abstract book

7.EBAT EURASIA BIOCHEMICAL APPROACHES& TECHNOLOGIES CONGRESS
06-09 NOVEMBER 2025 ANTALYA

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7th EURASIA BIOCHEMICAL APPROACHES & TECHNOLOGIES (EBAT) CONGRESS

SCIENTIFIC PROGRAMME

November 06, 2025 Thursday

13:00-16:00	**Registration**	***Registration Desk***
16:00-16:30	**Hall A**	
	Opening Ceremony	
Session 1 – Chair: Prof. Karl-Josef DIETZ		***Hall A***
16:30-17:05	**Invited Speaker (IS1) Prof. Reinhard STERNER**	
	"Artificial Photo-Control of Enzyme Activity and Allostery by Unnatural Amino Acids"	
17:05-17:20	**Coffee Break**	
Session 2 – Chair: Prof. Reinhard STERNER		***Hall A***
17:20-17:55	**Invited Speaker (IS2) Prof. Mamas PRODROMIDIS**	
	" Generation of Nanomaterials via Spark Discharge: A Rapid, Environmentally Friendly, and Versatile Method for In-Situ Modification of Electrochemical (bio)sensing Devices "	
19:00	**Dinner**	

November 07, 2025 Friday

Session 3 – Chair: Prof. Nicole JAFFREZIC-RENAULT	*Hall A*
09:00-09:35	**Invited Speaker (IS3) Prof. Hülya AYAR KAYALI**
	"Next-generation Biotechnological Drugs for Targeted Therapies"
09:35-09:50	**Oral Presentation (OP01) Suna ÇELİK**
	Remediation of İzmir Bay from Heavy Metal Pollution and Improvement of Secondary Microalgal Treatment Using Biochar
09:50-10:05	**Oral Presentation (OP02) Pınar ÇAKIR HATIR**
	Molecularly Imprinted Magnetic Nanoparticles for Protein Detection
10:05-10:20	**Oral Presentation (OP03) Doruk AKDOĞAN**
	β-Galactosidase Immobilization Into Polyvinyl Alcohol-Chitosan Hydrogels
10:20-10:35	**Oral Presentation (OP04) Canan ÖZYURT**
	Development of a Paper-Based Colorimetric Aptasensor for Detecting the Peanut Allergen Ara h1
10:35-10:55	**Coffee Break**

November 07, 2025 Friday

Session 4 – Chair: Prof. Sibel Ayşıl ÖZKAN	*Hall A*
10:55-11:30	**Invited Speaker (IS4) Prof. Bezhan CHANKVETADZE**
	"Isomeric drugs of abuse: Current analytical challenges and possible solutions"
11:30-11:45	**Oral Presentation (OP05) Melike BOR**
	"GABA" A Universal Regulator in Plants, Microorganisms and Animals
11:45-12:00	**Oral Presentation (OP06) Hamdi Ben HALİMA**
	Highly Sensitive Electrochemical Sensor Based on Zn Porphyrin for Enviromental Monitoring of Glyphosate
12:00-12:15	**Oral Presentation (OP07) Sema AKBABA**
	Fibroin/Sulfated Alginate Membranes Loaded with Hydroxyapatite Treated Stem Cell Exosomes for Periosteal Tissue Engineering

12:15-13:45 **Lunch**

November 07, 2025 Friday

Session 5 – Chair: Prof. Mustafa Kemal SEZGİNTÜRK	*Hall A*
13:45-14:20	**Invited Speaker (IS5) Prof. Nicole JAFFREZIC-RENAULT**
	"VOC biosniffers for food quality control and breath control"
14:20-14:35	**Oral Presentation (OP08) Albina Kika KRASNIQI**
	Effect of Grafting on the Morphological Parameters of Pepper Plant (Capsicum annum L.) in Open Field Conditions
14:35-14:50	**Oral Presentation (OP09) Mariam J.M. GHUNAIN**
	Recombinant L-Asparaginase Production
14:50-15:00	**Coffee Break**

November 07, 2025 Friday

	Short Oral Presentation Chair 1: Prof. Nagihan Sağlam ERTUNGA Hall A	Short Oral Presentation Chair 1: Prof. Harun BUDAK *Hall B*
15:00-15:05	**(OP22) Kardelen Damla ALKIM**	**(OP37) Emir Akın AK**
	Antiproliferative Activity of Quinazoline-Based Chiral Thioureas on MCF-7 and HT-29 Cancer Cell Lines	Electrochemical Detection of Kidney Injury Molecule-1 Using Au/3-Mercaptopropionic Acid Functionalized ITO-PET Based Biosensor
15:05-15:10	**(OP23) Öykü Irmak DİKKATLİ**	**(OP38) İlke KARAKAŞ**
	Synergistic Cytotoxicity of Doxorubicin and Phenylboronic Acid in GelMA-Encapsulated Tumor Spheroids	Evaluation of Antimicrobial Activities of Prodigiosin Produced Using Alternative Substrates
15:10-15:15	**(OP24) Elif Deniz YEŞİLYAPRAK**	**(OP39) Ozan YEŞİLTEPE**
	Synthesis of Benzene-1,4-diboronic Acid and Investigation of its Anticancer Potential	Development of Nanofiber-based Transdermal Nicotine Delivery Systems
15:15-15:20	**(OP25) Ahmet Burak BERK**	**(OP40) Eda GÜNAY**
	Investigation of In Vitro Efficacy of Novel Benzoxazaborine Derivatives as PARP Inhibitors	Comparative Evaluation of Salt Tolerance in Sunflower (*Helianthus annuus* L.) Varieties Cultivated in Türkiye
15:20-15:25	**(OP26) Merve ÖZTÜRK**	**(OP41) Müge TEKER YILDIZ**
	Selective Adsorption of Fluoxetine from Aqueous Solutions Using Glutamic Acid Incorporated Microbeads	Biochemical Responses to Exogenous Nitroxyl (HNO) Application in Tomato (*Solanum lycopersicum* L.) Under Drought Stress
15:25-15:30	**(OP27) Handan ÜSTÜKARCI**	**(OP42) Sinemnaz KARÇIĞA**
	Potential Applications of Anthocyanins from a Green Chemistry and Sustainability Perspective	Electrochemical Dual-Analyte Detection: A Novel Sensor for Simultaneous Quantification of Kynurenic Acid and Tryptophan

15:30-15:35	**(OP28) Şenol ALPAT**	**(OP43) Görkem TEKÇE**
	Determination of Terbutaline with SnO_2 Nanoparticle Modified Carbon Paste	Development of Biomedical Products for Oral and Dental Health with Antimicrobial Properties Integration of Berberine with Styrene-Butadiene Rubber Polymer Presentation
15:35-15:40	**(OP29) Emir KERMEN**	**(OP44) Anıl BUL**
	Determination of The Phytochemical Properties of Melissa officinalis, Hibiscus sabdariffa, Calendula officinalis, Althaea officinalis ve Salix babylonicae	Extraction of Flavonoids and Antimicrobial Peptides from Plant Species Belonging to the Artemisia Genus Growing in Our Geographic Conditions and Evaluation of Their Synergistic Effects
15:40-15:45	**(OP30) Nurgül ABUL**	**(OP45) Sevilay İNAL KABALA**
	Purification of Lactoperoxidase from Goat Milk by Hydroxamic Acid-Based Affinity Chromatography and Determination of Its Antibacterial Activity	Polyamines in Wound Healing: A Review of Metabolic and Clinical Perspectives
15:45-15:50	**(OP31) Umut MENGÜLLÜOĞLU**	**(OP46) Osman Nuri ASLAN**
	A Linear Chain Polymer-Based Enzymatic Biosensor for Enhanced Hydrogen Peroxide Detection in Food Samples	Synthesis, Characterization, and Bioactivity of Novel Hybrid Isoindole–Thiazole Molecules
15:50-15:55	**(OP32) İlayda YILMAZ**	**(OP47) Oznour Mourat Moustafa**
	Investigation of Antioxidant and Wound Healing Effect of Carbon Nano-Structures	Phytochemical Characterization and Cytotoxic Evaluation of Arum Italicum Extracts: Potential Protective Effects Against Skin and Liver Cancer-Related Oxidative Damage
15:55-16:00	**(OP33) İhsan KARABOĞA**	**(OP48) Melina DÖNMEZ**
	The Organoselenium Compound, Ebselen, Attenuates Lipopolysaccharide-induced Lung Injury; an Experimental Study	Effects of Olive Leaf Powder Addition on the Quality Parameters of Virgin Olive Oil

16:00-16:05	**(OP34) Demet KIZIL**	**(OP49) Mukaddes SAKLAN**
	Inhibitory Potential of Newly Synthesized Hydrazone Schiff Base and Some Plant Extracts on the Acetylcholinesterase Activity	Removal of Diuron from Aqueous Solutions Using the New Generation Adsorbent UiO-66-NH_2
16:05-16:10	**(OP35) Adem COŞKUN**	**(OP50) Mimoza Jakupi**
	Inhibition Effects of Some Novel Aminocyclitols and Their Derivatives on Carbonic Anhydrase Isoenzymes	Assessment of Genetic Diversity among Local Maize (Zea mays) Genotypes from Kosovo throught Retrotransposon- Based IRAP-PCR Analysis
16:10-16:15	**(OP36) Ilgın YALÇINÖZ**	**(OP51) Seda AĞÇAM**
	Sensitive Detection of Adiponectin Using 4-MBA-Modified Disposable Electrodes	Phenolic Profile and α-Amylase Inhibitory Potential of Gemlik Olive Leaf Extract Cultivated in Hatay, Turkıye

16:20-17:20	**Poster Presentations**	***Hall A***
19:00	**Dinner**	

November 08, 2025 Saturday

Session 6 – Chair: Prof. Mamas PRODROMIDIS	*Hall A*
09:00-09:35	**Invited Speaker (IS6) Prof. Konstantinos VLACHONASIOS** **"Histone Acetyltransferase GCN5 and the Associated Coactivators ADA2-From Evolution of the SAGA Complex to the Biological Roles in Plants"**
09:35-09:50	**Oral Presentation (OP10) Fazilet Özlem ALBAYRAK** Plant Growth-Promoting Bacteria as Biocontrol Agents: Molecular and Physiological Responses in Fusarium-Infected Tomato
09:50-10:05	**Oral Presentation (OP11) Zeynep KARPUZOĞLU** Investigation of Psyllium Husk Incorporated Alginate Beads as a Promising Platform for Intestinal Drug Delivery
10:05-10:20	**Oral Presentation (OP12) Esma AYBAKAN** Development of Isothermal Nucleic Acid Amplification Methods at Room Temperature
10:20-10:35	**Oral Presentation (OP13) Paola PELUSO** Computational approaches to study liquid-phase separation and enantioseparation processes in pharmaceutical and biomedical sciences
10:35-10:55	**Coffee Break**

November 08, 2025 Saturday

Session 7 – Chair: Prof. Paola PELUSO	*Hall A*
10:55-11:30	**Invited Speaker (IS7) Prof. Karl-Josef DIETZ**
	"Bioorganic synthesis of oxylipins and a library of derivatives as new tool to distinguish cell signaling mechanisms"
10:30-11:45	**Oral Presentation (OP14) Neşe AYŞİT**
	Functionalization of Gold Nanoparticles and Their Effects on Neuronal Viability
11:45-12:00	**Oral Presentation (OP15) Hichem MOULAHOUM**
	Laser-Printed Microfluidic Paper-Based Analytical Devices (LP-µPAD): Versatile Platforms for Environmental and Clinical Sensing
12:00-12:15	**Oral Presentation (OP16) Mimoza JAKUPI**
	Antioxidant Responses of Kosovo Maize Genotypes to PEG-Induced Drought Stress

12:15-13:45 Lunch

November 08, 2025 Saturday

Session 8 – Chair: Prof. Bezhan CHANKVETADZE	*Mirage I*
13:45-14:20	**Invited Speaker (IS8) Prof. Sibel Ayşıl ÖZKAN**
	" The Future of Biochemical Sensing: Innovations with Molecularly Imprinted Polymers"
14:20-14:35	**Oral Presentation (OP17) Serpil DEMİRCİ**
	Haloperoxidases Synthesis of New Heterocyclic Compounds by Multicomponent Reactions and investigation of Their Anticancer Activities
14:35-14:50	**Oral Presentation (OP18) Kerem TOK**
	Affinity-Driven Gadobutrol Enhanced Trp-Isa Functionalized MNPs for Biological Exploration in U-87 Cell Lines
14:50-15:00	**Coffee Break**

November 08, 2025 Saturday

	Short Oral Presentation Chair 1: Prof. Hülya YAĞAR Hall A	Short Oral Presentation Chair 1: Prof. Şenol ALPAT *Hall B*
15:00-15:05	(OP52) Deniz KÜÇÜK	(OP62) Busenur ORAL
	Dyestuff Removal by pHEMA-Cryogel Based Nanocomposites Loaded with Silver Nanoparticles Obtained from Pseudomonas fragi by Green Synthesis Method	Mechanochemical C(sp2)-H Alkylation of Biologically Relevant Chromane and Coumaran with para-Quinone Methides
15:05-15:10	(OP53) Ahmet ÇETİNKAYA	(OP63) Emine KIZILATES
	Molecular Imprinting Technology-Enabled Electrochemical Platform for High-Fidelity Detection of Zanamivir	In Vitro Evaluation of a Calcium–Boron–Ascorbic Acid Ester with Enhanced Bioactivity
15:10-15:15	(OP54) İbrahim KIRKIZ	(OP64) Senem KANBER
	Development of a Vaccine Targeting the TadE Protein to Solve the Acne Problem	Integration of ROS/NO and Kinase Signaling in ABA-Induced Stomatal Closure: AtPUB19 Perspective
15:15-15:20	(OP55) Duygu ZABİTLER	(OP65) Eda GÜNAY
	TNF-α as a Key Biomarker: A Novel Sandwich-Type Aptamer-Based Electrochemical Biosensor on Screen-Printed Electrodes	Histochemical Analysis of Superoxide Radical and Hydrogen Peroxide Accumulation in Wheat Seedlings under Drought Stress
15:20-15:25	(OP56) Hasan Yiğit YILMAZ	(OP66) Müge TEKER YILDIZ
	Development and Characterization of Drug Delivery Systems Based on Hydrogels Loaded with Quercetin Containing Silver Nanoparticles Obtained by Green Synthesis	Biochemical Effects of *Halomonas* sp. Isolated from Marine Habitat on Barley Under Salt Stress
15:25-15:30	(OP57) Harun BUDAK	(OP67) Ayşenur YILMAZ KABACA
	Evernic Acid, an Inhibitor of TrxR1, Blocks STAT3 Activity in Breast Cancer Cells	Electrochemical Sensor for the Simultaneous Determination of Epinephrine and Norepinephrine

15:30-15:35	**(OP58) Harun BUDAK**	**(OP68) Melike BİLGİ KAMAÇ**
	Anticancer Potential of Lobaric Acid in Breast Cancer: Role of Oxidative Stress	Electrochemical panel biosensor for the determination of cancer biomarkers
15:35-15:40	**(OP59) Esra ÜLKER**	**(OP69) Neda KHOSHNAVAZ**
	A Novel Platform of Electrochemical Aptasensor Based on Microfabricated Gold Electrodes for Ultra-Sensitive Detection of Atrazine	Investigation of Kinetic Parameters of Hesperidin Inhibitor Using Tyrosinase-Based MWCNT Modified Carbon Paste Electrode
15:40-15:45	**(OP60) Zeynep Yağmur Çelik**	**(OP70) Merve YILMAZ ÇILÇAR**
	Discovery of Potential DcpS Inhibitors for SMA Treatment: Virtual Screening and Molecular Dynamics Simulation Studies	Electrochemical Detection of AFP Using Nanostructured SPCEs
15:45-15:50	**(OP61) Tuğba TAŞ ÖZDEMİR**	**(OP71) Saffet ÇELİK**
	Targeting the Colchicine-binding site: Discovery of Microtubule-destabilizing Small Molecules	Phenethylquinazoline-Based İnhibitor of Human G6PH Suppresses Breast Cancer Cell Viabilityby Targeting Redox Homeostasis
15:50-15:55		**(OP72) Feyza Sönmez AYDIN**
		Investigating The Effect of Smoking on The Glutathione System in Bladder Cancer Patients at an Enzymatic Level

16:00-17:00	**Poster Presentations**	**Hall A**
19:00	**Dinner**	

November 09, 2025 Sunday

Session 9 – Chair: Prof. Levent CAVAŞ		***Hall A***
09:00-09:35	**Invited Speaker (IS9) Assoc. Prof. Burak BARUT**	
	"A new approach to cancer treatment: Photodynamic therapy and its applications"	
09:35-09:50	**Oral Presentation (OP19) Münteha Nur SONUÇ KARABOĞA**	
	From Design to Validation: Analytical Performance of a Portable Retinol Binding Protein Biosensor	
09:50-10:05	**Oral Presentation (OP20) Burçin GÜNGÖR**	
	Chronic Statin Administration Re-orchestrates Metabolic Activity in Breast Cancer Cell Lines	
10.05-10.20	**Oral Presentation (OP21) Elifnur AYAN**	
	Evaluation of Synergistic Effects of Traditional Medicinal Plants on Antioxidant and Antimicrobial Properties	
10:05-10:25	**Coffee Break**	
Session 10 – Chair: Prof. Konstantinos VLACHONASIOS		***Hall A***
10.25-11.00	**Invited Speaker (IS10) Prof. Serap EVRAN**	
	"In vitro selection of aptamers for proteins and small molecules: Applications in biorecognition and inhibition"	

11:00-12:00 **Closing Ceremony**

TITLE OF PRESENTATIONS

INVITED SPEAKER (IS)

IS1	Prof. Reinhard STERNER	A new approach to cancer treatment: Photodynamic therapy and its applications
IS2	Prof. Mamas PRODROMIDIS	Generation of Nanomaterials via Spark Discharge: A Rapid, Environmentally Friendly, and Versatile Method for In-Situ Modification of Electrochemical (bio)sensing devices
IS3	Prof. Hülya AYAR KAYALI	Next-generation biotechnological drugs for targeted therapies
IS4	Prof. Bezhan CHANKVETADZE	Isomeric drugs of abuse: Current analytical challenges and possible solutions
IS5	Prof. Nicole JAFFREZIC-RENAULT	VOC biosniffers for food quality control and breath control
IS6	Prof. Konstantinos VLACHONASIOS	Histone Acetyltransferase GCN5 and the Associated Coactivators ADA2-From Evolution of the Complex to the Biological Roles in Plants"
IS7	Prof. Karl-Josef DIETZ	Bioorganic synthesis of oxylipins and a library of derivatives as new tool to distinguish cell signaling mechanisms
IS8	Prof. Sibel Ayşıl ÖZKAN	The Future of Biochemical Sensing: Innovations with Molecularly Imprinted Polymers
IS9	Prof.Burak BARUT	Artificial photo-control of enzyme activity and allostery by unnatural amino acids"
IS10	Prof. Serap EVRAN	In vitro selection of aptamers for proteins and small molecules: Applications in biorecognition and inhibition

ORAL PRESENTATION (OP)		
OP01	Suna ÇELİK	Remediation of İzmir Bay from Heavy Metal Pollution and Improvement of Secondary Microalgal Treatment Using Biochar
OP02	Pınar ÇAKIR HATIR	Molecularly Imprinted Magnetic Nanoparticles for Protein Detection
OP03	Doruk AKDOĞAN	β-Galactosidase Immobilization Into Polyvinyl Alcohol-Chitosan Hydrogels
OP04	Esma AYBAKAN	Development of Isothermal Nucleic Acid Amplification Methods at Room Temperature
OP05	Melike BOR	"GABA" A Universal Regulator in Plants, Microorganisms and Animals
OP06	Hamdi Ben HALIMA	Highly Sensitive Electrochemical Sensor Based on Zn Porphyrin for Enviromental Monitoring of Glyphosate
OP07	Sema AKBABA	Fibroin/Sulfated Alginate Membranes Loaded with Hydroxyapatite Treated Stem Cell Exosomes for Periosteal Tissue Engineering
OP08	Albina Kika KRASNIQI	Effect of Grafting on the Morphological Parameters of Pepper Plant (*Capsicum annum* L.) in Open Field Conditions
OP09	Marian J.M. GHUNAIN	Recombinant L-Asparaginase Production
OP10	Fazilet Özlem ALBAYRAK	Plant Growth-Promoting Bacteria as Biocontrol Agents: Molecular and Physiological Responses in Fusarium-Infected Tomato
OP11	Zeynep KARPUZOĞLU	Investigation of Psyllium Husk Incorporated Alginate Beads as a Promising Platform for Intestinal Drug Delivery

OP12	Canan Özyurt	Development of a Paper-Based Colorimetric Aptasensor for Detecting the Peanut Allergen Ara h1
OP13	Paola PELUSO	Computational approaches to study liquid-phase separation and enantioseparation processes in pharmaceutical and biomedical sciences
OP14	Neşe AYŞİT	Functionalization of Gold Nanoparticles and Their Effects on Neuronal Viability
OP15	Hichem MOULAHOUM	Laser-Printed Microfluidic Paper-Based Analytical Devices (LP-µPAD): Versatile Platforms for Environmental and Clinical Sensing
OP16	Mimoza JAKUPI	Antioxidant Responses of Kosovo Maize Genotypes to PEG-Induced Drought Stress
OP17	Serpil DEMİRCİ	Synthesis of New Heterocyclic Compounds by Multicomponent Reactions and investigation of Their Anticancer Activities
OP18	Kerem TOK	Affinity-Driven Gadobutrol Enhanced Trp-Isa Functionalized MNPs for Biological Exploration in U-87 Cell Lines
OP19	Münteha Nur SONUÇ KARABOĞA	From Design to Validation: Analytical Performance of a Portable Retinol Binding Protein Biosensor
OP20	Burçin GÜNGÖR	Chronic Statin Administration Re-orchestrates Metabolic Activity in Breast Cancer Cell Lines
OP21	Elifnur AYAN	Evaluation of Synergistic Effects of Traditional Medicinal Plants on Antioxidant and Antimicrobial Properties

ORAL PRESENTATION (OP)		
OP22	Kardelen Damla ALKIM	Antiproliferative Activity of Quinazoline-Based Chiral Thioureas on MCF-7 and HT-29 Cancer Cell Lines
OP23	Öykü Irmak DİKKATLİ	Synergistic Cytotoxicity of Doxorubicin and Phenylboronic Acid in GelMA-Encapsulated Tumor Spheroids
OP24	Elif Deniz YEŞİLYAPRAK	Synthesis of Benzene-1,4-diboronic Acid and Investigation of its Anticancer Potential
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OP29	Emir KERMEN	Determination of the Phytochemical Properties of Melissa Officinalis, Hibiscus Sabdariffa, Calendula Officinalis, Althaea Officinalis and Salix Babylonicae
OP30	Nurgül ABUL	Purification of Lactoperoxidase from Goat Milk by Hydroxamic Acid-Based Affinity Chromatography and Determination of Its Antibacterial Activity
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OP68	Melike BİLGİ KAMAÇ	Electrochemical panel biosensor for the determination of cancer biomarkers
OP69	Neda KHOSHNAVAZ	Investigation of Kinetic Parameters of Hesperidin Inhibitor Using Tyrosinase-Based MWCNT Modified Carbon Paste Electrode
OP70	Merve YILMAZ ÇILÇAR	Electrochemical Detection of AFP Using Nanostructured SPCEs
OP71	Saffet ÇELİK	Phenethylquinazoline-Based İnhibitor of Human G6PH Suppresses Breast Cancer Cell Viabilityby Targeting Redox Homeostasis
OP72	Feyza Sönmez AYDIN	Investigating The Effect of Smoking on The Glutathione System in Bladder Cancer Patients at an Enzymatic Level

POSTER PRESENTATION (PP and OP)		
PP01	Hatice DENİZ	Synthesis of Methyl-Functionalized Vulpinic Acid Derivative and Investigation of Its Anticancer Effects on Human Breast Cancer MCF-7 Cells
PP02	Dilruba TIRPANLAR	Evaluation of RAC1 Activation upon Hypoxic Conditions in MCF7 Cells
PP03	Zülal Sevgi DEDE	Biological Evaluation of Tubulin Polymerization Inhibiting Novel Indole-Thiazolidinone Hybrids in MCF-7 Cells
PP04	Tuğçe ÇİTOĞLU	Investigation of Hyperlipidemia Drugs Efflux Using HPLC in Breast Cancer Cells
PP05	Busenur ORAL	1,4 Addition of Alcohols Benzofuran-Based Azadiens
PP06	Büşra ERDOĞAN	Foliar Application Effects of Ascorbic Acid and Salicylic Acid on Targeted Salt-Responsive Gene Expression Levels in Citrus aurantium L. Plants Under Salt Stress
PP07	Çağrı TARTAN	Thiophene-3-boronic Acid Based Molecularly Imprinted Polymers for Selective and Reusable Bacterial Detection
PP08	Asiye ÜÇER	Binding constant quantification of norfloxacin-DNA interaction using the UV spectrophotometric method
PP09	Damla EREN	Chitosan-Coated Magnetic Nanoparticles for the Efficient Capture of Salmonella Typhimurium
PP10	İlyas ÖZÇİÇEK	Development of Gold Nanoparticle/Quercetin Coated, and Nano-channeled PLGA/SF Film Scaffolds for the Oriented Growth of DRG Sensory Neurons
PP11	Ebrar TUTAR	Development of an RNA-Based Diagnostic Kit Supporting Early Detection of Colorectal Cancer
PP12	Tamar Jankhoteli	Biomonitoring of lead and other toxic elements in humans
PP13	Gökçe Seyhan	Novel Quinoline-derived Silicon(IV) Phthalocyanines as PDT for the Treatment of Endometrial Cancer

PP14	Dilan AKTAŞ	Development of DNA Aptamers for FadA Protein of Fusobacterium nucleatum
PP15	Yavuz ÖZGÜRLER	Investigation of DNazyme Activity for in vitro Selection Applications
PP16	Zeliş YARAR	Development of DNA Aptamers for Recognition of Sesame Allergen Protein
PP17	Aleyna TECER	Preparation of an Electrically Conductive Flexible Coating onto the Polyester Films from Wool Keratin Particles/Poly(ethylene glycol dimethacrylate)/Polyaniline for Soft Electrode Design
PP18	Kübra TURAN	Ultrasensitive Electrochemical Monitoring of Tau-441 Using a 3D-MoS_2 Nanoflowers–Molecularly Imprinted Polymer Platform
PP19	Özlem YALÇIN ÇAPAN	Plant-Based Polymeric Nanoparticles for Curcumin and TP53 Co-Delivery: Towards Novel Therapeutic Strategies in Non-Small Cell Lung Cancer
PP20	Burhan BORA	Development of DNA Aptamer-Based Detection Platform for Clostridium perfringens Epsilon Toxin
PP21	Burhan BORA	Peptide Aptamers Selective to CTX-M Extended Spectrum Beta Lactamase
PP22	Iza Matarashvili	Structure-retention and structure-selectivity dependence of novel chiral sulfoxides in high-performance liquid-chromatography
PP23	Nagihan SAĞLAM ERTUNGA	Investigation of DNA Binding Properties of Binuclear Cu (II) Complex Containing a Hydrazone Schiff Base
PP24	Begüm Ece DAĞLAR	Apigenin from Plants: Extraction and Purification
PP25	Seda DEMİREL TOPEL	Non-Enzymatic Electrochemical Glucose Sensor Based on Multiwalled Carbon Nanotube-COOH/Screen Printed Carbon Electrode and Boronic acid Linked Viologen
PP26	Sevilay İNAL KABALA	An Alternative Clinical Monitoring Method for Osteoporosis: Osteopontin Biosensor
PP27	Sefer DEMİRBAŞ	Effects of Proline and Biofertilizer on Rye Germination under Osmotic Stress

PP28	Şebnem Selen İŞBİLİR	Anti-tyrosinase and DPPH Free Radical Scavenging Activities of Ethanol Extracts from Some Plants
PP29	Ayşenur ERHAN	The Role of Pancreatic Lipase Enzyme in Obesity and Evaluation of Pancreatic Lipase Enzyme Studies in 2024-2025
PP30	Inci ULUDAĞ ANIL	Design of a Lactate Dehidrogenase Immobilized Au-Spe Platform for Sensitive Lactate Determination
PP31	Hatice PALÜZAR	Effect of Hicaz Pomegranate Peel Extract on Mushroom PPO Activity and Browning
PP32	Melike Yıldırım Akatın	Isolation and Acute Oral Toxicity of a Bioactive Isolate from a Bryophyte, Mnium spinulosum
PP33	İlyas ÖZÇİÇEK	Development of Quercetin and Polyethyleneimine Modified Gold Nanorods for Anticancer Applications
PP34	Levent CAVAŞ	Potential of Aronia melanocarpa (Michaux) Elliot in the Development of Functional Foods: A Sample Bioinformatics Study
PP35	Mustafa TEKE	Immobilization of Catalase onto Corn Silk and Characterization of Its Biochemical Properties
PP36	Mustafa TEKE	Electrospun PEO/Zein-Based Nanofibrous Scaffolds for Lipase Immobilization
PP37	Muhammed ELGASİ	Binding constant determination of maprotiline hydrochloride-DNA interaction using UV spectrophotometric method
PP38	Umutcan AYDIN	Development of a DNA Aptamer for a Virulence Enzyme of Mycobacterium Tuberculosis
PP39	Dilek ÜNAL	Physicochemical Characterization and Bioactive Potential Assessment of Brown Algae Colpomenia sinuosa Extract
PP40	Dilek ÜNAL	Temperature-Dependent Modulation of Microplastic-Induced Oxidative Stress and Antioxidant Gene Expression in Arabidopsis thaliana
PP41	Deniz Aktaş UYGUN	Development of aLabel-Free AuNPs-Ti_2 Nanostructured Imminosendor for Sensitive Carcinoembryonic Antigen Detection
PP42	Kader KELLE	Synthesis and Characterization of Silver Nanoparticles from Eucalyptus globulus via Green Synthesis
PP43	Uğur EVMEZ	Development of DNA Aptamers Against Pistachio Allergen Protein Pis v 3

PP44	Ezgi MAN	Selection and Characterization of a DNA Aptamer Targeting Succinylacetone, a Biomarker of Tyrosinemia Type I
PP45	Gözde AYDOĞDU TIĞ	Enhanced DMD-Targeted Aptamer Discovery For Titin N-Terminal Fragment with SELEX
PP46	Naz ÜNAL	Investigating The Effect of LXR Agonist with Combination of Statin Drugs on Breast Cancer
PP47	Ayça ÖZEL	High sensitive and cost-effective lactate determination by an electrochemical biosensing system with a portable analyzer
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INVITED SPEAKERS

ABSTRACTS

Artificial Photo-Control of Allosteric Interactions in a Bi-Enzyme Complex

Reinhard Sterner

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The artificial control of biological macromolecules by light is a rapidly emerging area of protein design.[1] Here, we have used this concept to allosteric interactions between the cyclase subunit HisF and the glutaminase subunit HisH of the bi-enzyme complex imidazole glycerol phosphate synthase (ImGPS). In this system, binding of the substrate PRFAR or its analogue ProFAR to the active site of HisF initiates an allosteric signal that leads to glutamine hydrolysis by HisH. In a first approach, competitive inhibitors of HisF based on the 1,2-dithienylethene (DTT) scaffold were designed. DTT in its ring-open form prevented the binding of ProFAR to the active site of HisF and hence impaired the allosteric activation of HisH. Following UV-light irradiation, the DTT adopted its ring-closed form and lost affinity for HisF, restoring activity and allostery.[2] Using an alternative approach for the photo-control of allostery in ImGPS, the three unnatural amino acids phenylalanine-4'-azobenzene (AzoF), *o*-nitropiperonyl-O-tyrosine (NPY) and methyl-*o*-nitropiperonyllysine (mNPK) were incorporated at strategic positions in HisF and HisH that have been shown to be essential for allosteric signal transduction. The light-mediated isomerization of AzoF at position 55 of HisF or at position 123 of HisH resulted in a reversible 10-fold regulation of HisH activity. The light-mediated decaging of NPY at position 39 of HisF or of mNPK at position 99 of HisF led to a 4-6-fold increase of HisH activity.[3-4] These findings show that photo-responsive inhibitors and unnatural amino acids can be used as a powerful tool for the spatio-temporal control of metabolic enzyme complexes by light.

References:

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Generation of Nanomaterials via Spark Discharge: A Rapid, Environmentally Friendly, and Versatile Method for In-Situ Modification of Electrochemical (bio)sensing Devices

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Spark discharge is emerging as one of the most promising physical methods for producing various types of nanomaterials, including metals, semiconductors, alloys, or carbon. This process occurs without the need for liquids, chemicals, or templates. It relies on the application of an electric field capable of generating an electric discharge when two conductors, connected to an external power supply, are brought close together. In the context of electrochemical (bio)sensing applications, one of the conductors is the sensing (working) electrode, while the other acts as the source of modifying material, such as a metal, alloy, or carbon (referred to as the electrode tip).

During the dielectric breakdown process, free electrons and ions are produced from ionized molecules of air constituents. These particles then bombard the sparked electrodes. The heat generated by the flow of electricity leads to the formation of air plasma and vaporized particles from each electrode material at the closest points between the conductors. After a natural cooling process, the vaporized material solidifies and deposits onto the surface of the electrodes.

This technique offers a straightforward method for generating template-free (nano)materials of high purity. It allows for the in-situ modification of sensing electrodes, resulting in sensors with enhanced detection capabilities and a wide range of applications. Sparked (single or mixed) metal or graphite nanomaterial-modified electrodes can be prepared on demand, even on-site, within seconds, using a completely green and solution-free method that only requires the respective metal/alloy/carbon wire and a power supply. Data on the generation of bismuth, copper, nickel, and alloyed copper/nickel, tin, gold, iron, molybdenum, carbon, and cobalt sparked nanomaterials on screen-printed, 3D-printed and laser scribed electrodes as well as the analytical utility of the resulting sensors will be presented[1-10].

References:

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Next-generation Biotechnological Drugs for Targeted Therapies

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Advances in biotechnology have transformed modern therapeutics, enabling the development of next-generation biopharmaceuticals with enhanced specificity and reduced systemic toxicity. Among these, monoclonal antibodies (mAbs), antibody–drug conjugates (ADCs), recombinant enzymes, and nanoparticle-based delivery systems have emerged as key tools for precision medicine. Monoclonal antibodies remain central to targeted cancer therapy due to their ability to recognize tumor-associated antigens and trigger immune-mediated cytotoxicity. However, limited tumor penetration and prolonged circulation have driven the development of engineered derivatives such as antibody fragments and ADCs, which retain antigen selectivity while improving pharmacokinetic performance.[1] ADCs exemplify this new generation of biotherapeutics by linking mAbs to potent cytotoxic drugs through cleavable linkers, ensuring selective intracellular release and minimizing off-target effects.[2-3] Advances in linker chemistry, payload optimization, and conjugation strategies have significantly improved their safety and therapeutic index. In parallel, antibody fragments such as Fab and scFv constructs are being utilized in multifunctional platforms for improved tissue penetration and adaptability.[4] Recent progress also highlights the integration of nanocarriers, including exosomes and liposomes, as complementary delivery vehicles. Exosomes, with their natural biocompatibility, and synthetic liposomes, with tunable lipid composition, enhance targeted drug accumulation and enable co-delivery of therapeutic molecules.[5-6] Furthermore, in silico modeling and in vitro validation approaches are increasingly employed to optimize molecular design, stability, and immunogenicity.[7]

Overall, the convergence of antibody engineering, nanocarrier design, and computational modeling defines a new era of personalized, multi-targeted cancer therapy. These next-generation systems represent a critical step toward safer, more efficient, and patient-specific precision medicines.

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Isomeric Drugs of Abuse: Current Analytical Challenges and Possible Solutions

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Substitution of controlled psychoactive substances on the illicit market with their isomers which are not (yet) controlled by the regulatory authorities is well established strategy. This quite popular and advanced approach creates serious challenges for toxicological and forensic laboratories, as well as from the legal point of view. Positional isomers on the aromatic ring having the same exact mass and sometimes very similar fragmentation pattern cannot be easily and reliably differentiated by using mass spectrometry[1]. Their chromatographic separation due to minor differences in their structure and physical and chemical properties and thus chromatographic retention (factor) is also difficult. If one deals with stereoisomers, then application of chiral chromatography is necessary. From the legal point of view differentiation between stereo- and structural isomers becomes critical if these isomers have different legal status. The examples of this are amphetamine, methamphetamine and methorphan. Thus, when dealing with these drugs of abuse prosecutors should know which enantiomer they deal with. Similar is the case with positional isomers. Beside legal status pharmacology and toxicology of positional isomers and enantiomers can be also very different. Therefore, development of methods for precise determination of positional isomers and stereoisomers of drugs of abuse is very hot topic[2]. This presentation describes the ways for solution of these challenges taking as examples 2-, 3- and 4-chloro-methcathinones[3] and 2-, 3- and 4-methyl-methcathinones[4].

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VOC Biosniffers for Food Quality Control and Breath Control

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Volatile organic compounds (VOCs) are chemicals with a relatively high vapor pressure at room temperature and atmospheric pressure so they vaporize readily. In the environment, Sources of VOC emission are widespread and can be of natural origin or through human activities. VOC can be used in breath to indicate health conditions and in packaging for controlling food quality. The techniques for quantifying VOC are GC-MS, PTR-MS, etc; these devices are bulky, expensive, and time-consuming. Semiconducting metal oxide-based gas sensors are cheap, miniaturized, and very sensitive; their main drawbacks are their high working temperature and rather bad specificity. Taking advantage of the enzyme selectivity, enzyme-based sensors were used as ''bio-sniffer'' for detecting different types of VOC.

Detection of ethanol in food

Analysing the headspace above the liquid sample, instead of the liquid sample itself, offers the advantage that possible non-volatile interfering substances in the liquid sample (e.g. ascorbic acid) cannot impair the measurement. The relation between the gas phase concentration at room temperature and the liquid concentration was calculated from Henry's law constants (kH) compiled by Sanders [1]. Fruit juice can contain small amounts of ethanol due to the fermentation of the fruits during storage before juice processing; the maximum permitted level of ethanol is 65 mM. An electrochemical detection of ethanol was carried out, using a 3-electrode configuration with a Pt gas diffusion electrode as the working electrode [2]. The amperometric detection of hydrogen peroxide, produced by the enzymatic reaction of the alcohol oxidase, allowed the detection of ethanol in the gas phase. The response time was 1 min and the detection limit was 10 µM. The concentration of ethanol, in different apple juices, was determined, and overestimated, compared to the HPLC result, due to the low sensitivity to methanol of the AOx. A simple conductometric microsensor, based on interdigitated electrodes and alcohol dehydrogenase immobilized in a chitosan film on top of the sensor, will be presented, for the detection of ethanol in the headspace of commercial wine [3].

Detection of ethanol in breath

An acetaldehyde "biosniffer", based on the reverse reaction of alcohol dehydrogenase, was composed of an UV-LED as an excitation light source, a photomultiplier tube as a fluorescence detector and an optical fiber. This biosniffer shows a response time of less than 2 min and a dynamic range of 0.02 – 10 ppm and was applied to measure the concentration of acetaldehyde in exhaled breath from healthy subjects after ingestion of alcohol.

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Histone Acetyltransferase GCN5 and the Associated Coactivators ADA2 - From Evolution of the SAGA Complex to the Biological Roles in Plants

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GCN5 is a well-characterised histone acetyltransferase in plants that functions in coordination with the transcriptional coactivator ADA2b within multiprotein complexes, such as SAGA (Spt-Ada-Gcn5 acetyltransferase), playing a critical role in regulating gene expression. Loss-of-function mutations in GCN5 and ADA2b in Arabidopsis thaliana result in a range of pleiotropic developmental defects, including dwarfism and aberrant root and floral morphogenesis. Phytohormones are central regulators of plant development, orchestrating processes from embryogenesis through to reproductive maturity. Notably, GCN5 and ADA2b have been implicated in regulating multiple hormonal pathways by modulating the expression of genes involved in hormone biosynthesis and signal transduction. Quantitative analyses revealed that the levels of key phytohormones—such as auxin, gibberellins, jasmonic acid, and abscisic acid—were markedly decreased in the inflorescence meristem of gcn5 and ada2b mutants. Transcriptomic profiling further demonstrated downregulation of a broad set of genes associated with both the biosynthetic and signaling components of these hormonal pathways in the mutant lines. Collectively, genetic, hormonal, and transcriptomic data converge to support a model in which the GCN5–ADA2b module functions as a positive regulator of multiple hormone-mediated developmental pathways, particularly during floral development.

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Molecular Editing of 12-Oxophytodienoic Acid for Functional Analysis and Differential Tuning of Oxylipin Signaling in Planta

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Oxylipins are oxidation products of polyunsaturated fatty acids that regulate physiological processes in plants and animals.[1] Prostaglandins in animals and 12-oxophytodienoic acid (OPDA) and jasmonic acid in plants, are such oxylipins that play roles e.g. in wound responses, reproduction and environmental acclimatization. OPDA is synthesized from α-linolenic acid in the chloroplast by consecutive action of three enzymes (13-lipoxygenase [13-LOX], allene oxide synthase, allene oxide cyclase). In addition to its function as metabolic precursor of the plant hormone jasmonic acid, OPDA is a versatile regulator of diverse biological processes including chloroplast cysteine synthesis, protein activity regulation by OPDAylation through Michael addition, reaction with other free thiols and inhibitor of 13-LOX[1-2]. These functions can partly be addressed genetically with drawbacks by pleiotropic effects and broad disturbance of plant physiology, or pharmacologically. However, at the start of the project, OPDA was available only at low amounts and high prices. We first established a bio-organic route for synthesizing OPDA3 and this process was optimized and upscaled[4-5]. However, the challenge was to obtain derivatives for scrutinizing the different physiological roles of OPDA, and this was realized by olefin-cross metathesis using a Hoveyda-Grubbs 2nd generation catalyst[5]. The outcome is a library of 15 molecularly edited OPDA derivatives for functional analysis in vitro and in vivo. It will be shown that this library is a unique tool to dissect the various functions of OPDA. An example is the differential binding to target proteins like cyclophilin 20-3 to activate chloroplast cysteine synthesis, the altered activity as Michael acceptor to glutathione or different triggering of stomatal closure in planta.[6] Successful molecular editing of OPDA for functional scrutiny in vivo may serve as blueprint for similar approaches in biology and medicine.

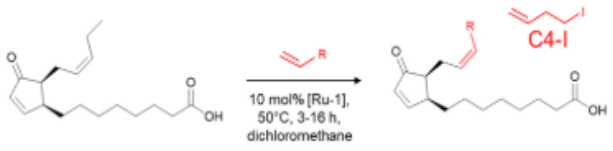

***Figure 1: OPDA derivative library generation** using olefin-cross meta-thesis and Hoveyda–Grubbs 2nd-generation catalysts [Löwe et al. 2020] Also shown is an example of an olefin donor and the here adopted nomenclature C4-I for this donor.*

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The Future of Biochemical Sensing: Innovations with Molecularly Imprinted Polymers

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Molecular imprinting technology, which forms molecularly imprinted polymers (MIPs), is a creative method that enables synthetic biorecognition gaps to imitate real biological derivatives like antibodies, receptors, enzymes, etc. After removing the target analyte, synthetic cavities allow the recognition and selective rebinding of the template. In this case, molecular imprinting technology offers biosimilar receptors with higher specific affinities and better stability than natural receptors and biomolecules[1]. Although stable and durable MIPs seem relatively easy to create to achieve maximum efficiency, some optimization parameters should be considered, such as appropriate functional monomer and crosslinker, and optimal ratios between functional monomer, template, and crosslinker[2]. The optimization process can vary based on the polymerization technique (electropolymerization, photopolymerization, and thermal polymerization). It was reported that template monomer interactions are realized through non-covalent interactions such as van der Waals forces, hydrogen bonds, and dipolar interactions. Among them, MIP-based electrochemical sensors have a significant place because, with MIPs, it is possible to overcome the lack of selectivity issue in electrochemical sensors.

Nanomaterials, famous for their prominent electron transfer capacity and specific surface area, are increasingly employed in modifications of MIP sensors. Unlike traditional electrochemical sensors, nanomaterials-based MIP sensors have excellent sensing and recognition capabilities. Nanomaterial-embedded MIP-based electrochemical sensors and miniature electrochemical transducers can detect target analytes in situ. Thanks to superior chemical and physical stability, low-cost manufacturing, high selectivity, and fast response, MIPs have become a fascinating field recently. Moreover, without requiring time-consuming preparation procedures, these sensors have been successfully used in biological fluids and pharmaceutical samples.

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A New Approach to Cancer Treatment: Photodynamic Therapy and its Applications

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Cancer remains one of the leading global health challenges, characterized by uncontrolled cell proliferation, high mortality, and a substantial socioeconomic burden. According to GLOBACAN 2022, approximately 20 million new cancer cases and 9.7 million related deaths were reported, with lung, breast, colorectal, liver, and prostate cancers being the most prevalent.[1] Current treatment modalities, including surgery, chemotherapy, radiotherapy, and hormone therapy, though effective, are often associated with severe side effects, limited selectivity, and the risk of recurrence. Consequently, developing novel, targeted, and minimally invasive therapeutic strategies is urgently required. Photodynamic therapy (PDT) has emerged as a promising alternative due to its unique characteristics, such as low systemic toxicity, repeatability, and high therapeutic efficacy.[2] PDT relies on three critical components—photosensitizer, light, and oxygen—to generate reactive oxygen species that selectively induce tumor cell death via apoptosis, necrosis, autophagy, vascular damage, and immune responses. Over time, the development of photosensitizers has evolved from first- to third-generation, with improvements in selectivity, tissue penetration, and pharmacokinetics. Among second-generation agents, phthalocyanines are particularly notable due to their strong absorption in the therapeutic window (650–800 nm), minimal cutaneous photosensitivity, and favorable clearance profile. Despite challenges such as hydrophobicity and aggregation that limit bioavailability, structural modifications and nanocarrier-based delivery systems have been employed to enhance their performance.[3] This study summarizes recent in vitro and in vivo studies investigating PDT applications in cancer, focusing on phthalocyanine-based photosensitizers. The aim is to provide a comprehensive overview of PDT's therapeutic potential, advantages, and limitations, while highlighting recent advancements that could support its translation into more effective clinical applications. This work was supported by the Turkish Academy of Sciences (TÜBA).

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In Vitro Selection of Aptamers for Proteins and Small Molecules: Applications in Biorecognition and Inhibition

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Nucleic acid aptamers are single-stranded DNA or RNA molecules that fold into specific three-dimensional structures and mimic the binding properties of antibodies.[1] Aptamers confer superiority to antibodies in terms of small size, ease of chemical synthesis, and low cost. In recent years, aptamers have been widely employed as biorecognition elements in biosensors and diagnostic assays. Aptamers also hold promise for therapeutic applications, as they are non-immunogenic and selective for their targets. Aptamers are selected using an in vitro method called the Systematic Evolution of Ligands by Exponential Enrichment (SELEX), which enables the screening of a diverse aptamer library against proteins, cells, and small molecules.[2] Since SELEX is performed in vitro, it is particularly advantageous for small-molecule targets, for which antibody production is challenging. Our studies have focused on the selection of DNA aptamers for proteins and small molecules[3-4]. One of the proteins we targeted was Yersinia outer protein M (YopM). We performed magnetic bead-based SELEX and identified an aptamer blocking the interaction between YopM and human DEAD-box helicase 3 (DDX3). In another study, we targeted histone deacetylase 10 (HDAC10). HDACs are emerging therapeutic targets for the treatment of cancer and inflammatory diseases. However, the lack of isoenzyme-specific inhibitors limits their application. Hence, we aimed to develop an isoenzyme-specific aptamer. For this aim, we performed counter-SELEX to eliminate the aptamers binding to the structurally similar HDAC6 isoenzyme. We showed that the aptamer could specifically inhibit HDAC10 enzyme activity, but not HDAC6 or other metalloenzymes. Our protein-SELEX studies also included the development of aptamers for the detection of food allergen proteins. In addition to proteins, we targeted small molecules that needed to be detected in biological samples. One of the targets was succinylacetone, a biomarker of tyrosinemia type 1. We performed graphene oxide SELEX (GO-SELEX) and obtained an aptamer for the detection of succinylacetone. The aptamer-based assay did not produce any signal against tyrosine, which is structurally similar to succinylacetone. We concluded that adjusting the in vitro selection conditions plays a major role in aptamer specificity.

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ORAL PRESENTATION ABSTRACTS

Remediation of İzmir Bay from Heavy Metal Pollution and Improvement of Secondary Microalgal Treatment Using Biochar

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Due to the increasing population and consumption, the seas are polluted both directly and indirectly. Microalgae species are being used in the literature for wastewater treatment with their benefits including not creating secondary pollution. The disadvantage of the method is that the wastewater aimed to be treated may not always be suitable for microalgae living conditions. Types of biochar derived from waste materials are also being studied for contaminant adsorption from aquatic environments.[1] In this study, two different treatment processes were carried out on water samples from İzmir Bay in order to treat the seas in a sustainable way with beneficial secondary effects. With the first one, the heavy metal treatment potential of activated (KOH) biochar obtained from pyrolysis of olive pruning residues was examined in water samples from İzmir Bay and results were obtained regarding the removal of Pb, Cd, Cr, As, Al.[2,3] In the second treatment study, it was aimed to cultivate the model microalgae *Chlamydomonas reinhardtii* after treatment of İzmir Bay with biochar and to obtain the maximum level of beneficial metabolic products of the microalgae due to its cellular stress.[4] The potential of different ratios of biochar (BC) and activated biochar (A-BC) as pre-microalgae adsorbents was studied and the biochar treatment that provides the most efficient stress level in terms of microalgae living condition and useful component production was determined. The biochar produced was characterized by SEM and BET analysis. Heavy metal removal was determined by ICP-OES analysis. Microalgae survival efficiency was analyzed in terms of the number of remaining cells, carotenoid and lipid extraction. As far as researched, optimization of microalgae living conditions and heavy metal adsorption using biochar for the treatment of İzmir Bay was carried out for the first time in this study. In this way, an innovative solution that addresses environmental pollution from multiple perspectives has been proposed against methods for the removal of contaminants that pose a danger to the environment and human health.

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Molecularly Imprinted Magnetic Nanoparticles for Protein Detection

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Molecularly imprinted polymers (MIPs) were developed as magnetic nanogels for the recognition of β-amyloid, a misfolded protein fragment increasingly investigated as a biomarker for preeclampsia. By employing the molecular imprinting technique, specific recognition sites complementary to β-amyloid were introduced into the polymer matrix, enabling selective protein binding.[1,2] To enhance separation and recovery, magnetic nanoparticles were incorporated into the polymer structure, allowing facile manipulation of the nanogels under an external magnetic field. A series of analytical techniques, including DLS, FTIR, zeta potential, and SEM, were employed to characterize the nanogels. MIPs exhibited a larger hydrodynamic diameter (387.0 nm) compared to non-imprinted polymers (NIPs, 270.7 nm), as well as more stable surface charge values (−33.4 mV vs. −28.5 mV). SEM analysis further revealed clear morphological differences between MIPs and NIPs. Binding studies confirmed the superior affinity and selectivity of MIPs toward β-amyloid peptide, in contrast to NIPs, which showed only limited nonspecific binding. Collectively, these findings demonstrate that molecular imprinting combined with magnetic nanoparticles can be effectively applied for protein recognition and provide strong evidence that MIP-based magnetic nanogels hold promise as a rapid, cost-effective, and reliable diagnostic platform for preeclampsia. The authors would like to thank Nazlican Yürekli for their valuable contributions to this work.

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β-Galactosidase Immobilization into Polyvinyl Alcohol-Chitosan Hydrogels

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β-Galactosidase (EC 3.2.1.23), commonly known as lactase, is one of the important hydrolytic enzymes found in both microorganisms and higher plants and animals.[1] β-Galactosidase, which hydrolyzes lactose to its monomers glucose and galactose, has important applications in the food industry. β-Galactosidase has broad application potential in different sectors such as the dairy industry, pharmaceuticals, biotechnology, and food processing. Recently, an advanced hydrogel-based 3D printing method for the immobilization of β-galactosidase during the hydrolysis of o-nitrophenyl-β-D galactopyranoside (ONPG) has been developed, allowing for the rapid fabrication of complex geometries and increased enzyme loading rates on carrier materials.[2] Such immobilization methods and accompanying materials have expanded the industrial application of enzymes, especially in the therapeutic field. In this study, commercially available β-galactosidase was immobilized in a polyvinyl alcohol-chitosan (PVA-CS) hydrogel mixture using the encapsulation method. The aim of this immobilization process was to characterize both free and immobilized enzymes, to determine the properties acquired after immobilization, and to investigate their effects on important parameters such as pH, temperature, and substrate concentration. The obtained results were compared with the free enzyme. Accordingly, after immobilization, the optimum temperature of β-galactosidase increased from 40°C to 50°C, the optimum pH rose from pH 5 to pH 6, and the Vmax value improved from 0.398 to 1.816; additionally, the immobilized enzyme demonstrated activity when used twelve times consecutively. These findings indicate that the catalytic activity of the enzyme was enhanced after immobilization. As a result, it was revealed that immobilized β-galactosidase may be more effective in industrial processes by showing stronger enzymatic properties than free β-galactosidase.

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Development of a Paper-Based Colorimetric Aptasensor for Detecting the Peanut Allergen Ara h1

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Peanut allergy is one of the most dangerous food-related hypersensitivity reactions because it often causes severe clinical symptoms and can trigger life-threatening, even fatal, reactions such as anaphylaxis[1]. The Ara h1 protein is one of the primary allergens found in peanuts. Because it is highly resistant to heat and digestion, it is easily recognized by the immune system and can trigger strong allergic reactions. IgE antibodies against Ara h1 are among the primary triggers of severe anaphylactic reactions, particularly in individuals with peanut allergy. Detection of Ara h1 protein in food products is a common strategy for identifying peanut contamination. In addition to traditional antibody-based methods for detecting the Ara h1 protein, aptamer-based strategies are increasingly gaining attention. Aptamers are single-stranded DNA (ssDNA) or RNA oligonucleotides capable of binding their specific targets with remarkable affinity and selectivity. In this study, Ara h1 protein specific aptamers[2] and their truncated forms were used as recognition elements in biosensor design. For this purpose, Ara h1 specific aptamers were first conjugated with gold nanoparticles (AuNPs). Ara h1 protein was applied to nitrocellulose membrane to prepare a competitive paper-based test. AuNPs-aptamer conjugates were applied to conjugation pads that had been pretreated for flow facilitation and dried in an oven for 2 hours. Paper-based tests were cut into 3 mm strips and placed in appropriate cassettes. As a result of buffer application to the cassettes, red line formation was observed as a result of the binding of AuNPs-aptamer conjugates to the Ara h1 protein on the nitrocellulose membrane. Application of Ara h1 protein to the test platforms resulted in a concentration-dependent decrease in line color intensity, as the protein bound to the AuNPs–aptamer conjugates and competitively inhibited their interaction with the immobilized antigen. The concentration-dependent decrease in line color intensity was evaluated by performing histogram and RGB analysis with the ImageJ program. Ara h1 determination in the nM range was carried out with the developed paper based biosensor system. In addition to the reproducibility and selectivity studies for the developed biosensor, the performance of the system in real food matrices was also evaluated. The results obtained demonstrate that the developed aptamer-based biosensor is effective in sensitively and selectively detecting Ara h1 protein. This study presents a successful approach for the rapid and reliable identification of peanut allergens in food products.

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"GABA" A Universal Regulator in Plants, Microorganisms and Animals

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Gamma-aminobutyric acid (GABA) is a ubiquitous non-protein amino acid, first discovered in potato tubers in 1949 and later identified as a major inhibitory neurotransmitter in mammals.[1,2] In the brain, GABA homeostasis is essential for neurological health, with imbalances linked to disorders such as epilepsy, depression, and Alzheimer's disease.[3] Plant tissues also accumulate GABA at concentrations ranging from micromolar to millimolar levels, depending on organ type and environmental conditions.[4]

In plants, GABA plays multifaceted roles, including protection against abiotic and biotic stresses, regulation of pollen tube growth, nitrogen and carbon metabolism, growth and development, pH regulation, and signaling.[2,4] Its biosynthesis mainly occurs via decarboxylation of glutamate by glutamate decarboxylase, while additional pathways originate from polyamine and proline metabolism.[4] Notably, GABA exhibits dual functions in plant–microorganism interactions: high concentrations can suppress pathogen growth, whereas lower levels may promote colonization.[5]

Manipulating GABA levels through metabolic engineering or exogenous treatments has recently attracted attention, both for enhancing plant stress tolerance and nutritional quality, and for its therapeutic potential in neurological health. Despite decades of research, many aspects of GABA function remain unresolved, and its diverse roles continue to raise important questions across biological systems. In this presentation, we will highlight GABA's central roles in plants, its relevance to agriculture and health, and current challenges and perspectives for future research.

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Highly Sensitive Electrochemical Sensor Based On Zn Porphyrin For Environmental Monitoring Of Glyphosate

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Glyphosate (Gly) is one of the most widely used herbicides in modern agriculture, and its potential risks continue to be a subject of considerable discussion. In this present work, a novel electrochemical sensor was developed using an indium tin oxide (ITO) electrode modified with a zinc (II) metalloporphyrin complex, [5,10,15,20-tetrayltetrakis(2-methoxybenzene-4,1-diyl) tetraisonicotinateporphyrinato] zinc (II) (ZnTMIPP), for the selective detection of glyphosate. The ZnTMIPP complex was synthesized and thoroughly characterized using UV–vis and FTIR spectrometry, and ^{1}H NMR spectroscopy to confirm its structure and purity [1]. The sensing platform was prepared by drop-casting the ZnTMIPP onto the surface of a cleaned ITO electrode, forming a uniform and stable film [2,3]. Electrochemical evaluation of the sensor was performed using cyclic voltammetry under optimized experimental conditions, revealing a sensitive response to glyphosate, with a wide linear detection range from 10^{-8} to 10^{-5} M and a low detection limit of 4.14 nM. Furthermore, the modified electrode demonstrated excellent selectivity versus glyphosate metabolite and other pesticides, reproducibility, and stability, highlighting its potential as a cost-effective and efficient platform for glyphosate monitoring in real water samples and fruit juice.

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Fibroin/Sulfated Alginate Membranes Loaded with Exosomes of Stem Cells Treated with Hydroxyapatite for Periosteal Tissue Engineering

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Periosteum, the tissue layer enclosing bones, plays a crucial role in both embryonic osteogenesis and bone defect repair.[1] In case of damage, cells homing periosteum ensure bone regeneration by migrating towards defect area and enabling nutrient transport needed for bone maintenance and regeneration.[2] In this study, novel fibroin/sulfated alginate (F/sA) membranes loaded with exosomes of human adipose derived stem cells (hADSCs) treated with pure and doped hydroxyapatite (HA) were developed for periosteal tissue engineering. It was found that, co-doping of B (8 mol%) and Zn (4 mol%) to HA provided both proliferative and osteogenic effects on hADSCs and angiogenic effect on human umbilical vein endothelial cells. Both F and sA led to immunomodulation by significantly decreasing IL1B and CASP1 levels of THP-1 macrophages. However, presence of sA more than 5% in the membranes did not cause a significant change. Considering that cell viability and proliferation were the highest for 95:5 membrane group, 95% F to 5% sA was chosen as the optimum ratio. Finally, effects of exosomes of untreated and HA, 8B HA and 8B 4Zn HA treated hADSCs were investigated. 8B HA group significantly increased exosome yield whereas treatment with all HA groups significantly decreased protein and DNA levels. Moreover, treatment with doped HA led to significant increase of RNA levels. F/sA membranes loaded with exosome groups increased early attachment and proliferation of hADSCs. Treated exosome groups were found to increase osteogenic differentiation and decreased expression of inflammatory markers except for 8B 4Zn HA group, which increased CASP1. Overall, F/sA membrane loaded with exosomes isolated from cells treated with pure and doped HA groups were able to increase proliferation and osteogenic differentiation of hADSCs as well as immunomodulation and hold promise for periosteal tissue engineering.

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Effect of Grafting on the Morphological Parameters of Pepper (*Capsicum annum* L.) Grown in Open Field Conditions

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Peppers are crops with significant nutritive and economic value in the Balkan region, as well as globally. Open field production is still largely present in this region, albeit more challenging due to the climate changes[1]. Grafting is considered as a valuable tool for overcoming numerous biotic and abiotic challenges during the production[2-3]. The effects of grafting are least investigated among the solanaceous vegetables[4]. The aim of this study was to assess the effect of grafting on the morphological parameters of two pepper cultivars, 'Kaptur' and 'Ariadni', grafted onto three commercial rootstocks: SM Tant, Vital Paprika, and 6210. The following fruit parameters have been monitored: fruit mass, fruit length, fruit diameter and pericarp thickness. The results showed that grafting can induce positive effect on the fruit lenght and pericarp thickness, while for fruit diameter there were no statistical significant differencies observed. Among the tested rootstocks, SM Tant showed the most positive impact on the morphological development across both pepper cultivars, suggesting that it can be an effective choice for improved performance under open field conditions.

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Recombinant L-Asparaginase Production

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L-asparaginases (ASNases) are therapeutic enzymes widely applied in the treatment of acute lymphoblastic leukemia (ALL). These enzymes function by depleting extracellular L-asparagine, thereby suppressing the proliferation of malignant cells [1]. In this study, we aimed to enhance the intracellular production of recombinant L-asparaginase II in *Escherichia coli* Rosetta. *E. coli* was selected as the host organism due to its rapid growth, well-characterized genetics, and suitability for genetic manipulation [2]. Nevertheless, the yield and enzymatic activity of recombinant proteins are strongly influenced by the composition of the growth medium [3]. To address this, various medium components—including carbon and nitrogen sources, salts, and phosphate concentrations—were systematically analyzed using statistical methods. The evaluation revealed sorbitol, yeast extract, KH_2PO_4, and asparagine as critical factors significantly affecting ASNase II activity. These variables were subsequently optimized, resulting in a refined medium formulation. Comparative analysis demonstrated that the optimized formulation achieved a substantial increase in enzyme activity relative to the unoptimized medium. The findings confirm that systematic optimization of culture medium is a key strategy for improving the efficiency of therapeutic protein expression in microbial systems. This study further illustrates the value of applying statistical approaches in experimental design, as they reduce experimental complexity while enhancing production outcomes. Beyond the case of ASNase, the insights gained are broadly applicable to the biotechnological production of other recombinant proteins with pharmaceutical relevance.

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Plant Growth-Promoting Bacteria as Biocontrol Agents: Molecular and Physiological Responses in Fusarium-Infected Tomato

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This study evaluated the biocontrol potential of six bacterial isolates against *Fusarium oxysporum* infection in tomato (*Lycopersicon esculentum*) plants through comprehensive physiological and molecular analyses. Tomato seeds were sterilized and grown in sterile peat:vermiculite:perlite mixture, followed by bacterial inoculation and subsequent Fusarium challenge. Initial screening based on plant growth parameters and disease resistance identified four promising candidates: IB18, IB22, NY1, and NY3, with IB18 (*Bacillus cereus*) demonstrating superior protective efficacy.

Physiological analyses revealed that bacterial treatments significantly enhanced plant defense mechanisms. Chlorophyll content analysis showed increased carotenoid levels in all bacterial treatments compared to controls, with IB18 showing the highest pigment enhancement. Lipid peroxidation assays demonstrated reduced oxidative stress in bacterial-treated plants, particularly in IB18 groups under Fusarium infection. Antioxidant enzyme activities (APX and CAT) were significantly elevated in IB18 and NY1 treatments, indicating enhanced cellular protection mechanisms.

Molecular studies using real-time PCR analysis of defense-related genes (WRKY6 and PR1) confirmed IB18's superior biocontrol activity. The upregulation of these genes suggests activation of systemic acquired resistance (SAR) and salicylic acid pathways[1]. Results demonstrate that IB18 provides effective bio-protection against Fusarium through coordinated activation of physiological and molecular defense mechanisms, making it a promising candidate for sustainable disease management in tomato cultivation. The integrated defense response suggests potential applications in biological control strategies for agricultural systems.

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Investigation of Psyllium Husk Incorporated Alginate Beads as a Promising Platform for Intestinal Drug Delivery

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Conventional drug delivery systems have common challenges such as low bioavailability and poor compatibility.[1] Nevertheless, biopolymer-based platforms reacting to pH variations in the body offer an appealing option for these challenges, while presenting regulated release.[2,3] pH-responsive biopolymers such as alginate (ALG), κ-carrageenan (κ-CAR), carboxymethyl cellulose (CMC), and psyllium husk (PsyH) can be perfect for intestine-targeting release.[4-6]

In the present study, a PsyH incorporated ALG/CMC/κ-CAR system (ALG/CMC/κ-CAR/PsyH) were developed and its potential utilization as a pH responsive drug release platform in simulated intestinal fluid were investigated. To that aim, ternary ALG/CMC/κ-CAR and quaternary ALG/CMC/κ-CAR/PsyH beads were prepared by $CaCl_2$ and Chitosan (CHI) crosslinking via ionotropic gelation. ALG, CMC, κ-CAR, and PsyH solutions in different predetermined concentrations varying in different ratios were mixed and dropped into gelation bath of $CaCl_2$. The resulted beads were subsequently coated by CHI by dipping up to 24 hours. The stability and swelling behaviour of the ALG/CMC/κ-CAR/PsyH beads were investigated in pH conditions mimicking the intestinal (pH: 7.4) and physiological body fluids (pH: 7.4) at 37°C. It is observed that ALG/CMC/κ-CAR beads are stable and have pH-responsive swelling properties at least five hours. Besides, it is found that although the overall stability of the beads decreases by increasing the CHI dipping time due to polyelectrolyte complex formation, increasing the $CaCl_2$ crosslinking time enhances their initial stability.

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Development of Isothermal Nucleic Acid Amplification Methods at Room Temperature

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Nucleic acid testing for infectious diseases at the point of care is beginning to enter clinical practice in developed and developing countries.[1] In this field, polymerase chain reaction-based systems are still relatively complex and expensive. The detection of infectious diseases with nucleic acid amplification tests (NAATs) is only carried out in central laboratories equipped with high-level devices and operated by skilled personnel in this field.[1] Developing countries have limited financial resources and cannot implement commercially available complex NAAT systems.[1,2] Point-of-care NAAT systems can provide access to the diagnostic methods needed in regions with low resources and high disease rates.[1,2] The difficulties, costs and complexity of implementing tests can be reduced by using a real-time monitorable isothermal amplification method. A functional protein called Protein 2 (P2) of M13 bacteriophages takes a role in phage replication by nicking only the single strand of double-stranded DNA on a specific sequence in the f1 replication origin.[3,4] The expression of the P2 occurs at 37°C by phage infected host bacterial cells. This suggests that the P2 can nick the DNA strand under similar temperatures or lower conditions at in vitro. Various NAAT methods have been developed using enzymes that can nick on a single strand of DNA. However, the high operating temperatures of these enzymes and the requirement of heating equipment increase the cost and limit the applicability of the method. Also, previous studies have not more information about the biochemical properties and enzymatic activity of P2. In this study, it is expected that developing the new isothermal nucleic acid amplification method using P2 at room temperature by designing a pathogen-specific primer pair and obtaining more data on P2. This study was supported by the Turkish Scientific and Technical Research Council, TUBITAK “2244-Industrial Ph.D. Fellowship Program” (Project No: 119C036) & Atabay Pharmaceuticals and Fine Chemicals collabration, “2214-A International Research Fellowship Program for Ph.D. Students” and by Health Institutes of Türkiye (TUSEB), TUSEB Group D R&D Project Call (Project No: 32529).

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Computational Approaches to Study Liquid-Phase Separation and Enantioseparation Processes in Pharmaceutical and Biomedical Sciences

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In modern pharmaceutical and biomedical research, molecular modeling represents a useful tool to explore processes and their mechanistic bases at the molecular level. Integrating experimental and virtual analysis is a fruitful approach to study ligand-receptor interaction in chemical, biochemical and biological environments.[1,2] Computational techniques have also become a useful tool in separation and enantioseparation science to model (chiral) selectors and related complexes with various chiral and achiral selectands at the molecular level. In the last decades, (enantio)separation science has advanced by using multidisciplinary and computational-based approaches to disclose the molecular bases of mechanisms and related noncovalent interactions controlling selector-selectand affinity and (enantio)selection.

In this presentation, up-to-date results emerging from experiments and theoretical analyses performed in our laboratories to explain the molecular bases of analytical (enantio)selection will be summarized. In our studies, theoretical and computational analysis has been used with the aim of explaining experimental processes but, in turn, experimental data have been exploited to validate theoretical tools and approaches. In this regard, chromatography and capillary electrophoresis proved to be very sensitive to detect weak noncovalent interactions compared to other analytical techniques. Indeed, these separation techniques are based on reiterative adsorption-desorption or complexation-decomplexation steps which amplify the effect of noncovalent interactions and, consequently, their detectability. On this basis, interesting results were obtained in the field of pharmaceutical and biomedical analysis, among them the first baseline enantioseparation of deuterated isotopomers,[3] the first enantioseparation of commendamide,[4] and the identification of dispersion forces as contributors to the enantioseparation of tetramisole through acetylated β-cyclodextrins.[5]

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Functionalization of Gold Nanoparticles and Their Effects on Neuronal Viability

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This study aimed to synthesize gold nanoparticles (AuNPs), perform surface functionalization, and evaluate their neurocompatibility in primary hippocampal neuron cultures for hydrogel-based applications. Core AuNPs (~20 nm, AuNP20) were initially synthesized via a modified Turkevich method and stabilized with citrate, yielding highly monodisperse nanoparticles[1] .Using a seed-mediated growth approach, intermediate-sized AuNPs (~50 nm, AuNP50) were produced[2]. Subsequent surface functionalization with polyethyleneimine (PEI) resulted in an average particle size of ~57 nm (AuNP57-PEI)[3]. Nanoparticle characterization was performed using dynamic light scattering (DLS) to determine particle size, polydispersity index (PDI), and zeta potential. Citrate-stabilized AuNP20 and AuNP50 exhibited negative zeta potential, whereas PEI-coated AuNPs displayed positive surface charge. UV-Vis spectroscopy demonstrated a red shift in surface plasmon resonance (SPR) peaks with increasing particle size. Scanning electron microscopy (SEM) confirmed monodispersity and stability, while Fourier-transform infrared spectroscopy (FTIR) verified chemical modifications corresponding to citrate stabilization and PEI functionalization[4-5-6]. In primary hippocampal neuron cultures, nanoparticles were applied at varying doses (5–100 µL) two hours post-incubation, and cells were monitored at 2, 24, 48, and 72 hours. Low-dose treatments (5 µL) caused no significant differences relative to control, whereas medium doses (10 µL) of AuNP50 citrate induced detectable effects at 24 hours. PEI-coated nanoparticles exhibited dose-dependent toxicity at higher concentrations (75 µL), while AuNP50 citrate remained non-toxic. Overall, cell viability at 24 hours exceeded 70%, consistent with ISO standards, indicating high neurocompatibility [7]. In conclusion, gold nanoparticles with target sizes of 20, 50, and 57 nm were successfully synthesized and surface-functionalized. The nanoparticles exhibited high monodispersity, stability, and favorable neurocompatibility, supporting their suitability for hydrogel formulations and future neuroengineering applications.

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Laser-Printed Microfluidic Paper-Based Analytical Devices (LP-µPAD): Versatile Platforms for Environmental and Clinical Sensing

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Microfluidic paper-based analytical devices (µPADs) have gained substantial attention as low-cost, portable, and disposable platforms for on-site diagnostics. Among the various fabrication strategies, laser printing (LP) has emerged as a promising approach, offering high resolution, reproducibility, and scalability without the need for complex instrumentation. This work highlights two recent studies demonstrating the versatility of laser-printed µPADs (LP-µPADs) in addressing critical challenges in both environmental monitoring and clinical diagnostics.

The first example, an LP-µPAD was engineered for the detection of the pesticide atrazine in water using gold and silver nanoparticles as colorimetric reporters[1]. The device combined optimized paper porosity, channel thickness, and toner-induced hydrophobic barriers to produce a robust sensing platform. Smartphone-assisted image analysis enabled semi-quantitative detection with limits of detection down to 3.5 µM (AgNPs) and 10.9 µM (AuNPs), along with good recovery from spiked water samples, even under interference from salts and pH variations. This work underscores the potential of LP-µPADs as accessible tools for environmental pollution monitoring.

The second study expanded the scope of LP-µPADs toward biomedical diagnostics by developing a dual-polymer chromogenic sensing system for salivary biomarkers associated with halitosis[2]. Maleic anhydride-grafted polyesters combined with crystal violet dye provided selective and confirmatory detection of biogenic amines in saliva. The device achieved strong linearity ($R^2 > 0.98$), low detection limits (0.43-1.25 µg/mL), rapid response (<5 min), and reliable recovery rates in real saliva samples, thereby overcoming the challenges of background interference and pH variability.

Together, these two studies establish LP-µPADs as versatile platforms capable of addressing diverse analytical needs, from pesticide detection in environmental samples to real-time, non-invasive oral diagnostics. Their scalability, affordability, and adaptability pave the way for future expansion into broader clinical and environmental applications.

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Antioxidant Responses of Kosovo Maize Genotypes to PEG-Induced Drought Stress

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Local maize (*Zea mays* L.) genotypes represent an important reservoir of genetic diversity, shaped by long-term adaptation to specific agro-ecological conditions[1]. Characterizing their responses to abiotic stresses such as drought is crucial for breeding programs aimed at enhancing stress resilience. Drought stress severely impairs plant growth and yield, particularly in rain-fed systems. Therefore, investigating the physiological and biochemical responses of local maize genotypes under drought conditions is essential[2]. This study aimed to evaluate the physiological and biochemical responses of five maize genotypes (Kompozit Şeker, Vrelle, Smallushe, Arllat and Suhodoll) under drought stress simulated by polyethylene glycol at concentrations of 10% and 20% over two-week periods. The tolerant genotypes exhibited strong activation of antioxidant defense mechanisms, particularly through increased activities of superoxide dismutase (SOD; EC 1.15.1.1), glutathione reductase (GR; EC 1.6.4.2), ascorbate peroxidase (APX EC 1.11.1.11), and peroxidase (POX; EC 1.11.1.7), as well as elevated levels of total glutathione (GSH), ascorbic acid (AsA), and flavonoids**,** especially under 20% PEG stress at 14th day. However, catalase (CAT; EC 1.11.1.6)) activity decreased in these genotypes, suggesting a possible shift toward alternative antioxidant pathways. In contrast, the sensitive genotypes showed pronounced accumulation of H_2O_2 and TBARS, substantial reductions in protein content, AsA, GSH, and flavonoid levels**,** along with limited enhancement of antioxidant enzyme activity. These results highlight genotype-specific drought responses in maize, emphasizing the relevance of both enzymatic and non-enzymatic antioxidants, in drought tolerance. The superior performance of Vrelle and Smallushe suggests their potential for use in breeding programs targeting drought resilience in maize.

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7.EBAT EURASIA BIOCHEMICAL APPROACHES& TECHNOLOGIES CONGRESS
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Synthesis of New Heterocyclic Compounds by Multicomponent Reactions and investigation of Their Anticancer Activities

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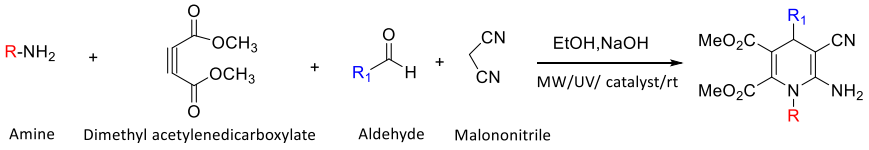
Multicomponent reactions have an important place among other synthesis methods due to their high yields, easy application, applicability to total syntheses with small molecular weights and the existence of extensive literature on this subject [1].

Reactions that use more than two starting materials are called "multicomponent reactions" (MCRs). MCRs reactions have recently offered a new approach to the synthesis of large and complex reactions in practice [2]. With these reactions, three or more starting compounds are combined in a single step to produce new possible biologically active products.

As a result of the one-pot 4-component reaction in the presence of aliphatic and aromatic amines and aldehydes with dimethyl acetylenedicarboxylate and malononitrile using known methods in the literature [3], new heterocyclic molecules with good anticancer activity potential were synthesized.



Scheme 1: General synthesis scheme

Keywords: Anticancer activity, *in vitro* study, multicomponent reactions.

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Affinity-Driven Gadobutrol Enhanced Trp-Isa Functionalized MNPs for Biological Exploration in U-87 Cell Lines

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Glioblastoma remains one of the most aggressive and treatment-resistant brain tumors, necessitating innovative approaches that integrate diagnostic and therapeutic functionalities.[1,2] In this study, we developed multifunctional magnetic nanoparticles (MNPs) through the conjugation of three distinct ligands: the amino acid tryptophan (Trp), the indole-based compound isatin, and the clinically approved contrast agent gadobutrol. Each molecule was selected for its unique role in enhancing nanoparticle performance, Trp for its natural affinity to brain components, isatin for its anti-tumor bioactivity heterocyclic scaffold, and gadobutrol for its established magnetic resonance imaging (MRI) contrast properties. The conjugation was achieved either individually or in combination, enabling the creation of versatile nanoplatforms with complementary functionalities. The synthesized MNPs were characterized using SEM-EDS, FTIR, XPS, and DLS techniques. In vitro evaluations were performed on U-87 glioblastoma cells to examine cellular adhesion, viability, and radiosensitization potential. Comparative results revealed that MNPs functionalized with combined ligands demonstrated superior cellular uptake and enhanced radiosensitizing efficiency compared to single-ligand formulations. The MNPs, with an average size of 100-110 nm, exhibited no cytotoxicity at concentration up to 10 µg/mL. Furthermore, their radiosensitizing effect resulted in a 60 % reduction in cell viability. Taken together, this work emphasizes the value of rational ligand selection for the design of multifunctional nanoplatforms. The combined use of Trp, isatin, and gadobutrol provides a promising pathway toward advanced glioblastoma management. These findings contribute to the growing field of nanomedicine, highlighting the potential of functionalized MNPs for glioblastoma therapy and broader biomedical applications.

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From Design to Validation: Analytical Performance of a Portable Retinol Binding Protein Biosensor

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This study presents the analytical validation of a portable electrochemical biosensor developed for the detection of Retinol Binding Protein (RBP). The biosensor was fabricated on a screen-printed carbon electrode (SPCE) surface modified with 3-glycidoxypropyl trimethoxysilane (GPTMS) to improve biomolecule immobilization and signal stability.[1] Analytical performance was evaluated in terms of repeatability, reproducibility, stability, selectivity, and applicability to real samples. The biosensor demonstrated high precision with relative standard deviations below 5% and maintained over 90% of its initial response after several weeks of storage. Selectivity studies showed minimal interference from abundant serum proteins such as albumin. Furthermore, analysis of artificial serum samples showed strong agreement with ELISA reference results, confirming the reliability of the proposed system. Overall, these findings indicate that the GPTMS-based portable biosensor provides a stable, reproducible, and cost-effective platform for the electrochemical quantification of Retinol Binding Protein in biological samples.[2-3]

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Chronic Statin Administration Re-orchestrates Metabolic Activity in Breast Cancer Cell Lines

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Statins are beneficial in lowering the risk of cardiovascular disease and have been suggested as a first-line medication for the prevention in clinical guidelines for the treatment of cardiovascular disease. Statins exerts the activity via inhibiting HMG-CoA reductase (HMGR) enzyme functions. Statins influence gene expression of pro-inflammatory genes in the innate and adaptive immune systems, as well as in non-haematopoietic cells, such as endothelial cells and fibroblasts[1]. Besides, short term usage of statins has been reported to exert anti-cancer properties against several cancer types[2]. On the other hand, knowing the fact that hyperlipidemic drugs were administered chronically at least 6 months on in clinical applications; typically, prescribed to patient for life-long usage. Long term usage of drugs very likely generates acquired or multi drug resistance which may reprogram the metabolism. Individual tolerance differences, possessing different genetic backgrounds, SNPs and epigenetic arrangements, and also life styles can easily cause odd outcomes of drug regimens. Especially knowing the fact that aging out brings up several different diseases such as cancer, people who regularly under medication for long term can be under risk of developing drug resistance.

In this study, we generated statin resistant breast cancer lines. For this, MCF7 and MDAMB231 cells were chronically exposed to atorvastatin/rosuvastatin for 6 months in different intervals of drug exposure. Proliferative characteristics of the statin resistant cells were tested. Resistant cells demonstrated high IC_{50} values against doxorubicin and vinblastine, typical chemotherapeutics used in clinic. Several inflammatory markers were altered in statin resistant cell lines. This re-orchestration of metabolic activities included increased ABCG2 protein levels which may be an explanation to multidrug resistance and elevated HIF1a, a prominent hypoxia marker indicates vascularization in metastatic tumors.

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Evaluation of Synergistic Effects of Traditional Medicinal Plants on Antioxidant and Antimicrobial Properties

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Plants with therapeutic properties or beneficial pharmacological effects on the human body are often referred to as medicinal plants. Medicinal plants have been used to treat chronic diseases (cancer, diabetes, neurodegenerative diseases) since ancient times.[1] These plants naturally synthesize and accumulate secondary metabolites such as alkaloids, sterols, terpenes, flavonoids, saponins, and glycosides.[1] For example, quercetin, one of the most frequently studied flavonoids, shows various biological and health-promoting effects such as anticancer, hepatoprotective, antidiabetic, anti-inflammatory, and antibacterial activities.[2] The project scope was determined as using the properties of medicinal plants in the health and pharmaceutical sectors by evaluating them through synergistic effects. Judging by the similarities in their traditional uses, *Equisetum arvense* (horsetail), *Urtica dioica* (stinging nettle), *Thymus vulgaris* (thyme), and *Cotinus coggygria Scop.* (smoke tree) were selected. Among the people, these plants are used in the disinfection of wounds, in the treatment of infections, and inflammatory diseases. Thyme and smoke tree are known for their strong antiseptic and antimicrobial properties. Horsetail, thyme, stinging nettle, and smoke tree are traditionally used on the skin and wounds for skin diseases, wounds, and inflammations.[3] It will provide alternative solutions for the health sector by evaluating the combined effect of these features mentioned with examples.

Total phenol determination was performed to measure the amount of phenolic compounds in plant extracts. Plant extracts' antioxidant capacity was measured with the antioxidant activity test to determine how much phenolic compounds and other antioxidant substances prevent cellular damage by fighting free radicals. To determine whether the compounds contained in the plants are effective against microorganisms, antimicrobial activity was assessed using the disk diffusion method. In this method, the zone diameters formed by extracts from each plant and their combinations on the Petri dish were evaluated according to standards determined by the European Antimicrobial Susceptibility Testing Committee, and the optimum ratio was identified. Since the selected plants can be advantageous on injured skin surfaces, surgical interventions, and the treatment of diseases requiring first aid, evaluating, identifying, and using the synergistic effect is important. As a result of evaluating four plants and their combinations, these tests offer an important research area that can lead to the development of more effective and targeted treatments.

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Antiproliferative Activity of Quinazoline-Based Chiral Thioureas on MCF-7 and HT-29 Cancer Cell Lines

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Breast cancer is one of the most frequently diagnosed malignancies among women worldwide. The high toxicity and limited selectivity of conventional chemotherapeutic agents underscore the need for more effective and targeted therapeutic strategies.[1] In this study, a series of quinazoline-based chiral thioureas (1a-f) were synthesized starting from natural amino acids *L*-alanine, *L*-valine, and *L*-phenylalanine. The structures of the (1a-f) were determined by NMR, IR, and HRMS techniques, while their optical purities were confirmed through HPLC analysis. The antiproliferative activities of the synthesized chiral thioureas were evaluated against MCF-7 (breast cancer) and HT-29 (colon cancer) cell lines. Among the tested compounds, the *L*-alanine derived 1a exhibited the most potent cytotoxic effect against MCF-7 cells (IC_{50} 0.65 µM), demonstrating stronger antiproliferative activity compared to carboplatin (7.77 µM) and docetaxel (12.65 µM). On the other hand, compound 1c exhibited the highest cytotoxic effect against the HT-29 cell line (IC_{50} 30.10 µM). Notably, 1a demonstrates high cytotoxicity against cancer cells while potentially exerting minimal effects on healthy tissues. As a result, 1a represents a promising candidate for further preclinical evaluation, particularly in the context of MCF-7 breast cancer cells, due to its superior antiproliferative efficacy.

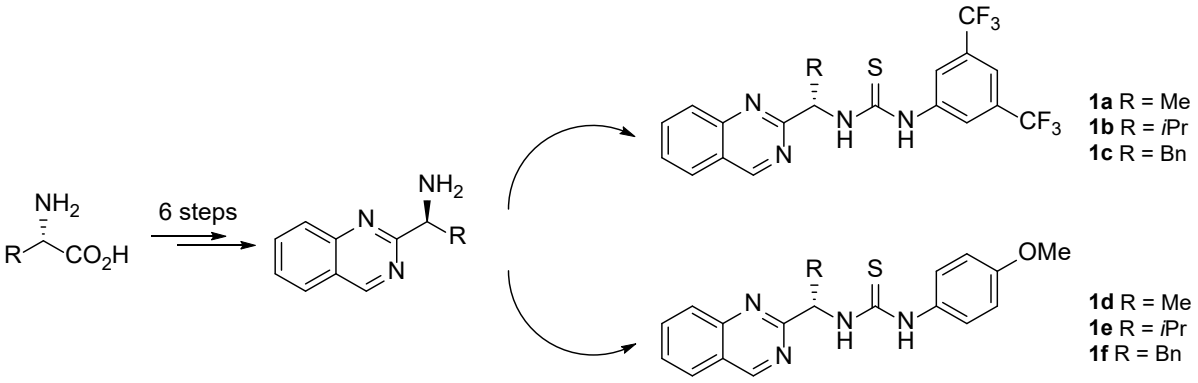

Figure 1. Structures of the quinazoline derived chiral thioureas (**1a-f**)

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Synergistic Cytotoxicity of Doxorubicin and Phenylboronic Acid in GelMA-Encapsulated Tumor Spheroids

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The therapeutic management of tumors remains a major challenge in oncology due to limited drug efficacy, a problem further exacerbated by the heterogeneous tumor microenvironment (TME), which is composed of diverse cell populations within a dense extracellular matrix. Tumor spheroids cultured in 3D systems more accurately recapitulate native tumor tissues, preserving key cell–cell and cell–matrix interactions, and providing a physiologically relevant platform to evaluate drug delivery, toxicity, and therapeutic response.[1]Among chemotherapeutic agents, the anthracycline derivative doxorubicin (DOX) is particularly effective and frequently employed in clinical settings.[2] In parallel, boron-containing compounds have gained attention for their potential anticancer applications, with phenylboronic acid (PBA) being the most potent boronic acid due to its ability to inhibit serine proteases, highlighting its promise as a complementary therapeutic agent.[3] In this study, tumor spheroids from five cancer cell lines (MCF-7, A549, SK-N-BE, SK-MEL-30, HT-29) were encapsulated in GelMA hydrogels to establish a 3D model for evaluating spheroid–drug interactions. Morphological characterization and cytotoxicity assays were performed under both 2D and 3D conditions. Co-administration of PBA and DOX showed synergistic cytotoxicity against 2D melanoma cells, with PBA enhancing DOX efficacy. After 12 days, spheroids showed variable density, shape, and size. DOX treatment in 2D cultures significantly reduced cell viability (IC_{50}: 0.01–3 µM), whereas 3D spheroids exhibited decreased sensitivity. This resistance is attributed to hydrogel encapsulation, which limits drug penetration due to a dense matrix. These findings indicate potential of PBA as a chemotherapeutic adjuvant in both 2D and 3D in vitro conditions.

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Synthesis of Benzene-1,4-diboronic Acid and Investigation of its Anticancer Potential

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Benzene-1,4-diboronic acid (BDBA) represents a promising organoboron compound has versatile applications in material science and medicinal chemistry.[1] In this study, BDBA was synthesized via selective borylation of a halogenated benzene precursor under optimized reaction conditions, and its structure and purity were characterized using ^{1}H, ^{13}C and elemental analysis. The anti-cancer effect of BDBA was evaluated *in vitro* against MDA-MB-231, MCF-7, A549, Panc-1, Mec-1, SK-MEL-30, Saos-2 cell lines. L929 mouse fibroblasts were used as control cells. MTT assay revealed that BDBA had IC_{50} value of 8.18 mM for L929 cells whereas it had IC_{90} value of 5.17, 5.29, 7.17 and 6.12 mM for MCF-7, MDA-MB-231, Mec-1 and Saos-2 cell lines, respectively. It was also revealed that IC_{50} value for SK-MEL-30 cells was 0.78 mM. Further studies were conducted with SK-MEL-30 cells, considering the effectivity of BDBA. Anticancer potential of BDBA was also investigated by generation of reactive oxygen species (ROS) by SK-MEL-30 melanoma cells. It was found that treatment with 6.4 mM BDBA significantly reduced ROS generation. Additionally, treatment of SK-MEL-30 cells with 6.4 mM BDBA led to significant increase of expression of apoptotic marker *BAX* and significant decrease of anti-apoptotic marker *BCL2*. These findings suggest that the potential of BDBA as a versatile chemotherapeutic adjuvant, providing a foundation for future studies exploring combination therapy strategies in lung, pancreatic, and skin cancer treatment. Further studies exploring its in vivo effects can further explore use of boron compounds in cancer treatment strategies.

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Investigation of *In Vitro* Efficacy of Novel Benzoxazaborine Derivatives as PARP Inhibitors

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Clinically, PARP inhibition is used to treat cancer. Additionally, these inhibitors may act as sensitizers, which could boost the efficacy of anticancer treatments like chemotherapy drugs and radiation therapy. PARP inhibitors are also employed as single-agent therapies for patients with BRCA-deficient breast, ovarian, or prostate cancer because they induce synthetic lethality in homologous recombination-dysfunction cells.[1] Because of their vacant p-orbital, which takes lone pair electrons (Lewis Base) and modifies hybridization, organoboron compounds can be characterized as Lewis acids. The number of functional groups, including boronic acid, in medicinal chemistry has increased because of this special characteristic, which makes organoboron compounds desirable therapeutic candidates.[2] Since boronic acids and relevant amino acids like serine create tertiary complexes, boron-containing heterocyclic rigid structures enhance drug-enzyme interactions. Considering this, we developed a heterocyclic library containing boron that comprises 21 derivatives of benzoxazaborinin, with yields varying from 20% to 99%. These substances have been examined for their ability to inhibit the PARP enzyme. Based on initial data, 4 compounds were selected and their effectivity was investigated *in vitro*. MCF-7, MDA-MB-231 were used as breast cancer cell lines whereas MCF-10A cells were used as control. Anticancer potential of the compounds was investigated with cytotoxicity assay, production of reactive oxygen species and gene expression analysis. Molecule 11A exhibited good potency against MDA-MB-231 (71μM) and MCF-7 (100 μM). Controversially, it showed less potency for MCF-10A, the healthy breast cell line (276μM). Additionally, chromosome aberration test was performed to assess safety of the selected molecules. In healthy blood lymphocytes, the selected molecules did not result in chromosomal abnormalities. Overall, novel benzoxazaborinin derivatives were shown to inhibit breast cancer cells, without causing cytotoxicity and genotoxicity on normal cells.

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Selective Adsorption of Fluoxetine from Aqueous Solutions Using Glutamic Acid Incorporated Microbeads

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The widespread presence of pharmaceutical contaminants in water poses serious risks to both the environment and public health. Among these contaminants, the widely used antidepressant fluoxetine hydrochloride (Prozac) is frequently detected in wastewater, highlighting the need for effective removal strategies[1]. In this study, glutamic acid incorporated microbeads were evaluated as an innovative adsorbent for the selective removal of Prozac from aqueous solutions. Adsorption performance was monitored by UV–Vis spectroscopy, and the effects of initial concentration (25–400 ppm), solution pH (2.1–10), adsorption time (1–120 min), and temperature (4–40°C) were systematically investigated. The modified microbeads exhibited the highest adsorption capacity of 21.85 mg/g at pH 7.4 and reached equilibrium within 30 min at 25 °C. The functional groups present in the glutamic acid incorporated microbeads enhance adsorption efficiency, enabling the effective removal of pharmaceutical contaminants from aqueous solutions. These findings suggest that functionalized microbeads can serve as an effective adsorbent for wastewater treatment, including the removal of other antibiotics, biological molecules, or mineral contaminants such as boron, and future studies will contribute to a deeper understanding of the adsorption mechanism through detailed kinetic and isotherm analyses.

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Potential Applications of Anthocyanins from a Green Chemistry and Sustainability Perspective

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Anthocyanins, natural pigments belonging to the flavonoid class that give red, purple, and blue colors to plants, also attract attention due to their strong biological activities. In today's world, where developing solutions in line with sustainability and green chemistry principles is becoming increasingly important, anthocyanins are drawing growing interest from researchers with their potential applications.[1] Identified under the code E163 as a natural colorant and functional ingredient in the food industry, anthocyanins yield positive results for sustainable production when extracted from food waste using environmentally friendly solvents.[2] In addition, they find application in smart food packaging as pH-sensitive biosensor materials, which both enhance food safety and contribute to the reduction of plastic waste.[3] Studies in the health field indicate that anthocyanins may provide protective effects against diabetes, neurological disorders, and cardiometabolic diseases.[4] Moreover, due to their light-triggered biochemical mechanisms, they offer new alternatives for pharmaceutical innovation in photodynamic cancer therapy. This review addresses both the applications and potential of anthocyanins from a sustainability and green chemistry perspective.

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Determination of Terbutaline with SnO_2 Nanoparticle Modified Carbon Paste

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Terbutaline hemisulfate (THS), a selective beta-2 agonist, is used as a bronchodilator in the treatment of asthma and bronchitis, as well as as an anticonvulsant during preterm labor. Taking beta-2 agonists above a certain dose is considered doping in sports competitions.[1] Therefore, it is important that they are determined sensitively and selectively in short analysis times. In our study, a carbon paste electrode was developed using SnO_2 nanoparticles for the determination of terbutaline hemisulphate (THS). In the research, cyclic voltammetry (CV) and differential pulse voltammetry (DPV) were used as electrochemical methods. Operating conditions such as scanning speed, SnO_2 nanoparticle amount, peak amplitude and pH of the developed SnO_2NP/CPE were optimized. At the end of the experiments scan rate,10 mV/s, 5 percent SnO_2 nanoparticles, 0.05 V peak amplitude and 0.25M pH:4.0 acetate buffer were determined as operating conditions. In our study, the analytical parameters of $SnO2_2$NP/KPE were also determined. The lineer range of the nanobiosensor was 2 µM-50 µM, with a limit of detection (LOD) of 0.55 µM and LOQ of 1.8 µM (figure 1,2). Repeatability was found to be 3%.

The developed nanobiosensor is easy to prepare and can be used directly for the determination of terbutaline in samples without the need for additional separation and extraction processes. It is thought to be suitable for the determination of terbutaline due to its advantages such as good reproducibility, reliability, low cost and short response time.

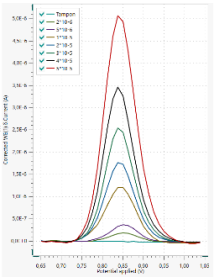

Figure 1. Differential pulse voltammograms of THS at different concentrations (THS concentrations: 2.0, 5.0, 10.0, 20.0, 30.0, 40.0, 50.0 µM and buffer. Electrolyte solution: 0.25 M pH: 4.0 acetate buffer, Scan rate: 10 mV/s, SnO2: 5%, t: 25^{0}C)

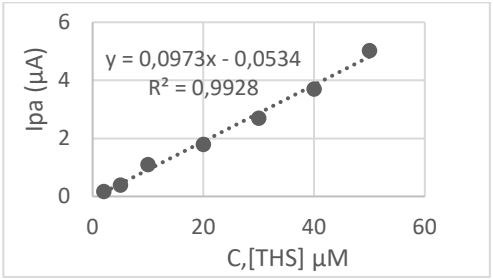

Figure 2. Calibration graph

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Determination of The Phytochemical Properties of *Melissa officinalis*, *Hibiscus sabdariffa*, *Calendula officinalis*, *Althaea officinalis* ve *Salix babylonicae*

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In traditional medicine, secondary metabolites synthesized from several plant parts (root, leaf, fruit, seed, etc.), can provide unique properties such as adapting to environmental stress conditions, participating in signal transmission, exhibiting allelopathic effects, provide protection against ultraviolet (UV) radiation, participate as cofactors in enzymatic reactions, repel pathogens, and defend against herbivores [1]. In addition to these, they also have many benefits for human health with their antipyretic, diuretic, wound healing, analgesic, antimalarial, anti-rheumatic, and anti-inflammatory effects. The synthesized metabolites are the subject of intensive scientific research due to their antioxidant, antimicrobial, anti-inflammatory, anticancer, and antihyperglycemic activities [2].

Metabolites obtained from plants stand out due to their eco-friendly nature compared to chemicals. These metabolites can be used as therapeutic agents, their ability to increase efficiency, their easy availability in terms of raw materials, and their reduction in processing costs. Besides, the diversity of metabolites obtained from plants under changing stress conditions has led to a significant increase in their use in fields such as medicine, genetics, and heredity [3].

The aim of this study is to evaluate the antioxidant and antimicrobial activities of extracts from *Melissa officinalis*, *Hibiscus sabdariffa*, *Calendula officinalis*, *Althaea officinalis*, and *Salix babylonica* species from the Aegean Region. After collecting and drying the plant samples, extracts were prepared using different solvents (water, ethanol, and methanol). Antioxidant activity was determined using total phenolic (TPC) and total flavonoid (TFC) content determinations and DPPH (2,2-diphenyl-1-picrylhydrazil) and ABTS (2,2'-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid)) radical scavenging tests. The antimicrobial activity was measured by the disk diffusion method with against *E. coli*, *S. aureus*, *C. albicans*, and *K. pneumoniae* strains.

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Purification of Lactoperoxidase from Goat Milk by Hydroxamic Acid-Based Affinity Chromatography and Determination of Its Antibacterial Activity

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Lactoperoxidase (LPO; E.C.1.11.1.7) is a heme peroxidase covalently bound to protein. LPO is found mostly in the exocrine glands of mammals, including humans, buffalo, goats, cows, camels, and mammary tissue,[1] saliva and tears,[2] and respiratory mucosal secretions.[3] LPO, with its broad antimicrobial properties, is an important component of the innate immune system (lactoperoxidase system, LPS), and its widespread use in the food and chemical industries and the aim of developing potential application areas of the enzyme have increased interest in enzyme purification studies.[4] However, most purification methods in the literature are multistep and require high costs and long processing times. This has increased the need for practical, low-cost, and high-yield alternative purification techniques. In this context, the aim of the study was to purify the LPO enzyme from goat milk in a single step using the affinity gel synthesized using a hydroxamic acid derivative ligand and to investigate the antibacterial effect of LPS catalyzed by the obtained enzyme on the pathogens *Klebsiella pneumoniae* ATTC 700603 and *Escherichia coli* ATTC 35218. In this study, an affinity gel was synthesized using 4-amino 3-nitro benzohydroxamic acid as a ligand. The LPO enzyme was purified from goat milk in a single-step by the designed affinity chromatography. The purified enzyme was confirmed by SDS-PAGE and western-blot analyses. The antibacterial effect of the KSCN-H_2O_2-LPO system formed with LPO enzyme was investigated by using the serial dilution technique. Bacterial growth in the wells was evaluated by measuring absorbance at 600 nm with a microplate reader. The lowest concentration at which no growth occurred compared to the control was determined as the MIC value, and the lowest concentration that destroyed the entire bacterial population was determined as the MBC value. According to the obtained data, LPO enzyme was purified in one step with a yield of 65.96% using 4-amino 3-nitro benzohydroxamic acid affinity column. The molecular weight was determined to be approximately 78 kDa by SDS-PAGE and confirmed by western blot. According to the antibacterial results, LPO purified from goat milk showed limited antibacterial activity at low concentrations, but significantly inhibited bacterial growth at 0.5 EU/mL (MIC) and completely suppressed bacterial growth at 5 EU/mL (MBC), exhibiting strong antibacterial activity. In conclusion, this study determined a new affinity ligand for the single-step purification of the LPO enzyme with high efficiency and lower cost, and demonstrated the antibacterial effect of the LPS system.

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A Linear Chain Polymer-Based Enzymatic Biosensor for Enhanced Hydrogen Peroxide Detection in Food Samples

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Hydrogen peroxide (H_2O_2) is widely used in the food industry as an antimicrobial agent for the sterilization and preservation of various products, including milk and fruit juices[1] . While the use of H_2O_2 in food products is beneficial up to a certain level, it can also be present in these products due to contamination from cleaning processes. The resulting high levels can pose significant health risks, damage gastrointestinal cells, and contribute to serious illnesses[2]. Therefore, accurate and rapid quantitative determination of H_2O_2 in foods is crucial for ensuring food safety, preventing adulteration, and maintaining quality control standards. Carbon nanotubes, nanoparticles, graphene and graphene oxides, and polymers are commonly used materials for H_2O_2 determination in electrochemical sensors. Among these, polymeric materials significantly enhance biosensor performance by providing strong stability. Both branched and linear polymeric structures provide researchers with diverse options for biosensor development. Linear-chain polymers, such as polyethylene glycol, polydiacetylene, polydimethylsiloxane, polyaniline and polypyrrole, have been widely used in biosensors due to their tunable properties, biocompatibility, and ability to create stable microenvironments for biomolecules[3]. These versatile materials serve a variety of roles, including flexible substrates, insulating layers, electrodes, and active components, thereby increasing biosensor sensitivity, stability, and detection range. They are quite useful for increasing the efficiency of enzyme immobilization, preventing nonspecific adsorption, and facilitating electron transfer in enzymatic biosensors[4]. In this study, a novel enzymatic biosensor was developed by utilizing the advantages of linear-chain polymers in terms of electrode surface modification for the practical, sensitive, and selective detection of hydrogen peroxide. The biosensor platform leverages the advantageous properties of polymers to provide a stable and fouling-resistant environment, optimizes enzyme immobilization, and achieves high activity, overcoming challenges often encountered in complex food matrices. The results demonstrate the biosensor's ability to sensitively, selectively, and rapidly measure H_2O_2, highlighting its significant potential for practical applications in food quality assessment.

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Investigation of Antioxidant and Wound Healing Effect of Carbon Nano-Structures

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Carbon nanostructures (CNs) are highly promising nanomaterials thanks to their low toxicity, biocompatibility, and unique optical properties, making them highly suitable for a variety of biomedical applications[1]. This study investigates the antioxidant and wound-healing effects of CNs synthesized from Mangifera indica (mango) peels, a non-recyclable agricultural waste rich in phytochemicals and natural antioxidant properties[2]. This approach contributes to the development of sustainable methods for converting agricultural waste into high-value nanomaterials. In this study, mango peels were first extracted using different concentrations of ethanol and water. The total phenolic and flavonoid contents of these extracts were determined using colorimetric methods. Antioxidant activity was assessed using the DPPH method. Extracts with the highest antioxidant capacity were selected for the synthesis of carbon nanodots (CNDs) using the hydrothermal autoclave method. The resulting fluorescent nanoparticles were characterized by various methods. They demonstrated strong fluorescence under UV light, confirming their successful synthesis and promising optical properties.

Following verification of their antioxidant properties and biocompatibility, these CNDs were subjected to in vitro testing to assess their wound healing potential. Our preliminary data confirmed their successful use in vitro applications, highlighting their wound healing properties. This work was supported by the TÜBİTAK 2209-A University Student Research Projects Support Program.

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The Organoselenium Compound, Ebselen, Attenuates Lipopolysaccharide-induced Lung Injury; an Experimental Study

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Ebselen, also known as 2-phenyl-1,2-benzisoselenazol-3(2H)-one, is a selenoorganic chiral compound with antioxidant properties similar to glutathione peroxidase.[1-2] Ebselen has pharmacological importance in the treatment and prevention of various human diseases, such as dementia, tinnitus, cancer, and cardiovascular disorders[3]. However, the role of Ebselen in the pathogenesis of sepsis-induced lung injury is not yet known. Therefore, we aimed to examine the effects of Ebselen on inflammation and oxidative stress in lung tissue in an LPS-induced lung injury model. We established a sepsis-induced rat lung injury model by intraperitoneally injecting 5 mg/kg LPS. Ebselen (5 and 10 mg/kg, orally) was administered to the rats before LPS injection. Histopathological changes in lung tissue were examined using hematoxylin-eosin and Masson trichrome staining. Additionally, immunohistochemical labeling of tumor necrosis factor alpha was performed on lung tissue. Malondialdehyde, glutathione peroxidase, catalase, and superoxide dismutase levels in lung tissue were measured using ELISA. Ebselen treatment was found to attenuate lung injury, suppress tumor necrosis factor alpha immunoreactivity, and reduce oxidative stress in lung tissue. In conclusion, we report that Ebselen may attenuate LPS-induced lung tissue injury.

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Inhibitory Potential of Newly Synthesized Hydrazone Schiff Base and Some Plant Extracts on the Acetylcholinesterase Activity

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Orosanga japonica (Melichar, 1898) (Hemiptera: Ricaniidae) is considered an important pest species in many countries worldwide. This species, which damages many crops, including tea and hazelnuts, the most important agricultural products of the Eastern Black Sea Region, by sucking their sap. It also serves as a vector for some important plant pathogenic fungi [1]. Acetylcholinesterase (AChE) [EC.3.1.1.7] is a key neuronal enzyme that regulates neurotransmission by hydrolyzing the neurotransmitter acetylcholine. Because of this important role in neurotransmission, it is the target of many insecticides [2]. In this study, considering the mechanisms of action of pesticides, the AChE inhibitory effects of newly synthesized N'-[(2-hydroxyphenyl)methylene]-2-(2-phenyl1H-benzimidazol-1-yl)acetohydrazone (H_2L^1) [3], cactus, and cherry laurel leaf aqueous extracts were investigated. The AChE inhibitory activities of edrophonium chloride, donepezil, new compound, cactus, and cherry laurel leaf were determined spectrophotometrically in the presence of acetylthiocholine iodide using the Ellman method [4]. The concentration that halved AChE activity was determined as the IC_{50}. The IC_{50} values for edrophonium chloride, donepezil, new compound, cactus, and cherry laurel leaf were calculated as 2.8±0.6 µM, 19.7±1.9 µM, 10.0±1.4 µM, 26.2±1.8, 240.2±12.1 respectively. Pesticides cause serious environmental and health problems worldwide, and therefore, new compounds that can be used instead of pesticides are being investigated. The new compound and aqueous plant extracts used in this study demonstrated an inhibitory effect on AChE. Regular application of such compounds or plant extracts, which can inactivate AChE, to agricultural fields can inhibit nerve conduction in pests, leading to their death. Compounds that can be alternatives to pesticides in controlling these pests will prevent the loss of many agricultural products, especially tea and hazelnuts, which are commercially important in the region, and will contribute significantly to the national economy.

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Inhibition Effects of Some Novel Aminocyclitols and Their Derivatives on Carbonic Anhydrase Isoenzymes

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Aminocyclitols are amino polyhydroxy cycloalkanes that must contain one hydroxyl group on each of three or more ring atoms in addition to one or several amino groups.[1] Aminocyclitols show a wide variety of biological activities. Thus, they are used as antidiabetic, antibiotic, and antiviral agents.[1] These properties ensure their use in a wide range of clinical and agricultural applications[1]. Carbonic anhydrases (CA) are very important enzymes that maintain pH balance in tissues. They are also effective in biological pathways such as urea synthesis, gluconeogenesis, and lipogenesis, and are effective in physiological and pathological conditions such as edema, Alzheimer's disease, glaucoma, cancer, obesity, epilepsy, and osteoporosis. Therefore, research on their inhibitors is very important.[2] In the present work, we have directed our interest to investigating the inhibitory effects of some 4-aminocyclooctanetriols and their 4-azidocyclooctanetriol derivatives on carbonic anhydrase isoenzymes CA-I and CA-II, which were isolated from human erythrocytes.The results of our work demonstrated that the IC_{50} value of (1*R**,2*S**,3*R**,4*S**)-3-aminocyclooctane-1,2,4-triol[3] on CA-I was 230 nM and the K_i value was 160 nM; the IC_{50} value of (1*R**,2*R**,3*R**,4*S**)-3-azidocyclooctane-1,2,4-triol[4] on CA-II was 866 nM and the K_i value was 15.32 µM. These results demonstrate the very high inhibitory effect of (1*R**,2*S**,3*R**,4*S**)-3-aminocyclooctane-1,2,4-triol and (1*R**,2*R**,3*R**,4*S**)-3-azidocyclooctane-1,2,4-triol used in our work on CA-I and CA-II, suggesting that they are effective active ingredients in the design of new treatments.

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Sensitive Detection of Adiponectin Using 4-MBA-Modified Disposable Electrodes

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Adiponectin is an adipocyte-derived protein that plays a central role in regulating glucose metabolism, lipid oxidation, and inflammation[1]. Its circulating levels are paradoxically reduced in obesity and related metabolic disorders, making it a promising biomarker and therapeutic target[2,3]. This study presents the development of a novel electrochemical biosensor based on modified ITO-PET (indium tin oxide–polyethylene terephthalate) disposable electrodes. Anti-adiponectin antibodies were covalently immobilized onto the electrode surface through 4-mercaptobenzoic acid (4-MBA) modification. Cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS) were employed to monitor and characterize the immobilization process. Optimization was performed for experimental variables including 4-MBA concentration, antibody concentration, and incubation time. The biosensor's analytical performance was evaluated in terms of linear detection range, repeatability, reproducibility, and selectivity. It exhibited a linear response in the range of 0.01 fg/mL to 25 fg/mL. Finally, the developed biosensor was successfully applied for the detection of adiponectin in a commercial human serum sample.

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Electrochemical Detection of Kidney Injury Molecule-1 Using Au/3-Mercaptopropionic Acid Functionalized ITO-PET Based Biosensor

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In this study, an Indium tin oxide- polyethylene terephthalate (ITO-PET) based electrochemical biosensor was developed for the rapid, selective and sensitive determination of Kidney Injury Molecule-1 (KIM-1), an important biomarker in the early diagnosis of acute kidney injury[1]. ITO-PET electrode, known for its conductive and flexible structure[2], was selected as a platform suitable for surface modifications, and by gold coating, both conductivity was increased and a surface suitable for establishing strong bonds with thiol groups was obtained. ITO-PET electrodes were modified with 3-mercaptopropionic acid (3-MPA) after deposition with gold. The Electrochemical impedance spectroscopy (EIS) and Cyclic voltammetry (CV) methods were used to monitor and characterize the immunosensor construction. With the designed biosensor, KIM-1 protein determination at a wide concentration range (0.05 fg/mL-100 fg/mL) could be successfully performed. To evaluate the analytical performance of the developed biosensor, repeatability, reproducibility, selectivity, and applicability to the commercial human serum samples were systematically investigated. Successful results were obtained in the selectivity study of the biosensor with high reproducibility and repeatability capacity.

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Evaluation of Antimicrobial Activities of Prodigiosin Produced Using Alternative Substrates

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Prodigiosin is one of the red pigments produced by microorganisms such as *Serratia* sp., *Pseudomonas* sp., and *Vibrio* sp., and has various biotechnological applications.[1,2] In this study, prodigiosin was produced using the bacterium *Pseudomonas putida* (TMX3) with economical and easily accessible substrates, and the antimicrobial potential of the obtained pigment was evaluated. Different carbon and nitrogen sources such as glucose (Glc), glycerol (Gly), starch (St), and whey (W) were added to the medium at concentrations of 5%, 10%, 20% and 25% to provoke prodigiosin synthesis. The produced pigment was dissolved in methanol (1:1 v/v) and investigated against *Bacillus subtilis* ATCC 6633 and *Proteus vulgaris* ATCC 13315 using disk diffusion, minimum inhibitory concentration (MIC), and minimum bactericidal concentration (MBC) tests. The antibiotic standards were Chloramphenicol (C30) and Tetracycline (TE30).

The results showed that prodigiosin production translated into antimicrobial activity for all substrates and concentrations. The highest efficacy was achieved with prodigiosin produced from W at a 10% concentration. These values were measured as a zone diameter of 20 mm, an MIC of 4 µg/mL, and an MBC of 8 µg/mL for *B. subtilis* ATCC 6633, and a zone diameter of 18 mm, an MIC of 4 µg/mL, and an MBC of 16 µg/mL for *P. vulgaris* ATCC 13315. In contrast, substrate-free prodigiosin showed the lowest efficacy, with a disk zone of 6 mm, MIC of 64 µg/mL, and MBC of 128 µg/mL on *B. subtilis* ATCC 6633 and a disk zone of 4 mm, MIC of 128 µg/mL, and MBC of 128 µg/mL on *P. vulgaris* ATCC 13315. Positive controls (C30 and TE30) confirmed the expected susceptibility profile.

The findings demonstrate that prodigiosin production by *Pseudomonas putida* can be effectively enhanced using low-cost and sustainable substrates. This pigment exhibits significant antimicrobial activity against both Gram-positive and Gram-negative bacteria, demonstrating its potential for biotechnological and pharmaceutical applications.

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Development of Nanofiber-based Transdermal Nicotine Delivery Systems

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Smoking remains one of the leading preventable causes of disease and death, claiming millions of lives annually due to tobacco-related illnesses. It was reported that more than 8 million people die from tobacco and tobacco-related diseases annually.[1] Among smoking cessation methods, nicotine replacement therapies (NRT), particularly nicotine patches, stand out as effective, simple, and user-friendly options. Nicotine patches are also listed on the World Health Organization Model List of Essential Medicines.[2] This study aimed to develop a novel nanofiber-based transdermal nicotine delivery system using a biodegradable polymer. Electrospinning, a versatile and cost-effective technique capable of producing nanofibers with high surface area-to-volume ratios and tunable properties, was employed to fabricate nanofibers.[3] Using the electrospinning technique, NFs were produced, and production parameters were optimized. Following this, characterization experiments were processed, including contact angle measurements, FTIR analysis, and SEM imaging. Subsequently, suitable formulations were selected, followed by nicotine absorption studies on the nanofiber platforms. Finally, *in vitro* nicotine release studies were conducted. In conclusion, we successfully developed a nanofiber-based transdermal nicotine delivery system, which holds promise as an alternative approach for smoking cessation therapies.

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Comparative Evaluation of Salt Tolerance in Sunflower (*Helianthus annuus* L.) Varieties Cultivated in Türkiye

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Salinity is one of the most critical abiotic stress factors limiting plant growth and agricultural productivity worldwide. High salt concentrations disrupt osmotic balance and ion homeostasis, causing oxidative stress, impaired photosynthesis, reduced metabolic activity, and even cell death. Seed germination and early seedling development are particularly sensitive to salinity, and reduced germination under saline conditions negatively affects subsequent growth and yield[1,2]. The Seedling Vigor Index (SVI), which combines germination percentage with seedling growth parameters such as shoot and root length or fresh weight, is widely used to assess seed quality and early seedling performance under stress conditions.

In this study, a comparative evaluation of salt tolerance was conducted on 20 sunflower (*Helianthus annuus* L.) varieties cultivated in Türkiye at the germination stage. Seeds were exposed to five NaCl concentrations (0, 50, 100, 200, and 300 mM), and germination percentage, root and shoot length, total chlorophyll content (SPAD), seedling vigor index, and growth phenotypes were recorded and photographed seven days after sowing. Increasing salinity levels significantly reduced germination and plant growth across all varieties, although notable differences were observed among varieties. Despite the overall reduction in growth parameters, certain varieties consistently exhibited superior performance at all salinity levels, maintaining the highest germination rate, SVI, and plant height. These findings provide valuable information for the selection and breeding of salt-tolerant sunflower varieties and contribute to the development of strategies aimed at improving crop performance under saline conditions.

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Biochemical Responses to Exogenous Nitroxyl (HNO) Application in Tomato (*Solanum lycopersicum* L.) Under Drought Stress

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The global climate crisis is affecting the duration and severity of existing abiotic stresses. Abiotic stresses are becoming a growing problem worldwide, with dwindling agricultural lands a limiting factor for sustainable agriculture. Increasing global population and global environmental problems are the primary pressures on tomato (*Solanum lycopersicum* L.) production. On the other hand, gaseous signaling molecules play an important role in plant growth and development, signal transduction, and responses to biotic and abiotic stresses. Nitroxyl (HNO), the single-electron-reduced and protonated congener of nitric oxide, is a novel nitrogen species with diverse chemical and biological effects.[1] The aim of this study was to examine physiological (root-shoot length, relative water content) and biochemical (chlorophyll content, total protein content, hydrogen peroxide (H_2O_2), lipid peroxidation (TBARs), and some antioxidant enzyme activities (peroxidase (POX), catalase (CAT)) parameters in tomato cultivars (*Solanum lycopersicum* L. cv. Rio Grande and *Solanum lycopersicum* L. cv. Falcon) under drought stress (water scarcity). Our results showed that root-shoot length, relative water content, and chlorophyll content decreased with increasing drought stress in the Falcon cultivar, while TBARs and H_2O_2 contents increased. In addition, when biochemical parameters were examined, it was found that the Rio Grande cultivar was less affected by drought stress and was more drought tolerant than the Falcon cultivar. In contrast, exogenous HNO application eliminated the negative effects of drought stress in the drought-sensitive Falcon cultivar, increasing chlorophyll content, CAT and POX activities. Consequently, exogenous HNO application alleviated the adverse effects of drought stress by reducing ROS production. These results further demonstrate that understanding the multifaceted roles of HNO during plant adaptation to drought stress is vital for the advancement of plant science and agricultural practices.

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Electrochemical Dual-Analyte Detection: A Novel Sensor for Simultaneous Quantification of Kynurenic Acid and Tryptophan

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Alzheimer's disease (AD) is a major global health challenge that demands early diagnosis through reliable biomarkers. Tryptophan (TRP) and its metabolite kynurenic acid (KYNA) have recently emerged as promising indicators, with altered levels observed in early-stage AD. The kynurenine pathway (KP), responsible for TRP metabolism, plays key roles in neural and immune regulation. Dysregulation of KP is linked to various neurological and psychiatric disorders, including Parkinson's, schizophrenia, and depression.[1-3] Given their clinical relevance, accurate detection of TRP and KYNA in biological fluids is essential for disease monitoring and therapeutic evaluation.

In this work, a glassy carbon electrode (GCE) was modified with Mn-doped TiO_2 nanopowders using a drop-casting method, followed by the electropolymerization of L-cysteine (L-Cys), resulting in the formation of the GCE/Mn@TiO_2/*p*(L-Cys) sensor. This dual-modified electrode facilitated simultaneous detection of KYNA and TRP, thereby enhancing analytical efficiency while reducing operational time and costs. The sensor was thoroughly characterized by electrochemical impedance spectroscopy (EIS), cyclic voltammetry (CV), differential pulse voltammetry (DPV), and scanning electron microscopy (SEM). The GCE/Mn@TiO_2/p(L-Cys) sensor exhibited high electroanalytical performance, a wide linear range, and low detection limits for both TRP and KYNA analytes. Additionally, the proposed sensor was tested using commercial human urine and serum samples to assess the practical utility of the detection system.

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Development of Biomedical Products for Oral and Dental Health with Antimicrobial Properties: Integration of Berberine with Styrene-Butadiene Rubber Polymer Presentation

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In the contemporary era, a wide array of materials is employed in the domain of oral and dental health to avert the development of cavities, restore lost teeth, and ensure optimal hygiene. These materials are required to exhibit both biocompatibility and durability. Natural and synthetic polymers are frequently utilized for this purpose; however, natural polymers have limited applications due to their reduced mechanical strength, accelerated biodegradability, and sensitivity to moisture and pH. In consideration of the characteristics above, styrene-butadiene rubber (SBR) is distinguished by its low toxicity, high durability, and flexibility. SBR offers several advantages over natural rubber, including reduced cost, enhanced processability, superior chemical resistance, and increased UV resistance. These properties contribute to the enhanced durability and cost-effectiveness of SBR when compared to natural rubber.[1]

Flavonoids (e.g., quercetin, apigenin) and phenolic compounds (e.g., gallic acid, caffeic acid) found in the Berberis vulgaris plant are widely used in the health sector. Among the bioactive compounds identified, berberine, a flavonoid and alkaloid, merits particular attention due to its noteworthy antimicrobial, antioxidant, and anti-inflammatory properties. Berberine demonstrates notable antimicrobial activity against gram-positive bacteria, such as *Streptococcus* mutans, the bacterium responsible for dental caries. Berberine has been shown to have several mechanisms of action, including the inhibition of bacterial growth, the disruption of cell membranes, and the prevention of biofilm formation. It also exhibits significant potential in reducing dental care. In this study, the flexibility and durability of SBR were combined with the antimicrobial properties of berberine to develop a new biomedical material for oral and dental health.[2]

In this project, *B. vulgaris* extract was integrated into SBR polymer for use in oral and dental health. he synthesized polymer was characterized using a variety of analytical methods, including release testing, FTIR, and SEM. The antimicrobial activity of the polymer against *S. mutans, S. aureus, E. coli, and C. albicans* microorganisms was tested using the disk diffusion method.

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Extraction of Flavonoids and Antimicrobial Peptides from Plant Species Belonging to the Artemisia Genus Growing in Our Geographic Conditions and Evaluation of Their Synergistic Effects

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Pathogenic microorganisms have caused diseases throughout history, leading to the use of plant-based remedies. Advances in basic sciences enabled the extraction of active compounds from plants, resulting in the development of antibiotics; however, their misuse has led to widespread resistance. This has renewed interest in plant-derived antimicrobials, with flavonoids identified as key bioactive agents.[1] Some other molecules occur in living systems, which are called antimicrobial peptides (AMPs), function as a primary immune defense, rapidly eliminating microbes and preventing resistance.[2] Flavonoids and AMPs demonstrate a synergistic antimicrobial effect, whereby their combined activity exceeds the sum of their individual effects, a property that is particularly valuable in reducing the likelihood of resistance development.[3]

In this research, Artemisia species (*A. absinthium, A. annua, A. vulgaris, and A. dracunculus*) were selected for experimental investigation. Roots, stems, leaves, and flowers were extracted with various solvents (n-hexane, methanol, etc.) and purified by gel filtration and ion exchange chromatography. Protein-containing fractions were identified via UV-Vis spectrometry (280 nm), and antimicrobial peptides (AMPs) were tested using the disk diffusion method. Peptide concentrations were determined by the Bradford method, while total flavonoid content was measured separately for each plant part to identify the richest sources. Minimum inhibitory concentrations (MIC) of the extracts were established, and the synergistic antimicrobial effects of flavonoids and AMPs were evaluated. The fact that AMPs had not previously been obtained from these plants and, consequently, the synergistic effect between the AMPs obtained from these plants and flavonoids had not been investigated, constitutes an original contribution.

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Polyamines in Wound Healing: A Review of Metabolic and Clinical Perspectives

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Wound healing is a complex tissue repair mechanism that progresses stepwise through homeostasis, inflammation, proliferation and remodeling. Polyamines (putrescine, spermine, and spermidine) are positively charged molecules that regulate important mechanisms at different stages of this process. They play a role by regulating important mechanisms such as cell proliferation, migration, mitochondrial metabolism, inflammatory response, and matrix remodeling in the different phases of wound healing.[1] In vivo and in vitro studies conducted in recent years clearly demonstrate the supportive effects of spermine and spermidine molecules on epithelial cell migration, cytokine production and energy metabolism. Furthermore, these molecules have been reported to accelerate wound healing and have therapeutic potential. These findings suggest that polyamines are a potential target for the development of therapeutic approaches to wound healing. This review examines the roles of polyamines in wound healing from metabolic and clinical perspectives, drawing on recently published research.

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Synthesis, Characterization, and Bioactivity of Novel Hybrid Isoindole–Thiazole Molecules

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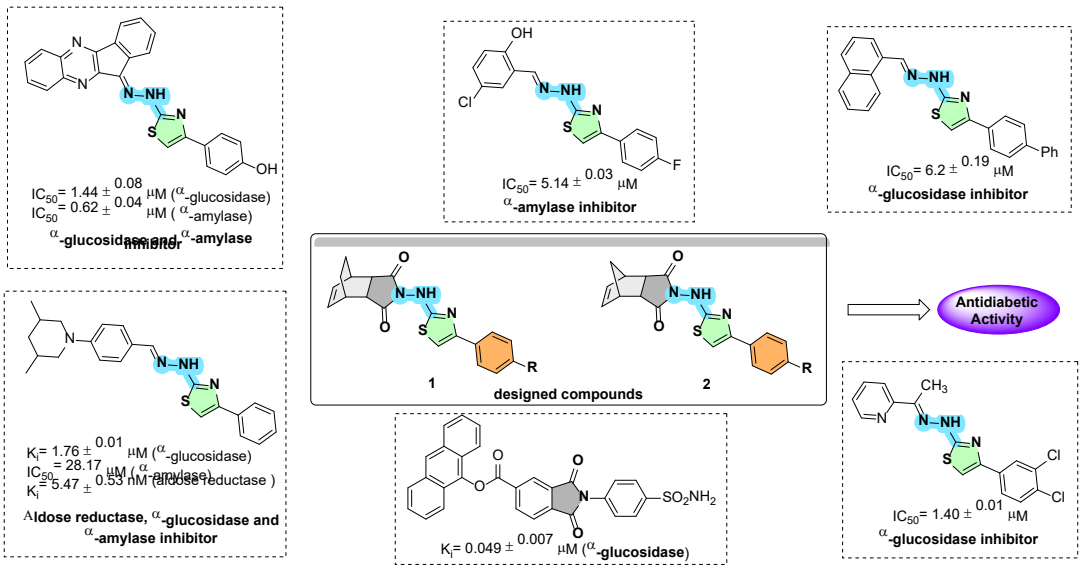
Heterocyclic compounds are versatile structural motifs found in natural products, vitamins, pharmaceuticals, and synthetic bioactive agents.[1] Among them, thiazoles and isoindoles attract attention due to their broad biological potential, including anticancer, anticonvulsant, antibacterial, and particularly antidiabetic effects.[2-3] Molecular hybridization has recently emerged as a promising strategy in drug discovery, enabling the combination of multiple pharmacophores within a single scaffold to achieve synergistic biological activity and multi-target interactions.[4] In this study, a novel series of isoindole–thiazole hybrid molecules (**1** and **2**) was synthesized. The synthesized compounds were characterized using ^{1}H NMR, ^{13}C NMR, FTIR, and HRMS techniques. Their antidiabetic potential was evaluated, and several derivatives exhibited promising inhibitory activity, suggesting that these new hybrids may serve as potential candidates for further pharmacological development.



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Phytochemical Characterization and Cytotoxic Evaluation of *Arum Italicum* Extracts: Potential Protective Effects Against Skin and Liver Cancer-Related Oxidative Damage

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Arum Italicum, a member of the Araceae family, is known to be toxic in its fresh form. However, after drying or heat treatment, it has been widely used in folk medicine for therapeutic purposes, particularly in the treatment of various skin and liver disorders.[1,2] In this study, the phytochemical composition, antioxidant capacity, and cytotoxic effects of *A. Italicum* extracts were investigated, with a focus on their potential protective roles against oxidative stress and cellular damage associated with skin and liver-related pathologies.

Leaves and tubers of *A. Italicum* collected from the Western Thrace region of Greece were extracted using the maceration method with 70% ethanol for three days. The resulting crude extracts were fractionated using a liquid-liquid extraction technique. The phenolic profiles of all extracts obtained were characterized using LC-MS/MS after acid hydrolysis with 2 M HCl to release glycosylated phenolic compounds. The antioxidant capacity of the extracts was evaluated through the DPPH radical scavenging assay. Cytotoxic effects were assessed via the MTT assay on Hep3B and SK-MEL-30 cancer cell lines, with healthy AML12 and HaCaT cells included for comparison. Ethyl acetate fractions from both tuber and leaf extracts exhibited strong antioxidant activity, consistent with their high phenolic content. These fractions also showed selective cytotoxicity, reducing the viability of cancer cells without affecting healthy cell lines. Based on these results, the ethyl acetate fractions were evaluated for their protective effects against hydrogen peroxide (H_2O_2) induced oxidative DNA damage in healthy cells and for possible DNA repair activity in cancer cells using 8-Hydroxy-2'-deoxyguanosine (8-OHdG) ELISA Kit. The tuber ethyl acetate fraction exhibited both protective and reparative effects.

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Effects of Olive Leaf Powder Addition on the Quality Parameters of Virgin Olive Oil

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The quality of olive oil varies depending on several factors, including the olive cultivar, climatic conditions of cultivation, geographical location, harvest period, transportation of the olives, oil extraction process, and storage conditions.[1,2] Olive leaves added to olive oil also constitute one of the factors influencing oil quality. In modern production facilities, olive leaves are considered impurities and therefore removed. In the past, these removed leaves were utilized solely as animal feed. However, due to their content of phenolic compounds and phytochemical constituents, olive leaves possess significant properties such as antioxidant, antimicrobial, anticarcinogenic, and antiviral activities. In this study, olive leaves of the Karamani and Gemlik cultivars, collected from olive trees grown in Hatay, were dried and ground, then added to extra virgin olive oil (EVOO). The mixtures were subjected to ultrasonic treatment for 1.5 hours (G1 and K1) and 5 hours (G2 and K2), followed by filtration. The extract subjected to 5 hours of ultrasonic treatment was allowed to stand for 24 hours before filtration. The quality characteristics of the olive oils, both treated and untreated with olive leaves, were investigated in terms of parameters such as fatty acid composition, free fatty acid content, peroxide value, and absorbance at 232 and 270 nm. It was determined that the olive leaf treatment did not affect the fatty acid composition of the olive oil but did alter the other parameters (Table 1).

Table 1. Quality parameters of olive oil treated with olive leaves

ANALYSIS NAME	G1	G2	K1	K2	EVOO	VALID VALUES
Free Fatty Acid	1.5	1.56	1.5	1.49	1.49	0.81-2.0
Peroxide (mEq O_2/Kg)	20.91	22.586	22.87	18.497	21.07	Max. 20.0
K232 (A_{232})	2.5	2.714	2.4	2.845	2.58	Max. 2.6
K270 (A_{270})	0.2	0.266	0.205	0.263	0.199	Max. 0.25

Differences were observed in the UV absorbance values (K232 and K270) and in the peroxide values.

We would like to thank Edem Safiyağ Gıda San.Tic.Ltd.Şti. for providing laboratory and equipment support.

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Removal of Diuron from Aqueous Solutions Using the New Generation Adsorbent UiO-66-NH_2

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Diuron (DU) is a herbicide widely used in agriculture. Its long persistence in soil and low solubility pose serious risks to the environment and food safety.[1] Although traditional analysis and removal methods offer high sensitivity, they are costly, time-consuming, and unsuitable for field applications. In recent years, metal-organic frameworks (MOFs) have emerged as promising materials for pesticide removal due to their high surface area, porosity, and modifiability with functional groups.[2] However, the agglomeration of MOFs in powder form and difficulties in recovery limit their industrial use. Therefore, immobilizing MOFs on flexible and portable substrates has become important. In particular, the use of waste polyester fabrics (Pol) for this purpose offers advantages in terms of low cost, sustainability, and practical application.[3]

In this study, the adsorption behavior of DU was first investigated using UiO-66-NH_2 powder under various parameters. The tests showed that UiO-66-NH_2 provided up to 95% removal efficiency and could be reused with 84% efficiency even after five cycles. Subsequently, waste polyester fabrics were activated in a basic environment to introduce carboxyl groups onto their surfaces, and UiO-66-NH_2 was immobilized using an in situ growth method. The resulting composite (Pol@UiO-66-NH_2) exhibited high structural stability and practical applicability in both aqueous solutions and real samples. The structural morphology of the developed composite was analyzed using techniques such as SEM, XRD, TGA, FTIR, and BET. The results revealed that it offers a low-cost and sustainable solution for environmental water treatment.[4]

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Assessment of Genetic Diversity among Local Maize (*Zea mays*) Genotypes from Kosovo throught Retrotransposon- Based IRAP-PCR Analysis

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Retrotransposons are transposable elements that constitute a significant portion of plant genomes and have the ability to replicate through a “copy-paste” mechanism via RNA intermediates. Due to their wide distribution and high genomic stability, they are considered effective molecular markers for analyzing genetic diversity, phylogenetic relationships, and genetic structure in various plant species, including maize[1].

The aim of this study was to evaluate the genetic variation and relatedness among 65 maize (Zea mays L.) genotypes, consisting of 60 local genotypes collected from different agroecological regions of Kosovo and 5 genotypes obtained from the Sakarya Maize Research Institute in Türkiye. Molecular analyses were performed using the IRAP-PCR (Inter-Retrotransposon Amplified Polymorphism) method with five retrotransposon primers: Grande, Tekay, Huck, Opie, and Ji. Amplified products were separated on 3% agarose gels, and the polymorphism was calculated using the Jaccard similarity coefficient. Dendrograms were constructed using the Neighbor-Joining (NJ) method in the PAUP4 software to visualize genetic relationships. The results revealed a high level of polymorphism among the analyzed genotypes, ranging from 0% to 100%, indicating broad genetic diversity. The genotypes in dendrogram were clustered according to their molecular similarity, displaying distinct phylogenetic relationships and clear genetic differentiation among the studied materials. In conclusion, the study demonstrates that local maize genotypes from Kosovo possess high genetic variability, while the inclusion of Turkish genotypes enhanced the comparative analysis. The use of IRAP-PCR markers proved to be a reliable and efficient approach for assessing genetic diversity and identifying valuable genetic resources for future maize breeding programs.

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Phenolic Profile and α-Amylase Inhibitory Potential of Gemlik Olive Leaf Extract Cultivated in Hatay, Türkiye

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Olive and olive oil, indispensable components of the Mediterranean diet, are well known for their richness in antioxidants and phenolic compounds. Among these, oleuropein—the major bioactive compound present in olives and olive leaves—has been reported to play a key role in the inhibition, regulation, and modulation of various enzymes[1] .In the study, olive leaves belonging to the Gemlik cultivar grown in Hatay were collected, dried, and extracted for 4 hours in an ultrasonic bath using 80% methanol–water as the solvent. The obtained extracts (OLE) were subsequently investigated for their phenolic compound profiles and their effects on α-amylase enzyme activity.

Table 1. Phenolic compound composition of olive leaf extracts

(ppm)	Tyrosol	3-Hydroxytyrosol	Caffeic Acid	Chlorogenic Acid	p-Coumaric Acid
8669,32	65,55	149,68	13,34	30,53	5,93
Ferulic Acid	**Sinapic acid**	**Rutin**	**Quercetin**	**Luteolin**	
6,40	2,40	95,06	19,95	5,03	

As shown in Table 1, the oleuropein content in OLE was found to be dominantly high. The activities of the α-amylase enzyme were determined in the presence of two different concentrations of the extract as a function of substrate concentration, and the corresponding kinetic parameters were calculated. These results were then compared with the data obtained in the absence of the extract (Table 2).

Table 2. Kinetic parameters of α-amylase in the presence of olive leaf extract

	No Extract	1 mg/ml OLE	2 mg/ ml OLE
Km (mg/ml)	101,98	64,03	46,08
Vmax (mg starch/Min.mg α-Amylase)	13,85	9,53	6,15

As shown in Table 2, OLE was found to inhibit α-amylase activity. It was also observed that increasing the concentration of OLE enhanced the degree of inhibition. We would like to thank Edem Safiyağ Gıda San.Tic.Ltd.Şti. for providing laboratory and equipment support.

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Molecular Imprinting Technology-Enabled Electrochemical Platform for High-Fidelity Detection of Zanamivir

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A first-in-class neuraminidase inhibitor, zanamivir (ZAM), is used to treat influenza viruses of all strains. To stop neuraminidase's action and prevent the release and spread of newly generated virions, ZAN has been shown to interact with specific amino acids in the enzyme's active site[1]. An efficient and precise electrochemical sensor was developed employing a molecularly imprinted polymer (MIP) and a simple photopolymerization (PP) procedure to measure ZAN. A polymeric thin film was synthesized on the surface of a glassy carbon electrode (GCE) using the template molecule ZAN, with 4-aminobenzoic acid (4-ABA) as the functional monomer, 2-hydroxyethyl methacrylate (HEMA) as the basic monomer, ethylene glycol dimethacrylate (EGDMA) as the cross-linker, and 2-hydroxy-2-methyl propiophenone as the photo initiator. The structural and electrochemical properties of the fabricated sensor (ZAN@4-ABA/MIP-GCE) were thoroughly characterized using a combination of analytical techniques. The scanning electron microscopy (SEM) was used to examine the surface morphology, while impedance spectroscopy (EIS) and cyclic voltammetry (CV) were used for electrochemical characterization. To assess the MIP binding affinity of ZAN, differential pulse voltammetry (DPV) was used with a 5.0 mM $[Fe(CN)_6]^{3-/4-}$ as a redox probe. Furthermore, density functional theory (DFT) calculations were performed to provide a more in-depth insight into the molecular interactions between the template molecule and the functional monomer. The developed sensor demonstrated a linear response within the concentration range of 3.75×10^{-12} to 3.75×10^{-11} M. The calculated limit of detection (LOD) and limit of quantification (LOQ) were 3.06×10^{-13} M and 1.02×10^{-12} M, respectively, indicating the high sensitivity of the method. Additionally, the developed electrochemical sensors demonstrated outstanding recoveries of 99.46-101.18% and 99.53-101.23% in commercial serum and urine samples, respectively. The results confirmed that the ZAN@4-ABA/MIP-GCE sensor is highly effective for the direct analysis of real samples, demonstrating selective recognition and sensitive detection of ZAN, even in the presence of structurally similar pharmaceutical compounds."

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Dyestuff Removal by pHEMA-Cryogel Based Nanocomposites Loaded with Silver Nanoparticles Obtained from *Pseudomonas fragi* by Green Synthesis Method

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The rapid growth of the world's population, expanding industrialization, urbanization and widespread agricultural practices have led to the continuous degradation of quality water resources, which is a matter of serious global concern [1]. Humans have had to treat wastewater in addition to existing water resources to ensure the continuation of life. There are many different methods for wastewater treatment. These methods include physical and chemical methods such as electro-coagulation, ozonation, membrane filtration and adsorption. In addition to all these, nanoparticles (NPs) are among the important materials used in wastewater treatment in recent years [2].

Physical, chemical and biological methods are used for NP synthesis. The 'green synthesis method', which is among the biological methods, is preferred for NP synthesis instead of the existing synthetic processes because it is environmentally friendly and economically feasible [3]. When integrated into cryogels, which have a large surface area, high water retention capacity, and are sustainable and cost-effective, NPs form high-performance wastewater treatment materials [4].

In this study, silver nanoparticles (AgNPs) were synthesized using *Pseudomonas fragi* via the green synthesis method. After optimization conditions (pH, temperature, time, and reducing agent concentration) and characterization (FTIR, SEM, XRD) of NP synthesis, AgNPs were integrated into pHEMA-cryogel polymers. Direct Green-6 ($C_{34}H_{22}N_8Na_2O_{10}S$) which is common dye in textile decolorized by using pHEMA-cryogels integrated with AgNPs. In the decolorization studies, the effects of NP and dye concentration, as well as time, pH, and temperature conditions, were investigated, and characterized by FTIR, SEM, and XRD.

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Development of a Vaccine Targeting the TadE Protein to Solve the Acne Problem

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Research on vaccines has accelerated thanks to immunoinformatic. The immunoinformatic tools effectively investigates the candidate vaccines and choose the best ones for the treatment. *Cutibacterium acnes* TadE proteins are promising candidates for the vaccine treatment. In this research, multi epitope-based vaccine design against *Cutibacterium acnes* was proposed. The antigenic potential of 28 TadE proteins were evaluated via VaxiJen 2.0.[1] Five proteins with the A0AA44U4S4, F9NTD2, H9ZMR3, A0A2B7J2H3 and A0AA44U2F7 accession numbers were chosen for further investigation since they have the highest scores. IEDB was used to predict MHCI and MHCII binding epitopes and maximum scores were found as "ASLSVEVLMW" for HLA-B*57:01 and "SRTVHATGSAPVDTY" for HLA-DRB1*07:01, respectively.[2] B-cell epitopes were identified using BepiPred2.0, ABCpred and SVMTriP.[3-5] AlgPred and AllerTOP v2.1 tools were used to evaluate the allergenicity of protein sequences and most of the proteins were found to be non-allergenic.[6-7] In conclusion, since topical and systemic antibiotics are being used to treat acne vulgaris, organisms start to develop antibiotic resistance. Therefore, more advanced treatments for the acne vulgaris are required and peptide-based vaccines may be a pioneer for those studies.

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TNF-α as a Key Biomarker: A Novel Sandwich-Type Aptamer-Based Electrochemical Biosensor on Screen-Printed Electrodes

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Tumor necrosis factor-alpha (TNF-α) is a determinant proinflammatory cytokine that regulates various physiological and pathological processes. Elevated TNF-α levels are not only linked to genetic and autoimmune diseases such as rheumatoid arthritis, Crohn's disease, ankylosing spondylitis, and psoriasis, but also to chronic and degenerative conditions, including cancer, diabetes, Alzheimer's disease, and cardiovascular disorders. [1,2] Despite its clinical significance, current diagnostic platforms for TNF-α, such as enzyme-linked immunosorbent assays (ELISA), radioimmunoassays, chemiluminescence imaging, and fluorescence immunoassays, remain limited due to their high cost, complexity, and laborious procedures. These limitations highlight the urgent need for rapid, reliable, and financially viable biosensing technologies for TNF-α detection.

In this study, we report the development of a novel sandwich-type aptamer-based electrochemical biosensor for the selective detection of TNF-α. Screen-printed electrode surface was successively modified with carbon black and bimetallic gold–platinum nanoparticles (AuPtNPs), providing a large surface area and enhanced electron transfer properties. [3,4] A thiolated primary aptamer (Apt-1) was immobilized onto the AuPtNP-modified electrode via Au–S bonding. Subsequently, TNF-α molecules were captured, followed by incubating a secondary aptamer (Apt-2) and a streptavidin–alkaline phosphatase (Strep-ALP) complex to form the sandwich structure. Optimization studies were systematically conducted using cyclic voltammetry (CV) and electrochemical impedance spectroscopy (EIS). Surface characterization was performed by scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS). In addition, the repeatability, reproducibility, and interference effects of the proposed biosensor were evaluated to demonstrate its reliability and practical applicability.

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Development and Characterization of Drug Delivery Systems Based on Hydrogels Loaded with Quercetin Containing Silver Nanoparticles Obtained by Green Synthesis

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Nanoparticle (NP)-based drug delivery systems enable therapeutic agents to be directed to targeted areas in the body, thereby reducing systemic side effects and increasing treatment efficacy [1]. In recent years, NP-loaded hydrogels, which stand out for their hydrophilic properties and high water content, have been developed using natural and synthetic polymers. [1]

The physicochemical methods used in metal-NP synthesis are costly, have low yields, and the chemicals used are harmful to the environment. In recent years, an environmentally friendly "green synthesis method" has emerged as an alternative to these methods, in which NPs are synthesized using natural resources (plants, fungi, etc.). The green synthesis method uses phytochemicals and enzymes as reducing agents and coating materials. [2]

Quercetin is a bioflavonoid with antioxidant properties and is a component of the polyphenol class found in plant sources. Quercetin is a phenolic compound with very low water solubility and chemical instability. Therefore, the use of hydrogel drug delivery systems is considered one of the most suitable techniques for improving the solubility and bioavailability of quercetin. [3]

In this study, AgNPs were synthesized using the seeds of the *Vitex agnus-castus* plant via a green synthesis method. The synthesized AgNPs were integrated into PVA-CMC hydrogel films along with quercetin, offering an innovative approach for a potential drug delivery system. The synthesized hydrogel film was subjected to swelling tests and *in vitro* release tests and characterized using UV-Vis spectroscopy, SEM, FT-IR, and XRD. The antimicrobial activity against of the characterized AgNP and quercetin-loaded PVA-CMC hydrogel films *E. coli, S. aureus, K. pneumonia,* and *C. albicans* were determined.

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Evernic Acid, an Inhibitor of TrxR1, Blocks STAT3 Activity in Breast Cancer Cells

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Signal transducer and activator of transcription 3 (STAT3) is an important transcription factor that promotes proliferation, metastasis, and immune evasion through its overexpression.[1] In recent years, it has been reported that some STAT3 inhibitors also exert an inhibitory effect on cytosolic thioredoxin reductase 1 (TrxR1), while some TrxR1 inhibitors block STAT3-dependent transcriptional activity.[2,3] The high expression of TrxR1 in many cancer types makes this relationship even more meaningful, and elucidating the TrxR1–STAT3 interaction is considered an important target for the development of new therapeutic strategies. In this context, natural products attract attention due to their capacity to affect multiple molecular targets; secondary metabolites produced by lichens, in particular, offer potent antitumor potential by inhibiting the growth and progression of cancer cells due to their antioxidant, cytotoxic, pro-apoptotic, and anti-proliferative properties.[4]

This study aimed to investigate the anticancer potential of the lichen secondary metabolite evernic acid (EA) by targeting the STAT3–TrxR1 pathway in human breast cancer (MCF-7) cells. EA, evaluated by the XTT assay, exhibited dose- (0–100 µg/ml) and time-(24 and 48 h) dependent cytotoxicity in MCF-7 cells, with an IC_{50} value of 33.79 µg/ml at 52 h. Transwell migration assay results showed that EA significantly inhibited migration in MCF-7 cells ($p<0.001$). TrxR1 enzymatic activity was significantly inhibited in EA-treated MCF-7 cells ($p<0.05$). According to quantitative Real Time PCR results, EA significantly down-regulated the gene expressions of IL-6 ($p<0.05$), JAK1 ($p<0.05$), JAK2 ($p<0.001$), and STAT3 ($p<0.01$) in MCF-7 cells, increased the expression of IFN-γ ($p<0.001$) and TNF-α ($p<0.01$) genes. Western blot analysis results showed that EA treatment significantly suppressed p-JAK1, p-JAK2, and p-STAT3 protein expressions ($p<0.05$).

The findings indicated that the TrxR1 inhibitor EA suppresses STAT3 activity by inhibiting the JAK/STAT pathway. Consequently, EA has both anticancer and immunomodulatory potential in breast cancer via the STAT3-TrxR1 interaction.

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Anticancer Potential of Lobaric Acid in Breast Cancer: Role of Oxidative Stress

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Cancer remains one of the leading health problems worldwide, and despite advances in treatment, limitations and side effects of current therapies continue to pose challenges.[1] Natural compounds have attracted considerable attention as alternative therapeutic agents due to their accessibility, low toxicity, and diverse biological activities.[2] Lichens, traditionally used in medicine, produce secondary metabolites with well-documented anti-proliferative, pro-apoptotic, anti-metastatic, and anti-angiogenic properties.[3,4]

The anticancer effect of lobaric acid (LA), one of the lichen acids, on human breast cancer has not yet been fully investigated. In this study, the anti-proliferative, pro-apoptotic, anti-migratory effects of LA and its effects on oxidative stress parameters (ROS, GSH, and MDA levels) were comprehensively investigated in MCF-7 breast cancer cells. XTT assay revealed a dose (0-100 µg/mL) and time (24 and 48 h) dependent decrease in cell viability, and the IC_{50} value was calculated as 44.21 µg/mL at 48 h on MCF-7 cells. Flow cytometry analysis showed that LA induced apoptosis ($p<0.001$) and increased ROS levels ($P<0.001$). Wound healing assay showed that LA markedly suppressed migration of MCF-7 cells, with wound closure reduced to ~11%, ~5%, and ~2% at 6, 12, and 24 h, compared to ~26%, ~30%, and ~39% in the control group. Glutathione (GSH) levels ($p<0.05$) were found to be reduced in LA-treated cells compared to the control group, while malondialdehyde (MDA) levels ($p<0.001$) were significantly increased

In conclusion, LA exhibits potent anticancer effects on MCF-7 cells by reducing cell viability, inducing apoptosis, increasing oxidative stress, and suppressing cell migration. These findings suggest that LA may serve as a promising natural compound for breast cancer therapy, potentially through modulation of apoptosis and oxidative stress pathways.

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A Novel Platform of Electrochemical Aptasensor Based on Microfabricated Gold Electrodes for Ultra-Sensitive Detection of Atrazine

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In agriculture, herbicides are widely used to control undesirable vegetation, with atrazine (ATZ) being a prominent and effective agent due to its cost-effectiveness and efficiency.[1] However, ATZ's environmental persistence and bioaccumulation pose risks to water, soil, and the food chain, as well as potential endocrine disruption, reproductive and nervous system damage, and increased cancer risk.[2] Reliable detection of ATZ at trace levels is therefore critical for environmental and public health. Recently, gold microelectrodes have emerged as a promising platform for sensitive detection of trace contaminants such as ATZ. Silicon-based gold electrodes have emerged as key components in biosensor development. The electrodes produced via microfabrication techniques such as lithography, deposition, and etching offer high resolution and flexibility. Their micro-sized designs improve signal-to-noise ratio and lower detection limits.[3] Among electrode geometries, microdisk array structures are particularly favored due to their rapid attainment of steady-state current and suitability for mass production.[4]

In this study, an ultrasensitive aptasensor platform (AuME/AuNDL/Apt) was developed by modifying gold planar microfabricated electrodes (AuME) with gold nanoneedles (AuNDL), followed by functionalization with target-specific aptamers (Apt). The sensor presented high sensitivity for detecting ATZ in the range of 0.001–250 pM with a low limit of detection. The morphological and chemical properties of the electrode surface were thoroughly verified by means of scanning electron microscopy (SEM) and X-ray photoelectron spectroscopy (XPS) analyses. The AuME/AuNDL/Apt sensor could successfully apply to achieve high recovery rates in real samples, thus offering an innovative and practical electroanalytical solution for the determination of ATZ at ultra-low levels.

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Discovery of Potential DcpS Inhibitors for SMA Treatment: Virtual Screening and Molecular Dynamics Simulation Studies

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Spinal muscular atrophy (SMA) is a neuromuscular disorder characterized by progressive muscle weakness. Deletions or point mutations in the survival motor neuron 1 (SMN1) gene are the primary causes of SMA. The decapping scavenger enzyme (DcpS) degrades transcripts that are no longer required once the biological function of specific mRNAs has been fulfilled, thereby preventing the accumulation and overexpression of unnecessary proteins[1]. Owing to its regulatory role in gene expression, DcpS represents a promising target in molecular medicine[2]. Inhibition of DcpS has been associated with increased SMN expression; thus, DcpS is proposed as a molecular target for SMA therapy and may provide hope for patients with limited treatment options. The low efficacy and restricted accessibility of currently available SMA drugs highlight the urgent need for novel, cost-effective therapeutic agents[1]. Based on this rationale, quinazoline-based compound libraries were constructed from the ZINC-20 (~3 million compounds), ChemDiv (8,404 compounds), and Enamine (1,173 compounds) databases using computational screening strategies. The interactions between compounds in these libraries and the DcpS protein were analyzed computationally. Each library was independently filtered using Glide HTVS and XP docking algorithms. Following XP-stage refinement, 25 compounds were retained. Molecular dynamics (MD) simulations (100–200 ns) were performed for the top candidates after evaluating their ADMET and PAINS properties. The MD data were compared with reference systems, and three compounds from the Enamine database Z4899523175, Z3397204674, and Z44851565 demonstrated the highest binding affinity toward DcpS. These results identify them as potential DcpS inhibitors for further investigation in SMA therapy.

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Targeting the Colchicine-binding site: Discovery of Microtubule-destabilizing Small Molecules

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Microtubules play a crucial role in cell division and signaling, and their dysregulation can contribute to tumorigenesis. Since the colchicine-binding site on β-tubulin is a well-established anticancer target [1–2], this study aimed to identify potential inhibitors among chalcone and indazole derivatives using a structure-based virtual screening approach. Structure-based virtual screening was conducted using the β-tubulin crystal structure and approximately 2.7 million chalcone and indazole derivatives retrieved from the ZINC-15 database. The Glide HTVS, SP, and XP modules were sequentially applied for molecular docking. ADME and PAINS filters were used to eliminate unsuitable compounds. Molecular dynamics (250 ns) simulations and MM-GBSA analyses were performed using Desmond to evaluate the stability and binding free energies of the β-tubulin–ligand complexes. The virtual screening workflow identified 27 compounds with favorable docking scores and binding poses within the colchicine-binding pocket. After ADME and PAINS filtering, 18 compounds were retained for further evaluation. Five top-ranked ligands (ZINC000436638960, ZINC000013366481, ZINC000552740681, ZINC000238000880, and ZINC000782304917) were selected for MD simulations and MM-GBSA analyses. The results showed that these β-tubulin–ligand complexes remained stable throughout the 250 ns simulations, supported by favorable binding free energies and consistent interactions with key residues in the colchicine-binding site. Overall, ZINC000436638960, ZINC000013366481, ZINC000552740681, ZINC000238000880, and ZINC000782304917 were identified as potential novel β-tubulin inhibitors targeting the colchicine-binding pocket for anticancer therapy.

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Mechanochemical C(sp2)-H Alkylation of Biologically Relevant Chromane and Coumaran with *para*-Quinone Methides

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Chromane and coumaran skeletons are biologically relevant heterocyclic compounds widely found in natural products and bioactive molecules, possessing diverse biological effects including antioxidant, anti-inflammatory, and anticancer activities. These versatile compounds serve as essential structural scaffolds in synthetic organic chemistry and drug development.[1] *para*-Quinone methides (*p*-QMs) are important reactive intermediates. It is known that they found in many biologically active natural compounds. *p*-OMs participate in various biochemical processes. These biological processes include lignin biosynthesis, enzyme inhibition and DNA alkylation.[2] Structural feature of *p*-QMs makes them reactive and important electrophilic acceptors in 1,6-conjugate addition processes.[3] In this work, C-H bond alkylation of chroman and coumaran structures was investigated using *p*-QM derivatives under solvent-free mechanochemical conditions. This novel strategy aligns with green and sustainable chemistry by maximizing energy efficiency and minimizing waste generation. The method aims to provide an environmentally friendly route for the rapid synthesis of new alkylated chromane and coumaran structures with potential biological significance.

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In Vitro Evaluation of a Calcium–Boron–Ascorbic Acid Ester with Enhanced Bioactivity

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Ascorbic acid (Asc), also known as vitamin C, is one of the most used supplements. Dietary Asc supports immune function, enhances collagen synthesis, promotes wound healing, improves iron absorption, and protects cells from oxidative stress.[1] Despite its abundance in fruits and vegetables, Asc has a short half-life limiting its bioavailability.[2] On the other hand, overuse of Asc was found to lead formation of kidney stones.[3] Hence, accurate administration is considered as a key factor for optimal benefits. In order to overcome issues related to stability, esterification of Asc was proposed.[4] In this study, *in vitro* effects of calcium-boron-ascorbic acid ester (Ca-B-Asc) were investigated as an alternative Asc complex with increased bioactivity. For this purpose, Ca-B-Asc was synthesized and characterized. Additionally, effects of Ca-B-Asc on cell viability and proliferation, angiogenesis, osteogenesis and macrophage polarization were investigated *in vitro*. Pure Asc was used as a control. Overall, it was found that Ca-B-Asc was concluded to increase potency of Asc by providing both stability and additional micronutrient source. Further identification of boron esters can help increasing potency of vitamins and minerals.

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Integration of ROS/NO and Kinase Signaling in ABA-Induced Stomatal Closure: AtPUB19 Perspective

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The ubiquitin/26S proteasome system (UPS) is a key protein modification pathway that plays a critical role in various cellular processes in plants, including biotic and abiotic stress responses, cell cycle progression, hormone signaling, senescence, and the circadian clock. The UPS consists of a series of enzymatic reactions, among which only E3 ligases confer substrate specificity to the ubiquitination pathway. Due to this unique property, E3 ligases have attracted considerable attention in recent years, with numerous studies reporting their roles in organismal growth, development, and stress responses. Plant E3 ligases are categorized into four major classes, including the Plant U-box (PUB) proteins. Particularly, leucine-rich class II and III members (e.g., AtPUB18, AtPUB19, AtPUB22, AtPUB23) play important roles in plant defense responses to environmental stresses. Abscisic acid (ABA), a critical hormone in drought stress responses, induces the expression of numerous genes, including PUB E3 ligases, to activate rapid and effective defense programs in plants.[1] Accordingly, U-box E3 ligases are known to be functionally associated with, and even required for, ABA-mediated stress responses.[2] However, the effects of AtPUB19, a U-box E3 ligase known to act as either a positive or negative regulator of ABA-induced stomatal closure, on ABA-dependent signaling components, transcriptional responses, and effector mechanisms remain unclear. For this purpose, in our study, we compared the stomatal conductance, NO and H_2O_2 levels, the expression of genes encoding transcription factors such as RAB18 and RAD29, and the expression of effector mechanism genes involved in stomatal regulation, including SLAC, OST1, SnRK, and CPK, between Arabidopsis thaliana atpub19 mutants and wild-type Columbia (Col-0) plants treated with exogenous ABA (abscisic acid), NO donor SNP (sodium nitroprusside), and ABA+SNP. Under control conditions, atpub19 mutants showed 28% higher stomatal conductance. ABA strongly reduced conductance in both genotypes (up to 97% in the mutant), while SNP increased it; ABA+SNP had limited effect. NO levels remained largely unchanged in Col-0 but slightly increased in the mutant; H_2O_2 levels were similar in both genotypes. RAD29 and RAB18 expression was strongly induced by ABA, SNP, and ABA+SNP in Col-0 but significantly attenuated in atpub19 mutants. PUB19 deficiency increased OST1 expression; however, ABA, SNP, and ABA+SNP treatments resulted in limited induction in the mutant. Consequently, CPK and SnRK activities were reduced or delayed in the mutant. These results indicate that PUB19 is a key regulator integrating ABA and NO signals to control stomatal closure and associated transcriptional and kinase responses.

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Histochemical Analysis of Superoxide Radical and Hydrogen Peroxide Accumulation in Wheat Seedlings under Drought Stress

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Plants are continuously exposed to environmental constraints, and drought is one of the most detrimental abiotic stress factors, limiting growth and productivity. Drought stress induces excessive production of reactive oxygen species (ROS) in plant tissues, leading to oxidative damage. While ROS such as superoxide anion ($O_2^{-}\bullet$) and hydrogen peroxide (H_2O_2) function as signaling molecules at low concentrations, their overaccumulation disrupts cellular integrity and damages biomolecules. Therefore, the localization and visualization of ROS at tissue and cellular levels are essential for understanding stress physiology and tolerance mechanisms. Histochemical techniques provide a powerful complementary approach for in situ detection of ROS accumulation in plant tissues under stress conditions. In this study, two major ROS, superoxide anion ($O_2^{-}\bullet$) and hydrogen peroxide (H_2O_2), were histochemically examined in two wheat (*Triticum aestivum* L.) cultivars with different drought tolerance subjected to drought stress. Superoxide anion was visualized using Nitroblue Tetrazolium (NBT), forming blue formazan crystals (Jabs et al., 1996), while hydrogen peroxide was localized with 3,3'-Diaminobenzidine (DAB), producing brown precipitates in the presence of peroxidases (Daudi & O'Brien, 2012). The histochemical staining results revealed distinct patterns of ROS accumulation in wheat leaves under drought stress. These findings contribute to a better understanding of ROS-mediated signaling, stress responses, and damage mechanisms in crops. Moreover, the study emphasizes the significance of histochemical detection techniques as reliable tools for assessing oxidative stress at the cellular and tissue levels, complementing molecular and biochemical approaches used in plant stress physiology.

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Biochemical Effects of *Halomonas* sp. Isolated from Marine Habitat on Barley Under Salt Stress

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Salinity stress disrupts physiological processes by causing ionic and osmotic imbalances in plants, negatively impacting arable land by reducing agricultural productivity. However, halophilic/halotolerant plant growth-promoting bacteria (PGPB) offer sustainable solutions for enhancing plant growth under stress through mechanisms such as ion homeostasis, osmotic balance, and compatible solute production. [1] In this study, the plant growth-promoting properties (ACC (1-amino cyclopropane-1-carboxylic acid) deaminase enzyme activity, nitrogen fixation capacity, phosphorus solubilization capacity, indole acetic acid (IAA) production capacity, siderophore production and molecular identification) of the bacteria isolated from the marine habitat were evaluated. In this context, it was aimed to investigate of *Halomonas* sp. QNSJ1 an isolated from the marine habitat (Çanakkale, Turkey) and diagnosed with 16s rRNA inoculating on two cultivated barley varieties (*Hordeum vulgare* L. salt-tolerant cv. Ocak, salt-sensitive cv. İnce-04) under salt stress (0, 100, 200, 300 mM NaCl). We focused on biochemical parameters (chlorophyll content, total protein content, hydrogen peroxide content (H_2O_2), lipid peroxidation (TBARs), and some antioxidant enzyme activities (peroxidase (POX), catalase (CAT)). Our results showed that chlorophyll content decreased with increasing salt stress in *H. vulgare* cv. İnce-04, while TBARs, H_2O_2 content, and ES increased. Furthermore, when biochemical parameters were examined, *H. vulgare* cv. Ocak was found to be less affected by salt stress and more tolerant to salinity than *H. vulgare* cv. İnce-04. In contrast, *Halomonas* sp. inoculation eliminated the negative effects of salt stress in the salt-sensitive *H. vulgare* cv. İnce-04, increasing chlorophyll content, CAT, and POX activities. Consequently, PGPB inoculation mitigated the negative effects of salt stress by reducing the production of reactive oxygen species. These results also indicate that *Halomonas* sp. QNSJ1 inoculation in barley can be used as a potential biofertilizer under salt stress conditions.

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Electrochemical Sensor for the Simultaneous Determination of Epinephrine and Norepinephrine

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Epinephrine (EP) and norepinephrine (NEP) are crucial neurotransmitters that regulate physiological and behavioral processes in the central nervous system. Due to their similar structures, the simultaneous, selective, and sensitive determination of these markers is of critical importance for clinical diagnosis and treatment.[1] Biosensors developed for this purpose provide significant advantages by providing rapid, low-cost, and highly selective analysis.[2]

In this study, a simple, rapid, sensitive, and disposable electrochemical sensors were developed for the simultaneous determination of EP and NEP using screen-printed carbon electrodes (SCPE). To do this, the electrodes were physically modified with an MWCNT-COOH@SiO_2NP composite (SPCE/MWCNT-COOH@SiO_2NP). The modified electrode was characterized electrochemically by cyclic voltammetry, differential pulse voltammetry, and electrochemical impedance spectroscopy; morphologically by scanning electron microscopy; and chemically by X-ray diffraction and Fourier-transform infrared spectroscopy. The analytical characterizations (linear range, limit of detection, repeatability, and selectivity test) of the EP-NEP sensor were performed using square wave voltammetry. The developed electrochemical EP-NEP sensor was used for the simultaneous determination of EP and NEP in blood serum samples, and high % recovery values were obtained. The developed disposable, practical, and low-cost EP-NEP sensor exhibits a wide linear range, low detection limit, and high selectivity.

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Electrochemical panel biosensor for the determination of cancer biomarkers

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Early diagnosis of cancer is critical for treatment success and patient prognosis. While diagnostic methods based on a single biomarker can be insufficient, the simultaneous evaluation of multiple biomarkers increases diagnostic accuracy and supports clinical decisions.[1] Especially in ovarian cancer, the levels of biomarkers such as anterior gradient-2 protein (AGR2), folate receptor alpha (FOLR1), glycodelin (GLY), and soluble mesothelin-related protein (SMRP) are significantly elevated in physiological fluids. The rapid and sensitive detection of these biomarkers plays a critical role in early diagnosis and disease monitoring.[2,3]

In this study, a disposable and low-cost electrochemical panel biosensor system was developed using hand-made electrodes for the simultaneous determination of AGR2, FOLR1, GLY, and SMRP. First, the hand-made electrodes were prepared using the screen-printing method. The surfaces of the working electrodes (WE1, WE2, WE3, and WE4) were electrochemically modified with AuNPs. Subsequently, the panel biosensors were prepared by incubating the working electrodes (WE1–WE4) with 6-mercaptohexanoic acid, EDC/NHS, the respective antibodies (Anti-AGR2, Anti-GLY, Anti-SMRP, Anti-FOLR1), bovine serum albumin, and the corresponding antigens, respectively. Before antibody immobilization, the SPCE/AuNPs/6MHA/EDC-NHS electrode was morphologically characterized by scanning electron microscopy and chemically characterized by X-ray photoelectron spectroscopy and Fourier transform infrared spectroscopy. Finally, the electrochemical characterization of the panel biosensors was performed using cyclic voltammetry (CV) and differential pulse voltammetry (DPV). The analytical performance parameters (linear range, detection limit, repeatability, selectivity test, and regeneration) of the panel biosensors prepared under optimum conditions (optimal antibody concentration, antibody/antigen incubation time) were carried out using DPV. The developed panel biosensors showed a low limit of detection in the wide linear range and also exhibited high selectivity and repeatability. The developed disposable panel biosensors for use in point-of-care testing stand out as a fast, practical, and reliable candidate.

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Investigation of Kinetic Parameters of Hesperidin Inhibitor Using Tyrosinase-Based MWCNT Modified Carbon Paste Electrode

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Tyrosinase is an oxidoreductase class enzyme that is widely found in different organisms and plays an important role in melanogenesis and enzymatic browning and contains two copper atoms in its active center. Inhibitors of this enzyme have recently attracted considerable attention as depigmenting agents in the cosmetic and medical industries, as well as anti-browning compounds in the food and agricultural industries. The understanding of the inhibition mechanisms of tyrosinase inhibitors is still poor, which has severely limited their application in the food industry and agriculture and the development of new inhibitors.[1] In this study, Km and IC50 values of hesperidin inhibitor were calculated with tyrosinase based MWCNT carbon pasta electrode by electrochemical methods. The mechanism of action of hesperidin inhibitor on tyrosinase enzyme was investigated by cyclic voltammetry and K_m and IC_{50} values were investigated by differential pulse voltammetry. As a result of the experiments, the Km constant was found to be $6.1x10^{-5}$ M and the IC_{50} was found to be 128.24 µM (figure 1 and 2). For the IC50 value, Hesperidin is a moderate inhibitor.

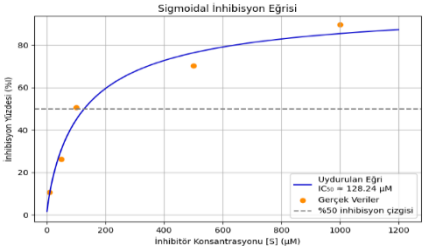

Figure 1. The calibration curve of hesperedin constructed by plotting the degree of inhibition as a function of hesperedin concentration in the presence of 1.10^{-4} M epinephrine concentration.

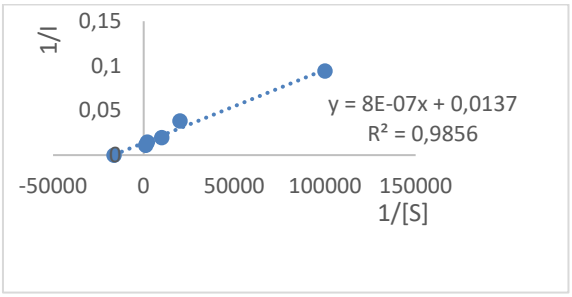

Figure 2. Lineweaver-Burk plot of Hesperidin at 1.10^{-4} M EP

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Electrochemical Detection of AFP Using Nanostructured SPCEs

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More than 70% of ovarian cancer (OC) cases are diagnosed at advanced stages.[1,2] Alpha-fetoprotein (AFP) levels are a Food and Drug Administration-approved biomarker for ovarian cancer that can be detected in the blood, and routine testing is costly.[3] In this study, we developed simple, fast, sensitive, and disposable electrochemical AFP immunosensors for the diagnosis of ovarian cancer using screen-printed carbon electrodes (SPCEs). To do this, the SPCEs were first modified with carboxyl-functionalized multi-walled carbon nanotubes (MWCNT-COOH). Then, azurA monomer prepared in deep eutectic solvent (DES) was electrochemically polymerized on SPCE/MWCNT-COOH. Then, gold nanoparticles (AuNP) were electrochemically formed on the SPCE/MWCNT-COOH/PAA_{DES}. The SPCE/MWCNT-COOH/PAA_{DES}/AuNP electrode was morphologically characterized using scanning electron microscopy and chemically characterized by X-ray diffraction and Fourier transform infrared spectroscopy. To prepare label-free AFP immunosensors, SPCE/MWCNT-COOH/PAA_{DES}/AuNP electrodes were incubated with 6-mercaptohexanol, 3-aminopropyltriethoxysilane, glutaraldehyde, anti-AFP, bovine serum albumin, and AFP, respectively. Electrochemical characterizations of the AFP immunosensors were performed using cyclic voltammetry, differential pulse voltammetry (DPV), and electrochemical impedance spectroscopy. Optimization of experimental parameters (antibody concentration, antibody and antigen incubation times) and analytical characterizations (linear range, detection limit, reproducibility, and selectivity test) for the AFP immunosensors were carried out. Application and storage stability, selectivity, reproducibility, regeneration, and real sample studies were also conducted. AFP levels in blood serum were successfully measured using the DPV method, and high recoveries were achieved. The AFP immunosensors created indicate that we can make even better and more precise immunosensors in the future to find other specific cancer markers.

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Phenethylquinazoline-Based Inhibitor of Human G6PD Suppresses Breast Cancer Cell Viability by Targeting Redox Homeostasis

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Cancer remains one of the most prevalent health challenges worldwide. Chemotherapeutic agents are commonly employed in its treatment; however, despite the systemic advantages of chemotherapy, many cancer types develop resistance to these drugs. Such resistance ultimately leads to diminished therapeutic efficacy and treatment failure [1]. The pentose phosphate pathway (PPP) plays a central role in biosynthetic processes and in DNA synthesis, the primary target of chemotherapeutics such as cisplatin and anthracyclines [2], thereby representing a critical target in cancer therapy [3]. Inhibition of glucose-6-phosphate dehydrogenase (G6PD), the first and rate-limiting enzyme of this pathway, has been shown to induce the death of rapidly proliferating cancer cells [4]. In this study, we designed and synthesized phenethylquinazolinone-based compounds targeting hG6PD using *in silico* approaches. These compounds potently inhibited G6PD activity, with IC_{50} values spanning from 2.92 nM to 793 nM. Functional assays revealed that most compounds exerted stronger cytotoxic effects on MCF-7 cells compared to H1299 cells. Notably, compound 13a displayed remarkable potency with an EC_{50} of 1.12 µM against MCF-7 cells, while exhibiting markedly weaker activity toward H1299 cells (EC_{50} = 222.3 µM). Taken together, these results establish this series as a new class of potent hG6PD inhibitors and highlight compound 13a as a promising and selective anticancer candidate.

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Investigating The Effect of Smoking on The Glutathione System In Bladder Cancer Patients at an Enzymatic Level

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Bladder cancer is one of the ten most common types of cancer worldwide. Approximately 350,000 people are diagnosed with the disease every year, and more than 150,000 people die from it [1]. Smoking is one of the most important and scientifically proven risk factors for bladder cancer. Around 60–65% of bladder cancer cases in men and 20–30% in women are linked to smoking. Smokers are 2–3 times more likely to develop bladder cancer than non-smokers, and the risk increases directly with the duration and amount of smoking [2]. This study aims to reveal the potential impact of cigarette smoking on the activities of enzymes in the glutathione system in bladder cancer patients, namely reduced glutathione (GSH), glutathione reductase (GR), glutathione peroxidase (GPX) and glutathione S-transferase (GST), in tumour biology. Tumour tissue samples obtained from bladder cancer patients diagnosed at the Department of Urology of Kütahya Health Sciences University Evliya Çelebi Training and Research Hospital were processed using a homogeniser and a homogenisation buffer. Specific enzyme activities were then measured using a spectrophotometer. This study found that the activity of glutathione S-transferase (GST) in non-smoking bladder cancer patients was significantly higher, at 142.2 ± 281.0 EU/mg, than in the control group, at 16.7 ± 26.7 EU/mg. GST activity in smokers was measured at 25.8 ± 18.5 EU/mg, which was higher than in the control group, but lower than in non-smoking bladder cancer patients. Glutathione peroxidase (GPX) activity was measured at 2.9 ± 6.0 EU/mg in non-smoking cancer patients, compared to 0.8 ± 0.4 EU/mg in smokers and 0.77 ± 0.8 EU/mg in the control group, showing a significant difference. Glutathione reductase (GR) activity was measured at 0.14 ± 0.31 EU/mg in non-smokers and 0.09 ± 0.07 EU/mg in smokers, representing a difference of 0.06 ± 0.02 EU/mg in the control group. These data provide important insight into the role of cigarette smoking in regulating oxidative stress in the pathogenesis of bladder cancer, highlighting the potential use of GST as a biomarker. Notably, significant variations in GST activity were observed between the smoker and non-smoker groups. GST activity was found to be significantly higher in tumour tissues from non-smokers than from smokers, demonstrating a potential modulatory role in the effect of smoking on oxidative stress mechanisms. Our results provide valuable insights into molecular interactions, helping us to better understand the relationship between smoking and bladder cancer. However, studies on this topic are scarce in the literature, and further research is needed in this area. Our study makes an important contribution to clarifying these rarely addressed issues.

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POSTER PRESENTATION ABSTRACTS

Synthesis of Methyl-Functionalized Vulpinic Acid Derivative and Investigation of Its Anticancer Effects on Human Breast Cancer MCF-7 Cells

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Thioredoxin reductase 1 (TrxR1) is accepted as a selective marker in cancer studies due to its overexpression in many cancer types, including breast, lung, and liver cancers.1 Our previous study, published in 2018, demonstrated in vitro that diffractaic, evernic, lecanoric, lobaric, and vulpinic lichen acids significantly inhibit the TrxR enzyme purified from rat lungs.2 In our other study, it was found that among these lichen acids, vulpinic acid in particular exhibits anticancer effects targeting TrxR1 in breast cancer cell line.3 In our current study, a methyl-functionalized vulpinic acid derivative (VA-CH3) with potential anticancer effects targeting TrxR1 was synthesized using a phenylacetic acid derivative, and its cytotoxicity was investigated on human breast cancer MCF-7 cells. This compound was first dissolved in dimethyl sulfoxide. Subsequently, the MCF-7 cells were treated with the methyl derivative in a dose-dependent (25-100 µg/mL) and time-dependent (24 and 48 h) manner, and its cytotoxic effect was assessed using the XTT cell proliferation assay. Following a 24-h period of incubation, a dose-dependent antiproliferative effect was observed. When the incubation period was extended to 48 h, MCF-7 cell proliferation began to decrease at concentrations of 50 µg/mL and above. The IC50 values of VA-CH3 on MCF-7 cells were determined to be 56.63±7.15 µg/mL and 87.34±6.83 µg/mL at 24 and 48 h, respectively. Considering the findings, it could be stated that the methyl derivative of vulpinic acid exhibits more effective antiproliferative activity on MCF-7 cells at the 24-h IC50 concentration. Furthermore, the effects of this compound on apoptosis and migration in MCF-7 cells following a 24-h treatment period were examined using the Annexin V-FITC/PI method and wound healing assay, respectively. The results showed that VA-CH3 induced low levels of apoptosis and inhibited migration in MCF-7 cells. Further research is needed to determine the potential of this compound as an anticancer agent

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Evaluation of RAC1 Activation upon Hypoxic Conditions in MCF7 Cells

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Hypoxia, is a hallmark of the tumor microenvironment, drives angiogenesis, metastasis, and therapy resistance via hypoxia-inducible factors (HIFs), and among them, HIF-1α is commonly overexpressed, enhancing proliferation, invasion, and drug resistance in cancer[1]. To model hypoxia *in vitro*, mimetics are attained to stabilize HIF proteins, with 2,2'-dipyridyl (DP) standing out as a lipophilic Fe^{2+} chelator that easily penetrates cell membranes to stabilize HIF-1α under normoxic conditions[2]. This is particularly relevant in breast cancer, which exhibits high iron dependency and hypoxia-driven metabolic reprogramming. Ras-related C3 botulinum toxin substrate 1 (RAC1), a small Rho GTPase and proto-oncogene, regulates cytoskeletal remodeling, migration, and transcriptional programs linked to tumor progression[3]. While other mimetic-mediated hypoxic signaling have been extensively studied, the role of DP in regulating RAC1 activity has yet to be uncovered. This study investigates the modulation of RAC1 activation under DP-induced hypoxia in MCF7 breast cancer cells to clarify its contribution to hypoxic adaptation which is known to trigger aggressive subpopulations. First, cells were exposed to DP for 8 h to induce hypoxia, after which they were treated for an additional 16 h with RAC1-specific inhibitor NSC-23766, DP, or their combination before further analyses, and in parallel, cell migration was evaluated by scratch assay under the same conditions, with area closure monitored at 0, 24, 48, 72, and 96 h. Protein lysates were collected for Western blot analysis of total RAC1 and GAPDH controls. RAC1 activation was determined using a pull-down assay with PAK-PBD affinity beads, followed by immunoblotting. Finally, the cell cycle progression and apoptosis were assessed by flow cytometry. Our findings indicate that DP-induced hypoxia promotes RAC1 activation without altering its protein expression levels. Moreover, hypoxia induced RAC1 hyper-activation was diminished by NSC-23766, a specific RAC1-PAK interaction inhibitor. The migratory ability and apoptotic fashion of MCF7 cells were altered by RAC1 inhibition despite DP-induced hypoxia. In this particular study with NSC-23766, it has been revealed that RAC1 could be suppressed even under hypoxic conditions. Our study suggested that RAC1 inhibition can be a good target for regression of heterogenous tumors which contains normoxic and hypoxic regions.

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Biological Evaluation of Tubulin Polymerization Inhibiting Novel Indole-Thiazolidinone Hybrids in MCF-7 Cells

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Breast cancer is the most common cancer in women and also one of the leading causes of cancer-related death worldwide. Although early diagnosis and current therapies have improved patient outcomes, drug resistance and limited treatment options create an urgent need for new anticancer agents. Indole and thiazolidinone derivatives are heterocyclic compounds known for their cytotoxic and pro-apoptotic activities. [1,2] Recent studies have shown that indole–thiazolidinone hybrid molecules have selective cytotoxicity against several cancer cell lines compared to healthy cells. Some synthesized hybrids were also shown to inhibit tubulin polymerization, arrest the cell cycle at the G2/M phase, and induce apoptosis.[3] In this study, the biological activities of 5-(substituted) benzylidene-2-{[2-(3H-indol-3-yl)ethyl]imino}-3-phenyl-1,3-thiazolidin-4-one compounds were evaluated in healthy and cancer cell lines (Abba A., PhD Thesis, Yeditepe University,2024).[4] Cell viability was assessed using MTT assay and IC_{50} values were determined. Upon compound treatment, tubulin polymerization was evaluated using a pure protein-based assay. Immunofluorescence microscopy was performed on cells to examine tubulin organization in the presence of the active compound. Scratch assay was performed to evaluate cell migration capacity. Cell cycle and apoptosis were analyzed by flow cytometry. Of the compounds, five selected compounds showed strong cytotoxic effects, with lower IC_{50} values in cancer cells compared to healthy cells. 3-hydoxy-4-methoxy substituted Compound 15 disrupted tubulin organization, reduced cell migration, and induced apoptosis in MCF-7 cells. These results suggest that indole–thiazolidinone hybrids are promising candidates through blocking tubulin and triggering apoptosis for anti-cancer drug development.

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Investigation of Hyperlipidemia Drugs Efflux Using HPLC in Breast Cancer Cells

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Statins, widely prescribed for hyperlipidemia, inhibit 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase to reduce de novo cholesterol synthesis. Beyond their lipid-lowering effects, they also display pleiotropic properties, including anti-inflammatory and anti-proliferative activities, raising interest in their potential as anticancer agents. Considering cancer progression, one of the major challenges, however, is the development of resistance against drugs, frequently mediated by multidrug resistance (MDR) mechanisms such as efflux transporters.[1] This study evaluated the anticancer effects of Atorvastatin and Rosuvastatin on breast cancer cell lines, focusing on cytotoxicity and resistance mechanisms. MCF7 cells were treated with various concentrations of Atorvastatin and Rosuvastatin to assess cell viability using the MTT assay. Both statins significantly exerted cytotoxicity in a dose- and time-dependent manner. Prolonged exposure, however, resulted in diminished drug efficacy, suggesting resistance development. To investigate the underlying mechanism, intracellular and extracellular drug levels were quantified by High-Performance Liquid Chromatography (HPLC). Results revealed decreased intracellular accumulation and increased extracellular concentrations after extended treatment, strongly implicating efflux-mediated resistance.[2] These findings indicate that overexpression of efflux pumps such as P-glycoprotein or multidrug resistance-associated proteins (MRPs) may play a central role in reducing statin efficacy.[2] In conclusion, Atorvastatin and Rosuvastatin possess measurable anticancer activity in breast cancer models but are limited by the rapid emergence of resistance. Strategies targeting efflux pathways, such as combining statins with pump inhibitors or employing novel delivery systems, may enhance therapeutic potential. Designing a determination methodology for drug uptake/ efflux dynamics will be helpful to evaluate the success of the treatments. These findings support the repositioning of statins as adjunctive agents in cancer therapy, while underscoring the need to address resistance mechanisms to maximize their clinical benefit.

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1,4-Addition of Alcohols to Benzofuran-Based Azadienes

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Heterocyclic compounds are of great importance in pharmaceutical chemistry due to their diverse bioactivity. In recent years, benzofurans, a class of heterocyclic compounds present in various natural products and pharmaceuticals, have attracted considerable attention in chemistry due to their broad range of biological activities. This scaffold exhibits diverse biological activities such as antitumor, antimicrobial, anti-inflammatory, anticancer, antihyperglycemic, antiparasitic, and enzyme inhibitory effects.[1] Benzofuran-derived azadienes are privileged intermediates that exhibit high reactivity in conjugate additions reactions due to their structures.[2] In general, the synthesis of benzofuran derivatives has become a prominent research area in organic and medicinal chemistry. Among the various synthetic approaches, benzofuran-based azadienes are notable as efficient precursors.[3] This study presents a new, simple, and efficient method based on the addition of alcohols to benzofuran-based azadienes.

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Foliar Application Effects of Ascorbic Acid and Salicylic Acid on Targeted Salt-Responsive Gene Expression Levels in *Citrus aurantium* L. Plants Under Salt Stress

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Citrus aurantium L. (Bitter orange) is a globally significant fruit tree, yet its productivity is known as relatively sensitive to salinity. Ascorbic acid (AsA), acting as a strong antioxidant, effectively protects plants from oxidative injury. Salicylic acid (SA) functions in modulating plant defense mechanisms in response to both abiotic and biotic stress factors. However, the underlying physiological and biochemical responses to exogenous treatments are still insufficiently characterized. This study investigated the effects of foliar AsA and SA applications on salt-stressed *C. aurantium* L. plants by evaluating total chlorophyll content and the relative expression of *CaMYB73* (salt-response transcription factor, *CaMIPS* (an osmoregulated gene-MIPS), and *CaSLAH1* (anion-associated channel). The total chlorophyll content was spectrophotometrically determined. Total RNA was isolated from leaf samples using a commercial RNA extraction kit, and quantitative real-time PCR (qRT-PCR) was performed[1]. Salt stress significantly reduced total chlorophyll content, whereas AsA and SA treatments effectively mitigated this decline. Notably, AsA and SA applications did not significantly modify the expression of the tested genes compared to salt stress alone, suggesting that protective effects of AsA and SA may operate through alternative regulatory pathways under these conditions. Further dose dependent studies could help understanding of exogenous applied AsA and SA-mediated physiological mechanisms under salinity and could offer valuable insights for enhancing *C. aurantium* L. salt response.

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Thiophene-3-boronic Acid Based Molecularly Imprinted Polymers for Selective and Reusable Bacterial Detection

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Biosensors are increasingly valued as rapid, cost-effective, and portable analytical devices for real-time monitoring in diverse fields. Molecularly imprinted polymers (MIPs) have emerged as synthetic recognition elements that combine stability, low cost, and specificity, making them attractive for improving biosensor selectivity.[1]

This study aimed to develop a selective and reusable biosensing platform for bacterial detection using MIPs. For this purpose, thiophene-3-boronic acid was electropolymerized on electrode surfaces to form MIPs with binding sites for *Staphylococcus aureus*. The boronic acid groups enabled reversible interactions with cis-diol structures on bacterial surfaces, supporting both recognition and regeneration. Cyclic voltammetry (CV) was used to characterize electrode modification, while electrochemical impedance spectroscopy (EIS) served as the primary technique for label-free detection. Measurements were collected over the range of 10^3–10^7 cfu/mL, and impedance changes were monitored as the sensing response. The MIP-modified electrodes exhibited a linear response within this range and demonstrated the ability to distinguish *S. aureus* from non-target bacteria with similar morphology. Furthermore, the reversible binding allowed efficient release of captured cells and regeneration of the sensing surface.

These findings highlight the potential of the developed MIP-based biosensor as a robust platform for rapid, selective, and reusable bacterial detection in applications such as food safety, clinical diagnostics, and biosecurity.

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Binding Constant Quantification of Norfloxacin-DNA Interaction Using the UV Spectrophotometric Method

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The interaction of norfloxacin (NOR) with DNA was systematically investigated under physiological pH conditions (tris-HCl buffer solution, pH 7.4) at 25 °C using the UV spectrophotometric method. This approach was chosen because UV spectroscopy is highly sensitive to structural and electronic changes occurring upon drug-DNA complexation, making it an effective tool for monitoring drug binding events. A set of samples was prepared in which the concentration of each NOR was fixed at 23.0 µM, while the DNA concentration was varied systematically at 40.0, 80.0, 120.0, 160.0, and 200.0 µM. To ensure that the ionic strength of the medium remained constant, 8.3 mM KCl was added to all solutions. After 20 min, UV spectra were recorded between 200–620 nm, with 272 nm chosen for analysis due to strong drug absorbance at 25 °C. For accurate comparative analysis, a DNA-free control sample of NOR was also prepared at the same fixed concentration (23.0 µM). The control spectra provided the baseline absorbance value of NOR, essential for identifying spectral shifts and calculating interaction parameters. To quantitatively evaluate binding strength, the spectroscopic data were analyzed using the following equation [1]:

$$\frac{A_0}{A-A_0} = \frac{\varepsilon_{A_0}}{\varepsilon_A-\varepsilon_{A_0}} + \frac{\varepsilon_{A_0}}{\varepsilon_A-\varepsilon_{A_0}} \frac{1}{K_b[DNA]} \qquad (1)$$

where A is the absorbance of the NOR-DNA complex at 272 nm, $A_0$is the absorbance of the pure NOR at the same wavelength, $K_b$is the binding constant, [DNA] is the DNA concentration, and $\varepsilon_{A_0}$and $\varepsilon_A$represent the molar absorption coefficients of the pure NOR and the NOR-DNA complex, respectively. By plotting $A_0/(A-A_0)$against $1/[DNA]$, a linear relationship was obtained. The slope and intercept of these plots enabled the calculation of the binding constants. Specifically, $K_b$corresponds to the ratio of the intercept to the slope, providing a quantitative measure of NOR-DNA affinity. This linear analysis is a well-established method for determining binding constants in spectroscopic studies of drug-DNA systems. The K_b was calculated to be 1.10 ± 0.482 x10^3 L mol^{-1}. This result confirms that NOR interacts with DNA primarily through non-intercalative mechanisms, likely involving groove binding and electrostatic associations.

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Chitosan-Coated Magnetic Nanoparticles for the Efficient Capture of *Salmonella Typhimurium*

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Glycan-coated magnetic nanoparticles (gMNPs) have emerged as a novel and cost-effective approach for the rapid concentration and recovery of foodborne pathogens. Unlike traditional immunomagnetic separation (IMS), which relies on antibody-based magnetic beads that are expensive and sensitive to storage conditions, gMNPs offer a more stable, economical, and adaptable alternative. This approach leverages the natural affinity between glycans and bacteria, enabling their capture directly from complex food matrices.[1]

In this study, chitosan-coated Fe3O4 magnetic nanoparticles (CS-MNPs) were synthesized using two methods: a one-pot hydrothermal synthesis, in which chitosan was incorporated during nanoparticle formation, and a post-synthesis surface coating technique. The nanoparticles were characterized by confirming successful chitosan functionalization and favorable magnetic properties. The performance of the CS-MNPs was evaluated for the recovery of *Salmonella Typhimurium* ATCC 14028 from pure cultures and ultra-high temperature (UHT) milk samples artificially contaminated with bacterial loads ranging from 10^1 to 10^7 CFU/mL. Both synthesis approaches yielded functional CS-MNPs, achieving recovery rates greater than 50%, depending on the synthesis method and initial inoculum level.

This study highlights the potential of CS-MNPs as a practical and cost-efficient alternative to IMS for pathogen recovery in food safety applications. While glycan-coated particles may exhibit lower intrinsic specificity compared to antibody-based methods, specificity can be enhanced through secondary detection strategies, such as biosensor integration. Additionally, targeted modifications-such as functionalizing gMNPs with specific molecular probes -can further improve selectivity toward particular pathogens. To fully establish the versatility and application range of this approach, future studies should explore its performance across different bacterial species and food matrices.

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Development of Gold Nanoparticle/Quercetin Coated, and Nano-channeled PLGA/SF Film Scaffolds for the Oriented Growth of DRG Sensory Neurons

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Neural injuries, which affect millions of people worldwide, have significant impacts on patients' quality of life. These injuries typically affect young people and adults of employable age, leading to permanent impairments in patients.[1] Following a nerve injury, ensuring the orientation of cellular neurites along a linear line is critical for functional regeneration. Thanks to the innovative approaches offered by the electron beam lithography technique, highly stable and precise nano-patterning can be safely applied on biomaterial surfaces. Gold nanoparticles (AuNPs) have become quite popular as an alternative to conductive polymers, which have been used for many years. Their advantages include their superior physicochemical properties, ease of synthesis, stability, electrical conductivity and biocompatibility.[2] The antioxidant, anti-inflammatory and antibacterial properties of the quercetin (Q) molecule, previously demonstrated in literature, have great potential for use in regenerative medicine studies when used in conjunction with nanomaterials.[3] Given the poor mechanical properties of silk fibroin (SF), a biodegradable and cell-compatible natural polymer, its hybrid use with a synthetic polymer is important for tissue engineering applications. Polylactic-co-glycolic acid (PLGA), an FDA-approved synthetic polymer with strong mechanical properties, flexibility, biodegradability, cell compatibility, and ease of processing, is a suitable polymer in this context. The aim of this study is to develop hybrid SF/PLGA film scaffolds with nano-channeled topography and modified with quercetin-conjugated AuNPs (AuNP-Q) and to investigate the behavior of DRG (dorsal root ganglion) sensory neurons isolated from the mice on these materials. The using hybrid film scaffold increased the physical and mechanical properties of the material. The laminin coating promoted cellular adhesion and growth. Nano-channeled scaffolds modified with nanoparticles (SF/PLGA $G_{0.5}$-$AuNP_{83}$-Q) highly promoted the axonal orientation. It was evaluated that the designed biomaterial could help the orientation of cellular axons/neurites and support regeneration after implantation in a nerve injury site, within the scope of potential *in vivo* neural tissue engineering studies.

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Development of an RNA-Based Diagnostic Kit Supporting Early Detection of Colorectal Cancer

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Colorectal cancer (CRC) remains a major cause of cancer mortality, highlighting the need for accurate and minimally invasive screening tools. Leveraging mRNA-based diagnostics, we designed and preliminarily validated a five-gene RNA panel (PPP2R2C, MYC, CDC20, CCT6A, CCT2) derived from the MYC module for early CRC detection using paired blood and stool specimens.[1] Blood (10 CRC, 10 healthy) and stool (5 CRC, 5 healthy) samples were collected prospectively. RNA was extracted (QIAamp/NucleoSpin), converted to cDNA, and analyzed via RT-qPCR. Relative expression was calculated by the 2^-ΔΔCt method, normalized to ACTB. Statistical significance was set at $p<0.05$. Diagnostic performance was evaluated through logistic regression and ROC analysis with 5-fold cross-validation.[2] Consistent signatures were observed across matrices. MYC, CDC20, CCT6A, and CCT2 were significantly upregulated, while PPP2R2C was downregulated in CRC vs. controls ($p<0.05$). Single-gene models achieved AUCs of 0.78–0.88; the combined five-gene panel improved discrimination to AUC 0.92 (blood) and 0.90 (stool). Directional concordance between sample types supports these genes as dual-source biomarkers for enhanced adherence and robustness.[3] The five-gene MYC-module panel effectively distinguishes CRC from healthy status via both blood and stool, demonstrating promising early diagnostic accuracy. Ongoing work includes assay optimization, external validation, and adaptation to a standardized RNA-based CRC screening kit.[1]

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Biomonitoring of Lead and Other Toxic Elements in Human s

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In this project the content of lead and some other toxic elements were monitored in the environment and various biological matrices of the habitants in the area of Kazreti township of Bolnisi municipality. In this area the mineral extraction works are carried out by the mining company.

In Kazreti 20 soil samples were collected and in Tsalka (as a reference) - 7. The lead content in the taken samples ranges from 23.41 to 198.93 mg/kg in Kazrei, and in the samples taken in Tsalka between 11.95-29.58 mg/kg. 17 water samples and 38 samples of seasonal fruits and vegetables were collected in Kazreti and Tsalka. The content of toxic elements higher than permissible limits was not detected in any of the samples. The bioanalytical study was performed on 25 volunteers, who were divided into the following groups: 1. Volunteers living very close to ore mining in Kazreti: (15 volunteers, 13 women and 2 men); 2. Population living in Tsalka, that is region within 30 km of ore extraction in Kazreti: (10 volunteers, 4 women and 6 men); In the Kazreti region following samples were collected: Venous blood -15, Urine-45 (3 per person at different daytime), Saliva – 15, Nails -11, Hair -14. In Tsalka region following biological samples were collected: Venous blood-10, Urine 30 (3 per person at different daytime), Saliva – 10, Nails -9, Hair -9. The results are shown in Tables 1 and 2:

Table 1. Content of lead in various matrices of habitants in Kazreti region

Kazreti	Blood, µg/dL	Urine, µg/dL	Saliva, µg/dL	Nail, mg/kg	Hair, mg/kg
Mean±SD	1.97±1.43	0.31±0.28	0.35±0.23	0.23±0.08	0.28±0.13
Min-Max	0.32-5.13	<0.1-1.04	<0.2-0.97	<0.1-0.34	<0.1-0.442
Median (25^{th}-75^{th} percentile)	1.35(1.08-2.65)	0.13(0.1-0.28)	0.24(0.2-0.29)	0.1(0.1-0.215)	0.141(0.1-0.345)

Table 2. Content of lead in various matrices of habitants in Tsalka region

Tsalka	Blood, µg/dL	Urine, µg/dL	Saliva, µg/dL	Nail, mg/kg	Hair, mg/kg
Mean±SD	3.03±1.36	0.24±0.04	0.49±0.40	0.22±0.14	0.64±0.51
Min-Max	1.61-6.14	<0.1-0.25	<0.2-1.37	<0.1-0.32	<0.1-1.28
Median (25^{th}-75^{th} percentile)	2.90 (1.9-3.64)	0.24 (0.1-0.24)	0.32 (0.2-0.41)	0.1 (0.1-0.11)	0.43 (0.1-0.205)

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Novel Quinoline-derived Silicon(IV) Phthalocyanines as PDT for the Treatment of Endometrial Cancer

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Endometrial cancer (EC) is the most diagnosed type of gynecological cancer, with an increasing incidence and mortality rate. EC is multifactorial occurring in the inner epithelial lining of the uterus.[1] While surgery is the primary treatment, adjuvant and targeted therapies are important in improving prognosis. Photodynamic therapy (PDT) is one of the non-invasive treatment methods to be used in early-stage EC. In PDT, photosensitizers activated by light of a specific wavelength produce reactive oxygen species (ROS) with molecular oxygen. ROS, which are highly toxic to cancer cells, cause cancer cells to undergo cell death through processes such as apoptosis.[2]This study aimed to reveal the PDT effects of novel quinoline-derived silicon(IV) phthalocyanine (8K-C3-D-SiQ) on EC cells *in vitro*. To this end, photochemical/physical properties and cytotoxic/phototoxic effects on human endometrial cancer (HEC-1B) and fibroblast (L929) cell lines were investigated. Cell death in HEC-1B cells was analyzed via apoptosis/necrosis and cell cycle assays, and protein expression (Topo IIalpha, caspase 3, p53, and cytochrome c) changes were assessed by western blotting. This study reveals that following PDT, 8K-C3-D-SiQ triggers a DNA damage response in HEC-1B cells through topoisomerases and p53, while simultaneously inducing apoptosis via the mitochondrial pathway.

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Development of DNA Aptamers for FadA Protein of *Fusobacterium nucleatum*

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Colorectal cancer (CRC) is a leading causes of cancer-related mortality worldwide, largely due to late diagnosis and therapeutic limitations.[1] Among microbial factors implicated in CRC progression, *Fusobacterium nucleatum* has gained particular attention. Its adhesin protein, FadA, promotes bacterial adhesion and invasion of host epithelial cells, triggering β-catenin and NF-κB signaling pathways that enhance inflammation and tumor progression.[2] Due to its critical role in host–pathogen interactions, FadA represents a promising biomarker and therapeutic target. DNA aptamers, short single-stranded biomolecules with high specificity and stability, offer a promising alternative to antibodies for targeting such virulence factors.[3] The aim of this study is to select DNA aptamers against the FadA protein of *F. nucleatum*.

In this study, DNA aptamers specific to the FadA protein were developed using the SELEX (Systematic Evolution of Ligands by Exponential Enrichment) method. The *fadA* gene was codon-optimized, cloned into the pET-21 (+) vector, and expressed in *Escherichia coli* BL21(DE3). Recombinant protein was purified using Ni-NTA affinity chromatography and immobilized onto NHS-activated agarose beads for SELEX. A total of 16 rounds of SELEX were performed, including negative and counter selection steps to increase specificity. After each round, bound DNA was amplified and converted into single-stranded DNA using lambda exonuclease. Following enrichment, the final aptamer library was cloned and subjected to sequencing. Bioinformatic analyses revealed 28 distinct aptamer sequences, which were further evaluated for conserved motifs, secondary structures, and potential G-quadruplex formations. These findings demonstrate the successful development of FadA-specific aptamers, which may serve as promising tools for colorectal cancer research and therapy.

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Investigation of DNazyme Activity for *in vitro* Selection Applications

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DNAzymes are catalytic DNA molecules discovered through *in vitro* selection methods, and their ability to catalyze biochemical reactions has made them an important research area in biotechnology.[1] These single-stranded DNA molecules can adopt three-dimensional conformations that enable them to catalyze reactions in the presence of metal ions, thereby serving as alternatives to natural enzymes. With advantages such as low cost, high stability, ease of modification, and adaptability to biosensor designs, DNAzymes stand out particularly in the rapid and sensitive detection of pathogens.[2]

In this study, CTX-M-1 β-lactamase, a key enzyme in antibiotic resistance, was selected as the model system. The study aimed to select DNAzyme sequences, determine their stability, and evaluate their catalytic activities. pET-28a(+) vector carrying the *CTX-M-1* gene was directly employed as the expression system in experimental procedures, and the recombinant protein was purified using Ni-NTA affinity chromatography. The purity and molecular weight were confirmed by SDS-PAGE analysis, validating the efficiency of the production process. To enrich functional DNAzyme candidates, an *in vitro* selection strategy was applied. During this process, the DNA library was incubated with CTX-M-1; non-binding or weakly binding sequences were removed by washing steps, while active sequences were recovered by elution and amplified in subsequent rounds. Additionally, negative and counter-SELEX steps were integrated into the selection process. After iterative selection rounds, the pool was enriched with sequences exhibiting DNAzyme activity against CTX-M-1. This study is expected to provide an important perspective for the development of DNAzymes targeting the CTX-M-1 enzyme and to serve as a basis for biosensor designs in future studies.

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Development of DNA Aptamers for Recognition of Sesame Allergen Protein

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Food allergies represent a growing global health concern, triggering severe immunological responses that may persist throughout life.[1] Sesame is recognized as a potent allergenic source, primarily due to the 7S globulin family protein Ses i 3. Reliable detection of such proteins in food remains challenging, as conventional antibody-based assays are often constrained by high costs, limited stability, and issues of cross-reactivity. In recent years, DNA aptamers, which can be generated *in vitro*, exhibit strong structural stability, and bind with high specificity to their targets, have emerged as promising alternatives to traditional methods in food safety applications.[2] This study aims to develop highly specific DNA aptamers against the Ses i 3 protein and to evaluate their potential applicability in allergen detection.

In this study, *Ses i 3* gene was cloned into the pET-21a(+) vector and engineered with a C-terminal His-tag. The recombinant protein was expressed in *Escherichia coli* BL21(DE3) cells, purified using Ni-NTA affinity chromatography, and verified by SDS-PAGE analysis. To obtain DNA aptamers specific to the target protein, the SELEX method was employed.[3] A random ssDNA library was properly folded and incubated with the target protein; non-binding sequences were removed, while bound sequences were eluted. To enhance specificity, counter-SELEX steps were included in selected rounds. The selection process was repeated for a total of 16 cycles to enrich high-affinity aptamer candidates. The final aptamer pool was analyzed, and motif discovery was performed using MEME Suite, G-quadruplex potential (G-score calculation) was evaluated with QGRS Mapper, and secondary structure predictions were conducted with the mFold program. Sequence similarity and phylogenetic relationships were further assessed with Clustal Omega. The binding properties of the selected aptamers to Ses i 3 were confirmed by electrophoretic mobility shift assay (EMSA). Additionally, investigations on the catalytic potential of G-quadruplex–containing aptamers revealed that only aptamer 7 exhibited DNAzyme activity upon complexation with hemin.

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Preparation of an Electrically Conductive Flexible Coating onto the Polyester Films from Wool Keratin Particles/Poly(ethylene glycol dimethacrylate)/Polyaniline for Soft Electrode Design

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Electrically conductive and flexible coating materials are of great importance, particularly in electrochemical applications such as biosensor design, heavy metal ion detection, and the sensing of biomacromolecules. In the development of such materials, the use of sustainable biopolymers and environmentally friendly approaches has received significant attention.[1] Keratin, a natural protein derived from waste wool, stands out due to its biocompatibility, functional groups, and environmental sustainability.[2] Polyaniline (PAn), on the other hand, is one of the most widely studied conducting polymers owing to its tunable oxidation states, high electrical conductivity, and facile synthesis. Furthermore, gel-like network structures such as PEGDMA provide compatibility with organic–inorganic hybrid systems, offering both flexibility and functional coating capabilities. Previous studies have reported that the polymerization conditions of aniline (Ani/APS molar ratio, reagent volumes, and reaction time) have critical effects on PAn yield, surface morphology, and conductivity. In this context, the development of environmentally friendly, flexible, and conductive composite materials represents a significant research field for biosensor electrode design. In this study, electrically conductive and flexible electrode materials were prepared by *in situ* surface polymerization of aniline on commercial polyester films. During synthesis, keratin particles (KerSH) derived from sustainable wool waste were immobilized onto the polyester surface through a PEGDMA gel-like paste. This was achieved via a thiol-ene “click” reaction between PEGDMA and thioglycolic acid (TGA), resulting in the encapsulation of KerSH particles within the PEGDMA network. Subsequently, aniline monomers were polymerized in the presence of ammonium persulfate (APS) oxidant on the gel coating, leading to the formation of a conductive polyaniline (PAn) layer. The effects of polymerization parameters (reagent volumes and Ani/APS molar ratio) on the PAn content (%) and surface resistivity were systematically investigated. The prepared composite films were characterized in terms of functional groups by ATR-FTIR spectroscopy, morphology by optical microscopy, and surface wettability by contact angle and wetting time measurements. The results demonstrated that the developed materials exhibited high electrical conductivity along with chemically active surface functionalities, making them promising candidates for application in biosensor electrode design.

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Ultrasensitive Electrochemical Monitoring of Tau-441 Using a 3D-MoS_2 Nanoflowers–Molecularly Imprinted Polymer Platform

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Alzheimer's disease (AD) is a progressive neurodegenerative disorder affecting approximately ~20% of the global population over 50 years of age.[1] Early and accurate diagnosis is crucial for slowing disease progression and preserving the quality of patients' lives.[2] Among biomarkers for AD early diagnosis, Tau-441, the longest isoform of Tau protein, is strongly associated with cognitive decline and serves as a key biomarker.[3] Recently, contrary to conventional detection methods such as ELISA, which are high-cost, molecularly imprinted polymers (MIPs) have been considered as low-cost and highly selective alternatives.

In this study, a cost-effective MIP-based electrochemical sensor was developed for rapid, sensitive detection of Tau-441. The glassy carbon electrode (GCE) was sequentially modified by electrodeposition of silver nanoparticles (AgNPs), coating with 3D molybdenum disulfide nanoflowers (MoS_2NFs), and dopamine electropolymerization in the presence of Tau-441 to form the MIP layer (MIP/MoS_2NFs/AgNPs/GCE). A non-imprinted polymer (NIP) sensor, prepared without Tau-441, served as the comparison sensor. Structural, morphological, and electrochemical analyses confirmed the sensor's successful fabrication. Linear working range, detection limit, selectivity, reproducibility, and stability were systematically evaluated. The practical utility of the platform was demonstrated through the successful quantification of Tau-441 in human serum and artificial cerebrospinal fluid. The sensor exhibited a wide linear range (1.93 fM–100 pM), an ultra-low detection limit (0.59 fM), and high recovery, highlighting its promise for early AD screening and point-of-care diagnostics.

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Plant-Based Polymeric Nanoparticles for Curcumin and TP53 Co-Delivery: Towards Novel Therapeutic Strategies in Non-Small Cell Lung Cancer

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Non-small cell lung cancer (NSCLC) is a leading cause of cancer-related mortality worldwide. The loss of tumor suppressor TP53 and poor bioavailability of curcumin limit therapeutic options. Previous studies showed that their co-delivery can enhance cancer cell sensitivity to chemotherapy and overcome drug resistance[1]. Here, we developed novel pH-sensitive polymeric nanoparticles (OYC4 and OYC5) from plant-based monomers for the dual delivery of wild-type TP53 plasmid DNA and curcumin and evaluated their physicochemical features. Nanoparticles were synthesized by photopolymerization of acrylated methyl ricinoleate, PEG, and cationic monomers. Size and zeta potential were measured by dynamic light scattering (DLS), functional groups by FTIR, and DNA binding by agarose gel retardation assay, confirming efficient DNA encapsulation. Curcumin loading efficiencies were 59% for OYC4 and 61% for OYC5. OYC4 displayed a bimodal size distribution (85/247 nm), while OYC5 showed 159/327 nm, both with positive charges suitable for DNA condensation. As a feasibility test, A549 lung cancer cells were treated with curcumin followed by TP53 transfection, which significantly enhanced cytotoxicity compared to curcumin alone, strongest at 20–40 µg/ml. In conclusion, OYC4 and OYC5 nanoparticles exhibit favorable physicochemical properties, efficient DNA binding, and promising potential for curcumin–TP53 co-delivery. While nanoparticle-based delivery to cells remains to be tested, these results encourage further studies, including combination with standard chemotherapeutics. Supported by Tekirdağ Namık Kemal University Scientific Research Projects Unit (NKUBAP.02. ÖNAP .24.533).

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Peptide Aptamers Selective to CTX-M Extended Spectrum Beta Lactamase

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The spread of genes encoding Extended-Spectrum Beta-Lactamases (ESBLs) among pathogenic strains remians to be a major global public health concern. ESBL enzymes are capable of hydrolyzing the beta-lactam ring of extended-spectrum beta-lactam antibiotics[1]. Since 2008, the CTX-M pandemic has made the treatment of *Enterobacteriaceae* infections one of the challenging healthcare problems. Currently, ESBL-producing *Enterobacteriaceae* (ESBL-E), particularly *E. coli* and *K. pneumoniae*, are widely prevalent, especially in urinary tract infections[2]. For ESBL detection, commercial ELISA kits and PCR-based molecular diagnostic kits are utilized in addition to conventional methods. Numerous studies in the literature have reported the superior sensitivity and specificity of molecular assays compared to traditional techniques. Consequently, it is recommended that findings obtained from conventional methods to be compared and validated using molecular testing[3]. This study aimed to develop peptide aptamers for the diagnosis of CTX-M, the dominant ESBL-E variant. To achieve the development of these aptamers, the mRNA display method was applied, utilizing protocols available in the literature[4]. The codon-optimized gene sequence encoding CTX-M was cloned into the pET-28a vector, and the recombinant protein was obtained with high purity following heterologous expression in *E. coli*. The protein, which was covalently linked to carboxyl-activated magnetic beads, was used as the target in nine rounds of mRNA display. Subsequently, the unique peptide aptamer encoding DNA sequences were cloned into a cloning vector and subjected to Sanger DNA sequencing. Sequence analysis revealed the enrichment of peptide aptamers exhibiting high levels of homology. The peptide aptamers, produced as fusions with mCherry and DsRed fluorescent proteins. Fusion proteins were used for *in vitro* characterization studies in order to determine their affinity and selectivity to CTX-M target. These peptide aptamers, which are the first reported to be developed specifically for CTX-M in the literature, possess the potential to play a key role in controlling the ESBL pandemic through their potential utility in the development of ELISA and LFA (Lateral Flow Assay) kits.

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Development of DNA Aptamer-Based Detection Platform for *Clostridium perfringens* Epsilon Toxin

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Clostridium perfringens epsilon toxin (ETX) is one of the most potent pore-forming toxins known, primarily causing severe enterotoxemia in livestock[1]. Due to its high toxicity, rapid and accurate detection of ETX is crucial for both veterinary health and public safety. Traditional detection methods, such as ELISA and PCR, often have limitations related to speed, cost, and complexity. This study addresses the need for a more efficient diagnostic tool by developing a novel single-stranded DNA aptamer that specifically binds to the epsilon toxin.

To accomplish this, the codon-optimized gene encoding the *C. perfringens* quadruple-mutant epsilon toxin was cloned into a pET-30a expression vector[2]. Recombinant ETX toxin was then heterologously expressed in *E. coli* and purified to a high degree of purity. The highly pure ETX was covalently attached to carboxyl-activated magnetic beads and used as a target for *in vitro* selection. After 11 rounds of selection, single aptamer clones were isolated and determined by Sanger sequencing. Sequence analysis of the final pool revealed a significant enrichment of aptamer candidates. The three most enriched aptamer sequences were chemically synthesized with fluorophore modifications. These fluorophore-labeled aptamers were then used to develop a novel fluorometric method for the detection of ETX in food and tap water samples.

Titration of the recombinant ETX resulted in a binding curve with a dissociation constant (Kd) at the nanomolar level. We studied the detection range and percent recovery and compared our findings to commercially available ELISA kits. The results indicate that our aptamer-based method provides performance comparable to that of commercial kits, demonstrating its potential as a robust and effective alternative for ETX detection.

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Structure-Retention and Structure-Selectivity Dependence of Novel Chiral Sulfoxides in High-Performance Liquid-Chromatography

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Chiral sulfoxides represent important group of organic compounds.[1,2] In the present study, separation of enantiomers of twenty-eight novel chiral sulfoxides was studied on ten polysaccharide-based chiral columns in high-performance liquid chromatography. The main aim of this study was to understand the effect of chemistry of chiral selector and chiral analyte, and of mobile phase nature on the enantioselective recognition and separation of the studied chiral sulfoxides. From the viewpoint of chiral selector chemistry, differences in the chiral polymer (amylose or cellulose), in the linkage type between the polymer backbone and pendant groups (carbamate or ester) as well as in the nature of the substituents (chlorine and methyl) and in their position on the phenyl moiety of the pendant groups were considered. From the viewpoint of chiral sulfoxide chemistry, the impact of the following structural factors on the enantioseparation were considered: position of amide functionality relative to the side chain containing the chiral sulfinyl moiety, substituents on the side chain containing sulfinyl moiety (R) as well as the substituents on the amide functionality (R_1 & R_2). The mobile phases used in this study were acetonitrile, methanol, aqueous-acetonitrile, aqueous methanol, as well as *n*-hexane containing various polar modifiers. Some correlations between the nature of chiral selector, chiral analyte and separation medium, on one side, and analyte retention and selectivity of separation of chiral sulfoxide enantiomers were observed. In some cases, enantiomers were separated with unusually high separation factors.

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Investigation of DNA Binding Properties of Binuclear Cu (II) Complex Containing a Hydrazone Schiff Base

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DNA plays a crucial role in the diversity of cellular processes and serves as a primary target for the treatment of diseases such as cancer and microbial infections. Therefore, exhaustive research over the past four decades has focused on the effects of small compounds that bind and break nucleic acids.[1-2]

In this study, the interaction of a previously synthesized and characterized binuclear Cu (II) complex containing a Hydrazone Schiff Base with DNA was examined using spectroscopic, electrophoretic and computational methods. Spectroscopic DNA titration studies have shown that both ligand and the binuclear Cu (II) complex interact with DNA. Additionally, electrophoresis studies revealed that the binuclear Cu (II) metal complex cleaves DNA in both hydrolytic and oxidative manner. Finally, the molecular docking findings demonstrated that the Cu (II)-complex preferentially binds to the major groove of B-DNA with higher affinity and stability compared to the minor groove. The results supported that this complex may be a suitable agent for DNA-based drug development.

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Apigenin from Plants: Extraction and Purification

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Apigenin, a naturally occurring flavonoid, has garnered significant attention for its antioxidant, anti-inflammatory, and anticancer properties. However, the industrial production of high-purity apigenin is often limited by low yields and costly processes [1]. The objective of this study was to develop a cost-effective extraction and purification protocol for apigenin from select plant sources and to evaluate its antimicrobial potential against clinically relevant bacterial strains.

Dried and homogenized samples of *Matricaria chamomilla L.(*chamomile), *Apium graveolens*(celery), and *Petroselinum crispum*(parsley) were extracted using methanol, dimethyl sulfoxide (DMSO), and ethyl acetate. The removal of solvents was accomplished through the process of rotary evaporation. The purification process was carried out via gel filtration chromatography (Sephadex G-75), and the fractions were subsequently analyzed by UV–VIS spectroscopy. These results were then compared with standard apigenin profiles [2]. The antimicrobial activity was assessed against *Staphylococcus aureus* (ATCC 6538), *Streptococcus mutans* (ATCC 35668), and *Escherichia coli* (ATCC 8739) using the disk diffusion method.

The highest yield of apigenin was obtained from parsley samples extracted with DMSO. The purified fractions demonstrated UV–VIS absorption peaks that corresponded to the established characteristics of standard apigenin. Assays demonstrated measurable inhibition zones against *Staphylococcus aureus*, *Streptococcus mutans*, and *Escherichia coli*, confirming broad-spectrum activity. The most pronounced effects were observed across all tested strains, with inhibition zones reaching diameters of up to 12.5 mm. The collective findings suggest that the tested plant sources exhibited favorable outcomes for apigenin extraction and antimicrobial activity. Among the tested methods, parsley extraction with DMSO yielded the highest yield and demonstrated the most consistent purification profile. This finding underscores the promise of parsley as a particularly effective source of apigenin and corroborates the broader applicability of the developed protocol for diverse plant matrices.

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Non-Enzymatic Electrochemical Glucose Sensor Based on Multiwalled Carbon Nanotube-COOH/Screen Printed Carbon Electrode and Boronic acid Linked Viologen

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The reliable and continuous monitoring of diabetes is one of the primary goals of modern health technologies. Traditional enzymatic glucose sensors present disadvantages such as high cost, instability of enzymes to heat and pH, and limited shelf life[1]. In recent years, research on non-enzymatic electrochemical glucose sensors has intensified to overcome these limitations. Especially, nanomaterial-based electrochemical transducers stand out as promising sensor systems due to their low detection limits, high sensitivity, and rapid response times.

In the study, a low-cost, fast, and practical non-enzymatic electrochemical glucose sensor was designed. In this design, multiwalled carbon nanotube (MWCNT)-COOH was first used to increase the conductivity and electroactive surface area of the screen-printed carbon electrode (SPCE) surfaces[3]. These MWCNT-COOH nanostructures served as a functional interface to immobilize boronic acid-substituted benzyl viologen (*o*-BBV) molecules, which have high electron transfer capacity. o-BBV was used to enable the sensor's selective binding to glucose, owing to the boronic acids in its structure[4]. For this purpose, SPCE/MWCNT-COOH@o-BBV electrodes were prepared by physically modifying the working electrode of the SPCE with MWCNT-COOH nanostructures and o-BBV. The SPCE/MWCNT-COOH@o-BBV modified electrode was characterized electrochemically by differential pulse voltammetry, cyclic voltammetry, and electrochemical impedance spectroscopy; morphologically by scanning electron microscopy; and chemically by Fourier-Transform Infrared spectroscopy. Under optimum operating conditions, the analytical characterization of the glucose sensor (linear range, detection limit, repeatability) was performed using Differential Pulse Voltammetry (DPV). The developed disposable, practical, and low-cost dual glycose sensor exhibits a wide linear range, low detection limit, and high selectivity.

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An Alternative Clinical Monitoring Method for Osteoporosis: Osteopontin Biosensor

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Osteopontin (OPN), one of the important glycoproteins in the extracellular matrix of bone tissue, is known to regulate the bone homeostasis (cell adhesion, migration, proliferation, and apoptosis). The increased OPN levels promote osteoclastic activity, leading to a decrease in bone mineral density, and this results in osteoporosis.[1] For osteoporosis diagnosis, a bone density tests are currently performed using the radiological methods, and but the alternative methods that are cost-effective and easy to use are needed in this field. The biosensors developed for osteoporosis biomarkers like OPN are promise for sensitive, rapid, and practical determination of osteoporosis. In this study, an OPN biosensor was fabricated for OPN determination, and OPN measurements was carried out using electrochemical impedance spectroscopy (EIS). EIS is a powerful technique that allows for monitoring biomolecular interactions on surfaces, such as charge transfer and impedance changes.[2] Electrochemical biosensors are highly sought due to their low detection limits and applicability to clinical samples.

As part of this study, the OPN biosensor was developed thorough the anti-osteopontin immobilization following the activation with EDC/NHS of the end carboxyl groups of SAMs (self-assembled monolayers) formed by using 4-MPA on a gold electrode surface. All these steps performed during OPN biosensor fabrication, and biosensor characterization were observed using EIS and cyclic voltammetry (CV). The detection time and range for the OPN biosensor were determined as 45 min and 10-60 pg μL^{-1} OPN concentration, respectively. The LOD value was determined as 2.64 pg μL^{-1} and the LOQ value as 8.8 pg μL^{-1}. The developed biosensor was successfully applied to OPN-spiked artificial serum samples.

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Effects of Proline and Biofertilizer on Rye Germination under Osmotic Stress

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Drought stress poses a major challenge for agriculture around the world by limiting crop yields.[1] To improve the development of drought-tolerant cereal crops, it is important to understand how seeds germinate when faced with water scarcity—especially in resilient plants like rye (*Secale cereale* L.).[2] This study examined how proline and biofertilizer treatments affect the germination of two rye cultivars (Üsküp and Poduyeva) under simulated drought conditions with PEG. Seeds were soaked in different concentrations of proline and biofertilizer (*Bacillus thuringiensis* LU3, *B. toyonensis* NMCC157, *B. cereus* L14 and *Brachybacterium nesterenkovii* NY-3 bacterial mixture grown in liquid carrier) before being placed in Petri dishes. The experiments compared untreated controls, several levels of PEG-induced osmotic stress (5–20%), various proline concentrations (1–20 mM), and different biofertilizer doses (1–5 mL/L) containing a mix of beneficial bacteria. Findings showed that higher osmotic stress reduced germination rates and slowed down the process overall. However, low proline concentrations (1–5 mM) improved both germination and seedling growth, while higher doses (15–20 mM) hindered these outcomes. Biofertilizer applications generally promoted better germination and stronger seedlings, with the most positive results seen at 5 mL/L. In summary, applying low concentrations of proline and 5 mL/L biofertilizer can enhance rye germination under drought conditions, suggesting a promising approach for developing crops that are better able to withstand water shortages.

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Anti-tyrosinase and DPPH Free Radical Scavenging Activities of Ethanol Extracts from Some Plants

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Tyrosinase is an enzyme found in many living organisms and is responsible for melanin formation in humans. In the cosmetics, health, and food industries, research is being conducted on the tyrosinase enzyme, and natural-source tyrosinase inhibitors are being investigated.[1-3] Tyrosinase inhibitors such as kojic acid, arbutin, and benzoate derivatives are used in topically applied products in the cosmetics and health fields.[4,5] In this study, the tyrosinase inhibition activity of ethanolic extracts obtained from the leaves of grapevine, mulberry, olives, willow tree, and sour cherry stalk was investigated. Since the skin is continuously exposed to UV light and thus radical formation, the free radical scavenging activity and total phenolic compound of the extracts were also determined.

Among these plants, two species of olive leaf extracts (Domat and Gemlik) and cherry stalk extract had higher phenolic content and DPPH radical scavenging activity and, they showed better anti-tyrosinase activity compared to the other extracts. However, none of the samples were able to inhibit the tyrosinase enzyme to a level comparable to the standard compound kojic acid.

According to the data obtained from the antioxidant activity study, the extracts of grapevine and olive leaves (Domat and Gemlik species) have removed DPPH radicals at a level comparable to BHT; the sour cherry stalk extract has removed DPPH radicals at a level comparable to BHA. Finally, the leaves which remain as organic waste while drying in nature, will increase the economic value of these plants due to their demonstrated biological activities and may find application potential in various fields.

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The Role of Pancreatic Lipase Enzyme in Obesity and Evaluation of Pancreatic Lipase Enzyme Studies in 2024-2025

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Obesity is one of the most significant public health problems in both developed and developing countries today. Pancreatic lipase is the primary enzyme involved in the hydrolysis of dietary triglycerides. This enzyme is directly linked to obesity and is considered a critical target for regulating fat absorption. In this context, pancreatic lipase (PL) plays a central role in the hydrolysis of dietary triglycerides, and its inhibition—by reducing fat absorption—has been considered an effective approach to obesity therapy. The aim of this study is to evaluate pancreatic lipase enzyme in the context of its relationship with obesity and to evaluate current research on lipase enzyme in 2024–2025. Recent studies have shown promising results for novel inhibitors derived from natural products. He et al. identified curcuminoids as potent PL inhibitors, whereas Toy et al. demonstrated that galactolipids from Brassica rapa delay fat digestion via non-competitive inhibition.[1,2] Rocha et al. revealed differences in inhibitory responses between human and porcine PL enzymes, emphasizing that human enzyme–focused screening may reduce translational loss.[3] Similarly, Qin et al. evaluated baicalin derivatives and developed new, potent hPL inhibitors, while Ponce Martínez et al. clinically tested the effect of silybin on PL inhibition in humans.[4,5] The field is shifting from classical screening methods to human-based enzymology and natural product-based research. PL studies hold a strategic position in the fight against obesity, both for pharmaceutical innovation and for functional food design. In conclusion, current studies on pancreatic lipase provide important contributions to the development of more effective and safe inhibitors in the treatment of obesity.

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Design of a Lactate Dehydrogenase Immobilized Au-SPE Platform for Sensitive Lactate Determination

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The early detection of metabolic disorders and tissue injury is dependent upon the rapid and reliable determination of biomarkers. The aim of the study is to create an amperometric enzyme biosensor for lactate detection, utilising gold screen-printed electrodes (Au-SPE). The high electrical conductivity and surface modification properties of Au-SPE electrodes make them a beneficial platform for biosensor development[1]. In order to facilitate enzyme immobilization, the electrode surface was functionalized with mercaptosilane agents. This method establishes a stable interlayer by establishing robust interactions between the thiol groups and the gold surface. Then, lactate dehydrogenase (LDH) was immobilized. LDH is a critical enzyme that is involved in the conversion of lactate to pyruvate and is a critically essential biomarker in clinical biochemistry for the detection of hypoxia, metabolic disorders, and tissue damage[2]. In order to assess the biosensor's functionality, direct amperometric measurements were implemented. The biosensor that has been developed is expected to exhibit high sensitivity and selectivity in lactate determination, be adaptable to biological samples, and be promising for portable diagnostic platforms, despite the fact that analytical data has not yet been concluded.

This study is produced from the “Development of new analytic tools and pathways to accelerate diagnosis and diagnostic monitoring of rare diseases: Metabolic test in vivo for Malignant Hyperthermia” project, and the authors are grateful for the financial support from The Scientific and Technological Research Council of Türkiye (TUBITAK) Project Number 123N049.

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Effect of Hicaz Pomegranate Peel Extract on Mushroom PPO Activity and Browning

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Mushroom is among the fresh-cut products that rapidly undergo enzymatic browning due to polyphenol oxidase (PPO) activity. In this study, the effects of phenolic-rich extract obtained from Hicaz pomegranate peel by ultrasound-assisted extraction on mushroom PPO enzyme were evaluated.

The specific activity of partially purified mushroom PPO was determined as 689,602.5 U/mg. In vitro inhibition assays revealed an IC_{50} value of 0.95 mg/mL for mushroom PPO, while Lineweaver–Burk analysis indicated a mixed-type (semi-competitive) inhibition mechanism[1]. Molecular docking studies demonstrated that quercetin (−7.3 kcal/mol), myricetin (−7.0 kcal/mol), and luteolin (−7.0 kcal/mol) established hydrogen bonds and π–π interactions with PPO, exhibiting stronger binding energies than ascorbic acid (−5.3 kcal/mol).

During cold storage (4 °C), the L* value of control samples decreased from 29.48 ± 3.72 (day 0) to 6.57 ± 3.37 (day 3) and 4.89 ± 1.95 (day 7). In extract-treated samples, L* values were better preserved, decreasing from 33.73 ± 11.09 (day 0) to 28.87 ± 3.42 (day 3) and 7.46 ± 6.08 (day 7). Texture analysis showed that firmness increased to 13.07 ± 1.61 N in the control group by day 7, whereas extract-treated mushrooms exhibited a lower value of 11.20 ± 1.52 N. Moreover, texture results indicated that the extract slowed down dehydration-induced hardening[2].

In conclusion, Hicaz pomegranate peel extract effectively inhibited mushroom PPO, reduced enzymatic browning, and extended shelf-life up to 3 days. These findings highlight the potential of this extract as a natural and sustainable anti-browning agent in the food industry.

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Isolation and Acute Oral Toxicity of a Bioactive Isolate from a Bryophyte, *Mnium spinulosum*

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In this study, bioactive fractions were isolated from *Mnium spinulosum* and evaluated as a potential natural source of α-glucosidase inhibitor, widely used in the management of postprandial hyperglycemia[1]. Dried plant material was powdered and extracted by Soxhlet using n-hexane/ethyl acetate (85:15, v/v), yielding a crude extract. The extract was subsequently fractionated via Silica gel column chromatography with a gradient elution of *n*-hexane/ethyl acetate mixtures. The resulting fractions were screened for α-glucosidase inhibitory activity *in vitro*. Among them, fraction fr3.1 showed the strongest inhibitory effect. Thin-layer chromatography (TLC) analysis of fr3.1 produced four isolates (izo1–izo4), of which izo2 exhibited the highest enzyme activity.

The acute oral toxicity of izo2 was evaluated in male C57BL/6 mice according to OECD 425 guidelines. At a dose of 17 mg/kg, histopathological examination of liver, kidney, heart, and pancreas revealed no abnormalities, confirming safety at this concentration. However, administration of higher doses resulted in pathological changes, including vascular congestion, inflammation, degeneration, and edema.

Overall, these findings identify izo2 from *M. spinulosum* as a bioactive natural compound with a significant α-glucosidase inhibitory potential and support its promise as a leading candidate for further antidiabetic drug development.

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Development of Quercetin and Polyethyleneimine Modified Gold Nanorods for Anticancer Applications

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Quercetin (Q, 3,3',4',5,7-pentahydroxyflavone) is an important bioflavonoid found abundantly in more than 20 plant materials. Q has anti-inflammatory, anticancer and antioxidant properties. There are some obstacles in the clinical applications of Q owing to its instability, hydrophobic structure, inadequate bioavailability. Considering such limiting aspects of Q, its use in conjugation with various materials at micro/nano scales may offer significant advantages.[1] Cancer is currently among the deadliest diseases of the world, and there is a great need for modern approaches that include innovative technologies for cancer therapy. Gold nanorods (AuNRs) have a major place in innovative approaches and they are ideal nanomaterials for photothermal therapy (PTT) applications in addition to the targeted delivery of various natural/synthetic therapeutic agents.[2] Suitable surface modification increases stability, biocompatibility, cellular uptake, biodistribution and finally bioavailability of AuNRs. Gold nanomaterials can be conjugated with biomolecules and drugs by covalent/ionic bonding or physical interactions.[3] The aim of the study is to synthesize quercetin and polyethyleneimine (PEI) modified gold nanorods (AuNRs) for anticancer applications. In this study, cetyltrimethylammonium bromide (CTAB) stabilized AuNRs were synthesized and their surfaces were modified with polyethyleneimine (PEI-SH), polyethylene glycol (PEG-SH), Q or Q-PEI-SH. The AuNRs synthesized successfully by the seeding growth method were quite stable and they had an average length of 90 nm and width of 15 nm. The obvious changes in the surface plasmon resonance (SPR) peak wavelength in the AuNR groups occurred depending on the surface modifications. The PEI, PEG, Q and Q/PEI surface coatings of the AuNRs were also confirmed by Fourier-transform infrared spectroscopy (FTIR) analysis. Scanning electron microscopy (SEM) characterizations of all the synthesized AuNRs groups were performed. Different zeta potential (mV) values were obtained depending on the surface modifications of the AuNRs. It was concluded that synthesized AuNRs can be used as a potential nanotherapeutic agent for various *in vitro/in vivo* anticancer biomedical applications.

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Potential of *Aronia melanocarpa* (Michaux) Elliot in the Development of Functional Foods: A Sample Bioinformatics Study

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Functional food is one of current topics in the food biochemistry. Discovering of new bioactive molecules and addition to the traditional foods have been investigating within the last decade. Bioactive peptides are maximum 20 amino acid long peptides with proven biological activities such as antilipidemic, antihypertensive and antioxidant.[1,2] In this study, the potential of *Aronia melanocarpa* (Michaux) Elliot in the development of functional foods is presented by using bioinformatics tools. The fasta sequence of the rubisco large chain of *A. melanocarpa* was retrieved from Uniprot.org. The accession number of the protein is A0A1V0J1T8. The protein parameters and bioactive potential of rubisco large chain from *A. melanocarpa* were estimated through protparam[3] and BIOPEP-UWM[4], respectively. According to the protparam results, the values of pI, maximum amino acid percentage, instability index and GRAVY were found to be 6.3, 9.9%, 40.34 and -0.245, respectively. The BIOPEP results revealed that there are many bioactive peptides such as dipeptidyl peptidase IV, ACE and alpha-glucosidase inhibitors in the structure of the rubisco large chain of *A. melanocarpa.* Moreover, hypouricemic, hypolipidemic, stimulating and antioxidative activities were detected. The AE, W, B and V values related to ACE inhibition were found to be 0.0654, 0.1189, 0.002 and 0.0952, respectively. In conclusion, the rubisco large chain of *A. melanocarpa* can be used as the source of bioactive peptides for development of functional foods.

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Immobilization of Catalase onto Corn Silk and Characterization of Its Biochemical Properties

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Catalase is an essential antioxidant enzyme that catalyzes the decomposition of hydrogen peroxide into water and oxygen, playing a crucial role in protecting cells from oxidative damage.[1] Due to its high catalytic efficiency and potential industrial applications, improving its stability and reusability has become an important focus of enzyme engineering studies.[2] Corn silk, the elongated stigma from the maize plant, is a low-cost and biodegradable agricultural by-product rich in cellulose-like structures, making it a suitable natural support for enzyme immobilization.[3]

In this study, catalase was immobilized onto corn silk using glutaraldehyde as a cross-linking agent. The immobilization process was optimized by examining key parameters including enzyme concentration, support amount, cross-linking time, and glutaraldehyde concentration. The optimum conditions were determined as 1 mg/mL catalase, 20 mg corn silk, 45 minutes cross-linking time, and 4% glutaraldehyde. Biochemical characterizations of both free and immobilized catalase were performed. The optimum temperature increased from 30°C (free) to 35°C (immobilized), and the optimum pH shifted from 7.0 to 8.0, indicating enhanced stability. Additional studies on thermal stability, pH stability, kinetics, reusability, and storage stability confirmed that the immobilized enzyme maintained significant activity over time and repeated use.

These findings suggest that corn silk is an effective, sustainable support for catalase immobilization, improving both its stability and functional performance in potential industrial and environmental applications.

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Electrospun PEO/Zein-Based Nanofibrous Scaffolds for Lipase Immobilization

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Lipase is a versatile biocatalyst widely used in industrial applications such as biotransformations, biodiesel production, and food processing. However, its stability and reusability can be significantly enhanced through immobilization.[1,2] Electrospun nanofibers provide an ideal support matrix due to their high surface area and tunable morphology, improving enzyme loading and activity.[3]

In this study, we synthesized polyethylene oxide (PEO)/zein nanofibers via the electrospinning method to serve as a novel support for lipase immobilization. The nanofibers were produced under optimized electrospinning parameters: polymer solution flow rate of 1.5 mL/h, applied voltage of 9 kV, and needle-to-collector distance of 17 cm. The resulting nanofibers were characterized using Scanning Electron Microscopy (SEM) to evaluate surface morphology, Fourier Transform Infrared Spectroscopy (FTIR) to investigate chemical interactions, and Thermogravimetric Analysis (TGA) to assess thermal stability. Following characterization, lipase enzyme was successfully immobilized onto the nanofiber surface.

These findings demonstrate the potential of PEO/zein-based electrospun nanofibers as a functional platform for enzyme immobilization, offering enhanced thermal stability and reusability for potential industrial biocatalysis applications.

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Binding Constant Determination of Maprotiline Hydrochloride-DNA Interaction Using UV Spectrophotometric Method

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The interaction of maprotiline hydrochloride (MAP) with DNA was investigated in a phosphate buffer solution at physiological pH (7.4) and 298 K using UV spectrophotometry. This technique is useful for monitoring drug–DNA interactions because changes in the absorption characteristics of the drug can reveal important information about binding affinity, binding modes, and conformational changes within the DNA structure. In the experimental setup, UV spectra were recorded for a series of MAP-DNA mixtures prepared with a fixed MAP concentration of 12.7 µM and increasing DNA concentrations of 40.0, 80.0, 120.0, 160.0, and 200.0 µM. The spectra were measured over the range of 200–400 nm, which covers the characteristic absorption regions of both MAP and DNA. To distinguish the spectral changes caused specifically by drug binding from those inherent to DNA absorption, the UV spectra of pure DNA solutions were also recorded as controls. These DNA spectra were subtracted from the spectra of the MAP-DNA mixtures, thereby isolating the contributions arising from MAP upon interaction with DNA. The corrected spectra showed a clear decrease in absorbance at 259 nm as the DNA concentration increased. Quantitative analysis of the binding interaction was performed using the following equation [1]:

$$\frac{A_0}{A-A_0} = \frac{\varepsilon_{A_0}}{\varepsilon_A-\varepsilon_{A_0}} + \frac{\varepsilon_{A_0}}{\varepsilon_A-\varepsilon_{A_0}} \frac{1}{K[DNA]} \qquad (1)$$

Here, $A_0$is the absorbance of pure MAP, $A$is the absorbance of the MAP-DNA complex, $K$is the binding constant, [DNA] is the concentration of DNA, and $\varepsilon_{A_0}$and $\varepsilon_A$are the molar absorptivity coefficients of MAP and the MAP-DNA complex, respectively. According to this relation, a linear plot is obtained when $\frac{A_0}{A-A_0}$is plotted against $1/[DNA]$. From the slope and intercept of this plot, the binding constant can be determined by taking the ratio of the intercept to the slope. Experimentally, this approach yielded a straight-line relationship, confirming that the binding process follows the expected model. At 298 K, the binding constant (K) was calculated to be $(1.09 \pm 0.020) \times 10^3$ M^{-1}. This magnitude of binding constant suggests a moderate affinity between MAP and DNA. This interaction may have biological significance, as drug–DNA binding can influence processes such as replication and transcription, thereby contributing to the drug's therapeutic or side effect profile.

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Development of a DNA Aptamer for a Virulence Enzyme of *Mycobacterium Tuberculosis*

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Tuberculosis, caused by *Mycobacterium tuberculosis*, is recognized as a major global health concern due to the emergence of multidrug-resistant strains. The limited success of conventional antibiotic discovery has intensified the need for novel therapeutic strategies. In this context, targeting bacterial virulence factors has emerged as an innovative approach that may reduce the risk of resistance development. Among these, the zinc-dependent metalloprotease Zmp1 has been identified as a critical target requiring selective inhibition. [1]

In this study, the aim was to develop selective DNA aptamer inhibitors against Zmp1, a key virulence factor of *M. tuberculosis*. The recombinant production of the Zmp1 protein was carried out using the *Escherichia coli* BL21(DE3) expression system, and the expressed protein was subsequently purified through Ni-NTA affinity chromatography. The purity and expected molecular weight of the purified product were verified by SDS-PAGE analysis, confirming the efficiency of the production process. To obtain DNA aptamers with high specificity toward the target protein, the SELEX (Systematic Evolution of Ligands by Exponential Enrichment) strategy was employed.[2] In this procedure, a single-stranded DNA library composed of random sequences was prepared under defined folding conditions to acquire secondary structures and then incubated with the Zmp1 protein. During the interaction phase, non-binding sequences were removed through consecutive washing steps, whereas high-affinity binders were recovered by elution. To further enhance the selection specificity, counter-SELEX steps were incorporated into certain rounds, aiming to eliminate sequences with potential binding to non-target proteins. Through this design, the selected aptamers were enriched to interact with Zmp1 with high affinity and selectivity.

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Physicochemical Characterization and Bioactive Potential Assessment of Brown Algae Colpomenia sinuosa Extract

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Marine macroalgae are rich in biologically active metabolites, making detailed investigation of different macroalgae compositions and their health-promoting effects important[1]. This study investigated the physicochemical properties and biological activities of Co*lpomenia sinuosa* extract obtained through pressurized hot water extraction from samples collected from İzmir/Urla Aşıklar Çeşmesi, Turkey. The extract was characterized for organic and inorganic composition, revealing carbohydrate content (22.10%), phenolic compounds (15.25%), notable macro-elements (phosphorus, sodium, potassium), micro-nutrients (cobalt, manganese, iron, zinc), and exceptionally high fucoxanthin content (284.346 µg/g). The extract demonstrated significant antioxidant activity with 50.45% DPPH radical scavenging at 5% v/w concentration and anti-inflammatory potential through albumin denaturation inhibition. Remarkably, the extract exhibited selective prebiotic properties, promoting growth and aggregation of oral probiotic strains *Streptococcus salivarius* M18 and K12 under both aerobic and limited oxygen conditions, while simultaneously inhibiting pathogenic *Streptococcus* mutans growth. Anti-proliferative effects were observed against HCT-116 colon cancer cells, with reduced cell viability compared to controls. These findings highlight *C. sinuosa* as a promising candidate for functional food applications and therapeutic development, warranting further investigation of specific bioactive molecules responsible for the observed effects.

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Temperature-Dependent Modulation of Microplastic-Induced Oxidative Stress and Antioxidant Gene Expression in *Arabidopsis thaliana*

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This study investigated the interactive effects of polystyrene (PS) microplastics and elevated temperature on oxidative stress responses in *Arabidopsis thaliana* seedlings. Microplastics were prepared by grinding Eppendorf tubes and characterized using SEM imaging, revealing particles approximately 10 µm in size. Seeds were germinated on MS medium containing three concentrations of microplastics (80, 160, and 320 mg/L) and grown under different temperature conditions (22°C, 28°C, and 32°C) for 3, 5, and 10-day periods. Results demonstrated that microplastic exposure significantly reduced root and shoot growth in a dose-dependent manner, with 320 mg/L showing the most severe growth inhibition. Temperature stress at 32°C exacerbated these negative effects, with the combination of 320 mg/L microplastics and elevated temperature causing the most dramatic reduction in plant growth. Oxidative stress assessment through NBT and DAB staining revealed increased superoxide radical and hydrogen peroxide production in microplastic-treated plants, with the highest ROS accumulation observed under combined microplastic and heat stress conditions. Lipid peroxidation analysis confirmed elevated oxidative damage, particularly in the 320 mg/L microplastic treatment at 32°C. Gene expression analysis showed upregulation of antioxidant enzymes (CAT and APX) under normal conditions with microplastic exposure. However, under combined microplastic and heat stress (32°C + 320 mg/L), CAT gene expression was downregulated, suggesting potential breakdown of antioxidant defense mechanisms under severe stress conditions. These findings are consistent with previous reports demonstrating that microplastics induce oxidative stress in plants[1] but extend this knowledge by showing temperature-dependent effects. The observed downregulation of antioxidant genes under combined stress conditions suggests that plants may experience compromised adaptive responses when faced with multiple environmental stressors simultaneously. This phenomenon aligns with the concept of stress cross-tolerance breakdown, where multiple stressors can overwhelm cellular defense mechanisms. The synergistic interaction between microplastic pollution and elevated temperature has important implications for plant survival under climate change scenarios, as rising global temperatures may amplify the negative effects of plastic contamination in agricultural and natural ecosystems.

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Development of a Label-Free AuNPs–TiS_2 Nanostructured Immunosensor for Sensitive Carcinoembryonic Antigen Detection

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Carcinoembryonic antigen (CEA) is a well-known tumor biomarker commonly used in the diagnosis and monitoring of various cancers, including colorectal, pancreatic, and breast cancer.[1] Early and sensitive detection of CEA is therefore crucial for effective clinical management. In this study, a novel label-free immunosensor was developed for the quantitative determination of CEA, integrating the synergistic advantages of zero-dimensional gold nanoparticles (AuNPs) and two-dimensional titanium disulfide (TiS_2) nanosheets.

Gold nanoparticles were electrochemically deposited onto the surface of a screen-printed electrode (SPE), and TiS_2 nanosheets were introduced to enhance conductivity and surface area. The electrode surface was further modified with 11-mercaptoundecanoic acid (MUA) to enable carboxyl functionalization, followed by the immobilization of anti-CEA antibodies via EDC/NHS coupling chemistry. Subsequently, Nafion was applied as a protective layer, while bovine serum albumin (BSA) was used to block nonspecific adsorption. For comparison, a similar immunosensor without TiS_2 was also fabricated.

CEA quantification was performed using an impedimetric technique. Results demonstrated that the AuNPs-only sensor provided limited analytical performance, whereas the AuNPs–TiS_2-based immunosensor exhibited a remarkably wide linear detection range (1–100 pg/mL) with a low limit of detection (LOD) of 0.21 pg/mL. The proposed immunosensor displayed high selectivity, reproducibility, and excellent storage stability, confirming its potential applicability for CEA determination in biological samples such as blood.

These findings highlight the promising role of the Au–TiS_2 nanocomposite-based immunosensor as a sensitive and reliable tool for early cancer diagnostics and clinical monitoring. The results of this study have been accepted for publication in the journal Biomedical Microdevices.[2]

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Synthesis and Characterization of Silver Nanoparticles from *Eucalyptus globulus* via Green Synthesis

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Metal nanoparticles (MNP) (gold, silver, zinc, copper, etc.) are commonly used valuable materials. Various methods are used to synthesize MNPs, including thermal processing, photochemical, and chemical processes. These methods have disadvantages such as application difficulty, high cost, and the use of toxic chemicals [1]. Recently, there has been growing interest in biological methods as an alternative to these methods, as they are environmentally friendly, economical, and sustainable [2].

Silver nanoparticles (AgNP) are used in many different fields such as food, cosmetics, agriculture, textiles, and electronics. Biological sources such as algae, fungi, bacteria, and plants are used in the synthesis of AgNPs. Plants are preferred over other sources because they produce a greater amount of nanoparticles (NP), the synthesized particles are more stable, and the application steps are simpler and easier [3]. The leaves, roots, flowers, and fruits of plants are used in the synthesis of AgNPs. Bioactive components such as alcohol, phenol, flavonoids, and terpenoids found in plant sources reduce Ag^{+} ions in aqueous solutions to the Ag^{O} form, thereby forming AgNPs [4].

Eucalyptus globulus is a shrubby plant or flowering tree belonging to the *Myrtaceae* family. It is currently grown in many regions of the world. The leaves of the plant are rich in tannins, flavonoids, and phenolic acids, as well as volatile oils containing mainly eucalyptol (1,8-cineole) [5].

In this study, AgNPs were synthesized via green synthesis using an extract obtained *from Eucalyptus globulus* leaves. In this context, the values of temperature, pH, synthesis time, and reducing agent concentration, which are known to affect the structure of AgNPs, were optimized. The synthesized NPs were characterized by UV-Vis spectroscopy, SEM, FT-IR, and XRD.

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Development of DNA Aptamers Against Pistachio Allergen Protein Pis v 3

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Pistachio (*Pistacia vera*) is among the most common tree nuts responsible for severe food allergies, with *Pis v 3* identified as one of its major allergenic storage proteins. Due to its strong IgE-binding capacity and its cross-reactivity with homologous proteins in other nuts such as cashew, *Pis v 3* poses a significant risk for allergic individuals[1]. Rapid and reliable detection of such allergens is critical for both food safety and clinical diagnostics. Conventional immunoassay-based approaches, particularly antibody-dependent ELISA tests, are limited by high production costs, stability issues, and cross-reactivity. This study addresses these limitations by developing a novel DNA aptamer capable of specifically recognizing *Pis v 3*[2] .

To achieve this, the *Pis v 3* encoding codon optimized gene was cloned into pET-28a expression vector. The recombinant protein was heterologously expressed in *Escherichia coli*, purified to high yield by His-tag affinity chromatography, and immobilized to Co-NTA magnetic beads. These beads were then used as the target in iterative SELEX rounds, including both negative and counter-selection steps. In counter-SELEX, *Cor a 11*, a hazelnut allergen protein sharing 55% sequence similarity with *Pis v 3*, was employed to eliminate cross-reactive candidates. Following enrichment, aptamer sequences were cloned, analyzed by Sanger sequencing, and subjected to structural characterization.

Structural and functional characterization revealed that the most enriched aptamers contained guanine-rich motifs forming stable G-quadruplex structures. These G-quadruplex aptamers exhibited intrinsic hemin-binding properties, enabling peroxidase-mimicking DNAzyme activity[3]. Without requiring any additional enzymatic or fluorescent tags, DNA aptamers could be directly used for both qualitative and quantitative analysis. Using hydrogen peroxide (H_2O_2) as the oxidizing agent and ABTS as the chromogenic substrate, the aptamer-based system achieved colorimetric detection of *Pis v 3* at concentrations as low as 1 ppb. These findings demonstrate the strong potential of G-quadruplex DNA aptamers as reproducible and cost-effective alternatives to antibody-based immunoassays inallergen detection and biosensor applications.

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Selection and Characterization of a DNA Aptamer Targeting Succinylacetone, a Biomarker of Tyrosinemia Type I

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Tyrosinemia Type I is a severe inherited metabolic disorder caused by the deficiency of fumarylacetoacetate hydrolase, the final enzyme in the tyrosine catabolic pathway. This enzymatic defect leads to the accumulation of toxic intermediates, including succinylacetone, which is responsible for the hepatotoxic and nephrotoxic effects observed in affected patients. Due to its strong correlation with disease severity, succinylacetone serves as a key biomarker for early diagnosis and newborn screening of Tyrosinemia Type I[1].

In this study, a novel DNA aptamer specific to succinylacetone was developed using the SELEX (Systematic Evolution of Ligands by Exponential Enrichment) method. Three aptamer candidates were selected and their binding affinities toward succinylacetone were determined using isothermal titration calorimetry (ITC), which is recognized as the gold standard technique for quantitative analysis of biomolecular interactions.Three aptamer candidates exhibiting distinct binding profiles were identified, and their dissociation constants (K_d values) were determined to be in the low µM range. The aptamers did not show detectable interaction with the counter-molecule tyrosine, confirming their high specificity toward succinylacetone.

This study represents the development of a specific DNA aptamer against succinylacetone, providing a strong foundation for its integration into newborn screening programs for Tyrosinemia Type I and for the creation of novel diagnostic tools for other metabolic disorders.

This study was supported by the Health Institutes of Turkey (TUSEB) under project number 33577.

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Enhanced DMD-Targeted Aptamer Discovery for Titin N-Terminal Fragment with SELEX

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Duchenne Muscular Dystrophy (DMD) is a rare, genetic muscle disease that causes progressive muscle breakdown and weakness in boys. The titin N-terminal has been emphasized as a potential pharmacodynamic biomarker in patients with DMD [1]. Different methods have been proposed for the determination of titin N-terminal fragment, such as ELISA[2] and Western-blot[3]. Due to the disadvantages of traditional methods, sensor and assay systems offer an important alternative to these methods. Aptamers are short, single-chain synthetic oligonucleotides that can selectively bind to their target molecules. They have superiority over monoclonal antibodies due to their ease of production and high stability.

In this study, the recombinant titin N-terminal fragment was produced and purified by column chromatography. Confirmation of the protein fractions obtained was performed by SDS-PAGE analysis. DNA aptamers specific for the titin N-terminal fragment were selected by the SELEX (systematic evolution of ligands by exponential enrichment) method. After each SELEX round, PCR products were visualized by agarose gel electrophoresis. The frequency of similar sequences among aptamer sequences and motif analysis was performed with the MEME-Suite program. As a result, significant enrichment was detected in 3 different motifs. Possible secondary structures of the selected aptamer sequences were predicted using the mfold program. The selected aptamer sequences were used as the recognition element of the biosensor for the specific determination of the titin N-terminal fragment.

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Investigating The Effect of LXR Agonist with Combination of Statin Drugs on Breast Cancer

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Liver X Receptor (LXR) is a nuclear receptor that regulates lipid metabolism and cholesterol biosynthesis. LXRs are activated by oxidized sterols to form heterodimers with Retinoid X Receptor (RXR) which induces the activation of ATP-binding cassette members to initiate reverse cholesterol transport. Therefore, LXR activation induces cholesterol accumulation in blood circulation.[1] LXR agonists promote cholesterol efflux by enhancing ABCA1 and ABCG1. Therefore, reduced cholesterol accumulation has been reported in lipid laden macrophages.[2] Besides, the anti-proliferative activity of LXR agonists have been proven in vitro on several cancers such as breast, ovarian and prostate cancers.[3] Another cholesterol metabolism modulating drug group Statins are widely used to inhibit HMG-CoA reductase which is a rate-limiting enzyme in cholesterol synthesis. The decrease in HMG-CoA reductase lowers the de novo cholesterol synthesis inside cells, therefore, helps metabolism stabilize overall cholesterol levels in the body. Recently, statin usage has been suggested in multiple anti-cancer studies including breast, lung, liver and kidney cancers.[4] The strategy as combination of inhibiting intracellular cholesterol uptake and blockage of de novo cholesterol synthesis is very likely a promising therapy for tumor cells to become vulnerable. In this study, the anti-cancer effect of LXR agonist T0901317 and statins (Atorvastatin and Rosuvastatin) was investigated individually and in combination against both MCF-7 and MDA-MB-231. For experimental methods, cell viability assay was performed to determine the IC_{50} values of T0901317, Atorvastatin and Rosuvastatin separately for each cell line. Later, IC_{50} values were applied to show the effect of T0901317 in combination with Atorvastatin and Rosuvastatin respectively. The IC_{50} values were then used for proliferation, scratch and cell cycle analysis. Our findings indicate that T0901317, Atorvastatin and Rosuvastatin showed significant difference compared to untreated groups, individually. Notably, combinations of T0901317 with Atorvastatin and T0901317 with Rosuvastatin showed even more prominent inhibitory effect on cell viability, proliferation, and cell mobility, suggesting a promising strategy against breast cancer treatment.

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Highly Sensitive and Cost-Effective Lactate Determination by An Electrochemical Biosensing System with A Portable Analyzer

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Lactate, long regarded merely as a byproduct of anaerobic metabolism, has emerged as a critical metabolite with diverse physiological and pathological roles. Beyond its traditional association with muscle fatigue during intense exercise, lactate plays a central role in energy metabolism, cellular signaling, and the regulation of pH homeostasis. It serves as a key energy substrate for various tissues, including the heart and brain, particularly under stress or hypoxic conditions[1]. Recent research has highlighted its function as a signaling molecule involved in processes such as angiogenesis, immune modulation, and cancer metabolism. The lactate shuttle concept has redefined our understanding of metabolic communication between cells and organs, emphasizing its role in maintaining systemic energy balance. Recognizing the multifaceted importance of lactate not only enhances our understanding of physiology and exercise science but also opens new avenues for therapeutic interventions in conditions such as sepsis, cancer, and metabolic disorders[2]. In this work, we developed an electrochemical analyzer system for the detection of lactate. As a biorecognition element, lactate oxidase enzyme was employed successively. Important optimization parameters were carried to obtain the best results for monitoring lactate. A wholly homemade and portable analyzer was also developed for lactate monitoring. The resulting biosensor with a portable analyzer was utilized for the detection of lactate in commercial serum samples.

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