaffolds

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Neural damages have significant effects on the quality of life, social and economic conditions of the patients as very common clinical problems in society. In the field of neural tissue engineering, intensive work is being done to develop alternative nerve guidance channels with the new techniques offered by nanotechnology.[1] Polycaprolactone (PCL) and poly-lactic-glycolic acid (PLGA) are highly biocompatible, biodegradable and FDA-approved biopolymers, and they have been frequently preferred in the field of tissue engineering due to their superior mechanical properties. Gold nanorods (AuNRs) have been investigated for a wide spectrum of biomedical applications, due to their unique chemical, optical and physical properties.[2] The aim of this study was the development of conductive and micro/nano-channeled PCL/PLGA film scaffolds and investigation of the behaviors of DRG (dorsal root ganglion) sensory neurons cultured on the designed scaffolds.

In this study, cetyltrimethylammonium bromide (CTAB) stabilized AuNRs were synthesized and their surfaces were modified with polyethyleneimine (PEI-SH). PCL/PLGA films (10:1 ratio) with three different channel widths (500 nm, 1µm and 5µm) were produced using silicon wafer molds which were prepared by e-beam lithography technique. Conductivity was provided by two different approaches: firstly, 200 µL of AuNRs/PEI stock solution was directly added to scaffolds. Secondly, an electrical field (1, 3, 5 V) was applied to scaffolds and 200 µL AuNRs/PEI were added. Also, polypyrrole (PPy, 1% v/v) and Au-sputter coating was applied on the films as alternative surface conductivity designs. DRG neurons were cultured on the smooth (S) and micro/nano-grooved (G) scaffolds for 3 days in static and bioreactor conditions (100 mV/mm).

PCL/PLGA (10:1 ratio) hybrid polymer composition has been shown to increase mechanical strength. It was found that AuNRs/PEI were best aligned when applying 1 V electrical field. The designed biomaterials did not show any toxic effects on the neurons, except for PPy modified scaffolds. PCL/PLGA G1 group promoted axonal guidance optimally, among the different channel widths. Electrical stimulation applied using the bioreactor system significantly increased axonal guidance.

In this study, AuNRs/PEI nanodesigned micro/nano-channeled film scaffolds were developed by applying optimal electrical field conditions. Developed nanodesigned micro/nano-channels acted as conductive hubs to direct the axonal guidance for DRG neurons. The developed biomaterial has the potential to be used as a guidance channel after a nerve injury.

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# CMC (Carboxymethyl Cellulose) – CHI (Chitosan) Based Hydrogel Beads for Removal of Cibacron Red-238 Dye

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With an increasing number of people, the need for the textile industry in the world is becoming apparent day by day. As a consequence, water pollution occurs in the textile industry. Dyestuffs color and pollute receiving waters, streams, and rivers as a result of inadequate treatment of industrial waste by various industrial applications, including food and beverage companies, dye production, textiles, dyeing, and printing.[1] However, due to their complex chemical structure and synthetic origin, the removal of dyes is a rather difficult process. Therefore, advanced technologies and materials are needed to remove pollutants from contaminated waters. Hydrogels have recently attracted attention due to their high adsorption capacity and structural stability, yet several issues remain to be explored, such as the number of reuse and engineering applications.[2]

The aim of this study is to synthesis CMC (carboxymethyl cellulose) and CHI (chitosan) based hydrogel beads for the removal of Cibacron Red-238 dye with focus on hydrogel preparation and properties and adsorption performance and mechanisms.

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# Pectin-Faujasite Based Hydrogels

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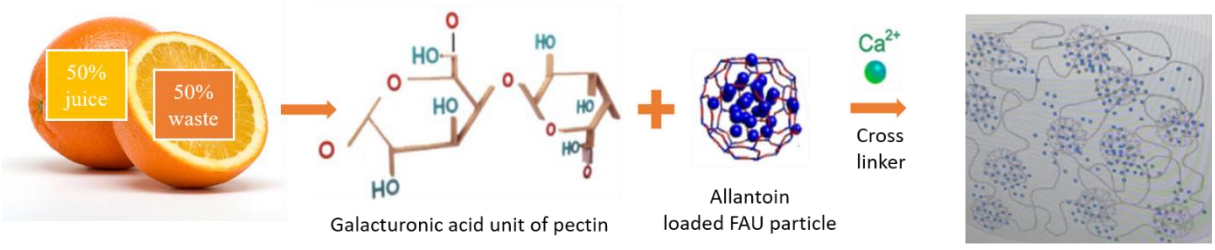
Commercial pectin is mainly extracted from citrus or apple fruits. It is a by or waste product of the fruit juice industry, making pectin easily available and cheap. Recent studies have revealed that, hydrogels are promising candidates as biomaterials. Pectin has a unique gel-forming ability when cross-linked with divalent cations, leading to the three-dimensional 'egg-box shell model,' making it an ideal biomedical field material[1]. This study aims to develop the preparation and characterization of active molecule Allantoin (ALL) loaded pectin-faujasite type zeolite (FAU) based systems. We use FTIR, SEM and UV-vis spectrophotometry. ALL-loaded pectin-FAU hydrogels are prepared in various ALL concentrations (1, 1.5, 3 mg ALL/mg FAU) by cross-linking with $Ca^{2+}$ ions through their $–COO^-$ groups using the ionotropic gelation method to yield a three-dimensional hydrogel structure. FAU particles are used to serve as a membrane core (drug loading entity) which are then surrounded by cross-linked pectin chains as a membrane that is permeable to both ALL and water. The synthesized hydrogels are smooth and transparent. The FTIR results show that the FAU particles are successfully incorporated into the pectin matrix. According to SEM images, all hydrogels have a porous structure. ALL loading efficiency to FAU particles is determined as 1437.10 ± 2.4 mg ALL/g FAU in the case of 3 mg ALL/mg FAU concentration. As a result, a novel and cost-effective hydrogel is developed for biomedical applications.

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# Transcriptomics-Based Drug Repurposing Unravels Novel Therapeutic Strategies in AML

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Acute myeloid leukemia (AML) is a disease of the hematopoietic system in which abnormal cells multiply rapidly, accumulate in the blood and bone marrow, and prevent the production of healthy blood cells. To date, first-line treatment of AML has been based primarily on conventional chemotherapy. Despite progress, the rate of complete remission in AML remains low, especially in older patients, and the relapse rate after complete remission remains high. The combination of clinical and laboratory data has been shown to play an important role in the development of new therapeutic strategies in AML, in addition to features of tumor histopathogenesis and transcriptional regulation.[1] Therefore, we integrated transcriptomics data from relapsed, refractory, and previously untreated AML patients based on their response to therapy using disease-specific signatures with biological and pharmacological data to enable rational identification of the potential of signaling pathways and drugs in AML. Based on the integration of transcriptomics data, we identified eight drug candidates by repurposing and evaluated their potential by in vitro testing in the HL60 and KG -1 cell lines. Six repurposed drugs, including nortriptyline, desipramine, doxepin, estramustine, risedronate, and hydrochlorothiazide, were proposed as potential drug candidates for the treatment of AML. We confirmed possible mechanisms of action of the drugs on cell viability HL -60 and KG -1 by apoptosis assays and Western blotting. Given the beneficial effects of the drugs on the apoptosis pathway, our results are intriguing and suggest that these therapies may prove useful and be potential candidates for the future treatment of AML.

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# Purification of Glutathione Reductase Enzyme from Scorpion Fish *(Scorpaena porcus)* Liver Tissue and Investigation of Some Heavy Metal Inhibition Kinetics

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Antioxidants are the most important weapon of the human body to eliminate the oxidative stress that can be created by free radicals.[1] Glutathione (GSH) is of great importance as an antioxidant molecule in the structural and functional preservation of the integrity of cell, tissue and organ systems.[2] Glutathione metabolism is an important element of the antioxidant defense system. The basic element of the system, reduced glutathione, is a reducing agent against oxidative formations. The glutathione reductase enzyme, which functions in this system, is the key enzyme that plays a role in maintaining the reduced glutathione (GSH)/oxidized glutathione (GSSG) ratio.[3] Scorpion fish *(Scorpaena porcus)* is a powerful antioxidant source in terms of amino acid and fatty acid content, it is a preventive factor in terms of cancer, Alzheimer's, cardiovascular diseases.[4] The importance of the study was demonstrated by the damage caused by heavy metals in nature. In this study, Glutathione reductase enzyme was purified from Scorpion fish *(Scorpaena porcus)* liver tissue. The purification process consisted of three stages; preparation of homogenate, ammonium sulfate precipitation and affinity chromatography. At the end of the steps, the enzyme with a protein specific activity of 10,479 EU/mg was purified 25.96-fold with a yield of 28.277%. The purity of the enzyme was checked by SDS-PAGE method and the inhibition effects of $Ni^{+3}$, $Mn^{+2}$, $Cr^{+}$, and $Cd^{+2}$ heavy metals on glutathione reductase enzyme were investigated. The $IC_{50}$ values of heavy metals were calculated as 135 µM, 2.4 µM, 206 µM and 30 µM, respectively. Optimization results of GR enzyme purified from scorpion liver tissue were found to be pH:6.5, substrate 2 mM NADPH and optimum buffer 300 mM $KH_2PO_4$

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# Antioxidant Activity of Liposomal Formulation of Ethanol and Aqueous Extracts of *Ulva lactuca*

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*Ulva lactuca* (Ulvophyceae; Ulvaceae) is a species of green macroalgae, also known as sea lettuce. It grows in shallow and rocky areas in the sea and its colors can vary from light green to dark green. Studies have shown that *U. lactuca* has antioxidant effects. It has been reported that sulfated polysaccharides, phenolics, terpenoids, lactones, sterols and fatty acids in *U. lactuca*'s composition are responsible for the antioxidant activity.[1] The antioxidant activity of these compounds is mainly attributed to their scavenging activity against superoxide and hydroxyl radicals, their chelating ability, and their ability to extinguish and reduce single and triple oxygen.[2]

We have developed a liposomal formulation of U. lactuca's aqueous and ethanol extract at different temperatures. The advantages of liposome structures are increase the bioavailability and stability of the material to be encapsulated. In this study, our aim was to investigate the antioxidant effects of *U. lactuca* in the liposomal formulation. Therefore, dried *U. lactuca* was extracted with 80% ethanol at 40°C and 60°C and also with water at 60°C. Antioxidant activity of these extracts was determined by DPPH assay. According to the result of DPPH assay, it was found that ethanol extract at 40°C temperature of *U. lactuca* has 53% radical scavenging activity at 400µg/µL concentration.

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# The Selective Transport of Ions and Organic Compounds into the Cells by Positively Charged Channel Forming Polyene Macrolide Antibiotics

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The elucidation of the mechanism selective permeability for ions and organic substrates through cell plasma membranes is a special problem demanding joint efforts of physicists and biologists. A general approach to solution this problem is to investigate of single ionic channel properties and kinetic of multichannel membrane conductivity in bilayer lipid membranes at the presence of channel forming substances a known chemical structure. The polyene antibiotics (amphotericin B, nystatin, mycoheptin, levorin and its derivatives) are a membrane-active compounds with a known chemical structure. The system of conjugated double bounds, hydrophilic chain, amino and carboxyl groups are important elements determining biological activity of polyene antibiotics. The main information about the function of these elements we can to get by studying the properties of a single ionic channels formed by polyene antibiotic molecules and their derivatives in a lipid membrane by voltage clamp technique. The mechanism selectivity and conductivity of ionic channels in the presence of polyene antibiotics is open. We supposed that these properties strongly depend on the structure of polar chain of the lactone ring. The polyene antibiotics is a nature compounds, which in a complex with sterols form structural ionic channels in biological and lipid membranes. The polyene antibiotics have a sensitive only to membranes in which is containing of sterol at definite structure. Thanks to this properties of polyene antibiotics, they have practical application in medical treatment of virological and fungi infections, cancer diseases, prostate adenoma, liver's fat dystrophy and others. The mechanism action of polyene antibiotics is studding on the human, animals, microorganisms and lipid membranes. The main purpose of these investigations is in determination of more efficient antibiotics having the less toxicity for human's organism and high selectivity of action on pathogenic microorganisms. The selectivity action of polyene antibiotics depends of sterol compounds in cell membranes. The polyene antibiotics have a different specific to cholesterol and ergosterol. It's known that cholesterol is containing in host cell membranes, but ergosterol is in fungi cell membranes. The polyene antibiotics are more sensitive to ergosterol-containing membranes, that to cholesterol-containing ones. At present time we have data that alkylation at polar part of polyene molecule lead to increasing of biological activity and selectivity of their action on phatogenic microorganisms. The finding of a new and efficient polyene antibiotics is urgently needed to medicine to treat many diseases, including tumors and AIDS. There is theoretically possible to get a new and very promising approach to the anticancer, antiviral (including AIDS) and genetic diseases therapy by been using a membrane-active positively charged molecules of polyene macrolide antibiotics.

# Effect of the Molecular Weight of Diols on Waterborne Dextran-Based Polyurethane Biomaterial

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Water-based polyurethane structures are a polymeric material that have versatile and environmentally friendly with different mechanical properties. Rapid implementation, suitable viscosity, flexibility, inflammability, highadhesion, biodegradability non-toxicity and rheological properties increase its applicability in biomedical field. Until today, studies with semi-synthetic waterborne polyurethane structures including different architectural designs based on natural monomers as biomaterial have been limited.[1] Moreover, the development of semi-synthetic biomaterials with appropriate degradation using natural resources is very important. The study carried out in line with this information; It includes the development of semi-synthetic water-based polyurethane biomaterials from natural dextran-monomer and diols with different molecular weights and examining the effect of the molecular weight of diols on these polymeric structures.

In this study, we designed a novel waterborne polyurethanes that reacted with isophorone diisocyanate, different molecular weight polyethylene glycols (PEG200, PEG400, PEG1000, PEG2000) dextran (Mw:100000 g/mol). The waterborne polyurethane products were reacted with diisocyanate, PEG, dextran and 2,2-bis(hydroxymethyl) propionic acid (DMPA), as potential ionic center for water dispersibility, and mixed with ethylene diamine (EDA) as extender chain to prepare polyurethane dispersions (WPU_IPDI_PEG$_{MW}$_D). The structure of final products was examined with infrared spectroscopy (FTIR). Considering the results, the thermal behavior of the synthesized WPU_IPDI_PEG400_Ds were investigated sensitively by thermogravimetric analysis (TGA), differential thermal analysis (DTA). Its biodegradability properties were assessed with in the condition of physiological pH. At the end of 3 weeks, the biodegradability of the polymer was identified at range of 7.84 ± 1.34%-82.51 ± 1.00%. We observed that water-based polyurethane materials containing dextran and PEG400 could be a novel biomaterial candidate for medical applications.

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# Metal Complexes of Novel Schiff Base: Evaluation of the Cholinesterase Inhibitory Activities

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Schiff bases are commonly known to be used in the synthesis of many drugs. These compounds have a wide range of biological activities and are a class of highly used ligands. The biological activity of these types of ligands increases upon complexation with transition metal ions. All possible applications of these bases are made possible by the bases' adaptable synthesis pathway, coordination ability to metal centers, structure, and presence of an imine functional group.[1] Herein we report on a new metal complex series, including Cd(II), Co(II), Cu(II), Fe(II), Hg(II), Mn(II), Ni(II), Pb(II), and Zn(II) of 2-amino-4-chlorophenol ligand investigated as inhibitors of the cholinesterase enzymes (AChE, EC.3.1.1.7, acetylcholinesterase and BChE, EC.3.1.1.8, butyrylcholinesterase).[2,3,4] The complexes efficiently inhibited the target AChE and BChE in the two-digit nanomolar range ($IC_{50}$s: 13.23-39.16 nM and 58.56-96.09 nM, respectively). After that, all complexes were docked into the active site of AChE and BChE, then poses displaying the best scoring values and favorable binding interactions were subjected to an MM-GBSA-based refinement.

**Acknowledgements**
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# Synthesis and Characterization of Novel Triazol-Oksadiazol-Sulfonamid Derivatives: Determination of Their Antidiabetic and Radical Scavenging Activities

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Compounds that have inhibitory effects on α-glucosidase and α-amylase enzymes are known as anti-diabetic agents.[1,2] In this study, the synthesis of new derivatives of these compounds is important because of the important biological activities of sulfonamides. In this context, the aim of the project is to synthesize new triazole-oxadiazole-sulfonamide hybrid compounds and to investigate the radical scavenging potential of these compounds, as well as their potential inhibitory effect on some important metabolic enzymes such as α glucosidase and α-amylase.

Inhibitory effects of newly synthesized triazole-oxadiazole-sulfonamide hybrid compounds on α-glucosidase and α-amylase enzyme were investigated. The compounds have inhibitory potential on α-glucosidase and α-amylase enzymes, which are also associated with diabetic diseases. Experimental results were also supported by in *silico* methods. With molecular docking studies, it has been clarified through which amino acid residues in the enzyme structure the compounds are bound. In addition, it was determined that the compounds have ABTS and DPPH radical scavenging effects. Therefore, it is predicted that many of the compounds may have potential effects in reducing oxidative stress.

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# Conducting Polymer Design for Optoelectronics and Sensor Applications

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Due to their advantageous properties, such as easy tunability, flexibility, processability, thermal stability, and electroluminescence, organic conductive polymers are undergoing extensive research with a view to their potential use in optoelectronic devices and a wide range of sensor applications. In order to used for the mentioned applications, it is necessary to make intelligent design conducting polymers starting from the monomeric structure. This article contains examples of functional conductive polymers synthesized in our lab for optoelectronic and sensor applications, considering the structure-property (Figure 1). [1-4]

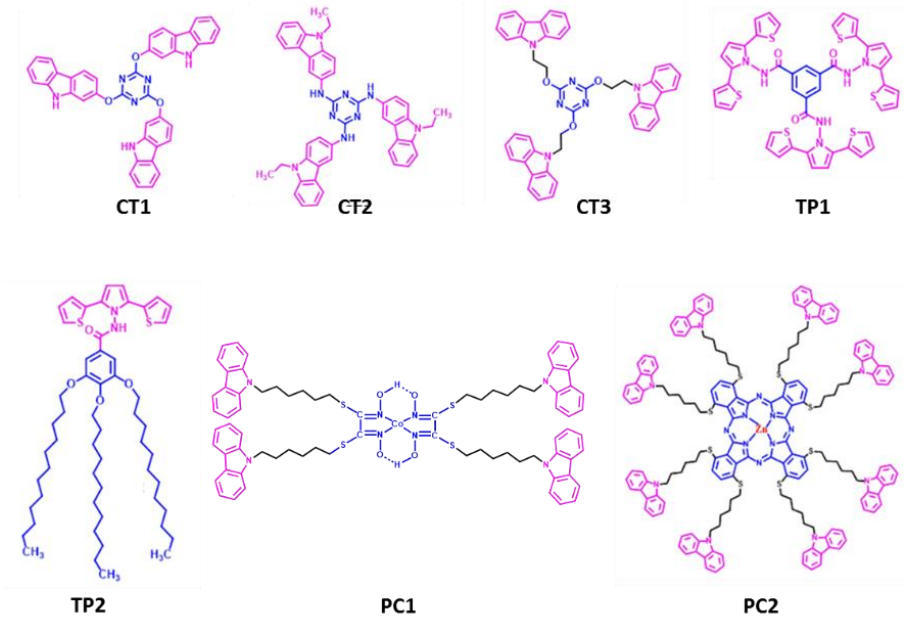


**Figure 1.** Designed monomer structures capable of forming conductive polymers

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# Synthesis of Quinazoline Derivatives with New Phenolic Moieties; In Vitro and In Silico Evaluations as Alternative Catechol Oxidase Inhibitors

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The quinazolines are an aromatic heterocycle with a bicyclic structure consisting of two fused six-membered aromatic rings, a benzene ring and a pyrimidine ring. It is a prominent class of compounds, being of particular interest in biotechnological and medicinal applications, acting as "privileged motifs" for drug discovery due to their attaching to numerous receptors.[1,2] In this study, it was aimed to synthesize new phenolic moieties and quinazoline derivatives to find more biologically active compounds. Then, the anti-browning effects of synthesized quinazoline derivatives were investigated in vitro and in silico.

Browning of foods is a major problem in the food industry. Therefore, it is necessary to inhibit the catechol oxidase enzyme, which is one of the main causes of browning in foods, by various methods. The most important of these methods is the use of various chemicals. The development of safe catechol oxidase inhibitors is important for the food industry and is still a field of study.[3]

In our study, six different quinazoline derivates were synthesized. The inhibition potentials of quinazoline derivatives on the pure catechol oxidase enzyme were determined by calculating $IC_{50}$ values and $K_i$ constants. The $IC_{50}$ values for molecules were calculated as 0.085, 1.145, 0.106, 6.86, 0.52, 7.07 µM, respectively. $K_i$ constants, which are inhibitory-enzyme binding constants, were calculated by using Lineweaver–Burk graphs as 0.16±0.0620, 0.906±0.3029, 0.055±0.0171, 9.363±2.5809, 0.773±0.3204, 7.863±1.9107 µM, respectively. For clarify the inhibitors-enzyme interactions, molecular docking studies were performed and possible binding interactions between the synthesized molecules and catechol oxidase were determined.

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# A Label-Free and Disposable Immunosensor for Detection of GM2 Activator Protein, A New Biomarker of Lung Cancer

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Lung cancer is the most common most serious threats to human health, with the related morbidity and mortality rising worldwide. The diagnosis of lung cancer is difficult in the early period because it usually gives nonspecific findings. According to the analysis of the World Health Organization (WHO), the fatality rate of lung cancer was about 88%, thus a timely and accurate detection technique is critical for lung cancer patients. Cancer biomarkers are measured extensively as a potential tool for diagnosis of cancer disease. Immunosensors are useful tools for detection of cancer biomarkers and they offer high specificity and high sensitivity for quantitative analysis of cancer biomarkers. Electrochemical immunosensors are ideal platforms for detection and quantification of cancer biomarkers accurately and sensitively. They combine the unique superiorities of electrochemical techniques, specific biorecognition reaction and biosensor equipment.[1] The morbidity and mortality of lung cancer is increasing rapidly, and it affects badly human health. GM2-activator protein (GM2A) is a potential diagnostic and prognostic biomarker in patients with lung cancer and in the presence of lung cancer the level of GM2A increases in human serum.[2] In this study, a reagentless electrochemical biosensor was designed for sensitive detection of GM2A biomarker in human serum samples. The electrochemical immunosensor was constructed by gold nanoparticles electrodeposition and amino-substituted poly(thiophene) conjugated polymer electropolymerization process. Anti-GM2A antibodies were attached on the polymer coated disposable indium tin oxide electrode surface through glutaraldehyde crosslinking. In the presence of GM2A target antigen, the suggested immunosensor gave an impedimetric signal due to anti-GM2A-GM2A interaction. The as prepared immunosensor illustrated a well linear relationship between the impedimetric response and the GM2A target antigen concentration ranging from 0.0185 to 111 pg/mL with a detection limit of 5.8 fg/mL. Additionally, the proposed immunosensor had high sensitivity, favorable reproducibility, and good storage stability. Moreover, the designed immunosensor was applied to determine GM2A in human serum samples and high recovery rates were obtained.

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# Preparation and Characterization of Magnetic Dual Enzyme-Inorganic Hybrid Nanoflowers

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Enzyme-inorganic hybrid nanoflower is an efficient and a new method in enzyme immobilization. Until now, a wide variety of enzymes have been immobilized in this way. In some studies, for easy separation, magnetic nanoparticles were incorporated or embedded in enzyme-inorganic hybrid nanoflowers. However, there are very limited studies on dual or multi enzyme-inorganic hybrid nanoflowers, especially magnetic ones.1

In this study, a magnetic dual enzyme-inorganic hybrid nanoflower that can be used enzymatically production of gluconic acid was prepared and characterized. Glucose oxidase (Gox) and catalase (Cat) were selected for the synthesis of this dual enzyme-inorganic hybrid nanoflowers (GOx-Cat-Cu(II) hnfs). GOx catalyzes the hydrolysis of β-D-glucose to glucono-δ-lactone (glucono-1,5-lactone) and hydrogen peroxide ($H_2O_2$) in the presence of molecular oxygen ($O_2$).[2-4] The formed glucono-δ-lactone spontaneously hydrolysis into gluconic acid in aqueous medium. However, other reaction product, $H_2O$, strongly inhibits and inactivates the GOx. So, $H_2O_2$ must be removed in order to protect the GOx. The easiest way to remove the $H_2O_2$ formed by the GOx is to add Cat. As it known, Cat uses $H_2O$ as a substrate. In our study, firstly, magnetic nanoparticles (MNPs) were synthesized, and surface of the synthesized MNPs were made suitable for enzyme adsorption and coated with polydopamine.[2-4]After that co-immobilization of GOx and Cat was performed on polydopamine coated MNPs. Then, the synthesis of magnetic dual enzyme-inorganic hybrid nanoflowers (GOx-Cat-Cu(II) hnfs) was carried out by using $Cu^{2+}$ ions in PBS. Finally, some characterization studies (SEM-elemental mapping, EDX, XRD, IR etc.) and activity measurements of GOx-Cat-Cu(II) hnfs were performed.

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# Antibacterial Activity of Liposomal Formulation of Ethanol Extract of *Codium sp.*

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*Codium* is a genus of marine algae belonging to the Bryopsidales order of Chlorophyta which is a green algae measuring 10 to 40 cm in diameter and consists of branching cylindrical segments.[1,2] In traditional medicine in some countries it is known to be used as anticancer and antipyretic agents.[3] It is also antiviral and has anticoagulant properties.[4] While in liposome encapsulated form of Codium, no studies were found in which the antibacterial and antioxidant properties of the extracts were investigated.

We have developed a liposomal formulation of ethanol extract of *Codium* sp. that collected from Marmara sea. The aim of this study is to examine the antibacterial effect of this formulation by increase the stability and bioactivity of the extract. After the collection of Codium sp., drying process has completed and extraction has done at 40°C with ethanol. Antibacterial activity test was performed with disk diffusion method on *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922 strains. According to the results obtained from *Codium* sp. extracts have antibacterial activity against tested bacterial strains.

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# Seeds Aglycone Extracts from *Lepidium sativum* and *Eruca vesicaria Linn.* Modulates Neutrophil Nitro-oxidative Functions *in Vitro*

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Plants are sources of various bioactive secondary metabolites with beneficial therapeutic potential against many human diseases associated with chronic or acute activation of inflammatory cells, such as neutrophils. This study evaluated the anti-inflammatory and antioxidant properties of seeds aglycone extracts from *Lepidium sativum* (LS) and *Eruca vesicaria* (EV) *Linn.,* on peritoneal neutrophils functions *in vitro*.

Neutrophils (PN) were harvested after intraperitoneal injection of thioglycollate broth to BALB/c mice. Exocytosis of azurophilic granules of formyl methionyl leucyl phenylalanine (fMLP)-activated PN was assayed by monitoring the myeloperoxidase (MPO) activity using ortho-dianisidine and $H_2O_2$. Absorbance was measured at 460 nm. The production of superoxide anion ($O_2^{\bullet-}$) stimulated by phorbol myristate acetate (PMA) was recorded by the superoxide dismutase-inhibitable reduction of cytochrome c at 550 nm. Nitric oxide (NO) level was determined as a marker of NO synthase (NOS) activity by measuring nitrites ($NO_2^-$) using the Griess reagent.

The results showed that extracts of LS at 0.016 (LS1) and 0.16 (LS2) mg/ml and EV at 0.16 (EV1) and 0.72 (EV2) mg/ml, moderately enhanced MPO release. The levels reached 12% (LS1) and 24% (LS2), and 22% (EV1) and 33% (EV2) of control. They reduced the production of $O_2^{\bullet-}$ by 36% (LS1) and 72% (LS2), and by 71% (EV1) and 87% (EV2). Aglycone extracts attenuated NO production by approximately 16% (EV1) and 18% (LS1). However, LS aglycone extract had an antioxidant effect at low concentration (LS1), but at higher concentration enhanced NO release by 36% (LS2), through a pro-oxidant effect.

This study highlighted the oxidative and antioxidant properties contained in LS and EV seeds aglycone extracts. These health-promoting compounds could be used to finely modulate critical events involved in inflammation and nitro-oxidative stress associated-diseases.

# About Biochemical Content Of Persimmon Fruits Spread in Sheki - Zakatala Region.

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The purpose of this study is research of vitamin C and sugar content in persimmon fruits of traditional selection, widely spread in Sheki-Zakatala economical region of Azerbaijan. Throughout the years the valuable varieties of persimmon sorts were developed by the local population by the means of traditional selection. Persimmon is an economically important plant because of its edible fruits and valuable wood. In nature, persimmon trees are about 15 meters high and they throw off their leaves in winter. Leaves are elliptical, flowers are single. Mainly are dioeciously plants. Often common in humid mountain slopes, they are widespread on heights of 400-800 meters above sea level. Persimmon is found all over the territory of Azerbaijan, being especially common in Balakan, Zakatala and Gakh regions. Persimmons grow wild and have a wide range of habitat. In traditional medicine, the ethanol extract of its fruits is used to treat thyroiditis, its fruits are used in the treatment of anemia. Moreover, it is recommended as a means for health improvement and rehabilitation in exhaustion, as well as diseases of nervous system, anorexia, hypertension, bronchitis and etc. In scientific medicine, drugs made of its fruits are used for treating goiter and thyrotoxicosis.

Researches were conducted in “Plant Biochemistry” department at Sheki regional scientific center of ANAS. Fully mature fruits of indicated sorts of persimmon were taken as samples for studies. The content of vitamin C and sugar in fruits of every sort was explored individually. Samples of fruits were collected in Sheki-Zakatala economic region at the beginning of December in 2021. The amount of vitamin C in the studied sorts was measured by Tilemans’ method. Total content of sugar in fruits were determined by universal saccharimeter СУ-4 using Bertrand’ method.

During research of biochemical content of persimmon fruits of traditional selection, it was discovered that the amount of vitamin C and sugar depends on the height of the fruit collection point. It was established that the amount of sugar and Vitamin C in the fruits decreases with the increase in the height of fruit collection point.

# Immobilization of L-Asparaginase on Magnetic Nanoparticles

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L-asparaginase (L-ASNase, EC3.5.1.1) can specifically catalyze L-asparagine conversion to ammonia and L-aspartic acid. Due to its antineoplastic ability, L-asparaginase has been widely studied as a potential treatment for acute lymphoblastic leukemia and lymphosarcoma. [1] Although it has the potential to be widely used in the food and pharmaceutical industries, free L-asparaginases have some disadvantages, such as short half-life, low stability at high temperature, and lack of reusability. Enzyme immobilization is a widely used technique to eliminate the drawbacks of free enzymes in industrial applications. $Fe_3O_4$ nanoparticles are widely used supports in enzyme immobilization since they have a large surface area and are easily separated from reaction system by magnet.[2] In this study, L-asparaginase was covalently immobilized on modified $Fe_3O_4$ nanoparticles. The optimum pH and temperature of free and immobilized L-asparaginase preparations were determined as 8.5 and 50 °C for the both preparations. The thermal stability experiments showed that the thermal stability of immobilized L-asparaginase increased by 30 folds at 50 °C compared to the free enzyme. The immobilized L-asparaginase remained 80% of its initial activity after 10 reuses.

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# Colloidal Bacterial Cellulose for UV Protection

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Bacterial cellulose (BC) is a biopolymer used in cosmetics, biomedical and food industries with its high biocompatibility, water-holding capacity, gas permeability, and nanofiber structure.[1] Ultraviolet (UV) rays negatively affect living and non-living surfaces; they are divided into three regions in terms of their different effects: UV-A (315-400 nm), UV-B (280-315 nm), and UV-C (100-280 nm). Studies in the literature report composite films with reduced UV transmittance using BC membranes.[2] The aim of this study is to colloidal BC membranes to increase their usability in different formulations and to investigate their UV protective potential. BC membranes were produced in the Hestrin&Schramm medium by *Komagataeibacter xylinus* ATCC 70078 in 2% v/v inoculation at 30°C, 7 days under static conditions purified under high temperature and alkaline conditions, then mechanically fragmented. BC (3 g dry BC/Liter) hydrolyzed using 2.5 M (v/v) $H_2SO_4$ solution at 90°C and purified by repeated washing (centrifuged at 6000 rpm/15 minutes). SEM analysis, viscosity, and water holding capacity of colloidal BC solution were determined. UV (190-400 nm) transmittance of its different concentrations (0.25%-10%) was measured. After purification, BC membranes were white and semi-opaque. The UV absorption capacity of hydrolyzed BC varied with its concentration. BC's highest (almost 100%) UV absorption was measured at 10% (ww/w) concentration for the three UV regions. Hydrolyzed BC in a colloidal structure showed thixotropic behavior, and its water-holding capacity was 89%. As a result, it has been determined that colloidal BC can be used as an alternative UV protection and thickening agent, especially for the cosmetic industry.

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# Investigation of Inhibition Effects of Some Sulfanilamide Derivatives on Horseradish (*Armoracia rusticana*) Peroxidase

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Peroxidases (POD) are frequently seen in prokaryotes, eukaryotes, and photosynthetic cells.[1] The most important of these, horseradish peroxidase (HRP; EC 1.11.1.7) oxidizes variety inorganic and organic compounds.[2] HRP has wide applications, such as immunological tests, removal of phenolic pollutants from wastewater, enzymological characterization, and medical diagnosis.[3-5]

Sulfanilamides ($R\text{-}SO_2\text{-}NH_2$) are broad-spectrum antibiotics and are popularly used as prescription medicines and agricultural herbicides.[6] Sulfanilamide residues and their metabolites in the environment, which are toxic to organisms, have been frequently detected in treated wastewater and natural water bodies.[7]

In this study, the *in vitro* inhibition effects on the HRP enzyme of two molecules, which are sulfanilamide derivatives, were investigated. In this context, HRP was purified in high yield in a single step from the attached affinity column of benzohydrazide derivates as a ligand. Then, to determine the $IC_{50}$ and $K_i$ values of each of the sulfanilamide derivatives, activity measurements were performed spectrophotometrically at 470 nm within the framework of the inhibition study. $IC_{50}$ and $K_i$ values were calculated as a result of inhibition studies. The possible binding mechanism on the active site of the enzyme was demonstrated by the molecular docking method.

According to obtained results, while the $IC_{50}$ values for sulfisomidine and sulfadiazine were determined as 272 µM and 197 µM, the $K_i$ values were determined as 282 µM and 412 µM respectively. Thus, the in vitro effect of two sulfanilamide derivatives, which have both metabolic and environmental importance, on the commonly used HRP enzyme has been demonstrated.

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# Inhibitory Effects of Some Compounds on ACHEs Purified from *Ricania simulans*

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In this study, it was aimed to investigate as the effect of some compounds on the acetylcholinesterases (ACHE, EC3.1.1.7) purified from the nymphs and adults of *Ricania simulans* (Walker, 1851) (Hemiptera: Ricaniidae) and to struggle this pest through the enzyme inhibition. ACHE plays an important role in neurotransmission by hydrolyzing the neurotransmitter acetylcholine into choline and acetate and is the target site of many insecticides for the struggle.[1] The ACHEs were purified from the adults and nymphs of *R. simulans* by the edrophonium-Sepharose affinity chromatography.[3] In inhibition studies, specific inhibitors of acetylcholinesterase, tacrine and edrophonium chloride, and newly synthesized compounds were used. In the studies with tacrine and edrophonium chloride, $IC_{50}$ values were determined as 18.0±0.3 and 1.2±0.4 µM for adults, 2.4±0.3 and 0.6±0.09 µM for nymphs, respectively. In the inhibition studies with newly having been synthesized compounds, it was determined that the $IC_{50}$ value of the compound [Zn(HL)(bipy)($OClO_3$)], which is the most effective in adults of *R. simulans* acetylcholinesterase, was 3.2±0.8 µM, and the $IC_{50}$ value of [Ni(HL)(bipy)($OClO_3$)] compound, which is the most effective for nymphs, was 4.6±0.8 µM. As a result, it has been shown that these complexes can be used potentially as metal-based insecticides in the agricultural struggle for *R. simulans*.

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# Affinity Gel Synthesis from *p*-Aminobenzoic Acid Derivative Compound and Purification of Polyphenol Oxidase from Different Herbal Sources

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Polyphenol oxidases (E.C.1.10.3.1, tyrosinase, and catechol oxidase) are members of oxidoreductases, to a set of copper containing metalloenzymes present in plants, animals, bacteria, and fungi.[1,2] Polyphenol oxidase (PPO) catalyzes hydroxylation of monophenols to o-diphenols (cresolase activity) and the oxidation of o-diphenols to quinones (catecholase activity), which results in protein complexing and the formation of brown melanin pigments.[3,4]

In this study, it was synthesized Sepharose 4B-L-tyrosine-4-amino-2-methylbenzoic acid, which is a new affinity gel for the purification with high efficiency of the PPO enzyme, which causes darkening in the food industry. For this purpose, a new affinity gel was synthesized by forming Sepharose-4B matrix, L-tyrosine extension arm and 4-amino-2-methylbenzoic acid ligand, a derivative of *p*-aminobenzoic acid. In addition, Sepharose 4B-L-tyrosine-*p*-aminobenzoic acid affinity gel known in the literature was also synthesized. In our study, the PFO enzyme was purified from potato, eggplant and culture mushroom sources. Potato PPO 41.17 times, culture mushroom PPO 64.47 times, and eggplant PPO 56.78 times from affinity gel using 4-amino-2-methylbenzoic acid as ligand were purified. From the affinity gel that was used as a ligand of *p*-aminobenzic acid, potato PPO 9.02 times, cultur mushrooms PPO 16.57 times, eggplant PPO 28.13 times was purified. In this study, a single band was observed for each enzyme by applying natural and SDS-PAGE for newly synthesized affinity gel purified enzymes. The molecular weight of each enzyme was determined to be approximately 50 kDa.

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# Purification of Lipoxygenase Enzyme from Quinoa (*Chenopodium Quinoa Willd*.) and Investigation of the Inhibition Effects of Some Newly Synthesized Schiff Bases on Enzyme Activity

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Lipoxygenases (LOXs) are a family of monomeric proteins that catalyze the oxidation of polyunsaturated fatty acids (arachidonic acid, linolenic, and linoleic) to produce hydroperoxides.[1] LOX reactions with unsaturated fatty acids can produce off-flavors/bad odors and cause food spoilage. Studies on LOX inhibition have gained importance due to undesirable components of the LOX pathway.[2] In this study, LOX enzyme was purified from Quinoa (*Chenopodium Quinoa Willd*.) using homogenate preparation, ammonium sulfate precipitation (20-40%), and Q-sepharose ion exchange chromatography method and determined the inhibition effects of newly synthesized Schiff bases on this enzyme activity. LOX enzyme was purified 77.89-fold with 1.48 EU/mg protein-specific activity 7.24% yield. As a result of SDS-PAGE, a single band was obtained. The molecular weight of the LOX enzyme was determined as 97.72 kDa using Coomassie blue R-250 staining method and silver staining process. The ligand of (E)-4-(((2-hydroxyphenyl)imino)methyl)benzene-1-3-diol was synthesized. Subsequently, the complexes of this ligand were prepared with Cd(II) and Ni(II). The ligand, Cd(II), and Ni(II) complexes were tested at various concentrations, which showed reduced *in vitro* LOX activity. $IC_{50}$ values were found to be 0.930, 0.502, and 0.253 µM, respectively whereas $K_i$ constants were 0.858 ± 0.194, 0.519 ± 0.014, and 0.448 ± 0.087 µM, respectively. Inhibition mechanisms of all compounds were found as competitive.

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# Design of a New Type and Multifunctional Micromotor: Synthesis, Characterization, and Selective Heavy Metal Detection

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Due to their superior properties, nano/micromotors have attracted a lot of attention in recent years in multidisciplinary fields from biotechnological applications to molecular imaging, from drug delivery to environmental pollution removal[1]. Designing a new, effective, and simple nano/micromotor for the numerous applications mentioned requires a great deal of effort. Taking advantage of different disciplines and perspectives to be successful in this field makes a very important contribution to the new multi-disciplinary nanomotor design.

In this study, we developed a facile strategy for designing a new type of micromotor which was using specific florescent-based conducting polymer synthesis. We produced a new fluorescent conducting polymer-based tubular magnetic-driven micromotor that exhibited steerable motion in water. The structural and chemical properties of the obtained micromotor were characterized by SEM-EDX. Obtained micromotors was used for selective detection of Hg (II) heavy metal ion with three different effective methods such as fluorometric, magnetic and amperometric. In this way, it has been observed that the obtained micromotor has great potential for an environmental and biomedical applications.

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# Collagen Based Nanobubbles for Controlled Drug Release

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Nanobubbles are basically nanosized bubbles designed to increase the structural stability and distribution of the transported drug to the targeted site.[1] Due to their small size, they can penetrate the desired area from the bloodstream. The structure of the bubbles contains gas inside, surrounded by an outer shell.[2] In this particular study, perfluoropentane (PFP), which has low solubility in aqueous media and does not show toxic effects at low doses, is used as a gaseous core. When drug-loaded nanobubbles burst into a cavity with the effect of ultrasound, they cause temporary pores to form on the cell surfaces and increase the cellular uptake of the drug they carry. In this study, the biodegradability and excellent biocompatibility of a well known protein collagen were used to prepare nanobubbles for the release of Ibrutinib, which is used for the treatment of lymph cancer. In accordance with this purpose, scanning electron microscopy (SEM), Fourier transform infrared (FTIR) characterization studies were carried out. The release studies of collagen nanobubbles prepared at various drug doses were carried out in a Franz cell using a dialysis membrane at different pH (5.0-7.4) and temperature (25-40°C). Collagen nanobubbles released approximately 80% of the drug at pH 7.4 within 6 days. In the future studies, ultrasound blasting of nanobubbles and cell culture studies will be carried out in the targeted tissue.

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# Principles and Biological Functions of Cotranslational Protein Degradation

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Nascent polypeptides are degraded by the proteasome concurrently with their synthesis on the ribosome, a process called co-translational protein degradation (CTPD). Although CTPD has been observed for decades, the underlying mechanism and its biological significance remains elusive. The main hurdle to understanding CTPD is lack of knowledge on the protein species genuinely undergoing CTPD. It has been a challenge to identify CTPD substrates because of technical difficulty and lack of a workable system. We recently discovered that CTPD is severely impaired in the yeast mutant *srp1-49*, which expresses a mutated form of Srp1 (also known as importin $\alpha$).[1] We demonstrated that Srp1 binds nascent chains emerging from the ribosome and recruits proteasomes to ribosome-nascent chain complexes. Thus, Srp1 plays a general and critical role in CTPD. The finding of the new role for Srp1 in CTPD provides a unique platform for identification of proteins subject to CTPD. The difference in the abundance of a ribosome-bound nascent chain between wildtype and *srp1-49* strains reflects whether and how much this nascent chain is degraded cotranslationally. Taking advantage of this genetic system and combining the powerful SILAC (stable isotope labeling by amino acids in cell culture) and PUNCH-P (puromycin-associated nascent chain proteomics) biochemical approaches, we have launched a global proteomic analysis and successfully identified the spectrum of CTPD substrates.[2] In the current project, we analyze the proteomic data and identify the contributing factors that determine the level of CTPD.

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# Capsaicin Purification From Samandağ (Hatay) Pepper With Affinity Chromatography

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Within the scope of this study, it was aimed to purify capsaicin, which has an important place in the health sector, from Samandağ pepper, a local product. The capsaicin content of Samandağ pepper, which is an endemic species, was examined in dry and wet form and compared with the contents of green, stuffed and capia peppers. Capsaicin determination was started with Soxhlet extraction and three different solvents, methanol, ethanol and acetonitrile, were selected for this purpose. In order to optimize the extraction, three different temperature and three different time parameters were studied in each selected solvent. It was determined that capsaicin yield as a result of Soxhlet extraction was obtained at 1780.9 µg/g at 80°C and by using methanol solvent for 3 hours. The extracts obtained as a result of the extraction were first analyzed by one-dimensional HPLC for the determination and purification of capsaicin content, and it was observed that only capsaicin and dihydrocapsaicin could be detected among capsaicinoids. As a result of the analysis of dried red pepper, it was calculated that 1780.9 µg/g capsaicin and 897.8 µg/g dihydrocapsaicin could be obtained, and considering the total amount of capsaicinoids, the pungency value was calculated as 40185.5 SU (ScovilleUnits). In fresh red peppers, 105.4 µg/g capsaicin and 66.48 µg/g dihydrocapsaicin could be obtained. As a result of one-dimensional HPLC analysis, capsaicinoid was not detected in stuffed and capia peppers. In order to obtain and purify capsaicinoids with a higher yield, two-dimensional HPLC analysis was performed and the p(HEMA-MATrp) monolithic column synthesized and characterized during the analysis was used as the first dimensional column. Thus, both preconcentration was made and the amount of capsaicinoid held in the column was increased. Commercial C-18 column was used as the second dimensional column and it was observed that four different capsaicinoids, namely capsaicin, dihydrocapsaicin, nordihydrocapsaicin, and homocapsaicin, could be detected at the end of the analysis. As a result of the two-dimensional HPLC analysis, it was revealed that the total amount of capsaicinoid increased to 3853.7 µg/g. As a conclusion of the study, it has been proven that capsaicin, an important bioactive molecule, can be obtained in pure form from Samandağ pepper which is a local product.

# Antifungal Activity of *Achillea sintenisii* and *Pyrus elaeagnifolia* Pallas Extracts Determination

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Herbally, plants have been used for drug therapy throughout history. The genus *Achillea* is represented by about 140 species on Earth. These species are used in folk medicine due to their anti-inflammatory, analgesic, antispasmodic, digestive, wound-healing, and hemostatic effects. *Achillea sintenisii* is an endemic species spreading in Central Anatolia.[1] *Pyrus elaeagnifolia* is a pear species widely grown in Anatolia. It is generally known as ahlat and, in some regions, there are also local names such as hyssop, pear. There are many things about the Ahlat that came from the culture 3000 years ago and were introduced by 24 Ahlat used by knitting.[2] The aim of this purpose is to investigate the antifungal activities of *Achillea sintenisii* (Kuruçay perçemi) and *Pyrus elaeagnifolia* Pallas (Ahlat armudu). Antifungal studies of methanol and water extract of the aerial part of *Achillea sintenisii* plant were carried out. It was observed that B. cinerea inhibited mycelial performance 100% in the production of 5.35 and 6.89 mg/ml of methanol extract of *Achillea sintenisii* plant. *Achillea sintenisii* was 100% inhibited in 0.49 and 0.98 mg/ml portions of the water extract. The ethanol extract of the fruit of *Pyrus elaeagnifolia* Pallas appears to inhibit the mycelial effort of B. cinerea 100% in the production of 10.70 and 13.79 mg/ml. It is antifungal effect in water extract of *Pyrus elaeagnifolia* Pallas.

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# Synthesis of Magnetic Egg White Hybrid Nanoflower

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Hybrid materials can be defined as synergistic combination of organic and inorganic components in one material with new and improved properties. Until now, different kinds of organic and inorganic compounds (small organic molecules or macromolecular compounds) have been used to prepare the hybrid materials.[1] Nanoflowers are the most remarkable among the hybrid materials.[2] In some studies, for easy separation, magnetic nanoparticles (MNPs) were incorporated in the hybrid nanoflowers.

In this study, for the first time, we sythesized magnetic organic–inorganic hybrid nanoflowers using crude egg white as the organic component, copper (II) ions as the inorganic component, and MNPs as magnetic component, under mild conditions.[3] Chicken eggs were purchased from a local market. The yolk and white were separated by decantation. Afterwards, this crude egg white was mixed with a blender until become foamy. This foam was stand at +4°C overnight. Then protein concentration of crude egg white was determined via Bradford assay and a certain amount of crude egg white was immobilized on MNPs surface at room temperature. After all of this preparation step, magnetic egg white-inorganic hybrid nanoflowers (mEW-hNFs) were prepared according to a modified reported method.[3] Finally, formation of mEW-hNFs was confirmed by some characterization studies such as SEM, SEM-elemental mapping, EDX, XRD, IR etc.

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# Preparation of Copper (II) Phthalocyanine Poly(Cresol Red) Composite Electrode for Voltammetric Determination of Antimony

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Antimony is a toxic element, found in both environmental and biological samples to which a large amount of the world's population is regularly exposed.[1] The relative toxicity of antimony has caused it to be considered a pollutant due to its increasing use in industry. It can be used to produce the fire retardants, glass and ceramics, batteries and also in the production of polyethylene terephthalate (PET) bottles where it is used as a catalyst.[2,3] Antimony trioxide ($Sb_2O_3$) is listed as a priority pollutant by the US EPA and EC. Because $Sb_2O_3$ is commonly used as a catalyst in a polycondensation polymerization reaction in PET production, most commercial PET materials contain antimony at a concentration of 100-300 mg $kg^{-1}$.[4] Recent studies have reported that antimony leaches from PET bottles into drinking water[5,6] and fruit juices. [7]

In this study, copper phthalocyanine (CuPc) and over-oxidised-poly(cresolred) ($CrRed_{ox}$) containing composite electrode was developed for antimony in PET samples using differential pulse anodic stripping voltammetry (DPASV). With optimum modified electrode the surfa modification analysis were performed. A higher anodic stripping peak current of antimony was appeared at -0.027 V on the CuPc/CrRedox/GCE compare with other electrodes. The dependence of peak current on antimony concentration shows two linear segments of 0.011 - 11.273 µg $L^{-1}$ and of 14.373 - 39.257 µg $L^{-1}$ with a detection limit of 0.0045 µg $L^{-1}$. The developed composite electrode was applied successfully for the analysis of antimony in PET samples.

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# Determination of Tryptophan Pathway Metabolites in Hardaliye, an Fermented Beverage

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Tryptophan is an essential amino acid for humans, and precursor of serotonin and melatonin molecules. A large amount of tryptophan proceeds along the kynurenine pathway to produce the final product, nicotinamide adenosine dinucleotide ($NAD^+$). During the kynurenine pathway it degrades to various molecules, including kynurenic acid with neuroprotective effect, quinolinic acid and 3-hydroxy kynurenine, which have neurotoxic properties. It has been reported that a decrease in tryptophan concentrations, an increase in kynurenine concentrations and an increase in Kyn/Trp ratio have been seen in many diseases.[1,2] Since kynurenine and its metabolites are biologically active substances, they have been also determined in various foods in recent years.[3-6] In this the study, it was aimed to determine tryptophan, kynurenine, kynurenic acid, 3-hydroxy kynurenine and niacin compounds by using LC-MS/MS method in two brands of hardaliye from Kırklareli and Edirne provinces.

Bacteria and yeasts which are used in fermentation technology have kynurenine pathway related to tryptophan. Hardaliye is a traditional beverage produced from grapes by the fermentation, especially in the Trakya region. The use of lactic acid bacteria in its production makes hardaliye a probiotic beverage.

As a result of the study, the high tryptophan levels were found in hardaliyes (1798 ng/ml and 2947 ng/ml), while 3-hydroxykynurenine was not detected. The amount of nicotinic acid which is the precursor of vitamin B3 and $NAD^+$, is higher in hardaliye from Edirne province. According to the results obtained, hardaliye can be considered as a valuable functional product candidate. It is thought that increasing the recognition of this local fermented product with such scientific studies will make it important socio-economically.

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# Development of an *in vitro* Gliosis Model and Comparison of Glio-Protective Effects of Various Fibrous Scaffolds

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Central and peripheral nerve damage and neurodegenerative diseases are critical and challenging to treat health problems that significantly affect life quality. There is a need for new generation studies in the field of **neural tissue engineering**, as it is not possible to fully recover patients with current treatments. In our study, **gliosis**, which plays a negative role in various neurological pathologies, especially stroke, Parkinson's and Alzheimer's diseases, was investigated. It was aimed to compare the glio-protective effects of various fibrous scaffolds obtained using **electrospinning** method.

First, *in vitro* gliosis model was optimized by inducing U-87 MG cells with LPS and IFN-γ. The optimized model was applied to U-87 MG cells grown on polycaprolactone (PCL), hyaluronic acid-coated PCL, gelatin-coated PCL and collagen-coated PCL fiber scaffolds. Immunofluorescent (IF) staining was performed with glial fibrillary acidic protein (GFAP) antibody to determine the level of gliosis. The glio-protective effect of fibrous scaffolds coated with different biopolymers on gliosis will be presented.

In the study, a new neural tissue engineering approach was tried for the treatment of gliosis, which plays a detrimental role in various neurological pathologies, including many neurodegenerative diseases, and an *in vitro* gliosis model was optimized. It has been revealed that different coatings have different effects on gliosis. This result will contribute to the studies on tissue engineering-based therapy options on recovery of gliosis.

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# Biological Evaluation of Triazolo Sulfonamide Substituted Oxime Ether Derivatives as Acetylcholinesterase Inhibitors

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Alzheimer's disease (AD), the most widespread form of dementia and one that affects older people most frequently, is a well-known neurodegenerative condition marked by memory loss and cognitive impairment. One of the most critical unmet therapeutic needs in the world continues to be the treatment of AD. Few medications are currently licensed for treating AD symptoms, which is primarily due to its uncertain pathophysiology.[1] Acetylcholine (ACh), a crucial neurotransmitter involved in memory and learning, is thought to be diminished in AD, according to the cholinergic hypothesis. Additionally, acetylcholinesterase (AChE, EC.3.1.1.7) is a hydrolase with the capacity to hydrolyze ACh and swiftly stop cholinergic synaptic transmission. ACh levels in the brains of AD patients might rise even more if AChE was blocked. As a result, the creation of AChE inhibitors (AChEIs) has emerged as the mainstay of AD treatment today. Herein, a series of triazolo sulfonamide substituted oxime ether derivatives were synthesized as novel AChEIs for AD. AChE was effectively inhibited by the majority of the target derivatives, mainly compound **6e**, which had strong inhibitory action. Kinetic and docking studies indicated that compound **6e** was a competitive-type inhibitor.[2,3]

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PP87

# 1,2,3-Triazole Based Sulfonamide Derivatives as Effective Inhibitors of Acetylcholinesterase Enzyme

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Alzheimer's disease (AD) is a central nervous system degenerative illness marked by deteriorating cognitive performance and behavioral abnormalities. Neurotransmitters and neurodegenerative diseases have a tight relationship, and one of the established etiology of Alzheimer's disease (AD) is the disruption of the cholinergic system. At this time, increasing cholinergic neurotransmission and reducing acetylcholine (ACh) hydrolysis remain the best treatments for AD. In general, acetylcholinesterase (AChE, EC.3.1.1.7) and butyrylcholinesterase (BChE, EC.3.1.1.8) are the cholinesterases that hydrolyze ACh.[1] In this study, we synthesized and biologically evaluated a series of sulfonamide derivatives of 1,2,3-triazoles as therapeutic agents for treating AD. After screening the AChE inhibitory activity, target compound **7h** stood out as a competitive type inhibitor of AChE.[2] Additionally, molecular docking studies were conducted to explore the inhibition actions on AChE.[3]

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# Computational Investigation of Tannin-Proline Interactions on Model Systems

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The interactions of tannins and prolin-rich protein cause protein aggregation. The parameters that affect those interactions are rarely investigated by molecular modeling methods which is the main motivation of this dissertation.

Experimental researches in the literature have shown that the main interactions between tannin-PRP interaction are hydrophobic interactions. In order to investigate those interactions with molecular modeling methods, the monomers involved have been optimized by DFT method. Afterwards, optimized gallic acid anions and zwitterionic L-proline interactions have been optimized in water as the solvent at ωB97XD/6-311++G(d,p) level. Characteristics of main non-covalent interaction has been determined.

By interpreting the calculated data, it is concluded that the interactions between gallic acid anion and L-proline zwitterion mainly consist of van der Waals, weak hydrogen bonding (either intermolecular or intramolecular), and steric interactions.

# *In Silico* Drug Repurposing Approach for Determination of Novel Hsp90 Inhibitors

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Hyperactive Hsp90, which is overexpressed in cancer cells and causes accumulation of oncogenic-related proteins that impair cellular homeostasis, has emerged as a therapeutic cancer target with degradation of associated proteins induced by Hsp90 inhibition.[1] In addition, Hsp90 inhibitors have a wide therapeutic window for cancer treatment, as the level of Hsp90 is distinctive between cancer cells and normal cells. Overexpression of Hsp90 causes dysregulation of chaperone functions and destroys cellular homeostasis, resulting in cell cycle acceleration, endless proliferation, and decreased sensitivity to anti-growth signals that are characteristic of tumors.[2,3] In this study, a virtual screening method was used to identify novel inhibitors of Hsp90 with these effects in mind.

In virtual screening, Hsp90 structure (PDB: 4W7T) was chosen as the receptor, all drugs in the Drugbank database (~10767) were downloaded and were used as ligand. SP/XP hierarchical virtual screening were performed to identify inhibitors targeting the Hsp90 protein in the screening process. Clusters were created for drugs determined by screening using the Maestro Canvas Similarity and Clustering program. These values were examined and hit molecules were determined. After, molecular dynamics simulation studies (200 ns) were performed to analyze the dynamics between Hsp90-drug complexes. System stabilities of the complexes was determined with RMSD and RMSF graphs and it was predicted that they could be new Hsp90 inhibitors. In addition, this study can be supported by *in vitro* studies and may lead to the design of potential new inhibitors.

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# New Hydrazine Derivatives Containing Piperazine or Benzimidazole: Synthesis, Anti α-Amylase Activity, Molecular Docking and *in vitro* Cytotoxicity Activity Studies

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α-Amylase (EC 3.2.1.1) is the key digestive enzyme that catalyzes the hydrolysis of α-(1,4) glycosidic linkages in starch to produce maltose, maltotriose, and limit dextrins[1], so that it has been known to be a pioneer target for type 2 Diabetes mellitus (DM). Type 2 DM has no certain cure and the global increase in the cases of DM requires effective and extensive number of drug candidates[2,3]. Drug discovery studies using organic biochemistry approaches are of important to describe novel compounds. In this study, inhibitory potential of 13 novel compounds containing piperazine or benzimidazole moieties on α-amylase were studied. The novel compounds were synthesized and structures of these molecules were corroborated by FTIR, UV-Vis, $^{1}$H NMR and $^{13}$C NMR analysis data then investigated for anti α-amylase activity. Compound 14 was found to be the most potent inhibitor for α-amylase ($IC_{50}$ 64.8 ± 1.8 µM) among the synthesized derivatives. Inhibition types and $K_i$ values of compound 14 and 10a were further determined. Molecular docking studies were conducted to correlate the outcome of *in vitro* biochemical kinetic assays and therefore rationalize the binding interactions. In addition, ADME properties of the synthesized compounds were predicted to examine the bioavailability of these compounds. Once and for all, compound 14 was evaluated by the MTT assay against pancreatic cancer cell line AR42J and it was found to be more effective compared to the positive control, acarbose.

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# NIR-II Emissive Conjugated Polymer Dots for Cell and Tissue Imaging

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Conjugated polymer dots (Pdots) are of an interest since they provide high photostability, strong emission and chemical modularity. We here showed that, Pdots made of polythiophene with benzobisthiadiazole (Donor-Acceptor) exhibit extraordinary penetration characteristic in to cells and organoids/tumoroids models. Here, we share the outcome of our project 120Z588 and briefly describe the synthetic and preparation steps of Pdots as well as their penetration studies in breast, HeLa, shsy5 cancer cell lines and NIH3T3 and their tumorid/organoid models.

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# Investigation of Tyrosinase Inhibition and Antioxidant Properties of Schiff Base-Boron Complexes Containing H, Br and $NO_2$ Substituent Groups

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Boron chemistry has a growing interest in different fields of medicine such as biosensors, drug delivery, diagnosis and therapy.[1,2] However, Schiff bases (imines) are considered to be one of the most valuable groups of bioactive molecules with wide applications in medical and pharmaceutical fields due to their ease of synthesis and wide structural diversity.[3] In addition, it has been reported in the literature that some compounds containing imine structure show remarkable biological activities, including antibacterial, antifungal, anti-tumor, antiviral, anti-tuberculosis, antioxidant and anti-inflammatory activities.[4]

In this study, Boron complexes of shift bases with H (**1**), Br (**2**) and $NO_2$ (**3**) substituents were synthesized and their structures were elucidated using NMR, MS and ATR-FTIR techniques. The enzyme inhibition and antioxidant activity properties of these synthesized compounds were investigated. Considering the $IC_{50}$ values in studies for tyrosinase inhibition, **1** compound showed 18 times better activity than kojic acid, while **2** compounds showed 7.56 times. The antioxidant activities of the compounds were evaluated using ABTS, CUPRAC and FRAP methods. When the compounds **1**, **2** and **3** were evaluated within themselves, **3** compounds showed the best antioxidant activity with 194673.4 mgTE/g according to the ABTS method, 20.1 mgTE/g according to the FRAP method and 95.1 mgTE/g according to the CUPRAC method.

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# New Antenna Type Conducting Polymer: Synthesis, and Investigation of Electrochemical and Optic Properties

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Conductive polymers are used in many new technological applications due to advantages such as showing high conductivity, being lighter than metals, easier to process, resistant to corrosion and chemical events, and being less costly than metals. The carbazole group has excellent electrical and charge-carrying properties and the new material is obtained by functionalizing with different substituents the carbazole group. Therefore, obtained a new polymer may have the potential to be used in photoelectric devices, sensor, and light emitting diodes. [1]

Within the scope of the study, a new antenna type triazine derivate electroactive monomer called as "ANT", using 2,4,6-trichloro-1,3,5-triazine as core and 3,5-bis(4-(9H-carbazole-9-yl)butoxy)benzohydrazide as arms was successfully synthesized. The characterizations of obtained the antenna monomer were carried out by $^{1}$H-NMR, $^{13}$C-NMR analysis. After the structural characterization of monomer, the electrically conductive film called as "pANT" was synthesized via electropolymerization on ITO in a lithium perchlorate/acetonitrile electrolyte–solvent couple. Besides electrochemical and spectroelectrochemical studies of pANT polymer film were examined. pANT polymer film is promising candidate with potential for use as sensing materials and medical agents.

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# Synthesis and Characterization of Near-Infrared (NIR)-Light Triggerable Upconverting Nanoparticles to Enhance Activity of Immobilized L-Asparaginase

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L-asparaginase (L-ASNase, EC.3.5.1.1) enzyme is used in the treatment of many different types of cancer, especially Acute Lymphoblastic Leukemia (ALL). The L-ASNase enzyme catalyzes the nonessential amino acid L-asparagine into L-aspartic acid and ammonia. Enzymes can be easily denatured by being affected by environmental conditions. For this reason, enzymes are immobilized on a solid carrier matrix to increase their resistance to environmental conditions and ensure their reusability. In this study, L-ASNase was immobilized on upconverting nanoparticles (UCNP) so that they become more resistant to environmental conditions and can be triggered by NIR.

In this study, PEG-L-ASNase enzyme was immobilized on UCNPs and its activity was improved by NIR. $NaYF_4$: $Yb^{3+}$, $Er^{3+}$/PEI UCNPs were characterized to observe structural and morphological changes before/after enzyme immobilization. Additionally, optimum pH and optimum temperature values were determined for PEG-L-ASNase and $NaYF_4$: $Yb^{3+}$, $Er^{3+}$/PEI-PEG-L-ASNase. While the optimum pH value was found to be 8.5 and 8 for PEG-L-ASNase and $NaYF_4$: $Yb^{3+}$, $Er^{3+}$/PEI-PEG-L-ASNase, the optimum temperature values were determined as 40 $^oC$ and 45 $^oC$, respectively. Also, after incubation at 50 °C for 6 hours, it was observed that PEG-L-ASNase and $NaYF_4$: $Yb^{3+}$, $Er^{3+}$/ PEI-PEG-L-ASNase retained 28% and 59% of their initial activities, respectively. Moreover, the kinetic parameters ($K_m$ and $V_{max}$) were calculated. These values for PEG-L-ASNase were found as 2.31 ± 0.04 mM and 140.85 ± 3.23 µmol/min, respectively. For $NaYF_4$: $Yb^{3+}$, $Er^{3+}$/PEI-PEG-L-ASNase, the $K_m$ and $V_{max}$ values were calculated as 1.56 ± 0.06 mM and 138.89 ± 1.66 µmol/min, respectively. Finally, it was determined that the application of NIR at 800 mW, for 60 min at 1 cm increased the activity approximately 4 times compared to the PEG-L-ASNase.

As a result, L-ASNase was successfully immobilized and the activity of the immobilized enzyme was increased approximately 4 times by using NIR light. Also, in this study is one of the pioneering studies in terms of the development of triggerable drug delivery systems.

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# Development of Aliphatic Polyurethane-Based Materials with Controlled Porosity for Use in Testosterone Hormone Replacement Therapy and Investigation of Release Kinetics

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An important type of hormone for our body is the hormone testosterone. Testosterone has many beneficial effects such as increasing bone strength and density, inducing hematopoiesis, stimulating sexual function and libido, providing a cardioprotective effect and increasing muscle strength.[1,2] It is also known that physiological plasma testosterone levels are necessary to maintain brain function and decreased plasma testosterone levels predispose to dementia.[3,4] Testosterone replacement therapy (TRT) is a reasonable treatment option in these situations. Therefore, in this study, an alternative polyurethane-based release system capable of releasing testosterone was synthesized. The chemical and physicochemical properties of the synthesized structures were determined by FTIR, TGA, DTA and SEM measurement methods. Drug delivery kinetics were followed by UV spectrophotometer. When the release graph was examined, it was observed that at the twentieth hour there was ~ 84% emission in the physical method and ~ 73% in the chemical method.

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