3EBAT

EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES CONGRESS

4-7 NOVEMBER 2021 ANTALYA

abstract book

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3rd EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES (EBAT) CONGRESS

SCIENTIFIC PROGRAMME

November 04, 2021 Thursday

13:00-17:00	**Registration**	***Registration Desk***
17:00-17:30	**Mirage I**	
	Opening Ceremony	
	Session 1 – Chair: Prof. Ahmet ÇOLAK	***Mirage I***
17:30-18:05	**Invited Speaker (IS1) Prof. Lawrence BERLİNER**	
	New Approaches to Biotechnology Analytical Sciences using Electron Spin Resonance (ESR) Spectroscopy	
18:05-20:00	**Dinner**	
20:00-21:00	**Workshop Prof. Lokman UZUN**	
	Scientific Presentation Techniques	

November 05, 2021 Friday

Session 2 – Chair: Prof. Figen ZİHNİOĞLU		***Mirage I***
09:00-09:35	**Invited Speaker (IS2) Prof. Reinhard STERNER**	
	Analysis of Allosteric Communication in a Multi-enzyme Complex by Ancestral Sequence Reconstruction	
09:35-09:50	**Oral Presentation (OP1) İsa GÖKÇE**	
	Development of One-Step RT-PCR Kit for Diagnosis of COVID-19	
09:50-10:05	**Oral Presentation (OP2) Abeer ALESKNDRANY**	
	A Comparative Study of the Effects of L-T4 and L-T3 on Zwitterionic DPPC Model Membranes	
10:05-10:20	**Oral Presentation (OP3) Müge ANDAÇ**	
	Molecular Modeling of Endocrine Disrupting Chemicals and Amino Acids	
10:20-10:35	**Oral Presentation (OP4) Fulya ÇAĞLAR**	
	Selection of DNA Aptamer(s) to Inhibit c-Fos Protein Interactions	
10:35-10:55	**Coffee Break**	
Session 3 – Chair: Prof. Suna TİMUR		***Mirage I***
10:55-11:30	**Invited Speaker (IS3) Prof. Karsten HAUPT**	
	Molecularly Imprinted Polymer Nanogels - Synthetic Antibody Mimics for Diagnostics and Therapy	

November 05, 2021 Friday

10:30-11:45	**Oral Presentation (OP5) Pinar CAKIR HATIR** Molecularly Imprinted Polymer Nanoparticles from Renewable Resources for Biomedical Applications
11:45-12:00	**Oral Presentation (OP6) Kazım KÖSE** Use of Cellulose Nanomaterials for Modification of Polymeric Adsorbents and Determination of Their Adsorption Performance
12:00-12:15	**Oral Presentation (OP7) Kerem TOK** Selective Isolation of SARS-CoV-2 Antigens using Affinity Material for Mass Spectrometry Profiling and Diagnosis
12:15-12:30	**Oral Presentation (OP8) Marium SABA** Synthesis of Keratin Micro-Particles From Feathers Hydrolysate, Their Characterization and Evaluation of Antimicrobial and Antioxidant Activities
12:30-14:00	**Lunch**
	Session 4 – Chair: Prof. İsa GÖKÇE ***Mirage I***
14:00-14:35	**Invited Speaker (IS4) Prof. Fatih İNCİ** Micro- and Nano-Systems for the Applications of Health and Beyond
14:35-14:50	**Oral Presentation (OP9) Duygu ASKER AKSOY** Encapsulation of Human Cord Blood-Derived Platelet Lysate In Nanovesicular Systems and Investigation of Its Wound Healing Potential

November 05, 2021 Friday

14:50-15:05	**Oral Presentation (OP10) İpek CANATAR** Pterostilbene Loaded Cryogel Membranes as Potential Wound Dressing Material: Preparation, Characterization, and *In Vitro* Studies
15:05-15:20	**Oral Presentation (OP11) Burcu EREN** Laccase Purification from Fermentation Medium using Cryogel Columns
15:20-15:45	**Coffee Break**
Session 5 – Chair: Prof. Şükrü BEYDEMİR	***Mirage I***
15:45-16:20	**Invited Speaker (IS5) Prof. Alexandrino FERNANDES** Understanding Enzymatic Mechanisms and Improving Enzyme's Catalytic Power with the Help of Computational
16:20-16:35	**Oral Presentation (OP12) Burhan ATEŞ** Near Infrared Light (NIR)-Propelled Upconverting Nanoparticles (UCNP) Carriers to Enhance L-Asparaginase Catalytic Activity: A Promising Strategy for Biotechnological Enzyme Drugs
16:35-16:50	**Oral Presentation (OP13) Beste TURANLI** Identification of Cervical Cancer Sub-type Specific Molecular Targets, Biomarkers and Repurposed Drug Candidates
16:50-17:05	**Oral Presentation (OP14) Mehmet ÖZBİL** Neisseria meningitidis Transferrin Binding Protein A (TbpA) Rearranges Itself for Binding Human Transferrin Protein (hTf)
17:05-17:20	**Coffee Break**

November 05, 2021 Friday

	Short Oral Presentation Chair 1: Prof. Nagihan Ertunga/Chair 2: Prof. Kazım Arğa *Mirage I*	Short Oral Presentation Chair 1: Prof. Azra B. BÜKEN/Chair 2: Prof. Zühal GÜVENALP *Odeon*
17:20-17:25	**Oral Presentation (OP35) DENİZ EMRE ŞEKER**	**Oral Presentation (OP55) Leman TARHAN**
	Antimicrobial Tenture Extraction from Hypericum Perforatum L. and Helicyrsum Arenarium with Phenolic Compund Determination	Entrapment of Amycolatopsis Orientalis 40040 in Modified Alginate and PVA Gels, and Antibiotic Vancomycin Production Capacities
17:25-17:30	**Oral Presentation (OP36) Aslıhan AYVAZ**	**Oral Presentation (OP56) Emine KARACA**
	Synthesis of New Derivatives of Quinolone Class Antibiotics Containing Thiazole Ring	Anti-Cancer Effect of Diffractaic Acid on Hepatocellular Carcinoma through Inducing of Apoptosis and Suppression of Metastasis
17:30-17:35	**Oral Presentation (OP37) Aslıhan AYVAZ**	**Oral Presentation (OP57) Nihan SERT**
	Synthesis, Anticancer Evaluation, Molecular Docking and ADMET Properties of Novel PANC-1 Inhibitors	Isolation and Characterization of Siderophore Producing Lactic Acid Bacteria
17:35-17:40	**Oral Presentation (OP38) Kazım YALÇIN ARĞA**	**Oral Presentation (OP58) Işıl Nihan KORKMAZ**
	Novel Systems Biomarker Candidates with High Diagnostic and Prognostic Performance in Esophageal Squamous Cell Carcinoma	Investigation of the Effects of New Amino Benzohydroxamic Acid Derivatives on Enzyme Activity
17:40-17:45	**Oral Presentation (OP39) Yakup KOLCUOĞLU**	**Oral Presentation (OP59) Demet KIZIL**
	Investigation of the Effects of 1,2,4-Triazole Semicarbazide and Thiosemicarbazide Type New Compounds on hEGFR Activity	Purification and Characterization of Acetylcholinesterase from Adults and Nymphs of Ricania simulans (Walker, 1851) (Hemiptera: ricanidae) Presentation Title

November 05, 2021 Friday

17:45-17:50	**Oral Presentation (OP40) Yakup KOLCUOĞLU**	**Oral Presentation (OP60) Serpil GERNİ**
	Determination of Some Properties of 1,2,4-Triazole-3-on and 1,2,4-Triazole-3-thion Type New Compounds as Anticancer Drug Candidate Molecules	Development of a New Affinity Chromatography Method for the Purification of Horseradish Peroxidase Enzyme
17:50-17:55	**Oral Presentation (OP41) Şeyda Nur KALIN**	**Oral Presentation (OP61) Özge ÇAĞLAR**
	Diffractaic Acid Induces Cytotoxicity and Apoptosis in MCF-7 Cell Line	Preparation of Fe-ZIF-8 with Iron Mineralization Technique and Lipase Immobilization
17:55-18:00	**Oral Presentation (OP42) İsmail ÖZMEN**	**Oral Presentation (OP62) Muhammet Serhat ÖZASLAN**
	Peroxidase Immobilized Zr-Based Metal Organic Framework for Dye Decolorization	Investigation of the *In Vitro* Effects of Some Pyrroles on Glutathione Reductase Enzyme Activity
18:00-18:05	**Oral Presentation (OP43) SÜMEYYE AKBULUT**	**Oral Presentation (OP63) Aleyna NALÇAOĞLU**
	Investigation of Bacteriocin Production Potentials of Lactic Acid Bacteria Isolated From Raw Milk Samples	Isolation and Identification of Amylase and Cellulase Producing Bacteria Compatible for Detergent Industry
18:05-18:10	**Oral Presentation (OP44) Meryem TOPAL**	**Oral Presentation (OP64) Eda Mehtap ÜÇ**
	Determination of Angelica archangelica's Antioxidant Capacity and Mineral Content	Investigation of the Effect of Coniferyl Alcohol and Coniferyl Aldehyde on Some Metabolic Enzymes
18:10-18:15	**Oral Presentation (OP45) Canan ARMUTCU ÇORMAN**	**Oral Presentation (OP65) Lokman DURMAZ**
	Designing an aptasensor for Electrochemical Detection of TNT from Aqueous Solution	The Effect of Isofraxıdıne on hCA I AND hCA II, AChE, BChE AND α-Glucosıdase Enzymes
18:15-18:20	**Oral Presentation (OP46) Ayşe TORAMAN**	**Oral Presentation (OP66) Nurgül ABUL**
	Evaluation of Oxidative Damage and Inflammation in Periodontal Tissues of Rats with Paclitaxel-Induced Neuropathic Pain	Evaluation of Nicotinic Acid Hydrazides as Cholinesterase Inhibitors

November 05, 2021 Friday

18:20-18:25	**Oral Presentation (OP47) Hilal FAZLI**	**Oral Presentation (OP67) Zeynebe BİNGÖL**
	Anticancer Drug Candidate Synthesis of Novel Heterocyclic Compounds Containing 3-Aryl-5-Alkyl-1*H*-1,2,4-Triazole Ring	Investigation of the Inhibition Effect of 1,1,2-Tetrakis (*p*-hydroxyphenyl) Ethane Molecule on Acetylcholinesterase, Butyrylcholinesterase and α-Glycosidase Enzymes
18:25-18:30	**Oral Presentation (OP48) Hilal FAZLI**	**Oral Presentation (OP68) Raziye OZTURK UREK**
	Synthesis of 3,5-Diaryl-1,2,4-triazol Substituted 1,2,4-Triazole-3-thion(one) Derivatives with hEGFR Inhibition Potential	Phenolic Compositions and Biological Activities of Stachys Species from Turkey
18:30-18:35	**Oral Presentation (OP49) Emine TORAMAN**	**Oral Presentation (OP69) Aylin ÖNER**
	The Effect of Parthenolide on Testicular Oxidative Stress during Paclitaxel-Induced Neuropathic Pain in Rat	Investigation of Phenolic Profile, Antioxidant and Anticancer Potential of Phlomis angustissima and Phlomis fruticosa
18:35-18:40	**Oral Presentation (OP50) Berna HUKKAMLI**	**Oral Presentation (OP70) Hatice KIZILTAŞ**
	A Comparative Study on Antioxidant System in Mouse Liver and Kidney Affected by Lipopolysaccharide-Induced Inflammation	Antioxidant Activity of Water Extracts of Astragalus fabaceus M. Bieb' aerial Parts
18:40-18:45	**Oral Presentation (OP51) Bülent ŞENGÜL**	**Oral Presentation (OP71) Esma CEYLAN**
	Inhibition Effects of Benzaldehyde Derivatives on Aldose Reductase Enzyme	Isolation, Characterization and Identification of Lipase and Protease Producing Bacteria Compatible for Detergent Industry
18:45-18:50	**Oral Presentation (OP52) Fevzi TOPAL**	**Oral Presentation (OP72) Ismet Burcu TURKYILMAZ**
	Terminalia citrina Roxb. Ex. Fleming Determination of Antioxidant Capacity, Phenolic Content and Investigation of Their Effects on Cholinesterase Enzymes	Protective Effects of Metformin Against Diabetes-Induced Lens Damage and Dunning Prostate Cancer Model

November 05, 2021 Friday

18:50-18:55	**Oral Presentation (OP53) Münevver Müge ÇAĞAL** *In Vitro* Cytotoxic Effects of Liposomal Formulation of Melissa officinalis Ethanol Extract	**Oral Presentation (OP73) Ahmet ÇETİN** Investigation of the Protective Effect of Salvia officinalis Extract against Epithelial Damage Caused by Paclitaxel
18:55-19:00	**Oral Presentation (OP54) Hande BALYAPAN** Gel Formulation of Nanostructured Lipid Carriers Developed for Topical Treatment of Melanoma	**Oral Presentation (OP74) Ahmet Burak BERK** Development of Molecularly Imprinted Polymers for Electrochemical Detection of TNT from Aqueous Solution
19:00-20:00	**Poster Presentations (PP01-PP53 and OP35-OP109)**	***Mirage I-II***
20:00-	**Dinner**	

November 06, 2021 Saturday

Session 6 – Chair: Prof. Lokman UZUN		***Mirage I***
09:00-09:35	**Invited Speaker (IS6) Prof. Frank HOLLMANN** Peroxygenase-catalysed Oxyfunctionalistation Reactions	
09:35-09:50	**Oral Presentation (OP15) Mehmet KAHRAMAN** Label-Free Biosensing on Plasmonic Nanostructures using SERS	
09:50-10:05	**Oral Presentation (OP16) Barış BİNAY** Pichia Pastoris Expression Systems for Producing Biocatalyst: Case Studies	
10:05-10:20	**Oral Presentation (OP17) Yunus ENSARİ** Revealing Substrate Scope of Novel Self-Sufficient P450 Monooxygenase	
10:20-10:35	**Oral Presentation (OP18) Dmitry BURMYKIN (Terra)** Non-targeted Metabolomics Approach Based on LC-QTOF Data and Software-Assisted Metabolite Detection and Identification	
10:35-10:55	**Coffee Break**	
Session7 – Chair: Prof. Burhan ATEŞ		***Mirage I***
10:55-11:30	**Invited Speaker (IS7) Prof. Gizem DÖNMEZ YALÇIN** The Investigation of Glutamate Metabolism and Its Modulators in Glioblastoma	
10:30-11:45	**Oral Presentation (OP19) Ismet Burcu TURKYILMAZ** Melatonin and Carnosine Ameliorate Ionizing Radiation-Induced Oxidative Brain Damage in Rats	

November 06, 2021 Saturday

11:45-12:00	**Oral Presentation (OP20) Zühal GÜVENALP** Evaluation of Antidiabetic Effect of Paeonia mascula L., Isolation and Structure Elucidation of the Compounds Responsible from the Effect
12:00-12:15	**Oral Presentation (OP21) Mariia NESTERKİNA** Terpene Derivatives: Skin Permeation Enhancers with Own Biological Activity
12:15-12:30	**Oral Presentation (OP22) M. Tekin ŞENSOY (Redoks)** Thermo Scientific Orbitrap Ultra High Resolution Mass Spectrometer
12:30-14:00	**Lunch**
Session 8 – Chair: Prof. Bilge Hilal CADIRCI EFELİ	***Mirage I***
14:00-14:35	**Invited Speaker (IS8) Prof. Hasan TÜRKEZ** Opportunities and Challenges of Boron Neutron Capture Therapy (BNCT) in Medical Oncology
14:35-14:50	**Oral Presentation (OP23) Safacan KÖLEMEN** Activatable Luciferin Derivatives for Bioluminescence Imaging of Cancer Cells
14:50-15:05	**Oral Presentation (OP24) İsmail KIRAN** Biotransformation of (1R,2R,5R)-(+)-2-Hydroxy-Pinanone by 14 Fungi and Antimicrobial Evaluation
15:05-15:20	**Oral Presentation (OP25) Aykut ÖZGÜR** Green Synthesis of Silver Nanoparticles Using Armillaria Mellea and Xerocomellus Chrysenteron Extracts and Evaluation of Their Antimicrobial and Anticancer Potentials

November 06, 2021 Saturday

15:20-15:35	**Oral Presentation (OP26) Suna Uçan (SEM)**	
	Metabolomics Workflow	
15:35-16:00	**Coffee Break**	
	Short Oral Presentation **Chair 1: Prof. Hamdullah KILIÇ/Chair 2: Prof. Deniz YILDIRIM** ***Mirage I***	**Short Oral Presentation** **Chair 1: Prof. Elif OZYILMAZ/Chair 2: Prof. Murat ÇANKAYA** **Phoenix II**
16:00-16:05	**Oral Presentation (OP75) Muhammet KARAMAN**	**Oral Presentation (OP92) Ercan BURSAL**
	Novel Schiff Base Derivative Glucose-6-Phosphate Dehydrogenase (G6PD) Inhibitors Suppress Proliferation of Cancer Cells by Blocking Pentose Phosphate Pathway	Acetylcholinesterase and Butyrylcholinesterase Enzyme Interactions of Major Phenolic Compounds of Some Plant Species: An *In Silico* Study
16:05-16:10	**Oral Presentation (OP76) Onur Can BODUR**	**Oral Presentation (OP93) Ercan BURSAL**
	A Tyrosinase Based Amperometric Biosensor for Determination of Dopamine	Phenolic Content and Antioxidant Activity Analyses of Propolis Samples from Different Regions of Turkey
16:10-16:15	**Oral Presentation (OP77) Şükran GÜNAYDIN**	**Oral Presentation (OP94) Sema MISIR**
	Investigation of Thioredoxin Reductase-Targeted Anticancer Effect of Diffractaic Acid	Development and Characterization of BSA-loaded Paclitaxel; Cytotoxic Activity in MCF7 Cancer Cells
16:15-16:20	**Oral Presentation (OP78) Emrah POLAT**	**Oral Presentation (OP95) Hilal ÖZBEK**
	Investigation of Anti-Cancer Effects of Enantiomerically Pure (S)-4-Aminoquinazoline Derivatives on Human Liver (HepG2) Cancer Cell Line	Phytopharmaceutical Potential of Polygonum Cognatum Meissn.
16:20-16:25	**Oral Presentation (OP79) Osman Nuri ASLAN**	**Oral Presentation (OP96) Mesut IŞIK**
	Synthesis and Potentiometric Sensor Applications of a Pyrazole Derivative Molecule	Synthesis, Characterization, Biological Evaluation and Molecular Docking Studies of Novel Azoimine Compounds with Sulfisoxazole Backbone

November 06, 2021 Saturday

16:25-16:30	**Oral Presentation (OP80) Erbay KALAY**	**Oral Presentation (OP97) Seda KOLAK**
	The Enantioselective Reduction of 1-Indanone using L Paracasei BD71 Whole-Cell Biocatalysts	Determination of Dichlorvos (DCV) using Electrospun Polymer Coated Surfaces in Magnetoelastic Sensors
16:30-16:35	**Oral Presentation (OP81) Fatma Pınar GÖRDESLİ DUATEPE**	**Oral Presentation (OP98) ESMA KÜBRA KAĞAN YENİÇERİ**
	Atomic Force Microscopy Investigation of the Adhesion and Mechanics of Planktonic and Biofilm-Dispersed E. Coli Cells	New Schiff Base Ligand-Complexes: Synthesis, Characterization and Biological Evaluation
16:35-16:40	**Oral Presentation (OP82) Fatima UZAR**	**Oral Presentation (OP99) Sevgi ALTIN**
	Comparison of Phenolic Compound Content of Laurus Nobilis Fresh and Dry Methanolic Leaf Extracts	Investigation of In Vitro Cytotoxic Effects of Different Extracts of Endemic Achillea Sintenisii Against MCF-7, MDA-MB-453 and HT-29 Human Cancer Cell Lines
16:40-16:45	**Oral Presentation (OP83) Zeynep BAYAT SARIOĞLU**	**Oral Presentation (OP9100) Zehra Betül TORTUMLU**
	Purification of Lipase Enzyme from Bovine Pancreas and Investigation of Inhibition Effects of Propolis Extracts on This Enzyme Activity	Investigation of the Inhibitory Effect of Carnosic Acid on Human Carbonic Anhydrase Isoenzymes
16:45-16:50	**Oral Presentation (OP84) Esra Tuba DEMİR**	**Oral Presentation (OP101) Samed ŞİMŞEK**
	Synergistic Anti-Cancer Effects of Alchemilla Vulgaris and Docetaxel on Prostate Cancer PC-3 Cell Line	Iridoid Glycosides from Endemic Verbascum leiocarpum
16:50-16:55	**Oral Presentation (OP85) Marium SABA**	**Oral Presentation (OP102) Berivan KAÇMAZ**
	Preparation and nutritional enhancement of Crackers by using Resistant Starch Corn Flour and propolis	Evaluation of Wound Healing Effect of Cichorium Intybus L.'s Stem Methanol Extract
16:55-17:00	**Oral Presentation (OP86) Mehmet Emin ÇORMAN**	**Oral Presentation (OP103) Yakup ULUTAŞ**
	Particle Assisted Molecularly Imprinted Membrane for the Determination of Fluoxetine	Isolation of Secondary Metabolites from an Endemic Plant Scrophularia erzincanica

November 06, 2021 Saturday

17:00-17:05	**Oral Presentation (OP87) Rüya SAĞLAMTAŞ**	**Oral Presentation (OP104) Cemalettin ALP**
	Determination of Enzyme Inhibition and Antibacterial Effect of Resin Obtained from Pistacia terebinthus	Investigation of the Cytotoxic Effect of Different Extracts of Lallemantia Canescens (L) Fisch & Fruit Plant on Cancer Cell Lines
17:05-17:10	**Oral Presentation (OP88) Ekrem KÖKSAL**	**Oral Presentation (OP105) Gözde YILDIRIM**
	Investigation of Antioxidant Activity of Hemp (Cannabis sativa) Seed Oil and Determination of Chemical Profile by LC-HRMS and GCMS	Enhancing Storage Stability of Fresh Eggs With Ultrasonication
17:10-17:15	**Oral Presentation (OP89) Hüseyin AKŞİT**	**Oral Presentation (OP106) Gamze DİK**
	Antiproliferative Effects of Three Endemic Sideritis Species: S. Libanotica, S. Germanicopolitana and S. Perfoliata	Immobilization of α-Amylase onto Quantum Dots Prepared from Hypericum perforatum L. Flower-Based.
17:15-17:20	**Oral Presentation (OP90) Duygu MISIRLI**	**Oral Presentation (OP107) Ramazan KALIN**
	Effect of Extraction Methods on Individual Phenolic Compounds in Laurus Nobilis Leaves	The Determination of Inhibitory Properties of Resorcinol Derivatives on Bovine Lactoperoxidase Enzyme
17:20-17:25	**Oral Presentation (OP91) Saffet ÇELİK**	**Oral Presentation (OP108) Faik GÖKALP**
	Analysis Targeted Organic Acids in Bee Venom	A Research For The Pharmacological Properties Of Ecballium Elaterium
17:25-17:30	**Oral Presentation**	**Oral Presentation (OP109) Fatih TOZOĞLU**
		Assessment of Antiradical and Anticholinergic Effects of Wild Cherry (Cerasus avium L.) Stem
17:30-19:30	**Poster Presentations (PP01-PP53 and OP35-OP109)**	***Mirage III***
19:30-	**Dinner**	

November 07, 2021 Sunday

Session 9 – Chair: Prof. İsmail KIRAN		***Mirage I***
09:00-09:35	**Invited Speaker (IS9) Prof. Abdullah YALÇIN**	
	Regulation of Mitochondrial Dynamics During Gestational Diabetes mellitus	
09:35-09:50	**Oral Presentation (OP27) Nese AYSİT**	
	Multiparametric Investigation of Neuronal Effects of Gold Nanorods with Various Surface Coatings	
09:50-10:05	**Oral Presentation (OP28) Deryanur KILIC**	
	Identification of Novel Selective Estrogen Receptor Alpha Antagonists: Virtual Screening, Molecular Dynamics Simulations	
10:05-10:20	**Oral Presentation (OP29) Elif Sibel ASLAN**	
	Expression and Biochemical Characterization of Hypsibius dujardini Epoxide Hydrolase (HdEH) Enzyme in Pichia pastoris	
10:20-10:35	**Oral Presentation (OP30) Emel DEMİRTAŞ**	
	Development of Molecular Imprinted Cryogel Membranes for Purification of Naringenin	
10:35-10:55	**Coffee Break**	
Session 10 – Chair: Prof. Mehmet ODABAŞI		***Mirage I***
10:55-11:30	**Invited Speaker (IS10)-(ONLINE) Prof. SEPPO VAINIO**	
	A Road Map Towards Non-Invasive Molecular Digital Biosensors	

November 07, 2021 Sunday

10:30-11:45	**Oral Presentation (OP31) Kadir BOZTAŞ**
	Antioxidant and Thioredoxin Reductase and Trypsin Inhibitor Activities of Honey, Bee Pollen and Bee Bread
11:45-12:00	**Oral Presentation (OP32) Buse ÇALOĞLU**
	Production of High Value-Added Proteins with Enzyme Engineering Techniques and Bioprocess Development
12:00-12:15	**Oral Presentation (OP33) Gizem TUTAR**
	Development of Nanostructured Lipid Carriers for Melanoma Treatment
12:15-12:30	**Oral Presentation (OP34) Melis SERCAN**
	The Impact of the Reference Database Selection on Activated Sludge Microbiome Analysis
12:30-13:30	**Closing Session**
	Awards for Poster Presentation
	Closing Ceremony

TITLE OF PRESENTATIONS

INVITED SPEAKER (IS)		
IS1	LAWRENCE BERLINER	New Approaches to Biotechnology Analytical Sciences using Electron Spin Resonance (ESR) Spectroscopy
IS2	REINHARD STERNER	Analysis of Allosteric Communication in a Multi-Enzyme Complex by Ancestral Sequence Reconstruction
IS3	KARSTEN HAUPT	Molecularly Imprinted Polymer Nanogels - Synthetic Antibody Mimics for Diagnostics and Therapy
IS4	FATİH İNCİ	Micro- and Nano-Systems for the Applications of Health and Beyond
IS5	ALEXANDRINO FERNANDES	Understanding Enzymatic Mechanisms and Improving Enzyme's Catalytic Power with the Help of Computational
IS6	FRANK HOLLMANN	Peroxygenase-catalysed Oxyfunctionalistation Reactions
IS7	GİZEM DÖNMEZ YALÇIN	The Investigation of Glutamate Metabolism and Its Modulators in Glioblastoma
IS8	HASAN TÜRKEZ	Opportunities and Challenges of Boron Neutron Capture Therapy (BNCT) in Medical Oncology
IS9	ABDULLAH YALÇIN	Regulation of Mitochondrial Dynamics During Gestational Diabetes Mellitus
IS10	SEPPO VAINIO (ONLINE)	A Road Map Towards Non-Invasive Molecular Digital Biosensors
ORAL PRESENTATION (OP)		
OP1	İSA GÖKÇE	Development of One-Step RT-PCR Kit for Diagnosis of COVID-19
OP2	ABEER ALESKNDRANY	A Comparative Study of the Effects of L-T4 and L-T3 on Zwitterionic DPPC Model Membranes
OP3	MÜGE ANDAÇ	Molecular Modeling of Endocrine Disrupting Chemicals and Amino Acids
OP4	FULYA ÇAĞLAR	Selection of DNA Aptamer(s) to Inhibit c-Fos Protein Interactions
OP5	PİNAR CAKİR HATİR	Molecularly Imprinted Polymer Nanoparticles from Renewable Resources for Biomedical Applications

ORAL PRESENTATION (OP)

OP6	KAZIM KÖSE	Use of Cellulose Nanomaterials for Modification of Polymeric Adsorbents and Determination of Their Adsorption Performance
OP7	KEREM TOK	Selective Isolation of SARS-CoV-2 Antigens Using Affinity Material for Mass Spectrometry Profiling and Diagnosis
OP8	MARİUM SABA	Synthesis of Keratin Micro-Particles From Feathers Hydrolysate, Their Characterization and Evaluation of Antimicrobial and Antioxidant Activities
OP9	DUYGU ASKER AKSOY	Encapsulation of Human Cord Blood-Derived Platelet Lysate In Nanovesicular Systems and Investigation of Its Wound Healing Potential
OP10	İPEK CANATAR	Pterostilbene Loaded Cryogel Membranes as Potential Wound Dressing Material: Preparation, Characterization, and *In Vitro* Studies
OP11	BURCU EREN	Laccase Purification from Fermentation Medium using Cryogel Columns
OP12	BURHAN ATEŞ	Near Infrared Light (NIR)-Propelled Upconverting Nanoparticles (UCNP) Carriers to Enhance L -Asparaginase Catalytic Activity: A Promising Strategy for Biotechnological Enzyme Drugs
OP13	BESTE TURANLI	Identification of Cervical Cancer Sub-Type Specific Molecular Targets, Biomarkers and Repurposed Drug Candidates
OP14	MEHMET ÖZBİL	Neisseria meningitidis Transferrin Binding Protein A (TbpA) Rearranges Itself For Binding Human Transferrin Protein (hTf)
OP15	MEHMET KAHRAMAN	Label-Free Biosensing on Plasmonic Nanostructures Using SERS
OP16	BARIŞ BİNAY	Pichia Pastoris Expression Systems for Producing Biocatalyst: Case Studies
OP17	YUNUS ENSARİ	Revealing Substrate Scope of Novel Self-Sufficient P450 Monooxygenase
OP18	DMITRY BURMYKIN (Terra)	Non-targeted Metabolomics Approach Based on LC-QTOF Data and Software-Assisted Metabolite Detection and Identification
OP19	ISMET BURCU TURKYILMAZ	Melatonin and Carnosine Ameliorate Ionizing Radiation-Induced Oxidative Brain Damage in Rats
OP20	ZÜHAL GÜVENALP	Evaluation of Antidiabetic Effect of Paeonia mascula L., Isolation and Structure Elucidation of the Compounds Responsible from the Effect

ORAL PRESENTATION (OP)

OP21	MARİİA NESTERKİNA	Terpene Derivatives: Skin Permeation Enhancers with Own Biological Activity
OP22	M. TEKİN ŞENSOY (Redoks)	Thermo Scientific Orbitrap Ultra High Resolution Mass Spectrometer
OP23	SAFACAN KÖLEMEN	Activatable Luciferin Derivatives for Bioluminescence Imaging of Cancer Cells
OP24	İSMAİL KIRAN	Biotransformation of (1R,2R,5R)-(+)-2-Hydroxy-Pinanone by 14 Fungi and Antimicrobial Evaluation
OP25	AYKUT ÖZGÜR	Green Synthesis of Silver Nanoparticles Using Armillaria mellea and Xerocomellus chrysenteron Extracts and Evaluation of Their Antimicrobial and Anticancer Potentials
OP26	SUNA UÇAN (SEM)	Metabolomics Workflow
OP27	NESE AYSİT	Multiparametric Investigation of Neuronal Effects of Gold Nanorods with Various Surface Coatings
OP28	DERYANUR KILIC	Identification of Novel Selective Estrogen Receptor Alpha Antagonists: Virtual Screening, Molecular Dynamics Simulations
OP29	ELİF SİBEL ASLAN	Expression and Biochemical Characterization of Hypsibius dujardini Epoxide Hydrolase (HdEH) Enzyme in Pichia pastoris
OP30	EMEL DEMİRTAŞ	Development of Molecular Imprinted Cryogel Membranes for Purification of Naringenin
OP31	KADİR BOZTAŞ	Antioxidant and Thioredoxin Reductase and Trypsin Inhibitor Activities of Honey, Bee Pollen and Bee Bread
OP32	BUSE ÇALOĞLU	Production Of High Value-Added Proteins With Enzyme Engineering Techniques and Bioprocess Development
OP33	GİZEM TUTAR	Development of Nanostructured Lipid Carriers for Melanoma Treatment
OP34	MELİS SERCAN	The Impact of the Reference Database Selection on Activated Sludge Microbiome Analysis
OP35	DENİZ EMRE ŞEKER	Antimicrobial Tenture Extraction from Hypericum Perforatum L. and Helicyrsum Arenarium with Phenolic Compund Determination
OP36	ASLIHAN AYVAZ	Synthesis of New Derivatives of Quinolone Class Antibiotics Containing Thiazole Ring
OP37	ASLIHAN AYVAZ	Synthesis, Anticancer Evaluation, Molecular Docking and ADMET Properties of Novel PANC-1 Inhibitors

ORAL PRESENTATION (OP)

OP38	GİZEM GULFİDAN	Novel Systems Biomarker Candidates with High Diagnostic and Prognostic Performance in Esophageal Squamous Cell Carcinoma
OP39	YAKUP KOLCUOĞLU	Investigation of the Effects of 1,2,4-Triazole Semicarbazide and Thiosemicarbazide Type New Compounds on hEGFR Activity
OP40	YAKUP KOLCUOĞLU	Determination of Some Properties of 1,2,4-Triazole-3-on and 1,2,4-Triazole-3-thion Type New Compounds as Anticancer Drug Candidate Molecules
OP41	ŞEYDA NUR KALIN	Diffractaic Acid Induces Cytotoxicity and Apoptosis in MCF-7 Cell Line
OP42	İSMAİL ÖZMEN	Peroxidase İmmobilized Zr-Based Metal Organic Framework for Dye Decolorization
OP43	SÜMEYYE AKBULUT	Investigation of Bacteriocin Production Potentials of Lactic Acid Bacteria Isolated From Raw Milk Samples
OP44	MERYEM TOPAL	Determination of Angelica archangelica's Antioxidant Capacity and Mineral Content
OP45	CANAN ARMUTCU ÇORMAN	Designing an Aptasensor for Electrochemical Detection of TNT from Aqueous Solution
OP46	AYŞE TORAMAN	Evaluation of Oxidative Damage and Inflammation in Periodontal Tissues of Rats with Paclitaxel-Induced Neuropathic Pain
OP47	HİLAL FAZLI	Anticancer Drug Candidate Synthesis of Novel Heterocyclic Compounds Containing 3-Aryl-5-Alkyl-1H-1,2,4-Triazole Ring
OP48	HİLAL FAZLI	Synthesis of 3,5-Diaryl-1,2,4-triazol Substituted 1,2,4-Triazole-3-thion(one) Derivatives with hEGFR Inhibition Potential
OP49	EMİNE TORAMAN	The Effect of Parthenolide on Testicular Oxidative Stress during Paclitaxel-Induced Neuropathic Pain in Rat
OP50	BERNA HUKKAMLI	A Comparative Study on Antioxidant System in Mouse Liver and Kidney Affected by Lipopolysaccharide-Induced Inflammation
OP51	BÜLENT ŞENGÜL	Inhibition Effects of Benzaldehyde Derivatives on Aldose Reductase Enzyme
OP52	FEVZİ TOPAL	Terminalia citrina Roxb. Ex. Fleming Determination of Antioxidant Capacity, Phenolic Content and Investigation of Their Effects on Cholinesterase Enzymes
OP53	MÜNEVVER MÜGE ÇAĞAL	In Vitro Cytotoxic Effects of Liposomal Formulation of Melissa officinalis Ethanol Extract

ORAL PRESENTATION (OP)

OP54	HANDE BALYAPAN	Gel Formulation of Nanostructured Lipid Carriers Developed for Topical Treatment of Melanoma
OP55	LEMAN TARHAN	Entrapment of Amycolatopsis orientalis 40040 in Modified Alginate and PVA Gels, and Antibiotic Vancomycin Production Capacities
OP56	EMİNE KARACA	Anti-Cancer Effect of Diffractaic Acid on Hepatocellular Carcinoma through Inducing of Apoptosis and Suppression of Metastasis
OP57	NİHAN SERT	Isolation and Characterization of Siderophore Producing Lactic Acid Bacteria
OP58	IŞIL NİHAN KORKMAZ	Investigation of the Effects of New Amino Benzohydroxamic Acid Derivatives on Enzyme Activity
OP59	DEMET KIZIL	Purification and Characterization of Acetylcholinesterase from Adults and Nymphs of Ricania simulans (Walker, 1851) (Hemiptera: ricanidae) Presentation Title
OP60	SERPİL GERNİ	Development of a New Affinity Chromatography Method for the Purification of Horseradish Peroxidase Enzyme
OP61	ÖZGE ÇAĞLAR	Preparation of Fe-ZIF-8 with Iron Mineralization Technique and Lipase Immobilization
OP62	MUHAMMET SERHAT ÖZASLAN	Investigation of The *In Vitro* Effects of Some Pyrroles on Glutathione Reductase Enzyme Activity
OP63	ALEYNA NALÇAOĞLU	Isolation and Identification of Amylase and Cellulase Producing Bacteria Compatible for Detergent Industry
OP64	EDA MEHTAP ÜÇ	Investigation of the Effect of Coniferyl Alcohol and Coniferyl Aldehyde on Some Metabolic Enzymes
OP65	LOKMAN DURMAZ	THE EFFECT OF ISOFRAXIDINE ON hCA I AND hCA II, AChE, BChE AND α-GLUCOSIDASE ENZYMES
OP66	NURGÜL ABUL	Evaluation of Nicotinic Acid Hydrazides as Cholinesterase Inhibitors
OP67	ZEYNEBE BİNGÖL	Investigation of the Inhibition Effect of 1,1,2-Tetrakis (p-hydroxyphenyl) Ethane Molecule on Acetylcholinesterase, Butyrylcholinesterase and α-Glycosidase Enzymes
OP68	RAZİYE OZTURK UREK	Phenolic Compositions and Biological Activities of Stachys Species from Turkey
OP69	AYLİN ÖNER	Investigation of Phenolic Profile, Antioxidant and Anticancer Potential of Phlomis angustissima and Phlomis fruticosa

ORAL PRESENTATION (OP)

OP70	HATİCE KIZILTAŞ	Antioxidant Activity of water extracts of Astragalus Fabaceus M. Bieb' aerial Parts
OP71	ESMA CEYLAN	Isolation, Characterization and Identification of Lipase and Protease Producing Bacteria Compatible for Detergent Industry
OP72	ISMET BURCU TURKYILMAZ	Protective Effects of Metformin Against Diabetes-Induced Lens Damage and Dunning Prostate Cancer Model
OP73	AHMET ÇETİN	Investigation of the Protective Effect of Salvia officinalis Extract against Epithelial Damage Caused by Paclitaxel
OP74	AHMET BURAK BERK	Development of Molecularly Imprinted Polymers for Electrochemical Detection of TNT from Aqueous Solution
OP75	MUHAMMET KARAMAN	Novel Schiff Base Derivative Glucose-6-Phosphate Dehydrogenase (G6PD) Inhibitors Suppress Proliferation of Cancer Cells by Blocking Pentose Phosphate Pathway
OP76	ONUR CAN BODUR	A Tyrosinase Based Amperometric Biosensor for Determination of Dopamine
OP77	ŞÜKRAN GÜNAYDIN	Investigation of Thioredoxin Reductase-Targeted Anticancer Effect of Diffractaic Acid
OP78	EMRAH POLAT	Investigation of Anti-Cancer Effects of Enantiomerically Pure (S)-4-Aminoquinazoline Derivatives on Human Liver (HepG2) Cancer Cell Line
OP79	OSMAN NURİ ASLAN	Synthesis and Potentiometric Sensor Applications of a Pyrazole Derivative Molecule
OP80	ERBAY KALAY	The enantioselective reduction of 1-indanone using L paracasei BD71 whole-cell biocatalysts
OP81	FATMA PINAR GÖRDESLİ DUATEPE	Atomic Force Microscopy Investigation of the Adhesion and Mechanics of Planktonic and Biofilm-Dispersed E. Coli Cells
OP82	FATİMA UZAR	Comparison of Phenolic Compound Content of Laurus nobilis Fresh and Dry Methanolic Leaf Extracts
OP83	ZEYNEP BAYAT SARIOĞLU	Purification of Lipase Enzyme from Bovine Pancreas And Investigation of Inhibition Effects of Propolis Extracts on This Enzyme Activity
OP84	ESRA TUBA DEMİR	Synergistic Anti-Cancer Effects of Alchemilla vulgaris and Docetaxel on Prostate Cancer PC-3 Cell Line
OP85	MARİUM SABA	Preparation and Nutritional Enhancement of Crackers by using Resistant Starch Corn Flour and Propolis
OP86	MEHMET EMİN ÇORMAN	Particle Assisted Molecularly Imprinted Membrane for the Determination of Fluoxetine

ORAL PRESENTATION (OP)

OP87	RÜYA SAĞLAMTAŞ	Determination of Enzyme Inhibition and Antibacterial Effect of Resin Obtained from Pistacia terebinthus
OP88	EKREM KÖKSAL	Investigation of Antioxidant Activity of Hemp (Cannabis sativa) Seed Oil and Determination of Chemical Profile by LC-HRMS and GCMS
OP89	HÜSEYİN AKŞİT	Antiproliferative Effects of Three Endemic Sideritis Species: S. libanotica, S. germanicopolitana and S. perfoliata
OP90	DUYGU MISIRLI	Effect of Extraction Methods on Individual Phenolic Compounds in Laurus nobilis Leaves
OP91	SAFFET ÇELİK	Analysis Targeted Organic Acids in Bee Venom
OP92	ERCAN BURSAL	Acetylcholinesterase and Butyrylcholinesterase Enzyme Interactions of Major Phenolic Compounds of Some Plant Species: An in silico Study
OP93	ERCAN BURSAL	Phenolic Content and Antioxidant Activity Analyses of Propolis Samples from Different Regions of Turkey
OP94	SEMA MISIR	Development and Characterization of BSA-loaded Paclitaxel; Cytotoxic Activity in MCF7 Cancer Cells
OP95	HİLAL ÖZBEK	Phytopharmaceutical Potential of Polygonum Cognatum Meissn.
OP96	MESUT IŞIK	Synthesis, Characterization, Biological Evaluation and Molecular Docking Studies of Novel Azoimine Compounds with Sulfisoxazole Backbone
OP97	SEDA KOLAK	Determination of Dichlorvos (DCV) Using Electrospun Polymer Coated Surfaces in Magnetoelastic Sensors
OP98	ESMA KÜBRA KAĞAN YENİÇERİ	New Schiff Base Ligand-Complexes: Synthesis, Characterization and Biological Evaluation
OP99	SEVGİ ALTIN	Investigation of In Vitro Cytotoxic Effects of Different Extracts of Endemic Achillea sintenisii Against MCF-7, MDA-MB-453 and HT-29 Human Cancer Cell Lines
OP100	ZEHRA BETÜL TORTUMLU	Investigation of the Inhibitory Effect of Carnosic Acid on Human Carbonic Anhydrase Isoenzymes
OP101	SAMED ŞİMŞEK	Iridoid Glycosides from Endemic Verbascum leiocarpum
OP102	BERİVAN KAÇMAZ	Evaluation of Wound Healing Effect of Cichorium intybus L.'s Stem Methanol Extract
OP103	YAKUP ULUTAŞ	Isolation of Secondary Metabolites from an Endemic Plant Scrophularia erzincanica

ORAL PRESENTATION (OP)		
OP104	CEMALETTİN ALP	Investigation of the Cytotoxic Effect of Different Extracts of Lallemantia Canescens (L) Fisch & Fruit Plant on Cancer Cell Lines
OP105	GÖZDE YILDIRIM	Enhancıng Storage Stability of Fresh Eggs with Ultrasonication
OP106	GAMZE DİK	Immobilization of α-Amylase onto Quantum Dots Prepared from Hypericum perforatum L. flower-based.
OP107	RAMAZAN KALIN	The Determination of Inhibitory Properties of Resorcinol Derivatives on Bovine Lactoperoxidase Enzyme
OP108	FAİK GÖKALP	A Research For The Pharmacological Properties Of Ecballium Elaterium
OP109	FATİH TOZOĞLU	Assessment of Antiradical and Anticholinergic Effects of Wild Cherry (Cerasus avium L.) Stem
POSTER PRESENTATION (PP)		
PP1	ASEL AYDEĞER	The Effects of Gold Nanorods with Various Surface Modifications on In vivo Toxicity and Biodistribution in Mice
PP2	ÖMER İRFAN KÜFREVİOĞLU	A New Thermostable Laccase From Bacillus licheniformis O12, Purification using One-Step Affinity Chromatography, Its Characterization and Potential for Decolorization
PP3	ÖMER İRFAN KÜFREVİOĞLU	Inhibition Effects of Fluorophenyl thiourea Compounds on Glucose-6-Phosphate Dehydrogenase Enzyme Activity
PP4	ESRA TANRIVERDİ EÇİK	Synthesis of Novel Photosensitizers and Controlled Singlet Oxygen Generation for Photodynamic Therapy
PP5	HANDE BEKLEN	Differential Interactome Based Drug Repositioning Unraveled Potential Therapeutics for Colorectal Cancers
PP6	AYŞE MİNE SARIDAĞ	Layer-by-Layer Assembly of Silver Nanoparticles on Diatom Frustules for Characterization of Bacteria Using SERS
PP7	NİHAN SERT	Siderophore Producing Environmental Bacteria
PP8	KAZIM KÖSE	Removal of Micro-Pollutants with CNC-Modified Polymeric Cryogels
PP9	BERTAN BORAN BAYRAK	Vitamin U Protects Brain Injury in Rats Administered with D-Galactosamine

POSTER PRESENTATION (PP)

PP10	BERTAN BORAN BAYRAK	The Effects of Moringa oleifera Lam. Extract on Sodium Valproate-Induced Oxidative Brain Injury in Rats
PP11	FATMA YAŞAR BOZTAŞ	Inhibitory Effects of Some Drug Substances on Alpha-Glucosidase Activity
PP12	ŞEYDA ÇİĞDEM ÖZKAN	Investigation of Interactions of Some Water-Soluble Calix[4]arenes with Some Amino Acids
PP13	FULYA ÖZDEMİR	An Alternative Biomaterial: 3D Printed Algal Scaffolds
PP14	SENA PİŞKİN	Controlled Release of Anakinra from Hyaluronic Acid Coated Chitosan Double-Shelled Microspheres
PP15	MÜNEVVER MÜGE ÇAĞAL	In Vitro Antimicrobial Activity of Liposomal Formulation of Carvacrol Incorparated with β-cyclodextrin
PP16	ELİF OZYILMAZ	Preparation of ZIF-Lipase Encapsulation in the Presence of Calix[4]arene Tetracarboxylic Acid
PP17	TUĞBA KARAKAYALI	Portal Vein Injection of Drug Delivery System for Hepatocellular Carcinoma Treatment
PP18	AYÇA EREK	In Vivo Biodistribution Study of Asiaglycoprotein Targeted Magnetic Nanoparticles Administrated via Portal Vein
PP19	ŞENAY ŞANLIER	*In Vivo* Biodistribution Study of Intravenous Administrated Asialoglycoprotein Targeted Magnetic Nanoparticles
PP20	EMRECAN YILDIZ	Controlled Drug Release From Interpolymeric Complexes
PP21	GÜLİZ AK DEMİROZ	Synthesis of an LAT 1 Targeting-Conjugate for Carrier-Mediated Melanoma Treatment Strategy
PP22	GÜLİZ AK DEMİROZ	Cytotoxic Effects of EGFR/Her2 Inhibition on Lung and Ovarian Cancer
PP23	SEZGİN GÜNDÜZ	Evaluation of Drug Release Parameters of Tranexamic Acid Loaded Bone Cements
PP24	İPEK ERTUĞRUL	3D Printed Decellularized Succulent Plants: Preparation and the Characterization
PP25	MİRAÇ TÜYSÜZ	Polydopamine Coated Flexible Electrode for Glycoprotein Detection
PP26	DENİZ YİLDİRİM	Immobilization of Ene-Reductase in Polyvinyl Alcohol Hydrogel

POSTER PRESENTATION (PP)

PP27	SEDA YÜZEREN SAĞSOY	Structural Properties of DNA Aptamers Specific for c-Fos Protein
PP28	ECE VARAN	Covalent Immobilization and Characterization of D-Lactate Dehydrogenase
PP29	GÜZİDE YÜCEBİLGİÇ	Investigation of Tyrosine Kinase Enzyme Activity in Behçet's Disease
PP30	NAGİHAN SAĞLAM ERTUNGA	Antioxidant Capacity and α-Glucosidase Inhibitory Effect of Some Bryophyte Species
PP31	DİLEK ALAGÖZ	A Lactate Biosensor Based on L-Lactate Dehydrogenase Immobilized onto Carboxylated Multiwalled Carbon Nanotubes/Polyaniline/Pencil Graphite Electrode
PP32	YELİZ DEMİR	Inhibition Effect of 7-deazahypoxanthine on Some Metabolic Enzymes
PP33	YELİZ DEMİR	The Influence of Some Antibiotic Drugs on Aldose Reductase and Sorbitol Dehydrogenase Enzymes
PP34	NURHAN KİSHALI	Enzyme Inhibition Study Of Drug Candidate Isoindole Derivatives
PP35	AZRA BOZCAARMUTLU BÜKEN	Modulation of Xenobiotic Metabolizing and Antioxidant Enzyme Activities in Rainbow Trout (Oncorhynchus mykiss) by Malachite Green
PP36	ÖZGE ÇAĞLAR YILDIRIM	In Vitro Evaluation of Folate-conjugated hBN Nanoparticles
PP37	ONUR CAN BODUR	A Novel Amperometric Biosensor for Detection of Bisphenol A
PP38	ECE KARAKAYA	Bone-Mimetic Electrospun PBAT Nanofibers for Breast Cancer Metastasis
PP39	SAMİRA JEBAHİ	Efficacy of Novel Bioactive Wound-Dressing Collagen/Chitosan /Nigella Sativa Oil
PP40	MÜSLÜM KUZU	Investigation of the Effects of Amitriptyline HCl and Amoxapine on the Activity of Human Carbonic Anhydrase I-II
PP41	EDA KILIÇ	Development of Heavy Atom Decorated Dicyanomethylene-4*H*-chromene Derivatives as Activatable Photosensitizers
PP42	MUSTAFA AKBULUT	Enzyme Immobilization on Amino-Functionalized Mesoporous Magnetic Nanotubes

POSTER PRESENTATION (PP)

PP43	GAMZE DİK	Synthesis and Characterization of Polycaprolactone (PCL)/Bentonite-based Porous Nanofibers for Effective Removal of Methylene Blue from Water
PP44	BÜŞRA BAKAR	Immobilization of Xylanase onto ZIF-67 and Manganese-Doped ZIF-67 Metal-Organic Frameworks (MOFs): A Comparison Study
PP45	ALİ KURUÇAY	L-asparaginase Immobilization on Glycidoxypropyltrimethoxysilane-Functionalized Upconverting Nanoparticles (UCNPs) *via* Covalent Interaction with Enhancing Activity
PP46	FİLİZ ÇANKAYA	Investigation of Synergic Anticancer Effects of Deinoxanthin and Docetaxel in PC-3 prostate cancer cells
PP47	MİNE AKSOY	Investigation of Inhibition Effect of Organosulfur Plant Extracts on Polyphenol Oxidase Activity
PP48	ŞÜKRÜ BEYDEMİR	Novel Schiff Base Ligand-Complexes: Synthesis, Characterization, and Biological Evaluation as Aldose Reductase Inhibitors
PP49	ŞÜKRÜ BEYDEMİR	Synthesis and Biological Evaluation of Novel Schiff Base Ligand-Complexes as Potential Cholinesterase Inhibitors
PP50	HATİCE İLHAN	The Biochemical and Histopathological Investigation of the Effect of Thymoquinone on Methotrexate-Induced Kidney Damage in Rats
PP51	RABİA YILMAZ	The Effect of Barberry Plant (Berberis crataegina DC.) on Rats with Alloxan-Induced Diabetes
PP52	SEDA KOLAK	Measurement of Parathion (PRT) in Biological Samples using Electrospun Polymer Coated Surfaces with Magnetoelastic Sensors
PP53	IRYNA KRAVCHENKO	Effect of Low-Frequency Ultrasound on Transdermal Delivery of Ibuprofen Esters

INVITED SPEAKER ABSTRACTS

New Approaches to Biotechnology Analytical Sciences using Electron Spin Resonance (ESR) Spectroscopy

Lawrence J. Berliner*

Department of Chemistry, The Ohio State University and Dept. Chemistry and Biochemistry, University of Denver, Colorado

**lawrence.berliner@gmail.com*

The spin labeling technique utilizes aminoxyl radical (nitroxide) labels which are tailored to either covalently or non-covalently bind to the system of choice. The distinct advantage of electron spin resonance (ESR) or electron paramagnetic resonance (EPR) is the sensitivity to label motion. Last, it does not need optical transparency, nor are solids or aggregates necessarily problematic. Recent applications to a unique molten globule state of proteins that form molten globules and fibrils and have been applied in cancer therapy as well. Studies on the proteins α-lactalbumin and lysozyme are described, which have a labile disulfide bridge that can easily be labeled without any mutagenesis needed. They are also calcium-binding proteins that may be substituted with paramagnetic cations, such as gadolinium. These and other results promise to offer more accurate measurements of distances by EPR between spin labels and other paramagnets. We also present several examples of the use of highly sensitive ESR spin traps, which can be specific for the radical type but also act as preventative, therapeutic agents. Some features of nitrone spin traps that are desirable are long lifetimes in vivo and stability of the radical adduct. This talk hopes to review the field over the years and reveal the promise for the future.

Analysis of Allosteric Communication in a Multi-Enzyme Complex by Ancestral Sequence Reconstruction

Michael Schupfner, Kristina Straub, Rainer Merkl, Reinhard Sterner*

University of Regensburg, Institute of Biophysics and Physical Biochemistry & Regensburg Center for Biochemistry, Regensburg

**Reinhard.sterner@ur.de*

Tryptophan synthase (TS) is a heterotetrameric αββα complex. It is characterized by the channeling of the reaction intermediate indole and the mutual activation of the α-subunit TrpA and the β-subunit TrpB via a complex allosteric network. We have analyzed this allosteric network by means of ancestral sequence reconstruction (ASR), which is an *in silico* method to resurrect extinct ancestors of modern proteins.[1] In a first step, the sequences of TrpA and TrpB from the last bacterial common ancestor (LBCA) were computed by means of ASR. The corresponding LBCA TrpA and TrpB proteins were then produced in *Escherichia coli*, purified, and characterized. The results showed that LBCA TS is reminiscent of modern TS by forming an αββα complex with indole channeling taking place.[2] However, LBCA TrpA decreases the activity of LBCA TrpB whereas, for example, the modern ncTrpA from *Neptuniibacter caesarensis* increases the activity of ncTrpB. To identify those amino acid residues that are responsible for these different characteristics, all six evolutionary TrpA and TrpB intermediates that stepwise link LBCA TS with *N. caesariensis* TS were produced and characterized. Remarkably, the switching from TrpB-inhibition to TrpB-activation by TrpA occurred between two successive TS intermediates. The comparison of these intermediates and the mutual exchange of residues by iterative rounds of site-directed mutagenesis allowed us to identify four (out of 420) residues from TrpB that are necessary and sufficient for its allosteric activation by TrpA. Our results demonstrate that ancestral sequence reconstruction can efficiently identify residues essential for allosteric communication and contribute to our understanding of large multi-enzyme complexes.[3]

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Molecularly Imprinted Polymer Nanogels-Synthetic Antibody Mimics for Diagnostics and Therapy

Karsten Haupt*, Bernadette Tse Sum Bui, Alejandra Mier, Paulina Ximena Medina Rangel

Université de Technologie de Compiègne, Alliance Sorbonne Universities, CNRS Laboratory for Enzyme and Cell Engineering, Rue du Docteur Schweitzer, Compiègne, France

**karsten.haupt@utc.fr*

Molecularly imprinted polymers (MIPs) are synthetic antibody mimics that specifically recognize molecular targets.[1] They are highly cross-linked polymers synthesized in the presence of the target molecule ore an epitope thereof, acting as a molecular template. This templating induces three-dimensional binding sites in the polymer that are complementary to the template in size, shape, and chemical functionality. The synthetic antibody can recognize and bind its target with an affinity and selectivity similar to a biological antibody. Herein, we demonstrate the potential of MIPs for antibody therapy on the example of cell surface biomarker targets, including the cell-cell adhesion proteins cadherins.[2] In addition, the application of MIPs in diagnostics will be discussed on the examples of bioimaging of cell surface glycans,[3] and the detection of soluble protein biomarkers like the Kidney Injury Molecule 1 (KIM-1).[4]

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Micro- and Nano-Systems for the Applications of Health and Beyond

Fatih Inci [a,b] *

[a] *UNAM-National Nanotechnology Research Center, Bilkent University, Ankara, Turkey*

[b] *Institute of Materials Science and Nanotechnology, Bilkent University, Ankara, Turkey*

**finci@bilkent.edu.tr*

The future of biology and medicine lies at the intersection of engineering, chemistry, nanotechnology, and materials science. In particular, the fields of micro/nano-scale technologies and biomedical engineering have seen unprecedented growth and development over the last decade. Integration of innovative technologies at the micro- and nano-scale, termed as "disruptive innovation", offers tremendous opportunities for addressing unmet needs and key challenges in biology and medicine, and also enables a wide range of applications in managing maladies. In this talk, Dr. Fatih Inci presents up-to-date micro- and nano-scale technologies as precise solutions to tackle real-world problems in biology and medicine, thereby improving human health. In the interdisciplinary domain, Dr. Inci's laboratory develops innovative, user-friendly, ultra-sensitive, and highly specific diagnostic and therapeutic screening platforms in the fields of early cancer detection, infectious diseases, biomarker discovery, and acute and chronic disorders.[1,2] In this manner, the platforms that were developed in his lab manipulate biomolecules, cells, and viruses in small volumes, and they are integrated seamlessly with multifunctional nanotechnological modalities to record minute signals derived from cells at their native environment.[3] In addition, these platforms are centralized at fundamental knowledge and engineering toolbox that are integrated with mobile health approaches to report disease status of patients to physicians and nurses on a daily basis, accelerating the monitoring of individuals and minimizing health disparities at remote settings. Ultimately, these platforms are targeted for the applications at bed-side, where individuals can easily self-monitor their health status for "precision medicine" applications.[4,5] All these applications are unified around Dr. Inci's and his team's expertise to push the limits of cell manipulations and engineering tools to provide real solutions to problems in the clinics.

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Understanding Enzymatic Mechanisms and Improving Enzyme's Catalytic Power with the Help of Computational Chemistry

Pedro Alexandrino Fernandes*

University of Porto, LAQV-REQUIMTE/Department of Chemistry and Biochemistry, Faculty of Sciences, Porto, Portugal

**pafernan@fc.up.pt*

This talk will address our most recent work on understanding enzyme reaction mechanisms using QM/MM methods.[1-6] First, the talk will overview the fields we work in, with selected examples to illustrate the concepts. Next, we will focus on structure-activity relationships, explaining the enzyme's precise structural and electrostatic requisites to catalyze a chemical reaction. Finally, based on the refined understanding of the structure-activity relationship, we will discuss methods to predict rate-enhancing mutations to engineer more efficient enzymes.

From a more broad point of view, we will discuss the insights that computer simulations brought on the general understanding of how enzymes work and how the flexible enzyme machinery influences and dictates the reaction rate and controls the chemical pathway it catalyzes

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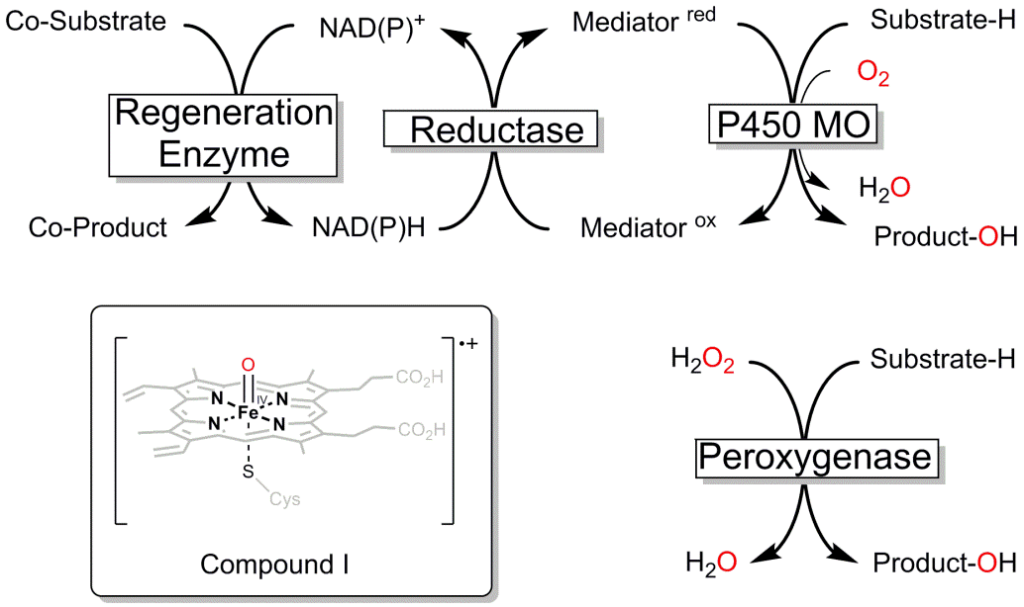
Peroxygenase-catalysed Oxyfunctionalistation Reactions

Frank Hollmann*

Delft University of Technology, van der Maasweg 9, 2629HZ Delft, The Netherlands

**f.hollmann@tudelft.nl*

Peroxygenases are experiencing a renewed interest as catalysts for selective oxyfunctionalisation chemistry.[1] Peroxygenases are promising alternatives to the well-known P450 monooxygenases due to the significantly simpler regeneration scheme.



Comparison of P450-monooxygenases and peroxygenases with respect to the regeneration of the catalytically Compound I.

New peroxygenases enable selective hydroxylation of non-activated C-H bonds in alkanes and aromatics, epoxidation, and heteroatom oxygenation. Yet, to assess the full scope of this exciting enzyme class a range of challenges need to be met: (1) more enzyme (variants) with tailored properties need to be identified/evolved; (2) new *in situ* H_2O_2-generation systems to minimize oxidative enzyme inactivation need to be established; (3) peroxygenase-reactions in non-aqueous media need to be established.

These issues together with some promising solutions will be discussed.

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The Investigation of Glutamate Metabolism and its Modulators in Glioblastoma

Gizem Dönmez Yalçın*

Aydin Adnan Menderes University, Faculty of Medicine, Department of Medical Biology, Aydin, Turkey

**gizem.yalcin@adu.edu.tr*

Excitotoxicity occurs as a result of the accumulation of glutamate in the synaptic cleft and is one of the underlying mechanisms of many brain diseases.[1] Glutamate Transporter (GLT-1) is expressed on glial cells and absorbs most of the excess glutamate.[2] Sirtuin 4 (SIRT4) is an enzyme that is expressed in glial cells and it deacetylates or ADP-ribosylates proteins.[3] Our previous study showed that kainic acid injected SIRT4 knockout mice display increased seizures compared to wild-type mice. This result showed that the absence of SIRT4 increased the kainic acid-induced excitotoxicity in mouse brains.[4] In our recent study, we induced excitotoxicity via kainic acid in A172 glioma cells and showed that overexpression of SIRT4 prevented excitotoxicity via regulating glutamate metabolism modulators (GLT-1, glutamate dehydrogenase (GDH), glutamine synthetase (GS)).[5] Additionally, GLT-1 was shown to be decreased in glioblastoma brain tumors compared to healthy brains.[6] We also investigated the GLT-1 degradation pathway in glioblastoma and glia cells. GLT-1 expression was found to be increased in glioblastoma cells so that the capacity to absorb the excess glutamate is higher.[7] Therefore, in excitotoxicity-related brain diseases and glioblastoma, new therapeutic strategies and research areas can be developed via modulating glutamate metabolism and SIRT4.

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Opportunities and Challenges of Boron Neutron Capture Therapy (BNCT) in Medical Oncology

Hasan Türkez[a] * and Adil Mardinoğlu[b]

[a]*Department of Medical Biology, Faculty of Medicine, Atatürk University, Erzurum, Turkey*

[b]*Centre for Host-Microbiome Interactions, Faculty of Dentistry, Oral & Craniofacial Sciences, King's College London, London, SE1 9RT, UK; Science for Life Laboratory, KTH - Royal Institute of Technology, Stockholm, Sweden.*

**hasanturkez@yahoo.com*

Anticancer therapeutics generally have a narrow therapeutic index. And great efforts are being performed towards to improvement of the therapeutic ratio of these therapeutics. In this regard, the targeted therapy options provide opportunities for treating several tumors while descrying healthy cells selectively. Boron Neutron Capture Therapy (BNCT) using boron-10 (^{10}B) compounds was identified as a promising and non-invasive application for the treatment of brain, head, and neck tumors as well as melanoma. However, BNCT is still not a common and well-known therapy due to several reasons. Further preclinical and clinical studies are urgently required to reveal the therapeutic value and potency of BNCT. In the content of our speech firstly the principles of BNCT applications and cell death mechanisms by BNCT will be executed. Then, the current and future opportunities by BNCT will be explained. The observed limitations mainly due to neutron source, dosimetry, and selectivity of boron delivery agents and their possible solutions will be discussed. Finally, the results of a few BNCT clinical trials will be criticized.

Regulation of Mitochondrial Dynamics During Gestational Diabetes Mellitus

Abdullah Yalçın*, Umut Kolaç

Aydin Adnan Menderes University Medical School, Department of Medical Biology, Aydin, Turkey

**abdullah.yalcin@adu.edu.tr*

Gestational diabetes mellitus (GDM) poses a risk factor for fetal mortality and morbidity by directly affecting the placenta and fetus. Mitochondria are dynamic organelles that play a key role in energy production and conversion in placental tissue. Mitochondrial fusion and fission proteins are important in terms of providing mitochondrial dynamics, the adaptation of the cell to different conditions, and maintaining the metabolic stability of the cells. Although GDM shares many features with Type 2 diabetes mellitus (T2DM), different effects of these conditions on the mother and the child suggest that GDM may have specific pathological effects on placental cells. Diabetes during pregnancy leads to processes that correlate with mitochondria dysfunction in the placenta. Our results showed that mitochondrial fusion markers significantly decrease in placental tissue of women with GDM, compared to the healthy non-diabetic women. The decrease in mitochondrial fusion markers was more severe during GDM compared to the Pre-DM. Our results suggest that there may be differences in the pathophysiology of these conditions.

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A Road Map Towards Non-Invasive Molecular Digital Biosensors

Seppo J. Vainio*

University of Oulu, Kvantum Institute, Faculty of Biochemistry and Mol. Med., Disease Networks Research Unit, Infotech Oulu, Finland

**Seppo.Vainio@oulu.fi*

To reach medically validated diagnostics one needs typically to visit a clinical laboratory to donate a blood sample enabling disease-associated biomarker evaluation. This strategy however fails to offer cost-effective, trustworthy, and easy access population level, frequent use, and preventive health measures for the top chronic diseases and the current pandemic. Besides this, the current electronic wearable monitors are in most part based on diagnostics of physical parameters such as body temperature, heart rate, and body motion kinetics with still low medical value. The cell-secreted extracellular vesicles (EVs) cargo the same molecular classes that are used for diagnosis in today's clinical practice. Given that the EVs can transcytose across the biological barriers such as the kidney, gut, placenta, brain, and skin to be presented in urine, stool, embryo, brain/saliva, and sweat offer tremendous opportunity to develop clinically validated mass-produced bioelectronic wearables to achieve eventually efficient hospital transmitted disease diagnostics measures. We have developed data and strategy towards this goal. This is based on integrated biochemical analysis of EVs in medical cohorts, urine, sweat, and saliva with Raman/ and OMICs, bar coding, fluidics, phage display libraries, and parallel use of disease conditioned dogs to identity EV based disease signatures paving the way towards medically relevant AI-based wearable innovations. The current evidence for the strategy will be presented and discussed.

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ORAL PRESENTATION ABSTRACTS

Development of One-Step RT-PCR Kit for Diagnosis of COVID-19

İsa Gökçe[a] *, Aykut Özgür[b], Yahya Tayhan[c], Özlem Kaplan[d], Rizvan İmamoğlu[e], Nazan Gökşen Tosun[f], Seçil Erden Tayhan[a], Sema Bilgin[g]

[a]Tokat Gaziosmanpaşa University, Faculty of Engineering and Architecture, Department of Bioengineering, Tokat, Turkey
[b]Tokat Gaziosmanpaşa University, Artova Vocational School, Department of Veterinary Medicine, Laboratory and Veterinary Health Program, Tokat, Turkey
[c]Tokat Gaziosmanpaşa University, Scientific and Technological Research Application and Research Center, Tokat, Turkey
[d]Istanbul University, Faculty of Science, Department of Molecular Biology and Genetics, Istanbul, Turkey
[e]Bartın University, Faculty of Science, Department of Molecular Biology and Genetics, Bartın, Turkey
[f]Tokat Gaziosmanpaşa University, Faculty of Engineering and Architecture, Department of Biomaterials and Tissue Engineering, Tokat, Turkey
[g]Tokat Gaziosmanpaşa University, Tokat Vocational School of Health Services, Department of Medical Services and Techniques, Tokat, Turkey
**isa.gokce@gop.edu.tr*

COVID-19 was considered as a pandemic by the World Health Organization (WHO) and most people were infected with the 2019-nCoV. Therefore, protective treatment methods are extensively performed to prevent the spread of the COVID-19 infection to healthy people. RT-PCR-based assays designed to amplify SARS-CoV-2-specific sequences are the primary method currently used for the detection of active infections.[1,2] Within the scope of this study, enzymes, and proteins, which are the main components of the RT-PCR method, were produced using recombinant DNA technology, and a national and domestic prototype kit was developed for the diagnosis of COVID-19. With this project, it is thought that it will provide an important contribution towards reducing foreign dependency in the field of biotechnology and PCR-based infection diseases test kits.

Acknowledgment: *This work was supported by The Scientific and Technological Research Council of Turkey (120Z310).*

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A Comparative Study of the Effects of L-T4 and L-T3 on Zwitterionic DPPC Model Membranes

Abeer Alesknd rany*, Ipek Sahin

Ege University, Institute of Science, Department of Physics, Bornova-Izmir, Turkey

**aaleskndrany@gmail.com*

Thyroid hormones thyroxine (T4) and triiodothyronine (T3) have a variety of effects on metabolism and development.[1] Levothyroxine (L-T4), the synthetic form of T4, and liothyronine (L-T3), the synthetic form of T3 are used to treat thyroid hormone deficiency known as hypothyroidism and goiter (enlarged thyroid gland).[2] This study aimed to evaluate the comparative effects of low (3 mol %) and high concentrations (15 mol %) of L-T4 and L-T3 on DPPC multilamellar liposomes (MLVs) as a function of temperature using two noninvasive techniques, namely Fourier Transform Infrared (FTIR) Spectroscopy and Differential Scanning Calorimetry (DSC). The investigation of the C-H, C=O, and PO^-_2 antisymmetric double stretching modes in FTIR spectra and DSC studies reveal that the inclusion of L-T4 and L-T3 changes the physical properties of the DPPC MLVs.

The DSC results demonstrated that the low concentration of L-T4 (3 mol %) does not induce a significant change in the overall shape of the thermotropic profile of DPPC MLVs while the phase transition shifts to lower temperatures and a slight broadening in the phase transition curve are also observed at higher concentration of L-T4 (15 mol %). However, the DSC peaks broaden and shift to lower temperature degrees with increasing concentrations of L-T3 and the curve contains more than one peak indicating the existence of phase separation at a high concentration of L-T3. When evaluating the effects of both hormones on the system, it is clear that L-T3 perturbs the system more than L-T4. FTIR results show that L-T4 and L-T3 have opposite effects on the order of DPPC liposomes both in the gel and liquid crystalline phases. While both concentrations of L-T4 disorder the system in the gel phase and order it in the liquid crystalline phase, L-T3 concentrations increase the order in the gel phase and decrease it in the liquid crystal phase. Moreover, L-T4 and L-T3 increase membrane fluidity in both phases, but L-T4 is more dominant in increasing the fluidity of liposomes as compared to L-T3. Furthermore, L-T4 causes dehydration of the head groups of phospholipids, whereas L-T3 forms strong hydrogen bonds with the carbonyl and phosphate groups of phospholipids. The importance of the present study is to contribute to the analysis of thyroid hormone-induced structural effects in model membranes and the characterization of specific spectral changes reflecting this lipid-hormone interaction.

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Molecular Modeling of Endocrine Disrupting Chemicals and Amino Acids

Gülgün Aylaz[a], Müge Andaç[b] *
[a]*Hacettepe University, Institute of Science, Nanotechnology and Nanomedicine Division, Ankara, 06800, Turkey*
[b]*Hacettepe University, Faculty of Engineering, Department of Environmental Engineering, Ankara, 06800, Turkey*
**andac@hacettepe.edu.tr*

Natural estrogenic hormones; are excreted in the urine, used as birth control pills in some treatments, or used in veterinary medicine, causing effects that threaten human health and wildlife by mixing with water resources or soil. Recently, because of these reasons, interest in these hormones has been increasing. Steroid estrogenic hormones are classified as natural or synthetic. In general, it is in the class of endocrine-disrupting chemicals (Endocrine Disrupting Chemicals, EDCs). In traditional methods used to determine low or even trace amounts of EDCs, extra steps such as pre-purification and enrichment are required due to the complex structure of sewage or wastewater.[1] Equilin, Estrone, and 17β Estradiol are the estrogenic hormones used in this study, which are also in the last pollutant candidate lists of the United States Environmental Protection Agency (US EPA).[2] Thanks to computer modeling techniques, the selected ligand and one of the target estrogenic hormones will be able to be determined effectively and cost-effectively.[3] Primarily, the amino acids tyrosine, phenylalanine, and tryptophan were chosen as the ligand molecules that would selectively recognize these molecules according to their three-dimensional geometric structures. As a result of molecular docking studies, tryptophan became interested in EDCs from the indole group, tyrosine phenyl group, phenylalanine benzene group. Aromatic amino acids can interact with non-protein ligands containing aromatic groups through stacking interactions (also called pi-pi stacking).[4] Free binding energy values between selected EDCs (equilin, estrone, and 17β estradiol) and amino acids (tyrosine, phenylalanine, and tryptophan) were calculated between -2.90 and -3.89 kcal/mol.

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Selection of DNA Aptamer(s) to Inhibit c-Fos Protein Interactions

Özge Uğurlu[a], Fulya Çağlar[b] *, Seda Yüzeren[b], Serap Evran[a,c], Cenk Selçuki[a,b,c]

[a]*Ege University, Graduate School of Natural and Applied Science, Biochemistry Program 35100, Bornova-İzmir, Turkey*

[b]*Ege University, Institute of Health Sciences, Health Bioinformatics Program,35100, Bornova-İzmir, Turkey.*

[c]*Ege University, Faculty of Science, Department of Biochemistry, 35100, Bornova-İzmir, Turkey*

**fulya_caglare@hotmail.com*

Activating protein-1 (AP-1) defines a family of transcription factors composed of dimeric (homo- or heterodimer) proteins, such as Jun and Fos.[1] AP-1 complex plays an active role in many biological processes including regulation of gene expression during cell differentiation, proliferation, and neoplastic transformation.[1-3] Since AP-1 is a potential drug target in the treatment of cancer and neurodegenerative diseases, AP-1 inhibitors attract much interest.

In this study, we aimed to develop DNA aptamer(s) to block the protein interactions of c-fos, thereby preventing the formation of the AP-1 complex. For this purpose, we selected DNA aptamers specific for c-Fos by using the magnetic bead-based SELEX method. For this purpose, the His-tagged c-Fos protein was immobilized onto cobalt magnetic beads and incubated with the aptamer library. Following incubation for 1 h, the bound sequences were eluted and amplified by polymerase chain reaction (PCR). Following the conversion of double-stranded DNA to single-stranded DNA, the second round of SELEX was performed. Similar steps were repeated, and SELEX was stopped at around 13. The sequence pools obtained from the SELEX rounds 1, 8, 10, and 13 were subjected to next-generation sequencing (NGS) to identify the enriched DNA aptamers. The enrichment coefficient was calculated, and the aptamer candidates were ranked according to their enrichment scores by using the MEME suit web server and the MEGA-X program. Six aptamers were selected for further characterization.

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Molecularly Imprinted Polymer Nanoparticles from Renewable Resources for Biomedical Applications

Necla Yucel[a], Elif Isikci Koca[a], Gokhan Cayli[b], Pinar Cakir Hatir[a]*

[a]*Istanbul Arel University, Faculty of Engineering and Architecture, Department of Biomedical Engineering, Istanbul, Turkey*

[b]*Istanbul University - Cerrahpasa, Faculty of Engineering, Department of Engineering Sciences, Istanbul, Turkey*

**pinarcakir@arel.edu.tr*

Molecularly imprinted polymers are biomimetic materials with tailor-made molecular binding sites. They have excellent recognition properties, and they are distinguished by improved chemical and physical stability, greater availability, and lower costs than their biological counterparts.[1] Molecularly imprinted polymers are used in biomedical applications, such as drug delivery systems, tissue scaffolds, and biosensors. Environmental concerns, on the other hand, contribute to the development of safe and mild systems to manufacture sustainable polymers from renewable resources.[2] Biobased raw materials are suitable candidates for environmentally friendly manufacturing processes. Castor oil is one of the promising biobased raw materials because it is a long-chained unsaturated fatty acid with a hydroxyl group in which chemical modifications are possible. In this study, we developed antibiotic imprinted polymer nanoparticles as drug delivery vehicles using castor oil and lactic acid-based functional monomers. Ciprofloxacin, a broad-spectrum antibiotic, was used as the model drug molecule. Free radical polymerization was performed with a thermal initiator. Nanoparticles with a size of 146 nm were successfully synthesized using the precipitation polymerization technique in a high dilution medium. Ciprofloxacin imprinted polymer nanoparticles were characterized in terms of chemical structure, morphology, particle size distribution, and loading-release profiles. These nanoparticles can be incorporated into hydrogel or nanofiber-based scaffolds to be used as drug delivery systems in tissue engineering applications.

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Use of Cellulose Nanomaterials for Modification of Polymeric Adsorbents and Determination of Their Adsorption Performance

Kazım Köse[a,b] *, Miran Mavlan[c], Lokman Uzun[d], Jeffry P. Youngblood[b]

[a]*Hitit University, Department of Joint Courses, Çorum, Turkey*
[b]*Purdue University, Department of Materials Engineering, West Lafayette, IN 47906, USA*
[c]*Purdue University, Department of Chemistry, West Lafayette, IN, USA*
[d]*Hacettepe University, Department of Chemistry, Ankara, Turkey*
**kazimose@hitit.edu.tr*

Cellulose nanomaterials (CNM) are among the most preferred materials in recent years, as they are both 'greener' and more durable than their counterparts in many areas from food packaging to the inner coating of sewer pipes.[1-4] CNM, which is preferred in the synthesis or modification of green adsorbents since the abundance of hydroxyl groups in its environment and its natural polymeric structure is suitable for modification, was used in the modification of glycidyl methacrylate-based polymeric adsorbents.[5] Adsorption performance of these modified polymeric materials against biomolecules was investigated. The structure has been strengthened by grafting cyclodextrin resulting in enhancement of adsorption ability, especially against molecules with hydrophobic properties such as cholesterol or low-density lipoprotein (LDL). The results obtained from the polymeric characterization and adsorption studies show that CNMs will be used successfully in adsorbent modification and will increase the performance of adsorbents.

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Selective Isolation of SARS-CoV-2 Antigens Using Affinity Material for Mass Spectrometry Profiling and Diagnosis

Kerem Tok[a]*, Hichem Moulahoum[a], Faezeh Ghorbanizamani[a], Duygu Harmancı[a], Simge Balaban Hanoglu[a], Ceren Durmus[a], Serap Evran[a], Candan Cicek[b], Ruchan Sertoz[b], Bilgin Arda[c], Tuncay Goksel[d,e], Kutsal Turhan[f] , Suna Timur[a,g], Figen Zihnioglu[a]

[a]*Ege University, Department of Biochemistry, Faculty of Science, Bornova, Izmir, Turkey*
[b] *Ege University, Department of Medical Microbiology, Faculty of Medicine, Bornova, Izmir, Turkey*
[c]*Ege University, Department of Infectious Diseases and Clinical Microbiology, Faculty of Medicine, Bornova, Izmir, Turkey*
[d]*Ege University, Department of Pulmonary Medicine, Faculty of Medicine, Bornova, Izmir, Turkey*
[e]*EGESAM-Ege University Translational Pulmonary Research Center, Bornova, Izmir, Turkey*
[f]*Ege University, Department of Thoracic Surgery, Faculty of Medicine, Bornova, Izmir, Turkey*
[g]*Ege University, Central Research Test and Analysis Laboratory Application and Research Center, Bornova, Izmir, Turkey*
**kerem.tok@ege.edu.tr*

Proteomic strategies are highly suitable for disease biomarker discovery especially in the recent coronavirus pandemic that hit the World. The majority of proteomic approaches are focused on mass spectrometry coupled with various analytical methods. The complexity of biological sample matrices makes proteomic analysis hard to perform. Furthermore, some disease-specific proteins are found at low concentrations which further hinder their exploitation for diagnostics and therapy.[1] These limitations can be overcome through various approaches such as decreasing sample complexity, enrichment, or pre-fractionation. Virus infections are a good example of proteins found at low concentrations.[2] For this purpose, we propose a simple and quick magnetic nanoparticle (MNP)-based isolation method for mass spectrometry profiling and diagnosis of SARS-CoV-2 antigens.

In here, antibodies were purified from infected human serums and then were conjugated with magnetic nanoparticles. The material was optimized and used for the selective isolation of antigens from human nasopharyngeal samples. The antigens were characterized by SDS-PAGE, electrochemical analysis, and isothermal titration calorimetry. The proteins (Pre- and post- enrichment as well as gel bands) were trypsinized and analyzed via mass spectrometry using LC-Q-TOF-MS/MS. The peptide sequence analysis and identification were performed using the online Mascot search engine (hSARS-CoV-2 and contaminants databases). Peptide similarity with variants and other viruses was checked by the BLASTP suite. The use of MNP-based separation allowed selective enrichment of SARS-CoV-2 antigens and eliminated unnecessary proteins going from 946 peptides to 66 peptides post-MNP-Ab separation. These sequences belong to the various SARS-CoV-2 antigens [spike (S), nucleocapsid (N), membrane (M), ORF3a, ORF8, and envelope protein (E)] with the majority being represented by S and N proteins. The found sequences can be exploited in many ways for the development of efficient diagnostic tools and specific treatments.[3]

The current study demonstrates the development of an isolation approach using a magnetic nanoparticle-based affinity material for selective profiling and diagnosis of SARS-CoV-2 antigens using mass spectrometry.[4] This methodology can pave a stepping stone for the creation of efficient tools used to fight the current or any eventual pandemic.

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Synthesis of Keratin Micro-Particles From Feathers Hydrolysate, Their Characterization and Evaluation of Antimicrobial and Antioxidant Activities

Marium Saba[a,b] *, Fulya Ay Sal[b], Dilsat Nigar Colak[b], Kadriye Inan Bektas[c], Ali Osman Belduz[b], Malik Badshah[a], Samiullah Khan[a]

[a]*Quaid-e-Azam University, Faculty of Biological Sciences, Department of Microbiology, Islamabad, Pakistan*

[b]*Karadeniz Technical University, Faculty of Science, Department of Biology, Trabzon, Turkey*

[c]*Karadeniz Technical University, Faculty of Science, Department of Molecular Biology and Genetics, Trabzon, Turkey*

**mariumsaba92@gmail.com*

Feathers are an abundantly present keratinaceous waste on the planet earth.[1] Waste has been converted into less toxic forms by several chemical and physical techniques.[2] Recently, eco-safe and biological conversion of feathers have been carried out, and value-added products are being generated.[3] One of them is microparticles, which can be used for pharmaceutical industries.[4]

In the current study, chicken feathers hydrolysate was prepared with the help of keratinolytic bacterial strain *Pseudomonas aeruginosa-C1M* under optimized conditions. The pH value of hydrolysate was adjusted according to the *iso*-electric precipitation. Under acidic conditions, two types of keratin micro-particles were synthesized and named as KM1 and KM2. Microparticles under scanning electron microscopy (SEM) revealed even and round surfaces. Fourier transform infrared spectroscopy (FTIR) results showed that the keratin microparticles retained the most of protein backbone. Thermal degradation properties were studied through thermo-gravimetric (TGA) analysis which indicated that microparticles are less stable than feathers due to their disulfide bond breakage. Similarly, Nuclear magnetic resonance (NMR) spectra showed the formation of thiol groups. Both microparticles have shown better antimicrobial activities against *E.coli* and *Staphylococcus aureus*. Ferrous reducing activity exhibited 9.7 ug/mL and 7ug/mL activity against ascorbic acid standard for KM1 and KM2 respectively. In conclusion, keratin microparticles possess bio-functional properties and can be applied in pharmaceutical use.

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Encapsulation of Human Cord Blood-Derived Platelet Lysate in Nanovesicular Systems and Investigation of Its Wound Healing Potential

N. Duygu Asker Aksoy[a] *, F. Barış Barlas[c], Suna Timur[a,b]

[a]*Ege University- Science Faculty, Biochemistry Department, 35040, Bornova/IZMIR*

[b]*Ege University Central Research Test and Analysis Laboratory Application and Research Center, 35100, Bornova/IZMIR*

[c]*Istanbul University-Cerrahpasa Institute of Nanotechnology and Biotechnology, 34500, Buyukcekmece/İstanbul*

**nduyguasker@gmail.com*

Niosomes, being one of the nano vesicular systems, are getting attention with the latest developments in nanotechnology and are being used in various fields including wound healing in medicine. On the other hand, the efficiency of the growth factors in platelet alpha granules on wound healing is shown in numerous studies. In this study, platelets obtained from cord blood, which is considerable as biological waste after birth, are converted to lysates with independent granule content and these platelet lysates are encapsulated to niosomes with more than 80% high encapsulation efficiency. With the characterization studies, particle size analyses are made with DLS and AFM, as a result, their sizes are recorded approximately as 150 nm. The wound healing study carried out with the Human Keratinocyte Cell Line resulted in a significant difference between the control group and NiPLs, on the other hand, there is no significant difference between the PL and NiPLs is observed, as expected. Besides, cell uptake studies show that NiPLs can easily be taken into the cell and accumulated in the cytoplasm. PDGF-AB dependent short-term stability test carried out with the Human PDGF-AB ELISA. This experiment shows that NiPLs are significantly more stable than free PLs. These results show NiPLs have a great potential to be used in wound healing with their high stabilities.

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Pterostilbene Loaded Cryogel Membranes as Potential Wound Dressing Material: Preparation, Characterization, and *In-vitro* Studies

İpek Canatar*, Okan Zenger, Sibel Özdaş, Gözde Baydemir Peşint

Adana Alpaslan Türkeş Science and Technology University, Faculty of Engineering Sciences, Department of Bioengineering, Adana, Turkey

**icanatar@atu.edu.tr*

Wound is loss of physiological properties of the skin and mucous membrane due to various reasons, trauma, surgical procedures, etc.[1] Wound dressings are commonly used in wound treatment and development of new wound dressing materials that contain bioactive compounds, have a high water absorption capacity, provide a moist environment on the wound surface, allow gas exchange, non-toxic, biocompatible, and produced to fulfill or support tissue function, is very important.[2] Pterostilbene (3,5-dimethoxy-40-hydroxy-trans-stilbene; PTS) is a bioactive phenolic compound isolated from the heartwood of *Pterocarpus marsupium.*[3] It is an analog of the antioxidant Resveratrol and has higher bioavailability[4], and it has been demonstrated that the PTS may be beneficial in the prevention and treatment of various diseases, including cancer, dyslipidemia, obesity, diabetes, cardiovascular and neurological degeneration.[4-6] In this study, poly(hydroxyethyl methacrylate) (PHEMA) based cryogel membranes[7] loaded with PTS (PHEMA/PTS) were synthesized as a new wound dressing material, in order to investigate the effect of PTS on cell proliferation. PHEMA /PTS cryogel membranes' surface area was determined as 27 m^2/g via BET studies and the swelling (in water) ratio was calculated as 98.6%. The effect of PHEMA/PTS cryogel membranes on cell proliferation, cell number, and genotoxicity; MTT assay, trypan blue exclusion assay and DNA fragmentation analysis were performed, at 24th, 48^{th,} and 72nd h after 3T3 fibroblast cells were cultured on cryogels. In addition, the effect on cell morphology was evaluated by phase-contrast microscopy and SEM. *In vitro* cell culture studies have demonstrated that PHEMA/PTS cryogel membranes promote cell viability (greater than 92% for 24-48-72 h) and proliferation and do not cause DNA fragmentation.

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Laccase Purification from Fermentation Medium using Cryogel Columns

Burcu Eren*, Okan Zenger, Hatice İmge Oktay Başeğmez, Gözde Baydemir Peşint

Adana Alpaslan Türkeş Science and Technology University, Faculty of Engineering Sciences, Department of Bioengineering, Adana, Turkey

**beren@atu.edu.tr*

Laccases belong to the blue multicopper oxidases and they are involved in cross-linking of monomers, degradation of polymers, and ring cleavage of aromatic compounds.[1,2] They play important role in dye decolorization, bioremediation, biodegradation, paper, and pulp industry, food processing, etc. In addition, laccases can decrease odor arising from the garbage disposal sites, livestock farms, and pulp mills.[1] They are widely distributed in higher plants and fungi. In fungi, laccases appear more than the higher plants.[3] Extracellular laccases purified and characterized from diverse fungal sources belonging to *Deuteromycetes*, *Ascomycetes*, as well as Basidiomycetes, are known producers of laccase. *Aspergillus niger* (*A. niger*) has been reported to be a good source of laccases.[4] To develop an effective, high-yielding, and cost-effective methods for the production and purification of laccase is crucial for industrial-scale processes.[5] Cryogels are macroporous and cross-linked polymeric structures, which have become significant in applications based on separation, purification, and selective molecular recognition.[6] In this study, it was aimed to prepare cryogel columns for laccase purification following the production of laccase via *A. niger*. 2-hydroxyethyl methacrylate-based cryogels were synthesized in the presence of 1-vinylimidazole as the affinity ligand for binding to laccase. Cryogels were characterized by swelling tests, Brunauer–Emmett–Teller, and scanning electron microscopy analysis. Surface area and water uptake ratio cryogel column were found to be 35 m^2/g and 93%, respectively. The effect of temperature, flow rate, time, and laccase concentration on laccase adsorption was examined. The enzyme purification ratio was calculated as 84% from the synthetic medium. In addition, the purification yields and folds were also calculated for Laccase from *A. niger*. It was demonstrated that cryogel columns can be used up to 10 times without a significant decrease in adsorption capacity.

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Near-Infrared Light (NIR)-Propelled Upconverting Nanoparticles (UCNP) Carriers to Enhance L -Asparaginase Catalytic Activity: A Promising Strategy for Biotechnological Enzyme Drugs

Burhan Ateş[a] *, Meltem Asiltürk[b], Samir Abbas Ali Noma[a], Ahmet Ulu[a], Seda Demirel Topel[c], Gamze Dik[a], Ali Kurucay[a]

[a]*Inonu University, Faculty of Science & Arts Department of Chemistry,* [a]*Biochemistry and Biomaterials Research Laboratory, Malatya, 44280, Turkey*
[b]*Akdeniz University, Faculty of Engineering, Department of Material Science and Engineering, 07058, Antalya, Turkey*
[c]*Antalya Bilim University, Faculty of Engineering, Department of Electrical and Electronics Engineering, 07190, Antalya, Turkey*

**burhan.ates@inonu.edu.tr*

The immobilization of enzymes is used as an alternative to enhance functional efficiency, reusability, reproducibility, and stability[1]. The most important issues in this field are increasing the enzyme activity and making the controllable (on/off) enzyme activity with an externally inducible mechanism after immobilization[2]. Therefore, innovative approaches are absolutely needed to increase the catalytic activity of immobilized enzymes. In this context, there are UV light and magnetic field induced enzyme platforms in the literature. However, in the literature, there is concern about the toxicity and the limited access to internal tissues of UV light and the magnetic field. NIR excitation can be an important alternative in this area with low toxicity and accessibility to internal tissues. We hypothesize that the enzyme bound to the upconverting nanoparticles (UCNP) exposed to the NIR light at the appropriate wavelength will interact with their substrate with the more appropriate conformation.

One of the most important examples of these biotechnological enzyme drugs is L-asparaginase (L-ASNase) and pegylated L-ASNase (PEG-LASNase) is a vital drug used in the treatment of remission (stage of recovery) which is the first stage of acute lymphoblastic leukemia (ALL) disease. In this study, $NaYF_4$: Yb^{3+}, Er^{3+} induced at 980 nm and $NaYF_4$: Nd^{3+} Yb^{3+}, Er^{3+}, induced at 808 nm UCNPs were firstly synthesized by hydrothermal method, and PEG-L-ASNase on UCNP modified with polyethylenimine (PEI) was immobilized by using electrostatic interactions. Laser intensity, exposure time, and laser distance studies were performed as NIR triggering parameters for carrier platforms containing enzymes. Immobilization parameters (immobilization efficiency, optimum pH, temperature, thermal stability, reusability, *in vitro* half-life, storage stability, trypsin digestion, etc.) were examined in detail. *In vitro* toxicity studies for UCNPs and UCNP-PEG-L-ASNase were performed on the L-929 cell line.

In conclusion, in this study, PEG-L-ASNase was immobilized to UCNPs inducible at 980 and 808 nm for the first time, and it was shown that the enzyme could be induced by NIR. Induction rates of L-ASNase enzyme activity with NIR reached approximately 323%. In addition, since this carrier system is not toxic to humans, it seems to be a promising system for biotechnological enzyme drugs.

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Identification of Cervical Cancer Sub-type Specific Molecular Targets, Biomarkers and Repurposed Drug Candidates

Beste Turanli*

Marmara University, Department of Bioengineering, Istanbul, Turkey.

**beste.turanli@marmara.edu.tr*

Cervical cancer, a malignant neoplasm arising from the endocervical canal, is the second most common cancer in women and one of the leading causes of death in women ages 20 to 39, especially when the cancer is diagnosed at an advanced stage.[1] Precision medicine aims to classify patients by considering individual differences among cancer patients, unlike traditional treatments. Novel biomarkers should be determined for cancer diagnosis and prediction of treatment response via sub-typing.[2] In this study, HPV-16 and HPV-18 infected groups which are the two most common oncogenic types of cervical cancer, were examined separately using system biology approaches unlike the previous cervical cancer studies regardless of disease heterogeneity and subtype information.[3] For the first time, transcriptomic data on HPV-16 and HPV-18 infected patient groups were investigated separately and differential mRNAs were determined by using the RMA normalization and limma method.[4] Moreover, sub-type specific reporter biomolecules in transcriptional regulation (miRNA, transcription factor) were purposed by implementing reporter feature algorithm[5] on the gene expression profiles through genome-scale biomolecular networks.[3]As a result of the construction of protein-protein interaction network, 17 proteins were found as hub proteins specific to subtypes, except common 8 proteins. Among the transcriptional elements, no significant difference was observed in TF that could distinguish subtypes, HIF1α was the only reporter TF for HPV-18 infected group. hsa-miR-101-3p and hsa-let-7d-5p were found specific to the HPV-16 group while there were 81 miRNAs specific to HPV-18. Lastly, drug repositioning was performed focusing on drugs that target some of the hub proteins. Ibuprofen and procainamide drugs were repurposed for the treatment of HPV-16 infected cancer whereas hydralazine and memantine were repurposed drugs for HPV-18 infected cancers.

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Neisseria meningitidis Transferrin Binding Protein A (TbpA) Rearranges Itself For Binding Human Transferrin Protein (HTF)

Gizem Nur Duran[a], Safiye Erdem[a], Mehmet Özbil[b] *

[a]*Marmara University, Department of Chemistry, Istanbul, Turkey*

[b]*Gebze Technical University, Institute of Biotechnology, Kocaeli, Turkey*

**mozbil@gtu.edu.tr*

Neisseria meningitidis is a member of Neisseria, a Gram-negative bacteria family, which invades nasopharynx, causing meningitis.[1] It relies on iron (Fe) for its survival and virulence, which is acquired by a neisserial transport system from a human host. This system includes two surface proteins, transferrin binding protein A (TbpA) and transferrin binding protein B (TbpB).[2] TbpA is highly conserved among the Neisseria family and binding to the host human transferrin protein (hTF) it acquires the Fe^{3+} ion needed for its survival. TbpA has an outer trans-membrane region with hydrophobic amino acid residues lined on the outer surface and highly hydrophilic forms a β-barrel, where the abstracted iron can go through and reach the periplasm. Another important feature of TbpA structure is the 158 amino acid long plug domain, which is believed to interact with the hTf.[3] X-ray structures of TbpA from *N. meningitidis* bound to only C-lobe containing hTf by Noinaj et al. revealed protein-protein interactions were facilitated by these extracellular loops.[4] Specifically, loop 5 created one long arm, and loops 7 and 8 created a shorter arm, which hug hTf from its C-lobe.

In this study, we aimed to obtain hTf free TbpA structure and to identify structural mechanisms preparing TbpA for hTf binding through classical all-atom molecular dynamics (MD) simulations. Conformational changes within hTf binding domains were analyzed, which will shed light on the complexation mechanism of transferrin binding proteins and ferric ion source proteins at the atomic level. We identified key conformational changes throughout the MD simulations, starting from hTf bound free TbpA protein structure. TbpA remained in a 'closed' state with loops 5 and 8 are closer to each other and the helix domain faced downwards. Prior to hTf binding, two loops must get away from each other in order to hug hTf from both sides. The helix finger domain swings up so that it can get into the cleft of hTf. Thus, TbpA must get into the 'open' state prior to the complexation.

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Label-Free Biosensing on Plasmonic Nanostructures Using SERS

Mehmet Kahraman[a]* Aysun Korkmaz[a], Adile Gurkan[a], Handan Yuksel[b], Ramazan Solmaz[b], Sebastian Wachsmann Hogui[c]

[a]*Gaziantep University, Department of Chemistry, Sehitkamil, Gaziantep, Turkey,*

[b]*Bingöl University, Department of Chemistry, Bingöl, Turkey,*

[c]*McGill University, Department of Bioengineering, Montreal, Canada*

**mskahraman46@gmail.com*

Surface-enhanced Raman scattering (SERS) is an emerging analytical technique for the detection and identification of chemicals and biological molecules and structures. Rapid, sensitive, and accurate identification of biomolecules and structures is critical not only for clinical diagnostics but also for industrial applications. Several studies have been demonstrated that SERS can be used as a powerful technique for the identification of bacteria and proteins using different sample preparation methods and SERS substrates.[1-3] Sample preparation and SERS substrates are critical factors to obtain strong, sensitive, and reproducible SERS spectra from the analytes. In this study, label-free identification and characterization of bacteria and proteins on different plasmonic nanostructures is demonstrated. Different types of SERS substrates (plasmonic nanovoids and nanodomes) are fabricated using different fabrication approaches and characterized. Different types of bacteria and proteins are used to test the performance of the fabricated plasmonic nanostructures for SERS-based biosensing.

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Pichia Pastoris Expression Systems for Producing Biocatalyst: Case Studies

Ahmet Tülek[a], Ersin Karataş[a], Barış Binay[a] *

[a]*Gebze Technical University, Department of Bioengineering, 41400 Gebze Kocaeli Turkey*

**binay@gtu.edu.tr*

P. pastoris is a commonly used heterologous eukaryotic expression system. The advantages of the Pichia expression system are protein folding, post-translational modifications, the presence of processes in high eukaryotic cells such as protein processing, easy molecular manipulations, and inexpensive, rapid, and high level of protein expression. In this expression system, *P. pastoris*, a methylotrophic yeast, uses methanol as the sole carbon source. Methanol is oxidized to formaldehyde using molecular oxygen with alcohol oxidase enzyme encoded by alcohol oxidase (AOX1 and AOX2) genes. To compensate for the weak affinity of alcohol oxidase to oxygen, it produces a large amount of target protein with the AOX, a powerful promoter. Thus, the product that is intended to be produced as heterologous is produced through this promoter.

P. pastoris is manipulated so that it can produce foreign proteins intracellularly or extracellularly (secreted). A secretion sequence (signal) is required for foreign proteins to be secreted extracellularly. This signal sequence can be found naturally in some proteins or it can be designed as a fusion protein. However, the secretion efficiency may vary for a different protein and signal sequence. Since natural proteins secreted extracellularly are low levels in *P. pastoris*, heterologous extracellular protein is an advantage for protein production. The medium is minimal in the Pichia growth medium. The most of protein in the medium is heterologously expressed protein. This provides a great advantage in the protein to be purified. The absence of hyperglycosylated in proteins secreted extracellularly in *P. pastoris* is an advantage over *Saccharomyces cerevisiae*.[1]

Laccase, pectinase and formate dehydrogenase enzymes are widely used for industrial purposes. As with other enzymes, the biggest problem in these enzymes is the problem of obtaining a high amount of active enzymes. In our studies, selected formate dehydrogenase, pectinase, and laccase enzymes from different sources were cloned and successfully expressed by the Pichia expression system. The enzymes have been produced in high quantities by this system and their biochemical characterizations have been made.[2,3] Both purified high yield pectinase and laccase enzymes were tested under industrial conditions in apple juice clarification and cotton bleaching applications respectively. Moreover, the formate dehydrogenase was obtained in high yield and tested for CO^2 capture.[4]

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Revealing Substrate Scope of Novel Self-sufficient P450 Monooxygenase

Yunus Ensari*

Kafkas University, Engineering and Architecture Faculty, Bioengineering Department, Kars, Turkey

**yunusensari@kafkas.edu.tr*

Cytochrome P450 monooxygenases (P450 or CYPs) a superfamily of heme-thiolate-containing proteins are one of the oldest and largest gene families.[1,2] CYPs are found in all kingdoms of life and have a diverse range of functions in primary and secondary metabolism and drug detoxification.[1, 3-4] P450 monooxygenases catalyze more than 40 different types of reactions and accept a diverse range of substrates which make P450s important catalysts for industrial and synthetic applications. [2-4] However, low catalytic activity against industrially relevant substrates, poor stability in organic solvents, difficulty in supplying electron reducing power limit large scale industrial use of P450 monooxygenases. Thus, it is crucial to identify novel P450 enzymes with new and unusual properties.

In this study, the substrate scope of a novel self-sufficient P450 monooxygenase enzyme from *Azorhizobium caulinodans* was investigated by using a combined in silico and experimental approach. For this aim, a 3D homology model of the heme domain of the *A. caulinodans* P450 monooxygenase was constructed and molecular docking against various substrates from different classes such as fatty acids and their esters, linear alkanes, cyclic alkanes, aromatic compounds, steroids, and pharmaceuticals was performed using YASARA software. Subsequent to detailed computational analysis, substrates were also tested experimentally by employing NADPH depletion assay in order to determine which substrates were accepted by *A. caulinodans* P450 monooxygenase. Experimental studies revealed that P450 monooxygenase enzyme showed high activity towards 10 substrates out of 59 tested substrates. The highest NADPH depletion rate was observed towards 2-Amino-5-chlorobenzoaxazole. Furthermore, 27 substrates showed slight activity and 20 substrates were not accepted by monooxygenase. Ultimately, computational and experimental findings were compared and the substrate scope of the *A. caulinodans* P450 monooxygenase enzyme was revealed.

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Non-targeted Metabolomics Approach Based on LC-QTOF Data and Software-Assisted Metabolite Detection and Identification

Burmykin D.[a]*, Podolskiy I.[a], Ovcharov M.[a], Temerdashev A.[b]

[a]*Bruker Ltd., Moscow, Russian Federation*

[b]*Kuban State Universitry, Krasnodar, Russian Federation*

**Dmitry.Burmykin@bruker.com*

Non-targeted metabolomics is an approach that allows to identify small molecule biomarkers formed in response to particular biological processes that may be caused by internal or external factors. Such approach is used to search for markers of the disease, as well as to search for metabolites of drug use.

Bruker Daltonics offers an ultimate solution for non-targeted metabolomics based on Bruker QTOF platform and Metaboscape® software. The most complicated challenge is annotating new unknown metabolites. Combining accurate mass MS and MS/MS data with integrated software modules like BioTransformer, CompoundCrawler and MetFrag allow to streamline metabolite detection and identification. Another problem is finding the most significant analytes from the entire data set. Metaboscape® software includes PCA and PLS statistics modules to highlight major changes.

Bruker non-targeted metabolomics approach can be demonstrated on an example of the UHPLC-HRMS study of 2-ethylsulfanylbenzimidazole (bemethyl) metabolism. This compound is considered by WADA as a doping substance, but still not in the Prohibited list, because of the very fast elimination of the native compound from the human body and the absence of long-term metabolite studies till now. Metaboscape® software helped to find more than 10 new major bemethyl metabolites and 2 long-term metabolites that remain detectable more than 2 weeks after a single therapeutic dose. Days of painstaking work could be transformed into several minutes. The assumption about the elemental composition of metabolites was based on exact mass and fragmentation observed in MS/MS spectra.

Nowadays, measuring complex samples is a routine task in many metabolomics laboratories. An integral part of the metabolomics workflow is the application of statistical methods to quickly pinpoint relevant information and generate knowledge.

Melatonin and Carnosine Ameliorate Ionizing Radiation-Induced Oxidative Brain Damage in Rats

Ismet Burcu Turkyilmaz[a] *, Huseyin Us[b], Ayca Sezen-Us[b], Omur Karabulut-Bulan[b], Refiye Yanardag[a]

[a]*Istanbul University-Cerrahpasa, Faculty of Engineering, Department of Chemistry, Avcilar-Istanbul, Turkey*

[b]*Istanbul University, Faculty of Science, Department of Biology, Vezneciler-Istanbul, Turkey*

**burcut@iuc.edu.tr*

Exposure to ionizing radiation becomes inevitable during these days from many sources. It has been mentioned that irradiation has many deleterious consequences on the different organs including the brain via causing the production of free radicals.[1] Melatonin, an important antioxidant, and anti-inflammatory mediator regulates many brain activities and is capable to penetrate the blood-brain barrier.[2,3] Carnosine is a small and water-soluble substance which has been proven as having an antioxidant effect on many organ damages as well as anti-glycation, maintaining pH-balance of the body and metal chelating capacity.[4,5] In this study, it was aimed to investigate the protective effects of melatonin and carnosine on radiation-induced brain damage. The rats were randomly divided into five groups. Group I; control animals received physiological saline by intraperitoneally; Group II, the radiation-induced group only received physiological saline (0.9% NaCl) by intraperitoneally; Group III, animals injected 10 mg/kg melatonin by subcutaneously; Group IV, animals received 250 mg/kg L-carnosine by intraperitoneal injection; Group V, animals received melatonin and L-carnosine at the same doses and times. Injections were made three times a week in a 48h period. After the second injection, Group II, III, IV, and V received total bodily 8Gy radiation using IBL-437 C (Cesium 137) as a radiation source for 1.51 minutes. Irradiation of animals was applied either getting close or going away from the gamma source. At the end of the experiment, they were sacrificed under anesthesia and brain tissues were collected. 10% (w/v) homogenates were prepared and then centrifuged. Brain-reduced glutathione and total antioxidant capacity levels were found to decrease while nitric oxide, total oxidant status, reactive oxygen species, oxidative stress index levels, and acetylcholine esterase activity were found to increase in the radiation group. Administration of melatonin and carnosine either alone or as combined form reversed these levels and activity in the radiation group. In conclusion, we can suggest that melatonin and carnosine have shown protection on brain tissue against radiation-induced damage.

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Evaluation of Antidiabetic Effect of *Paeonia mascula* L., Isolation and Structure Elucidation of the Compounds Responsible from the Effect

Sefa Gözcü[a], R. Anıl Uğan[b], Hilal Özbek[c], Zühal Güvenalp[c] *

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Pharmacognosy, Erzincan, Turkey*

[b]*Atatürk University, Faculty of Pharmacy, Department of Pharmacology, Erzurum, Turkey*

[c]*Atatürk University, Faculty of Pharmacy, Department of Pharmacognosy, Erzurum, Turkey*

**guvenalp@atauni.edu.tr*

Paeonia genus (Paeoniaceae) is represented in Turkey by 6 species.[1] The leaves of *Paeonia mascula* L. are used in folk medicine as antidiabetic, sedative, antidiareic, and antitussive.[2,3] Antimicrobial, analgesic, anti-inflammatory, and antioxidant effects of *P. mascula* were indicated in previous studies.[4-6]

The aim of this study is the scientific investigation of the antidiabetic effect of *P. mascula* and the determination of its phytopharmaceutical potential for treating *Diabetes mellitus*. For this aim, 70% methanol extract and its different polarity fractions prepared from aerial parts of this plant were evaluated for *in vitro* and *in vivo* antidiabetic activity. *In vitro* activity studies were performed with *α*-glucosidase enzyme inhibitory effect assay and *in vivo* studies with a streptozotocin-induced diabetic rat model. Also, the structures of the isolated compounds were identified by spectral methods.

Among the extracts of *P. mascula*, the highest *α*-glucosidase inhibitory effect was determined at ethyl acetate and *n*-butanol extracts. They also significantly lowered blood glucose levels in diabetic rats. In the isolation studies, 8 compounds were purified. As a result of the *α*-glucosidase inhibitory activity studies on these compounds, 1,2,3,4,6-penta-*O*-galloyl-*β*-D-glucose was found to be responsible for the effect. According to these results, *P. mascula* can be used in diabetes and its complications.

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Terpene derivatives: skin permeation enhancers with own biological activity

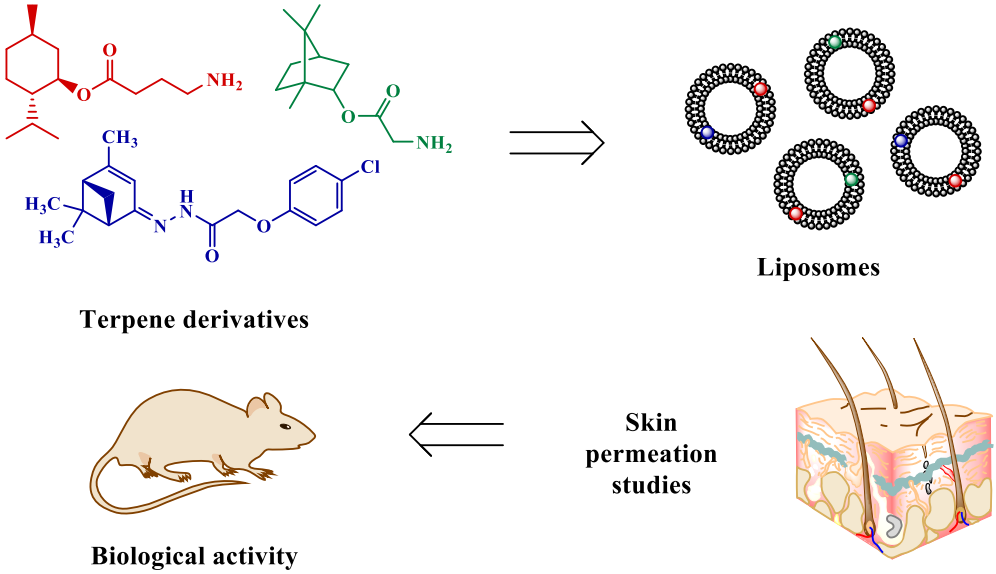
Mariia Nesterkina*, Iryna Kravchenko

Odessa National Polytechnic University, Department of Organic and Pharmaceutical Technology, Odessa, Ukraine

**mashaneutron@gmail.com*

The present study aims to investigate the novel potential skin permeability enhancers based on derivatives of mono- and bicycle terpene. For this purpose, a series of terpene esters containing residues of neurotransmitter amino acids (GABA and glycine) as well as terpene hydrazones with *para*-substituted phenoxycetic acids have been used as objects.

The action mechanism of terpene derivatives on phospholipids of artificial membranes and lipids isolated from the rat stratum corneum was studied by fluorescence and FT-IR spectroscopy. When applying the fluorescent method, excimer/monomer emission intensity (I_E/I_M) ratio was calculated by measuring the relative intensities of pyrene excimer and monomer forms at 394 nm and 475 nm, respectively. According to our data, the inclusion of terpene derivatives in phospholipid liposomes leads to the growth of excimer to monomer ratio (I_E/I_M) indicating a decrease of membrane microviscosity. The disruption of a hydrogen-bonded network formed by polar lipid groups was suggested as a mechanism of action for terpene esters and hydrazones confirmed by FT-IR analysis.



Given the above, terpene esters and hydrazones were estimated after topical application as potential analgesic agents via chemical-induced pain models using capsaicin and allyl isothiocyanate (AITC) as algogens. All the tested compounds were found to suppress painful sensations produced by noxious stimuli which indicate TRP receptors as one of the pharmacological targets of terpene derivatives.

Thermo Scientific Orbitrap Ultra High-Resolution Mass Spectrometer

M. Tekin Şensoy*

Serfali Mah. Bayraktar Bul. Emin Sokak. No:4 Ümraniye, İSTANBUL

**tekin.sensoyedokslab.com*

In the presentation, the latest products of ThermoScientific Orbitrap Ultra High-Resolution Mass Spectrometer technology, Orbitrap Exploris, and Orbitrap Eclipse models, will be introduced and examples of their applications in qualitative and quantitative protein analysis will be given.

Activatable Luciferin Derivatives for Bioluminescence Imaging of Cancer Cells

Safacan Kölemen[a] *

Koç University, Department of Chemistry, Istanbul, 34450 Turkey

**skolemen@ku.edu.tr*

Bioluminescence is a striking phenomenon, which can be simply defined as an enzyme-catalyzed reaction that emits light. Among different bioluminescent agents D-luciferin, also known as the firefly luciferin, is the most established one in bio-imaging studies and it emits around 600 nm in the presence of luciferase enzyme and several cofactors (ATP and Mg^{2+}).[1,2] Bioluminescence imaging has attracted great attention during the last decade as it addresses almost all of the drawbacks that can be seen with regular fluorophores such as auto-fluorescence and limited light penetration depth of the light through tissues.[1] Thus, bioluminescent agents have appeared to be highly suitable for *in vivo* tumor imaging studies and D-luciferin-based agents have been extensively used in this direction.[1,2] Another remarkable advantage of bioluminescence imaging is that the D-luciferin can be easily designed as a cancer cell-selective probe by masking the hydroxyl group with a cage unit that can be cleaved via tumor-associated stimuli. Caged luciferin is non-emissive and selectively restores its characteristic luminescence in cancer cells upon cleavage of the cage unit.[2,3] In this direction, we have designed the first ever example of a matriptase activatable luciferin derivative (ML-1) and a glutathione (GSH)/matriptase dual responsive luciferin-based agent (ML-2) for selective imaging of prostate cancer cells. Both probes were successfully synthesized and their response to matriptase and GSH/matriptase were tested. Both ML-1 and ML-2 exhibited turn-on luminescence upon reacting with the analyte of interest(s) in luciferase (Fluc) buffer, while no signal was detected in the absence of the activators.

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Biotransformation of (1R,2R,5R)-(+)-2-Hydroxy-Pinanone by 14 Fungi and Antimicrobial Evaluation

İsmail Kıran[a] *, Hatice Üçer[b], Emine Sıralı İrdem[c]

[a] *Eskişehir Osmangazi University, Faculty of Science and Letters, Chemistry Department, Meşelik Campus, 26040, Eskişehir, Turkey*

[b] *Eskişehir Osmangazi University, Graduate School of Natural and Applied Sciences, Chemistry Department, Meşelik Campus, 26040, Eskişehir, Turkey*

[c] *Eskişehir Osmangazi University, Graduate School of Natural and Applied Sciences, Biology Department, Meşelik Campus, 26040, Eskişehir, Turkey*

**ikiran1971@gmail.com, ikiran@ogu.edu.tr*

Monoterpenes are a class of terpenes with branched-chain C10 hydrocarbons biosynthesized from two isoprene units. They are valuable compounds for the pharmaceutical and cosmetic industry since they exert important biological activities such as antimicrobial, antiviral, and anticancer and high volatility and strong sensory qualities.[1-3] This study aimed to investigate the microbial transformation of (1R,2R,5R)-(+)-2-hydroxy-3-pinanone with fungi and to assess antimicrobial activities of its biotransformed metabolites against a panel of pathogenic microorganisms.

Among the pre-screening biotransformation experiments carried out with 14 fungal cultures, both *Aspergillus niger* NRRL 326 and *Aspergillus fumigatus* (wild type) reduced the keto group of (1R,2R,5R)-(+)-2-hydroxy-3-pinanone to its *β*-hydroxy derivative, *Fusarium culmorum* (wild type) reduced the keto group of (1R,2R,5R)-(+)-2-hydroxy-3-pinanone to its *α*-hydroxy derivative whereas *Alternaria infectoria* (wild type) yielded mono-hydroxylated derivative in an α–medium at 25◦C for 7 days. Antimicrobial evaluation of (1R,2R,5R)-(+)-2-hydroxy-3-pinanone and its biotransformation metabolites against 5 fungi, 3 yeast, and 6 bacteria were carried out using a broth micro-dilution method recommended by CLSI (Clinical Laboratory Standards Institute).[4,5] The results in bacteria tested indicated moderate inhibitory activity when compared to the standard, with MICs > 500 µg/mL. The highest activity was shown by its *β*-hydroxy derivative against *Candida albicans* with 2.5 mg/mL where the Fluconazole (1mg/mL) did not show any inhibition.

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Green Synthesis of Silver Nanoparticles Using *Armillaria mellea* and *Xerocomellus chrysenteron* Extracts and Evaluation of Their Antimicrobial and Anticancer Potentials

Aykut Özgür[a,*], Nazan Gökşen Tosun[b], Özlem Kaplan[c], İbrahim Türkekul[d], İsa Gökçe[e]

[a]*Tokat Gaziosmanpaşa University, Artova Vocational School, Department of Veterinary Medicine, Laboratory and Veterinary Health Program, Tokat, Turkey*
[b]*Tokat Gaziosmanpaşa University, Faculty of Engineering and Architecture, Department of Biomaterials and Tissue Engineering, Tokat, Turkey*
[c]*Istanbul University, Faculty of Science, Department of Molecular Biology and Genetics, Istanbul, Turkey*
[d]*Tokat Gaziosmanpaşa University, Faculty of Arts and Sciences, Department of Biology, Tokat, Turkey*
[e]*Tokat Gaziosmanpaşa University, Faculty of Engineering and Architecture, Department of Bioengineering, Tokat, Turkey*

**aykut.ozgur@gop.edu.tr*

Metallic nanoparticles have a big potential in cancer therapy as an effective carrier and contrast agent. Especially, silver is a popular metal in the synthesis of metallic nanoparticles due to its unique physical and chemical properties.[1,2] In this study, silver nanoparticles (AgNPs) were synthesized using *Armillaria mellea* and *Xerocomellus chrysenteron* extracts by a microwave-assisted method. The synthesized AgNPs were characterized by UV-Vis, FTIR, XRD, EDS, and STEM analysis. The synthesized AgNPs were almost spherical shaped, well-dispersed, and stable with average sizes below approximately 20 nm. The antimicrobial activity of the synthesized AgNPs against the pathogen bacterial strains of *Pseudomonas aeruginosa*, *Klebsiella pneumonia*, *Staphylococcus aureus* and *Enterococcus faecalis* was determined by minimum inhibitory concentration method. The anticancer activity of the AgNPs was examined on human liver cancer (HUH-7) and colon cancer (HT-29) cell lines by MTT assay. The AgNPs exhibited significant antibacterial and antiproliferative effects in a dose-depended manner. Hence, the synthesized AgNPs may be potential metal-based nanoparticle systems to treat infectious and cancer in nanomedicine.

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Metabolomics Workflow

Suna Uçan*

SEM Laboratuar Cihazları Paz. San. ve Tic. A.Ş., İSTANBUL

**suna.ucan@sem.com.tr*

Metabolomics is the fastest growing “omics” field in the world and it is powerful technique to understand biological samples. Key techniques used for metabolomics are LC, GC, QQQ or QTOF systems.

Multiparametric Investigation of Neuronal Effects of Gold Nanorods with Various Surface Coatings

Ilyas Ozcicek[a, b], Nese Aysit[a, b] *, Cagri Cakici[c]

[a]*Istanbul Medipol University, Department of Medical Biology, School of Medicine, Turkey*

[b]*Istanbul Medipol University, Health Science and Technologies Research Institute (SABITA), Turkey*

[c]*Istanbul Medipol University, Department of Medical Biochemistry, School of Medicine, Turkey*

** naysit@medipol.edu.tr*

Due to their stability, biocompatibility, unique chemical, physical and optical properties, gold nanorods (AuNRs) have been investigated for a number of biomedical applications including that bio-imaging, detection, drug delivery, photothermal therapy, targeting, and DNA/RNA delivery. It is known that various surface coatings of the AuNRs are very important in terms of toxicity, biodistribution, cellular localization, and potential therapeutic uses.[1] Neuronal toxicology, localization and cellular uptake studies of AuNRs are very limited when compared to the gold nanoparticles. Again, many common neurodegenerative syndromes and diseases are closely related to neuronal nucleolar insufficiencies.[2]

In this study, cetyltrimethylammonium bromide (CTAB) stabilized gold nanorods (AuNRs) were synthesized and their surfaces were coated with polyethyleneimine (PEI-SH) and polyethylene glycol (PEG-SH) by ligand exchange chemistry. Dorsal root ganglion (DRG) sensory neurons were isolated from BALB/c mice. Cell viability, apoptosis, reactive oxygen species (ROS) production, the structure of neuronal cytoskeletal elements, and cellular gold uptake of the AuNRs were evaluated multi-parametrically. Additionally, neuronal localization of the different AuNR groups was determined using a two-photon microscope and transmission electron microscope (TEM).

In general, PEI and PEG surface coatings increased both biocompatibility and cellular uptake of the AuNRs. Using the near-infrared laser of the two-photon microscope, very strong signals were taken from the nucleolus parts of the neurons particularly and these localizations of the AuNRs-PEI were also confirmed by the TEM images. The PEI coating of the AuNRs was evaluated to give superior results compared to PEG surface modification for the potential cellular applications of the gold nanorods.

Synthesized surface-modified gold nanorods are promising candidates for the potential biomedical neural cellular applications given their chemical stability, large surface area, biocompatibility, and easy synthesizability.

Acknowledgment: *This study was supported by The Scientific and Technological Research Council of Turkey (Grant no: 217S135).*

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Identification of Novel Selective Estrogen Receptor Alpha Antagonists: Virtual Screening, Molecular Dynamics Simulations

Deryanur Kilic*

Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey

**deryanurerdem@atauni.edu.tr*

Breast cancer is the most common invasive cancer affecting women worldwide. The success of endocrine treatments is limited due to the development of resistance. [1] Therefore, there is a need to develop new lead compounds for the treatment of breast cancer. 70% of breast carcinoma is ER+. Estrogen receptor alpha (ERα) is overexpressed in cases of ER+.[1,2] Therefore, in this study, we used a comprehensive approach to screen for potential molecules against ERα.

To achieve this, the focus was on compounds containing the benzothiophene core. An integrative computational approach including virtual screening, similarity, clustering, and molecular dynamics simulation was used to find the hit antagonists among these compounds. The approach predicted information on binding site residues, ligand and protein conformations, binding energies, and revealed that the benzothiophene core-containing compounds exhibit significant binding to ERα.

The complexes with the top docking scores were selected for molecular dynamics simulation studies. RMSD showed that the systems were highly stable and RMSF analysis calculated fluctuations on a per-residue showed that the residues were flexible enough to interact with the ligand. To confirm the binding of potential benzothiophene derivative antagonists following molecular simulation, MMGBSA analysis, which reveals the binding energy of ligands, was performed. Overall, the results indicated that the hit benzothiophene derivatives could be potential antagonists against ERα.

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Expression and Biochemical Characterization of *Hypsibius dujardini* Epoxide Hydrolase (*Hd*EH) Enzyme in *Pichia pastoris*

Elif Sibel Aslan[a] *, Hakan Onur[b], Ahmet Tülek[c], Barış Binay[c]

[a]*Biruni University, Department of Molecular Biology and Genetics, Zeytinburnu, Istanbul, Turkey*

[b]*Gebze Technical University, Department of Molecular Biology and Genetics, Gebze, Kocaeli, Turkey.*

[c]*Gebze Technical University, Department of Bioengineering, Gebze, Kocaeli, Turkey*

**easlan@biruni.edu.tr*

Epoxides are organic three-membered oxygen compounds that arise from the oxidative metabolism of endogenous, as well as xenobiotic compounds via chemical and enzymatic oxidation processes.[1] Epoxide rings are highly unstable in an aqueous environment, which can cause irreversible toxic effects in reactions with DNA, amino acids, or purines. These effects can give rise to mutagenesis and carcinogenesis.[2] Epoxide hydrolase (EH) catalyzed enantioselective hydrolysis of epoxides provides a simple and green method for the syntheses of enantiopure epoxides and vicinal diols that are useful and valuable chiral pharmaceutical products.[3] Thus EH plays a vital role in the metabolism and removal of these epoxide ring compounds.[4]

In this study, it is aimed to accomplish heterologous production, purification, and biochemical characterization of the epoxide hydrolase *Hypsibius dujardini* (*Hd*EH). The specific EH gene to be used has been identified through the NCBI and UniProt databases. Studies have focused on *Hd*EH and epoxide hydrolase characteristics of the related gene were determined. hdeh gene was amplified by using the cDNA of Hypsibius dujardini,[5] then ligated to pPIC9K vector. Competent cells of *P. pastoris* GS115(his4) was made by treatment with Pichia EasyCompTM Transformation kit (Invitrogen) and was transformed with the linear plasmid DNA by electroporation technique. Transformant colonies were proved by colony PCR, HIS4 selection, and antibiotic selection (Geneticin®). Heterologous production of the enzyme was performed. The presence of intracellular and extracellular enzymes was checked by the SDS-PAGE method. Recombinant enzyme activity was determined by its effect on styrene oxide (substrate). The necessary optimizations were made for the production of recombinant enzyme and the characterization of the produced enzyme. In future studies, it is planned to production medium conditions optimization (temperature, methanol concentration), purification, and kinetic calculations of the recombinant enzyme.

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Development of Molecular Imprinted Cryogel Membranes for Purification of Naringenin

Emel Demirtaş*, Mehmet Odabaşı

Aksaray University, Faculty of Science and Literature, Department of Chemistry, Aksaray, Turkey

**emeldemirtas88@gmail.com*

Naringenin is an important natural flavonoid with high analgesic, antioxidant, anti-inflammatory, anti-tumoral, and anti-viral effects. It is found in citrus fruits such as grapefruit (43.5 mg/100 mL) and oranges (2.13 mg/100 mL). After consumption of orange juice containing 8 mL/kg of naringenin, the plasma levels of naringenin increase from 0 to 300 mg/L in 4 hours.[1]

Naringenin, a natural and excess flavanone, has a wide range of biological and pharmacological activities. When we look at the in vitro impressive anti-inflammatory activities of naringenin, numerous studies have tested the efficacy of naringenin in animal models of inflammation-associated disease such as sepsis and endotoxic shock, hepatitis, pulmonary fibrosis, atherosclerosis, radiation-induced lung Injury, obesity, diabetes, and cancer.[2] In silico analysis in SARS-CoV-2 showed that naringenin has the potential to inhibit SARS-CoV-2 $3CL^{pro}$ and thus inhibit viral replication, which still needs further confirmation experimentally.[1]

In this study, molecular imprinted cryogel membranes have been developed for the fast and selective purification of "naringenin" molecule, which has a wide range of uses in medicine and industry. Adsorption capacities of cryogels in naringenin solution at different ionic strength values (0.1 - 0.4 mg/mL NaCl) were determined. According to the results obtained, it was observed that the effect of ionic strength was negligible. Adsorption capacities of cryogels in naringenin solution at different temperatures (i.e., 10 - 30 ^{o}C) were determined, and the highest adsorption was observed at 20 ^{o}C.

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Antioxidant and Thioredoxin Reductase and Trypsin Inhibitor Activities of Honey, Bee Pollen and Bee Bread

Kadir Boztas[a] *, Eda Dagsuyu[b] , Yusuf Can Gercek[a,c], Nesrin Ecem Bayram[d], Gul Cevahir Oz[a,c], Refiye Yanardag[b]

[a]*Istanbul University, Department of Biology, Faculty of Science, Istanbul, Turkey.*

[b]*Istanbul University-Cerrahpasa, Department of Chemistry, Faculty of Engineering, Istanbul, Turkey*

[c]*Centre for Plant and Herbal Products Research-Development, Istanbul, Turkey*

[d]*Bayburt University, Department of Food Processing, Aydıntepe Vocational College, Bayburt, Turkey.*

**kadir.boztas@istanbul.edu.tr*

Nowadays, some natural foods have started to be preferred by people because of their health protective-therapeutic properties. Among these products, bee products have a very important value. In particular, honey has been used in traditional medicine for centuries because of its nutritional and therapeutic properties. Other bee products except for honey such as pollen and bee bread have started to be consumed intensively as functional foods in recent years due to their pharmacological properties such as antibacterial, antifungal, antioxidant, anti-inflammatory, and hypoglycemic activities[1]. However, scientific research on bee bread is very limited.

In this study, it was aimed to determine the total phenolic-flavonoid content, antioxidant capacity, and thioredoxin reductase and trypsin inhibitor activities of different bee products (honey, bee pollen, bee bread) collected from Turkey, Bayburt. Total phenolic and flavonoid content of bee products was determined by using Folin-Ciocalteu and aluminum chloride methods, respectively, and antioxidant activity was determined by using CUPRAC (Cupric Reducing Antioxidant Capacity) and DPPH (1,1-diphenyl-2-picrylhydrazyl) assay. As a result, the total phenolic content of honey, pollen, and bee bread samples were found to be 0.73, 9.03, 6.28 mg GA/g, and the total flavonoid content was 0.31, 3.00, 1.74 mg QE/g respectively. As a result of the antioxidant activity analysis, the extracts tested were sorted as bee pollen> bee bread> honey. All bee products exhibited various concentration-dependent degrees of inhibition against thioredoxin reductase and trypsin. Honey showed the highest thioredoxin reductase and trypsin inhibitory activities.

As a result, consumption of bee products classified in the functional food class, which has a remarkable total phenolic-flavonoid content and antioxidant activity, may be beneficial for people to be protected from diseases and to lead a healthier life. For this reason, it is important to determine the chemical contents and biological activities of such natural products and to carry out detailed researches for their standardization in Turkey, which is an important point in terms of beekeeping activities.

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Production of High Value-Added Proteins with Enzyme Engineering Techniques and Bioprocess Development

Buse Çaloğlu[a] *, Elif Günay[b], Ferhat Öcal[a], Barış Binay[c]

[a]*Gebze Technical University, Institute of Biotechnology, Industrial Biotechnology, Kocaeli, Turkey*

[b]*Gebze Technical University, Institute of Natural and Applied Sciences, Molecular Biology and Genetics, Kocaeli, Turkey*

[c]*Gebze Technical University, Faculty of Engineering, Department of Bioengineering, Kocaeli, Turkey*

[*]*b.caloglu2020@gtu.edu.tr*

Biotechnological applications are the trend for the production of the desired products used in the enzyme technology, biomaterial, etc. owing to the application of technological developments to the biological processes.[1] Enzyme, is one of the biological products that biotechnological applications including bioprocess developments and enzyme engineering techniques have been applying. Formate dehydrogenase is an industrial enzyme that catalyzes the reversible reaction of CO_2 and formate.

Enzyme engineering techniques including site-directed mutagenesis and iterative saturation mutagenesis was applied for enhancing the activity of formate dehydrogenase enzyme from *Chaetomium thermophilum* (*Ct*). In site-directed mutagenesis application, the effect of amino acid positions located on the linked region on C*haetomium thermophilium* formate dehydrogenase (*ct*FDH) activity was determined. According to the activity results, K_M value decreased 2.53 times and 2.97 times, respectively for Glu164Ala and Asp188Arg in forward reaction. Iterative saturation mutagenesis was applied to enhance activity *Ct*FDH in reverse reaction and determine the functional analysis of valine 124 positions in *Ct*FDH enzyme. As well as enzyme engineering methods, bioprocess development is a method for enhancing activity by increasing cell density.

In bioprocess development, medium composition arrangement is one of the studies to enhance cell density. In our study, different carbon sources effect on the growth of *Pichia pastoris*, which is one of the most commonly used host organism to the production of recombinant protein, was examined. The optimization studies for three different carbon sources showed that corn bran and dextrose can be used for reaching high cell density instead of glycerol as an alternative source but corn germ extract did not have any effect to increase cell density.

Site-directed mutagenesis on *Ct*FDH resulted in effective result by decreasing K_m value and also different carbon sources were proved for their effectiveness as a carbon source for the growth of *Pichia pastoris*.

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Development of Nanostructured Lipid Carriers for Melanoma Treatment

Güliz Ak Demiroz[a,b], Gizem Tutar[a] *, Hande Balyapan[b]

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University Center for Drug Research & Development and Pharmacokinetic Applications, Izmir, Turkey*

**gizemtutar9@gmail.com*

Skin cancer is one of the most common cancers worldwide. Melanoma accounts for about 4% of all skin cancer cases, but the vast majority (75%) of skin cancer-related deaths occur, and worldwide melanoma cases are increasing day by day.[1] Doxorubicin is an anticancer drug that binds to the DNA molecule and inhibits topoisomerase II activity thus preventing DNA duplication and transcription. Trabectedin is also an anticancer drug that acts by covalently binding to guanine residues in the DNA minor groove. Both drugs have a low therapeutic index and many side effects. Nanocarrier systems are desired for the delivery of such drug molecules.[2,3] Nanostructured lipid carriers (NLC) are obtained by using different lipid forms and thanks to irregular crystal structures, drug loading capacity increases, and controlled drug release is ensured.[4] In addition, nanostructured lipid carriers have advantages such as low toxicity and biodegradability. The aim of this study is the development of targeted and doxorubicin and trabectedin containing nanostructured lipid carriers in order to provide enhanced melanoma treatment. In this work, doxorubicin and trabectedin encapsulated and targeted nanostructured lipid carriers (DTP-NLC) were produced using the melt-emulsification and ultrasonication techniques. The nanocarriers were physicochemically characterized and the results of empty nanoparticle and DTP-NLC were compared. Drug encapsulation efficiency was determined using high pressure liquid chromatography (HPLC). DTP-NLC was found to have a hydrodynamic size as 123.77 nm±9.69, zeta potential as -27,89±1,12 and have spherical shape. Doxorubicin and trabectedin encapsulation efficiency was found %60,01 and %95, respectively. Based on the all data it can be suggested that dual drug-containing nanolipid carriers could show promise in the treatment of melanoma.

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The Impact of the Reference Database Selection on Activated Sludge Microbiome Analysis

Melis Sercan[a] *, Gizem Gülfidan[b], Kazım Yalçın Arğa[b], Didem Okutman Taş[a]

[a] *Istanbul Technical University, Environmental Engineering Department, Istanbul, Turkey*
[b] *Marmara University, Department of Bioengineering, Istanbul, Turkey*

**melissercan.95@gmail.com*

Activated sludge consists of various types of microorganisms that play a role in wastewater treatment. The diversity of these microorganisms has been characterized by previous studies using 16S rRNA gene amplicon sequencing. These techniques have provided an idea about the relative abundance of microbial species in activated sludge systems. However, for analyzing 16S rRNA amplicon data of activated sludge microbiome, there is no current criteria to select available reference databases which are used to amplicon data into readable bacterial names.[1] In literature, there are several reference databases to analyze 16S rRNA sequences (i.e., NCBI, SILVA, RDP, Greengenes, MİDAS).[2] The aim of this study is to determine and compare the impact of two mostly referred reference databases which are NCBI and SILVA on α-diversity measurements and β-diversity comparisons at the genus level. In this content, activated sludge samples were obtained from laboratory-scale sequencing batch reactors operating at sludge ages of 5 days, 10 days, and 20 days. Results indicated that analysis of microbiome by NCBI and SILVA databases lead to different taxonomic information. Although reference databases impact is not notable on taxonomic assignment at higher phylogenetic affiliations (i.e., class or phylum level), differences found prominently at the genus level. Compared to NCBI taxa at the genus level, SILVA database provided more taxon information. On the other hand, a high percentage of uncultured genera was observed in SILVA database which was not the case in NCBI database. These findings indicated the significant impact of the database selection during the characterization of the activated sludge samples.

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Antimicrobial Tenture Extraction from *Hypericum Perforatum L.* and *Helicyrsum Arenarium* with Phenolic Compound Determination

Deniz Emre Şeker[a]*, Çiğdem Sönmez[a], Aişe Ünlü[b]

[a]*Gebze OSB Bahcesehir Science & Technology High School, Gebze, 41400, Kocaeli, Turkey*

[b]*Gebze Technical University, Department of Chemistry, Gebze, 41400, Kocaeli, Turkey*

**ertas82@hotmail.com*

Staphylococcus Aureus is an Antibiotic-Resistant Pathogen that causes many skin infections such as acne, boil etc. Tenture D'iyote is an old method that has been used for bacteriolysising this gram-positive pathogen for over years. However, in terms of its content; it's a noxious chemical solution that contains Ethyl Alcohol as a solvent. In addition, Not Ethyl Alcohol, only bacteriolysis the *Staphylococcus Aureus* pathogen, but destructs the cells that are responsible for wound healing and causes self-destruction of cells in longtime exposure. Instead of all these chemicals, many plants that exist in nature and have a high antimicrobial effect can be used easily, besides they have no side effects.

In this study, Antimicrobial Activity was studied from St. Johns Wort and Everlasting Flower plants that are endemic plants in Turkey in order to make a herbal tincture that would be equivalent to Tenture D'iyote. First of all, the extracts of the plants were prepared by Hot Extraction Method in different solvents (Water, Ethyl Alcohol, Natural Apple Cider Vinegar), and then the Total Phenolic Components in these prepared extracts were calculated. After that, the Antimicrobial Activities of the plant extracts against *Staphylococcus Aureus* isolates which is an Antibiotic-Resistant Pathogen were determined.

In the Conclusion; it has been revealed that, the Herbal Tincture that we obtained from the study can be used as an alternative to Tenture D'iyote. The study also confirmed that, the best herbal tincture against the *Staphylococcus Aureus* pathogen is Everlasting Flower + St. Johns Wort (together as a plant-mix) and Natural Apple Cider Vinegar as a solvent.

Synthesis of New Derivatives of Quinolone Class Antibiotics Containing Thiazole Ring

Aslıhan Ayvaz[a] *, Neslihan Demirbaş[a], Ahmet Demirbaş[a], İnci Durukan[b]

[a]*Karadeniz Technical University, Department of Chemistry, Trabzon, Turkey*
[b]*Karadeniz Technical University, Department of Medical Microbiology, Trabzon, Turkey*
**aslihanayvaz61@gmail.com*

Quinolones and thiazoles from the class of heterocyclic ring systems are important heterocycles for developing new therapeutic agents.[1] The quinolone skeleton is widely involved in the structures of various chemotherapeutic agents.[2] The thiazole ring is found in the structure of many pharmacologically active compounds of synthetic or natural product origin. Thiazole-based compounds, anticancer, anti-leukemic, anti-inflammatory, antiviral, antifungal, antirheumatic, are in clinical use as immunomodulatory and anti-parasitic agents. Some important drugs in clinical use in this class are; Thiazofurin, Dasatinib, Fenetizol, Talipexole.[3] Today, diseases caused by microorganisms, a major threat to global health.[4] This is why medicinal chemists and pharmacologists have concentrated their work on the design, development, and study of pharmacological properties of these structures.[2] In this study, Compounds containing the quinolone ring and hybridized with the thiazolidinone ring in the C-3 position, anticancer, antioxidant, and other biological activities such as the anti-cholinesterase potential to show where it is seen.

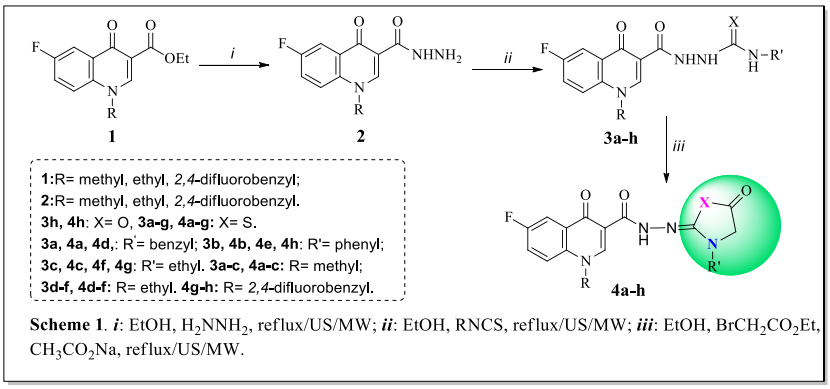

Figure. Synthesis of new quinolone-thiazolidinone hybrid compounds

Acknowledgment: *The Scientific and Technological Research Council of Turkey (Project No: 217Z085).*

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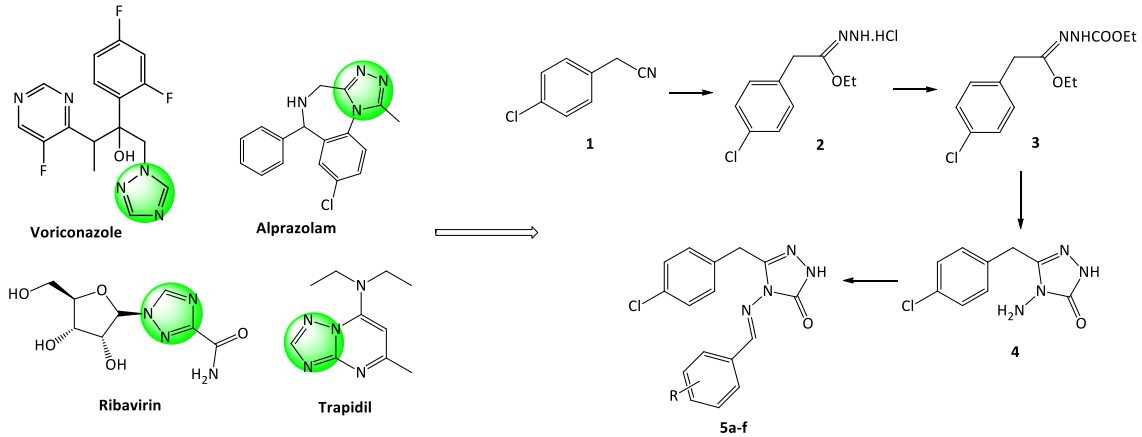
Synthesis, Anticancer Evaluation, Molecular Docking and ADMET Properties of Novel PANC-1 Inhibitors

Arif Mermer[a*], Aslıhan Ayvaz[b] *, Sümbül Yıldırım[c]

[a]*University of Health Sciences Turkey, Experimental Medicine Research and Application Center, 34662, Istanbul, Turkey*
[b]*Karadeniz Technical University, Department of Chemistry, 61080, Trabzon, TURKEY*
[c]*Yeditepe University,Department of Genetics and Bioenginering, 34755, İstanbul, TURKEY*
**arif.mermer@sbu.edu.tr*

Pancreatic cancer is deadly among various cancers and ranks 6th as the most frequent cause of cancer death. The 5-year survival rate of the patients is the lowest among different cancer types because the patients are diagnosed usually at the advanced metastatic stage.[1] In addition, therapeutic protocols for the treatment of pancreatic cancer often fail to be effective due to drug resistance and impaired drug delivery pathways.[2] Therefore, novel chemotherapeutic agents to target pancreatic cancer are urgently required. Triazole-containing compounds have been found to possess antidiabetic, anti-inflammatory, antioxidant, anticancer and antiviral activities. Triazoles have gained clinical interest due to their low toxicity, economical price, and relative ease of chemical modification.[3] In this study, six novel 1,2,4-triazole derivatives were synthesized via green chemistry techniques, microwave irradiation and ultrasound sonication. Compared to conventional method, the reaction time decreased about 3-4-fold, while the reaction yields increased in the range of 30-40%. Further, the obtained compounds were investigated against PANC-1 cell line and one of the compounds exhibited a very promising result with an IC_{50} value of 5.9487 µM. The *in silico* ADMET properties of all compounds were performed using a web-based platform (www.swissadme.ch), and molecular docking studies were also done.



Scheme. FDA approved 1,2,4-triazole containing drugs and synthetic pathway of target compounds

Acknowledgment: *The Scientific and Technological Research Council of Turkey (Project No: 217Z085).*

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Novel Systems Biomarker Candidates with High Diagnostic and Prognostic Performance in Esophageal Squamous Cell Carcinoma

Gizem Gulfidan[a] *, Hande Beklen[a], Beste Turanli[a], Dilara Ayyildiz[a,b], Raghu Sinha[c], Kazim Yalcin Arga[a]

[a] *Marmara University, Faculty of Engineering, Department of Bioengineering, Istanbul, Turkey.*
[b] *Princess Máxima Center for Pediatric Oncology, Utrecht, The Netherlands.*
[c] *Penn State College of Medicine, Department of Biochemistry and Molecular Biology, Hershey, Pennsylvania, USA.*
**gizemgulfidn@gmail.com*

Esophageal squamous cell carcinoma (ESCC) is among the most dangerous cancers with high mortality and lack of robust diagnostics and personalized/precision therapeutics. To achieve a systems-level understanding of tumorigenesis, unraveling of variations in the protein interactome and determination of key proteins exhibiting significant alterations in their interaction patterns during tumorigenesis are crucial[1]. To this end, we have described differential protein-protein interactions and differentially interacting proteins (DIPs) in ESCC by utilizing the human protein interactome and transcriptome[2]. Furthermore, DIP-centered modules were analyzed according to their potential in elucidation of disease mechanisms and improvement of efficient diagnostic, prognostic, and treatment strategies. Seven modules were presented as potential diagnostic, and 16 modules were presented as potential prognostic biomarker candidates. Importantly, our findings also suggest that 30 out of the 53 repurposed drugs were noncancer drugs, which could be used in the treatment of ESCC. Interestingly, 25 of these, proposed as novel drug candidates here, have not been previously associated in a context of esophageal cancer. In this context, risperidone and clozapine were validated for their growth inhibitory potential in three ESCC lines. Our findings offer a high potential for the development of innovative diagnostic, prognostic, and therapeutic strategies for further experimental studies in line with predictive diagnostics, targeted prevention, and personalization of medical services in ESCC specifically, and personalized cancer care broadly. The scholarships under the YOK 100/2000 Doctoral Fellowship Program and 2211/A National PhD Scholarship Program under The Scientific and Technological Research Council of Turkey (TUBITAK) provided to Gizem Gulfidan are greatly acknowledged. This research was supported in part by Penn State Cancer Institute Funds to Raghu Sinha, and by TUBITAK through project number 116M014 to Kazim Yalcin Arga.

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Investigation of the Effects of 1,2,4-Triazole Semicarbazide and Thiosemicarbazide Type New Compounds on hEGFR Activity

Yakup Kolcuoğlu[a] *, Emine Şahin[a], Şenay Hamarat Şanlier[b,c], Hilal Fazli[a], Narin Ustalar[a]

[a]*Karadeniz Technical University, Science Faculty, Department of Chemistry, Trabzon Turkey*
[b]*Center for Drug Research & Development and Pharmacokinetic Applications, Ege University, Izmir, Turkey*
[c]Biochemistry Department, Faculty of Science, Ege University, Izmir, Turkey

**yakupkolcuoglu@yahoo.com*

In order to cope with cancer, one of the deadliest diseases of our age, selectively targeted drugs are being developed against tumor cells. In this area, one of the most promising targets is the EGFR. EGFR is a protein-structured receptor located on the cell surface. When activated, it causes signal transduction within the cell and as a result, intracellular changes.[1] One of the protein tyrosine kinase receptors, EGFR not only controls the biological events necessary for cell viability but also assists in angiogenesis, which is essential for tumor growth and metastasis. Agents targeting EGFR are successful drugs that have taken their place in the treatment of various cancers, especially colorectal cancer, head and neck cancer, lung cancer, and breast cancer.[2]

In this study, the inhibitory effects of newly synthesized 1,2,4-triazole semicarbazide and thiosemicarbazide derivative compounds on hEGFR activity were investigated. In addition to the inhibition studies, the inhibition types of these molecules on the enzyme were also determined. As a result of the studies, it was determined that the 11c molecule showed the best inhibition on enzyme activity among these molecules and the inhibition type was uncompetitive. The mean Ki value of the 11c molecule was calculated as 0.0889 µM.

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Determination of Some Properties Of 1,2,4-Triazole-3-on and 1,2,4-Triazole-3-Thion Type New Compounds as Anticancer Drug Candidate Molecules

Yakup Kolcuoğlu[a]*, Emine Şahin[a], Şenay Hamarat Şanlier[b,c], Hilal Fazli[a], Narin Ustalar[a]

[a]*Karadeniz Technical University, Science Faculty, Department of Chemistry, Trabzon, Turkey*
[b]*Center for Drug Research & Development and Pharmacokinetic Applications, Ege University, Izmir, Turkey*
[c]*Biochemistry Department, Faculty of Science, Ege University, Izmir, Turkey*

**yakupkolcuoglu@yahoo.com*

Although significant advances have been made in understanding the molecular mechanisms of cancer formation and progression, and in the discovery of new treatments, cancer is still one of the most important health problems today. One of the most important reasons for the formation of this disease is protein kinases. The reason why protein kinases are active in uncontrolled cell proliferation is that these proteins generally communicate information about when cells will grow and divide in biological pathways in normal cells. Agents targeting EGFR, a member of the protein kinase family, are widely used in the treatment of various cancers, especially colorectal cancer, head and neck cancer, lung cancer and breast cancer. [1]

For this purpose, the inhibitory effects of new compounds containing 1,2,4-triazole-3-on and 1,2,4-triazole-3-thione structures on hEGFR and their potential as drug candidates were investigated. 17c, 18 and 19a were found to have the best inhibitory effect among these molecules. The inhibition types of these molecules on the receptor proteins were found to be noncompetitive. The mean K_i values of these molecules were calculated as 0.169 µM, 0.161 µM and 0.00232 µM, respectively. When the studied molecules were compared with gefitinib, which is used as a standard, it was understood that these molecules could be developed as an anticancer drug.

Acknowledgment: *This study was supported by TUBITAK (project no. 118Z187).*

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Diffractaic Acid Induces Cytotoxicity and Apoptosis in MCF-7 Cell Line

Şeyda Nur Kalin[a] *, Ahmet Altay[b], Harun Budak[a]

[a]*Atatürk University, Science Faculty, Department of Molecular Biology and Genetics, 25240, Erzurum, Turkey*

[b]*Erzincan Binali Yıldırım University, Faculty of Science and Arts, Department of Chemistry, 24002, Erzincan, Turkey*

**seydanurcakir32@gmail.com*

Breast cancer is one of the most common cancer types among women all over the world and it is one of the leading causes of morbidity and mortality.[1] Due to the limited and high cost of breast cancer treatments, it is important to identify new target molecules and therapeutic agents. Lichen acids have an extremely important feature in preventing the formation or development of carcinogenesis due to their cytotoxic, pro-apoptotic, anti-oxidant, anti-proliferative, anti-migratory, anti-invasive properties.[2,3] The fact that more than 1000 lichen acids are known so far constitutes a unique resource for anticancer studies.[4] The anticancer effect of diffractaic acid, one of the lichen acids, on human breast cancer has not been fully investigated.

In this study, the effects of diffractaic acid on cell viability, apoptosis, and migration in MCF-7 cell line were investigated by using cell proliferation (XTT) assay, quantification of BAX, BCL2, and P53 gene expressions by Real-Time PCR (qPCR), and wound healing test, respectively. According to our XTT assay results, the best IC_{50} value for diffractaic acid on MCF-7 cells was determined as 51.32±2.24 µg/mL at 52 hours. qPCR results indicated that diffractaic acid induced apoptosis in MCF-7 cells through increasing apoptotic pathway genes expression, including BAX/BCL2 ratio ($p<0,05$) and P53 ($p<0,01$). Wound healing assay results demonstrated that diffractaic acid decreased the migration of MCF-7 cells considerably at 6 ($p<0,001$), 12 ($p<0,01$), and 24 ($p<0,05$) hours.

In conclusion, diffractaic acid can be nominated as a potential therapeutic agent against MCF-7 cells. However, studies of the anticancer mechanism of diffractaic acid at the molecular level are still ongoing.

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Peroxidase Immobilized Zr-Based Metal-Organic Framework for Dye Decolorization

Selmihan Sahin*, Ali Tahreer Abdulmajeed Abdulmajeed, Ismail Ozmen

Faculty of Arts and Sciences, Department of Chemistry, Suleyman Demirel University, Cunur, Isparta 32260, Turkey

**selmihansahin@sdu.edu.tr*

Zirconium (Zr) is widely distributed in nature and is found in all biological systems. The rich content and low toxicity of Zr provides using them in different applications and attracts the interest of researchers. In recent years, metal-organic frameworks (MOFs) have emerged as a new category of porous and crystalline materials. Due to their unique properties such as high porosity and internal surface area, having both organic and inorganic components, they can be used in different applications such as sensing, separation and storage, drug delivery, batteries, adsorption and catalysis[1,2].

In this study, Zr- based MOF was prepared as a support material for peroxidase immobilization and used for decolorization of methyl orange dye. ZR-MOF was characterized using XRD, FTIR, TEM and EDS analysis. Immobilization of peroxidase on Zr-MOFs by adsorption was optimized. Peroxidase immobilized Zr-MOF was used for decolorization of methyl orange and compared with Zr-MOF.

As a result, decolorization of methyl orange with peroxidase immobilized Zr-MOFs was optimum at pH 5.0 and 30 °C. It showed ~20% higher decolorization value than Zr-MOF.

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Investigation of Bacteriocin Production Potentials of Lactic Acid Bacteria Isolated From Raw Milk Samples

Sümeyye Akbulut*,Elanur Tuysuz, Ahmet Adıgüzel, Hakan Özkan, Mesut Taşkın

Atatürk University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey

**sumeyya.arslan@atauni.edu.tr*

Lactic acid bacteria (LAB) which are Gram (+), catalase (-) and non-spore-forming are accepted as microorganisms producing lactic acid as the main end product as a result of their carbohydrate metabolism. LAB lowers the pH of the environment due to the lactic acid they produce, and they produce acid at these low pH's. LAB, which has an inhibitory effect on many bacteria, hamper the development of pathogen and contaminant organisms with substances such as lactic acid, hydrogen peroxide, diacetyl and bacteriocin they produce.[1] Since LAB produces these substances, they are very important in the protection and safety of the food product and these bacteria are regarded as reliable (GRAS) bacteria that have been used as a preservative culture in food production for many years. LAB are isolated from nutrient-rich media containing soluble carbohydrates, vitamins and proteins. They are abundant in meat, fruits, vegetables and dairy products, they are also found in the intestines and mucous membranes of mammals, in manures and wastewater.[2] In our current study, 18 isolates were obtained from 7 raw milk samples obtained from Erzurum province and these isolates were characterized phenotypically in the first stage. The isolates, whose morphological and physiological analyzes were performed, were then distinguished from each other on the basis of species by genomic fingerprint analysis [rep-PCR (GTG_5 and BOX PCR)]. As a result, 5 isolates considered to be different were genomically identified by 16S rRNA sequence analysis. At the first stage, antimicrobial properties of 5 identified isolates were tested *against Salmonella typhi, Staphylococcus aureus, Listeria monocytogenes, Bacillus cereus, Escherichia coli, Yersinia enterocolitica* and *Candida albicans*. Simultaneously, specific PCR analysis was performed to determine whether these 5 isolates contain the relevant bacteriocin genes (Plantaricin, Lactococcin, Pediocin, Brevicin, Nisin), determined by species at the genomic level. As a result of these two methods, it was determined that the ET2 isolate had strong antimicrobial effects against *Staphylococcus aureus* and *Bacillus cereus* and this isolate was a strong nisin producer. It was detected that as a result of 16S rRNA sequence analysis of the ET2 isolate, which has an antimicrobial effect and the potential to produce bacteriocin, ET2 showed 99% similarity to the *Enterococcus durans* species, and then this isolate was biochemically analyzed with the RapiD 20E System (bioMérieux, France).

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Designing an Aptasensor for Electrochemical Detection of TNT from Aqueous Solution

Tunca Karasu*, Canan Armutcu, Lokman Uzun

Hacettepe University, Faculty of Science, Department of Chemistry, Ankara, Turkey

**tuncakarasu@me.com*

Aptamer-based biosensors have been widely applied to detect food contaminants, pharmaceuticals, viruses, proteins, etc. thanks to their selectivity, sensitivity, rapidness and low cost. [1] In the past few years, aptamer-based biosensors have also been gaining considerable attention in forensic sciences[2], since these biosensors proved their worthiness having the aforementioned advantages.[3] Herein, we developed an aptamer-based sensor in order to detect 2,4,6-trinitrotoluene (TNT) from aqueous solutions. The TNT binding aptamer was attached onto the surface of gold electrode, which was activated with piranha solution prior to the study. The sensing experiments were performed by a portable device providing on-site measurements. The aptasensor linearly detected TNT in nanomolar range. It has also displayed high selectivity compared to the inference agents, 1,2,5-trinitrobenzene and 2,6-dinitrotoluene. According to the results, it has to be mentioned that the sensor platform could be a good candidate for on-site detection.

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Evaluation of Oxidative Damage and Inflammation in Periodontal Tissues of Rats with Paclitaxel-Induced Neuropathic Pain

Ayşe Toraman[a]*, Emine Toraman[b], Mustafa Özkaraca[c], Harun Budak[b]

[a]*Health Sciences University, Faculty of Dentistry, Department of Periodontology, İstanbul, Turkey*
[b]*Atatürk University, Science Faculty, Department of Molecular Biology and Genetics, Erzurum, Turkey*
[c]*Cumhuriyet University, Faculty of Veterinary Medicine, Department of Preclinical Sciences, Department of Veterinary Pathology, Sivas Turkey*
** draysetoraman@gmail.com*

Over one-third of the world's population suffers from persistent or recurrent pain.[1] Chronic pain is associated with conditions such as migraine, arthritis, herpes zoster, diabetic neuropathy, temporomandibular joint disorders, orofacial pain, rheumatoid arthritis, and cancer. [1, 2] Cancer-related pain is very difficult to treat, and the emotional burden of being cancer increases this situation. This is particularly common in certain types of cancer, such as head and neck carcinomas.[2] Periodontal disease is a chronic bacterial inflammatory process that causes periodontal tissue destruction. Periodontal disease is a very common public health problem in the world.[1] It has been reported that some diseases such as migraine, which can cause chronic pain, increase periodontal inflammation.[1,2] Although the underlying mechanism should be well known to treat chronic pain, this mechanism is still unclear today. The aim of this study is to evaluate the effect of oxidative stress and inflammation on the periodontal tissue of rats in the paclitaxel-induced neuropathic pain model.

For this purpose, 16 male albino Wistar rats (220-295 g body weight) were divided into 2 groups as Control (C) and Neuropathic pain model (NP) groups. Neuropathic pain was induced by intraperitoneal administration of 2 mg/kg paclitaxel (PTX) (4 doses) to the NA group. After the treatment of PTX, all rats were sacrificed by decapitation and all gingival tissue samples of the right mandible first and second molar teeth were collected. Then, the gene expression changes of *Hcn2*, *Scn9a* which are pain-related genes, were examined by Real-Time PCR. The left mandible was taken together with the surrounding gingiva, and the number of 8-hydroxy-2-deoxyguanosine (8-OHdG) immune positive cells was examined in histological sections of the first and second molar teeth to evaluate the oxidative stress. The results showed that there was a significant increase in *Hcn2* and *Scn9a* gene expression of the NA group compared to the C group. The number of 8-OHdG positive cells in the NA group was significantly higher than in C group. In the histopathological examination, clinical attachment loss was observed to be significantly higher in the NA group compared to the C group.

In conclusion, chronic pain induced by PTX caused inflammation and oxidative damage in periodontal tissues.

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Anticancer Drug Candidate Synthesis of Novel Heterocyclic Compounds Containing 3-Aryl-5-Alkyl-1H-1,2,4-Triazole Ring

Hilal Fazlı[a]*, Aslı Türe[b], Narin Ustalar[a], Olcay Bekircan[a], Atilla Akdemir[c], Yakup Kolcuoğlu[a]

[a]*Karadeniz Technical University, Department of Chemistry, Trabzon, Turkey*

[b]*Marmara University, Faculty of Pharmacy, Professional Pharmaceutical Sciences, İstanbul, Turkey*

[c]*Bezmialem Vakif University, Faculty of Pharmacy, Department of Pharmacology, İstanbul, Turkey*

**hilalfazlifazli@gmail.com*

Heterocyclic compounds are widely used in pharmaceuticals and agricultural chemicals and form an important part of organic chemistry. In addition, it has been determined that these derivatives have very important antibacterial, antifungal, antituberculosis, antitumor, antimicrobial, anticonvulsant, antidepressant, antiobesity, antioxidant, anti-urease, antiparkinsonian, antihypertensive, anti-inflammatory and antiviral properties[1,2]. Mercapto-1,2,4-triazoles, which are among heterocyclic compounds are in basic environment and contain 3 Nitrogen and 1 Sulfur atom in their structure. [1,3,4].

In this study, 1,2,4-triazole-3-thion(thiol) derivatives containing new type 3,5-substituted-1,2,4-triazole rings designed as anticancer molecules by *in silico* studies were synthesized. The structures of the synthesized molecules were elucidated by FT-IR and NMR methods.

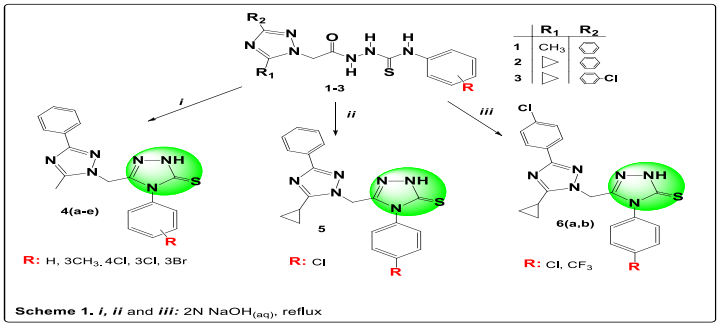

Figure. Synthesis of new 1,2,4-triazole-3-thion compounds

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Synthesis of 3,5-Diaryl-1,2,4-Triazol Substituted 1,2,4-Triazole-3-thion(one) Derivatives with hEGFR Inhibition Potential

Hilal Fazlı[a] *, Narin Ustalar[a], Aslı Türe[b], Atilla Akdemir[c], Olcay Bekircan[a], Yakup Kolcuoğlu[a]

[a]*Karadeniz Technical University, Department of Chemistry, Trabzon, Turkey*
[b]*Marmara University, Faculty of Pharmacy, Professional Pharmaceutical Sciences, İstanbul, Turkey*
[c]*Bezmialem Vakif University, Faculty of Pharmacy, Department of Pharmacology, İstanbul, Turkey*
**hilalfazlifazli@gmail.com*

Some of the drugs used in cancer treatment are (thio)semicarbazide-derived compounds containing 1,2,4-triazole ring in their molecular structure. These compounds, in addition to their high pharmacological activity, are also used as key products in the synthesis of many bioactive compounds [1,2]. In addition, compounds containing mercapto-1,2,4-triazole and 1,2,4-triazol-3-one rings in their structures can show different biological activities including antibacterial, antifungal, antitubercular, anti-inflammatory, antioxidant, anti-urease and antidiabetic effects.[3] These properties of (thio)semicarbazides, mercapto triazoles and their derivatives have led to the systematic investigation of their biochemical properties.[4]

In this study, (thio)semicarbazide, mercapto-1,2,4-triazole and 1,2,4-triazol-3-one derivatives containing 1,2,4-triazole ring were synthesized, after selection with *in silico* studies, and their potential as drug candidates were investigated. Among these synthesized molecules, it was determined by our group that compound **2e** showed moderate activity and compound **4** showed good activity.

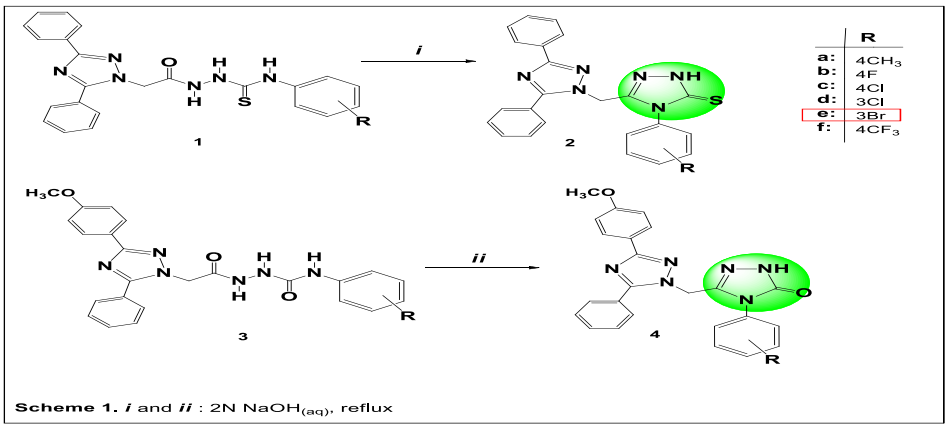

Figure. Synthesis of new mercapto triazole and 1,2,4-triazole-3-on compounds

Acknowledgement: *This study was supported by TUBİTAK (Project no. 118Z187).*

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The Effect of Parthenolide on Testicular Oxidative Stress during Paclitaxel-Induced Neuropathic Pain in Rat

Emine Toraman[a] *, Cemil Bayram[b], Selma Sezen[b], Ahmet Hacımüftüoğlu[b], Harun Budak[a]

[a]*Atatürk University, Science Faculty, Department of Molecular Biology and Genetics, Erzurum, Turkey*

[b]*Atatürk University, Faculty of Medicine, Department of Medical Pharmacology, Erzurum, Turkey*

**emine.toraman@atauni.edu.tr*

Cancer, which is the second leading cause of death after heart diseases in developed countries, is responsible for 22.3% of all deaths[1]. Chemotherapy is one of the most effective treatment methods used in cancer treatment. Paclitaxel is a chemotherapy drug mostly used in the treatment of solid tumors[2]. However, severe neuropathic pain syndrome and some other side effects prevent the use of this drug for a long time and in high doses. Many studies are carried out to eliminate these side effects of Paclitaxel[3]. The aim of this study is to investigate the effects of parthenolide (PTL) on the elimination of oxidative stress in rat testicular tissue due to pain caused by paclitaxel (PTX) treatment.

For this purpose, 48 male albino Wistar rats (220-295 g body weight) were divided into 6 groups as negative control (NC), positive control (PC), sham group (SG), Treatment 1 (T1), Treatment 2 (T2), and Treatment 3 (T3). Neuropathic pain was induced by intraperitoneal administration of 2 mg/kg PTX (4 doses) to all groups except the NC. To show the formation of pain, the expression of *Hcn2* and *Kcns1*, which are pain-related genes, were examined by Real-Time PCR in rat testicular tissue. An increase in *Hcn2* expression and decrease in *Kcns1* expression compared to the NC group were illustrated the formation of the pain model. Pain model groups except the PC and SG groups were treated with 1, 2, and 4 mg/kg PTL, respectively, for 14 days. After the treatment of PTL, all rats were sacrificed by decapitation and all testicular tissues were collected. Then, the activity of SOD, CAT, and GPx enzymes was investigated in testicular tissues taken from all groups in case of pain. The activities of the treatment groups including T1, T2, and T3 and the untreated groups including NC, PC, and SG were compared. According to our results, while SOD, CAT and GPx enzyme activities increased during pain, their activities decreased significantly after PTL treatment.

In conclusion, it may be thought that PTL, a natural product, could be used to eliminate the oxidative stress that occurs in testicular tissue during chemotherapy with PTX.

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A Comparative Study on Antioxidant System in Mouse Liver and Kidney Affected by Lipopolysaccharide-Induced Inflammation

Berna Hukkamlı[a,b] *, Burak Dağdelen[c], Feyza Sönmez Aydın [a,d], Harun Budak[a]

[a]*Atatürk University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*

[b]*Sinop University, Boyabat Vocational School, Department of Chemical and Chemical Processing Technologies, Sinop, Turkey*

[c]*Selçuk University, Faculty of Medicine, Department of Medical Biology, Konya, Turkey*

[d]*Doğuş University,Vocational School, Department of Pathology Laboratory Techniques, Istanbul, Turkey*

**bhukkamli@sinop.edu.tr*

Inflammation is an intercellular adaptive response that occurs in the event of traumatic, post-ischemic, toxic, or autoimmune damage triggered by infections and tissue damage. Inflammation and oxidative stress are linked to a number of diseases, including diabetes, cardiovascular diseases, neurodegenerative diseases, cancer, and aging[1]. The aim of this study was to compare how the mouse hepatic and renal antioxidant systems act during LPS-induced inflammation.

Eight to ten weeks old male BALB/c mice (20-30 g) were randomly divided into control and treatment (Lipopolysaccharide (LPS)) groups, with five mice in each group. Treatment group mice were intraperitoneally injected with LPS (5 mg/kg) dissolved in distilled water to induce inflammation. In parallel, an equal amount of sterile saline solution (0.15 mol/L NaCl) was given to the control group. Six hours after the injection, the mice were killed by breaking the neck. Interleukin-1 (*Il-1*) gene expression in both tissues was measured by the Real-Time PCR method and the increase in expression is evidence of inflammation[2,3]. The change in the ratio of reduced glutathione/oxidized glutathione (GSH/GSSG) in organisms is an indicator of oxidative stress[4] and this ratio was decreased in both tissues. Finally, the activities of antioxidant enzymes such as superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), glutathione reductase (GR), and thioredoxin reductase (TRXR) were measured in the liver and kidney tissues of both groups. While an increase was observed in SOD and CAT enzyme activities in liver tissue, a decrease was observed in both enzyme activities in kidney tissue. While there was a critical decrease in GPx and GR enzyme activities in liver tissue, GPx activity increased and GR enzyme activity decreased in kidney tissue. There was no change in TRXR activity in liver tissue. But, TRXR activity was decreased in kidney tissue.

In conclusion, it is observed that antioxidant system elements behaved differently during acute inflammation in both tissues. In addition, kidney tissue takes precautions against oxidative stress earlier than the liver tissue in preventing the transition of acute inflammation to the chronic phase.

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Inhibition Effects of Benzaldehyde Derivatives on Aldose Reductase Enzyme

Bülent Şengül*

Bayburt University, Vocational School of Health Services, Department of Health Care Services, Bayburt, Turkey

**bulentsengul@bayburt.edu.tr*

Diabetes mellitus is a metabolic condition defined by chronic hyperglycemia caused by insufficient insulin production from pancreatic cells. It is associated with a significant risk of death and morbidity. Many organs, including the eye, kidney, nerve, heart, and blood vessels, are damaged by chronic hyperglycemia. The hexokinase enzyme phosphorylates approximately all of the cellular glucose to glucose 6-phosphate under normo-glycemic circumstances. A tiny amount of non-phosphorylated glucose enters the alternate glucose metabolism route known as the polyol pathway. The polyol pathway's first and rate-limiting enzyme, aldose reductase (E.C.1.1.1.21), uses NADPH as a cofactor. Cardiovascular disorders, depression, inflammation, ovarian abnormalities, renal failures, and cancer are all linked to the AR enzyme. These regulatory actions of the AR highlight the significance of research into this enzyme.[1,2]

In this study, the effects of five different benzaldehyde derivatives on Aldose Reductase enzyme activity were investigated and all of the compounds had a substantial inhibitory effect on this enzyme. The *in vitro* inhibitory effects of benzaldehyde derivatives on AR activity were evaluated using a spectrophotometric technique under *in vitro* circumstances at various chemical concentrations. The IC_{50} method is well-known for determining enzyme inhibition levels. The IC_{50} values of these compounds were determined at the millimolar level for AR enzyme in the current investigation using activity% against chemical compound concentration regression analysis graphs. Benzaldehyde, 4-methylbenzaldehyde, 4-phenylbenzaldehyde, 2-methylbenzaldehyde, and 2-naphthaldehyde had IC_{50} values of 6.3 mM, 2.4 mM, 0.23 µM, 2.65 mM, and 34.65 µM, respectively, for AR. These findings show that each of the five chemicals is an effective inhibitor of the AR enzyme. On the other hand, 4-phenylbenzaldehyde is a more potent inhibitor of the AR enzyme than the others. 4-phenylbenzaldehyde appears to be a promising therapeutic option for preventing or delaying diabetes complications.

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In Vitro Cytotoxic Effects of Liposomal Formulation of *Melissa officinalis* Ethanol Extract

Nagihan Nizam[a], Gökçe Taner[b], Münevver Müge Çağal[b] *

[a]*Bursa Technical University, Graduate School of Natural and Applied Sciences, Department of Biotechnology, Bursa, Turkey*

[b]*Bursa Technical University, Faculty of Engineering and Natural Sciences, Department of Bioengineering, Bursa, Turkey*

**munevver.cagal@btu.edu.tr*

Melissa officinalis (lemon balm) is an aromatic perennial herb, growing in Mediterranean countries including the coastal regions of Turkey. Due to containing various bioactive compounds such as phenolic acids, tannins, flavonoids, terpenes and volatile compounds, both extracts and essential oil of the plant have anti-proliferative, anti-tumoral and cytotoxic effects.[1-2]

In this study, we recently developed the liposomal formulation of *Melissa officinalis* ethanol extract, considering the advantages of liposome structures which increase bioavailability and stability of the material to be encapsulated. Our aim was to investigate cytotoxic effects of our liposomal formulation on different cell lines. For this reason, the leaves of the plant were extracted by 80% ethanol and total phenolic content was determined by Folin-Ciocalteu assay. After that, liposomes were prepared by ultrasonic homogenizer using soybean phospholipid under 65% amplitude and constant pH for 5 minutes to obtain small-sized liposomes with narrow size distribution. The lyophilized extract was loaded into prepared liposomes at 1:1 ratio. Size, size distribution and morphology of vesicles obtained from the liposomal formulation of extract were characterized by SEM. Cytotoxic effects of formulation were investigated on A549 and BEAS-2B cell lines by MTT test. Cells were treated with 7 different concentrations (0.01, 0.025, 0.05, 0.1, 0.25, 0.5, 1 mg/mL) of liposomal formulation.

Results showed that the formulation's IC_{50} values are 3.5 mg/mL on A549 cell line and 868.05 µg/mL on BEAS-2B cell line. Although liposomal formulation increased cell proliferation in all tested concentrations on A549 cells, using liposomes reduced the potentially toxic effects of the extract on healthy BEAS-2B cells.

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Gel Formulation of Nanostructured Lipid Carriers Developed for Topical Treatment of Melanoma

Güliz Ak Demiroz[a,b], Hande Balyapan[a] *, Gizem Tutar[a], Gülbeyaz Yıldız Türkyılmaz[b,c]

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University Center for Drug Research & Development and Pharmacokinetic Applications, Izmir, Turkey*

[c]*Ege University, Faculty of Pharmacy, Department of Pharmaceutical Technology, Izmir, Turkey*

**handebalyapan@gmail.com*

Melanoma is one of the most common cancers worldwide and accounts for approximately 75% of skin cancer deaths.[1] The general treatment protocol is operational practice and radiation therapy. In addition, chemotherapy is sometimes preferred as a better alternative.[2] However, patients with melanoma can be treated in case of early diagnosis, but classical clinical applications are not successful in cases diagnosed at a late stage. Stratum corneum, one of the skin layers, causes the problem of low drug intake as a result of topical application for the treatment of melanoma. Nanostructured lipid carrier (NLC) is obtained by using different lipid forms, solid lipid and liquid lipid, and irregular crystal structures are formed. Topical application of NLC-loaded gel containing lipid-soluble drug creates a monolayer lipid film on the skin. This prevents trans-epidermal water loss. Thus, it has an occlusive effect and keeps the skin moist leading the drug to reach the target area. The aim of this study is to prepare a gel formulation to provide ease of use and effective treatment of melanoma. Carbopol gel formulation was formed by incubating dual drug containing targeted NLC (DTP-NLC) suspension with carbopol 940.[3] Physiological and morphological characterizations of the gel formulation were investigated. DTP-NLC gel has viscosity as 13689 cp ± 101.89, pH 6.01 ± 0.05, and zeta potential -34.52 mV ± 13.16. According to the all results, it can be concluded that DTP-NLC gel could be useful for topical treatment of melanoma and DTP-NLC gel could be examined in future studies with in vitro and in vivo assays.

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Entrapment of *Amycolatopsis orientalis* 40040 in Modified Alginate and PVA Gels, and Antibiotic Vancomycin Production Capacities

Leman Tarhan[a]*, Kubra Ozcan[b], Aylin Oner[c]

[a]*Dokuz Eylül University, Faculty of Science, Department of Chemistry-Biochemistry, Buca, Izmir, Turkey*
[b]*AYG Sistemleri San. Tic. A.Ş. Ayrancılar, Torbalı, Izmir, Turkey*
[c]*Dokuz Eylül University, Graduate School of Natural and Applied Sciences, Department of Chemistry/Biochemistry, Buca, Izmir, Turkey*
**leman.tarhan@deu.edu.tr*

Vancomycin is one of the glycopeptide antibiotics, inhibiting one or two sequential enzymatic reactions of the cell wall peptidoglycan synthesis of susceptible microorganisms[1]. Immobilized cells have been widely used in the production of industrial chemicals as well as pharmaceutical important compounds. Immobilization of cells carried out by either entrapment in microcapsules, porous inert polymers or binding to inorganic or organic support matrixes. In the first stage of this research, it was aimed to optimize the entrapment conditions in modified alginate and polyvinyl alcohol (PVA) gels[2, 3]. Gel beads, in which *Amycolatopsis orientalis* 40040 cells ($1x10^7$ cells/mL) entrapped in alginate as natural polymer matrix (high G, low viscosity and 2.5%, w/v), were cross-linked first with poly-L-lysine (15-20$x10^3$ Mr, 0.02%, w/v) and then with glutaraldehyde (1%). Entrapment of *A. orientalis* cells ($1x10^8$ cell/mL) in the medium containing PVA (50-85$x10^3$ Mr, 10%, w/v) as synthetic polymer and alginate (0.03%, w/v) was achieved by harvesting gel beads in a saturated boric acid solution containing $CaCl_2$ (2%, w/v). During these procedures, the amount of vancomycin in the culture medium was determined by HPLC at 240 nm after passing through the Sep-Pak Vac (3mL) C18 cartridge[4]. The numbers of entrapped and free cells were determined hemocytometrically by phase-contrast microscopy. In the second stage of the research, the processing stabilities of the gel beads and the efficiency of vancomycin production in a batch reactor were investigated for both entrapped samples. The immobilized in gel beads (2.3 mm) and free *A. orientalis* cells were incubated in growth medium of 150 mL, at 110 rpm of the agitation speed, 1.4 vvm of the aeration rate (20-30% DOT), 28°C, and pH 7.2. The incubation mediums were refreshed every 3 days. Total produced vancomycin amounts were determined as 30.5±0.47, 15.2±0.64 and 8.3±0.26 gL^{-1} for in alginate, PVA gel beads, and free *A. orientalis* cells at 24., 18., and 6. days of incubation, respectively. In this stage, the morphological changes of beads were observed in scanning electron microscopy. The vancomycin production efficiency of *A. orientalis* cells, which were entrapped in alginate beads, is significant.

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Anti-cancer Effect of Diffractaic Acid on Hepatocellular Carcinoma through Inducing of Apoptosis and Suppression of Metastasis

Emine Karaca[a,b] *, Şükran Günaydın[a], Şeyda Nur Kalın[a], Ahmet Altay[c], Harun Budak[a]

[a]*Atatürk University, Science Faculty, Department of Molecular Biology and Genetics, Erzurum, Turkey*

[b]*Erzurum Technical University, Faculty of Science, Molecular Biology and Genetics Department, Erzurum, Turkey*

[c]*Erzincan Binali Yıldırım University, Faculty of Science and Arts, Department of Chemistry, Erzincan Turkey*

**emine.karaca@erzurum.edu.tr*

Primary liver cancer is placed the sixth in terms of incidence and the third in terms of cancer death worldwide in 2020. Hepatocellular carcinoma (HCC) is the most common primary malignant tumor in liver cancer.[1] Today, most anti-cancer drugs or compounds are derived from natural products including plants.[2] Recent studies have shown that lichens may also be one of these natural resources.[3,4] Diffractaic acid, one of the secondary metabolites of lichens, has antioxidant, immunostimulatory, and anticarcinogenic effects against various types of cancer.[5] However, there is no study in the literature about its usability for the treatment of HCC. The aim of this study is to investigate whether diffractaic acid has an anti-cancer effect on HCC.

Here, the effects of diffractaic acid on the viability of HepG2 cells were investigated by using cell proliferation (XTT) assay in a dose- and time-dependent manner. The results showed that the best IC_{50} value was determined as 78.07±1.60 µg/mL at 48 hours. Annexin V-FITC assay and wound healing assay demonstrated that diffractaic acid induced apoptotic cell death and inhibited the migration of HepG2 cells. Considering apoptosis in detail, according to the Real-Time PCR results, it was observed that while diffractaic acid only upregulated the quantitative gene expression of P53 in HepG2 cells ($p<0.0001$), it did not significantly change the BAX/BCL2 ratio ($p>0.05$).

Taken together, our findings suggest that diffractaic acid may be a new chemotherapeutic agent in the treatment of HCC. But, these data still need to be investigation in detail with further study.

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Isolation and Characterization of Siderophore Producing Lactic Acid Bacteria

Nazlıcan Yücesoy, Nihan Semizoğlu Sert*, Bilge Hilal Çadırcı Efeli

Tokat Gaziosmanpasa University, Faculty of Engineering and Architecture Department of Bioengineering, Tokat, Turkey

**nihansem@hotmail.com*

Iron is an element that plays a role in metabolic reactions of living microorganisms such as photosynthesis, oxygen release, respiration, TCA (tricarboxylic acid) cycle, gene regulation, nitrate synthesis, nitrogen fixation, ATP synthesis and DNA synthesis, and is necessary for microorganisms to continue their important vital activities.[1-3] To facilitate the cellular uptake of this important element, siderophores, which are chelating agents, have attracted attention recently. Siderophores are secondary metabolites secreted from the cell body by binding iron with high affinity. They are produced by microorganisms such as fungi, actinomycetes and algae. The presence of stronger probiotic strains of siderophore-producing microorganisms shows us the potential to use siderophores in food biotechnology.[4] Siderophore production capacities of microorganisms and optimum conditions in which they can produce maximum siderophores were investigated.

In this study, siderophore-producing microorganisms were selected from lactic acid bacteria obtained from milk, yoghurt and kefir varieties and 16s rRNA gene sequence analysis of the best producer was performed. Maximum siderophore production of lactic acid bacteria identified as *Lactobacillus plantarum* at 37°C, pH: 7, 1 µl $FeCl_3$ concentration, yeast extract and when using maltose as a carbon source. In recent years, the applicability of siderophores in many fields, including clinical and agricultural, has increased the importance of these microbial iron chelates in biotechnology. Siderophores are also used as antibiotics and biocontrol agents. After this study, it is expected that the usage areas of siderophores will have a wider range.

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Investigation of the Effects of New Amino Benzohydroxamic Acid Derivatives on Enzyme Activity

Işıl Nihan Korkmaz[a] *, Hasan Özdemir[a]

[a]*Department of Chemistry, Faculty of Science, Atatürk University, 25240 Erzurum, Turkey*

**isil.krkmz@gmail.com*

Carbonic anhydrases (CAs, EC 4.2.1.1) are metalloenzymes that contain zinc ions on the active side and convert carbon dioxide to bicarbonate in metabolism. Human CA-I and CA-II, the most abundant CA isozymes in erythrocytes, have been therapeutic targets in the treatment of glaucoma, hypertension, ulcer, osteoporosis, and neurological disorders.[1] Acetylcholinesterase (AChE) is an enzyme that hydrolysis acetylcholine, located in the postsynaptic membranes in the synaptic fissure (gap) in the autonomic ganglia. Inhibition of AChE has become an important treatment against Alzheimer's disease (AD).[2] Hydroxamic acids, also known as the best iron chelators, compose of the largest class of histone deacetylase (HDAC) inhibitors. They have so many biological activities such as antibiotic, anti-tumor, anti-AIDS.[3-4] These structures, which have metal ion selectivity, show important inhibition properties on metalloproteins (enzymes).[5-6]

In this study, the in vitro effects of new amino benzohydroxamic acid derivatives on carbonic anhydrase isozymes (hCA-I, hCA-II) and AChE activities were investigated. For this purpose, CA isozymes were isolated sequentially from human erythrocytes by affinity chromatography and AChE was commercially purchased. Then, the effects of inhibitors were examined.

Among the chemicals we used in our study, 4-Amino-3-methyl benzohydroxamic acid compound exhibited the best inhibition against, hCA I, hCA II and AChE with Ki of 0.170±0.026 µM, 0.151±0.020 µM and 1.207±0.514 µM, respectively.

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Purification and Characterization of Acetylcholinesterase from Adults and Nymphs of *Ricania simulans* (Walker, 1851) (Hemiptera: ricanidae)

Demet Kizil[a] *, Barbaros Dinçer[b]

[a]*Bursa Technical University, Central Research Laboratory, Bursa, Turkey*

[b]*Recep Tayyip Erdogan University, Faculty of Arts and Sciences, Chemistry Department, Rize, Turkey*

**demet.kizil@btu.edu.tr*

Acetylcholinesterase (EC 3.1.1.7, ACHE) is a key enzyme in the central and peripheral nervous systems where it is responsible for the hydrolysis of the neurotransmitter acetylcholine into choline and acetate[1]. The ACHEs were purified from adults and nymphs of *Ricania simulans* using edrophonium-Sepharose 6B affinity chromatography in one step, and some kinetic properties of the ACHEs were studied[2]. The ACHEs were purified 251.6-fold with a yield of 34.2% for adults and 65.5-fold with a yield of 2.2% for nymphs. While the subunit molecular weight of the purified enzyme was about 52 kDa for adults, it was about 59 kDa for nymphs[3]. The *K*m, *V*max, and *k*cat values of *R. simulans* ACHE for acetylthiocholine iodide (ATC) hydrolysis were determined to be 0.04±0.01 mM, 2,000.0±250 EU/mg protein and 104.5±13 min^{-1} for adults and 0.02±0.01 mM, 500.0±52 EU/mg protein and 30.3±6.4 min^{-1} for nymphs, respectively. Both enzymes showed optimal activity at 40.0°C and pH 8.0.

In order of IC_{50} values for tacrine and edrophonium chloride, known as competitive inhibitors of ACHE, were found to be 18.0±1.9 μM and 2.4±0.3 μM for adults, and to be 1.2±0.4 and 0.6±0.09 μM for nymphs. The inhibitors inhibited the ACHE of the nymphs more effectively than adults. Considering the results, it would be more appropriate to fight *R. simulans* at the nymphal stage.

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Development of a New Affinity Chromatography Method for the Purification of Horseradish Peroxidase Enzyme

Serpil Gerni*, Hasan Özdemir

Atatürk University, Faculty of Science, Department of Chemistry, 25240-Erzurum/Turkey

** gerni-serpil@outlook.com*

Horseradish peroxidase (HRP) is purified from Horseradish (*Armoracia rusticana*), an antibiotic and anti-inflammatory herb and commonly used in chemical engineering, mutagenesis applications, enzymological characterization and medical diagnosis.[1,2]

In this study, it was aimed to improve a purification procedure for HRP by using (4-amino 2-methoxy benzohydroxamic acid, 4-amino 3-nitro benzohydroxamic acid, and 4-amino 3-methyl benzohydroxamic acid) molecules as ligand.

In the experimental step, three new amino benzohydroxamic acid derivatives (4-amino 2-methoxy benzohydroxamic acid, 4-amino 3-nitro benzohydroxamic acid and 4-amino 3-methyl benzohydroxamic acid) were synthesized and *in vitro* inhibition effects on HRP were investigated. Then, affinity columns for each inhibitor were prepared by using these compounds as ligands. The molecular weight and enzyme purity were checked by SDS-PAGE.

The purification of HRP was carried out in one step with affinity chromatography. According to our results, the IC_{50} values and K_i constants of, 4-amino 2-methoxy benzohydroxamic acid, which is the ligand with the highest purification coefficient and yield %, were found as 0,306 mM and 0,218 mM respectively.

In conclusion, a novel affinity column was improved for the purification of HRP. The purification process was carried out in one step and with higher efficiency compared to the literature.

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Preparation of Fe-ZIF-8 with Iron Mineralization Technique and Lipase Immobilization

Elif Ozyilmaz[a], M. Sami Biltekin[b], Ozge Caglar[a,c] *, Mustafa Yilmaz[c]

[a] *Selcuk University, Faculty of Science, Department of Biochemistry, 42075 Konya, Turkey*
[b] *Selcuk University, Department of Advanced Material and Nanotechnology, Konya 42075, Turkey*
[c] *Selcuk University, Faculty of Science, Department of Chemistry, 42075 Konya, Turkey*

** ozgecaglar07@gmail.com*

Metal-organic frames (MOFs) are a class of materials with unique properties, consisting of organic ligands and metal ions.[1] Zeolitic imidazolate frames (ZIFs) are a type of zinc-based MOF. ZIF-8 is the most widely used MOF type especially in biocatalytic applications and can be synthesized using different methods.[2,3] With the biomineralization method, it was observed that the cage maintains its activity conformation along the boundary at high temperature and pH.[4] In the iron mineralization technique, unstable ferrous (Fe^{+2}) minerals integrated into ZIF-8 frames provide easy gliding and the mesostructure in Fe@ZIF-8.[5]

Lipases are the most widely used enzymes in biocatalysis due to their unique properties. Its use in industry is limited, due to its conformational changes in harsh conditions such as high temperature and pH.[6] With their unique properties, MOFs show promise in preserving the activities and stability of enzymes.[2]

In this study, mesoporous Fe@ZIF-8 and ZIF-8 were designed with an easy iron mineralization technique. The synthesized ZIF-8s were used for the immobilization of *Candida rugosa* Lipase. After the synthesized biocatalysts (Fe@ZIF-8, ZIF-8, Fe@CRL@ZIF-8 and CRL@ZIF-8) were characterized, optimum temperature, pH, thermal stability and reusability were investigated, their kinetic parameters were determined. Fe@CRL@ZIF-8 showed lipase activity 3.72 times higher than CRL@ZIF-8. After recycling it 5 times, Fe@CRL@ZIF-8 retained 80 % of its initial activity. Iron mineralization is a simple, quick, and cost-effective process that offers up new possibilities for the usage of biomacromolecules.

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Investigation of the In Vitro Effects of Some Pyrroles on Glutathione Reductase Enzyme Activity

Muhammet Serhat Özaslan*

Ardahan University Department of Pharmacy Services, Nihat Delibalta Göle Vocational High School, Ardahan, Turkey

**serhatozaslan@ardahan.edu.tr*

Glutathione is an important molecule of the antioxidant defense system. In the presence of NADPH, Glutathione reductase (EC 1.8.1.7) (GR), that converts oxidized glutathione to reduced glutathione. The most important known function of GR is to maintain the intracellular -SH/-SS- ratio by increasing the GSH/GSSG ratio.[1] Pyrrole is a five-sided heterocyclic system that forms the basic structural subunit of many important biological molecules such as heme, chlorophyll, bile pigments, natural antibiotics, enzymes and alkaloids. [2]

In this study, firstly GR enzyme was purified from human erythrocytes. Then, *in vitro* inhibition effects of 3-acetyl pyrrole, N-methyl pyrrole and 3-acetyl-2,4-dimethyl pyrrole compounds on GR enzyme activity were investigated. All the studied pyrrole compounds demonstrated millimolar levels of inhibitory effect against GR. IC_{50} values of compounds are in the range of 0.034-0.119 mM and K_i values of compounds are in the range of 0.017±0.001-0.135±0.01 mM. Besides, 3-acetyl 2,4-dimethyl pyrrole showed higher inhibitor effect on GR.

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Isolation and Identification of Amylase and Cellulase Producing Bacteria Compatible for Detergent Industry

Aleyna Nalçaoğlu[a] *, Esma Ceylan[b], Kadriye İnan Bektaş[a], Sueda Güneş[a], Pınar Çağlar[a], Sabriye Çanakçı[b], Ali Osman Beldüz[a]

[a]*Department of Molecular Biology and Genetic, Faculty of Science, Karadeniz Technical University, Trabzon, Turkey*

[b]*Department of Biology, Faculty of Science, Karadeniz Technical University, Trabzon, Turkey*

** aleynanalcaoglu@ktu.edu.tr*

Enzymes are important biomolecules found in every living cell such as plants, animals, and microorganisms.[1] Important enzymes produced by bacteria are widely used in many areas such as the detergent industry and today there are many studies on this issue. Due to the importance of using detergent-compatible enzymes in the world enzyme market, an increase in demand is expected in this field. [2-3] Thermophilic and mesophilic microorganisms are interesting to study areas because they produce important enzymes such as cellulases and amylase. [4-5] Amylases and cellulases are trending enzymes that can be added to detergents to improve soil removal and prevent fabric damage.[6,7]

The aim of our study was to isolate and characterize new bacteria from soil and investigate their enzyme production potential for the detergent industry. In this context, the characterization of many bacteria that we isolated from water and soil and the determination of their enzymes were carried out. Amylase and cellulase enzyme-producing bacteria were determined from the obtained bacteria. Studies were carried out for the characterization of these bacteria, which were detected with special media. Morphological and physiological tests of bacteria were performed. In addition, the catalase and oxidases of the bacteria were tested and the enzymes they produced were determined. The detergent compatibility of the obtained enzymes was tested with commercial detergents. In addition to detergent compatibility, optimum temperature, pH and stability of the obtained enzymes were determined.

Our results show that the nine amylase and eight cellulase bacteria we studied produce detergent-compatible enzymes. It has been determined that bacteria can live at an average of 7% NaCl at pH between 5-9 and at a temperature of 30-50°C. The 16S rRNA sequences of these bacteria were performed and their related species were determined. In the results obtained, it was found that the bacteria belong to the genus *Bacillus* sp. It has been shown that enzymes are compatible with high temperatures and pH in different ranges. The results support that they are enzymes suitable for use in the detergent industry.

In conclusion, our study is important in terms of determining the structures of many bacteria and testing the suitability of enzymes obtained from these bacteria for the detergent industry. Purification of these enzymes and elucidation of their structures are promising for the literature and industry.

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Investigation of the Effect of Coniferyl Alcohol and Coniferyl Aldehyde on Some Metabolic Enzymes

Eda Mehtap Üç*, İlhami Gülçin

Atatürk University, Faculty of Science, Department of Chemistry, 25240-Erzurum/Turkey

**edamehtap3@gmail.com*

Acetylcholinesterases (AChE) are enzymes belong to the hydrolase class. Acetylcholine, particularly in memory, plays a key role in cognitive functions. Alzheimer's disease occurs as a result of disruption of AChE activity. BChE is a sister enzyme of AChE. For the treatment of Alzheimer's disease, growing interest in BChE has developed increasingly owing to its potential role at the beginning of anticholinesterase treatment.[1,2] AChE and BChE inhibitors are used as drugs in the treatment of the disease.

The enzyme α-glucosidase, which plays a major role in the digestive system, is the enzyme primarily responsible for the increase in blood glucose level after feeding. α-Glycosidase enzyme plays an important role in hydrolyzing oligosaccharides and disaccharides to glucose. α-Glycosidase inhibitors can reduce the uptake of dietary carbohydrates and repress postprandial hyperglycemia and also could be effective for therapy of diabetic disease.[1-4]

For this purpose, the inhibition effects of coniferyl alcohol and coniferyl aldehyde, which have wide usage areas, on AChE, BChE and α-Glycosidase were examined in vitro and their inhibition types, kinetic properties were shown in detail. As a result, K_i and IC_{50} values were obtained.

In conclusion, coniferyl alcohol and aldehyde were tested on AChE, BChE and α-Glycosidase enzymes. Coniferyl alcohol and aldehyde competitively inhibited AChE enzyme at IC_{50}:17,76 nM, K_i: 7,44±2,05 nM and IC_{50}:5,09 nM, K_i: 7,23±2,85 level, respectively. Coniferyl alcohol and aldehyde were shown competitive inhibition. BChE enzyme at IC_{50}:77,00 nM, K_i:76,34±22,66 nM and IC_{50}:86,62 nM, K_i:24,64±6,50 nM, respectively. Coniferyl alcohol and aldehyde inhibited the α-Glycosidase enzyme. IC_{50} values for α-Glycosidase enzyme were determined as 49,50 nM, 69,3 nM and K_i constants for this enzyme were determined as 44,88±6,78 nM, 39,59±3,65 nM, respectively. Both of these inhibitors showed noncompetitive inhibition type. We predict that the data obtained will make an important contribution to the design and pharmacological applications of drugs to be used for therapeutic purposes.

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The Effect of Isofraxidine on hCA I and hCA II, AChE, BChE and α-Glucosidase Enzymes

Lokman Durmaz[a] *, Parham Taslimi[b], İlhami Gülçin[c]

[a]*Erzincan Binali Yıldırım University, Çayırlı Vocational School, Medical Services and Technical Department, Erzincan*

[b]*Bartın University, Faculty of Science, Department of Biotechnology, Bartın*

[c]*Atatürk University, Faculty of Science, Department of Chemistry, Erzurum*

**lokmandurmaz25@gmail.com*

Isofraxidine is a coumarin derivative isolated from medicinal plants such as *Sarcandra glabra*.[1] On the other hand carbonic anhydrase enzyme is an important metabolic enzyme that converts carbon dioxide (CO_2) and water into bicarbonate (HCO_3^-) and proton (H^+). Also, acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) enzymes are important enzymes and hydrolysis of acetylcholine and butyrylcholine to choline/acetate and choline/butyrate respectively. The α-glycosidase enzyme is another important digestive enzyme and converts glycogen to glucose. In this study, the inhibition effects of Isofraxidine on hCA I and hCA II, AChE, BChE and α-glucosidase were investigated.

In carbonic anhydrase activity, hydrolysis of p-nitrophenylacetate to p-nitrophenolate was spectrophotometrically determined at 348 nm.[2] AChE and BChE enzymes activities were determined according to the Ellman's method of as described previously.[2] Acetylcholiniodate (AChI) and butyrylcholinodate (BChI) were used as substrates for this purpose, respectively. After the hydrolysis of the substrates, the yellow-colored 5-thio-2-nitrobenzoate anion formed as a result of the reaction of DTNB with thiocholine gives maximum absorbance at a wavelength of 412 nm. Lastly, p-NPG was used as substrate to determine α-glycosidase enzyme activity. First, 20 µL of the enzyme was added to phosphate buffer (0.15 U/mL, pH 7.4) containing different amounts of Isofraxidine. Then 20 µL of enzyme in 5 µL of the sample was added. After addition of substrate p-NPG (5 mM, pH 7.4), it was incubated at 35°C for 10 minutes. Absorbances were measured spectrophotometrically at 405 nm[2]. IC_{50} values were calculated from the Activity (%)-[Isofraxidine] graph. On the other hand, K_i values were calculated from the Lineweaver-Burk graph for Isofraxidine, which showed an inhibitory effect.

According to the results, the IC_{50} values of Isofraxidine were determined 67.61, 52.42, 18.49, 10.75 and 55.16 nM respectively, while the K_i values of Isofraxidine were determined 27.56, 49.65, 17.69, 2.44 and 56.81 nM respectively. It is thought that the obtained results will make an important contribution to drug design and pharmacological applications.

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Evaluation of Nicotinic Acid Hydrazides as Cholinesterase Inhibitors

Nurgül Abul[a] *, Serpil Gerni[a], Aykut Öztekin[b], Hasan Özdemir[a]

[a]*Ataturk University, Faculty of Science, Department of Chemistry, 25240-Erzurum, Turkey*

[b]*Agri Ibrahim Cecen University, Department of Medical Services and Techniques, Vocational School of Health Services, Agri, Turkey*

**nurgul.abul@ogr.atauni.edu.tr*

Acetylcholine (ACh) and butyrylcholine (BCh) are active cholinergic system neurotransmitters and are immediately degraded by acetylcholinesterase (AChE) and butyrylcholinesterase (BChE) after signal transmission.[1] Loss of cholinergic neurons in the brain structures is associated with the development of disease such as dementia, including Alzheimer's disease (AD).[2] Cholinesterase inhibitors improve neuronal transmission by inhibiting the enzymes responsible for the hydrolysis of ACh and BCh. Thus, these can be used in the treatment of some neurological diseases.[3-6]

Nicotinic acid hydrazides are very important compounds in the literature that are proposed and used as an active agent for the treatment of many diseases. In accordance with the view of this point, this study was conducted to clarify the inhibitory effects of isonicotinohydrazide, 6-aminonicotinohydrazide and 6-amino-5-bromonicotinohydrazide on cholinesterases. For this, enzyme activity levels were determined at a fixed substrate and five different inhibitor concentrations. IC_{50} values were calculated.

According to the results especially isonicotinohydrazide showed remarkable inhibition potential for acetylcholinesterase and butyrylcholinesterase with the IC_{50} value of 6,026 µM and 1,156 µM, respectively.

In conclusion, new inhibitors for AChE and BChE inhibition, which are important in the treatment of some diseases, were suggested.

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Investigation of the Inhibition Effect of 1,1,2-Tetrakis (*p*-hydroxyphenyl) Ethane Molecule on Acetylcholinesterase, Butyrylcholinesterase and α-Glycosidase Enzymes

Zeynebe Bingöl[a] *, İlhami Gülçin[b]

[a] *Tokat Gaziosmanpaşa University, Vocational School of Health Services, Department of Medical Services and Techniques, 6250-Tokat/Turkey*
[b]*Atatürk University, Faculty of Science, Department of Chemistry, 25240-Erzurum/Turkey*

**zeynep.bingol196@gmail.com*

Acetylcholinesterase (AChE; E.C.3.1.1.7) hydrolyzes the neurotransmitter acetylcholine (ACh) to choline and acetate. Butyrylcholinesterase (BChE; E.C.3.1.1.8) created inside the liver, is considered as a backup for the analogous AChE.[1] Alzheimer's disease (AD) is the main health concern in old people worldwide, which can affect multitude aspects of bodily functions and life of people. Inhibition of AChE and BChE has become an important target in the treatment of Alzheimer's disease.[2] α-Glycosidase (α-Gly; E.C.3.2.1.20) released from the intestine, it hydrolyzes polysaccharides and oligosaccharides to monosaccharide units.[3] α-Gly inhibitors used to control glucose levels prevent the formation of diabetes by suppressing hyperglycemia.[4]

In this study, it was aimed to investigate the *in vitro* inhibition effects of 1,1,2,2-Tetrakis ethane, which is found in the resin part of plants and trees, on AChE, BChE and α-Gly enzymes.

As a result, while IC50 values were found as 0,184 nM, 0,159 nM and 0,240 µM for enzymes, respectively, inhibition types were found as competitive for AChE and BChE and non-competitive for α-Gly.

It was concluded that Tetrakis ethane which had an inhibitory effect on the enzymes in this study, can be used in the synthesis and design of new drugs for diabetes and Alzheimer's diseases.

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Phenolic Compositions and Biological Activities of *Stachys* Species from Turkey

Raziye Ozturk Urek[a] *, Leman Tarhan[a], Aylin Oner[b], Umar Muazu Yunusa[b], Yildizay Ayyildiz[c], Mahmure Nakiboglu[d]

[a]Dokuz Eylül University, Faculty of Science, Department of Chemistry-Biochemistry, Buca, Izmir, Turkey

[b]Dokuz Eylül University, Graduate School of Natural and Applied Sciences, Department of Chemistry/Biochemistry, Buca, Izmir, Turkey

[c]Dokuz Eylül University, Torbali Vocational School of Higher Education, Torbali, Izmir, Turkey

[d]Dokuz Eylül University, Faculty of Science, Department of Biology, Buca, Izmir, Turkey

raziye.urek@deu.edu.tr

Medicinal plants containing natural bioactive compounds are important sources of raw materials for the production of drugs against various diseases[1]. Investigating the pharmaceutical and antioxidant properties of plants as bioactive compound sources is important in terms of evaluating the bioeconomic potential in the world[2]. Within the scope of this research, it was aimed to elucidate the phenolic profile, antioxidant and cytotoxic activities in aerial part extracts of *Stachys cretica, Stachys annua, Stachys tmolea*, which belong to the Lamiaceae family grown in Turkey. Phenolics in *Stachys* species were determined in flavonoid subgroups flavone, flavanone, flavonol, flavan-3-ol and phenolic acid extracts by using RP-HPLC-DAD system. The first three prominent phenolic compounds were benzoic acid, t-cinnamic acid, epigallocatechin in *S. cretica*; epicatechin, t-cinnamic acid, vanillic acid in *S. annua* and epicatechin, t-cinnamic acid, protocatechuic acid in *S. tmolea*. As antioxidant parameters, DPPH and hydroxyl radical scavenging activities, metal chelating, reducing power, FRAP assay, and also total phenolic, flavonoid and tannin contents were determined by spectroscopic methods in the extracts. The best IC_{50} values of DPPH and hydroxyl radical scavenging capacities were determined to be 5.53±0.32 ppm and 1.09±0.02 ppm in *S. annua*, respectively. Additionally, *S. annua* was also prominent in the results of reducing power (2.085±0.11 mg Cvit/g_{DWE}) and FRAP (1.455±0.08 mg Cvit/g_{DWE}) assay values. Of other antioxidant parameters, IC_{50} value of the metal-chelating activity was found to be 27.73±0.85 ppm in *S. tmolea*. Similarly, the highest total phenolic (397.04±4.72 mg GA/g_{DWE}), flavanoid (80.07±1.26mg QE/g_{DWE}) and tannin (208.9±3.84 mg TA/g_{DWE}) levels were also determined in extract of *S. tmolea*. The cytotoxic effects of the 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 *Stachys* species extracts were found to be 20 ppm against all investigated cancer cell line. They were *S. tmolea* extract against the HeLa cell, *S. tmolea* and *S. annua* extracts against the ACC-201 cell and *S. cretica* extract against the OE-33 cell line. Under the determined IC_{50} conditions of the cancer cell lines apoptosis profiles and the activity variations of caspase-3 and caspase-9 were examined in flow cytometry and microplate reader, respectively. The phenolic component profile, antioxidant properties and cytotoxic capacity results of *S. cretica, S. annua, S. tmolea* investigated within the scope of this research show that these species can contribute to the bioeconomic potential of our country for the future.

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Investigation of Phenolic Profile, Antioxidant and Anticancer Potential of *Phlomis angustissima* and *Phlomis fruticosa*

Leman Tarhan[a], Raziye Ozturk Urek[a], Aylin Oner[b]*, Mahmure Nakiboglu[c]

[a]*Dokuz Eylül University, Faculty of Science, Department of Chemistry, Biochemistry Division, Buca-Izmir/Turkey*
[b]*Dokuz Eylül University, Graduate School of Natural and Applied Sciences, Department of Chemistry/Biochemistry, Buca-Izmir/Turkey*
[c]*Dokuz Eylül University, Faculty of Science, Department of Biology, Buca-Izmir/Turkey*
**aylinoner35@gmail.com*

Clarification of bioactive components and investigation of their usability in food, food additives and health sectors are of great importance in determining the bioeconomic potential of plants[1,2]. In this study, it was aimed to contribute to the evaluation of plant sources of Turkey, which draws attention in terms of the plant species variations and especially endemic plants. For this purpose, flavonoid and phenolic acid compounds were determined by HPLC-DAD in Methanol/Water (4/1) and Ethylacetate/Water (7/3) extracts of *Phlomis angustissima* and *Phlomis fruticosa* leaves and flowers. The first three identified phenolic compounds were epigallocatechin and vanillic acid in *P. angustissima*-flower$_W$ and benzoic acid in *P. fruticose*-flower$_W$ extracts, as 89.394±3.76 mg/g$_{DWE}$, 48.357±1.27 mg/g$_{DWE}$ and 39.204±2.14 mg/g$_{DWE}$, respectively. The antioxidant properties of *Phlomis* species extracts were examined spectrophotometrically and the best values of DPPH scavenging (IC_{50}:47.07±1.48 ppm), metal chelating (IC_{50}:25.60±0.76 ppm), reducing power (1131±9.54 mg Cvit/g$_{DWE}$) and FRAP (288±11.41 mg Cvit/g$_{DWE}$) assay were determined in *P. angustissima*-flower$_W$. Among the other antioxidant parameters, hydroxyl radical scavenging (IC_{50}:1.06±0.07 ppm), total phenolic (538.91±4.3 mg GA/g$_{DWE}$), flavonoid (282.50±1.56 mg QE/g$_{DWE}$) and tannin (479.04±3.56 mg TA/g$_{DWE}$) values were determined in *P.angustissima*-flower$_{EA}$. The hydroxyl radical scavenging capacity of *P. angustissima*-flower$_{EA}$ is 4.81 times higher than that of butylatedhydroxytoluene, which is widely used in food preservation, while the DPPH radical scavenging capacity of the flower$_W$ extract of the same species was around 57%. The cytotoxic effects of *P. angustissima* and *P. fruticosa* extracts against ACC-201, OE-33 and HeLa cancer cell lines were determined in a microplate reader by using the MTT assay. The best IC_{50} values of *P. fruticosa*-leaf$_{Met/W}$, -leaf$_{EA}$, and *P. angustissima*-flower$_W$ extracts against ACC-201 cell and *P. fruticosa*-leaf$_{EA}$, -flower$_W$ and *P. angustissima*-leaf$_W$ extracts against OE-33 cell were determined as 20 ppm. This value was 80 ppm for *P. fruticosa*-flower$_{EA}$ extract against HeLa cell line. Apoptotic profiles of the cancer cell lines were elucidated by the AnnexinV-PI test in flow cytometry for an extract from each *Phlomis* species that provided the best IC_{50} values. In addition, in order to explain the mechanism of apoptosis, increases in caspas-3 and caspas-9 activities and decreases in mitochondrial membrane potentials were determined in the microplate reader. According to the results of this study, the richness of *P. angustissima* and *P. fruticosa* in phenolic components, the significance of their antioxidant properties, and their effectiveness against ACC-201 and OE-33 cancer cell lines, open the horizon for further research.

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Antioxidant Activity of Water Extracts of *Astragalus fabaceus* M. Bieb' Aerial Parts

Hatice Kızıltaş*

Van Yüzüncü Yıl University, Van Health Services Vocational School, Van, Turkey.

**haticekiziltas@yyu.edu.tr*

In Turkey's flora, *Astragalus* L. (Fabaceae) is the richest genus with 425 taxa and 20 of them are endemic. In folk medicine, it is known that the roots of *Astragalus* species are used as hepatoprotective, antioxidative, antibacterial, antiperspirant, antihypertensive, antidiabetic, diuretic and tonic. It is also used in the treatment of diabetes mellitus, nephritis, leukemia and uterine cancer. Also, in Anatolia, *Astragalus* roots are traditionally used against leukemia and wound healing.[1] These activities depend on the presence of various secondary metabolites of *Astragalus* species. In particular, alkaloids, saponins, flavonoids and anthraquinones are thought to be the main compounds responsible for these biological activities.[2]

Oxidative stress has been recognized to play an important role in many diseases, such as Alzheimer's disease and type II diabetes mellitus.[3] Antioxidants delay the occurrence of degenerative diseases due to free radical formation by reducing oxidative stress in the body. These compounds also protect the body against metabolic damage caused by free radicals.[4] Recently, interest in finding natural antioxidants has increased significantly in place of synthetic antioxidants that are restricted by their carcinogenicity.[5]

The current study aimed to document antioxidant and radical scavenging activity of water extracts of aerial parts of *Astragalus fabaceus* M. Bieb. (WEAF). For this purpose potassium ferricyanide (Fe^{3+} reducing), Fe^{3+}-TPTZ reducing (FRAP), cupric ions (Cu^{2+}) reducing capacity (CUPRAC) and $DPPH^{\cdot}$ and $ABTS^{\cdot+}$ scavenging activity assays had been used. In addition, its total phenolic and flavonoid contents were determined. From scavenging activity assays; $ABTS^{\bullet+}$ scavenging activity for WEAF and standard antioxidants was determined in the following order: BHT (IC_{50}: 5.824 ± 0.011)> Ascorbic acid (IC_{50}: 7.533 ± 0.037)> α-Tocopherol (IC_{50}: 8.058 ± 0.008)> WEAF (IC_{50}: 36.473 ± 0,003). According to the results WEAF had an effective antioxidant activity but did not show antioxidant abilities close to standard antioxidants.

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Isolation, Characterization and Identification of Lipase and Protease Producing Bacteria Compatible for Detergent Industry

Esma Ceylan[a] *, Aleyna Nalçaoğlu[b], Kadriye İnan Bektaş[b], Sevda Ağırman[b], Nur Sena Sivri[b], Alanur Kaya[b], Sabriye Çanakçi[a], Ali Osman Beldüz[a]

[a]*Karadeniz Technical University, Department of Biology, Trabzon, TURKEY*

[b]*Karadeniz Technical University, Department of Molecular Biology and Genetic, Trabzon, TURKEY*

**esmaceylan@ktu.edu.tr*

The field of microbiology is an important branch of bioprocess technology. Enzymes have constructively assisted the improvement of industrial detergents. Many enzymes from microbial sources including fungi, yeasts and especially bacteria are used for this purpose. [1-3] Proteases and lipases each provide specific benefits for application in detergent industry. [4] The industrial enzyme market has reached the value expressed in billions of dollars and is expected to grow rapidly in time ahead. [2-5]

The aim of this study is to isolate and characterize new bacterial strains from soil and to explore novel sources of lipase and protease for application in detergent industry. Lipase and protease producing several bacteria were isolated from soil contaminated with household waste. After determining the species of the isolated bacteria according to 16S rRNAs, the morphological, physiological and biochemical properties of these bacteria were determined. Optimum pH and temperatures, pH stability and thermal stability of lipase and protease enzymes of these bacteria were determined. Detergent compatibilities were tested with commercial detergent.

According to the results, seven of the isolated bacteria produced lipase and five of them produced protease. Bacteria have shown broad pH and temperature spectrum for growth from 5-9 and 30-50°C, respectively. However, on average 6% of NaCl was necessary for their growth. The 16S rRNA analysis showed that nine bacteria were closely related to *Bacillus sp*. and the remaining two were *Staphylococcus sp.*. Also, optimum temperature and pH of all enzymes were determined between 40-60°C and pH 7-10, respectively.

In conclusion, the results of the study indicated that isolated strains and their enzymes can be used as a source of industrial enzymes. Hence, more economical and eco-safe alternatives can be added in daily life by utilizing these enzymes.

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Protective Effects of Metformin Against Diabetes-Induced Lens Damage and Dunning Prostate Cancer Model

Ismet Burcu Turkyilmaz[a] *, Pınar Koroglu-Aydin[b], Ilknur Bugan[c], Omur Karabulut-Bulan[c], Refiye Yanardag[a]

[a]*Istanbul University-Cerrahpaşa, Faculty of Engineering, Department of Chemistry, Avcilar-Istanbul, Turkey*

[b]*Halic University, Faculty of Medicine, Department of Histology and Embryology, Istanbul, Turkey*

[c]*Istanbul University, Faculty of Science, Department of Biology, Vezneciler-Istanbul, Turkey*

**burcut@iuc.edu.tr*

Diabetes mellitus is described as a group of metabolic syndromes which is characterized by elevated blood glucose levels.[1] Cancer can be simply defined as the abnormal growth of cells and these cells lose their ability to stop growing.[2] Either diabetes or cancer, these two diseases are strictly related to free radical production.[3,4] Lens tissue is a very closed system and has, unfortunately, limited capability for repairing or regenerating itself. Altered glucose balance, related oxidative stress, affected polyol pathway are all important signals for the development of ocular damage.[5] It was aimed to investigate the protective role of metformin on diabetic and cancer induced ocular tissue damage. Male Copenhagen rats were divided into six groups; 1. Control group, 2. Diabetic group, 3. Cancer group, 4. Diabetic+cancer group, 5. Diabetic+cancer+metformin group, 6. Cancer+metformin group. Diabetes was induced by injecting a single dose of streptozotocin (65 mg/kg) to Copenhagen rats, while prostate cancer was induced through subcutaneous inoculation of $2x10^4$ MAT-LyLu cells. Metformin treatment was administered daily by gavage following inoculation of the Mat- Lylu cells to fifth and sixth groups. The experiment was terminated on the 14th day following MAT-LyLu cell injection. At the end of the experimental period, the rats were sacrificed, and lens tissues were taken. They were prepared as 10% (w/v) homogenates and then centrifuged. In supernatants, it was detected that lens reduced glutathione and total antioxidant capacity levels were decreased while lipid peroxidation, total antioxidant status, oxidative stress index levels and sorbitol dehydrogenase activity were increased in diabetic, cancer, and diabetic+cancer groups. Administration of metformin reversed these levels and its activity in these groups. We can conclude that metformin prevented harmful effects of diabetes and cancer in ocular tissue.

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Investigation of the Protective Effect of *Salvia officinalis* Extract against Epithelial Damage Caused by Paclitaxel

Ahmet Çetin* , Murat Çankaya

Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Biology, Erzincan, Turkey

**ahmetcetin06@gmail.com*

Chemotherapy can damage cancer cells as well as rapidly dividing healthy cells. Paclitaxel is a widely used chemotherapy agent in the treatment of ovarian, breast, lung, head and neck cancers. Mouth sores and skin reactions have been observed in 15% of patients using paclitaxel.

It is known that *Salvia officinalis* (SO), which is commonly used in alternative medicine, also plays a role in the healing of wounds on the skin.[1] It has also been shown that *Salvia officinalis* acts as an inhibitor for skin pathogens.[2] In the use of paclitaxel, the side effects that can be seen in patients; Intraoral wound formation and skin reactions reduce the quality of life considerably. The most common herbal treatment method used by patients in such cases is the use of water extract of SO as a mouthwash and also drinking it.

In our study, the effects of combinations of SO extract prepared by decoction method with paclitaxel on healthy epithelial cells (HFF cell line) were investigated. The effect of paclitaxel and SO extract separately and together on the viability of HFF was examined by an MTT test. In addition, the results obtained were evaluated with the CompuSyn program and the CI value was calculated. In vitro wound-healing assay was performed at the concentrations with the highest CI value and in combination, microscopic images were taken every 6 hours. To evaluate the status of oxidative damage after paclitaxel and SO extract applications; MDA, SOD, CAT and GR were analyzed by spectrophotometric method and GPx was analyzed by ELISA method. In addition, 8-dOHG levels were determined by ELISA method to examine DNA damage.

According to the results of MTT; The best antagonistic effect (CI: 3.00814) was determined as 25 nM paclitaxel-25 ug/ml SO extract at 24 hours, and it was found to be correlative with the results obtained in the *in vitro* wound-healing assay. In the experiments performed with this combination, it was determined that the levels of MDA and 8-dOHG were lower in the combination compared to paclitaxel alone. It was also observed that there was a significant decrease in the activity of SOD, CAT, GR and GPx.

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Development of Molecularly Imprinted Polymers for Electrochemical Detection of TNT from Aqueous Solution

Ahmet Burak Berk[a] *, Erdoğan Özgür[b], Lokman Uzun[a]

[a]*Hacettepe University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

[b]*Hacettepe University, Advanced Technologies Application and Research Center, Ankara, Turkey*

**a.burakberk@yahoo.com*

Detection of explosives such as 2,4,6 trinitrotoluene (TNT) and 2,6-dinitrotoluene (DNT) has become more significant due to the increasing terrorism cases throughout the world. In addition, the application of those explosives in the mining industry causes serious environmental problems. For instance, TNT results in the pollution of clean water, also called red water since TNT dissolves poorly in water (0.13 g/l at 20°C).[1,2] On the other hand, molecular imprinting technique have been used to recognize a target analyte by creating cavities that are quite specific for the analyte while providing high affinity and selectivity as well.[3] In this study, we prepared a molecularly imprinted polymer (MIP) film coated graphite electrode by electro-polymerization of pyrrole-2-carboxylic acid in the presence of the template molecules, DNT, in order to detect the explosive in aqueous solutions. Herein, graphene oxide particles were utilized to enhance conductivity and detection performance of the electrode, which added into polymeric network as a dopant. The surface topography of the electrode was monitored using scanning electron microscope (SEM) whereas electrochemical characterization was performed via cyclic voltammetry (CV) measurements. TNT detection performance was evaluated by applying two main electrochemical techniques as CV and electrochemical impedance spectroscopy (EIS). The results indicated that electropolymerization resulted in a porous film on the graphite electrode while the adsorption of analyte molecule, DNT decreased/shifted the intensity of the anodic peaks from 3.2 μA to 0.2 μA. According to the impedance measurements, charge transfer resistance (Rct) values for plain, graphene oxide modified, non-imprinted, and DNT-imprinted were determined as 261.6 Ω, 175.8 Ω, 741.3 Ω, and 4962 Ω, respectively. The results emphasized that surface modification, as well as the electrpolymerization approach, showed variations for the surface conductivity. Moreover, the DNT-imprinted electrode gave a linear response in the DNT concentration range of 0.5 ppm-100 ppm and had a limit-of-detection (LoD) and limit-of-quantification (LoQ) values calculated from signal/noise ratio as 0.33 ppm and 1.01ppm, respectively.

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Novel Schiff Base Derivative Glucose-6-Phosphate Dehydrogenase (G6PD) Inhibitors Suppress Proliferation of Cancer Cells by Blocking Pentose Phosphate Pathway

Muhammet Karaman[a]*, Halide Sedef Karaman[b], Fatma Yapici[a]

[a]*Kilis 7 Aralik University, Faculty of Arts and Sciences, Department of Molecular Biology and Genetics, Kilis, Turkey*

[b]*Ataturk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*

**mhmmtkaraman@gmail.com*

The cancer cells need greater nucleic acid synthesis, NADPH generation, and fatty acid synthesis than normal cells to fulfill the requirements for rapid division. This phenomenon is regulated by the pentose phosphate pathway.[1] Therefore, cancer cells develop resistance to chemotherapy. The G6PD which is the first rate-limiting enzyme of the pentose phosphate pathway is the primary target for increasing sensitivity of cancer cells to chemotherapy.[2] For this purpose, we designed and synthesized novel Schiff base derivatives for blocking the pentose phosphate pathway by inhibiting G6PD enzyme activity. Binding affinities of **3a**, **3b**, **3c**, **3d**, **3e**, **3f** and **3g** compounds were detected as -9.474, -10.603, -9.802, -8.796, -9.902, -12.086, and -8.907 kcal/mol with *in silico* studies, respectively. After that, IC_{50} values of all compounds were detected as 53.82 nM, 53.23 nM, 81.74 nM, 67.26 nM, 42.57 nM, 59.24 nM, and 38.24 nM at *in vitro* kinetic studies. According to the results, **3b** and **3g** compounds were selected as the most effective inhibitors against G6PD enzyme activity. The selected compounds have caused decreasing cell viability of A549 cancer cell line with 19.2 µM and 282.3 nM of EC_{50}, respectively.

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A Tyrosinase Based Amperometric Biosensor for Determination of Dopamine

Muhammed Ali Akbıyık[a], Onur Can Bodur[a] *, Merve Keskin[b], Meryem Kara[c], Saliha Dinç[d], Mustafa Özmen[e], Fatma Arslan[a]

[a]*Department of Chemistry, Faculty of Science, Gazi University, Ankara, Turkey*

[b]*Vocational School of Health Services, Bilecik Seyh Edebali University, Bilecik, Turkey*

[c]*Çumra Vocational High School, Selcuk University, Konya, Turkey*

[d]*Cumra School of Applied Sciences, Selcuk University, Konya, Turkey*

[e]*Department of Chemistry, Faculty of Science, Selcuk University, Konya, Turkey*

**onurcanbodur@gazi.edu.tr*

Dopamine is an important neurotransmitter that plays a vital role in central nervous, cardiovascular and endocrine systems.[1] Dopamine levels are low in patients with Parkinson's syndrome, schizophrenia and split personality disorder. Therefore, rapid and sensitive detection of dopamine has importance for early diagnosis. Biosensors are devices used in various applications such as medical diagnosis, medicine, food safety, environmental monitoring, physics, chemistry, biology, biochemistry and engineering, with advantages such as high sensitivity, easy availability, fast (real-time) sensing and low cost.[2]

In this study, an amperometric biosensor based on tyrosinase enzyme was designed. For this purpose, (3-Chloropropyl)-trimethoxy silane (CPTMS) coated CDs were synthesized and characterized. Modified carbon paste electrode was prepared by CPTMS coated CDs and used for the detection of dopamine. Tyrosinase enzyme was immobilized by cross-linking onto the electrode surface. The determination of dopamine was performed measuring the electrochemical reduction of the dopaquinone as a result of the enzymatic reaction at -0.15 V vs Ag/AgCl. Then, the optimum working conditions for the dopamine biosensor were investigated. The effect of pH and temperature on the dopamine response of the prepared biosensor was determined. Optimum pH and temperature were found to be 6.0 and 40 ^{o}C, respectively. In addition, optimum CDs-CPTMS amount, the linear operating range of the biosensor and the interference effect were investigated.

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Investigation of Thioredoxin Reductase-Targeted Anticancer Effect of Diffractaic Acid on Human Lung Cancer

Şükran Günaydın[a] *, Emine Karaca[a,b], Şeyda Nur Kalın[a], Ahmet Altay[c], Harun Budak[a]

[a]*Atatürk University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*

[b]*Erzurum Technical University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*

[c]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Chemistry, Erzincan, Turkey*

**sukrangunaydin@outlook.com*

Lung cancer, the leading cause of cancer-related deaths is the most common cancer incidence in both men and women worldwide.[1] Thioredoxin reductase (TRXR1), which plays a role in the regulation of intracellular redox balance, is overexpressed in many cancer types including lung cancer. Recently, chemotherapeutic agents targeting the thioredoxin system have been frequently investigated in cancer treatment.[2,3] In literature, it has been reported that diffractaic acid, which is the secondary metabolite of lichen, has antioxidant, antitumoral, and anticancer activities. It also inhibits TRXR, purified from rat lung.[4,5] However, the TRXR1-targeted anticancer effect of diffractaic acid on human lung cancer (A549) has not been investigated so far.

In this study, first of all, the effect of diffractaic acid on viability of A549 cells was investigated by cell proliferation (XTT) assay. It was determined that diffractaic acid had the most cytotoxic effect against A549 cells with an IC_{50} value of 46.37±1.92 µg/mL at 48 hours. The effect of diffractaic acid on the apoptotic pathway in A549 cells was examined by Real-Time PCR (qPCR), and it was shown that the increase in BAX/BCL2 ratio ($p<0.01$) and P53 ($p<0.0001$) gene expressions induced the apoptotic cell death. And then, quantitative protein expression and enzyme activity of TRXR1 were investigated by western blot and DTNB methods, respectively. According to the results, although no significant difference in the quantitative protein expression of TRXR1 was observed, the enzyme activity of TRXR1 was significantly decreased in A549 cells.

In conclusion, diffractaic acid showed anticancer activity by targeting TRXR1 in A549 cells and this lichen acid may be evaluated as a potential chemotherapeutic agent. But, it still needs to be investigated in detail with further study.

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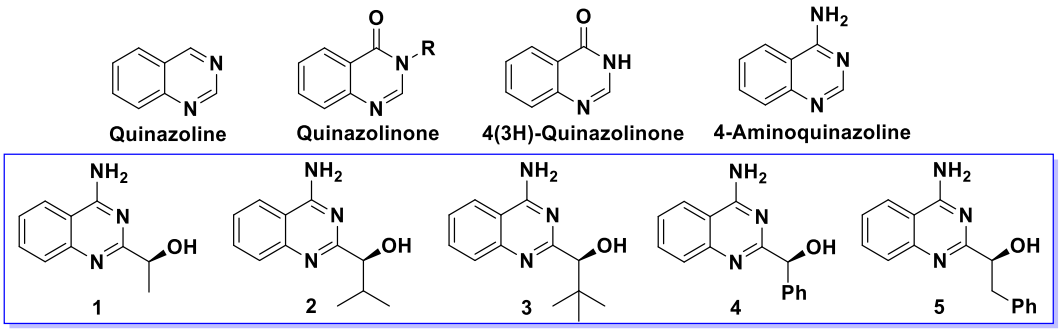
Investigation of Anti-Cancer Effects of Enantiomerically Pure (*S*)-4-Aminoquinazoline Derivatives on Human Liver (HepG2) Cancer Cell Line

Emrah Polat[a]*, Emine Karaca[b,c], Şükran Günaydın[b], Harun Budak[b], Murat Çakıcı[a]

[a]*Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*
[b]*Atatürk University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*
[c]*Erzurum Technical University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*
**emrah.polat13@ogr.atauni.edu.tr*

Heterocyclic compounds have an important place in medicinal chemistry because they are frequently found in biologically active compounds, including antifungal, enzyme inhibitors, anti-HIV, antidiabetic, anticancer, and in biomolecules such as enzymes, vitamins, and natural products.[1] Quinazoline, quinazolinone and particularly 4(3H)-quinazolinone nuclei have attracted great interest as an important group of pharmacophores in medicinal chemistry, especially for the synthesis of anticancer drugs.[2] Among the quinazoline derivatives, 4-aminoquinazolines have received special attention due to their pharmacological properties.[3]



Scheme. Enantiomerically pure (*S*)-4-aminoquinazoline alcohol derivatives

In this study, the cytotoxic activities of the synthesized enantiomerically pure (*S*)-4-aminoquinazoline alcohol derivatives[4] (1-5) against HepG2 cells were conducted by cell proliferation (XTT) assay. According to the results, it was observed that the most effective derivative on HepG2 cells was (*S*)-4-aminoquinazoline alcohol derivative (number 3). The IC_{50} value belonging to (*S*)-4-aminoquinazoline alcohol derivative **3** were calculated as 147.14±0.77 µg/mL at 48 h.

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Synthesis and Potentiometric Sensor Applications of a Pyrazole Derivative Molecule

Oğuz Özbek[a], Ömer Işıldak[b], Meliha Burcu Gürdere[b], Osman Nuri Aslan[c] *

[a]*Zonguldak Bülent Ecevit University, Science and Technology Application and Research Center, Zonguldak, Turkey*

[b]*Tokat Gaziosmanpasa University, Faculty of Science and Arts, Department of Chemistry, Tokat, Turkey*

[c]*Atatürk University, Eastern Anatolia High Technology Application and Research Center, Erzurum, Turkey*

**onaslan@atauni.edu.tr*

Pyrazoles are one of the important members of heterocyclic compounds with two nitrogens in a five-membered ring system. Pyrazole ring shows a wide range of biological activities such as anti-bacterial, anti-fungal, anti-cancer, anti-depressant, anti-inflammatory, anti-tuberculosis, anti-oxidant and anti-viral agents.[1-3] Molecules containing multiple donor atoms such as nitrogen, sulfur and oxygen are potentially preferred in the development of different sensors.[4] In this study, a pyrazole derivative molecule (5,5'-(1,4-phenylene)bis(3-(naphthalen-2-yl)-4,5-dihydro-1*H*-pyrazole-1-carbothioamide)) was synthesized. The synthesized molecule was used as an ionophore in the development of chromium(III)-selective potentiometric sensor. The potentiometric properties of the developed sensor were investigated under laboratory conditions. As a result, the chromium(II)-selective sensor has certain characteristics such as wide concentration range, low detection limit, short response time, wide pH working range, good selectivity and reusability. In addition, this sensor was applied for the direct determination of chromium(III) ions in different real samples.

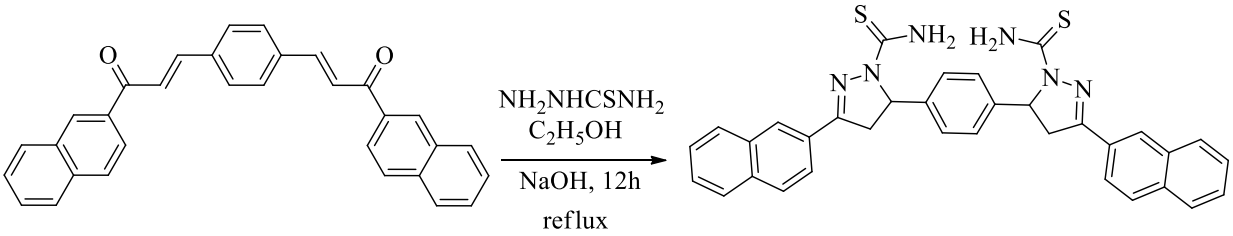

Figure: Synthesis of 5,5'-(1,4-phenylene)bis(3-(naphthalen-2-yl)-4,5-dihydro-1*H*-pyrazole-1-carbothioamide)

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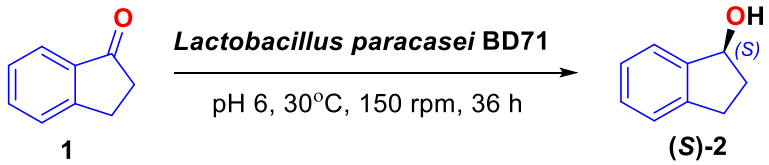
The Enantioselective Reduction of 1-Indanone using *Lactobacillus paracasei* BD71 Whole-Cell Biocatalysts

Erbay Kalay[a]*, Engin Şahin[b], Enes Dertli[c]

[a]*Kafkas University, Kars Vocational School, Department of Material and Material Processing Technologies, Kars, Turkey*
[b]*Bayburt University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Bayburt, Turkey*
[c]*Yildiz Technical University, Chemical and Metallurgical Engineering Faculty, Food Engineering Department, Istanbul, Turkey*

**ekalay@kafkas.edu.tr*

Optically active (*S*)-1-indanol is important precursor in some biologically active compounds, such as rasagiline mesylate TVP-1012 for the treatment of Parkinson's disease (Figure 1).[1] To date, numerous chemical catalysts have been reported for the enantiopure synthesis of (*S*) or (*R*)-1-indanol using synthetic methodologies such as asymmetric reduction and asymmetric hydrogen transfer to ketones.[2] These chemically catalyzed processes have disadvantages such as the need to use expensive chiral ligands, expensive metal, byproduct, and metal contamination in the target product.[3] Bio-catalyzed processes have been developed to eliminate these problems. These processes have inherent advantages such as high selectivity, environmentally benign, and mild reaction conditions.



1 **(*S*)-2**

conv. >99%
yield: 93%
ee >99%

In this study, an efficient and convenient method was developed for the asymmetric reduction of prochiral ketone **1** using *L. paracasei* BD71 whole-cell biocatalyst. In this context, (*S*)-**2** secondary alcohol was obtained with >99% ee and 93% yield. In addition, to our knowledge, this is the first study on the production of (*S*)-**2** using whole-cell biocatalyst in excellent yield, conversion with enantiopure form.

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Atomic Force Microscopy Investigation of the Adhesion and Mechanics of Planktonic and Biofilm-Dispersed *E. coli* Cells

Ayşe Ördek[a] and Fatma Pınar Gördesli Duatepe[b]*

[a]*Izmir University of Economics, Graduate School, Bioengineering Graduate Program, Izmir, Turkey*
[b]*Izmir University of Economics, Faculty of Engineering, Department of Genetics and Bioengineering, Izmir, Turkey*
**pinar.gordesli@ieu.edu.tr*

Biofilm formation develops as a process with different stages. Initial stage is the adhesion of planktonic bacteria to a surface via their cell-surface-associated biopolymers, which takes place at the nano-scale. Then the formation of microcolonies and the synthesis of exopolymeric substances (EPS) takes place. Microcolonies form mature biofilms surrounded by EPS matrix, which acts as a protective shield for bacterial cells against external factors such as antibiotics or disinfectants. Final stage is the dispersal stage, in which biofilm-dispersed cells migrate to other surfaces and form new biofilm structures, which is indeed the main cause of the spread of biofilms or the transition of acute infections to a chronic state.[1] The ultimate way to prevent biofilm formation is to prevent the initial attachment of the bacterial cells to a surface. Since little is known about this critical initial step taking place at the nano-scale, most of the strategies developed to combat biofilms aim primarily at dispersing the mature biofilms. In order to develop effective strategies, it is necessary to understand the adhesion of planktonic and biofilm-dispersed cells and the mechanical properties of their surface biopolymers mediating their initial adhesion. The overall goal of this study is to provide the differences between adhesion energies and mechanical properties of planktonic and biofilm-dispersed cells' surface biopolymers. For this purpose, first *E. coli* biofilms were grown as batch cultures and subsequently dispersed using 0.5 µM of NO-donor sodium nitroprusside (SNP).[2] Planktonic cells were obtained by growing *E. coli* cells until the late exponential phase of growth. The adhesion energies of the bacterial cells were calculated using the force-distance curves measured at different spots on the bacterial surfaces under water by atomic force microscope (AFM). Our results indicated that mean and median values of adhesion energies quantified for biofilm-dispersed cells were almost 8-fold higher than those quantified for planktonic cells. In addition, by fitting a steric model to the approach force-distance data, the mechanical properties (biopolymer brush thickness and grafting density) of the bacterial surface biopolymers were predicted.[3] Consequently, biofilm-dispersed cells were found to have a higher capacity of adhesion to surfaces at the nano-scale due to their longer and denser surface biopolymers in comparison to those of planktonic cells.

Acknowledgement: *This study is financially supported by TÜBİTAK (project no: 118M404).*

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Comparison of Phenolic Compound Content of *Laurus nobilis* Fresh and Dry Methanolic Leaf Extracts

Fatıma Uzar[a] *, Sibel Ataseven[b], Duygu Mısırlı[c], Mahfuz Elmastaş[c]

[a]*University of Health Sciences, Hamidiye Health Sciences Institute, Department of Phytotherapy, Istanbul, Turkey*

[b]*University of Health Sciences, Hamidiye Health Sciences Institute, Department of Traditional and Complementary Medicine, Istanbul, Turkey*

[c]*University of Health Sciences, Hamidiye Pharmacy Faculty, Department of Biochemistry, Istanbul, Turkey*

**fatimauzar@gmail.com*

The aim of this study is to evaluate and compare the phenolic compound content of dry and fresh *Laurus nobilis* methanolic leaf extracts using High Performance Liquid Chromatography-Diode Array Detector (HPLC-DAD). *Laurus nobilis* L. is an aromatic and medicinal plant used in traditional medical systems belonging to the Lauraceaea family.[1]

Fresh and dry leaves were extracted using overnight maceration method on an orbitally shaker at room temperature. The solvent was evaporated using a rotary evaporator to obtain the dry extract. Quantitative analysis was conducted on stock solutions (1000 ppm) of extracts using HPLC device. Detection was done using DAD at a wavelength of 254 nm. Phenylhexyl 4.6 x 150 mm, 3 µm column was used as a stationary phase. The chromatographic separation conditions were adjusted for oven temperature 30°C and flow rate 1 mL/min. 0.1% formic acid in water (A) and acetonitrile (B) were used as mobile phase. All used solvents were HPLC grade. The gradient program was as follows: 100%-95% A (0-0.01 min); 95-90.5% A (0.01-7 min); 90.5-83% A (7-20 min); 83-60% A (20-35 min); 60-100% A (35-40 min).

Phenolic compounds detected in fresh leaf extracts were epicatechin (0.679 ppm), rutin (1.549 ppm), chicoric acid (0.710 ppm), and naringenin (1.388 ppm). Phenolic compounds in dry leaves were detected as epicatechin (2.562 ppm), rutin (1.242 ppm), chicoric acid (4.453 ppm), and apigenin-7-O-glucoside (0.367 ppm) in the study. Some qualitative and quantitative differences in the phenolic compounds content in fresh and dry samples were observed. The detection of these compounds possesses a potential for their use as lead compounds in drug development and biotechnological applications.

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Purification of Lipase Enzyme from Bovine Pancreas and Investigation of Inhibition Effects of Propolis Extracts on This Enzyme Activity

Zeynep Bayat Sarioglu[a]*, Metin Bulbul[a], Sevgi Kolayli[b]

[a]*Kutahya Dumlupinar University, Faculty of Science and Literature, Department of Biochemistry, Kutahya, Turkey*

[b]*Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, Turkey*

**zeynep.bayat@dpu.edu.tr*

The aim of this study is to investigate purification of pancreatic lipase enzyme with chromatographic techniques that are gathered from biological sources and frequently used in medical and drug industry, effect of some crucial natural propolis sources that can show inhibitor effect on enzyme activity thus investigating availability of natural inhibitors for bariatric treatment. Pancreatic lipase enzyme (EC.3.1.1.3), which is responsible for digestion of triglyceride and released by acinar cells of pancreas.[1,2] In the study, this enzyme was purified with gel-filtration chromatography method from bovine pancreas and lipase activity which is obtained with 17.94% productivity ratio and 568.58 purification ratio and characterized with sodium dodecyl sulfate polyacrylamide gel electrophoresis.[3] Propolis samples were collected from six different regions and after their extraction, their effect on pancreatic lipase activity was analyzed. All propolis extracts indicated inhibitor effect and their IC_{50} values were calculated. IC_{50} values are as 4.00 mg/mL (Düzce propolis), 11.80 mg/mL (Balıkesir propolis), 7.69 mg/mL (Kırmızı propolis), 6.91 mg/mL (Hakkâri propolis), 12.68 mg/mL (Kırklareli propolis), 9.23 mg/mL (Artvin propolis). According to this data, Düzce propolis extract has the highest inhibition effect with ratio of IC_{50} 4.00 mg/mL. To define composition of propolis extracts, total sum of polyphenol and flavonoid content were determined by spectrophotometric methods.[4,5] This sample with the highest total amount of polyphenol and flavonoid content has been with ratio of 41.35+0.43 mg GAE/mL and 5.69+0.05 QE/mL. The gathered findings show that inhibition effect can be depended on propolis composition and propolis extracts have the potential to be used as anti-obesity agent.

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Synergistic Anti-cancer Effects of *Alchemilla vulgaris* and Docetaxel on Prostate Cancer PC-3 Cell Line

Esra Tuba Demir[a] *, Ahmet Çetin[b], Nihan Günay[b], Seda Kılınç[b], Murat Çankaya[b]

[a]*Erzincan Binali Yildirim University, Vocational School of Health Services, Department of Medical Services and Techniques, Anesthesia Program, Erzincan, Turkey*

[b]*Erzincan Binali Yildirim University, Faculty of Arts and Sciences, Department of Biology, Erzincan, Turkey*

**esra.demir@erzincan.edu.tr*

Prostate cancer is the second most frequent cancer diagnosed in men and is one of the leading causes of death worldwide.[1] And the evidence resulting from epidemiological, cancer cell line, human tissue and animal studies showed that estrogen is important in prostate carcinogenesis.[2] Docetaxel, a semisynthetic taxane is effective alone against prostatic tumors. It is believed that by inhibition of microtubular depolymerization and attenuation of the effects of *BCL-2* and *BCL-XL* gene expression; docetaxel shows its antineoplastic activity.[3]

Alchemilla vulgaris (AV), or lady's mantle, is a member of the rose family (Rosaceae). In last studies, people focused on anticancer properties of AV in estrogen depended cancer lines.[4] Because it has long been known that estrogens are effective against prostate cancer; recent studies are focused on relationship between estrogen and prostate cancer.[5]

In this study, we examined the synergistic anticancer effect of AV aqueous decoction extract (5%) and docetaxel on prostate cancer and used PC-3 cell line. The inhibitory activity of D, A, D+A against growth of PC-3 cells were investigated using the MTT assay. According to the CI values of AV-docetaxel combinations, 100 µg/mL AV+100 nM docetaxel showed the most synergistic effect for 24h (CI= 0.22743). Protein levels of *BAX, BCL-2* and *CASPASE-3* were determined by ELISA. The combination of AV and docetaxel has been shown to increase *BAX* protein expression levels. In this case, the combination can be considered to induce an intrinsic apoptotic pathway. We determined the levels of total antioxidant capacity and the activity of the antioxidant enzymes glutathione peroxidase, glutathione S-transferase and superoxide dismutase in the docetaxel and AV-applied cells. We showed that decrease in glutathione S-transferase enzyme levels, is an indication that the synergistic effect of Docetaxel and *Alchemilla vulgaris* drags the cell to apoptosis.

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Preparation and Nutritional Enhancement of Crackers by Using Resistant Starch Corn Flour and Propolis

Marium Saba[a,b] *, Fulya Ay Sal[b], Emel Alemdaroglu[b], Anum Khan[a], Numan Salehzada[a], Sabriye Canakci[b], Ali Osman Belduz[b], Samiullah Khan[a]

[a]*Quaid-i-Azam University, Faculty of Biological Sciences, Department of Microbiology, Islamabad, Pakistan*

[b]*Karadeniz Technical University, Faculty of Sciences, Department of Molecular Biology, Trabzon, Turkey*

**mariumsaba92@gmail.com*

Carbohydrates are major part of our daily meal. In recent years, utilization of starch based foods in the form of resistant starch has been increased. Resistant starch resists digestion in the small intestine of healthy individuals and act as fiber and improved feed for gut microbiota.[1] Several food products have been prepared from resistant starch and they have improved sensory and nutritional properties. And one of them is crackers, as they are considered as healthy, delicious and appropriate way to utilize staple foods.[2]

This study aims to produce healthy crackers by using corn flours and its derivatives. Corn flour has been converted into enhanced resistant starch flour by heat treatment and enzyme (amylase) treatment. Flour primed with amylase has higher resistant starch content as compared to heat treated. Four types of crackers formulations were prepared. First one was based on only corn flour (C), second composition include heat treated resistant starch (HT), third includes enzyme treated corn flour (E-RS) while fourth one has E-RS along with propolis. Crackers were baked by using AOAC guidelines. Sensory evaluation was carried out and it has been found that a significant difference was observed in scrumptiousness and color parameters of RS based and non-RS based crackers. Structural characterization of crackers was carried out through FTIR and SEM analyses. SEM revealed that RS and RS+P crackers have less compact structure. FTIR analysis revealed that more flavonoid content is present in crackers containing propolis. However, it has been found that crackers prepared with enzymatically treated resistant starch and E-RS + Propolis has significantly higher flavonoid content, better nutritional and functional properties. Hence, it could be recommended to use investigated grains in bakery products to obtain healthy bakery products.

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Particle Assisted Molecularly Imprinted Membrane for the Determination of Fluoxetine

Mehmet Emin Çorman[a,b,*], Canan Armutcu[c], Ahmet Cetinkaya[a], Lokman Uzun[c], Sibel Aysil Ozkan[a]

[a]*Ankara University, Faculty of Pharmacy, Department of Analytical Chemistry, Ankara, Turkey*

[b]*Sinop University, Faculty of Science, Department of Chemistry, Sinop, Turkey*

[c]*Hacettepe University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

**mehmetemincorman@gmail.com*

In this study, we developed a ZnO nanoparticle-mediated interface imprinting approach which offers a promising alternative to traditional technique while mimicking the surface imprinting approach.[1] In the first step, fluoxetine (FLX) was adsorbed on zinc oxide (ZnO) nanoparticles, which then pre-complex between FLX and the amino acid-based functional monomer (N-methacryloyl-L-phenylalanine, MAPA) was formed and molecular imprinting membrane was synthesized by bulk polymerization in the presence of 2-hydroxyethyl methacrylate (HEMA) and ethylene glycol dimethacrylate as a cross-linking agent. After polymerization terminated, FLX-ZnO particles were etched to expose out effective imprint sites onto the bulk polymeric network which is responsible for the formation of template orientation. The characterization of membranes was investigated by using swelling degree (SD), Fourier transform infrared (FTIR) spectroscopy, and scanning electron microscopy (SEM). In order to optimize the adsorption conditions, the effective factors including pH, initial concentration and interaction time were evaluated from aqueous solutions. Under optimum conditions, the interface molecularly imprinted membranes have a relatively high specific rebinding capacity of 2894.2 µg/g and high reusability as 94.2%. The ZnO particles were used not only to ensure the preservation of the imprint cavities in the polymer network but also provide higher template removal efficiency and better rebinding kinetics.[2] This novel design with multiple recognition sites is quite simple and suitable for the determination of drugs.

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Determination of Enzyme Inhibition and Antibacterial Effect of Resin Obtained from *Pistacia terebinthus*

Ruya Saglamtas[a] *, Abdullah Demirci[a], Ilhami Gülçin[b].

[a]*Ağrı İbrahim Çeçen University, Central Research and Application Laboratory, Agri, Turkey*

[b]*Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*

**ruyakaya17@gmail.com*

The resin obtained from branches of *Pistacia terebinthus* L. grown in Turkey is popularly known as "menengiç gum". *Pistacia* species are widely used in traditional treatment as antibacterial, anticoagulant, antidiarrheal and preventive of throat infections. In addition, it is used as a natural adhesive, a food additive in soft drinks, and a filler in toothpastes and dentistry.[1]

In this study, *in vitro* inhibition effects of ethanol extract of resin were investigated on acetylcholinesterase (AChE), butyrylcholinesterase (BChE), α-glucosidase, human carbonic anhydrase (hCA) I and II isoenzymes.[2,3] In addition, antibacterial activities of ethanol extract of the resin were determined against *Staphylococcus aureus, Bacillus cereus, Pseudomonas aeruginosa* and *Staphylococcus epidermidis* using the disk-diffusion method. Also, Gentamicin was used as positive control.

On the other hand, for determination of enzyme inhibition of the ethanol extract, half maximal inhibition concentration values (IC_{50}) were calculated. The IC_{50} values of the ethanol extract of the resin were calculated as 56.80 mg/mL for AChE, 41.25 mg/mL for BChE, 73.52 mg/mL for *α*-glucosidase, 73.72 mg/mL for hCA I and 69.3 mg/mL for hCA II. According to these values, it was determined that the ethanol extract of resin had effective inhibition effects on the used metabolic enzymes, which related to some global diseases. The antibacterial effect of the ethanol extract was observed at the lowest level of 1 µg, and the evaluation was made by measuring the zone diameters. According to these results, it was determined that resin's ethanol extract showed antibacterial effect for *S. aureus* and *B. cereus*, but not for *S. epidermidis* and *P. aeruginosa*. Also, it was determined that the resin water extract did not show any effect on enzymes and bacteria.

As conclusion, effective inhibition ability of resin's ethanol extract was demonstrated for the first time. Also, it has a positive effect to treat some diseases and has antibacterial properties against some bacteria

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Investigation of Antioxidant Activity of Hemp (*Cannabis sativa*) Seed Oil and Determination of Chemical Profile by LC-HRMS and GCMS

Muzaffer Mutlu[a], Zeynebe Bingöl[b,c], Ekrem Köksal[d] *, Ahmet Ceyhan Gören[e], İlhami Gülçin[c]

[a]*Gelişim University, Vocational School of Applied Sciences, İstanbul, Turkey*

[b]*Tokat Gaziosmanpaşa University, Vocational School of Health Services, Tokat, Turkey*

[c]*Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*

[d]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Chemistry, Erzincan, Turkey*

[e]*Gebze Technical University, Faculty of Basic Sciences, Department of Chemistry, Kocaeli, Turkey*

**koksalekrem@gmail.com*

Hemp (*Cannabis sativa* L.), an annual herbaceous plant, has been grown agriculturally for many centuries for its fiber and oil.[1] Hemp seed, in addition to its nutritional value, has demonstrated positive health benefits including the lowering of cholesterol and high blood pressure.

In this study, antioxidant activity of hemp seed oil was determined. In order to evaluate the antioxidant activity of cold pressed hemp seed oil some antioxidant methods such as ferric ions (Fe^{3+}) reduction method, $ABTS^{\cdot+}$ scavenging effect, $DPPH^{\cdot}$ scavenging activity, cupric ions (Cu^{2+}) reducing capacity, and ferrous ions (Fe^{2+}) binding activities were separately performed. As standard antioxidant compounds, BHA, BHT, α-Tocopherol and Trolox were used. Chemical content of hemp was determined by liquid chromatography-high resolution mass spectrometry (LC-HRMS) and gas chromatography (GCMS).

Although the antioxidant activity of hemp seed oil was lower than the standards in applied some methods, however, it was determined that hemp seed oil had higher antioxidant activity than tocopherol and Trolox according to the copper reduction method. Cu^{2+} reducing ability of hemp seed oil and standard compounds were demonstrated as follows: BHA (λ_{450}: 2.418±0.018, r^2: 0.9887) > BHT (λ_{450}: 1.953±0.045, r^2: 0.9998) > Trolox (λ_{450}: 1.800±0.096, r^2: 0.9974) > hemp seed oil (λ_{450}: 1.208±0.061, r^2: 0.9655) > α-Tocopherol (λ_{450}: 0.851±0.046, r^2: 0.9994) > Ascorbic acid (λ_{450}: 0.983±0.048, r^2: 0.9822). According to LC-HRMS analysis, the main phenolics in 1 mg of hemp seed oil are Hispudilin (14.60 mg/L), Ascorbic acid (4.21 mg/L) and Naringenin (0.85 mg/L). According to GCMS analysis, the main fatty acids in hemp seed oil are as follows: Linoleoyl chloride (RT:25.45, % Area: 34.62) > Linoleic Acid (RT:25.37, % Area: 33.21) > 2-4-di-tert-butylphenol (RT: 14.63, % Area: 5.79) > Palmitic acid (RT: 22.65, % Area: 4.83) > Stenol (RT: 19.83, % Area: 3.74) > Cetal (RT: 16.15, % Area: 3.19). The results showed that hemp seed oil had marked antioxidant activity when compared to standard antioxidants and can be used as natural antioxidant sources.

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Antiproliferative Effects of Three Endemic *Sideritis* Species: *S. libanotica, S. germanicopolitana* and *S. perfoliata*

Hüseyin Akşit[a] *, İbrahim Demirtaş[b], Ali Aydın[c]

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Analytical Chemistry, Erzincan, Turkey*

[b]*Iğdır University, Faculty of Science and Letters, Department of Biochemistry, Iğdır, Turkey*

[c]*Yozgat Bozok University, Faculty of Medicine, Department of Basic Medical Sciences, Yozgat, Turkey*

**huseyinaksit@gmail.com*

The genus *Sideritis* (Lamiaceae) is distributed mainly in the Mediterranean and Macaronesian regions and contains more than 140 species all the over world.[1] In Turkey flora, 46 species grow, among which 36 species endemic with high endemism ratio.[2] *Sideritis* species are widely used as a folk medicine for many years in Anatolia. Phytochemical studies were shown the genus *Sideritis* contains a large number of secondary metabolites such as flavonoids, iridoids, phenyl ethanoids, and terpenoids. *Sideritis* species exhibit various biological activities mainly anti-inflammatory, antirheumatic, gastroprotective, antioxidant, anti-microbial, and anticancer activities.[3] *S. libanotica, S. germanicopolitana and S. perfoliata* species are the Turkey endemics that are mainly distributed to the east and mediterranean regions of Turkey.[4] In this study, the antiproliferative activity of methanolic extracts of different parts (stem, leaf, and floral parts) of plants was evaluated by MTT assay against HeLa (Human cervical cancer cell), A549 (Human lung cancer cell), Hep3B (Human liver cancer cell), and FL (Human amnion cell) cell lines. According to our results, especialy, all organs of the *S. germanicopolitana* plant and the stem part of the *S. libanotica* plant exhibited very low GI_{50} values (4.28–5.74 µg/mL) on A549 cells. These active extracts were also found less cytotoxic than 5-FU and cis-platin against FL cell lines. From this point of view, it can be said that these extracts contain precursor molecules that can be used in the treatment of lung cancer.

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Effect of Extraction Methods on Individual Phenolic Compounds in *Laurus nobilis* Leaves

Duygu Mısırlı[a] *, Elif Karakişi[b], Fatıma Uzar[c], Mahfuz Elmastaş[a]

[a]*University of Health Sciences, Hamidiye Pharmacy Faculty, Departments of Biochemistry, Istanbul, Turkey*

[b]*Üsküdar University, Faculty of Engineering and Natural Sciences, Departments of Molecular Biology and Genetics, Istanbul, Turkey*

[c]*University of Health Sciences, Hamidiye Health Sciences Institute, Departments of Phytotherapy, Istanbul, Turkey*

**duygumisirli@gmail.com*

Different extraction methods can be used to obtain extracts rich in phenolic compounds from plants.[1] *Laurus nobilis* L. is one such plant containing phenolic and medicinal functional compounds generally used in traditional medical systems.[2] This study therefore aims to extract *Laurus nobilis* fresh leaves using microwave assisted extraction (MAE) and decoction methods using water as a solvent. Phenolic compounds of *L. nobilis* will analyzed using High Performance Liquid Chromatography-Diode Array Detector (HPLC-DAD).

MAE was carried out using the Ethos X Microwave Extraction System (Milestone). 1500 W were applied for 15 minutes and the reduced to 600 W for a period of 50 minutes. Extracts were lyophilized to remove the water using a freeze dryer. Quantitative analysis was conducted on stock solutions (1000 ppm) of extracts using HPLC-DAD device. The column used for separation was phenyl hexyl 4.6 x 150 mm, 3 µm column. The chromatographic separation conditions were adjusted for oven temperature 30°C and flow rate 1 mL/min. 0.1% formic acid in water (A) and acetonitrile (B) were used as mobile phase. All used solvents were HPLC grade. The gradient elution program applied for separation was as follows: 100%-95% A (0-0.01 min); 95-90.5% A (0.01-7 min); 90.5-83% A (7-20 min); 83-60% A (20-35 min); 60-100% A (35-40 min).

According to obtained data, Epicatechin (1.447 ppm), ferulic acid (0.077 ppm), rutin (1.615 ppm), and chicoric acid (1.129 ppm) were detected in extracts using MAE. Gallic acid (0.070 ppm), epicatechin (0.642 ppm), rutin (1.296 ppm), and chicoric acid (0.832 ppm) were detected in decoction method of *L. nobilis* leaves. According to the results, it was observed that the phenolic compounds of *L. nobilis* leaves changed both qualitatively and quantitatively when used different extraction methods.

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Analysis Targeted Organic Acids in Bee Venom

Saffet Çelik[a] *, Yusuf Can Gerçek[b,c], Aslı Özkök[d], Nesrin Ecem Bayram[e]

[a]*Trakya University, Technology Research and Development Application and Research Center, Edirne, Turkey*
[b]*Istanbul University, Faculty of Science, Department of Biology, Istanbul, Turkey*
[c]*Istanbul University, Centre for Plant and Herbal Products Research-Development, Istanbul, Turkey*
[d]*Hacettepe University, Bee and Bee Products Application and Research Center, Ankara, Turkey*
[e]*Bayburt University, Department of Food Processing, Aydıntepe Vocational College, Bayburt, Turkey*

**saffetcelik@trakya.edu.tr*

Organic acids are bioactive small molecules which occurrence naturally or after metabolism.[1] Among all biological products, organic acids have the world's third largest production market and are widely used as antimicrobial agents in the food industry. Quantitative and qualitative analysis of organic acids very important because of different biological effect and structural isomerism.[2] Organic acids are minor components of bee products. Bee venom, which is a complex substance produced by *Apis mellifera*, is widely used to treat various diseases, such as pain, inflammation, and cancer.[3] Bee venom contains proteins, peptides and small molecules such as amino acids and organic acids. In this study, it was aimed to investigate the organic acid profile of bee venom samples. For this purpose, in this study, a new method was developed for the determination and quantification of organic acid content in bee venom samples. This method contains 54 organic acids, simple sample preparation and without derivatization step.

As a result, citric acid, pyruvic acid and malic acid were determined as the organic acids detected at the highest concentrations in bee venom samples. This study is the first to investigate the detailed profile of bee venom samples from Turkey.

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Acetylcholinesterase and Butyrylcholinesterase Enzyme Interactions of Major Phenolic Compounds of Some Plant Species: An *In Silico* Study

Ercan Bursal*

Muş Alparslan University, Faculty of Health Sciences, Muş, Turkey

**e.bursal@alparslan.edu.tr*

Medicinal plants contain various secondary metabolites such as phenolic acid, flavonoids, and fatty acids that are mostly related to some biological activities.[1,2] This study was carried out to determine the enzyme inhibitory potentials of medicinal plants specialized with their phenolic contents. We reported the in vitro enzyme inhibition potentials of several plant species against acetylcholinesterase and butyrylcholinesterase enzymes in our previous studies.[3-6] In this present study, the molecular docking interactions of the most abundant phenolic compounds (quinic acid, hesperidin and rutin) of the plant species with the respective target enzymes by using Chimera, AutoDock Vina and Autodock Tools softwares. Quinic acid, hesperidin and rutin compounds have good interactions with AChE/BChE enzymes with low energy levels. According to the AutoDock Tools analyzing results, hesperidin showed best interaction with BChE. The estimated free energy binding score of hesperidin-BChE was calculated as -7.03 kcal/mol and the estimated inhibition constant (Ki) was calculated as 7.04 µM. On the other hand, the estimated free binding energy of quinic acid found as -6.2 kcal/mol for AChE and -5.8 kcal/mol for BChE according to the Chimera and AutoDock Vina analyses. Conventional hydrogen bond and the other interactions of phenolics with AChE/BChE are shown on the 2D view of the hydrogen bonds donor/acceptor surface on the receptor. As a conclusion, low binding energy levels of hesperidin and quinic acid indicate their high interactions with the respected enzymes.

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Phenolic Content and Antioxidant Activity Analyses of Propolis Samples from Different Regions of Turkey

Ebubekir Izol[a], İsmail Yapıcı[b], İsa Yılmaz[c], Ercan Bursal[d]*, İlhami Gülçin[e]

[a]*Bingol University, Central Laboratory Application and Research Center, Bingol, Turkey*

[b]*Gümüşhane University, Central Laboratory Application and Research Center, Gümüşhane, Turkey*

[c]*Muş Alparslan University, Faculty of Practical Applications, Muş, Turkey*

[d]*Muş Alparslan University, Faculty of Health Sciences, Muş, Turkey*

[e]*Ataturk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*

**e.bursal@alparslan.edu.tr*

Propolis is resinous material released from various plant sources, collected by honeybees and produced by bee secretions.[1] Honeybees use propolis materials to seal holes and cracks in beehives for protecting them from microbial infection and extreme weather conditions. The plant sources and geographical conditions could change the biochemical content and activities of propolis samples.[2] Biochemical properties of many propolis samples from different parts of the world have been studied and evaluated. Antioxidant, antimicrobial activities and phenolic contents of them have been investigated.[3]

The present study reports the total phenolic and flavonoid contents as well as antioxidant activities of different propolis samples. The propolis samples were obtained from Muş, Ordu, Manisa and Iğdır cities, located in different regions of Turkey. The effective antioxidant properties of ethanol and water extracts of propolis were determined by using five different *in vitro* bioanalytical methods including three reducing antioxidant methods (CUPRAC, FRAP, and Fe^{3+}-TPTZ reducing assays) and two radical scavenging antioxidant methods (ABTS and DPPH).[4,5] According to the results, the propolis sample gathered from Ordu city had highest total phenolic and flavonoid contents. Remarkably, the propolis sample gathered from Ordu city had highest antioxidant activity for all five antioxidant methods. The results supported the relation of phenolic compounds with antioxidant activity.

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Development and Characterization of BSA-loaded Paclitaxel; Cytotoxic Activity in MCF7 Cancer Cells

Sema Misir[a] *, Serap Ozer Yaman[b], Begüm Kurt[c] , I. Afsin Kariper[d], Ceylan Ozsoy Hepokur[a]

[a]*Sivas Cumhuriyet University, Faculty of Pharmacy, Department of Biochemistry, Sivas, Turkey*
[b]*Karadeniz Technical University, Department of Medical Biochemistry, Faculty of Medicine, Trabzon, Turkey*
[c]*Sivas Cumhuriyet University, Department of Gynecology and Obstetrics, Medical Faculty, Sivas, Turkey*
[d]*Erciyes University, Faculty of Education, Kayseri, Turkey*

**smisir@cumhuriyet.edu.tr*

Nowadays, advance in nanotechnology promises to develop innovative drugs with greater efficacy and less side effects than standard treatments by taking advantage of the properties of nanomedicinal substances. It has enabled the development of new strategies for different diseases treatment, especially cancer.[1] In this study, we aimed to develop and characterize a delivery system for paclitaxel-loaded (PEB) by bovine serum albumin (BSA) in nanocarriers is a promising strategy to optimize cancer treatment. The structures of the obtained products were characterized by RAMAN, FT-IR, and TEM. The release behavior of PEB was analyzed in phosphate buffer saline (PBS, pH: 7.4). Cytotoxic activity of free paclitaxel, BSA, and PEB were investigated using XTT assay in MCF-7 cells. The mean diameter of PEBs was about 100-200 nm. In the drug release study, it was observed that paclitaxel was released to 80% for 3 h. Cytotoxic activity of PEB was significantly increased after BSA-loaded on MCF-7 cells relative to free paclitaxel and BSA. These results indicate that encapsulation is an interesting strategy to be a potential carrier and accumulation of drugs in cells.

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Phytopharmaceutical Potential of *Polygonum cognatum* Meissn.

Sefa Gözcü[a], R. Anıl Uğan[b], Hilal Özbek[c]*, Zühal Güvenalp[c]

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Pharmacognosy, Erzincan, Turkey*

[b]*Atatürk University, Faculty of Pharmacy, Department of Pharmacology, Erzurum, Turkey*

[c]*Atatürk University, Faculty of Pharmacy, Department of Pharmacognosy, Erzurum, Turkey*

**ozbek@atauni.edu.tr*

The genus *Polygonum* (Polygonaceae) is represented in Turkey by 40 species.[1,2] The aerial parts of *Polygonum cognatum* Meissn. is used traditionally as hypoglycemic, diuretic and in rheumatic diseases.[3] In previous studies on *P. cognatum* flavonoids, sterols and phenolic acids were isolated[4] and antibacterial, antihelmentic and antioxidant effects were recorded.[5-7]

The purpose of our study is to determine the *in vitro* and *in vivo* antidiabetic effects of extracts and subfractions of the aerial parts from *P. cognatum*, to isolate pure compounds from active extracts and to determine the antidiabetic activities of the pure isolates. In order to test the *in vitro* and *in vivo* antidiabetic effects, *α*-glucosidase enzyme inhibitory activity assay and streptozotocin (STZ) induced diabetic rat model were used, respectively. The structures of the isolated compounds were established using spectral methods.

Ethyl acetate and *n*-butanol extracts of *P. cognatum* showed the highest α-glucosidase enzyme inhibitory effect *in vitro* and significantly lowered blood glucose in rats with *in vivo* experimental diabetes. In the isolation studies, 11 compounds were purified. As a result of the *α*-glucosidase inhibitory activity studies performed on these compounds, quercetin was found to be responsible for the effect. According to these results *P. cognatum* can be used in diabetes and its complications.

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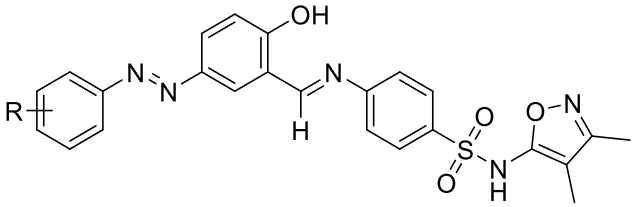
Synthesis, Characterization, Biological Evaluation and Molecular Docking Studies of Novel Azoimine Compounds with Sulfisoxazole Backbone

Mesut Işık[a]*, Nebih Lolak[b], Suleyman Akocak[b], Hatice Esra Duran[c], Cüneyt Türkeş[d], Mustafa Durgun[e], Şükrü Beydemir[f,g]

[a]*Bilecik Şeyh Edebali University, Faculty of Engineering, Department of Bioengineering, Bilecik, Turkey*
[b]*Adıyaman University, Faculty of Pharmacy, Department of Pharmaceutical Chemistry, Adıyaman, Turkey*
[c]*Kafkas University, Faculty of Medicine, Department of Medical Biochemistry, Kars, Turkey*
[d]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Biochemistry, Erzincan, Turkey*
[e]*Harran University, Faculty of Arts and Sciences, Department of Chemistry, Şanlıurfa, Turkey*
[f]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*
[g]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**mesut.isik@bilecik.edu.tr*

Carbonic anhydrases, playing an important role in the acid-base balance in body fluids and tissues, catalyze the conversion reaction of carbon dioxide (CO_2) to bicarbonate (HCO_3^-). Among the metabolic enzymes, it has been reported that CA inhibitors are used for diseases such as leukemia, *diabetes mellitus*, cystic fibrosis and epilepsy.[1-3] Sulfisoxazole is a sulfonamide antibiotic used with other antibiotics to prevent and treat a variety of bacterial infections. In this study, sulfisoxazole derivatives were synthesized and characterized by FT-IR, ^{13}C NMR, ^{1}H NMR, and elemental analysis.



Human erythrocyte isoenzymes (hCA-I and hCA-II) were purified by affinity chromatography method (Sepharose 4B-L-tyrosine-sulfanilamide) for *in vitro* studies. The inhibitory capacity of compounds was screened against hCA isoenzymes (hCA I and hCA II). Possible binding mechanisms of inhibitors to the active site of enzymes with competitive inhibitory effects was elucidated by in silico studies. The compounds exhibited the highest inhibition with the KIs in the range of 24.49 ± 5.05-96.45 ± 24.61 nM for hCA I and 16.34 ± 2.01-67.19 ± 12.24 nM for hCA II. They are more effective against hCA isoenzymes than standard inhibitors such as acetazolamide (K_I of 98.28-439.17 nM). The results will contribute to the literature for the design and synthesis of novel selective inhibitors targeting hCA isoenzymes.

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Determination of Dichlorvos (DCV) Using Electrospun Polymer Coated Surfaces in Magnetoelastic Sensors

Seda Kolak[a] *, Orhan Orçun İnan[b], Murat Şimşek[c], Sevgi Balcioğlu[d], Veli Serkan Kolat[b], Tekin İZGİ[b], Süleyman Köytepe[a], Burhan Ateş[a], Selçuk Atalay[b]

[a]*İnönü University, Faculty of Arts and Sciences, Department of Chemistry, Malatya, Turkey*
[b]*İnönü University, Faculty of Arts and Sciences, Department of Physics, Malatya, Turkey*
[c]*İnönü University, Faculty of Engineering, Department of Biomedical Engineering, Malatya, Turkey*
[d]*Sakarya University of Applied Sciences, Akyazı Vocational School, Department of Medical Services and Techniques, Sakarya, Turkey*

**sedakolak4465@gmail.com*

Magnetoelastic (ME) biosensors are mass change-based measurement systems produced from amorphous and ferromagnetic (2826 MB) alloys. The working principles of ME biosensors are based on the measurement and comparison of the resonance frequencies of the mass change that occurs as a result of the interaction of various biological molecules (enzymes, bacteria, phages, drugs, etc.) applied to the sensor surface and the target substances.[1] In this study, ME biosensor was prepared by using membranes containing nanofibers prepared by electrospinning for determination of dichlorvos and its usability in food samples was tested. In this context, first of all, chromium coating was applied on 2826 MB alloy, which is 35 mm long, 5 mm wide and 25 µm thick. Chromium coated strips were coated with polycaprolactone (14%) and chitosan (1.4%) nanofibers by electrospinning method that was carried out under 27 kV, 18 cm distance and 0.7 mL/h flow rate conditions. Surface modification was achieved with glutaraldehyde (GA), acetylcholinesterase enzyme (AChE) and bovine serum albumin (BSA).[2] Optimum GA ratio, enzyme concentration, and BSA concentration were determined as 5%, 2U/mL, and 1%, respectively. For ME biosensors, the frequency range was determined as 56.800-58.400 Hz. Total frequency shift was measured as Δf = 350 Hz in the 50 µg/mL DCV concentrations. The detection limit for DCV was 14 µg/mL. In addition, it was observed that the ME biosensor can be used for DCV measurements in tomato samples.

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New Schiff Base Ligand-Complexes: Synthesis, Characterization, and Biological Evaluation

Sümeyra Tuna Yıldırım[a], Cüneyt Türkeş[b], Esma Kübra Kağan Yeniçeri[c] *, Hatice Esra Duran[d], Ahmet Altay[e], Şükrü Beydemir[f,g]

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Analytical Chemistry, Erzincan, Turkey*

[b]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Biochemistry, Erzincan, Turkey*

[c]*Erzincan Binali Yıldırım University, Institute of Science and Technology, Department of Chemistry, Erzincan, Turkey*

[d]*Kafkas University, Faculty of Medicine, Department of Medical Biochemistry, Kars, Turkey*

[e]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Chemistry, Erzincan, Turkey*

[f]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*

[g]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**esma.kagan@gmail.com*

Schiff bases are compounds containing the azomethine group (-HC=N) formed due to the reaction of a primary amine with an active carbonyl compound. These compounds are useful chelates because of their ease of preparation, structural variety, and steric and electronic control mechanisms. These are considered "privileged ligands" and find much use due to their advantages in versatile synthesis and good solubility. In azomethine compounds, the C=N bond is important for biological activity, and the nitrogen atom of azomethine plays a role and interacts in the formation of components in normal cell processes.[1] It is known that heterocyclic structures containing an azo ring system and phenol derivative have a wide range of biological applications such as antifungal, antimicrobial, antibacterial, antioxidant, antitumor, anti-inflammatory, anticancer, antipyretic, antiulcer. In this study, we have conducted an investigation that involved the synthesis, characterization, and biological activity of a series of metal complexes to discover novel cholinesterase (ChEs; acetylcholinesterase, AChE and butyrylcholinesterase, BChE) inhibitors,[2-4] and also to determine their antiproliferative potentials on human prostate adenocarcinoma PC-3 cell line. Hence, firstly, the ligand of 3-ethoxysalicylidene-4-chloro-o-aminophenol was synthesized. Subsequently, the complexes of this ligand were prepared with Co(II), Ni(II), Cu(II), Zn(II), Cd(II), Mn(II), Pb(II), and Fe(II). These complexes were characterized using FT-IR, ^{1}H-NMR, ^{13}C-NMR, UV-VIS techniques.[5] Lastly, the metal complexes of 3-ethoxysalicylidene-4-chloro-o-aminophenol were determined to be potent inhibitors of AChE and BChE with IC_{50} values in the range of 31.02 ± 1.90-87.83 ± 2.14 nM and 263.10 ± 16.64-754.10 ± 30.76 nM, respectively as well as having potent cytotoxic effects against PC-3 cancer cells with IC_{50} values varying from 8.42 to 86.46 µM.

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Investigation of *In Vitro* Cytotoxic Effects of Different Extracts of Endemic *Achillea sintenisii* Against MCF-7, MDA-MB-453 and HT-29 Human Cancer Cell Lines

Sevgi Altın[a]*, Ekrem Köksal[b], Cemalettin Alp[b,c], Ahmet Altay[b], Hüseyin Akşit[d], Yakup Ulutaş[b]

[a]*Erzincan Binali Yıldırım University, Institute of Science and Technology, Department of Chemistry, Erzincan, Turkey*
[b]*Erzincan Binali Yıldırım University, Faculty of Arts and Science, Department of Chemistry, Erzincan, Turkey*
[c]*Erzincan Binali Yıldırım University, Çayırlı Vocational School, Department of Medical Services and Techniques, Medicinal Laboratory Techniques, Erzincan, Turkey*
[d]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Analytical Chemistry, Erzincan, Turkey*

**sevgialtin2424@gmail.com*

Medicinal and aromatic plants have been used for various purposes from past to present. The interest in natural and herbal treatment is increasing rapidly, especially due to the possible side effects of synthetic drugs. Due to the bioactive properties of medicinal plant extracts and secondary metabolites isolated from these plants, their use has increased especially in cancer treatment.[1] *Achillea* is a plant belonging to the Asteraceae family. Contains more than 100 species worldwide. There are 50 species (56 taxa) in Turkey, 26 of which are endemic.[2] *Achillea* species is used in folk medicine in the treatment of many ailments such as stopping blood, inflammatory conditions, pain relief, diuretic, carminative, wound healing and gastrointestinal diseases.[3] In this study, the cytotoxic effects of various extracts (ethyl acetate, methanol and hexane) obtained from the aerial parts of endemic *A. sintenisii* were investigated. The cytotoxicity of the extracts was investigated by XTT assay on human colorectal adenocarcinoma (HT-29) and human breast adenocarcinoma (MCF-7 and MDA-MB-453) cells. XTT assay results showed that ethyl acetate extract had the highest cytotoxicity against all tested cancer cell lines with low IC_{50} values. Especially for MDA-MB-453 human breast adenocarcinoma cell, an IC_{50} value of 83 µg/ml is a very important result. IC_{50} values for other cell lines MCF-7 and HT-29 were 138 µg/ml and 255 µg/ml, respectively, depending on dose increase. Since this study is the first anticancer study conducted for an endemic species, *A. sintenisii*, it makes our study original. The results of this study, while the high antiproliferative effect of *A. sintenisii* on human breast and colon cancer cells is promising for further studies, it also constitutes a source for other studies on this species.

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Investigation of the Inhibitory Effect of Carnosic Acid on Human Carbonic Anhydrase Isoenzymes

Zehra Betül Tortumlu*, İlhami Gülçin

Ataturk University, Faculty of Sciences, Department of Chemistry, Erzurum, Turkey

**zehra.tortumlu@gmail.com*

Carnosic acid was first discovered by Linde in *Salvia officinalis*. It is a phenolic (catecholic) diterpene, endowed with antioxidative and antimicrobial properties. It is increasingly used within food, nutritional health and cosmetics industries.[1] Also, Wenkert and co-workers found carnosic acid at much higher levels (~3% on weight basis of air-dried leaves) in *Rosmarinus officinalis* L. leaves.[2]

Carbonic anhydrases (CAs) are widespread zinc containing metalloenzymes that are related to many important physiological and pathological processes. They catalyze the interconversion of carbon dioxide (CO_2) to bicarbonate (HCO_3^-) and the corresponding dehydration of bicarbonate in acidic medium with regeneration of CO_2. CA inhibitors (CAIs) are used in therapy as diuretic and antiglaucoma agents. They also show anti-obesity and antitumor effects.[3] In this study, *in vitro* inhibition effects of carnosic acid on the esterase activity of hCA I and hCA II isoenzymes were investigated. 4-Nitrophenyl acetate was used as substrate for both isoenzymes.[4]

Carnosic acid, which has different functional groups in the scaffolds, especially the phenolic OH and COOH groups, effectively inhibited both CA isoenzymes. For CA I, IC_{50} and K_i values of carnosic acid was found as 25.67 and 15,37±2,27 nM, respectively. On the other hand, for CA II, IC_{50} and K_i values of carnosic acid was found as 18.30 and 13.66±1.92 nM, respectively. The results clearly show that carnosic acid has the potential to be a drug for the treatment of some diseases associated with CA inhibition such as mountain sickness, idiopathic intracranial hypertension, gastric and duodenal ulcers, neurological disorders, or osteoporosis.[5]

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Iridoid Glycosides from Endemic *Verbascum leiocarpum*

Samed Şimşek[a] *, Ekrem Köksal[b], Hüseyin Akşit[c], Ali Kandemir[d]

[a]*Erzincan Binali Yıldırım University, Çayırlı Vocational School, Medical Services and Techniques Department, Erzincan, Turkey*
[b]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Chemistry, Erzincan, Turkey*
[c]*Erzincan Binali Yıldırım University, Faculty of Pharmacy Faculty of Pharmacy, Department of Basic Pharmacy, Erzincan, Turkey*
[d]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Biology Department, Erzincan, Turkey*

**samed.simsek@erzincan.edu.tr*

The genus *Verbascum* L. (Scrophulariaceae) known as "Sığır kuyruğu" in Anatolia is represented by 245 species, 194 of them are endemic. *Verbascum* genus is one of the plant species used in the treatment of various diseases in traditional medicine as an expectorant, diuretic, demulcent, sedative, antibacterial, antiviral, antifungal, antiulcerogenic, antioxidant, cytotoxic, antitumor, antihepatoma, immunomodulatory, and antiulcerogenic effects.[1,2] It was also used for healing wounds in animal care. Previous studies on Verbascum species have reported the presence of iridoids, phenylethanoids, lignans, saponins, flavonoids, and sterols.[3] *Verbascum leiocarpum* is an endemic species in Turkey growing in Erzincan. To the best of our knowledge, there is no study about the phytochemical content of *V. leiocarpum* has been published. In this study, the isolation and characterization of secondary metabolites of *Verbascum leiocarpum* were aimed. The plant materials were collected from Kemaliye-Erzincan, in June 2019. The aerial parts were extracted with methanol:water (7:3) under room conditions for 24 hours. The crude extract was fractionated using flash chromatography over a prepacked C18 column. The separation process has achieved the isolation of two iridoid glucosides named catalpol (500 mg) and ajugol (750 mg). The occurrence of catalpol and ajugol in *Verbascum* species was previously reported.[4,5] Also, this study reports the iridoid glycoside contents of *V. leiocarpum* plant for the first time.

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Evaluation of Wound Healing Effect of Cichorium intybus L.*'s Stem Methanol Extract*

Berivan Kaçmaz[a] *, Duygu Mısırlı[a], Seçil Erden Tayhan[b], Zafer Ömer Özdemir[a], Mahfuz Elmastaş[a]

[a]*University of Health Sciences, Hamidiye Faculty of Pharmacy, Istanbul, Turkey*

[b]*Tokat Gaziosmanpaşa University, Faculty of Engineering and Natural Sciences, Tokat, Turkey*

**berivankacmaz06@gmail.com*

Cichorium intybus L. growing as a weed has been used to treat many diseases in the past. The plant firstly was cultivated and therapeutically used by Ancient Egyptians.[1] The plant is also used medicinally in Europe, Asia and North Africa.[2] *C. intybus* traditionally was used to heal the wounds on the necks of the oxen that used in agricultural in province Van, Turkey. In addition, ointments obtained from different parts of the plant and its products were made and used to heal wounds.[3]

In this study, it was aimed both to investigate of methanol extract of *C. intybus* L. stem part the wound healing activity with the scratch test using healthy mouse fibroblast cells (L929) *in vitro* and to determine the phenolic compounds content in the extract by HPLC-DAD.

The effective dose of the extract was determined by the MTT method firstly. Cells were incubated for 24 and 48 hours with the determined effective concentration dose of the extract. The image of the cells was examined with a phase-contrast inverted microscope. Wound closure rate was calculated spatially using ImageJ software. Wound healing percentage was calculated by comparing the values obtained as a result of the calculations with the negative control.

The viability and the toxic effect of methanol extract of *C. intybus* L. stem were less than the negative control, especially at the highest dose (at 15.625 μg/mL) after 24 hours incubation of L929 cell line. In addition, it was determined that it did not contribute to cell proliferation at low doses.

In this study, phenolic compounds content of the extract was also determined. It was observed that chlorogenic acid (0.370 mg/g extract) and chichoric acid (1.217 mg/g extract) were the two compounds with the highest amount in the extract.

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Isolation of Secondary Metabolites from an Endemic Plant *Scrophularia erzincanica*

Yakup Ulutaş[a] *, Ekrem Köksal[a], Hüseyin Akşit[b], Ali Kandemir[c]

[a]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Chemistry, Erzincan, Turkey*
[b]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Analytical Chemistry, Erzincan, Turkey*
[c]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Biology, Erzincan, Turkey*

**ykp.ulutas@gmail.com*

Natural products continue to lead the development of new drugs to treat the rapidly growing number of multiple and common drug-resistant cancer patients. Plant secondary metabolites such as phenolic compounds (phenolic acids, flavonoids, kinins, coumarins, lignans, stilbenes, saponins, tannins, etc.), nitrogenous compounds (alkaloids, amines) are of great importance for human health. Many studies such as antioxidant, anti-inflammatory, antimutagenic, and anticarcinogenic activity have been previously reported on different species of the Scrophulariaceae family.[1] *Scrophularia buergeriana's* dried roots are used for anti-inflammatory purposes in Chinese medicine.[2] It has been stated that the dried roots of *Scrophularia ningpoensis* are used as antipyretic, antibacterial, and cancer treatment in Vietnam.[3] *Scrophularia* species have long been used in the treatment of tumors and inflammation among the public. Such effective substances such as iridoids and phenylpropanoids are isolated from these species.[4] This study aimed to isolate secondary metabolites from plant extracts prepared from aerial and root parts of *Scrophularia erzincanica* plant (Scrophulariaceae), which is endemic to Erzincan and to determine their structures by spectroscopic methods. Two molecules were isolated from the methanol extract. The separation process has achieved the isolation of two iridoid glucosides named catalpol and 6-O-(*3''-O-trans-p-coumaroyl*)-α-L-rhamnopyranosylcatalpol.

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Investigation of the Cytotoxic Effect of Different Extracts of *Lallemantia Canescens* (L) Fisch & Fruit Plant on Cancer Cell Lines

Cemalettin Alp[a,b]*, Sevgi Altın[c], Ekrem Köksal[a], Ahmet Altay[a]

[a]*Erzincan Binali Yıldırım University, Faculty of Arts and Science, Chemistry Department, Erzincan, Turkey*
[b]*Erzincan Binali Yıldırım University, Çayırlı Vocational School, Department of Medical Services and Techniques, Medicinal Laboratory Techniques, Erzincan, Turkey*
[c]*Erzincan Binali Yıldırım University, Department of Chemistry, Institute of Science and Technology, Erzincan, Turkey*

**calp@erzincan.edu.tr*

Plants have been used as medicine since ancient times, as they reorganize the body balance and increase the resistance of the patient against the damage caused by cancer in the tissues.[1] It has been determined that these properties of medicinal plants are due to the bioactive compounds in their structures.[1,2] Medicinal plants are a very important resource in cancer treatment because they are easily and cheaply available compared to modern drugs and do not show toxic effects.[3] The *Lamiaceae* family is among the largest families in the world, with approximately 236 genera and 7173 taxa, especially grown in temperate regions. In our country, *Lamiaceae* family ranks fourth with 586 species and ranks third among endemics.[4] Some members of the *Lamiaceae* family continue to be used in folk medicine in various parts of the world.[5] Although there are biological activity studies for various species of the *Lamiaceae* family, no studies have been found on the phytochemical content and anticancer studies of *Lallemantia canescens*. In this study, the cytotoxic effects of various extracts (hexane, ethyl acetate, methanol and water) from the aerial parts of *Lallemantia canescens* were investigated. The cytotoxicity of the extracts was investigated by XTT assay on human colorectal adenocarcinoma (HT-29), human lung adenocarcinoma (A549) and human breast adenocarcinoma (MCF-7) cells. According to XTT assay results, while methanol was the extract with the highest cytotoxicity in A549 cell line, water and ethyl acetate extracts showed the highest cytotoxic effect among all extracts for MCF-7 and HT-29.

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Enhancing Storage Stabilty of Fresh Eggs with Ultrasonication

Gözde Yildirim*, Muhammed Yuceer, Cengiz Caner

Çanakkale Onsekiz Mart University, Faculty of Engineering, Department of Food Engineering, Çanakkale, Türkiye

**gozdeyldrm.281@gmail.com*

Egg is a food with the highest nutritional value among all food groups, with a biological value of 93.7. However, eggs with this important nutritional value are very sensitive to internal quality deterioration and rapid microbial spoilage during storage.[1] The slightest improvement in the overall quality of the egg will result in significant savings from an industrial perspective.[2] The aim of this research is to investigate the effectiveness of ultrasonication processes (80W, 160W and 360W) on quality criteria (albumin and egg yolk pH, Haugh unit, egg yolk index, dry matter and RWC) in extending the storage stability of fresh eggs.

Fresh-daily white-shelled eggs were used for the study. Egg samples were quickly transported to the laboratory and classified in terms of dirty, broken, cracked, hidden crack, size and weight, and the unsuitable ones were removed. Fresh-shelled egg samples were randomly divided into different groups, and ultrasound at different powers (80W, 160W, 360W) was applied to the eggs in the other group, except for the control group. According to the Turkish Standards Institute Chicken Egg Standard No. 1068, eggs with a Haugh Unit of 72 and above, which are used as a freshness indicator in shell eggs, are classified as "AA". It is classified as "A" class between 55-71. Those 55 and below are defined as "B" class, and those 30 and below are defined as "C" class.[3] According to this study, at the end of the 4th week in eggs stored at room temperature, the control and 360w groups decreased to "A" quality, while the 80W and 160W groups continued to maintain "AA" quality.

From this study, it was revealed that the functional properties of fresh eggs (pH, HU, YI, DM and RWC) were preserved depending on the ultrasonication power used. High ultrasound (360W) caused micro cracks that reduced shell strength. This study showed that the storage stability of fresh eggs, especially 80W and 160W, was extended for at least 1 week without any adverse effect on shell strength. Ultrasonication can be a feasible and effective process for increasing the long-term storage stability of fresh eggs.

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Immobilization of α-Amylase onto Quantum Dots Prepared from *Hypericum perforatum* L. flower-based.

İdil Karaca Açarı[a], Gamze Dik[b] *, Büşra Bakar[b], Ahmet Ulu[b], Yunus Önal[c], Burhan Ateş[b]

[a]*Malatya Turgut Ozal University, Faculty of Engineering and Natural Sciences, Bioengineering Department, Malatya, Turkey*
[b]*İnönü University, Faculty of Arts and Science, Department of Chemistry, Biochemistry and Biomaterials Research Laboratory, Malatya, Turkey*
[c]*İnönü University, Faculty of Engineering, Department of Chemical Engineering, Malatya, Turkey*

**gamzedik2389@gmail.com*

Amylases (E.C.3.2.1.1) hydrolyze 1-4 glycosidic bonds in starch, thereby converting starch into reducing sugars such as glucose and maltose. In addition, they have been widely used in food, fermentation, textile, paper, detergent and pharmaceutical industries.[1-3] However, as it is known, the factors such as enzymes being easily affected by environmental conditions, not being reusable and being expensive limit the use of enzyme. One of the most common methods used to prevent these limitations is enzyme immobilization.

In this study, α-amylase was immobilized on quantum dots from *Hypericum perforatum* L., which was carbonized at different temperatures, and its physicochemical properties were characterized by scanning electron microscopy (SEM), and Fourier transform infrared (FTIR) spectrometer. The values of α-amylase and immobilized α-amylase such as optimum pH, optimum temperature, thermal stability, kinetic parameters were determined, and their effects on real corn starch and flour were investigated. According to the results obtained, the optimum pH and temperature values for both enzyme forms were found to be 6.0 and 40℃, respectively. After the kinetic parameter studies, a decrease was observed in K_m and V_{max}. In thermal stability experiments, it was determined that the immobilized α-amylase was more stable than the free α-amylase. In the study using corn starch and flour, the free and immobilized α-amylase showed maximum activity in a 0.75% substrate solution.

Based on these results, we concluded that α-amylase was successfully immobilized on quantum dots and immobilized α-amylase has the potential to be widely used in industrial applications.

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The Determination of Inhibitory Properties of Resorcinol Derivatives on Bovine Lactoperoxidase Enzyme

Ramazan Kalın*

Erzurum Technical University, Faculty of Science, Department of Basic Sciences, Erzurum, Turkey

**ramazan.kalin@erzurum.edu.tr*

Lactoperoxidase (LPO; E.C.1.11.1.7) is a heme-containing glycoprotein and lactoperoxidase-thiocyanate-hydrogen peroxide system. LPO is a natural antimicrobial system that eliminates the harmful effects of microorganisms in milk. It is of great importance, especially in the immune system of newborns.[1,2] Resorcinol, a phenolic compound, is an antioxidant molecule with two hydroxyl groups attached to the benzene ring. Resorcinol-based derivatives are used in many areas such as drugs, dyes, and preservatives in the industry.

In this study, *in vitro* inhibition effects of resorcinol derivatives (resorcinol, 5-methyl resorcinol, 4-ethyl resorcinol 4-hexyl resorcinol, and 2-methyl resorcinol) on bovine LPO enzyme were investigated. For this purpose, The LPO enzyme was purified from bovine milk. The purification was performed with an affinity column that used sulfanilamide as ligand for CNBr-activated-Sepharose 4B.[3] The potential inhibition effects of resorcinol derivatives on LPO were examined spectrophotometrically at 412 nm. IC_{50} values were determined from the % Activity-[resorcinol derivatives] graphics drawn. The IC_{50} values were calculated as 72.96, 54.58, 84.53, 69.32, and 79.67 nM for resorcinol, 5-methyl resorcinol, 4-ethyl resorcinol 4-hexyl resorcinol, and 2-methyl resorcinol, respectively. The inhibition types and K_i values were determined from the plots of 1/V versus 1/[S]. K_i values for the LPO enzyme were found to be in the range from 32.33 ± 3.31 to 142.27 ± 34.3 nM.

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A Research for the Pharmacological Properties of *Ecballium elaterium*

Faik Gökalp[a] *, Umit M. Koçyiğit[b]

[a]*Kırıkkale University, Education Faculty, Department of Mathematics and Science Education, Science Education, Kırıkkale, Turkey*

[b]*Cumhuriyet University, Faculty of Pharmacy, Sivas, Turkey*

**akgokalp@gmail.com*

The main active compounds derived from *Ecballium elaterium* responsible for biological activities including antimicrobial properties have been reported to be fatty acids, proteins, cucurbitacins.[1-3] Cucurbitacins have various pharmacological values in health-related diseases as an inexpensive and low-cost drug for human treatment.[4] Cucurbitacin B, which is widely used as traditional medicines, is known to be anti-inflammatory, and this compound has chemopreventive and anti-carcinogenic activity.[5,6] Within the scope of this study, it will be aimed to investigate some pharmacological effects of *Ecballium elaterium*, popularly known as bitter melon. In this study, the inhibition effect on antioxidant, anticancer and some enzymes in *E. elaterium* plant extracts will be investigated. After the active substances in this plant are determined based on the literature, inhibition effects will be investigated comparatively by using chemical calculation methods. This is a study that will start with the comparison of the effects on the inhibition of xanthine oxidase, a form of xanthine oxidoreductase, an enzyme that produces reactive oxygen species, with the docking method. The determination of the substance with the highest inhibition effect is very important in terms of giving direction to experimental and clinical studies by preventing time and substance loss.

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Assessment of Antiradical and Anticholinergic Effects of Wild Cherry (*Cerasus avium* L.) Stem

Fatih Tozoğlu[a]*, Mesut Işık[b], Emrah Dikici[c], Ekrem Köksal[d], Hakan Söyüt[e]

Şükrü Beydemir[f,g]

[a]*Bilecik Şeyh Edebali University, Vocational School, Department of Food Processing, Bilecik, Turkey*
[b]*Bilecik Şeyh Edebali University, Faculty of Engineering, Department of Bioengineering, Bilecik, Turkey*
[c]*Aksaray University, Science and Technology Application and Research Center, Aksaray, Turkey*
[d]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Chemistry, Erzincan, Turkey*
[e]*Uludag University, Faculty of Education, Department of Basic Education, Bursa, Turkey*
[f]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*
[g]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**fatih.tozoglu@bilecik.edu.tr*

In the endogenous antioxidant defense system, the presence of reactive oxygen species (ROS) and free radicals above the normal level in the cell causes the formation of oxidative stress. This oxidative stress plays a role in the pathogenesis of many neurodegenerative diseases, including excessive inflammatory responses and Alzheimer's disease (AD). Oxidative stress can cause oxidative and neuronal damage to cells or tissues, resulting in cell death and necrosis leading to neuronal diseases.[1,2] Medicinal aromatic plants are known to be effective in reducing oxidative stress, which causes many diseases due to their antioxidant activities. For this reason, it is important to study foods with antioxidant effects from medicinal plants for the treatment of neurodegenerative diseases.

Today, the use of synthetic antioxidants, used for food preservation and medical purposes, has been limited due to their side effects, and as an alternative to them, the interest in natural medicinal aromatic plants with antioxidant properties has increased.[3,4] The plants, containing phenolic and flavonoid metabolites, play an important role in protecting cells against free radicals and oxidative stress.[5] In addition, many parts of some plants are frequently used in alternative medicine. One of these, cherry (*Cerasus avium* L.) stem is widely used for therapeutic purposes after being dried and boiled. Many cherry species are widely grown in Turkey for their fruits.[5,6]

In the study, the cherry stem (*Cerasus avium* L.) was dried and ethanol extract was prepared. The anticholinergic and antiradical effects of the extract were investigated. The extract had an inhibitory effect on acetylcholinesterase (AChE) with IC50 values of 0.052 mg/mL. Also the extract showed the highest activity with 39% ABTS radical scavenging activity.

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POSTER PRESENTATION ABSTRACTS

The Effects of Gold Nanorods with Various Surface Modifications on *In vivo* Toxicity and Biodistribution in Mice

Ilyas Ozcicek[a, b], Nese Aysit[a, b], Asel Aydeger[c] *, Cagri Cakici[d], Nilufer Ulas Ayturk[e]

[a]*Istanbul Medipol University, Department of Medical Biology, School of Medicine, Istanbul, Turkey*
[b]*Istanbul Medipol University, Health Science and Technologies Research Institute (SABITA), Istanbul, Turkey*
[c]*Istanbul Medipol University, Graduate School of Health Sciences, Istanbul, Turkey*
[d]*Istanbul Medipol University, Department of Medical Biochemistry, School of Medicine, Istanbul, Turkey*
[e]*Çanakkale Onsekiz Mart University, Faculty of Medicine, Department of Histology and Embryology, Canakkale, Turkey*
**aselaydeger1@gmail.com*

Gold nanorods (AuNRs) are very popular metallic nanomaterials which can be synthesized easily in various surface chemistry and they can be functionalized by desired polymers or biomolecules. Surface modification of AuNRs is attracting increasing attention with regard to toxicity, biodistribution, cellular localization and therapeutic potentials. AuNRs have wide range of biomedical applications including photothermal therapy, targeted therapy, biosensors, detection, drug delivery, DNA/RNA delivery.[1] There is big a need for more effective and optimal surface modifications and more multiparametric *in vivo* studies.

In this study, cetyltrimethylammonium bromide (CTAB) stabilized gold AuNRs were synthesized and their surfaces were modified with polyethyleneimine (PEI-SH) and polyethylene glycol (PEG-SH). Suborgan biodistribution of the AuNRs were investigated in the mice on different days (day 1, day 5, day 15, day 30) after a single high dose (5 mg Au/kg animal weight) i.v. injection of the various gold nanorod groups. Additionally, *in vivo* biochemical analyses were performed for multiparametric biochemical parameters. Transmission electron microscopy (TEM) analysis was applied in order to reveal the effects of various AuNRs groups on the ultrastructural changes in the liver of the mice in more detail.

AuNRs synthesized successfully by the seeding growth method were quite stable and had the average length of 90 nm and width of 15 nm. It has been observed that the surface coatings of the AuNRs significantly increase the suborgan biodistribution and *in vivo* biocompatibility. Inductively coupled plasma mass spectrometry (ICP-MS) analysis showed the presence of AuNRs in liver, spleen, kidney, heart, blood and brain within a 30 days period. Especially, PEG coating of the AuNRs has facilitated the escape of nanorods from the reticuloendothelial system (RES) elements, again the transition processes through tissue barriers. In terms of all the biochemical data in our study, the PEI modification was considered to be more advantageous than the PEG modification.

All these data show that these surface modified gold nanorods may be a useful potential nanoplatform for various biomedical applications given their chemical stability and biocompatibility.

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A New Thermostable Laccase from *Bacillus licheniformis* O12, Purification Using One-Step Affinity Chromatography, Its Characterization and Potential for Decolorization

Arzu Öztürk Kesebir[a], Melda Şişecioğlu[b], Ahmet Adıgüzel[b], Deryanur Kilic[a],

Ö. İrfan Küfrevioğlu[a] *

[a]*Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*
[b]*Atatürk University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*
**okufrevi@atauni.edu.tr*

Laccase (benzenediol:oxygen oxidoreductases; E.C.1.10.3.2) has been used for many purposes in industry in recent years. It has been observed that laccase is quite effective in decolorization of dyes found in textile wastewater.[1] It is also preferred because laccase does not produce a toxic component as a result of the reaction.[2]

In this study, an extracellular laccase enzyme from *Bacillus licheniformis* O12 was purified 4.8- fold in 38.3% yield by using Sepharose 4B-L-tyrosine-ρ-amino benzoic acid affinity column. The molecular weight of the purified enzyme was found as ~70 kDa by SDS-PAGE method. Purified laccase revealed its optimum activity at pH 4.0 and 92°C temperature. The increased activity of laccase at very high temperatures is a great advantage for industrial applications. The laccase was found to retain 100% activity even after 12 hours of incubation at 60°C and 92°C. In addition, it was observed that it maintained its initial activity after 2 hours in acidic and alkaline environment. The laccase showed the highest affinity to the ABTS substrate (0.0075 mM). The enzyme activity was significantly enhanced by Al^{3+}, Fe^{2+}, Hg^{2+}, Cr^{2+}, NaN_3, NaF, EDTA, and SDS while activity was strongly inhibited in the presence of organic solvents and non-ionic surfactants. The purified laccase decolorized with varied efficiencies such as 35% of Reagent black 5, 31% of Acid black 1, 28% of Methylene blue, and 15% of Acid red 27 in 120 minutes without the use of any redox mediators. As a result, the laccase was found to be quite tolerant towards especially heat, pH, and metal ions. Obtained results show that *B. licheniformis* O12 laccase could be a potential candidate for use in various biotechnological and industrial applications.

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Inhibition Effects of Fluorophenyl Thiourea Compounds on Glucose-6-Phosphate Dehydrogenase Enzyme Activity

Muhammed Lütfü Yildiz[a], Yeliz Demir[b], Ö. İrfan Küfrevioğlu[a]*

[a]*Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*

[b]*Ardahan University, Nihat Delibalta Göle Vocational High School, Department of Pharmacy Services, Ardahan, Turkey*

**okufrevi@atauni.edu.tr*

Glucose-6-phosphate dehydrogenase (E.C.1.1.1.49, G6PD) is a significant enzyme of the pentose phosphate metabolic pathway, which produces NADPH in the metabolism.[1] It plays an important role in oxidation of glucose 6-phosphate to 6-phosphoglucono-δ-lactone.[2]

In this study, G6PD enzyme was purified from human erythrocytes using 2',5'-ADP Sepharose 4B affinity chromatographic step and determined the inhibition effects of fluorophenyl thiourea compounds on this enzyme activity. G6PD was purified 2448.57-fold with a yield of 43.64% and a specific activity of 17.14 EU/mg protein. Fluorophenyl thiourea compounds were tested at various concentrations, which showed reduced in vitro G6PD activity. IC_{50} values for 2-fluorophenylthiourea, 3-fluorophenylthiourea, 4-fluorophenylthiourea, 2,5-difluorophenylthiourea and 2,6- difluorophenyl thiourea were found to be 30.13, 19.80, 21.00, 24.75, and 22.35 µM, respectively whereas K_i constants were 27.98 ± 6.75, 39.70 ± 11.26, 26.53 ± 6.25, 23.84 ± 4.32, and 21.60 ± 8.42 µM, respectively. The inhibition mechanisms of all compounds were found as competitive.

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Synthesis of Novel Photosensitizers and Controlled Singlet Oxygen Generation for Photodynamic Therapy

Esra Tanrıverdi Eçik [a]*, Onur Bulut[b,c], Hasan Huseyin Kazan[d], Elif Senkuytu[a], Elif Yıldız[a] and Bünyemin Çoşut[e]

[a]*Atatürk University, Department of Chemistry, Erzurum, Turkey*
[b]*Konya Food and Agriculture University, Department of Bioengineering, Konya, Turkey*
[c]*Konya Food and Agriculture University, Research and Development Center for Diagnostic Kits (KIT-ARGEM), Konya, Turkey*
[d]*Middle East Technical University, Department of Biological Sciences, Ankara, Turkey*
[e]*Gebze Technical University, Department of Chemistry, Kocaeli, Turkey*
**esra.ecik@atauni.edu.tr*

Cancer is a global health problem and one of the most fatal diseases. Although conventional methods such as surgical intervention, chemotherapy and radiation therapy are frequently preferred in cancer treatment, low success rates and negative effects of these methods on the quality of the patient life are widely reported disadvantages.[1] Photodynamic therapy (PDT), which has a lower side effect than the traditional methods, has emerged as a promising technique in cancer treatment.[2,3] The success of PDT depends on the ability of the photosensitizer (PS), which is ineffective in the dark, to destroy the cancerous cells through controlled production of singlet oxygen ($^1O_2$) under light.

In this study, we focused on photodynamic activities of triazine rings bearing three BODIPY units. Novel triazine-based BODIPY trimers were designed, synthesized and characterized. The photosensitizing abilities of the trimers under controlled light were determined using chemical and phosphorescence methods. The effects of different halogen atoms (I and Br) on the photophysical and photochemical properties of the compounds were evaluated. Moreover, the photodynamic therapy efficacy of the novel trimers was evaluated on human cervical cell line, HeLa, *in vitro*.[4] Our results provided critical candidate agents for *in vitro* and *in vivo*, as further studies, PDT applications.

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Differential Interactome Based Drug Repositioning Unraveled Potential Therapeutics for Colorectal Cancers

Hande Beklen[a] *, Sema Arslan[b], Gizem Gulfidan[a], Beste Turanli[a], Pemra Ozbek[a], Betul Karademir Yilmaz[b,c], Kazim Yalcin Arga[a]

[a]*Marmara University, Faculty of Engineering, Department of Bioengineering, Istanbul, Turkey*
[b]*Marmara University, School of Medicine, Department of Biochemistry, Istanbul, Turkey*
[c]*Marmara University, Genetic and Metabolic Diseases Research and Investigation Center (GEMHAM), Istanbul, Turkey*

**handebeklenn@gmail.com*

There is a critical requirement for alternative strategies to provide the better treatment in colorectal cancer (CRC). Hence, our goal was to propose novel biomarkers as well as drug candidates for its treatment through differential interactome based drug repositioning. Differentially interacting proteins (DIPs)[1] and their modules were identified, and their prognostic power was estimated through survival analyses. Drug repositioning was carried out for significant target proteins, and candidate drugs were analyzed via *in silico* molecular docking prior to *in vitro* cell viability assays in CRC cell lines. Six modules (mAPEX1, mCCT7, mHSD17B10, mMYC, mPSMB5, mRAN) were highlighted considering their prognostic performance. Drug repositioning resulted in eight drugs (abacavir, ribociclib, exemestane, voriconazole, nortriptyline hydrochloride, theophylline, bromocriptine mesylate, and tolcapone). Moreover, significant *in vitro* inhibition profiles were obtained in abacavir, nortriptyline hydrochloride, exemestane, tolcapone, and theophylline (positive control).[2] Our findings may provide new and complementary strategies for the treatment of CRC. On the other hand, these results should be supported by further experiments to elucidate the mechanisms of drug action in CRC cells. Moreover, our results highlight the value of studying DIPs to propose potential therapeutics.

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Layer-by-Layer Assembly of Silver Nanoparticles on Diatom Frustules for Characterization of Bacteria using SERS

Ayse Mine Saridag[a]*, Fatma Uysal Ciloglu[b], Ibrahim Halil Kilic[c], and Mehmet Kahraman[a]

[a]*Gaziantep University, Department of Chemistry, Gaziantep, Turkey*

[b]*Erciyes University, Department of Biomedical Engineering, Kayseri, Turkey*

[c]*Gaziantep University, Department of Biology, Gaziantep, Turkey*

**ayseminesaridag@gmail.com*

Surface-enhanced Raman scattering (SERS) is an emerging analytical technique used for characterization of biological and non-biological structures. Plasmonic properties of nanostructures are main factors influencing SERS performance. Thus, fabrication of plasmonic nanostructures having different plasmonic properties is significant research interest. Recently, guided-mode resonances (GMRs) in diatoms have significant attention due to their potential contribution to SERS enhancement. Furthermore, there is also evidence showing that diatoms can be utilized in improving SERS enhancement by optically coupling the GMRs of the diatom frustules with the LSPRs of the nanostructures.[1,2] In this study, inexpensive, robust, and flexible diatom-based SERS platforms on a box tape are fabricated using layer-by-layer assembly of silver nanoparticles (AgNPs) having different number of layers. The fabricated SERS platforms are characterized using UV-Vis spectroscopy and scanning electron microscopy (SEM). The SERS performance of the platforms was evaluated using 4-aminothiophenol (4-ATP) and rhodamine-6G. The results demonstrate that SERS performance of the platforms is dependent on the number of layers of the structures. The SERS platform having highest SERS activity is used for the characterization of model bacteria.

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Siderophore Producing Environmental Bacteria

Nazlıcan Topbaş, Nazlıcan Yücesoy, Nihan Sert*, Bilge Hilal Çadırcı Efeli

Tokat Gaziosmanpasa University, Faculty of Engineering, Department of Bioengineering, Tokat, Turkey

**nihansem@hotmail.com*

Iron is essential element which is required for microbial growth and proliferation. Under low-iron conditions, bacteria produce siderophore to survive.[1] Siderophores are small organic compounds secreted by microorganisms, algae, actinomycetes and plants which enhance the uptake of iron. Siderophores can play affective roles in ecology, agriculture, biosensor, bioremediation etc.[2,3]

In this study, siderophore producing bacteria were isolated from soil and water. Siderophore production was controlled by spectrophotometric measurements using CAS (Chrome Azurol S) assay. Then, the microorganism with a higher siderophore production was identified as *Chronobacter spp.* by using 16S rRNA gene sequencing. Temperature, pH, nitrogen source, and carbon sources were optimized which were carried out for maximum robustness of siderophore production in the environment with low iron concentration. As a result, according to spectrum scans, it has been observed that in OD 400 and OD 580 there were two types of siderophores are produced at 37°C. The first siderophore, which was produced at 18th hour is expressed at pH 8.5, with ammonium chloride as nitrogen source and glycerol as carbon sources. The second one produced at 28th h is showed maximum production rate at pH 6.5 with potassium nitrate as nitrogen source and glycerol as carbon source. In future studies, it is aimed to use optimized bacterial siderophores for bioremediation.

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Removal of Micro-Pollutants with CNC-Modified Polymeric Cryogels

Kazım Köse[a]*, Miraç Tüysüz[b], Mehtap Evci[c], Lokman Uzun[b], D. Ali Köse[d]

[a]*Hitit University, Department of Joint Courses, Çorum, Turkey*
[b]*Hacettepe University, Department of Chemistry, Ankara, Turkey*
[c]*Mineral Research and Exploration Directorate, Department of Jeochemistry, Ankara, Turkey*
[d]*Hitit University, Department of Chemistry, Çorum, Turkey*
**kazimose@hitit.edu.tr*

In addition to the benefits they provide, the latest technologies contain serious threats in the long term that cannot be observed clearly at the moment. Especially sedentary lifestyle, uncontrolled drug and chemical consumption threaten life. Pesticides, which are considered to be in the most harmful category, accumulate in biological structures and reach all living things through the food chain and groundwater.[1-4] Due to its resistance to natural degradation, pesticides joined in groundwater and surface waters bring risks especially for the endocrine system.[5,6] It is essential to remove these chemicals from the environment to keep the groundwater or the food safe. Cellulose nanomaterials (CNM) are 'green' materials that are very popular recently and are easy to modify.[7] The structure of CNM-modified GMA-based adsorbents obtained within the scope of the study has been characterized by FT-IR, SEM etc. techniques and has been proven with experimental results that it can be used in pesticide removal.

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Vitamin U Protects Brain Injury in Rats Administered with D-Galactosamine

Bertan Boran Bayrak*, Dastagul Mahmarzayeva, Ismet Burcu Turkyilmaz, Ozlem Sacan, Refiye Yanardag

Istanbul University-Cerrahpasa, Faculty of Engineering, Department of Chemistry, Division of Biochemistry, Istanbul, Turkey

** bertanb@iuc.edu.tr*

D-Galactosamine (D-GalN) is a chemical compound that is widely used to induce experimental acute liver inflammation model in animals whose symptoms are very close to human viral hepatitis in the clinic.[1] The toxicity of D-GalN is mainly due to the depletion of uridine triphosphate pools that are related to limited ribonucleic acid (RNA), protein synthesis, and to induce hepatocyte necrosis and inflammation, hence altering hepatocellular function as well as its regeneration.[2] Vitamin U (Vit U, S-methyl methionine sulfonium chloride) is a derivative of essential amino acid L-methionine. Vit U is present in *Brassica* species (raw cabbage, broccoli, and kale, etc.), which has also been shown antiinflammatory, antitumor, antilipidemic, and antioxidant effects.[3-6] The main objective of the current study was to evaluate possible protective role of Vit U against oxidative brain injury induced by D-GalN in rats. Female Sprague-Dawley rats were randomly separated into four groups as follows: Group I was intact animals; Group II was administered to Vit U (50 mg/kg/day) by gavage technique for three days. Group III was injected D-GalN (500 mg/kg) at a single dose by intraperitoneally. Group IV was given Vit U one hour prior to treatment with D-GalN. At the end of the experimental period, all the animals were sacrificed under anesthesia, 8 h after D-GalN administration. Brain tissues were dissected out, thereafter 10% (w/v) homogenates were prepared. According to our findings, hydroxyproline and nitric oxide levels significantly increase whereas sodium/potassium adenosine triphosphatase activity remarkably decreased in D-GalN injected groups. In contrast, all alterations observed were reversed when Vit U was administered to D-GalN groups. Collectively, our data suggest that Vit U exhibits a potential protective effect against D-GalN-mediated toxicity and this effect might be attributed to its antioxidant properties.

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The Effects of *Moringa oleifera* Lam. Extract on Sodium Valproate-Induced Oxidative Brain Injury in Rats

Bertan Boran Bayrak[a]*, Umar Faruk Magaji[a,b], Ozlem Sacan[a], Refiye Yanardag[a]

[a]*Istanbul University-Cerrahpasa, Faculty of Engineering, Department of Chemistry, Division of Biochemistry, Istanbul, Turkey*

[b]*Federal University Birnin Kebbi, Department of Biochemistry and Molecular Biology, Birnin Kebbi, Kebbi, Nigeria*

** bertanb@iuc.edu.tr*

Valproate (sodium valproate, SVP) is a commonly used antiepileptic agent for the medication of epilepsy, bipolar disorder, and schizoaffective diseases.[1] Despite being used in the treatment of epilepsy for approximately 50 years, valproate has been reported to cause side effects in various tissues.[2-4] *Moringa oleifera* Lam. (MO) is grown in many countries and is used as a medicinal plant owning to its diverse biofunctional and phytochemical properties as well as rich nutritional components.[5] MO has been reported to have antioxidant, anti-obesity, glucose-lowering, anti-hypertensive effects. With all those attributions to MO, it has also been called "the miracle tree".[6,7] The main goal of the present work was to evaluate possible protective role of hydroalcoholic extract of MO leaves against SVP-induced oxidative brain injury in rats. Female Sprague-Dawley rats were randomly divided into four groups as follows: Group I animals orally given similar dose of physiologic saline; Group II was administered to only 70% ethanol extract of MO leaves for 15 days (300 mg/kg/day) orally. Group III was given only SVP for 15 days (500 mg/kg/day) orally. Group IV was given similar dose of SVP + MO extract for 15 days. On the 16th day of the experiment, all the animals were fasted overnight, sacrificed under anesthesia. Brain tissues were dissected out, thereafter 10% (w/v) homogenates were prepared. According to our findings, reduced glutathione and total antioxidant status levels remarkably decreased while total oxidant status, oxidative stress index, and nitric oxide levels remarkably increased in SVP given groups. Conversely, assessed parameters in this study were reversed to normal levels when MO was treated with SVP groups. As a consequence, MO prevented SVP-mediated oxidative brain injury in rats due to its diverse biofunctional properties.

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Inhibitory Effects of Some Drug Substances on Alpha-Glucosidase Activity

Fatma Yasar Boztas*, Sevim Tunalı

Istanbul University-Cerrahpasa, Faculty of Engineering, Department of Chemistry, Istanbul, Turkey

**fattmayasar@gmail.com*

Enzymes, biological catalysts that accelerate metabolic reactions, have extreme importance for all living organisms. Enzyme activators and inhibitors are the key molecules that regulate the velocity of enzymatic reactions in metabolism. Possible correlation between enzyme activity and diseases is an important reason for increasing interest in inhibition researches.[1]

Alpha-glucosidases (E.C.3.2.1.20) are the enzymes that catalyzing hydrolysis of glycosidic bonds in polysaccharides and glycoconjugates. Inhibition of alpha-glucosidase delay the breakdown of carbohydrates in the small intestine and lowers postprandial blood glucose. Therefore, inhibition of alpha-glucosidase has a significant effect on polysaccharide metabolism which widening opportunities for the discovery and development of new therapeutic agents against diseases such as diabetes, obesity, metastatic cancer and viral infection.[2]

In this study, we have examined alpha-glucosidase inhibitory activities of different drug substances such as ketorolac trometamol, paracetamol, diclofenac sodium, dexketoprofen trometamol and teicoplanin. Acarbose was used as a positive control. Alpha-glucosidase activities of different drug substances were increasing as a dose-dependent manner. As obtained results, among the studied drug substances, paracetamol showed the highest inhibitory activity. These findings encourage us to hypothesize that studied drug substances could be appropriate alpha-glucosidase inhibitors.

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Investigation of Interactions of Some Water-Soluble Calix[4]arenes with Some Amino Acids

Şeyda Çiğdem Özkan[a]*, Aydan Yılmaz[b]

[a]*Nevşehir Hacı Bektaş Veli University, Acıgöl Vocational School of Technical Sciences, Department of Chemistry and Chemical Processing Technologies, Nevşehir, Turkey*

[b]*Selçuk University, Faculty of Science, Department of Chemistry, Konya, Turkey*

**seydaozkan87@gmail.com*

Calixarenes are macrocyclic compounds obtained as a result of the condensation reaction of phenol and formaldehyde.[1] Because of their natural basket and/or vase structures, they are particularly good sensors or extractants for many cations, anions and neutral molecules.[2-4] Amino acids are molecules known as the building blocks of proteins, which can be positive, negative or neutral in structure according to the side groups they carry. The separation of amino acids from each other has been a subject that has been studied for many years and many molecules or substances are used for the analysis or detection of amino acids.[5,6]

In this study, water-soluble calix[4]arene molecules were synthesized to the literature and illuminated their structures by FTIR, ^{1}H NMR.[7] Then, their interactions with different amino acids (L-alanine, L-glycine, L-lysine etc.) were examined by UV-Vis spectrophotometer. The results obtained showed that especially the ester-derived calixarene compound had high affinity towards amino acids. The rate of binding was determined by the Job method and found that 1:1 binding. The obtained results showed that these water-soluble molecules can be used in amino acid determination.

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An Alternative Biomaterial: 3D Printed Algal Scaffolds

Fulya Özdemir [a,b]*, İpek Ertuğrul[b], Sedat Odabaş[b]

[a]*Ufuk University, Vocational School of Health Services, Ankara, Turkey*

[b]*Ankara University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

**fulya.ozdemir@ufuk.edu.tr*

Spirulina platensis (SP) is a kind of algae that is used as a nutritional supplement as they are rich in protein, carbohydrates, polyunsaturated fatty acids, sterols, and some vital elements such as Ca, Fe, Zn, Mg, Mn, and Se. In addition, SP is a natural source of vitamin B12, vitamin E, ascorbic acid, tocopherols, and the full spectrum of natural mixed carotene and xanthophyll phytopigments.[1,2] Beyond these benefits, studies have shown that SP also inhibits tumor growth and has anti-inflammatory.

Here in this study, our aim is to present their potential use for tissue engineering purposes, especially for hard tissues. Briefly, SP was obtained as a live culture and propagated for 10 days in Zarrouk medium as reported in the literature. The mixture was filtered and dried in an oven, and ground into powder. Later on, carboxymethyl cellulose (CMC) and SP were mixed and dissolved in various proportions (5:1; 7:1; 9:1 w/w) to make them suitable for 3D printing. The resulting hydrogels were characterized by FTIR, XRD, TGA, and SEM. *In vitro* cell studies shows that these combinations have no cytotoxicity and allow proper cell growth for a week.

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Controlled Release of Anakinra from Hyaluronic Acid Coated Chitosan Double-Shelled Microspheres

Sena Pişkin[a]*, Canan Armutcu[a], Demet Yalçın Kehribar[b], Lokman Uzun[a]

[a]*Hacettepe University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

[b]*Ondokuz Mayıs University, Faculty of Medicine, Department of Internal Medicine, Samsun, Turkey*

**senapiskin@hacettepe.edu.tr*

Controlled drug release is the technique that provides releasing of a drug at the therapeutic dose to the desired site in the body.[1] Many polymeric controlled release drug delivery systems (DDS) have been currently being used to provide drug release for long periods avoiding the side effects of the drugs. Chitosan microspheres have been used a good alternative for DDSs due to chitosan is a natural polysaccharide and has been proved a non-toxic, biodegradable and biocompatible.[2] The aim of this study was to develop an effective controlled drug delivery system based on hyaluronic acid (HyA)-coated chitosan microspheres for the treatment of autoimmune diseases such as rheumatoid arthritis (RA). In this study, it is focused on the treatment strategy to a controlled release of Anakinra (Kineret) as a model therapeutics due to that it is effectively used in the treatment of rheumatoid arthritis.[3] The chitosan microspheres was crosslinked via ionotropic gelation of chitosan (CS) in presence of sodium tripolyphosphate (TPP) as crosslinking agent. The developed chitosan microspheres were coated with hyaluronic-acid (HA) to develop double-shelled microspheres for providing slow and controlled drug release. The characterization techniques were employed to evaluate the physicochemical properties as scanning electron microscopy (SEM), swelling test (S), and Fourier transform infrared-attenuated total reflection (FTIR-ATR). The release studies from chitosan microspheres prepared in various drug dose were carried out in the aqueous solutions at different pH (5.0–8.0) and temperature (4-37°C). The approximately half-amount of Anakinra in C3-HA was released in 24 h and about 83.10% was released within 5 days at pH 5.0. Kinetic models such as zero-order, first-order, and Korsmeyer-Peppas models were applied to the drug release data. It was determined that the drug release from chitosan microspheres fits well in the Korsmeyer-Peppas model.

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In Vitro Antimicrobial Activity of Liposomal Formulation of Carvacrol Incorparated with β-cyclodextrin

Münevver Müge Çağal[a]*, Nagihan Nizam[b]

[a]*Bursa Technical University, Faculty of Engineering and Natural Sciences, Department of Bioengineering, Bursa, Turkey*

[b]*Bursa Technical University, Graduate School of Natural and Applied Sciences, Department of Biotechnology, Bursa, Turkey*

**munevver.cagal@btu.edu.tr*

Carvacrol is a monoterpenic phenol found in aromatic plants and in many essential oils of the *Labiatae* family.[1] The compound is mainly known for its antimicrobial activity against a wide range of microorganisms including bacteria, yeasts and fungi.[2]

In this study, we developed the liposomal formulation of carvacrol incorporated with β-cyclodextrin. Our aim was to increase the antimicrobial activity of carvacrol by using β-cyclodextrin and liposome which increase solubility, bioavailability and stability of a drug by encapsulation. For this purpose, liposomes were prepared by ultrasonic homogenizer using soybean phospholipid under 65% amplitude and constant pH for 5 minutes to obtain homogeneous small-sized liposomes. Then, the liposome solution was loaded with β-cyclodextrin and carvacrol mixture which was previously prepared at 1:4 molar ratio. The final formulation was characterized by Zetasizer to determine size distribution and zeta potential. The formulation was further used for evaluating antimicrobial activity against *Staphylococcus aureus* ATCC 25923 and *Escherichia coli* ATCC 25922 strains by Kirby-Bauer disk diffusion method. The data were collected from 3 replicates and analyzed statistically.

Antimicrobial tests showed that the formulation has high antimicrobial activity against tested bacterial strains. *S. aureus* ATCC 25923 was found to be more susceptible to liposomal formulation than *E. coli* ATCC 25922. It was found that the liposomal formulation created a zone of growth inhibition against *E. coli* ATCC 25922 as much as the positive control ofloxacin, and against *S. aureus* ATCC 25923 statistically greater than the positive control. Empty liposomes used as control were found to have no antimicrobial effect against the tested bacteria.

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Preparation of ZIF-Lipase Encapsulation in the Presence of Calix[4]arene Tetracarboxylic Acid

Sebahat Ascioglu[a], Mustafa Yilmaz[b], Elif Ozyilmaz[a]*

[a]*Selcuk University, Department of Biochemistry, Konya, Turkey*
[b]*Selcuk University, Department of Chemistry, Konya, Turkey*
**eyilmaz80@gmail.com*

Metal-organic frameworks (MOFs), composed of metal ions or clusters linked by organic ligands, is a kind of highly crystalline porous materials with attractive properties of high surface area, tunable ultrahigh porosity, designable functionality, and excellent thermal stability.[1] MOFs have also attracted considerable research interest as a new platform for immobilizing various enzymes. The MOF–enzyme platforms have offered high enzyme-substrate ratios, water-stability, and reusability due to their ease of functionalization, presence of desired hydrophilic/hydrophobic groups, and strong electrostatic interactions with proteins. The subclass of MOFs, the zeolitic imidazolate framework (ZIF), is known to exhibit high chemical and thermal stability, functionality and negligible cytotoxicity.[2]

The calix[n]arenes, cone-shaped molecules with a hydrophobic cavity that can accommodate a variety of functional groups, have great potential as protein surface binders and interact with different functional groups of the enzyme to maintain conformation.[3] With this in mind, for the first time, calix[4]arene tetracarboxylic acid (Calix) was treated with *Candida rugosa* lipase (CRL) and reacted with Zn^{2+} and imidazole by coprecipitation method. The prepared biocomposite was characterized by SEM, EDX, FT-IR, and XRD. The prepared CRL@Calix-ZIF-8 with high encapsulation efficiency showed improved resistance to alkaline and thermal conditions. The CRL@Calix-ZIF-8 with the biocatalytic activity was 2-folds higher than that of the CRL@ZIF-8 (without Calix). It was observed that the CRL@Calix-ZIF-8 showed an excellent recycle performance that can retain 83% of its initial activity even after being reused for 6 times.

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Portal Vein Injection of Drug Delivery System for Hepatocellular Carcinoma Treatment

Tuğba Karakayalı[a,b]*, Ayça Erek[a,b], Güliz Ak Demiroz[a,b], Tarkan Ünek[c], Şenay Hamarat Şanlıer[a,b]

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University, Center for Drug Research Development and Pharmacokinetic Applications (ARGEFAR), Izmir, Turkey*

[c]*Dokuz Eylül University, Faculty of Medicine-Surgery Medicine, General Surgery Department, Izmir, Turkey*

**tugbakrkyl@gmail.com*

Intravenous administration is the most preferred method for drugs in medicine. However, intravenous drugs enter the systemic circulation and go to the liver and undergo a "first-pass effect" reducing effectiveness. The development of alternative methods of drug administration has improved the ability of physicians to manage specific problems.[1] The focused arterial delivery of anticancer agents to liver tumors has been performed for decades. Portal vein injection provides liver invasion by anatomical routes, thereby preserving liver function and providing unaffected liver tissue.[1] Hepatocellular carcinoma (HCC) is a common type of cancer that ranks first among liver cancer types and affects approximately one million people worldwide each year.[2] In this study, an asialoglycoprotein receptor-treated and a fluorescence agent doxorubicin-loaded magnetic nanoparticle formulation (DANP) was used to confirm the efficient liver targeting. In the present work, a method was described for injection into the hepatic portal vein in mice[3]. This study aimed to establish preclinical portal vein injection models in a mouse and confirm magnetic nanoparticle delivery with an IVIS imaging system. CD-1 mice were used in the application and were anesthetized with intraperitoneal injections of ketamine S and xylazine. After the sterilization process, a midline cut was performed. In the abdomen, which was opened in accordance with the technique, revealing the portal vein (PV) and DANP formulation was applied with sterile microinjection. The operation area was closed. After the application, the vital functions of the mice were observed. DANP formulations given to mice via portal vein were checked with an IVIS imaging device. It was seen that this transportal vein chemoembolization method was performed successfully based on the IVIS results.

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In Vivo Biodistribution Study of Asiaglycoprotein Targeted Magnetic Nanoparticles Administrated via Portal Vein

Ayça Erek[a,b]*, Tuğba Karakayalı[a,b], Güliz Ak Demiroz[a,b], Tarkan Ünek[c], Yeliz Yıldırım[b,d], Şenay Hamarat Şanlıer[a,b]

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University, Center for Drug Research Development and Pharmacokinetic Applications (ARGEFAR), Izmir, Turkey*

[c]*Dokuz Eylül University, Faculty of Medicine Surgery Medicine, General Surgery Department, Izmir, Turkey*

[d]*Ege University, Faculty of Science, Chemistry Department, Izmir, Turkey*

**erekayca@gmail.com*

Hepatocellular carcinoma (HCC) accounts for 80 – 90% of all primary liver cancers. In the treatment of HCC, chemotherapy, transcatheter therapy, radiotherapy, and organ transplantation can be performed when the conditions are suitable. Doxorubicin is an anthracycline-derived antibiotic widely used in classical liver cancer chemotherapy applications. It is known that this drug has many side effects such as cardiotoxicity, myelosuppression, etc. It is essential to develop drug delivery systems in which the side effects of doxorubicin will be eliminated, and the clearance rate of the drug will be reduced. Asialoglycoprotein receptors (ASPGR) are highly expressed in hepatocellular carcinoma, and they can be target receptors for drug delivery. Also, magnetic nanoparticles provide addressing of particles to the area where external magnetic field applied and reducing side effects while increasing therapeutic index. Within the scope of the study, ASGPR targeted doxorubicin-loaded magnetic nanoparticles for HCC treatment were developed, and biodistribution was examined *in vivo*. For this purpose, the prepared formulation was given to mice by portal vein application.[1] Following the nanoparticle application, a 0.1 Tesla neomidium magnet was applied to the liver region. At 1- and 3-hours following administration, mice were sedated under isoflurane and visualized in the in vivo imaging system (IVIS) as fluorescent. In addition, at the end of the period, images were taken from the organs removed from the mice with IVIS-Spect. According to IVIS results, it can be said that there is no accumulation of magnetic nanoparticles containing drugs in heart and lung. However, when the liver and kidney images are examined, magnetic nanoparticle accumulation is observed. Based on the data obtained, it was concluded that the developed formulation could be used to treat HCC.

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In Vivo Biodistribution Study of Intravenous Administrated Asialoglycoprotein Targeted Magnetic Nanoparticles

Tuğba Karakayalı[a,b], Ayça Erek[a,b], Bilge Eryakıcı[b,c], Güliz Ak Demiroz[a,b], Yeliz Yıldırım[b,d],

Şenay Hamarat Şanlıer[a,b]*

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University, Center for Drug Research Development and Pharmacokinetic Applications (ARGEFAR), Izmir, Turkey*

[c]*Ege Universty, Institute of Science, Biotechnology Department, Izmir, Turkey*

[d]*Ege University, Faculty of Science, Chemistry Department, Izmir, Turkey*

**senay.sanlier@gmail.com*

Biodistribution is a method of monitoring the extent to which compounds of interest or drug are distributed in the body of a test animal. Biodistribution is critical for locating target organs and determining safety and efficacy.[1] Doxorubicin (Dox) is an anthracycline antibiotic and has shown anticancer activity in liver cancer. However, Dox has many severe side effects that limit treatment effectiveness. Liver cancer is the third leading cause of cancer deaths in the world and ranks sixth in terms of incidence of cases in the 2020 WHO data.[2] Today, a drug delivery system is used to minimize anticancer agents[1] side effects and increase the therapeutic effect.[3] In this study, magnetic nanoparticles targeted to the asialoglycoprotein receptor and loaded with doxorubicin were used. It was aimed to examine the biodistribution profile of this drug delivery system administrated through intravenous route to CD-1 mice. The 0.1 Tesla neomidium magnet was applied to the liver following administration. At the end of 1- and 3-hours, mice were visualized in the *in vivo* imaging system (IVIS) as fluorescent (λ_{ex} 465 nm/λ_{em} 600 nm). After the *in vivo* imaging, mice were sacrificed and their organs (kidney, lung, liver, heart) removed. Imaging of the removed organs with IVIS was also performed. Based on IVIS results, it can be said that while magnetic nanoparticle deposition was not observed in the lungs and heart, magnetic nanoparticle deposition was observed in the kidney and liver. As a conclusion, the developed formulation could be used to treat liver cancer based on the IVIS data.

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Controlled Drug Release from Interpolymeric Complexes

Emrecan Yıldız[a]*, İhsan Alacabey[b], Orkun Ersoy[c], N. Arul Murugan[d], Lokman Uzun[a]

[a]*Hacettepe University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

[b]*Mardin Artuklu University, Vocational School of Health Services, Mardin, Turkey*

[c]*Hacettepe University, Faculty of Engineering, Department of Geological Engineering, Ankara, Turkey*

[d]*KTH Royal Institute of Technology, Department of Computer Science, Stockholm, Sweden*

**emrecan.yildiz@hacettepe.edu.tr*

Controlled drug release systems have many advantages, such as reducing possible side effects compared to traditional release systems, increasing patient comfort by extending the time intervals in drug intake.[1] In this study, expanded perlite particles[2] due to their high adsorption capacities were utilized as drug carrier material whereas doxorubicin[3] was chosen as a model drug for the study. Interpolymeric complexes were used to adjust drug release profiles from drug loaded expanded perlite particles.[4] Moreover, interpolymeric complexes by using two amino acid-based polymers (poly-L-histidine and poly-L-lysine) with different charges were coated the expanded perlite. Drug release studies of both drug-loaded and interpolymeric complex formed expanded perlite samples were analyzed comparatively. The drug delivery systems prepared were characterized by Raman spectroscopy, zeta-potential analysis, thermal gravimetric analysis and scanning electron microscopy. As a result of the characterization process, the effects of parameters such as pH, time, temperature and concentration on drug release profiles were investigated. Optimum release conditions were determined as 5.5, up to 21 days, and 37°C for pH, time, and temperature, respectively. For the mathematical analyses of releasing profiles, the Korsmeyer-Peppas model is more suitable for both systems, however the system has a profile close to the zeroth order releasing profile. The presence of the interpolymeric complex has been determined to positively affect the drug release profile and resulted in more controlled, pH sensitive and suitable for prolonged sustained release. Computational modeling studies were carried out to understand the pH dependence on the structure of interpolymeric complexes in aqueous environment.

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Synthesis of an LAT 1 Targeting-Conjugate for Carrier-Mediated Melanoma Treatment Strategy

Güliz Ak Demiroz[a,b]*, Günnur Güler[c], Gizem Tutar[a], Hande Balyapan[a]

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University, Center for Drug Research Development and Pharmacokinetic Applications, Izmir, Turkey*

[c]*Izmir Economy University, Faculty of Engineering, Biomedical Engineering, Izmir, Turkey*

**guliz.ak@ege.edu.tr*

L-Type aminoacid transporter 1 (LAT 1) carries branched or aromatic amino acids (i.e leucine, tyrosine), which are necessary for basic cellular activities such as cellular growth, proliferation, and maintenance.[1] This amino acid carrier can be overexpressed in melanoma cells, as opposed to its limited distribution and low-level expression in normal tissues.[2] LAT 1 targeting could be a promising targeted anticancer strategy for melanoma. In this study, we aimed to synthesis LAT-1 targeting polymeric conjugate for further carrier-mediated treatment studies of melanoma. L-Tyrosine was used as the targeting ligand and 1,2-distearoyl-sn-glycero-3-phosphoethanolamine-N-[carboxy (polyethylene glycol)] (DSPE-PEG) was used as the chain in the structure of conjugate. DSPE-PEG-Tyrosine was prepared via esterification reaction.[3] The conjugate was characterized by Fourier transform infrared (FTIR) and ^{1}H and ^{13}C nuclear magnetic resonance (NMR) spectroscopies. The five carbon signals at 196.83-169.68 ppm, the four signals belong to tyrosine ring at 159.55-116.46 ppm and $-CH_2$ and $-CH_3$ signals at 72.75-14.38 ppm were determined in ^{13}C NMR spectrum of DSPE-PEG-Tyrosine. According to the all data, DSPE-PEG-Tyrosine was successfully synthesized. As conclusion, DSPE-PEG-Tyrosine could be studied as a targeting compound in drug carriers designed for melanoma.

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Cytotoxic Effects of EGFR/Her2 Inhibition on Lung and Ovarian Cancer

Güliz Ak Demiroz[a,b]*,Yakup Kolcuoğlu[c], Şenay Şanlıer[a,b]

[a]*Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey*

[b]*Ege University, Center for Drug Research Development and Pharmacokinetic Applications (ARGEFAR), Izmir, Turkey*

[c]*Karadeniz Technical University, Faculty of Science, Chemistry Department, Trabzon, Turkey*

**guliz.ak@ege.edu.tr*

Most of the drugs used in clinical practice achieve their effects in two different ways. One of them is to prevent the interaction of a body component with the receptor antagonist by interfering with the agonist. The other is to inhibit the activity of an enzyme that is of great importance for the functioning of metabolism using enzyme inhibitors. Nowadays, studies on receptor tyrosine kinase (EGFR/Her2) inhibitors are increasing rapidly due to their higher effect on preventing cancer progression.[1] Within the scope of this study, the cytotoxic effects of five previously synthesized molecules containing heterocyclic structures (19a, 17c, 11c, 18, and Gefitinib) on lung and ovarian cancers and also healthy lung cell were investigated. These molecules were selected based on the best inhibitory effect on hEGFR as a result of enzyme inhibition studies. The cytotoxicity studies were carried out on A549, CRL-5807, WI-38, SKOV-3, and OVCAR-3 cell lines using varying doses of the molecules.[2] MTT test, which allows the measurement depending on the mitochondrial enzyme activity was applied. Concentration values (IC_{50}) that reduced cell growth by 50% under laboratory conditions were determined using the GraphPad Prism v8 program. As a result, the cytotoxic activities of synthesized organic compounds under in vitro conditions were evaluated. The molecule 18 has a similar IC_{50} value (0.05 µM) with positive control, gefinitinib against WI-38 cell line. However the molecules 19a and 17c have IC_{50} values (2.55 and 3.56 µM) higher than gefinitinib. As a conclusion, organic compounds as receptor tyrosine kinase inhibitors could have the potential to be anticancer drugs that are more important as contributing to our country's economy.

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Evaluation of Drug Release Parameters of Tranexamic Acid Loaded Bone Cements

Umut Öktem[a], Sezgin Gündüz[b]*, Tunca Karasu[b], Durmuş Ali Öçgüder[a], Osman Tecimel[a], Lokman Uzun[b]

[a]*Yıldırım Beyazıt University, Ankara City Hospital, Department of Orthopedics and Traumatology, Ankara, Turkey*

[b]*Hacettepe University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

**sezogs@hotmail.com*

Polymethylmethacrylate (PMMA), which is known as bone cement, was first used as a dental implant and was later used in arthroplasty surgeries fixation of implants or artificial joints thanks to its hardness and mechanical strength.[1] Bone cement is also biocompatible, easily polymerizable and has a potential to use as a drug delivery system.[2] On the other hand, the use of perioperative blood loss reductives is a routine procedure in total hip and knee arthroplasty and spine surgeries. Tranexamic acid (TXA), a synthetic lysine amino acid derivative, is an antifibrinolytic drug that prevents excessive or recurrent bleeding resulted from rapid dissolution of haemostatic fibrin (hyperfibrinolysis) by stabilizing fibrin clot.[3] In this study, tranexamic acid loaded bone cements were developed and their optimum release parameters such as temperature, pH and drug concentration were investigated in a Franz cell. The surface topography of TXA loaded cements was monitored by scanning electron microscopy (SEM) whereas the chemical structures of the cements were investigated by Fourier-transform infrared spectroscopy (FTIR). The results indicated that the prepared cements successfully released the entrapped TXA in vitro for up-to 26 days. The optimum temperature and pH were investigated by varying the temperature (4°C, 25°C and 37°C) and pH (5.0, 6.0, 7.0, 7.4, and 8.0). The optimum temperature and pH were determined as 37°C and 7.4, respectively. TXA amounts were varied as 70 mg, 140 mg, and 280 mg while keeping the amounts of cements as constant of 10 g each. The highest release was observed at the highest amount of drug loaded. The present model is to be studied *in vivo* by virtue of the preliminary results to understand if the model will prevent perioperative blood loss.

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3D Printed Decellularized Succulent Plants: Preparation and Characterization

İpek Ertuğrul*, Fulya Özdemir, Sedat Odabaş

Ankara University, Faculty of Science, Department of Chemistry, Ankara, TURKEY

**miertugrul@ankara.edu.tr*

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] Generally, animal tissues are for decellularization but recently it's been reported that plants can also be an alternative source for decellularization.[2,3]

Here in this study, fresh succulents were chosen as they have high water holding capacity. Decellularization of succulent plants was carried out in different groups using certain concentrations of SDS (1-3-5%), Triton X-100 (1-3-5%), and both detergents (3% SDS-3% Triton X-100). The plant leaves were stirred at 37°C at 100 rpm for 72 hours for chemical decellularization and left in the isotonic solution overnight. Later on, the plants were rinsed several times using rinsed buffered solutions. The leaves were then lyophilized and grounded into powder form. Decellularized succulent incorporated 3D printed hydrogels were prepared by combining the decellularized powder with alginate. Morphological and chemical characterization of these constructs were performed with SEM, XRD, and TGA analyses. *In vitro* cytotoxicity analyses were performed in the human mesenchymal stem cell (HMSC) line with the basic MTT assay. Results show that these 3D printed constructs have adequate structural and biocompatible properties to be used as a potential candidate for tissue engineering purposes.

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Polydopamine Coated Flexible Electrode for Glycoprotein Detection

Miraç Tüysüz[a]*, Ömer Çolak[b], Sena Pişkin[a], Emrecan Yıldız[a], Tunca Karasu[a], Lokman Uzun[a]

[a]*Hacettepe University, Department of Chemistry, Ankara, Turkey*

[b]*Hacettepe University, Department of Electrical and Electronics Engineering, Ankara, Turkey*

**mirac_tuysuz@hacettepe.edu.tr*

Flexible thin-film electrodes are nanomaterials having desirably higher electrical conductivity.[1] They provide great gains in electrochemistry in terms of adjusting their physicochemical properties.[2] Composite structures created by utilizing carbon-based materials or organic polymers are preferred to solve the structural stability problem of these materials. The detection of glycoprotein is one of the growing research-subject in related to proteomics, metabolomics, and glycomics analyses.[3] Herein, we focused our attention on developing flexible electrode-based biosensors for the determination of glycosylated proteins. In this context, the graphite particles coated on the surface of flexible films by air spraying method as a contact material. At this stage, the effect of the carrier polymer:graphite ratio was optimized by varying it in the range of 250-1000 mg. Polydopamine coating as a functional polymer was carried out in basic medium (pH 8.5) in order to utilize it as a recognition element for selective detection of glycosylated protein on the contact surface. SEM, FTIR and conductivity measurements were performed for the characterization of the developed electrodes. Then, the sensor performances for selective detection of immunoglobulin G selected as the model glycosylated protein were evaluated. The effects of pH, temperature and interaction time as affective parameters were investigated. In electrochemical measurements, cyclic voltammetry (CV), differential pulse voltammetry (DPV) and impedance spectroscopy were applied. According to the results, the carrier polymer:graphite ratio was determined as 1% PCL:500 mg graphite. It was determined that the surface conductivity increased linearly with increasing graphite ratio. Polydopamine coating process was completed in 3 hours whereas the optimum IgG determination conditions as pH, temperature, interaction time as 7.4, 25°C and 30 min, respectively. As conclusion, the flexible electrode should be classified as an intriguing alternative for monitoring glycosylated protein level for -omics researches.

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Immobilization of Ene-Reductase in Polyvinyl Alcohol Hydrogel

N. Ece Varan[a], Ali Toprak[a], Dilek Alagöz[b], S. Seyhan Tükel[a], Deniz Yildirim[a]*

[a]*Cukurova University, Science & Letters Faculty, Chemistry Department, Adana, Turkey*

[b]*Cukurova University, Imamoglu Vocational School, Adana, Turkey*

[c]*Cukurova University, Ceyhan Engineering Faculty, Chemical Engineering Department, Adana, Turkey*

**dyildirim@cu.edu.tr*

Ene-reductases (ERs) catalyze the nicotinamide-dependent reduction of alkenes activated by a conjugated electron-withdrawing group in an asymmetric fashion.[1] However, the practical industrial applications of ERs are often limited, mainly due to their short lifetime as well as the difficulty in recovering and recycling them which might result in high production costs. Immobilization of enzymes permits their repeated or continuous use as well as easy separation from the reaction mixtures. Moreover, the stability, activity and selectivity of an enzyme may enhance by proper enzyme immobilization technique.[2] Entrapment of enzymes in polyvinyl alcohol hydrogel offers several advantages such as high enzyme loading, protection of enzyme structure from external interfaces, prevention of subunit dissociation and etc.[3] In this study, ER was immobilized in polyvinyl alcohol hydrogel (PVA) and the free and immobilized ER preparations were characterized in terms of optimal pH, temperature and thermal stability. The both free and immobilized ER preparations had an optimum pH at 7.0. The both ER preparations showed their optimal temperature at 30°C. The thermal stability of immobilized ER increased 3.6- and 2-3-folds than those of free ER at 25°C and 30°C, respectively.

These results showed that the immobilization of ER in PVA hydrogel protected its activity from thermal denaturation.

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Structural Properties of DNA Aptamers Specific for c-Fos Protein

Seda Yüzeren Sağsoy[a]*, Fulya Çağlar[a], Rabia Çakmak[c], Özge Uğurlu[b], Serap Evran[b,c], Cenk Selçuki[a,b,c]

[a]*Ege University, Institute of Health Sciences, Health Bioinformatics Program, İzmir, Turkey*

[b]*Ege University, Graduate School of Natural and Applied Science, Biochemistry Program, İzmir, Turkey*

[c]*Ege University, Faculty of Science, Department of Biochemistry, İzmir, Turkey*

**93190000366@ogrenci.ege.edu.tr*

Nucleic acid aptamers are single-stranded DNA (ssDNA) or RNA molecules that can bind to their targets with high affinity and specificity. In this study, we aimed to understand the structural properties of DNA aptamers that bind to c-Fos protein. c-Fos, c-Jun, and MafB proteins form the AP-1 complex and are involved in cell differentiation, apoptosis, as well as various cancer development processes.[1] In this study, we followed a protocol applied in a previous study to identify structures.[2] DNA secondary structures were obtained from the ssDNA structures. Then, RNA tertiary structures were formed according to the secondary structures. After this step, the conversion of RNA three-dimensional structures into DNA three-dimensional structures was done in .pdb format. Later, structures were minimized for structure improvement. Follow-up studies include determination of aptamer-protein interaction regions by using Molecular Dynamics simulations. Afterwards, the binding affinities of the identified aptamers to AP-1 and the level of inhibition of the AP-1 complex will be determined. Thus, drug candidates that can bind and inhibit the AP-1 complex will be identified.

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Covalent Immobilization and Characterization of D-Lactate Dehydrogenase

Nazlı Ece Varan*, S. Seyhan Tükel

Cukurova University, Sciences & Letters Faculty, Chemistry Department, Adana, Turkey

**evaran@cu.edu.tr*

D-Lactate dehydrogenase (E.C.1.1.1.28, D-LDH) catalyzes the NADH-dependent conversion of pyruvate to D-lactic acid and reverse reaction.[1] The detection of D-lactate has a considerable importance in medicine and fermentation processes.[2]

In this study, the covalent immobilization of D-LDH from *Leuconostoc mesenteroides* onto 3-aminopropyl silica gel via the glutaraldehyde spacer arm was optimized. The optimum pH and temperature values and kinetic parameters of free and immobilized D-LDHs were characterized. The optimum pH for free D-LDH was determined as 7.0, however, it was 6.0 for immobilized D-LDH. The optimum temperatures for free and immobilized D-LDHs were found to be 37°C and 45°C, respectively. The K_m and V_{max} values for free D-LDH were determined as 0.365 mM and 86.95 U/mg protein, respectively. The corresponding values were determined as 0.077 mM and 19.16 U/mg protein for immobilized D-LDH. In addition, the free D-LDH preserved 86% of its initial activity after 4 hours of incubation at 45°C while immobilized D-LDH preserved 82% under the same conditions. Also, the immobilized D-LDH retained 38% of its initial activity after 10 uses in a batch reactor.

These results showed that the covalent immobilization of D-LDH onto 3-aminopropyl silica gel via the glutaraldehyde spacer arm was a suitable method due to the higher catalytic efficiency of immobilized D-LDH than free e D-LDH.

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Investigation of Tyrosine Kinase Enzyme Activity in Behçet's Disease

Akram Mudher Kareem Aljubouri[a], Ramazan Bilgin[a], Didem Arslan[b], Mehmet Ali Işık[b],

Güzide Yücebilgiç[a]*

[a]*Cukurova University, Arts and Sciences Faculty, Chemistry Department, Adana, Turkey*

[b]*Cukurova University, Medicine Faculty, Rheumatology Department, Adana, Turkey*

**gybilgic@cu.edu.tr*

Behçet's disease, a chronic disease affecting many systems of the body, is a multisystem disorder characterized by mucocutaneous lesions (oral ulcers, genital ulcers, and skin pustules), arthritis and intraocular inflammation. The pathogenesis of Behçet's disease is poorly understood but it is considered a complex polygenetic syndrome with environmental triggers. The highest prevalence is seen in Turkey. Tyrosine protein kinases are enzymes that phosphorylate tyrosine residues of protein substrates.[1] Protein-tyrosine kinases are essential regulators of virtually all biological processes and they have pivotal roles in development and disease.[2] In this study, tyrosine kinase enzyme activity was investigated in 48 patients with Behçet's disease and 48 healthy normal subjects were selected as a control group. Tyrosine kinase enzyme activities of patients group were found as 5.57 ± 1.20 ng/mL whereas that of control group was found as 2.42 ± 072 ng/mL.

The results showed that there was a significant increase in patients group as compared with that of controls ($p<0.0001$).

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Antioxidant Capacity and α-Glucosidase Inhibitory Effect of Some Bryophyte Species

Melike Yildirim Akatin[a], Faik Ahmet Ayaz[b], Gulsum Merve Boyraci[a], Mehtap Er Kemal[a], Nevzat Batan[a], Nesrin Colak[b], Nagihan Saglam Ertunga[c] *

[a]*Karadeniz Technical University, Macka Vocational School, Trabzon, Turkey*

[b]*Karadeniz Technical University, Faculty of Science, Department of Biology, Trabzon, Turkey*

[c]*Karadeniz Technical University, Faculty of Science, Department of Chemistry, Trabzon, Turkey*

**nagihan@ktu.edu.tr*

Bryophytes are a stock for natural compounds such as terpenoids, phenols, glycosides and fatty acids. Numerous bryophytes are widely used to treat conditions including burns, bruises, external wounds, snake bites, tuberculosis, fractures, contractions and pneumonia. There is currently a particular desire to prevent and treat major lifestyle diseases (Alzheimer's, cardiovascular, oncological, and degenerative diseases, etc.), which especially result from human aging, using plant-based active substance/natural products. The inhibition of enzymes associated with the treatment of such diseases is particularly emphasized for that purpose. However, the effects of only a few molecules isolated from only a small number of bryophyte species on 5-lipoxygenase, hyaluronidase, cyclooxygenase, DNA polymerase, β- and α-glucosidase enzymes have been investigated up to now.[1,2]

Extracts/sub-extracts were prepared in this study using different solvents (n-hexane, ethanol, water, ethyl acetate, and n-butanol) from five separate bryophytes (*Pellia epiphylla* (L.) Corda*, Conocephalum conicum* (L.) Dumort.*, Porella platyphylla* (L.) Pfeiff.*, Plagiomnium cuspidatum* (Hedw.) T.J.Kop. and *Mnium spinulosum* Bruch & Schimp.) collected from Trabzon, Turkey. The antioxidant capacity and content of these extracts/fractions were determined experimentally. Finally, their inhibitory effects on α-glucosidase were investigated.

The plants used exhibited high phenolic and flavonoid contents and high antioxidant properties. In addition, n-hexane extracts of all plants had IC_{50} values almost 100 times lower than acarbose, the standard inhibitor of the enzyme.

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A Lactate Biosensor Based on L-Lactate Dehydrogenase Immobilized onto Carboxylated Multiwalled Carbon Nanotubes/Polyaniline/Pencil Graphite Electrode

Dilek Alagöz[a]*, Nazlı Ece Varan[b], Gökmen Siğircik[b], Ali Toprak[c], Deniz Yildirim[d], Tunç Tüken[b], S. Seyhan Tükel[b]

[a]*Cukurova University, Imamoglu Vocational School, Adana, Turkey*

[b]*Cukurova University, Sciences & Letters Faculty, Chemistry Department, Adana, Turkey*

[c]*Nevsehir Haci Bektas Veli University, Acigol Vocational School, Nevsehir, Turkey*

[d]*Cukurova University, Ceyhan Engineering Faculty, Chemical Engineering Department, Adana, Turkey*

**alagozdilek@yahoo.com, dalagoz@cu.edu.tr*

L-Lactate dehydrogenase (LDH) catalyzes the conversion of L-lactate to pyruvate using NAD as a cofactor. The determination of lactate is vital in the areas of clinical diagnostic, fermentation, and food analysis.[1,2] Therefore, determination of lactate is very important for food and health applications Currently biosensor technology provides this kind of sensitive and selective measurements.

In this study, a lactate biosensor was developed based on covalent immobilization of L-Lactate dehydrogenase (LDH) onto carboxylated multiwalled carbon nanotubes (cMWCNT)/polyaniline (PANI) hybrid film electrodeposited on the surface of a pencil graphite electrode (PGE). Electrochemical polymerization was carried out using a three-electrode cell configuration via cyclic voltammetry (CV). Electropolymerization of PANI in 0.1 M HCl/aniline aqueous solution system at a scan rate of 100 mV s^{-1} on PGE (up to 50 cycles). The modified electrode was characterized by scanning electron microscopy (SEM) and electrochemical experiments. Experimental parameters affecting the sensor responses, such as applied potential, pH, and lactate concentration, were assessed and optimized. Optimal pH for L-LDH biosensor was determined as 7.0. It was determined that the response of the biosensor increased as the lactate concentration (from 0.1 to 1.1 mM) increased. The obtained current values were 0.026 $mAcm^{-2}$ and 0.038 $mAcm^{-2}$ at 0.2 V for 0.1 and 1.1 mM lactate solution with NAD^+ as a cofactor, respectively. We determined that the biosensor using carbon nanotube was more sensitive than the biosensor without carbon nanotube.

After this study, we may offer that the L-LDH biosensor for lactate determination was successfully performed.

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Inhibition Effect of 7-deazahypoxanthine on Some Metabolic Enzymes

Yeliz Demir[a]*, Cüneyt Türkeş[b], Bükre Yaren Ertano[c], Elif Aksakal[c],

Orhan Erdoğan[c], Şükrü Beydemir[d,e]

[a]*Ardahan University, Nihat Delibalta Göle Vocational High School, Department of Pharmacy Services, Ardahan, Turkey*

[b]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Biochemistry, Erzincan, Turkey*

[c]*Atatürk University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum, Turkey*

[d]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*

[e]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**yelizdemir@ardahan.edu.tr*

Glucose-6-phosphate dehydrogenase (G6PD) plays an important role in oxidation of glucose 6-phosphate to 6-phosphoglucono-d-lactone and produces the reduced form of NADPH. 6-Phosphogluconate dehydrogenase (6PGD) catalyzes the second oxidative step of the pentose phosphate metabolic pathway.[1] Glutathione reductase (GR) is found in the NADPH-dependent oxidoreductase family. The enzyme catalyzes the reduction of glutathione disulfide to the sulfhydryl form glutathione.[2] In the current study, G6PD, 6PGD and GR were purified using affinity chromatography from human erythrocytes. G6PD and 6PGD enzymes activity was assayed according to Beutler method.[3] SDS-PAGE was carried out to check the purity of the enzymes and calculate molecular weights. Then, *in vitro* inhibition effects of 7-deazahypoxanthine studied on the G6P, 6PGD and GR enzymes were investigated at least 5 different concentrations for the IC_{50} plots. The IC_{50} values were determined 43.880±0.600 for G6PD, 43.140±0.604 for 6PGD and 37.770±0.521 for GR. K_i values and inhibition types were found by Lineweaver and Burk curves. The K_i values were determined 83.360±17.540 for G6PD, 56.400±9.883 for 6PGD and 74.520±39.950 for GR. 7-Deazahypoxanthine showed competitive inhibition effect on all enzymes studied.

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The Influence of Some Antibiotic Drugs on Aldose Reductase and Sorbitol Dehydrogenase Enzymes

Cüneyt Türkeş[a], Yeliz Demir[b]*, Şükrü Beydemir[c,d]

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Biochemistry, Erzincan, Turkey*

[b]*Ardahan University, Nihat Delibalta Göle Vocational High School, Department of Pharmacy Services, Ardahan, Turkey*

[c]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*

[d]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**yelizdemir@ardahan.edu.tr*

Diabetes mellitus is a metabolic disease characterized by risen blood glucose level related to the failure in insulin action and/or secretion, leading to imperfect protein carbohydrate and lipid metabolism. The two-step sorbitol pathway is mostly studied among these several biochemical pathways. The sorbitol pathway comprises of two members.[1] Aldose reductase (AR; E.C.1.1.1.21) is the rate-determining enzyme of polyol pathways, catalyzes the conversion of glucose to sorbitol when the glucose concentration increases in the cell.[2] Sorbitol dehydrogenase (SDH; E.C.1.1.1.14) is the second enzyme of the polyol pathway. It plays an important role conversion of sorbitol to fructose in polyol pathways.[3] In the current study, AR and SDH were purified using some column materials. The activities of AR and SDH enzymes were assayed according to previous study.[3] SDS-PAGE was carried out to check the purity of the enzymes and calculate molecular weights. Moreover, the effect of antibiotic drugs such as daptomycin, tigecycline, ganciclovir sodium, and ertapenem sodium was determined on AR and SDH at least 5 different concentrations for the IC_{50} plots. The IC_{50} values were determined in the range of 0.041±0.001-0.810±0.021 mM for AR and 0.082±0.002-0.523±0.004 mM for SDH.

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Enzyme Inhibition Study of Drug Candidate Isoindole Derivatives

Nurhan Kishali[a]*, Ozlem Gundogdu[b], Hayrunnisa Nadaroglu[c], Azize Alaylı[d],

Belgin Sever[e], Mehlika Dilek Altintop[e]

[a]*Ataturk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey*

[b]*Ahi Evran University, Kaman Vocational School, Department of Food Technology, Kırsehir, Turkey*

[c]*Ataturk University, Erzurum Vocational School, Department of Food Technology, Erzurum, Turkey*

[d]*Sakarya University of Applied Sciences, Faculty of Health Sciences, Sakarya, Turkey*

[e]*Anadolu University, Faculty of Pharmacy, Department of Pharmaceutical Chemistry, Eskişehir, Turkey*

**nhorasan@atauni.edu.tr*

An enzyme inhibitor is a molecule that binds to an enzyme and reduces its activity. Most drugs are essentially enzyme inhibitors as blocking the activity of an enzyme and can kill a pathogen or correct a metabolic imbalance. Therefore, drug discovery and development are an active research topic in biochemistry and pharmacology. An enzyme inhibitor with drug properties is often evaluated for its specificity and potency. A high specificity / potency ensures that a drug has few side effects and therefore low toxicity.[1]

Isoindoline-1,3-dione is a prominent compound in organic synthesis for the preparation of diverse biologically active molecules. Isoindoline-1,3-dione derivatives exhibit various biological activities, like anticancer, antimicrobial, antioxidant, anti-inflammatory and analgesic activities. The hydrophobic character of isoindoline-1,3-diones increases their potential to cross different biological membranes *in vivo*.[1,2]

In this study, a series of drug candidate isoindole-1,3-dione derivatives were synthesized and their carbonic anhydrase enzyme inhibitory activity was investigated.

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Modulation of Xenobiotic Metabolizing and Antioxidant Enzyme Activities in Rainbow Trout (*Oncorhynchus mykiss*) by Malachite Green

Azra Bozcaarmutlu Büken[a]*, Volkan Yıldırım[a], Canan Sapmaz[a], Ahmet Günbür[a], Hakan Türker[b]

[a]*Bolu Abant Izzet Baysal University, Faculty of Arts and Science, Department of Chemistry, Bolu, Turkey*

[b]*Bolu Abant Izzet Baysal University, Faculty of Arts and Science, Department of Biology, Bolu, Turkey*

**bozcaarmutlu_a@ibu.edu.tr*

Malachite green is a cheap organic dye used in many different industrial fields. It is a mutagenic and carcinogenic chemical.[1] Aquatic organisms are under the risk of malachite green exposure due to its usage in different fields.[2,3] In this study, our aim was to determine the effect of two different doses of malachite green on cytochrome P450 system and antioxidant system in rainbow trout (*Oncorhynchus mykiss*). For this purpose, 24 fishes were randomly divided into three groups namely control, 0.1 mg/L malachite green administration group and 0.5 mg/L malachite green administration group. After 24 hours, 5 of the fish samples treated with 0.5 mg/L malachite green died and remaining 3 samples were killed and liver samples were taken. The fish samples treated with 0.1 mg/L malachite green continued to be treated with malachite green for 54 hours. At the end of this time period, fish samples were killed by cervical dislocation and liver were taken and stored at -80° until used. 7-ethoxyresorufin-O-deethylase (EROD), erythromycin N-demethylase (ERND) and 7-pentoxyresorufin O-dependentylase (PROD) activities of fish were determined in microsomes. Glutathione S-transferase (GST), glutathione reductase (GR) and catalase (CAT) activities were measured in cytosols. Highly elevated EROD activities were measured in fish treated with 0.5 mg/L malachite green. PROD activities were increased with increasing doses of malachite green. ERND activities were higher in 0.1 mg/L and 0.5 mg/L malachite green administration groups than that of the control group. However, these differences in ERND activities were not statistically significant. GST activities were not affected from the malachite green treatment. CAT activities of 0.1 mg/L malachite green administration group were higher than that of the control group. Similar to the catalase activity, GR activities of 0.1 mg/L malachite green administration group were higher than that of the control group. The role of CYP1A on the metabolism of malachite green was also determined with *in vitro* studies. CYP1A associated EROD activity inhibited with increasing concentration of malachite green. All of these results clearly indicate that malachite green has modulatory effect on EROD, PROD, CAT and GR activities in rainbow trout.

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In Vitro Evaluation of Folate-conjugated hBN Nanoparticles

Özge Çağlar Yıldırım[a]*, Mehmet Enes Arslan[a], Hasan Türkez[b]

[a]*Erzurum Technical University, Faculty of Science, Department of Molecular Biology and Genetics, Erzurum*, Turkey
[b]*Ataturk University, Faculty of Medicine, Department of Medical Biology, Erzurum*, Turkey

**ozge.caglar@erzurum.edu.tr*

Nano drug delivery systems offer many advantages such as lower toxicity, high bioavailability, target-specific, and dose-dependent drug release.[1] Hexagonal boron nitride (hBN) nanoparticles are structurally analogous to graphene. The hBN nanoparticles have received increasing attention in recent years.[2] Although they have a wide spectrum research potential, the use of hBN nanoparticles (hBNNPs) in medicine is relatively new and not fully elucidated. In this study, it was aimed to develop a new drug delivery system using hBNNPs for the treatment of neurodegenerative diseases. In accordance with this purpose, hBNNPs were prepared by chemical vapor deposition method. Then, folic acid was attached onto hBN nanoparticles via the esterification reaction. Particle characterization was performed by using SEM imaging and UV-vis spectrophotometric measurement (200-800 nm) for hBN, hBN-FA. Then, the cytotoxic effects of hBN-FA and hBN were investigated on healthy human dermal fibroblast cell viability by 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) test in a specific dose range (7.8-500 µg/mL). SEM imaging results showed that the average particle size of hBN-FA was 250 nm. In the UV-vis spectrophotometric analysis, it was observed that the hBN-FA complex gave a peak similar to that of pure FA, and this value was approximately 290 nm. In addition, *in vitro* cytotoxicity results revealed that hBN-FA didn't cause significant toxicity in dermal fibroblast cells according to MTT results for 24h. In the group treated with the highest dose of hBN and hBN-FA, cell viability was calculated as 64.48% and 64.68%, respectively for 24h. Cell viabilities were calculated for the control group as 98.7% and for the hBN and the hBN-FA applied group as 90.7% and 95.7%. All these results show that the hBN-FA complex does not have a toxic effect on healthy human dermal fibroblasts compared to the negative controls and has a high potential for use as a drug delivery system.

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A Novel Amperometric Biosensor for Detection of Bisphenol A

Onur Can Bodur[a]*, Merve Keskin[b], Başak Arslan Avan[c], Halit Arslan[a]

[a]*Gazi University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

[b]*Bilecik Seyh Edebali University, Vocational School of Health Services, Bilecik, Turkey*

[c]*Gazi University, Faculty of Dentistry, Department of Orthodontics, Ankara, Turkey*

**onurcanbodur@gazi.edu.tr*

Bisphenol A, 2,2-bis-4-hydroxyphenyl-propane, (BPA) is a monomer commonly used in the production of epoxy resins and polycarbonate plastics. BPA plastics are frequently used in cups, home food containers and dental filling materials. Due to its chemical structure, BPA shows activity similar to the endocrine hormones including estradiol and diethylstilbestrol.[1] BPA and its derivatives can bind to estrogen receptors and cause neurological disturbances, even at low doses, where it acts similar to estrogen. Therefore, it is important to determine BPA and its derivatives quickly and sensitively at low concentrations.[1]

In this study, the amount of BPA in various materials used in daily life was determined with an amperometric tyrosinase biosensor. Commercial Fe_3O_4 nanoparticles were used to modify carbon paste electrode (MCPE). Tyrosinase was immobilized on MCPE by cross-linking method with glutaraldehyde. BPA is oxidized to p-bisbenzoquinone by an enzymatic reaction catalyzed by tyrosinase in the presence of oxygen. BPA was quantified by measuring the electrochemical reduction of the p-bisbenzoquinone compound formed as a result of the enzymatic reaction at -0.15 V. Then, the optimal working conditions necessary for the BPA biosensor were investigated and the linear operating range of the biosensor was determined. In order to determine the optimum operating conditions of the biosensor, the effect of pH and temperature was investigated. Optimum pH and temperature were found to be 5.0 and 40°C, respectively. The storage stability and application stability of the biosensor were also studied. Several possible interfering substances' effects on the BPA biosensor were investigated. The developed biosensor was tested in determinations of BPA amount in a real sample.

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Bone-Mimetic Electrospun PBAT Nanofibers for Breast Cancer Metastasis

Ece Karakaya[a]*, Emel Emregül[a], Burak Derkuş[b]

[a]*Ankara University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

[b]*Ankara University, Faculty of Science, Department of Chemistry, Stem Cell Research Lab, Ankara, Turkey*

**karakaya.ece@hotmail.com*

Breast cancer is now the most frequently diagnosed cancer and leading cause of cancer death in women worldwide. Metastatic breast cancer is breast cancer that has spread to other parts of the body, most often the bones that occurs approximately at 70% frequency.[1] Several of the existing models of anti-cancer therapeutics in this field are restricted and non-effective in applicability due to a lack of accurate models of breast cancer bone metastasis. Besides, the mechanisms of the tumor to invade of skeleton are poorly understood. There is required to develop bone models to investigate the interactions between tumor cells and bone microenvironment.[2] Here, the combination of PBAT (poly(butylene-adipate-co-terephthalate) and decellularized bone extracellular matrix (dBECM) was suggested. PBAT is flexible and biodegradable aromatic-aliphatic copoliester and it has been shown to have great potential for bone tissue engineering. In this study, random and aligned electrospun PBAT membranes were prepared with electrospinning system. Membranes were coated with dBECM, then were seeded human breast cancer cells (MDA-MB-231). The results show that MDA-MB-231 cells grown on bone-mimetic PBAT nanofibers are spread on aligned fibers compared to random fibers. Besides, MMP-2 and MMP-9 expression levels in aligned uncoated PBAT membranes were significantly higher than random uncoated PBAT membranes, and likewise, N-cadherin / E-cadherin expression levels were significantly higher in aligned PBAT membranes. The results revealed a clear association between fiber alignment and cell behaviours. It is obvious that the fiber alignments can easily effected cell behaviors and played vital role in determining cellular behaviors. It is reported that the development of an effective *in vitro* model using MDA-MB-231 cells on random, aligned and decellularized bone ECM (dBECM) coated random / aligned PBAT electrospun nanofibers to understand metastatic breast cancer in bone tissue.

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Investigation of the Effects of Amitriptyline HCl and Amoxapine on the Activity of Human Carbonic Anhydrase I-II

Merve Balaban[a], Ebru Akkemik[a,b], Müslüm Kuzu[c]*

[a]*Siirt University, Science and Technology Applications Center, Siirt, Turkey*

[b]*Siirt University, Faculty of Engineering, Food Engineering, Siirt, Turkey*

[c]*Karabük University, Faculty of Health Sciences, Department of Nutrition and Dietetics, Karabük, Turkey*

**muslumkuzu@karabuk.edu.tr*

Depression is a mental disorder in which abnormal physical and emotional features (such as loss of interest, desire, loss of concentration, eating-drinking and sleep disorders, or feelings of guilt and unhappiness) can negatively affect the individual's daily life.[1] It has been hypothesized that antidepressant drugs have traditionally demonstrated their clinical effects through their interaction with serotonergic and noradrenergic systems.[2] Amitriptyline HCl, one of the antidepressants used in the study, shows its effect by preventing the reuptake of noradrenaline (norepinephrine) and serotonin (5-hydroxytryptamine; 5-HT) and increasing the activities of these hormones. Furthermore, amitriptyline also has an antimuscarinic activity.[3] Amoxapine has been shown to act similarly to imipramine and some other tricyclic antidepressants in animal studies.[4] Furthermore, it has been stated that amoxapine inhibits tetrabenazine-induced depression, antagonizes reserpine-induced hypothermia, and enhances yohimbine lethality.[4] Nowadays, treatment of depression is usually done with drug intake. However, many scientists believe that the side effects of antidepressants should be investigated.[5] This study aimed to investigate the effects of amitriptyline HCl and amoxapine on the carbonic anhydrase I-II enzyme activity. Because these enzymes have a connection with various diseases.[6,7] To determine the effects of the compounds on enzyme activity, different concentrations of inhibitors were added to the reaction medium to read activity values. Activity-[I] inhibitor concentration graph was drawn by measuring activity at five different inhibitor concentrations, and IC_{50} values were calculated. Each measurement was repeated three times. The calculation was performed by taking the average of three values.[6,7] When the effect of antidepressant compounds on the cytosolic hCA-I activity of the enzyme was investigated, the amitriptyline HCl showed an activation effect of about 18%. In contrast, amoxapine showed an inhibition effect of about 24% on enzyme activity. While amitriptyline HCl did not affect on hCA-II enzyme activity, amoxapine showed an inhibitory effect (IC_{50} 0.143 mM) on hCA-II enzyme activity. As a result, it is thought that amoxapine derivative compounds can be evaluated as CA inhibitors.

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Development of Heavy Atom Decorated Dicyanomethylene-4H-chromene Derivatives as Activatable Photosensitizers

Eda Kilic[a]*, Zubeyir Elmazoglu[b], Gorkem Gunbas[b], Safacan Kolemen[a]

[a]*Koc University, Faculty of Science, Department of Chemistry, Rumelifeneri Yolu, Istanbul, Turkey*

[b]*Middle East Technical University, Faculty of Science, Department of Chemistry, Ankara, Turkey*

**ekilic19@ku.edu.tr*

Photodynamic therapy (PDT) is a new therapeutic option for different types of cancers that uses light-activated photosensitizers (PS), PDT drug or PDT agent, to kill cancer cells.[1-3] During PDT action, a PS is irradiated with light to excite an electron to a singlet-excited state. Excitation is followed by inter-system crossing, and the electron is transferred to a triplet-excited state. The addition of heavy atoms (like Br, I, Se) to the core structure of photosensitizers is one of the popular strategies for enhancing inter-system crossing.[4] Heavy atoms facilitate inter-system crossing (ISC), which is normally prohibited, by increasing spin-orbit coupling. Within the final step, triplet-excited state energy is exchanged to molecular oxygen and excites it to produce highly cytotoxic singlet oxygen ($^1O_2$). The singlet oxygen then reacts with biomolecules to cause cell apoptosis or necrosis.

DCM, dicyanomethylene-4H-chromene, has been categorized as an excellent NIR fluorophore for detecting several types of analytes in living cells. Besides its fluorescence properties, DCM core is developed by our group as a new D-π -A photosensitizer by incorporating iodine-substituted phenolate as the electron donor part to the core structure. Iodination of the parent DCM scaffold not only initiates effective ISC but also decreases the pKa value of the phenolic group, which is critical to have red-shifted signals under physiological conditions. It is also investigated the effect of iodine position on the core by synthesizing two different types of iodinated DCM cores. Additionally, sulfur analogue of the iodinated DCM was also introduced to analyze the effect of sulfur atom as a heteroatom. Among all DCM-based PSs, mono iodinated regular DCM core gave the highest singlet oxygen quantum yield. Thus, it was converted into a cysteine activatable PS to enhance the cancer cell selectivity of the PDT action. *In vitro* cell culture studies in cancerous HeLa and A549 cells showed remarkable cell death upon 595 nm LED irradiation.

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Enzyme Immobilization on Amino-Functionalized Mesoporous Magnetic Nanotubes

Mustafa Akbulut[a]*, Fatma Ulusal[b], Nalan Özdemir[a]

[a]*Erciyes University, Faculty of Science, Chemistry Department, Kayseri, Turkey*

[b]*Tarsus University, Vocational School of Technical Sciences at Mersin Tarsus Organized Industrial Zone, Department of Chemistry and Chemical Process Technologies, Mersin, Turkey*

**mstf.akblt96@gmail.com*

Nanostructured materials with huge accessible surface area are being considered as ideal materials for enzyme immobilization.[1] Until now, many nanomaterials have been used to enhance enzymatic activity and stability. Among the nanomaterials, magnetic nanoparticles (MNPs) are promising carriers. MNPs are nontoxic, biocompatible and also, they can be easily separated with a magnet.[2]

In this study, for the first time, the useability of amino-functionalized mesoporous magnetic Fe_3O_4 nanotubes (MNTs-NH_2) for enzyme immobilization was investigated. This study consists of three parts. In the first part, MNTs were synthesized and functionalized with amine group (MNTs-NH_2). Then, MNTs-NH_2 were characterized using some techniques such as FT-IR, XRD, TEM, TGA, PPMS, SEM etc. In the second part, horse radish peroxidase (HRP) was immobilized onto the synthesized MNTs-NH_2. To calculate immobilization efficiency%, amount of non-immobilized enzyme was determined using the Bradford assay.[3] HRP immobilized MNTs-NH_2 was also characterized. For this purpose, FT-IR, XRD, TEM, SEM analysis were performed. In the last part, the activity measurement of immobilized HRP was performed.

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Synthesis and Characterization of Polycaprolactone (PCL)/Bentonite-based Porous Nanofibers for Effective Removal of Methylene Blue from Water

Gamze Dik[a]*, Seda Kolak[a], Ahmet Ulu[a], Musa Alpaslan[b], Ahmet Gültek[a], Burhan Ateş[a]

[a]*İnönü University, Faculty of Arts and Science, Department of Chemistry, Biochemistry and Biomaterials Research Laboratory, Malatya, Turkey*

[b]*Mersin University, Çiftlikköy Campus, Geological Engineering Department, Mersin, Turkey*

**gamzedik2389@gmail.com*

The development of industrial activities has brought some problems with it. Among them, the most serious is water pollution. Organic and toxic pollutants are discharged directly into the environment or water in different ways from various industries. One of the most important of these pollutants is methylene blue. Although it is known that there are some clinical applications of methylene blue, intense exposure causes irreversible negative effects on human health.[1] Various adsorbents have been developed by using nanotechnological methods to remove such pollutants, especially methylene blue, from the environment and water.

In this study, PCL/bentonite nanofibers were synthesized by electrospinning method for methylene blue removal. Physicochemical characterizations of the obtained nanofibers were performed by scanning electron microscope (SEM), energy dispersive X-ray analysis (EDX), X-ray diffraction (XRD), and Fourier transform infrared spectrophotometer (FTIR). To determine the absorbance properties of the nanofibers, the effects of initial concentration of methylene blue, adsorbent dosage, pH value, contact time, ionic strength, and temperature on methylene blue removal percentage the prepared membrane was examined in detail. The highest removal rate (90%) was obtained under the following conditions: adsorbent dose, 0.05 g; solution pH, 9-10; dye concentration, 100 ppm; and time, 48 hours.

As a result, these results revealed that the suggested nanofibers have a high potential for dye removal from wastewater and are a very suitable nanomaterial for industrial applications.

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Immobilization of Xylanase onto ZIF-67 and Manganese-doped ZIF-67 Metal-Organic Frameworks (MOFs): A Comparison Study

Büşra Bakar*, Gamze Dik, Ahmet Ulu, Burhan Ateş

[a]*İnönü University, Faculty of Arts and Science, Department of Chemistry, Biochemistry and Biomaterials Research Laboratory, Malatya, Turkey*

** busraabakarr@gmail.com*

Metal organic frameworks (MOFs) are materials with high surface area, ease of pore size adjustment, and thermal/chemical stability. Thanks to these unique properties, MOFs are of great interest as carrier matrix in enzyme immobilization. Zeolitic-imidazolate frameworks (ZIF) take part a subclass of metal organic frameworks (MOF) and have properties of both MOFs and zeolites. Xylanase (E.C.3.2.1.8) is an enzyme that plays an important role in the degradation of β-1,4-xylan straight-chain polysaccharide into xylose. Xylanase have been used in various industrial fields such as raw material remediation, juice clarification, wastewater treatment, paper and food industry.

In this study, Zeolitic-imidazolate frameworks (ZIF-67), and manganese-doped ZIF-67 (Mn/ZIF-67) constructs were synthesized using the hydrothermal method.[1] Afterward, immobilization of xylanase enzyme onto ZIF-67, and Mn/ZIF-67 constructs was carried out by co-precipitation method. Xylanase activity was determined as xylose formation activity using 3,5-dinitro salicylic acid (DNS) reagent.[2] The morphology and structure of synthesized and enzyme immobilized the constructs were determined by scanning electron microscopy, X-ray diffraction, Fourier transform infrared spectrophotometer, and energy-dispersive X-ray spectroscopy. Besides, the optimum pH, optimum temperature, kinetic parameters, thermal stability and operational stability profiles were evaluated. It was concluded that Xylanase@ZIF-67 and Xylanase@Mn/ZIF-67 exhibited improved pH, thermal, and storage stability in comparison to free xylanase.

In conclusion, this investigation paves the way to use the porous Mn/ZIF-67 material as a novel carrier of immobilized xylanase for industrial applications.

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L-Asparaginase Immobilization on Glycidoxypropyltrimethoxysilane-Functionalized Upconverting Nanoparticles (UCNPs) via Covalent Interaction with Enhancing Activity

Ali Kuruçay[a]*, Samir Abbas Ali Noma[a], Ahmet Ulu[a], Seda Demirel Topel[b], Meltem Asiltürk[c], Burhan Ateş[a]

[a]*İnönü University, Faculty of Science & Arts Department of Chemistry, Biochemistry and Biomaterials Research Laboratory, Malatya, Turkey*

[b]*Antalya Bilim University, Faculty of Engineering, Department of Electrical and Electronics Engineering, Antalya, Turkey*

[c]*Akdeniz University, Faculty of Engineering, Department of Materials Science and Engineering, Antalya, Turkey*

**alikurucay95@gmail.com*

L-Asparaginase (E.C.3.5.1.1) has been widely used in medical, food and biosensing applications.[1] Especially, it is broadly employed to catalyze the hydrolysis of asparagine amino acid in therapy of various cancer types. However, due to its bacterial origin, it causes annoying side effects such as fever, hypersensitivity and anaphylaxis in long-term use and unfortunately, it is expensive for industrial processes.[2] Immobilization is one of the promising strategies to overcome these major problems.

Herein, $NaYF_4$: Yb^{3+}, Er^{3+}-based UCNPs were synthesized and functionalized by glycidoxypropyltrimethoxysilane (GPTMS). Afterward, the GPTMS-UCNPs were characterized in terms of structural, thermal and morphological, etc. and L-asparaginase was immobilized via covalent binding. The optimum parameters (pH and temperature), thermal stability, pH stability and reusability of the immobilized L-asparaginase were examined. Moreover, the kinetic behavior and thermodynamic properties of the immobilized L-asparaginase were also investigated. The immobilized enzyme possessed high catalytic activity at broad pH and high temperature ranges in comparison to free one. Additionally, it exhibited good reusability and promising long-term storage stability. By taking advantage of UCNPs, it was demonstrated that the high efficiency in the immobilization, and reused several times without important losses in enzymatic activity.

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Investigation of Synergic Anticancer Effects of Deinoxanthin and Docetaxel in PC-3 Prostate Cancer Cells

Filiz Çankaya*, Erdem Çardak, Mehmet Kuzucu

Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Biology, Erzincan, Turkey

**filizhanabab@gmail.com*

Prostate cancer is the most common type of cancer in the world, followed by others such as lung, colon, and breast cancer. According to GLOBOCAN 2018 data, prostate cancer is seen in the second place after lung cancer in terms of cancer incidence in men all over the world. Lung cancer (59.3%) has the highest rate of age-standardized cancer in Turkey's cancer data, followed by prostate cancer (36.4%). While the age-standardized mortality rate was 12.9% and 12.8% in Australia and New Zealand, respectively, it was reported to be 22.8% in Turkey.[1,2]

Docetaxel is an important chemotherapeutic agent used in the treatment of many solid tumors such as breast cancer, prostate cancer, non-small cell lung cancer, head and neck cancers, as monotherapy or in combination with other chemotherapeutic agents.[3] *Deinococcus radiodurans* synthesizes deinoxanthin, a xanthine derivative with a strong pro-oxidative effect, which it stores in the cell wall. Deinoxanthin has an antioxidant effect as well as a pro-oxidative effect under certain conditions. In many studies, it has been determined that deinoxanthin causes an increase in intracellular ROS due to its pro-oxidant activity and induces apoptosis in various cancer lines.[4]

In this study, the synergistic anticancer effect of deinoxanthin and docetaxel on prostate cancer, PC-3 cell line was examined. The cytotoxic activity of deinoxanthin and docetaxel against on the viability of PC-3 separately and together was examined by MTT assay. According to the CI values of deinoxanthin and docetaxel combinations; best agonistic effect was determined at 50 nM docetaxel-25 µM deinoxanthin at 24 hours. Levels of BAX, BCL-2, and CASPASE-3 were determined by ELISA. When the results are evaluated, the increase in CASPASE 3 and BAX protein levels shows that intrinsic apoptosis is induced. In addition, the decrease in BCL2 protein level supports the induction of intrinsic apoptosis. The results obtained by the RT-qPCR method performed to determine the BAX, CASPASE-3 and BCL2 gene expression levels were found to be correlated with the ELISA data. We also determined activity of GR, GPx and SOD in the docetaxel and deinoxanthin-applied cells. Results may reveal that increase in glutathione reductase, glutathione peroxidase and superoxide dismutase levels, is an indication that the pro-oxidative effect of deinoxanthin and docetaxel drags the cell to apoptosis.

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Investigation of Inhibition Effect of Organosulfur Plant Extracts on Polyphenol Oxidase Activity

Mine Aksoy*, Songül Bayrak

Atatürk University, Faculty of Science, Department of Chemistry, Erzurum, Turkey

**maksoy@atauni.edu.tr*

Enzymatic browning of fruits and vegetables is the occurrence of color changes that can develop from yellow to brown as a result of mechanical and physical processes during post-harvest processing and storage. Enzymatic browning reactions are mainly driven by polyphenol oxidase (PPO, E.C.1.10.3.1), an intracellular diphenol oxidase commonly found in higher plants and fungi.[1] The enzymatic activity of polyphenol oxidase (PPO) in certain foods is responsible for most of the degradation in food systems and causes changes in the color, taste and texture of foods, resulting in economic losses. Potato is one of these foods, and it is extremely important to prevent enzymatic browning in such foods by the natural inhibitors.

In this study, the ability of selected plant extracts with organosulfur content to inhibit enzymatic browning in potatoes was evaluated to improve the processing quality of potatoes. The plants of celery, turnip, radish, arugula, dill, coriander, cabbage, cauliflower, broccoli, leek known to contain organosulfur were selected for inhibition of potato PPO. For this purpose, first of all, PPO enzyme from potato was purified by sepharose-4B-L-tyrosine-p-aminobenzoic acid affinity chromatography.[2] The inhibition effect of the extracts prepared using celery, turnip, radish, arugula, dill, coriander, cabbage, cauliflower, broccoli, leek plants on the purified PPO enzyme activity was examined, and I_{50} values were determined. The total flavonoid and phenolic acid contents in the plant extracts were examined. Organosulfur content of the plant extracts showing the inhibitory effect were examined with high performance liquid chromatography (HPLC) and the relationship between the organosulfur content of the plant extracts and the inhibition of potato PPO was determined.

The purification results were recorded as 22.76-fold with a yield of 7.5%. I_{50} values of celery, turnip, radish, arugula, coriander, cabbage, cauliflower, broccoli, leek plants were determined as 22.41, 30.87, 35.12, 26.6, 2.47, 88.46, 4.95, 6.45, 38.5 µg, respectively. Of these plant extracts, only dill did not show an inhibition effect. The total phenolic acid content and the total flavonoid content of the plant extracts ranged from 8.56 to 389.34 mg GAE/L and from 56.44 to 889.78 mg QE/L, respectively.

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Novel Schiff Base Ligand-Complexes: Synthesis, Characterization, and Biological Evaluation as Aldose Reductase Inhibitors

Sümeyra Tuna Yıldırım[a], Cüneyt Türkeş[b], Hatice Esra Duran[c], Şükrü Beydemir[d,e]*

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Analytical Chemistry, Erzincan, Turkey*
[b]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Biochemistry, Erzincan, Turkey*
[c]*Kafkas University, Faculty of Medicine, Department of Medical Biochemistry, Kars, Turkey*
[d]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*
[e]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**sukrubeydemir@anadolu.edu.tr; sukru.beydemir@bilecik.edu.tr*

Schiff bases and their metal complex derivatives applicability in biological systems acting as antibacterial, antifungal, antiviral, antitubercular, antitumor, insecticidal, bacteriostatic, *in vitro* cytotoxic, anti-inflammatory, and antipyretic agents, and it is well known that some drugs have higher activity when administered as metal complexes than as free ligands.[1] All applications of these bases are possible due to the flexibility in the synthesis route, coordination ability to metal center, structure, and presence of an imine functional group.[2] Aldose reductase (AR, E.C.1.1.1.21) is a crucial enzyme contained in the polyol pathway liable for the formation of cataracts. Glucose flux increases after activating the polyol pathway converted to sorbitol via AR in the hyperglycemic state. In this paper, in an attempt to identify potent AR inhibitors, firstly, the ligand of 3-hydroxysalicylidene-*o*-aminophenol was synthesized by the reaction of 3-hydroxysalicylaldehyde and *o*-aminophenol in the absolute ethanol at 50°C by the catalyzed of *p*-toluene sulfonic acid. Secondly, the complexes of this ligand were prepared with Co(II), Ni(II), Cu(II), Zn(II), Cd(II), and UO_2(II) in acetate forms at pure EtOH. These complexes, bidentate ligands involving the imino nitrogen and phenolic oxygen atoms, were characterized using FT-IR, ^{1}H-NMR, ^{13}C-NMR, and UV-Vis techniques.[3] Finally, the synthesized complexes were validated for efficacy by *in vitro* assays.[4,5] The complexes were determined to exhibit the high AR inhibition, with the IC_{50} values in the low nanomolar range (IC_{50}s = 96.76 ± 6.66–198.20 ± 11.23 nM), compared with standard drug epalrestat (IC_{50} = 308.70 ± 0.45 nM).

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Synthesis and Biological Evaluation of Novel Schiff Base Ligand-Complexes as Potential Cholinesterase Inhibitors

Sümeyra Tuna Yıldırım[a], Cüneyt Türkeş[b], Hatice Esra Duran[c], Şükrü Beydemir[d,e]*

[a]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Analytical Chemistry, Erzincan, Turkey*
[b]*Erzincan Binali Yıldırım University, Faculty of Pharmacy, Department of Biochemistry, Erzincan, Turkey*
[c]*Kafkas University, Faculty of Medicine, Department of Medical Biochemistry, Kars, Turkey*
[d]*Anadolu University, Faculty of Pharmacy, Department of Biochemistry, Eskişehir, Turkey*
[e]*Bilecik Şeyh Edebali University, The Rectorate, Bilecik, Turkey*

**sukrubeydemir@anadolu.edu.tr; sukru.beydemir@bilecik.edu.tr*

Schiff bases have been used as ligands because of their ability to create stable coordination compounds with different oxidation states. Therefore, Schiff base complexes have centered on the role of such complexes in providing synthetic models for the metal-containing sites in metalloproteins and -enzymes. These complexes make the compounds effective and stereospecific catalysts for oxidation, reduction, and hydrolysis, and they show biological activity and other transformations of organic and inorganic chemistry.[1] In this study, firstly, the ligand of 2-hydroxy-1-naphtalidene-*o*-aminophenol was synthesized by the reaction of 2-hydroxy-1-naphthaldehyde and *o*-aminophenol in the absolute ethanol at 60°C catalyzed of *p*-toluene sulfonic acid. The complexes were prepared with Co(II), Ni(II), Cu(II), Zn(II), Cd(II), and UO_2(II) in acetate forms at pure EtOH and characterized using FT-IR, ^{1}H-NMR, ^{13}C-NMR, thermogravimetric techniques, and UV-Vis techniques.[2] Lastly, these complexes were determined using Ellman's method to be potent inhibitors of choline esterases (ChEs; acetylcholinesterase, AChE, E.C.3.1.1.7 and butyrylcholinesterase, BChE, E.C.3.1.1.8) with IC_{50} values in the range of 30.58 ± 2.20-153.50 ± 10.63 nM and 448.70 ± 24.90-1084.00 ± 56.37 nM, respectively.[3,4]

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The Biochemical and Histopathological Investigation of The Effect of Thymoquinone on Methotrexate-Induced Kidney Damage in Rats

Hatice İlhan[a]*, T. Abdülkadir Çoban[a], Murat Çankaya[b], Halis Süleyman[c]

[a]*Erzincan Binali Yıldırım University, Faculty of Medicine, Department of Biochemistry, Erzincan, Turkey*

[b]*Erzincan Binali Yıldırım University, Faculty of Arts and Sciences, Department of Biology, Erzincan, Turkey*

[c]*Erzincan Binali Yıldırım University, Faculty of Medicine, Department of Pharmacology, Erzincan,* Turkey

**haticeilhan24@hotmail.com*

Methotrexate is one of the widely used antimetabolites because it inhibits cell division.[1] It is a cytotoxic agent and a folic acid antagonist.[2] High doses of methotrexate cause acute renal failure. Antioxidant, anti-inflammatory and chemoprotective effects of thymoquinone have been reported.[3,4] The aim of this study is to biochemically and histopathologically investigate the effect of thymoquinone, which is a powerful antioxidant, in the acute kidney injury model induced by methotrexate in rats.

The study consisted of 4 groups, each including 6 rats. Groups; I. Healthy (Control), II. Methotrexate (20 mg/kg), III. Methotrexate (20 mg/kg) + Thymoquinone (20 mg/kg) and IV. Methotrexate (20 mg/kg) + Thymoquinone (50 mg/kg) kg) form. All animals were sacrificed at the end of the 6th day.

Statistically significant differences were found between the groups in histopathological examinations ($p < 0.05$). While acute kidney injury was severe in the MTX group, it was mild in the MTX-20 and MTX-50 groups.

In conclusion, methotrexate causes kidney damage by oxidative damage. Thymoquinone prevents this damage with its antioxidant and other properties. Based on the findings obtained, it is revealed that thymoquinone can be used as a protective against kidney damage caused by chemotherapeutic drugs after further clinical studies.

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The Effect of Barberry Plant (*Berberis crataegina* DC.) on Rats with Alloxan-Induced Diabetes

Rabia Yılmaz[a]*, Mehmet Aktaş[b], Halis Süleyman[c]

[a]*Erzincan Binali Yıldırım University, Institute of Health Sciences, Erzincan, Turkey*

[b]*Erzincan Binali Yıldırım University, Faculty of Medicine, Department of Biochemistry, Erzincan, Turkey*

[c]*Erzincan Binali Yıldırım University, Faculty of Medicine, Department of Pharmacology, Erzincan Turkey*

* *rabiaylmaz893@gmail.com*

Diabetes mellitus (DM) is a disease whose prevalence is increasing every year in the world, threatening human health, and causing serious and permanent damage to the organs of the living thing if left untreated. Although anti-diabetic drugs have been used for a long time in the treatment of this disease, an effective result has not been reached yet. Therefore, there is a need for drugs that are more effective and have the power to maintain their effect for a long time in the treatment of DM.[1]

Plant species that are considered safe plants have been widely used in traditional treatment due to their anti-hyperglycemia, anti-inflammation and anti-oxidation properties. Species belonging to the genus *Berberis* have been used in the treatment of diabetes. In the literature, it is reported that the berberine substance found in *Berberis* species has a regulatory effect on glucose metabolism.[2] It is emphasized that berberine has effects of promoting intestinal glucagon-like protein-1 secretion, increasing mRNA expression of hepatic low-density lipoprotein receptor and increasing the level of glucose transporter.[3]

It was aimed to investigate the effects of water extracts of barberry plant root, systematically named *Berberis crataegina* DC, on rats with alloxan-induced diabetes. In the blood plasma of alloxan-induced diabetic rats of these extracts; the effects on the levels of glucose, insulin, HbA1c, aspartate amino transferase, alanine amino transferase and alkaline phosphatase enzymes were investigated. For this, water extracts obtained from the plant root were applied to the rats. In our study, 36 Albino Wistar male rats were used. Rats were divided into 6 groups, 6 in each group: 1. Control group, 2. Diabetes-induced control group, 3. Healthy and *B. crataegina* extract applied group, 4th, 5th and 6th groups were diabetes-induced and *B. crataegina* in different doses. Extracts were determined as applied. *B. crataegina* extracts were given orally to the 3rd, 4th, 5th and 6th groups for 15 days. On the 5th, 10th and 15th days, glucose measurements were made in the blood taken from the tail of the rats. Afterwards, the animals were euthanized and biochemical and histopathological examinations were performed on blood samples and tissue samples.

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Measurement of Parathion (PRT) in Biological Samples Using Electrospun Polymer Coated Surfaces with Magnetoelastic Sensors

Seda Kolak[a]*, Orhan Orçun Inan[b], Murat Şimşek[c], Sevgi Balcioğlu[d], Veli Serkan Kolat[b],

Tekin İzgi[b], Süleyman Köytepe[a], Burhan Ateş[a], Selçuk Atalay[b]

[a]*İnönü University, Faculty of Arts and Sciences, Department of Chemistry, Malatya, Turkey*

[b]*İnönü University, Faculty of Arts and Sciences, Department of Physics, Malatya, Turkey*

[c]*İnönü University, Faculty of Engineering, Department of Biomedical Engineering, Malatya, Turkey*

[d]*Sakarya University of Applied Sciences, Akyazı Vocational School Department of Medical Services and Techniques, Sakarya, Turkey*

**sedakolak4465@gmail.com*

Organophosphates (OP) have been used as insecticides to kill insects in many areas such as home and workplaces, especially in agricultural pest control. In many people, the remains of OP can lead many health problems range from paralysis to death. For this reason, it is very important to detect OPs in food, which is the most important way of passage to human organism, as sensitive, fast and cheap way. Magnetoelastic (ME) biosensors are mass change-based measurement systems.[1] ME biosensors measure the resonance frequencies of the mass change that occurs as a result of the interaction of biological molecules with target substances on the sensor surface. The magnetoelastic sensors are preferred because of their low cost, disposable application, wireless and easier to use. In this study, ME biosensor coated with nanofibers prepared by electrospinning was prepared for parathion measurement and its usability in biological samples (blood and tomato samples) was tested. In this context, first of all, chromium coating was applied on 2826 MB alloy. Chromium coated strips were coated with polycaprolactone/chitosan nanofibers by electrospinning method. Nanofiber characterization was proven by FTIR, XRD and SEM methods and the diameter of the produced nanofibers was recorded as 250-400 nm. Surface modification was achieved with glutaraldehyde, acetylcholinesterase enzyme (AChE) and bovine serum albumin.[2] The frequency range of ME biosensors was determined as 54.300-55.800 Hz. Total frequency shift was measured as Δf = 120 Hz for 50 µg/mL concentration of PRT. The detection limit for PRT was 14 µg/mL. In addition, the developed sensor can be used in PRT measurements in biological samples such as blood and tomato.

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Effect of Low-Frequency Ultrasound on Transdermal Delivery of Ibuprofen Esters

Iryna Kravchenko[a]*, Bogdan Prystupa[b]

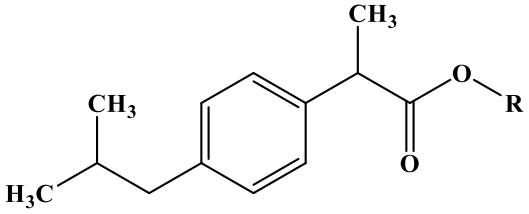
[a]*Odessa National Polytechnic University, Department of Organic and Pharmaceutical Technology, Odessa, Ukraine*

[b]*Odessa National Medical University, Department of Pharmacology and Pharmacognosy, Odessa, Ukraine*

** kravchenko.pharm@gmail.com*

Ultrasound therapy is included in the basic program of physiotherapeutic treatment of inflammatory joint diseases. Recently, low-frequency ultrasonic vibrations are often used in physiotherapy practice. The biological effect of ultrasound depends on its dose, small doses of ultrasound accelerate protein synthesis, lead to the synthesis of elastin and collagen fibers, loosen connective tissue, have anti-inflammatory, absorbable, analgesic and antiseptic effects. The combination of thermal, chemical and mechanical changes in the skin structure under the influence of ultrasound enhances the administration of drugs. Cavitation causes changes in the lipid structure of the stratum corneum, which leads to increased transdermal drug administration.

The aim of the study was to investigate the effect of low-frequency ultrasound on the anti-inflammatory activity of ibuprofen esters.



R= -H, -CH_3, -C_2H_5, -C_7H_{15}, -C_8H_{17}, -$C_{14}H_{29}$, -$C_{16}H_{33}$

The study was carried out on a model of the inflammatory response caused by subplantar injection of 0.2% carrageenan solution into the hind paws of rats. Ibuprofen esters were used in the form of a 0.5% ointment, and skin permeability was enhanced using 10 minutes of sonication at a frequency of 23 kHz. The control group of animals was treated with 5% ibuprofen ointment.

It was found that the combined use of ibuprofen esters with low-frequency ultrasound leads to a more rapid removal of the inflammatory response compared to the control group. Combined usage of ultrasound with ethyl ester of ibuprofen made it possible to reduce the concentration of the active substance from 5% (for the ointment with ibuprofen in the control group) to 0.5% with an increase in the anti-inflammatory effect.

It was hypothesized that this is due to increased penetration of ibuprofen esters through intact skin and the anti-inflammatory effect of low-frequency ultrasound.

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