



Ege Üniversitesi Yayınları
Fen Fakültesi Yayın No: 223

**1st International
Congress on Solutions
in Science
(INSCORE)
Online
11-13 September 2023
İzmir – Türkiye
inscore.ege.edu.tr**



Ege Üniversitesi Yayınları
Fen Fakültesi Yayın No: 223

**1st International Congress on
Solutions in Science
(INSCORE)
Online
11-13 September 2023
İzmir – Türkiye
inscore.ege.edu.tr**

**1st International Congress on Solutions in Science
(INSCORE)**

Online

11-13 September 2023

İzmir – Türkiye

inscore.ege.edu.tr

E-ISBN: 978-605-338-425-0

Ege Üniversitesi Üst Yayın Komisyonu'nun 24.09.2023 tarih ve 04/06 sayılı kararı ile yayınlanmıştır.

© Bu kitabın tüm yayın hakları Ege Üniversitesi'ne aittir. Kitabın tamamı ya da hiçbir bölümü yazarının önceden yazılı izni olmadan elektronik, optik, mekanik ya da diğer yollarla kaydedilemez, basılamaz, çoğaltılamaz. Ancak kaynak olarak gösterilebilir. Eserin bilim, dil ve her türlü sorumluluğu yazarına/editörüne aittir.

T.C. Kültür ve Turizm Bakanlığı Sertifika No: 52149

Ege Üniversitesi Yayınları

Ege Üniversitesi Basım ve Yayınevi

Bornova -İzmir

Tel: 0 232 342 12 52

E-posta: basimveyayinevisbm@mail.ege.edu.tr

Yayın Link

<https://basimveyayinevi.ege.edu.tr>

e-Yayın Tarihi: Ekim, 2023



Bu eser, Creative Commons Atıf 4.0 Uluslararası lisansı (CC BY-NC-ND) ile lisanslanmıştır. Bu lisansla eser alıntı yapmak koşuluyla paylaşılabilir. Ancak kopyalanamaz, dağıtılamaz,

değiştirilemez ve ticari amaçla kullanılamaz.

This work is licensed under a Creative Commons Attribution 4.0 International license (CC BY-NC-ND). Under this license, the text can be shared with the condition of citation. However, it cannot be copied, distributed, modified or used for commercial purposes.

ORGANIZING COMMITTEE

Assoc. Prof. Dr. Harika ATMACA - Manisa Celal Bayar University, Türkiye
Assoc. Prof. Dr. Güliz AK DEMİROZ - Ege University, Türkiye
Assoc. Prof. Dr. Süleyman İLHAN - Manisa Celal Bayar University, Türkiye
Res. Asst. Dr. Yusuf BAYRAKCI - Ege University, Türkiye
Res. Asst. Dr. Muhammet Burak BATIR - Manisa Celal Bayar University, Türkiye
Res. Asst. Ümmühan Fulden AYDIN - Çukurova University, Türkiye
Dursun DEMİROZ - Ege University, Türkiye
Çisil ÇAMLI PULAT - Manisa Celal Bayar University, Türkiye
Ferdi OĞUZ - Manisa Celal Bayar University, Türkiye
Aslı BAYRAKDARLAR - Ege University, Türkiye
Özge YILMAZ - Ege University, Türkiye

SCIENTIFIC COMMITTEE

(Alphabetic order)

Prof. Dr. Abdullah TULİ - Çukurova University, Türkiye
Prof. Dr. Adil MARDİNOĞLU - King's College London, U.K.
Prof. Dr. Ana Beatriz RODRIGUEZ MORATINOS - University of Extremadura, Spain
Prof. Dr. Ataç UZEL - Ege University, Türkiye
Prof. Dr. Ayhan ŞENKARDEŞLER - Ege University, Türkiye
Prof. Dr. Bayram ŞAHİN - Ege University, Türkiye
Prof. Dr. Burcu OKUTUCU - Ege University, Türkiye
Prof. Dr. Burçak KARACA YAYLA - Ege University, Türkiye
Prof. Dr. Carmen GALAN - University of Cordoba, Spain
Prof. Dr. Cenk SELÇUKİ - Ege University, Türkiye
Prof. Dr. Dilek ODACI - Ege University, Türkiye
Prof. Dr. Dinçer AYAZ - Ege University, Türkiye
Prof. Dr. Emel Öykü ÇETİN UYANIKGİL - Ege University, Türkiye
Prof. Dr. Emre MENTEŞE - Recep Tayyip Erdoğan University, Türkiye
Prof. Dr. Ergün TAŞKIN - Manisa Celal Bayar University, Türkiye
Prof. Dr. Ersin MİNARECİ - Manisa Celal Bayar University, Türkiye
Prof. Dr. Evrim KAYA - Manisa Celal Bayar University, Türkiye
Prof. Dr. Fatih KALYONCU - Manisa Celal Bayar University, Türkiye
Prof. Dr. Fatma YURT ONARAN - Ege University, Türkiye

Prof. Dr. Figen ZİHNİOĞLU - Ege University, Türkiye
Prof. Dr. Funda DEMİRHAN - Manisa Celal Bayar University, Türkiye
Prof. Dr. Güven ÖZDEMİR - Ege University, Türkiye
Prof. Dr. Hakan BEKTAŞ- Giresun University, Türkiye
Prof. Dr. Hasan TÜRKEZ - Atatürk University, Türkiye
Prof. Dr. Irada M HUSEYNOVA - Baku State University, Azerbaijan
Prof. Dr. Jose Antonio Pariente LLANOS, University of Extremadura, Spain
Prof. Dr. Kerim ÇİÇEK - Ege University, Türkiye
Prof. Dr. Mohammed ZNARI - Cadi Ayyad University, Morocco
Prof. Dr. Muhammet S. TOPRAK - KTH Royal Institute of Technology, Sweden
Prof. Dr. Murat AFSAR - Manisa Celal Bayar University, Türkiye
Prof. Dr. Mustafa ATEŞ - Ege University, Türkiye
Prof. Dr. Onur ŞAHİN - Sinop University, Türkiye
Prof. Dr. Rovshan KHALILOV - Baku State University, Azerbaijan
Jun.-Prof. Dr. Sangeun LEE - Saarland University, Germany
Prof. Dr. Seçil ÖNAL - Ege University, Türkiye
Prof. Dr. Selçuk TAKIR - Giresun University, Türkiye
Prof. Dr. Selma KATALAY - Manisa Celal Bayar University, Türkiye
Prof. Dr. Şenay ŞANLIER - Ege University, Türkiye
Prof. Dr. Uğur TIRNAKLI - Izmir University of Economics, Türkiye
Prof. Dr. Urfat NURİYEYEV - Ege University, Türkiye
Prof. Dr. Vecdi AYTAÇ - Ege University, Türkiye
Prof. Dr. Yakup KOLCUOĞLU, Karadeniz Technical University, Türkiye
Prof. Dr. Yiğit UYANIKGİL - Ege University, Türkiye
Prof. Dr. Yasemin KURT - İstanbul University Cerrahpaşa, Türkiye
Assoc. Prof. Dr. Adem GÜNER - Sinop University, Türkiye
Assoc. Prof. Dr. Arif GÜRİSOY - Ege University, Türkiye
Assoc. Prof. Dr. Aygun NASİBOVA - Baku State University, Azerbaijan
Assoc. Prof. Dr. Aziz EFTEKHARİ - Ege University, Türkiye
Assoc. Prof. Dr. Başak TOGAR - Bayburt University, Türkiye
Assoc. Prof. Dr. Burak DERKUŞ - Ankara University, Türkiye
Assoc. Prof. Dr. Çığır Biray AVCI - Ege University, Türkiye
Assoc. Prof. Dr. Elanur Aydın KARATAŞ - Erzurum Teknik University, Türkiye
Assoc. Prof. Dr. Esra AKAT ÇÖMDEN - Ege University, Türkiye
Assoc. Prof. Dr. Güliz AK DEMİROZ - Ege University, Türkiye

Assoc. Prof. Dr. Harika ATMACA - Manisa Celal Bayar University, Türkiye
Assoc. Prof. Dr. Hayal BOYACIOĞLU - Ege University, Türkiye
Assoc. Prof. Dr. İdris YAZGAN - Kastamonu University, Türkiye
Assoc. Prof. Dr. İlker BÜYÜK - Ankara University, Türkiye
Assoc. Prof. Dr. Kemal Volkan ÖZDOKUR - Erzincan University, Türkiye
Assoc. Prof. Dr. Necla KIRCALI GÜRSOY - Ege University, Türkiye
Assoc. Prof. Dr. Nur Selvi GÜNEL - Ege University, Türkiye
Assoc. Prof. Dr. Sabina OMAROVA - Baku State University, Azerbaijan
Assoc. Prof. Dr. Serap EVRAN - Ege University, Türkiye
Assoc. Prof. Dr. Sevilay ÖZTÜRK - Manisa Celal Bayar University, Türkiye
Assoc. Prof. Dr. Sezgi SOMUNCU - Sakarya University, Türkiye
Assoc. Prof. Dr. Süleyman İLHAN - Manisa Celal Bayar University, Türkiye
Assoc. Prof. Dr. Tuncay YILMAZ - Manisa Celal Bayar University, Türkiye
Assoc. Prof. Dr. Yavuz Emre ARSLAN - Çanakkale Onsekiz Mart University, Türkiye
Assist. Prof. Dr. Ayşe ÖZKAN - İzmir Bakırçay University, Türkiye
Assist. Prof. Dr. Fatma KOÇBAŞ - Manisa Celal Bayar University, Türkiye
Assist. Prof. Dr. Ferhat ŞİRİNİLDİZ - Adnan Menderes University, Türkiye
Assist. Prof. Dr. Günnur GÜLER - Izmir Institute of Technology, Türkiye
Assist. Prof. Dr. Habibe YILMAZ - Trakya University, Türkiye
Assist. Prof. Dr. Nurşah ERTUNÇ - Simon Fraser University, Canada
Assist. Prof. Dr. Simge ÜNAY, Lokman Hekim University, Türkiye
Assist. Prof. Dr. Syeda Abida EJAZ- The Islamia University of Bahawalpur, Pakistan
Dr. Emir BOZKURT - Royal College of Surgeons in Ireland, Ireland
Dr. Gizem DİMLİOĞLU - University of Warwick, U.K.
Dr. Gönül DÜNDAR - Technical University of Munich, Germany
Dr. Gülizar ÇALIŞKAN BİLGİN - Izmir University of Economics, Türkiye
Lecturer Ousman BAJINKA - University of Gambia, Gambia

CONTENTS

ORAL PRESENTATIONS

Circulating levels of soluble vascular endothelial growth factor receptor-2 (VEGFR-2) are elevated in women with polycystic ovary syndrome	2
Investigation of age-related histological hepatic alterations after intermittent fasting	4
Solutions of the modified Sihler's staining technique	5
Altered electroencephalogram recordings in sleep apnea	6
Relationship between HMGB1 and chemotherapy-induced peripheral neuropathy	9
Relationship between circadian rhythm, melatonin and obesity	11
Investigation of the role of IFN γ signaling pathway in response to BRAF inhibitors in A375 and SK-MEL-1 human melanoma cells	13
Comparative evaluation of antioxidant and antidiabetic activities of fruit extracts from diverse regions of Trabzon	14
In vitro evaluation of doxorubicin loaded chitosan-hyaluronic acid nanoparticles in two different cancer cell lines	15
Preparation of liposomes for use in glioblastoma treatment and in vitro studies	16
Preparation of liposomes containing nanoparticles combined with levothyroxine for use in thyroid diseases	18
Gel formulation of bio-synthesized zinc oxide nanoparticles loaded with antibiotic for use in skin infections	20
Preparation and characterization of axial disubstituted silicon phthalocyanine modified nano TiO ₂ thin films	21
Antioxidant activity of <i>Bellevalia sasonii</i>	22
Synthesis and characterization of silver nanoparticle-loaded albumin nanocarriers as cisplatin carrier for breast cancer therapy	24
Formulation and evaluation of oro-dispersible tablets containing trandolapril-cyclodextrin complex	25
Optimal solvent selection: development of a spectrophotometric quantification method for plant oil-based SNEDDS formulation	26
Synergistic drug delivery strategies for colorectal cancer therapy	28
Artificial intelligence applications in drug design	29
Investigation of the antibiofilm potential of <i>Ganoderma lucidum</i> as a potential food additive source	30

Investigation of the structures of alzheimer's disease and anti-alzheimer's effective compounds.....	31
Distribution of the seagrass <i>Posidonia oceanica</i> on the Aegean coasts of Türkiye ..	32
Biodiversity of marine Cladophorales on coasts of İzmir (Aegean Sea, Türkiye) ..	34
Investigation of the histopathological effects of different concentrations of borax on <i>Eisenia fetida</i>	35
Alterations of Ca ⁺² , pH, and reactive oxygen species in spermidine treated pollen tubes of <i>Actinidia deliciosa</i>	36
Toxic effects of phosmet on non-target organisms.....	37
Solution-centric approach: micropropagation of <i>R. odorata</i> and <i>R. rugosa</i> with emphasis on solvent modification and hormonal effects.....	39
Comparative de novo transcriptome analysis and random UV mutagenesis: application in high biomass and astaxanthin production enhancement for <i>Haematococcus pluvialis</i>	40
In silico characterization of pharmacokinetic and toxicity parameters of prevalent monosaccharides associated with mammalian glycans in glyconanotechnology applications.....	41
Radiolabeling, quality control and <i>in vitro</i> evaluation of [^{99m} Tc]Tc-HMPAO-exosomes for wound healing	42
Immobilization of <i>Candida rugosa</i> Lipase by Conformational Design Approach to Obtain Effective Catalysts at Ester Production.....	43
Phytochemical screening and anti-tyrosinase activity of three endemic plants grown in Trabzon region.....	44
Gold nanoparticle glycoconjugates targeting cancerous cell lines	45
Gold nanoparticle glycoconjugates improve the antibacterial activity of colistin...	46
Efficacy of green synthesis of nickel, copper and silver nanoparticles using <i>Thymus serpyllum</i> extract against <i>Acanthamoeba castellanii</i>	47
The usage of vegetable plant protein supported superabsorbent polymer in agriculture.....	49
Exploring anti-cancer constituents and cytotoxic effects of <i>Feijoa sellowiana</i> fruit extract on breast cancer	51
Preparation and determination of thermal properties of wood ash/lauric Acid (LA) composite for thermal energy storage.....	52
Removal of sirius blue from aqueous solutions by <i>Craterellus cornucopioides</i> biomass	53

The use of cross-linked sodium alginate hydrogels prepared loaded with tropical fruit wastes as biosorbent	55
The usage of solid-state nuclear track detectors in radon adsorption	56
Performance evaluation of anoxic/aerobic treatment unit using disc aerator with surface agitator: Case of Kayseri sugar factory	57
Performance evaluation of continuous stirred tank reactors.....	58
(CSTR-LESAR): Case of Kayseri sugar factory	58
The effects of different extraction methods on the antioxidant activity capacity of <i>Inula viscosa</i> L.	60
An investigation of self-organized complexity in one-dimensional atomic chain.....	61
Investigating the ion conductivity of $\text{Li}_{0.29}\text{Sr}_{0.6}\text{Mn}_{0.2}\text{Cr}_{0.1}\text{Ti}_{0.7}\text{O}_3$ as a solid electrolyte for Li-ion batteries	62
Transition metal substitution effects on structural and electrochemical performance of in high nickel Li-ion cathode material	63
Effect of annealing on optical band gap energy of tin oxide thin films.....	65
Non-extensive statistical physics analysis of earthquakes.....	66
The Usability of Soil Gas CO_2 Anomalies and $^{222}\text{Rn}/^{220}\text{Rn}$ Ratios Along the İzmir Fault Zone as Precursors for the definition of fault activity	67
The ongoing study on indoor radon levels in primary schools.....	68
An extended theoretical study on $^6\text{Li}(^3\text{He},d)^7\text{Be}$ reaction	69
A Matlab-based software package for computing 3D similarity transformations ...	70
A new approach to decision making in multi-fuzzy soft sets	71
Modeling of celiac diagnosis with fuzzy logic method in machine learning.....	72
A Matlab-based software package for converting coordinates in different formats and projections	74
A novel deep-learning-based model for breast cancer detection	75
Improvement of disaster logistics by independence axiom approach.....	76
Emergency shelter location selection using the Novel Sine Trigonometry TOPSIS method based on the Aczel-Alsina function.....	77
The role of food components in new product development	78
POSTER PRESENTATIONS	
Development of antivenom through antibody purification for <i>Mesobuthus gibbosus</i> anatolicus venom: A promising approach for scorpionism treatment	80
The role of hypoxia-inducible factor-1 alpha in the stem cell protective effect of AT-101	81

Investigation of antioxidant and cytotoxic activities of some endemic plants of Manisa on breast cancer cells.	83
[^{99m} Tc]Tc-dexketoprofen trometamol: radiolabeling and quality control studies....	85
Colchicine drug-induced gingivitis.....	86
Phenotypic and genotypic effects of fosfomycin resistance on <i>Escherichia coli</i> strains.....	87
Determination of three-dimensional structures of selected TRAF2 protein variants by computational methods	89
Effects of fruit and root extracts of <i>Terminalia citrina</i> on cell viability and cell migration	90
Optimal solvent selection: Development of a spectrophotometric quantification method for plant oil-based SNEDDS formulation.....	91
Radiolabeled Antiepileptic Drug: ⁶⁸ Ga-Zonisamide.....	93



ORAL PRESENTATIONS

Circulating levels of soluble vascular endothelial growth factor receptor-2 (sVEGFR-2) are elevated in women with polycystic ovary syndrome

Fatma Zeynep Ozen¹, Ecem Kaya-Sezginer^{2*}, Omer Faruk Kirlangic³, Aysun Tekeli Taskomur⁴, Fugen Aktan², Gul Kaplan², Taner Ozgurtas⁵

¹Amasya University, Faculty of Medicine, Department of Pathology, Amasya, Türkiye

²Ankara University, Faculty of Pharmacy, Department of Biochemistry, Ankara, Türkiye

³Ankara University, Vocational School of Health, Ankara, Türkiye

⁴Amasya University, Faculty of Medicine, Department of Obstetrics and Gynecology, Amasya, Türkiye

⁵University of Health Sciences, Gulhane Faculty of Medicine, Department of Medical Biochemistry, Ankara, Türkiye

*Corresponding author e-mail: ecemkaya@ankara.edu.tr

Abstract

Dysregulation of angiogenesis related markers is involved in polycystic ovary syndrome (PCOS) progression. This study aimed to investigate the serum levels of key angiogenesis factors, vascular endothelial growth factor (VEGF)-C and its receptors [soluble VEGF receptor-2 (sVEGFR-2) and VEGFR-3] and the relationship between their levels and clinical data in PCOS patients.

Serum concentrations of VEGF-C, sVEGFR-2, and VEGFR-3 in patients with PCOS (n=36) and healthy controls (n=30) were measured using an enzyme-linked immunosorbent assay. The relationship between serum levels of VEGF-C, sVEGFR-2, VEGFR-3 and clinical variables was also studied. ROC curve analysis was performed to determine the specificity and sensitivity of sVEGFR-2 for discrimination between women with and without PCOS.

A significantly higher level of sVEGFR-2 was detected in women diagnosed with PCOS compared to controls (p=0.023). The difference in serum concentrations of VEGF-C and VEGFR-3 was not statistically significant between the two groups. Serum sVEGFR-2 concentration was significantly and positively correlated with VEGF-C, VEGFR-3, total cholesterol and anti-müllerian hormone, while inversely correlated with testosterone in PCOS patients. Additionally, circulating VEGF-C levels demonstrated a significant association with high-density lipoprotein cholesterol and VEGFR-3. ROC curve analysis showed that a cutoff value of sVEGFR-2 was 4.24 ng/mL, with an appropriate sensitivity (68%) and specificity (64%) to distinguish individuals with and without PCOS [area under the curve (AUC)=0.772 (p<0.001, 95% CI 0.650–0.893).

PCOS patients demonstrated elevated serum levels of sVEGFR-2. We further found that sVEGFR-2 was associated with VEGF-C and VEGFR-3 serum levels. These results suggest that sVEGFR-2 may have the potential as a diagnostic marker for PCOS.

Keywords: polycystic ovary syndrome, growth factors, vascular endothelial growth factor receptors, soluble vascular endothelial growth factor receptor-2, inflammation

Ethical approval: The study was approved by Amasya University Faculty of Medicine Clinical Research Ethics Committee (January 19 2023 date, 2023/08 number).

Investigation of age-related histological hepatic alterations after intermittent fasting

Taha Ceylani ¹, Hikmet Taner Teker ², Işıl Eranıl ³, Fatma Yılmaz Ertürk ⁴, Seda Keskin ^{5*}

Taha Ceylani ¹, (ORCID: 0000-0002-3041-6010), Hikmet Taner Teker ² (ORCID: 0000-0002-6621-3071), Işıl Eranıl ³ (ORCID: 0000-0001-9557-8523), Fatma Yılmaz Ertürk ⁴ (ORCID: 0000-0002-6983-1561), Seda Keskin ⁵ (ORCID: 0000-0002-4726-982X)

¹ Department of Food Processing, Vocational School of Technical Sciences, Mus Alparslan University, Muş, Türkiye

² Department of Biochemistry, Ankara Medipol University School of Medicine, Ankara, Türkiye

³ Department of Pathology Laboratory Techniques, Cappadocia Vocational School, Cappadocia University, Nevşehir, Türkiye

⁴ Department of Pathology, Kars Harakani State Hospital, Kars, Türkiye

^{*5} Department of Medical Histology and Embryology, Van Yuzuncu Yil University School of Medicine, Van, Türkiye
*e-mail: sedakeskin@yyu.edu.tr

Abstract

Intermittent fasting (IF) is a preferred dietary approach in preventing or delaying age-related diseases due to its effects on lifespan and regulation of cellular damage. IF is an important nutritional strategy for improving multiple features of hepatometabolic and age-related pathologies, due to weight and insulin resistance reduction. This study aimed to evaluate the possible histoprotective effects of IF on age-related rat liver. In this study, twelve rats were divided into two groups: the Nonfasting Group (12 months) without IF and the Fasting Group (12 months, for 35 days). The Fasting group's access interval to food was between 09.00 am and 15.00 pm. In addition, their access to food was restricted for 18 hours. At the end of the experiment, the liver sections were stained with H&E and Masson trichrome, and then evaluated for histopathological examination by light microscopy. In the H&E analysis, there was a significant increase in inflammation in the lobular and portal areas, spotty necrosis, and balloon degeneration in the Nonfasting group compared to the Fasting group. In addition, Masson Trichrome staining results showed a significant decrease in the density of collagen deposition in the connective tissue of the liver in the Fasting group compared to the Nonfasting group. Intermittent fasting may help improve the morphological changes that happen as the liver ages by reducing cell damage in the aged liver histological structure.

Keywords: Aging, inflammation, intermitted fasting, liver, histopathology

Solutions of the modified Sihler's staining technique

Melisa Gulcan^{1*} (ORCID: 0000-0002-2612-7080), Servet Celik¹ (ORCID: 0000-0002-1102-4417),

Canberk Tomruk² (ORCID: 0000-0002-3810-3705), Okan Bilge¹ (ORCID: 0000-0002-8993-2271),

Yigit Uyanıkgil³ (ORCID: 0000-0002-4016-0522)

^{*1} Ege University, Faculty of Medicine, Department of Anatomy, Izmir, Türkiye.

² Samsun Education and Research Hospital, Department of Histology and Embryology, Samsun, Türkiye.

³ Ege University, Faculty of Medicine, Department of Histology and Embryology, Izmir, Türkiye.

*melisagulcann@hotmail.com

Abstract

Background: The modified Sihler technique (MST) was used to investigate the intramuscular nerve course, Six solutions and seven steps are required for the technique.

Purpose: The technique has six different solutions and we aim to describe what is the objective of each solution.

Methodology: MST is staining the nerve fibers and transparent the muscle fibers. Technique has 7 steps; fixation, maceration & depigmentation, decalcification, staining, destaining, neutralization and clearing. After each step, the muscles were rinsed in running tap water. 10% formalin was used for fixative. The fixed specimens were kept in a 3% aqueous potassium hydroxide solution for the maceration & depigmentation step. In the decalcification step, the macerated specimens were then kept in 6 volumes of 1% aqueous chloralhydrate, 1 volume of glacial acetic acid, 1 volume of pure glycerine (Sihler solution 1). Decalcified specimens were then stained in 1 volume Ehrlich's hematoxylin, 1 volume pure glycerin, 1 volume 1% chloralhydrate (Sihler solution 2). Adequately stained specimens were kept again in Sihler solution 1 for destaining. In the neutralization step, the muscles were kept in 0.05% lithium carbonate solution for 1-2 hours. The muscles were placed in glycerin at increasing concentrations (from 40% to 100% by 20% every day) as part of the cleaning step and finally preserved by adding a few thymol crystals into 100% glycerin

Results: We used 12 different chemicals. Each chemical has a different function. The same solution was used in the decalcification and destaining steps. At the end of the technique, muscles became transparent and the nerves stained purple.

Conclusion: A series of chemical processes are applied to the muscle in this anatomical procedure. It is important for researchers to know what each solution does.

Keywords: Modified Sihler's staining technique, Maceration, Decalcification, Staining, Destaining, Neutralization

Altered electroencephalogram recordings in sleep apnea

Ferhat Şirinyıldız¹, (ORCID: 0000-0001-8800-9787), Benan Usul²

¹Aydın Adnan Menderes University, School of Medicine, Department of Physiology Medicine, Aydın, Türkiye.

²Aydın Adnan Menderes University, Institute of Health Sciences, Department of Physiology Medicine, Aydın, Türkiye.

*ferhat.sirinyildiz@gmail.com

Abstract

Obstructive sleep apnoea (OSA) is the most prevalent manifestation of sleep disordered breathing (SDB) characterised by repeated episodes of complete or partial collapse of upper airway during sleep. Clinical manifestation of OSA includes snoring, disturbed sleep, fatigue, daytime sleepiness, loss of concentration, memory decline, and neuropsychiatric symptoms. OSA is diagnosed using overnight polysomnography (PSG) when the apnoea or hypopnoea occurs five or more times per hour (apnoea-hypopnoea index [AHI] ≥ 5). Individuals with sleep apnea experience airway collapse in deeper sleep states, causing them to experience reduced time in stage N3 and REM sleep. This leads to excessive daytime drowsiness as proper, efficient sleep is not obtained throughout the night. There are two types of sleep apnea: central and obstructive. Central sleep apnea occurs when the brain fails to properly signal respiratory muscles during sleep. In contrast, obstructive sleep apnea is a mechanical problem in which there is a partial or complete blockage of the upper airway. Electroencephalographic (EEG) arousals are seen in EEG recordings as an awakening response of the human brain. Sleep apnea is a serious sleep disorder. Severe sleep apnea brings about EEG arousals and sleep for patients with sleep apnea syndrome (SAS) is thus frequently interrupted. The number of respiratory-related arousals during the whole night on PSG recordings is directly related to the quality of sleep. Detecting EEG arousals in the PSG record is thus a significant task for clinical diagnosis in sleep medicine. To effectively detect respiratory-related arousals, threshold values were determined according to pathological events as sleep apnea and electromyogram (EMG). If resumption of ventilation (end of the apnea interval) was detected, much lower thresholds were adopted for detecting EEG arousals, including relatively doubtful arousals. Conversely, threshold was maintained high when pathological events were undetected. EEG waveforms may be characterized based on their location, amplitude, frequency, morphology, continuity (rhythmic, intermittent or continuous), synchrony, symmetry, and reactivity. However, the most frequently used method to classify EEG waveforms is by the frequency, so much so, that EEG waves are named based on their frequency range using Greek numerals. The most commonly studied waveforms include delta (0.5 to 4Hz); theta (4 to 7Hz); alpha (8 to 12Hz); sigma (12 to 16Hz) and beta (13 to 30Hz). In addition, there are other waveforms such as infra slow oscillations (ISO) (less than 0.5Hz) and high-

frequency oscillations (HFOs) (greater than 30Hz) which are outside the conventional bandwidth of clinical EEG but have recently found clinical importance with the advent of digital signal processing. This study aimed to characterize EEG power in different frequency bands during REM sleep and NREM sleep in patients with OSA. By computing the normalized spectral power densities, we found elevated normalized PSD in the delta band and decreased normalized PSD in the other frequency bands in the severe OSA group compared to the other two groups in NREM sleep. In REM sleep, similar changes were observed in the frontal region. Findings provide neurophysiological evidence for pathological cortical activation during REM/NREM sleep, which may be associated with the arousals and cognitive impairments in OSA. The technique of power spectral analysis could prove a potentially useful tool in complementing traditional PSG parameters in assessing disease burden to guide therapeutic decisions.

Keywords: Electroencephalogram, NREM, OSA, REM, Sleep apnea.

The effect of olanzapine in the bipolar mania model

Eser Çakmak^{1*}, Özgür Korhan Tunçel¹, Mehmet Emin Önger²

^{*1}Ondokuz Mayıs University, Faculty of Medicine, Department of Medical Biochemistry, Samsun, Türkiye.

²Ondokuz Mayıs University, Faculty of Medicine, Department of Histology and Embryology, Samsun, Türkiye.

* yeneneser@hotmail.com

Abstract

It is not fully understood which changes in which parts of the brain are effective in the emergence of bipolar disorder. The effect of olanzapine on the brain still remains unclear. Could the emergence of bipolar disorder and the effect of olanzapine be related to IGF-1 and IGF-1R, which are effective in neuron development? Our study aims to examine the relationship between IGF-1 and IGF-1R levels in the prefrontal cortex and hippocampus in the emergence of bipolar disorder, and also to examine the effect of olanzapine on IGF-1 and IGF-1R. Of all 48 adult male albino Wistar rats, the control group (n=12) saline (0.5 ml), ketamine group (n=12) ketamine (0.5 ml, 25 mg/kg), olanzapine group (n=12) olanzapine (0.5 ml, 2 mg/kg), ketamine+olanzapine group (n=12) ketamine (0.5 ml, 25 mg/kg) was administered intraperitoneally once a day for 14 days. In addition to ketamine administration, olanzapine (0.5 ml, 2 mg/kg) was administered once a day to ketamine+olanzapine group between 8-14 days. Volume, IGF-1 and IGF-1R protein levels (immunohistochemical staining) were measured in prefrontal cortex and hippocampus. In the prefrontal cortex, we detected that there was a decrease in volume and IGF-1R protein levels in the ketamine group, an increase in IGF-1 protein levels in the olanzapine group; an increase in IGF-1 and IGF-1R protein levels in the ketamine+olanzapine group. In the hippocampus, we detected that there was a decrease in volume and IGF-1 protein levels in the ketamine group, a decrease in volume and IGF-1 protein levels, an increase in IGF-1R protein levels in the olanzapine group; a decrease in volume, IGF-1 and IGF-1R protein levels in the ketamine+olanzapine group. One of the underlying causes of bipolar disorder may be changes in the IGF-1 and IGF-1R regions in the prefrontal cortex and hippocampus. Olanzapine, used in treatment, has a neuroprotective effect by increasing IGF-1 and IGF-1R levels in the prefrontal cortex, and a neurodegenerative effect by decreasing IGF-1 and IGF-1R levels in the hippocampus.

Keywords: Olanzapine, IGF-1, IGF-1R, Prefrontal cortex, Hippocampus

Relationship between HMGB1 and chemotherapy-induced peripheral neuropathy

Simge Unay^{1*} (ORCID: 0000-0002-5582-5574)

^{*1}Lokman Hekim University, Faculty of Medicine, Department of Biophysics,
Ankara, Turkey, 06510.

*simge.unay@lokmanhekim.edu.tr

Abstract

High mobility group protein 1 (HMGB1; also known as Amphoterin) is a nonhistone nuclear protein with highly conserved amino acid sequences in evolution. HMGB1 supports DNA replication, repair, and nucleosome stability in the nucleus. HMGB1 can also be released into the extracellular environment, and its release is associated with various physiological and pathological processes, including inflammation, tissue damage, infection, and immune response. HMGB1 can be secreted in 5 different ways such as passive release, active release, infection and inflammation, cellular stress, and immune activation. In a passive release, HMGB1 can be released passively from damaged or dying cells. When cells undergo stress, injury, or cell death (necrosis), HMGB1 can be released into the extracellular space. In active release, certain immune cells, such as macrophages and monocytes, can actively secrete HMGB1 in response to specific signals. Inflammatory cytokines, such as tumor necrosis factor-alpha (TNF- α) and interleukin-1 beta (IL-1 β), can trigger the active release of HMGB1. Moreover, Toll-like receptors (TLRs), receptors for advanced glycosylation end products (RAGE), and C-X-C motif chemokine receptor 4 (CXCR4) are only a few of the receptors that extracellularly released HMGB1 activates, which causes inflammation in the cell or tissue. In response to infection, HMGB1 release can contribute to the immune response. Various stressors, such as oxidative stress, can induce the release of HMGB1. It has been suggested that HMGB1 release can be a cellular response to stress to promote tissue repair and regeneration. HMGB1 can interact with specific receptors on immune cells, such as Toll-like receptor 4 (TLR4) and the receptor for advanced glycation end products (RAGE).

Chemotherapy-induced peripheral neuropathy (CIPN) refers to a condition characterized by damage or dysfunction of the peripheral nerves caused by certain chemotherapy drugs such as cisplatin, oxaliplatin, and docetaxel. CIPN primarily affects the peripheral nervous system, which consists of sensory and motor neurons. Sensory neurons are responsible for transmitting information from the body's periphery (such as skin, muscles, and organs) to the central nervous system (spinal cord and brain). These neurons have long projections called axons responsible for transmitting signals over long distances. Chemotherapy drugs damage these axons, leading to disrupted signal transmission and sensory symptoms like numbness, tingling, burning sensations, and pain. Chemotherapy drugs induce cellular stress and activate apoptotic pathways in neuronal cells. Chemotherapy drugs can disrupt

mitochondrial function, leading to energy deficits within neuronal cells. This can contribute to their dysfunction and degeneration. A growing body of research has revealed that HMGB1 plays a pro-nociceptive role in peripheral tissues and the spinal cord, and it has also shown that endogenous HMGB1 plays a role in the pathogenesis of a few intractable pain conditions, including post-stroke, cancer pain, neuropathic pain, visceral pain, and inflammatory pain. Considering the total prevention of CIPN by inactivating HMGB1 with anti-HMGB1-neutralizing antibody (HMGB1-nAb) or thrombomodulin, endogenous HMGB1 also appears to play a significant role in the formation of CIPN in rats or mice treated with cancer chemotherapeutics such paclitaxel, oxaliplatin, and vincristine.

In conclusion, the development of pathological pain, including CIPN, is currently thought to be largely regulated by the molecule HMGB1. Thus, it is believed that HMGB1 and its upstream and downstream molecules are suitable candidates for creating CIPN prevention drugs.

Keywords: High mobility group protein 1, Chemotherapy-induced peripheral neuropathy, Neuronal cells, Chemotherapy drugs

Relationship between circadian rhythm, melatonin and obesity

Ferhat Şirinyıldız¹,(ORCID: 0000-0001-8800-9787), Kübra Ballı²

¹Aydın Adnan Menderes University, School of Medicine, Department of Physiology Medicine, Aydın, Türkiye.

²Aydın Adnan Menderes University, Institute of Health Sciences, Department of Physiology Medicine, Aydın, Türkiye.
*ferhat.sirinyildiz@gmail.com

SUMMARY

In many studies, disruption of circadian rhythm confirms that it causes obesity, and therefore this study was prepared by compiling 23 articles to explain the relationship between circadian rhythm, melatonin and obesity. The circadian rhythm is the repetition of the biochemical, physiological and behavioral rhythms on living things that emerge as a result of the earth's 24-hour journey around its axis. Factors such as sleep-wake cycle, heart rate, blood pressure, body temperature, hormone release, metabolic activities, nutrition, personal performance and mood changes are part of the circadian rhythm. The circadian rhythm, which is directly related to daylight, is highly affected by environmental factors such as darkness and light. The human brain increases or decreases the release of hormones in the body with the stimuli it receives from the environment. Hormonal changes in the body due to environmental changes, on the other hand, adjust the body temperature, causing the metabolism to act appropriately and its regulation. The World Health Organization defines obesity as "a disease that can occur as a result of abnormal and excessive fat accumulation that can impair human health". Obesity has become a worldwide problem with the development of the food industry and the change in eating habits. It is a major source of problems for young and old as well as for children today. Obesity also reduces people's quality of life and affects life expectancy. Apart from this, it is also the trigger of many diseases and causes death. Although it is known that disrupted circadian rhythms accelerate obesity, there is no definite conclusion about how obesity disrupts circadian rhythm. However, studies confirm that circadian rhythm can be regulated by feeding time and duration. In animal studies, it has been shown that meal time can affect the circadian clock of metabolic tissues such as adipose tissue, liver and pancreas, and the normal functions of glucocorticoids during the day. In a study with mice, it was concluded that rats fed a high-fat and high-sucrose diet in dark places had increased fatty liver compared to rats fed the same content in a daily cycle. The control center that regulates the circadian rhythm is the suprachiasmatic nucleus located bilaterally in the hypothalamus. SCN, which is active during the day, decreases at night. With the absence of light in the pineal glands, the synthesis and release of melatonin increases, and sleep begins. While the effect of SCN, which works actively during the day under the influence of light, gradually decreases, the activity of the pineal gland increases and melatonin synthesis occurs. The hormone melatonin secreted

from the pineal gland regulates this cycle. Abnormal eating behaviors during the sleep period are called either night eating syndrome or sleep-related eating disorder. Night eating syndrome is an eating disorder in which anorexia in the morning, hyperphagia in the evening, and nocturnal eating after awakening are accompanied by insomnia. Recently, night eating syndrome has been conceptualized as a circadian delay in eating food. It has been stated that sleep duration/irregularity, light, physical and social activities disrupt the circadian rhythm, and the disrupted circadian rhythm increases the desire for energy-dense foods. Regulation of shift work practices, meal times, sleep-wake status and eating habits of individuals prevents disruptions in circadian rhythm. Apart from this, adequate and balanced nutrition and adjusting the distribution of nutrients according to the appropriate times of the day contribute to the circadian rhythm balance.

Keywords: Circadian Rhythm, Obesity, Melatonin, Night Eating Syndrome, Suprachiasmatic Nucleus, Sleep.

Investigation of the role of IFN γ signaling pathway in response to BRAF inhibitors in A375 and SK-MEL-1 human melanoma cells

Ferdi OĞUZ^{1*} (orcid.org/0000-0002-3123-8519), Harika ATMACA İLHAN² (orcid.org/0000-0002-8459-4373)

^{*1} Section of Molecular Biology, Department of Biology, Institute of Natural and Applied Sciences, Manisa Celal Bayar University, Muradiye, Manisa, Turkey.

^{*2} Section of Molecular Biology, Department of Biology, Faculty of Science and Letters, Manisa Celal Bayar University, Muradiye, Manisa, Turkey.

*ferdioguz94@gmail.com

Abstract

Malignant melanoma is responsible for approximately 80% of skin cancer deaths, although it accounts for 4% of skin cancer types. In recent years, targeted therapies have been developed to combat molecular damage. Vemurafenib and dabrafenib are drugs that directly inhibit the BRAF protein. Compared to conventional treatments, BRAF inhibitors have higher response rates and have significantly improved overall survival, but adverse events such as disease relapse, short survival time and resistance to treatment still remain the most significant clinical problems in patients in the later stages. To overcome this situation, other small molecule inhibitors such as adjuvant therapy need to be developed. The fact that IFN γ both controls tumor initiation and progression and triggers the growth of tumor cells with immuno-invasive properties suggests that this cytokine may have a dual role. The aim of this study is to reveal the role of the IFN γ signaling pathway in the response to BRAF inhibitors in human melanoma BRAF-mutant A375 and BRAF-mutant SK-MEL-1 cell lines with blocked IFN γ signaling pathway. MTT test was used to evaluate cell viability. IFN γ gene was silenced in a group of melanoma cells by application of IFN γ siRNA. Whether IFN γ was successfully suppressed in melanoma cells following IFN γ siRNA applications was examined by qRT-PCR. In SK-MEL-1 and A375 melanoma cells treated for 24, 48 and 72 hours with increasing concentrations of VEM and DAB, a decrease in cell viability was detected depending on increasing time and concentration (*p<0.05). An increase in cell viability occurred in A375 and SK-MEL-1 human melanoma cells with IFN γ gene blocked, compared to melanoma cells without IFN γ gene blocked, and resistance to BRAF inhibitors was detected. These results show that IFN γ induction should be performed as well as IFN γ inhibition in cells.

Keywords: IFN γ , melanoma, vemurafenib, dabrafenib, BRAF, A375, SK-MEL-1

Comparative evaluation of antioxidant and antidiabetic activities of fruit extracts from diverse regions of Trabzon

Ummuhan Cakmak^{1*} (ORCID: <https://orcid.org/0000-0001-8719-2436>)

¹Department of Chemistry, Faculty of Science, Karadeniz Technical University,
61080 Trabzon, Türkiye

* ucakmak@ktu.edu.tr

Abstract

Diabetes mellitus (DM), is one of the metabolic disorders found to be increasing predominantly nowadays. DM is a metabolic disorder that is initiated by a high level of glucose. Inhibition of carbohydrate hydrolyzing enzymes such as α -amylase and α -glucosidase is a major approach to maintaining more stable glucose levels. Antioxidants prevent chain reactions that can cause many diseases and premature aging by neutralizing free radicals that can easily interact with many biomolecules and cause damage.

In this study, extracts were prepared from Indian hawthorn, Cockspur hawthorn, and Autumn olive fruits using different solvents (methanol, ethanol, ethyl acetate, and hexane). The antioxidant capacity of these extracts was assessed using various methods, including FRAP reducing power, ABTS radical scavenging activity, total antioxidant capacity by the phosphomolybdate method, CUPRAC method, and metal chelating activity. Among the extracts tested, the ethyl acetate extract of Cockspur hawthorn showed the highest antioxidant properties (ABTS: 1938.8 ± 6.0 mg TE/g; CUPRAC: 1614.8 ± 2.5 mg TE/g; MCA: 1065.5 ± 4.2 mg EDTA/g; FRAP: 1955.1 ± 4.2 mg TE/g; TAC: 3.3 ± 0.2 mmol TE/g). Additionally, the ethyl acetate extract of Autumn olive (ABTS: 38.4 ± 1.2 mg TE/g; CUPRAC: 24.1 ± 0.7 mg TE/g; MCA: 17.5 ± 0.5 mg EDTA/g; FRAP: 8.3 ± 0.3 mg TE/g; TAC: 2.1 ± 0.1 mmol TE/g) and the ethanol extract of Indian hawthorn (ABTS: 2152.3 ± 63.2 mg TE/g; CUPRAC: 279.2 ± 1.7 mg TE/g; MCA: 834.9 ± 22.4 mg EDTA/g; FRAP: 204.9 ± 3.3 mg TE/g; TAC: 3.0 ± 0.1 mmol TE/g) also exhibited significant antioxidant properties. Furthermore, the Indian hawthorn ethanol and methanol extracts, Autumn olive ethyl acetate extract, and Cockspur hawthorn ethyl acetate extract demonstrated strong inhibitory effects against α -amylase and α -glucosidase, surpassing the effects of the standard drug acarbose. These findings suggest that these fruits have the potential to be used as antidiabetic and antioxidant agents.

Keywords: Antioxidant capacity, α -Amylase inhibitory, α -Glucosidase inhibitory, Fruit extracts

In vitro evaluation of doxorubicin loaded chitosan-hyaluronic acid nanoparticles in two different cancer cell lines

Ümmühan Fulden Aydın^{1*} (0000-0003-2603-739x), Güliz Ak Demiroz² (0000-0001-9613-6348), Buket Özel³ (0000-0003-2659-4129) , Şenay Şanlıer² (0000-0001-6532-7221)

¹Medical Biochemistry Department, Faculty of Medicine, Cukurova University, Adana, Türkiye

²Department of Biochemistry, Faculty of Science, Ege University, İzmir, Türkiye

³Medical Biology Department, Faculty of Medicine, Ege University, İzmir, Türkiye

*bozkayafulden@gmail.com/fbozkaya@cu.edu.tr

Abstract

Cancer is the second cause of death worldwide. Traditional cancer treatments have side effects and limitations such as the distribution of the chemotherapeutic agent throughout the body, inability to reach the therapeutic level in the desired area, and effectiveness on healthy cells. Drug carriers are a novel approach to solve these problems. In this study, we aimed to examine the cytotoxicity of nano-polymeric drug carriers prepared using chitosan-hyaluronic acid biopolymer combination and loaded with doxorubicin (Dox), an anticancer agent used in solid tumors, in two different cell lines and to compare with free drug cytotoxicity. Chitosan-hyaluronic acid nanoparticles (CS-HA NPs) were formed by gelation method and Dox was loaded into the nanoparticles via adsorption. Nanoparticle characterization studies were carried out via SEM, FTIR and hydrodynamic size analyses. In vitro drug studies of Dox-loaded CS-HA NPs and of free drugs were performed in acidic (5.5) and physiological (7.4) pHs. *In vitro* cell cytotoxicity tests were performed for CS-HA NPs, Dox-loaded CS-HA NPs and free drugs for ovarian cancer cell line SKOV-3 and lung cancer cell line A549-luc-C8. The optimum pH and drug quantity for drug adsorption were selected as 8 and 1.5 mg/mL with 89.8% of adsorption yield respectively. According to in vitro drug release studies, while free drug was released 37.3% at pH 7.4 and 74% at pH 5.5 after 1.5 hours, Dox-loaded CS-HA NPs released the drug 44.6% at pH 7.4 and 61.5% at pH 5.5 after 6 hours. According to cytotoxicity tests, IC50 values show that the drug delivery system was 1.86 times cytotoxic for A549-luc-C8 cells compared to free drug and 153.8 times cytotoxic than free drug for SKOV-3 cells for 72 hours. As a result, because Dox-loaded CS-HA NPs had a controlled drug release profile and more cytotoxic activity than free drugs, they could have a potential for the targeted treatment of ovarian cancer.

Keywords: Chitosan- hyaluronic acid nanoparticles, Doxorubicin, In vitro cytotoxicity, Ovarian cancer, Lung Cancer.

Acknowledgement: This study was supported by the Ege University Scientific Research Project Unit with the project number “17 Fen 004”.

Preparation of liposomes for use in glioblastoma treatment and in vitro studies

Yiğit Kaan KIZLIER¹ (ORCID 0009-0006-8606-4858), Aslı BAYRAKDARLAR^{2*} (ORCID 0009-0004-2082-395X), Güliz AK DEMİROZ³ (ORCID 0000-0001-9613-6348), Şenay ŞANLIER³ (ORCID 0000-0001-6532-7221)

¹İzmir Atatürk High School, İzmir, Türkiye

²Department of Biochemistry, Graduate School of Natural and Applied Sciences, Ege University, İzmir, Türkiye

³Department of Biochemistry, Faculty of Science, Ege University, İzmir, Türkiye
*aslbayrakdarlar@gmail.com

Abstract

Glioblastoma is a malignant brain tumor that is more common in the adult population. The poor response of glioblastoma to treatment is associated with the delivery of drugs to tissues within the central nervous system. There is no curative treatment for this tumor yet. However, drug delivery systems allow the development of treatment of uncontrollable diseases such as glioblastoma. and enable to increase the therapeutic efficacy of anticancer drugs. Thus, while reducing the side effects in normal cells, they increase the accumulation of drugs in cancer cells. In this study it is aimed to develop doxorubicin delivery system that could pass through the blood-brain barrier and treat glioblastoma. Doxorubicin, a drug used in cancer chemotherapy, was loaded into liposomes which were obtained by thin lipid film technique. Stearyl amine- β -hydroxybutyrate conjugate was integrated into liposomes to facilitate to cross the blood-brain barrier. Characterization tests such as fourier transform infrared spectroscopy (FT-IR), scanning electron microscope (SEM) and hydrodynamic dimension analyses were performed. Drug amount was examined with UV-Visible Spectroscopy. Doxorubicin release was tested at pH 5 and pH 7.4 with the dialysis membrane technique. Cytotoxicity assay on U87MG glioblastoma cells was done. According to all the data, doxorubicin was incorporated into liposomes at a concentration of 0.37 mg/mL and liposomes have hydrodynamic size of 163.7 nm. It was determined that there was more drug release from liposomes in the acidic environment than in the physiological environment. In addition, conjugate integrated and doxorubicin loaded liposomes caused more toxic effects than the free form of the drug against U87MG cells based on MTT test results. It is thought that conjugate integrated and doxorubicin loaded liposomes could have the potential to cross the blood brain barrier and to be used in the treatment of glioblastoma.

Keywords: Glioblastoma, drug delivery system, liposome, doxorubicin, blood-brain barrier.

Acknowledgement: Patent application in the national area has been filed for this invention, which has been supported by Ege University (application number: 2023/005068).

Preparation of liposomes containing nanoparticles combined with levothyroxine for use in thyroid diseases

Eylül ATAN^{1*} (ORCID:0009-0003-3260-4271), Güliz AK DEMİROZ¹
(ORCID:0000-0001-9613-6348)

¹Department of Biochemistry, Faculty of Science, Ege University, İzmir, Türkiye
*eylulatan@gmail.com

Abstract

Low thyroid hormone synthesis and low circulating thyroid hormone levels are known to result in biochemical hypothyroidism. Levothyroxine is considered the safest and most widely prescribed drug for the treatment of hypothyroidism and is widely used as replacement therapy in patients with hypothyroidism. Selenium nanoparticles play a role in many physical processes such as growth, reproduction and immunomodulation, which are very important for human life, and in addition to these, they have a very important place in human health and pharmaceutical fields due to their antioxidant, antimicrobial, antidiabetic and anticancer effects. The decrease in serum selenium levels in hypothyroid patients proves that selenium has an important role in the control of thyroid gland functions. Selenium nanoparticles have been shown to be very safe nanoparticles, especially due to their low toxicity. The aim of this study was to develop an oral drug delivery system for treatment of hypothyroidism by co-loading selenium nanoparticles and levothyroxine into liposomes and coating the surface with polyethylene glycol (PEG). Sodium selenite and ascorbic acid solution were mixed for selenium nanoparticle preparation. The nanoparticles were characterized using UV-Visible Spectroscopy, Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD). Levothyroxine and selenium nanoparticles were encapsulated into liposomes which were prepared with thin film hydration method, then liposomes were coated with 1,2-distearoyl-sn-glycero-3-phosphoethanolamine conjugated PEG (DSPE-mPEG₂₀₀₀). Liposomes were evaluated with FTIR and SEM. Encapsulated levothyroxine amount was analyzed spectrophotometrically and selenium content was investigated by Inductively Coupled Plasma-Mass Spectrometry (ICP-MS). Drug release from liposomes was tested in gastric pH and physiological medium. FTIR, XRD, UV/Vis spectroscopy peaks confirmed the selenium nanoparticles. Levothyroxine was encapsulated into liposomes with 91.4% efficiency, selenium content in liposomes is about 7.07 µg/mL and liposomes have ~80 nm in size. Considering the release data, it was observed that encapsulated levothyroxine release was slower than free from. In addition, encapsulated levothyroxine was released faster in pH 1.2 than in pH 7.4 medium. It can be suggested that the liposomes containing selenium nanoparticles combined levothyroxine could have a potential as an oral drug delivery system for treatment of hypothyroidism.

Keywords: thyroid, levothyroxine, selenium nanoparticle, liposome, polyethylene glycol

Acknowledgement: This study was supported by TUBITAK-2209-A programme (Project ID: 1919B012205565). Patent application in the national areas has been filed for this invention, which has been supported by Ege University (application number: 2022/021211). We would like to thank to Abdi Ibrahim İlaç for providing levothyroxine sodium.

Gel formulation of bio-synthesized zinc oxide nanoparticles loaded with antibiotic for use in skin infections

Ece UĞURLU^{1*} (ORCID 0009-0006-9208-1849), Güliz AK DEMİROZ¹ (ORCID 0000-0001-9613-6348), Şenay ŞANLIER¹ (ORCID 0000-0001-6532-7221)

¹Department of Biochemistry, Faculty of Science, Ege University, İzmir, Türkiye
*eceugurlu8@gmail.com

Abstract

Skin is an organ of the body that serves as a protective covering, maintaining the balance of heat and water and enveloping the body from the outside. Being located on the outermost layer, it is constantly in contact with microorganisms and has developed physiological protective barriers to prevent the transmission of diseases through this contact. However, in some cases, these barriers may prove insufficient. Microorganisms can easily settle on the skin and cause inflammation in open wounds. Numerous treatment methods have been developed for such situations, but the increasing resistance of bacteria to commonly used antibiotics has made treatment considerably challenging in recent times. The aim of the project is to develop a gel formulation containing bio-synthesized zinc oxide nanoparticles (ZnO) loaded with clarithromycin (Cla) for transdermal use to overcome those problems. In this study walnut shell (*Juglans regia*) containing highly beneficial active ingredients was used for obtaining ZnO nanoparticles with green chemistry method. The bio-synthesized ZnO were characterized using UV-Visible Spectroscopy, Fourier Transform Infrared Spectroscopy (FT-IR), Scanning Electron Microscopy (SEM), X-Ray Diffraction (XRD). Then, different concentrations of Cla were mixed with ZnO and incubated at 37°C for 16 h and bound drug amounts were calculated. Cla bound ZnO nanoparticles (Cla-ZnO) were analyzed with FTIR and SEM. Cla release from nanoparticles and free solution form was also conducted. The gel formulation of Cla-ZnO was developed using Carbopol 940. Bio-synthesized ZnO had a size of ~20 nm and FT-IR spectrum signals revealed characteristic ZnO bonds. Cla was bound to ZnO with 74% efficiency and controlled Cla release from nanoparticles was observed. Cla-bound ZnO gel was formulated at pH 6.0. It could be suggested that the gel formulation with the potential to be used in skin infections, represents transdermal anti-bacterial therapy as well as in reducing the burden of solid waste on the environment.

Keywords: Walnut shell, Zinc oxide nanoparticle, Green chemistry, Clarithromycin, Carbopol 940 gel.

Acknowledgement: This project was supported by TÜBİTAK 2209/A programme (Project ID: 1919B012205566). Patent application in the national areas has been filed for this invention, which has been supported by Ege University (application number: 2022/021217). We would like to thank to Deva Holding A.Ş. for providing the active pharmaceutical ingredient, clarithromycin.

Preparation and characterization of axial disubstituted silicon phthalocyanine modified nano TiO₂ thin films

Hilal Fazlı^{1*}, Çağla Akkol¹, Ömer Kesmez², Ece Tugba Saka¹, Zekeriya Bıyıklıoğlu¹

^{*1}Karadeniz Technical University, Department of Chemistry, 61080, Trabzon, Türkiye

²Akdeniz University, Department of Chemistry, 07058, Antalya, Türkiye

*Corresponding author e-mail: hilalfazlifazli@gmail.com

Abstract

Although phthalocyanines were first used only as pigments and dyestuffs, they have been used as advanced technology materials in chemical sensors, liquid crystal, non-linear optics and photodynamic therapy applications in the last 20 years. The addition of different groups to the phthalocyanine core provides the production of new materials with the necessary functions for different application areas [1]. In this study, silicon phthalocyanine compounds in which two different groups are substituted to the phthalocyanine ring in axial positions were synthesized and characterized. Then, silicon phthalocyanines and modified TiO₂ nanoparticles were synthesized by sol-gel process under reflux [2]. By determining the crystal structures of the obtained modified TiO₂ nanoparticles, zeta potential and particle size distribution measurements were carried out. In the determination of the photocatalytic activities of the prepared coatings, the degradation of methylene blue as a model impurity was investigated comparatively.

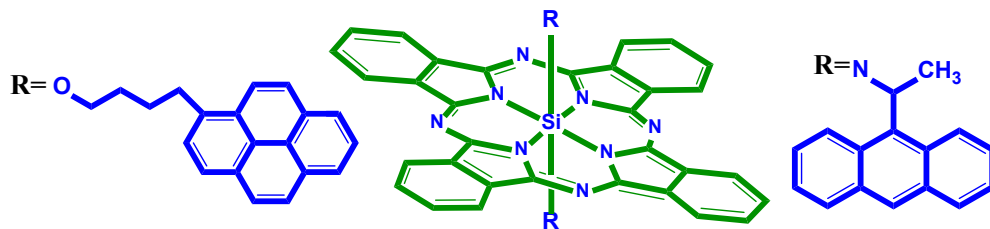


Figure 1.

Keywords: Silicon Phthalocyanine, Sol Gel Method, Hybrid Coating, Thin Film, Nanoparticle

Acknowledgement: This study was supported by The Research Fund of Karadeniz Technical University (Project no: 10412), Trabzon, Türkiye.

Antioxidant activity of *Bellevalia sasonii*

Nesrin HAŞİMİ BESEN* (ORCID: <https://orcid.org/0000-0003-1367-5624>)

*BatmanUniversity, Faculty of Science and Literature, Biology Department,
Batman, Türkiye.

* nesrin.hasimi@batman.edu.tr

Abstract

Plants have been used by people for a variety of purposes such as nutrition, treatment and cosmetics, from the beginning of human history to the day to today. The most basic reason why plants can address different consumption areas is undoubtedly the rich chemical components found in their structures.

The genus *Bellevalia* is a taxon, which is in the Asparagaceae family, represented by approximately 74 species, most of which spread in the Mediterranean Region (starting from Morocco and Algeria to the Caucasus and Iran in the east). The Asparagaceae family, to which the genus belongs, is a semi-cosmopolitan family represented by 7 subfamilies, 114 genera and approximately 2900 species, and is widely distributed in the world, including arid areas.

In this study, we aimed to determine antioxidant activity and the total phenol and flavonoid content, of methanol and acetone extracts of underground and aboveground parts of the *Bellevalia sasonii*.

DPPH free radical scavenging activity, cupric reducing antioxidant capacity (CUPRAC) and ABTS radical cation decolorization methods was carried out to determine the antioxidant activity. The total phenol and flavonoid content were determined as gallic acid and quercetin equivalence, respectively.

Extracts exhibited antioxidant activity at different strengths. In the DPPH method, underground acetone extract exhibited the best activity with an 11.6 ± 1.10 µg/ml of IC₅₀ value. This was followed by underground methanol extract (IC₅₀: 45.6 ± 1.10), aboveground acetone extract (IC₅₀: 167.5 ± 0.31) and underground methanol extract (IC₅₀: 70.7 ± 1.18). Extracts showed higher activity than BHT (IC₅₀: 216.5 ± 0.39 µg/ml) used as positive control.

In ABTS method, while aboveground methanol (IC₅₀: 1.8 ± 0.72 µg/ml) and underground acetone (IC₅₀: 1.9 ± 1.11 µg/ml) extracts found to possess the lowest IC₅₀ values, it was followed by underground methanol (IC₅₀: 2.8 ± 1.16 µg/ml) and aboveground acetone extracts (IC₅₀: 6.5 ± 0.35 µg/ml).

In the cuprac method, the underground acetone extract (A_{0.5}: 3.1 ± 0.72) exhibited the highest activity. This was followed by underground methanol extract (A_{0.5}: 4.9 ± 0.91), aboveground methanol extract (A_{0.5}: 7.2 ± 0.33) and aboveground acetone extract (A_{0.5}: 27.1 ± 0.2).

The extract richest in total phenolic content was determined as the underground acetone extract (288.5 ± 1.72 µgGAs/mg extract), followed by aboveground acetone extract (141.6 ± 2.65 µgGAs/mg extract), underground methanol extract (74.7 ± 1.76 µgGAs/mg extract) and aboveground methanol extract (57.2 ± 2.76 µgGAs/mg

extract). The extract richest in total flavonoid content was determined as the underground methanol extract (602.8 ± 1.87 $\mu\text{gQEs/mg}$ extract), followed by aboveground methanol extract (310.9 ± 1.54 $\mu\text{gQEs/mg}$ extract), underground acetone extract (222.8 ± 1.93 $\mu\text{gQEs/mg}$ extract) and aboveground acetone extract (71.6 ± 1.98 $\mu\text{gQEs/mg}$ extract).

Keywords: *Bellevalia sasonii*, antioxidant activity, DPPH, ABTS, CUPRAC

Acknowledgement: This study was funded by Batman University Scientific Research Projects Coordinatorship (Project number: BTÜBAP-2021-YL-02).

Synthesis and characterization of silver nanoparticle-loaded albumin nanocarriers as cisplatin carrier for breast cancer therapy

Serkan Aydın^{1*} (0009-0001-8494-832X), Güliz Ak Demiroz² (0000-0001-9613-6348)

¹Department of Biochemistry, Graduate School of Natural and Applied Sciences, Ege University, İzmir, Türkiye

²Department of Biochemistry, Faculty of Science, Ege University, İzmir, Türkiye
*aydinserkan44@gmail.com

Abstract

Breast cancer is the most common type of cancer in women and is also one of the leading causes of cancer-related deaths. Today, drug delivery systems are developed and targeting strategies are used in order to reduce the side effects caused by current cancer treatment methods, to increase drug efficacy, thus treatment efficiency and patient well-being. Passive targeting takes advantage of the enhanced permeability and retention effect, which is a unique feature of the cancer microenvironment. In this study, it was aimed to synthesize and characterize the albumin-based cisplatin carrier to provide passive targeting to use in breast cancer treatment. In addition, the synthesis and characterization of silver nanoparticles (AgNPs), which have many medical uses and are thought to have cytotoxic activity on breast cancer, have been performed and loaded into the drug carrier system. For this purpose, AgNPs synthesized by chemical method and encapsulated to albumin nanoparticles which are synthesized by desolvation and cross-linking technique. Cisplatin was adsorbed on albumin nanoparticles loaded with AgNPs. Nanoparticles were characterized with SEM, FTIR and UV-Visible spectroscopy. Drug release studies of the drug carrier system and free cisplatin at acidic and physiological media were carried out. The size of the AgNPs was measured as 35.5 nm by SEM. They showed the characteristic absorption peak and their structures were confirmed by FTIR. The loading efficiency of cisplatin loaded under optimum conditions was determined as 87.4%. The results from the SEM analysis show that the size of the final carrier system was about 85 nm and spherical in shape. According to the results of the drug release study, it was observed that the carrier system had a controlled drug release profile. As a result, it is thought that the prepared system is a drug delivery system that has the potential to increase therapeutic efficacy on breast cancer with passive targeting of cisplatin together with silver nanoparticles.

Keywords: silver nanoparticle, albumin nanoparticle, cisplatin, drug delivery, breast cancer

Formulation and evaluation of oro-dispersible tablets containing trandolapril-cyclodextrin complex

Yakup Gültekin^{1*} (ORCID: <https://orcid.org/0000-0001-6504-0757>)

^{*1}Selçuk University, Faculty of Pharmacy, Department of Pharmaceutical Technology, Konya, Türkiye.

*yakup.gultekin@selcuk.edu.tr

Abstract

Trandolapril is an angiotensin-converting enzyme inhibitor used in the treatment of hypertension and heart failure. It has low oral bioavailability (4%-9%; BCS-II) due to poor water solubility. Cyclodextrins are cyclic oligosaccharides obtained by enzymatic degradation of starch, containing a hydrophobic inner cavity and a hydrophilic outer surface, and can increase the solubility of drugs by forming complexes. The aim of this study was to prepare cyclodextrin trandolapril complexes to increase the solubility of trandolapril and to develop and evaluate oro-dispersible tablets (ODT) with this complex. Trandolapril cyclodextrin complex was prepared by kneading method. Tablets were prepared by direct compression method. Croscarmellose sodium, crospovidone, magnesium stearate, stearic acid, aspartame, microcrystalline cellulose and raspberry flavor were used as excipients. Quality control tests such as weight uniformity, diameter and thickness, hardness, friability, wetting time, content uniformity, disintegration time and dissolution studies were performed. Dissolution studies were carried out at 37°C and in 500 mL of pH 6.8 phosphate buffer at 50 rpm using the pedal method. The quality control studies revealed that the tablets were acceptable in terms of weight uniformity, diameter and thickness, hardness, friability and content uniformity. The disintegration time of the tablets was 18.1 ± 1.7 s and the wetting time was 34.3 ± 2.8 s. In dissolution studies, for the ODT formulation, 75.4% of trandolapril was released within 5 minutes and all was released within 15 minutes. In the marketed conventional tablets, 16.2% of trandolapril was released within 5 minutes and all was released within 120 minutes. The trandolapril beta cyclodextrin complex has been successfully applied for the preparation of fast disintegrating oro-dispersible tablets with a rapid drug release profile.

Keywords: Beta cyclodextrin, inclusion complex, oro-dispersible tablets (ODT), trandolapril

Optimal solvent selection: development of a spectrophotometric quantification method for plant oil-based SNEDDS formulation

Yalçın Çelik Aydın^{1*} (<https://orcid.org/0000-0001-5549-1087>), Dilek Mutlu²
(<https://orcid.org/0009-0001-7368-1287>) Emine Esin Çalışkan¹
(<https://orcid.org/0000-0002-8837-1222>) Emel Öykü Çetin Uyanıkgil¹
(<https://orcid.org/0000-0001-8822-9130>)

^{*1}Ege University, Faculty of Pharmacy, Department of Biopharmaceutics and Pharmacokinetics, İzmir, Türkiye.

²Istanbul University, Faculty of Science, Molecular Biology and Genetics, Istanbul, Türkiye.

*yalcin.celik.aydin@gmail.com

Abstract

Emulsions are mixtures prepared by dispersing water and oil phases within each other. Various surfactants are employed to effectively promote the mixing of the utilized water and oil phases. Self-emulsifying systems represent contemporary pharmaceutical carrier systems that allow the creation of classical emulsions with reduced energy consumption. Within this drug delivery system, the oil phase is accompanied by a surfactant and a co-surfactant or co-solvent, while the water phase is absent. Once the formulated system is applied to the body, it triggers the formation of an emulsion by utilizing available water, at the application site or in the stomach for oral administration. Self-emulsifying systems typically possess droplet sizes in the micro or nano range and are termed accordingly as self-nano emulsifying drug delivery systems (SNEDDS) or self-micro emulsifying drug delivery systems (SMEDDS), denoting their dimensions.

In the SNEDDS formulation prepared utilizing sweet almond oil as the oil phase, Tween 80 as the surfactant, PEG 400 as the co-surfactant, and Propylene Glycol as the co-solvent, we employed Berberine as the model active ingredient. Our aim was to develop a spectrophotometric quantification method for Berberine within the self-nano emulsifying drug delivery system (B-SNEDDS) formulation. To achieve this, we sought a solvent that is compatible with spectrophotometric analysis, capable of dissolving the oil phase within the SNEDDS formulation, consequently disrupting the SNEDDS structure, and thereby facilitating the release of loaded berberine from the carrier. Simultaneously, we aimed to identify a solvent wherein berberine's solubility remains high.

Within the scope of the planned study objective, ethanol, methanol, acetonitrile, and acetone were employed as solvents. Initially, specific quantities of berberine were dissolved separately in each solvent, and stock solutions were prepared to have a concentration of 100 ppm. Spectrophotometric measurements were conducted using the prepared stock solutions within the wavelength range of 190 to 400 nm to determine the wavelength corresponding to the highest absorbance value. Dilutions were performed from the 100 ppm stock solutions to achieve specific

concentrations, and calibration curves were constructed using these diluted solutions with known concentrations. Subsequently, the B-SNEDDS formulations, prepared separately for each chosen solvent, were dissolved. The amount of berberine within the formulations was determined using the calibration curves established in the previous steps. Consequently, spectrophotometric quantification methods were developed for the SNEDDS formulation using different solvents, and the impact of the solvents on the developed quantification methods was compared.

Keywords: SNEDDS, Spectrophotometry, Berberine, Emulsion

Synergistic drug delivery strategies for colorectal cancer therapy

Emine Esin ÇALIŞKAN^{1*} (ORCID: 0000-0002-8837-1222), Yalçın Çelik AYDIN¹ (ORCID: 0000-0001-5549-1087) Fatma Gülay DER² (ORCID: 0000-0002-2515-8846), İlayda ALÇIN² (ORCID: 0000-0001-9584-9493), Emrah KILINÇ² (ORCID: 0000-0002-4583-8371), Emel Öykü ÇETİN UYANIKGİL¹ (ORCID: 0000-0001-8822-9130)

¹Ege University, Faculty of Pharmacy, Department of Biopharmaceutics and Pharmacokinetics, Izmir, Türkiye.

²Department of Biopharmaceutics and Pharmacokinetics, Department of Analytical Chemistry, Izmir, Türkiye.

*eesincaliskan@hotmail.com

Abstract

The present study is aimed at developing a drug delivery system for the treatment of colorectal cancer. To achieve this objective, niosomes loaded with indomethacin and metformin were prepared using the film hydration method. In this process, cholesterol, chloroform, and surfactants were dissolved in an organic solvent, which was subsequently evaporated under vacuum to yield a thin film layer. Following the formation of the film, hydration was carried out, and particle size reduction was achieved. The resulting niosomes were then precipitated through centrifugation and subsequently lyophilized.

The particle size, zeta potentials, and polydispersity index of the prepared niosomes were measured using Zetasizer. Surface characteristics were examined through SEM analysis. Additionally, DSC and FTIR analyses were conducted, and entrapment efficiency was quantified. Release studies were performed using dialysis bag method, and the release profiles were plotted as a function of time.

For the synthesis of capecitabine loaded mesoporous silica nanoparticle (MSN), double surfactant system was used. This involved the thorough mixing of cetyltrimethylammonium bromide (CTAB), poloxamer 407 (Lutrol F 127), tetraethyl orthosilicate (TEOS), and aqueous ammonia, followed by centrifugation and vacuum drying. The particle size, zeta potential, and polydispersity index of the prepared mesoporous silica nanoparticles were determined using Zetasizer. The surface properties were evaluated via SEM analysis, and a Brunauer-Emmett-Teller (BET) surface area analysis was conducted.

The results obtained from the characterization tests were found to be consistent with the existing literature. Subsequently, the study progressed to the next phase, involving in vitro efficacy investigations.

Keywords: niosome, mesoporous silica nanoparticle, drug delivery system, indomethacin, metformin, capecitabine

Acknowledgement: This project is supported by TÜBİTAK (120S926).

Artificial intelligence applications in drug design

Özden Tari^{*1} (ORCID: <https://orcid.org/0000-0001-9280-6594>), Nuray Arpacı¹
(ORCID: <https://orcid.org/0009-0003-7870-2934>)

^{*1}Çukurova University, Faculty of Pharmacy, Department of Pharmaceutical
Chemistry, 01330, Adana, Türkiye.

*ozdentari@hotmail.com

Abstract

The increasing number of studies on artificial intelligence causes the pharmaceutical industry to benefit from these studies, as in every other field. This study is aimed at examining how artificial intelligence applications play a role in drug design and development. In today's world, where the need for new biologically active compounds is increasing, the continuous emergence of new algorithms in artificial intelligence, strong computational ability, and accumulation of obtained chemical and biological data allows the use of artificial intelligence in drug design. With artificial intelligence methods that can be applied at almost all stages of drug design, difficulties such as long-time requirements and high costs in developing new drugs are tried to be reduced. As a result of this study, the applications of artificial intelligence technology in the drug design process and its advantages over traditional methods have been extensively analyzed and compared.

Keywords: Artificial intelligence, Deep learning, Drug design, Machine learning

Investigation of the antibiofilm potential of *Ganoderma lucidum* as a potential food additive source

Abdullah Yücel Baba ^{1,2} (<https://orcid.org/0000-0003-4856-8773>),
Abdurrahman Aygöl ³ (<https://orcid.org/0000-0003-3887-1381>)

^{*1} Necmettin Erbakan University, Faculty of Medicine, Department of Medical Microbiology, Konya, Türkiye.

² Ankara Medipol University, Vocational School of Health Sciences, Ankara, Türkiye.

³ Çukurova University, Faculty of Pharmacy, Department of Pharmaceutical Microbiology, Adana, Türkiye.

*abdullahyucel.baba@ankaramedipol.edu.tr

Abstract

Food safety is of great importance to prevent the emergence of foodborne diseases caused by biofilm-producing microorganisms. This study aims to investigate the effect of *Ganoderma lucidum*, known as Lingzhi or Reishi mushroom, on bacterial biofilm formation in terms of food safety. The antibiofilm potential of *G. lucidum*, known for its antimicrobial and immunomodulatory properties, was investigated by testing the ethanol extract for biofilm formation in standard strains of *Pseudomonas aeruginosa*, *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Escherichia coli* and *Enterococcus faecalis*. Bacterial suspensions prepared from each bacterial culture and 35% ethanol extract of *G. lucidum* were used in the study. Biofilm formation was assessed by measuring the absorbance value of the dyed biofilm using a spectrophotometer. The results showed that the ethanol extract exhibited concentration-dependent inhibitory activity against *P. aeruginosa* and *S. aureus* biofilm, but no significant activity was observed for *K. pneumoniae*, *E. coli*, and *E. faecalis*. These findings suggest that *G. lucidum* is promising in the prevention of foodborne infections caused by *P. aeruginosa* and *S. aureus*, and that further research could investigate its effectiveness in preventing contamination of biomedical products caused by these pathogens.

Keywords: Antibiofilm, *Ganoderma lucidum*, Food safety, Public health

Investigation of the structures of alzheimer's disease and anti-alzheimer's effective compounds

Özden TARI^{1*}(ORCID: <https://orcid.org/0000-0001-9280-6594>),
Ramazan YAĞMURTAŞAN²(ORCID: <https://orcid.org/0000-0002-4182-5135>)

^{*1}Farmasötik Kimya Anabilim Dalı, Eczacılık Fakültesi, Çukurova Üniversitesi,
Adana, Türkiye

²Eczacılık Fakültesi, Çukurova Üniversitesi, Adana, Türkiye

* ozdentari@hotmail.com; otari@cu.edu.tr

Abstract

Alzheimer's disease, the most common form of dementia, is a complex disease characterized by memory loss and other cognitive problems. Understanding the pathophysiology of Alzheimer's disease, which has an increasing prevalence, and investigating the structures of compounds that are effective in the treatment of this disease will help to develop new effective drug molecules. In this sense, it is of great importance to investigate the hypotheses that are effective on the disease, the structure of the active compounds, and their mechanisms of action. Recent studies have shown that focus on obtaining stronger compounds that can affect more than one of the hypotheses that are effective in the pathology of the disease. In this review study, the important hypotheses that play a role in the pathology of Alzheimer's disease and the structures of drug active compounds with proven anti-Alzheimer activity over these hypotheses are revealed.

Keywords: Alzheimer's Disease, Dementia, Anti-Alzheimer compounds

Distribution of the seagrass *Posidonia oceanica* on the Aegean coasts of Türkiye

Ergün Taşkın^{1*}, Furkan Bilgiç¹, Onur Karayalı¹, Ersin Minareci¹, Ozan Güreşen², Aysu Güreşen², Orkide Minareci¹

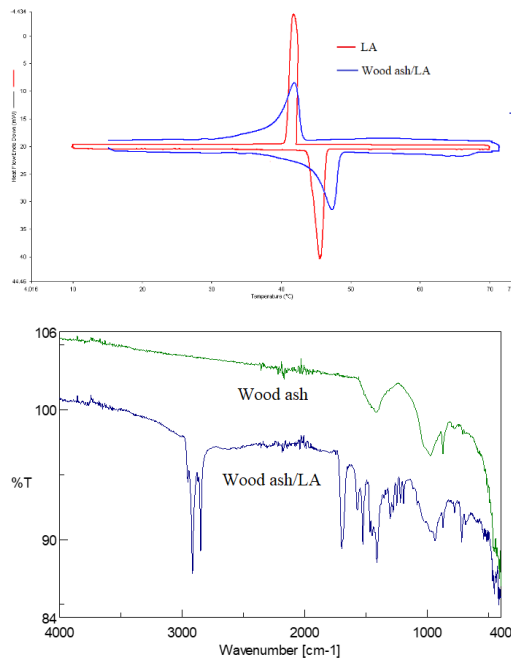
¹Manisa Celal Bayar University, Faculty of Arts and Sciences, Department of Biology, 45140, Muradiye, Yunusemre, Manisa, Türkiye

²İstanbul University, Faculty of Water Sciences, İstanbul, Türkiye

*ergun.taskin@cbu.edu.tr

Abstract

In this study, wood ash, an industrial waste product, was impregnated with lauric acid and a composite phase change material (Wood ash/LA) was synthesized. While synthesizing this composite, direct impregnation method was used and it reached 32% entrapment rate. DSC, TG and FT-IR analysis methods were used to determine the thermal and chemical properties of the synthesized composite.



The melting temperature and latent heat of the composite prepared according to the DSC analysis were determined as 41.24°C and 60.80 J/g, respectively. The composite has also been subjected to multiple repeated thermal cycling tests and is reported to have high thermal reliability. In addition, the thermal resistance of the prepared phase change composite was determined by thermal gravimetry analysis.

Finally, the thermal conductivity value of the synthesized composite was measured and its thermal conductivity was improved by adding carbon nano fiber.

Keywords: PCM, Energy storage, composite, Thermal property

Biodiversity of marine Cladophorales on coasts of İzmir (Aegean Sea, Türkiye)

Öznur Yazılan Çamlık^{1*}, Ergün Taşkın¹

¹Manisa Celal Bayar Üniversitesi, Fen Edebiyat Fakültesi, Biyoloji Bölümü, 45140

Yunusemre, Manisa, Türkiye

*oznuryazilan@gmail.com

Abstract

The Chlorophyta (green algae) division includes approximately 500 genera and 8000 species. Most live in freshwater, but there are also marine species. The green algal order Cladophorales consists of 493 species belonging to 71 genera and members with branched or unbranched filamentous thalli. On the coast of Türkiye, 34 species belonging to 4 families of Cladophorales order have been identified: 2 Anadyomenaceae, 29 Cladophoraceae, 1 Siphonocladaceae, and 2 Valoniaceae. In this study, to determine the biodiversity of Cladophorales species, a green algal order, from the stations determined in the Aegean Sea of Türkiye, the aim was to identify species by taking into account morphological characteristics and to identify Cladophorales species that have recently entered these regions, if any, and investigations were carried out in this direction. Samples were collected seasonally between April 2021 and July 2023 from stations located on the coast of İzmir (Aegean Sea, Türkiye). Sampling was carried out by hand and snorkelling from the upper infralittoral region, and by scuba diving from deeper depths. In addition, the effects of terrestrial pressure and opportunistic species were evaluated. In this study, 16 Cladophorales species were identified along İzmir coast. This study has been supported by TÜBİTAK (121Y215).

Key words: Aegean Sea, Cladophorales, *Cladophora*, Chlorophyta, green algae

Investigation of the histopathological effects of different concentrations of borax on *Eisenia fetida*

İrem Nur Güngör* (ORCID: <https://orcid.org/0009-0008-8465-4621>), Esra Akat
Çömden (ORCID: <https://orcid.org/0000-0001-7080-3106>)
Ege University, Faculty of Science, Biology Department, İzmir, Türkiye.
*gungor.iremnur@gmail.com

Abstract

The aim of this study is to investigate the effects of borax chemical in fertilizer on *Eisenia fetida*, contributing to a better understanding of potential ecological consequences and promoting informed decision-making regarding borax usage in various environments. Borax ($\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$) is commonly used in agriculture due to it has insecticidal, fungicidal, and herbicide properties. *E. fetida* earthworms are important for soil ecosystems as they enhance crop and soil fertility in agricultural areas and facilitate the conversion of organic materials to inorganic materials. *E. fetida* samples were obtained from Argesol Agriculture Livestock Industry and Trade Limited Company. Five groups were formed, including the control group. Earthworms with prominent clitellum were exposed to borax concentrations of 12.5, 25, 50 and 100 mg/kg. The study was replicated three times. On the 7th, 14th, and 21st days, three worms were from each group were selected and weighed. Afterwards, earthworm tissue samples were fixed in Bouin's fixative for 48 hours. The tissue samples were dehydrated through sequential immersion in increasing concentrations of alcohol. After dehydration, the samples were rendered transparent using xylene. They were then immersed in paraffin, and the resulting paraffin blocks contained the embedded samples. A microtome was used to create transverse sections with a thickness of 5µm, which were subsequently stained using histochemical methods (Hematoxylin-eosin, Mallory Trichrome, Alcian blue, Periodic Acid Schiff). The epidermis, longitudinal and circular muscle layers of the earthworms were evaluated. More pronounced changes were observed in the high-concentration groups (50 and 100 mg/kg). Our results indicated that borax led to disruptions in muscle layers, deformation of epidermal cells, epidermal stratification, and epidermal degeneration. In conclusion, our study demonstrates that exposure to high concentrations of borax elicits significant adverse effects on earthworms.

Keywords: borax, earthworms, histopathology, ecotoxicology

Acknowledgement: This study was financially supported by TUBITAK (The Scientific and Technological Research Council of Turkey, Project number: 2209-A, 1919B012205159)

Alterations of Ca⁺², pH, and reactive oxygen species in spermidine treated pollen tubes of *Actinidia deliciosa*

Özkan Kilin^{1*} (ORCID: <https://orcid.org/0000-0002-9283-4576>), Melse Su Bilgili¹ (ORCID: <https://orcid.org/0000-0002-2062-7295>), Aslıhan Çetinbaş-Genç¹ (ORCID: <https://orcid.org/0000-0001-5125-9395>)

^{*1}Marmara University, Faculty of Science, Biology Department, Istanbul, Türkiye.
*ozkankilin@gmail.com

Abstract

Pollen tubes are tip-growing structures and the elongations of the pollen tubes depend on the proper distribution of Ca⁺², pH, and reactive oxygen species at the tube apex. However, plant growth regulators could change the distribution of Ca⁺², pH, and reactive oxygen species at the tube apex. This study aims to investigate the alterations of Ca⁺², pH, and reactive oxygen species in spermidine (0.01 mM, 0.025 mM, 0.05 mM, 0.1 mM, 0.25 mM, 0.5 mM) treated pollen tubes of kiwi (*Actinidia deliciosa*). The results showed that Ca⁺² concentration in a 100 µm² area of the apex increased statistically by 79.56% after 0.025 mM, by 83.32% after 0.25 mM and by 76.35% after 0.5 mM spermidine treatment. pH concentration in a 100 µm² area of the apex increased statistically by 161.87% after 0.25 mM and by 185.54% after 0.5 mM spermidine treatment. Concentrations of reactive oxygen species in a 100 µm² area of the apex decreased statistically by 16.66% after 0.01 mM, by 33.96% after 0.025 mM, by 20.74% after 0.05 mM, by 36.91% after 0.1 mM and by 33.91% after 0.25 mM. However, concentrations of reactive oxygen species increased statistically by 9.42% after 0.5 mM spermidine treatment. The results show that different spermidine concentrations cause different effects on distribution of Ca⁺², pH, and reactive oxygen species.

Keywords: calcium, pH, pollen tube, polyamine, reactive oxygen species, spermidine

Acknowledgement: This work was supported by the 2209-A-Research Project Support Programme for Undergraduate Students with project identification number 1919B012201192.

Toxic effects of phosmet on non-target organisms

Muhterem Elif Demirağ* (ORCID: <https://orcid.org/0009-0007-6343-1309>), Esra Akat Çömnden (ORCID: <https://orcid.org/0000-0001-7080-3106>)
Ege University, Faculty of Science, Biology Department, Izmir, Türkiye.
*elifdemirag035@gmail.com

Abstract

Pesticides play a crucial role in enhancing agricultural productivity by controlling pests and increasing crop yields. Lately, the significant increase in pesticide usage is notable. In the absence of pesticide use, there would be a significant decrease of 78% in fruit yield, 54% in vegetable yield, and 32% in grain harvest. These statistics show that approximately one-third of agricultural products depend on their existence to the use of pesticides. While pesticides can increase productivity, their long-term impacts on environmental and human health can lead to substantial damage. Among these pesticides, phosmet, an organophosphorus compound, is widely used in agriculture, particularly in the cultivation of fruits and vegetables. However, this widespread use of phosmet raises concerns about its potential ecological damage because the continued use of phosmet has resulted in its residues being detected in soil, water, and air, contributing to environmental pollution. The residues can persist for extended periods, posing risks to various ecosystems and their inhabitants. They can enter the food chain through various routes, affecting organisms at different trophic levels. The disruption of the natural food chain can result in imbalances in biodiversity and ecosystem stability. This leads to the bioaccumulation of the pesticide in higher-order consumers, further magnifying its toxic effects. While phosmet effectively targets pests, its unintended impacts can be observed on non-target organisms. Phosmet functions as an acetylcholinesterase inhibitor, disrupting nerve conduction in pests and leading to their demise, but on the other hand this mechanism also affects non-target organisms, causing serious nervous system problems due to the inhibition of acetylcholinesterase in unintended targets. Studies have shown that phosmet residues reach many non-target organisms, including beneficial insects, birds, and small mammals. These organisms experience neurotoxic effects similar to those observed in targeted pests, leading to impaired motor functions, reduced foraging abilities, and potential disruption of their reproductive cycles. Apart from its neurotoxic effects, phosmet exposure has been linked to oxidative stress and hormone imbalances in non-target organisms. Such physiological disruptions can impair the overall health and reproductive success of affected populations. It is essential to carefully consider the ecological consequences of pesticide use and implement sustainable agricultural practices that minimize the risks posed by pesticides like phosmet. Further research is necessary to develop alternatives and mitigate the detrimental impact of pesticides on non-target organisms and overall ecosystem health. To mitigate the ecological damage caused by pesticides, it is essential to initially investigate the

extent of the damages. This presentation aims to provide a comprehensive review of the toxic effects of phosmet on non-target organisms and its implications for the environment.

Keywords: pesticide, phosmet, toxicity, soil contamination

Solution-centric approach: micropropagation of *R. odorata* and *R. rugosa* with emphasis on solvent modification and hormonal effects

İbrahim Halil HATİPOĞLU^{1*} (ORCID: <https://orcid.org/0000-0002-7236-4976>),
Bekir Erol AK¹ (ORCID: <https://orcid.org/0000-0001-6938-942X>)

^{*1}Harran University, Faculty of Agriculture, Horticulture Department, Sanliurfa, Türkiye.

*ibrahimhhatipoglu@gmail.com

Abstract

In this study, shoot tips of *R. odorata* 'XIV. Louis' and *R. rugosa* taxa, cultivated under greenhouse conditions as plant material, were used. Young shoot tips of 1 cm in length were collected, subjected to surface sterilization, and utilized as explants. Tissue culture experiments often exhibit leaf yellowing and shedding in the cultured plants, possibly due to iron chlorosis or ethylene accumulation. Previous researches have indicated that silver nitrate is a highly effective inhibitor in mitigating the effects of ethylene. MS media were modified by the addition of AgNO₃ and FeEDDHA solutions at various concentrations. Furthermore, mediums containing different ratios of cytokinin (BAP) and auxin (IBA) were investigated within the scope of this study to assess their effects on the formation of healthy leaves. The control application consisted of 20 g/l sucrose, 6 g/l agar, and 4.4 g/l MS nutrient medium. Determining and modifying suitable media for micropropagation of the Halfeti Rose and Seashore Rose, which are significant for landscape use in our country's ecology, is crucial. The key factors in tissue culture studies are the selection of explants and the establishment of sterilization protocols. It was observed that using young shoots yielded better results in applications. The statistical data revealed that the addition of FeEDDHA to the growth media influenced healthy leaf formation, while AgNO₃ affected shoot number, and the presence of auxin in the growth medium impacted shoot length parameters in the examined *Rosa* L. taxa.

Keywords: Micropropagation, silver nitrate, iron, solvent modification, hormonal effects

**Comparative de novo transcriptome analysis and random UV mutagenesis:
application in high biomass and astaxanthin production enhancement for
*Haematococcus pluvialis***

Murat Telli^{1*} (ORCID: [https:// 0000-0001-5546-0379/](https://orcid.org/0000-0001-5546-0379)), Ercan Selçuk Ünlü²

¹Bolu Abant İzzet Baysal University, Faculty of Art and Science, Department of Biology, 14280 Bolu, Türkiye.

²Bolu Abant İzzet Baysal University, Faculty of Art and Science, Department of Chemistry, 14280 Bolu, Türkiye.

*tellim@ibu.edu.tr

Abstract

Astaxanthin as a natural carotenoid is highly demanded by the food, pharmaceutical and nutraceutical industries. *Haematococcus pluvialis* has been characterized as one of the most promising species for astaxanthin biosynthesis. However, its slow growth limits the usage of the species for large-scale production. In this study, we generated a mutated *H. pluvialis* strain by using one-step random UV mutagenesis for higher biomass production in the green flagellated period and in turn higher astaxanthin accumulation in the red stage. Isolated mutant strains were tested for the astaxanthin accumulation and yield of biomass. Among tested strains only the mutant strain designated as MT-3-7-2 showed a consistent and higher growth pattern than the wild type. To demonstrate the phenotypical changes in MT-3-7-2 are associated with transcriptome, we carried out a comparative analysis of transcriptome profiles between MT-3-7-2 and the wild-type strains. De novo assembly was carried out to obtain the transcripts. Differential expression levels for the transcripts were evaluated by functional annotation analysis. Data showed that increased biomass for the MT-3-7-2 strain was different from wild type with expression of transcripts upregulated in carbohydrate metabolism and downregulated in lipid metabolisms. Our data suggest a switching mechanism is enrolled between carbohydrate and lipid metabolism to regulate cell proliferation.

Keywords: *Haematococcus pluvialis*, Microalgae, Transcriptomics, Mutation, Astaxanthin

In silico characterization of pharmacokinetic and toxicity parameters of prevalent monosaccharides associated with mammalian glycans in glyconanotechnology applications

Ramiz Demir^{1*} (ORCID: <https://orcid.org/0000-0001-6435-7883>), Cem Güler² (ORCID: <https://orcid.org/0000-0003-4945-4794>.)

^{*1} Koç University Research Center for Translational Medicine (KUTTAM),
Istanbul, Türkiye.

² Ege University, Faculty of Science, Department of Biology, Izmir, Türkiye.

*Corresponding author e-mail: demir.ramiz@yahoo.com

Abstract

Monosaccharides are the smallest units of glycans that may conjugate with protein and lipids to regulate human physiology and pathology, ranging from signal transduction to pathogenic infections. Decorating nano-scale materials with monosaccharides provides them with various benefits to eliminate physiological barriers such as biocompatibility, half-life, dispersibility, and toxicity. Indeed, selecting the monosaccharide for a specific nanomaterial is a critical issue. In this study, we aimed to characterize pharmacokinetic and toxicity parameters of mammalian glycan-associated prevalent monosaccharides (Glucose, Mannose, *N*-Acetylglucosamine, *N*-Acetylgalactosamine, Glucuronic acid, Fucose, Sialic acid). Two-dimensional structure information of these monosaccharides was obtained from the PubChem chemical information database at the National Institutes of Health. Prediction of pharmacokinetic and toxicity parameters (absorption, distribution, metabolism, excretion, toxicity) was analyzed by the ADMETlab 2.0 platform. As a result, the monosaccharides were found to be a higher permeability potential in MDCK cells but not in Caco-2 cells. Acetylated monosaccharides (Sialic acid, *N*-Acetylgalactosamine and *N*-acetylglucosamine) were found to have binding ability to P-glycoprotein above 80%. The oral bioavailability potential (F30%) of these monosaccharides (except Fucose) was above 70%. In contrast, Fucose was found to have higher volume distribution compared to the others. From a toxicological perspective, three cytochrome P450 family members (CYP2C19, CYP2C9 and CYP2D6) were found to be the most affected redox-active proteins. Two types of monosaccharides (*N*-Acetylgalactosamine and *N*-acetylglucosamine) were potentially found to have liver toxicity. These findings about pharmacokinetic and toxicity parameters of monosaccharides are expected to help us choose appropriate monosaccharides for designing glycan-conjugated nanomaterials (such as glyconanoparticles) in glyconanotechnology applications.

Keywords: Glycan, Glyconanotechnology, Monosaccharide, Pharmacokinetics, Toxicity.

Radiolabeling, quality control and *in vitro* evaluation of [^{99m}Tc]Tc-HMPAO-exosomes for wound healing

Meliha EKİNCİ^{1*} (ORCID: <https://orcid.org/0000-0003-1319-3756>),
Simgе MALKOÇ² (ORCID: <https://orcid.org/0000-0001-8238-1449>),
Burak ÇAKAR² (ORCID: <https://orcid.org/0000-0002-4334-9320>),
Derya ERİŞİK² (ORCID: <https://orcid.org/0000-0002-8199-6051>),
Emine Esin ÇALIŞKAN³ (ORCID: <https://orcid.org/0000-0002-8837-1222>),
Canberk TOMRUK² (ORCID: <https://orcid.org/0000-0002-3810-3705>),
Yalçın Çelik AYDIN³ (ORCID: <https://orcid.org/0000-0001-5549-1087>),
Derya İLEM-ÖZDEMİR¹ (ORCID: <https://orcid.org/0000-0002-1062-498X>),
Yiğit UYANIKGİL^{2,4,5} (ORCID: <https://orcid.org/0000-0002-4016-0522>),
Emel Öykü ÇETİN UYANIKGİL³ (ORCID: <https://orcid.org/0000-0001-8822-9130>)

^{*1}Ege University, Faculty of Pharmacy, Department of Radiopharmacy, İzmir, Türkiye.

²Ege University, Faculty of Medicine, Department of Histology and Embryology, İzmir, Türkiye.

³Ege University, Faculty of Pharmacy, Department of Pharmaceutical Technology, Department of Biopharmaceutics and Pharmacokinetics, İzmir, Türkiye.

⁴Ege University, Health Science Institute, Department of Stem Cell, İzmir, Türkiye.

⁵Ege University, Cord Blood, Cell and Tissue Research and Application Centre, İzmir, Türkiye.

* melihaekinci90@gmail.com

Abstract

In this study, exosomes derived from mesenchymal stem cells were radiolabeled with [^{99m}Tc]Tc-HMPAO, and quality control and stability studies of the radiolabeled exosomes were performed. The radiochemical purity (RP) of [^{99m}Tc]Tc-HMPAO-exosomes was measured using radioactive thin layer chromatography and paper electrophoresis, and the RP was higher than 93% for up to 6 h. [^{99m}Tc]Tc-HMPAO-exosomes showed high 0.9% sodium chloride solution, serum, and cell medium stability (90%). In addition, the partition coefficient value of [^{99m}Tc]Tc-HMPAO-exosomes was calculated to be 1.358±0.012, indicating lipophilic properties. The effects of [^{99m}Tc]Tc-HMPAO-exosomes on the wound model were comparatively investigated in the WI38 fibroblast cell line with and without a wound model to shed light on *in vivo* studies for the biomedical application of exosomes. This study is important because it is the first in the literature to conduct *in vitro* studies on a wound model of radiolabeled exosomes.

Keywords: exosomes, radiolabeling, ^{99m}Tc-HMPAO, wound healing.

Acknowledgement: The authors would like to thank the Ege University Aliye Üster Foundation for providing financial support.

Immobilization of *Candida rugosa* Lipase by Conformational Design Approach to Obtain Effective Catalysts at Ester Production

Mine AKGÜN^{*1} (ORCID: 0000-0001-8480-3887), Funda KARTAL² (ORCID: 0000-0001-8701-8809.)

¹Ege University, Graduate School of Natural and Applied Sciences, Izmir, Türkiye.

²Ege University, Faculty of Science, Biochemistry Department, Izmir, Türkiye.
*mineakgun231@gmail.com

Abstract

Lipases have broad potential in industry due to their ability to catalyze different reactions (esterification, amidation, transesterification). Mostly, the catalytic site of lipases is covered by either one or two mobile peptides called the "lid". The lid structure controls the entrance of substrate to the active side. The lid holds unique conformational allostery via interfacial activation to regulate the dynamics and catalytic functions of lipases, thereby highlighting its importance in redesigning these enzymes for industrial applications. There are several techniques for lid rebuilding (e.g., metagenomic technology, protein engineering and enzyme immobilization). Superiority of immobilization technique to the others is reusability of enzyme which reduce the cost of industrial process. In this study *Candida rugosa* lipase was immobilized on Fe₃O₄ magnetic particule. To induce conformational change of enzyme, Fe₃O₄ magnetic particules were coated with oleic acid. To evaluate the effect of immobilization process on conformation of the enzyme, esterification activities were compared for free and enzymes immobilized on Fe₃O₄ and Fe₃O₄@oleic acid. Different fatty acid were used for coating Fe₃O₄ magnetic particules to reveal their effect on conformational modulation of enzyme. Different chain length acids and alcohols were used as substrates to reveal the substrate selectivity of enzyme which is concerned as a consequence of conformational change accompanying immobilization of lipase.

Keywords: Conformational engineering, lipase, magnetic particule, interfacial activation, ester synthesis

Phytochemical screening and anti-tyrosinase activity of three endemic plants grown in Trabzon region

Fulya Oz Tuncay^{*1} (ORCID: <https://orcid.org/0000-0003-3185-4933>)

^{*1}Karadeniz Technical University, Faculty of Science, Department of Chemistry,
61080 Trabzon, Türkiye

*fulyaoz@ktu.edu.tr

Abstract

Tyrosinase is an essential enzyme that contains copper and plays a crucial role in the pigmentation process of mammalian hair and skin. Melanin synthesis is influenced by a variety of extrinsic and intrinsic factors, including hormone fluctuations, inflammation, aging, and subsequent exposure to ultraviolet light. Excessive melanin production can lead to several undesirable side effects, including melasma, senile lentigines, freckles, and diminished coloration. The present study evaluated the anti-tyrosinase activity and the phenolic profiles of four extracts (methanol, ethanol, ethyl acetate, and hexane) obtained from fruits of Autumn olive, Indian hawthorn and Cockspur hawthorn. Fourteen typical compounds were identified and quantified by liquid chromatography-high-resolution mass spectrometry (LC-HRMS). Also, the anti-tyrosinase activities of all extracts were investigated with spectrophotometric methods, using Kojic acid ($IC_{50} = 7.5 \pm 0.1 \mu\text{g/mL}$) as a standard inhibitor. The ethyl acetate extract of Cockspur hawthorn fruits was found to have the highest total phenolic and flavonoid content, with $99.0 \pm 3.3 \text{ mg GAE/g dry weight}$ and $20.8 \pm 0.3 \text{ mg QE/g dry weight}$, respectively. According to LC-HRMS analysis, fumaric acid ($2133.3 \pm 64.0 \text{ mg/L}$) was the most abundant compound in the ethyl acetate extract of Autumn olive. Additionally, an excellent tyrosinase inhibitory activity was observed for the methanolic extract of Indian hawthorn, $IC_{50} = 5.5 \pm 0.3 \mu\text{g/mL}$. Overall, all three plants could be regarded as rich sources of bioactive phytochemicals that could further lead to the development of novel phytopharmaceutical commodities.

Keywords: LC-HRMS, Anti-tyrosinase activity, Phenolic profiles, Fruit Extracts

Gold nanoparticle glycoconjugates targeting cancerous cell lines

Şevval Güney¹ (<https://orcid.org/0009-0007-7908-7864>), Adnan Ayna² (<https://orcid.org/0000-0001-6801-6242>), Ekrem Darendelioğlu² (<https://orcid.org/0000-0002-0630-4086>), Abdullah Tunç³ (<https://orcid.org/0000-0002-2378-5897>), Sedanur Özbolat² (<https://orcid.org/0000-0001-7597-5388>), Aslı Uğurlu Bayarslan¹ (<https://orcid.org/0000-0003-2131-2823>), İdris Yazgan^{1*} (<https://orcid.org/0000-0002-0264-1253>)

^{*1}Kastamonu University, Faculty of Science, Biology Department, Kastamonu, Türkiye.

²Bingöl University, Faculty of Science, Department of Chemistry, Bingöl, Türkiye.

³Bingöl University, Faculty of Health Sciences, Occupational Health and Safety, Bingöl, Türkiye.

*iyazgan@kastamonu.edu.tr, aayna@bingol.edu.tr

Abstract

Carbohydrate-lectin interactions are currently under massive search to develop bioactive agents that can be directly used as drug or drug carriers. Due to the short lifetime in blood circulation, carbohydrate ligands cannot fulfill their duties. Therefore, their conjugation on to gold nanoparticles (AuNPs) and silver nanoparticles (AgNPs) has been proposed as a viable approach in the development of anticancer agents. In this manner, the utilization of carbohydrate ligands that recognize lectins in the cells brings out selectivity toward the cancerous cells. Hereby, we synthesized a series of carbohydrate ligands that were used in the synthesis of nanoparticle glycoconjugates (NPGs). In order to further enhance the anticancer activity of the NPGs, D-penicillamine was coated onto the gold NPGs. Anticancer of the carbohydrate ligands and corresponding nanoparticles were tested using A549 human lung epithelial cell line and HT-29 human colorectal adenocarcinoma cell line. The results revealed that the chemistry of the sugar ligand played the key in the toxicity due to the fact that cancerous cells alter their membrane lectin composition. Besides, genetic studies showed that cell death gave related to increased apoptotic gene expression and increased oxidative stress. It is promising that further studies can give a deeper insight into the molecular mechanisms of the NPGs mediated toxicity on cancerous cells.

Keywords: Carbohydrate ligand, Nanoparticle glycoconjugate, lectin, cancerous cells.

Acknowledgement: This research was funded by Kastamonu University under project number KÜ-BAP01/2018-33.

Gold nanoparticle glycoconjugates improve the antibacterial activity of colistin

Sedanur Sel¹ (ORCID: <https://orcid.org/009-0005-0157-2785>),

İdris Yazgan^{1*} (ORCID: <https://orcid.org/0000-0002-0264-1253>)

^{*1}Kastamonu University, Faculty of Science, Biology Department, Kastamonu, Türkiye.

*iyazgan@kastamonu.edu.tr

Abstract

Gold nanoparticle glycoconjugates (AuNPGs) are relatively benign and bio-compatible inorganic nanoparticles in addition to that they can recognize cell surfaces through carbohydrate-lectin interactions. Therefore, they have found widespread utilization in the development of drug-formulations. Hereby, we performed a study containing phenolic substituted lactose carbohydrate ligands synthesized AuNPGs. Colistin was further physically adsorbed onto the AuNPGs. The formed colistin-AuNPGs (cAuNPGs) were compared with the free colistin for toxicity on *Escherichia coli* and *Pseudomonas aureus*. The results revealed that the minimum inhibitory concentration (Mic) and minimum bactericidal concentration (MBC) went down 6 times by cAuNPGs in comparison to the free colistin treatment. Due to the fact that *P.aeruginosa* has lactose-binding lectins as the major surface lectins while *E.coli* possessed mannose-binding lectins as the major lectin composition, superior performance was obtained during the *P.aeruginosa* antibacterial studies. Therefore, growth kinetic and metabolic studies were performed to evaluate how the cAuNPGs interfere with the growth and production of bacterial virulence factors (i.e. pyoverdine and pyochelin) for *P.aeruginosa*. The results showed that conjugation of classical antibiotics to the AuNPGs can enhance their antibacterial potentials with improved MIC/MBC values along with disrupting the growth pattern and production of virulence factors.

Keywords: Gold Nanoparticle glycoconjugate, lectin, conjugation, colistin, *Pseudomonas aeruginosa*.

Acknowledgement: KÜBAP-01/2022-20.

Efficacy of green synthesis of nickel, copper and silver nanoparticles using *Thymus serpyllum* extract against *Acanthamoeba castellanii*

Mehmet Aykur^{1*} (ORCID: <https://orcid.org/0000-0002-6100-1037>),
Nazan Göksen Tosun² (ORCID: <https://orcid.org/0000-0001-5269-1067>),
Özlem Kaplan³ (ORCID: <https://orcid.org/0000-0002-3052-4556>),
Aykut Özgür⁴ (ORCID: <https://orcid.org/0000-0002-4457-1249>)

^{*1}Tokat Gaziosmanpaşa University, Faculty of Medicine, Parasitology Department, Tokat, Türkiye.

²Tokat Gaziosmanpaşa University, Tokat Vocational School of Health Services, Department of Medical Services and Techniques, Tokat, Türkiye

³Alanya Alaaddin Keykubat University, Rafet Kayış Faculty of Engineering, Department of Genetics and Bioengineering, Antalya, Türkiye

⁴Tokat Gaziosmanpaşa University, Artova Vocational School, Department of Veterinary Medicine, Laboratory and Veterinary Health Program, Tokat, Türkiye

*Corresponding author e-mail: mehmetaykur@gmail.com

Abstract

Acanthamoeba is a common protozoan in many environments, leading to infection in humans and animals. This amoeba causes vision-threatening *Acanthamoeba* keratitis (AK) in the eye and granulomatous amoebic encephalitis (GAE) in the central nervous system. AK is an infection in the eye that can lead to vision loss and does not have a fully effective treatment. The aim of the study was to evaluate the anti-amoeba activity of TS-AgNPs, TS-CuNPs and TS-NiNPs on *Acanthamoeba castellanii*. In the present study, the microwave-assisted assay was used for green synthesis of AgNPs, CuNPs and NiNPs using *Thymus serpyllum* extract. The anti-amoebic activity of TS-AgNPs, TS-CuNPs and TS-NiNPs was evaluated using by MTT method. Anti-amoebic activity as IC₅₀ value of TS-AgNPs, TS-CuNPs and TS-NiNPs was observed 1818.36 ± 28.81 µg/ml, 1952.97 ± 21.65 µg/ml, and 2159.0 ± 22.04 µg/ml after 24 hours, respectively. Moreover, TS-AgNPs, TS-CuNPs and TS-NiNPs inhibited cell proliferation of *Acanthamoeba* trophozoites with IC₅₀ of 739.98 ± 4.06 µg/ml, 1192.57 ± 7.14 µg/ml and 1607.75 ± 2.56 µg/ml at 48 hours, respectively. These results demonstrated that TS-AgNPs showed higher anti-amoebic activities than TS-CuNPs, TS-NiNPs and PVP-I in *Acanthamoeba* trophozoites at 24 and 48 hours. It was observed that the effect of TS-AgNPs on *Acanthamoeba* trophozoites at 1000 µg/ml concentration in 24 hours was more effective than TS-CuNPs, TS-NiNPs and PVP-I. However, it was observed that TS-AgNPs, TS-CuNPs and TS-NiNPs had a higher anti-amoebic effect than PVP-I on *Acanthamoeba* trophozoites at a concentration of 2000 µg/ml in 24 hours. It was observed that the effect of TS-AgNPs on *Acanthamoeba* trophozoites at 250, 500, 1000, and 2000 µg/ml concentrations at 48 hours was more effective than PVP-I. The conclusion of the present study demonstrates the most effective of TS-AgNPs among the nanoparticles when used against the treatment of infections caused by *A.*

castellanii. These agents show the potential to create new, efficient, and secure treatment options.

Keywords: *Acanthamoeba castellanii*, *Thymus serpyllum*, Nanoparticles, Green synthesis, Anti-amoebic activity

The usage of vegetable plant protein supported superabsorbent polymer in agriculture

Neslihan Güngör^{1*,2} (ORCID: <https://orcid.org/0000-0003-2684-6357>),

Elif Çatan^{1,2} (ORCID: <https://orcid.org/0009-0005-4968-4727>),

Zehra Doğruatar¹ (<https://orcid.org/0009-0007-0532-9402>),

Burcu Okutucu¹ (ORCID: <https://orcid.org/0000-0002-0907-4175>)

¹Ege University, Faculty of Science, Biochemistry Department, Izmir, Turkey

²Ege University, Graduate School of Natural and Applied Sciences, Biochemistry Department, Izmir, Turkey

*e-mail: nmirik.nm@gmail.com

Abstract

The soil and water resources are the most important components of agricultural production. Unlike the rapidly increasing world population, these resources are deteriorating or becoming unusable day by day. The development of water resources and the effective use of irrigated agricultural areas, which are among the most important elements of productivity increase in agricultural, are also important in terms of food supply. To realize and maintain commercial crop production in arid conditions, some alternative practices are needed. In recent years, the application of some additional chemicals to the soil in this context has attracted attention. Among these substances are water-retaining polymers (Super Absorbent Polymer: SAP), which have a high-water retention capacity and allow plants to be grown in a better quality under arid conditions. In addition to the positive effects of water-retaining polymers on plant growth, yield, quality, flowering and irrigation efficiency, there are many studies reporting that water and fertilizer, which are among the most important inputs in agriculture, provide savings by allowing them to be retained in the root zone without causing much leakage. Proteins are non-toxic and biocompatible. For this reason, the development of protein-supported super adsorbent polymer for agricultural applications will be beneficial in terms of minimizing the damage to nature in plant cultivation in agriculture due to its low toxicity effect as well as increasing the yield of the grown plant. In this study, protein extraction was carried out from different plant sources (yellow lentils, kidney beans, white beans and Mexican beans) by acidic and alkaline purification methods. The protein content obtained from different plant sources was compared and the source with the highest protein content was selected. Protein-supported super adsorbent polymers were prepared with different ratios of monomer and crosslinker (acrylamide and N,N-methylenebis acrylamide) to polymer. The results were compared to evaluate the best water retention capacity. SAP and protein from plant source were mixed. Physical and chemical (swelling test, solubility, reproducibility, FTIR) characterization tests were carried out with obtained protein supported SAP. The effect of water reserve and protein content on plant growth of

the obtained protein-SAP on the growth of arugula was studied and compared with standard soil.

Keywords: Vegetable protein, hydroponics, super absorbent polymer, water reserve

Exploring anti-cancer constituents and cytotoxic effects of *Feijoa sellowiana* fruit extract on breast cancer

Çisil ÇAMLI PULAT^{1*} (ORCID: <https://orcid.org/0000-0002-9641-7219>),

Suleyman ILHAN² (ORCID: <https://orcid.org/0000-0002-6584-3979>)

^{*1}Applied Science and Research Center (DEFAM), Manisa Celal Bayar University,
Manisa, Türkiye

²Section of Molecular Biology, Department of Biology, Faculty of Science and
Letters, Manisa Celal Bayar University, Muradiye, Manisa, Türkiye

*e-mail: cisil.camli@cbu.edu.tr

Abstract

Breast cancer remains a leading cause of mortality among women, necessitating heightened attention and innovative treatment approaches. Given the heterogeneous nature of breast cancer, exploring novel therapeutic avenues is crucial. Natural products, with their potential to offer less aggressive alternatives to conventional chemotherapy, have garnered interest. In this study, the potential cytotoxic effect of *Feijoa sellowiana* fruit extract (FE) was investigated on a panel of human breast cancer cells. GC-MS analysis was performed to identify the active constituents present in the FE extract and MTT analysis was conducted to evaluate the cytotoxicity of FE against breast cancer cells. Results showed a strong efficacy of FE against MDA-MB-453 and MDA-MB-231 cell lines. The cytotoxicity was evident after a 24-hour treatment duration for both lines. It was observed that the two cell lines in which the FE extract was most effective belonged to the triple-negative breast cancer category. These findings underscore FE's targeted efficacy against triple-negative breast cancer cells, indicating its promise as an alternative avenue to tackle this formidable cancer subtype. The viability of MCF-7 cells decreased to 23.2% after 72 hours of exposure to 1000 µg/mL FE, and this decline was also noticeable at lower concentrations. Conversely, the BT-474 cell line displayed the least susceptibility, with a viability of 43.9% even at the highest concentration of 1000 µg/mL FE. According to GC-MS analysis, the main component of FE ethanol extract was determined to be flavone. Flavone is known to induce cytotoxicity and apoptosis in cancer cells. The findings suggest that FE has demonstrated specific efficacy against triple-negative breast cancer cells and its potential as an alternative approach to address this challenging breast cancer subtype.

Keywords: cytotoxicity, GC-MS, breast cancer, pineapple guava, anti-cancer

Acknowledgment: The experiments in this paper were partially performed at Manisa Celal Bayar University (Türkiye)- Applied Science and Research Center (DEFAM).

Preparation and determination of thermal properties of wood ash/lauric Acid (LA) composite for thermal energy storage

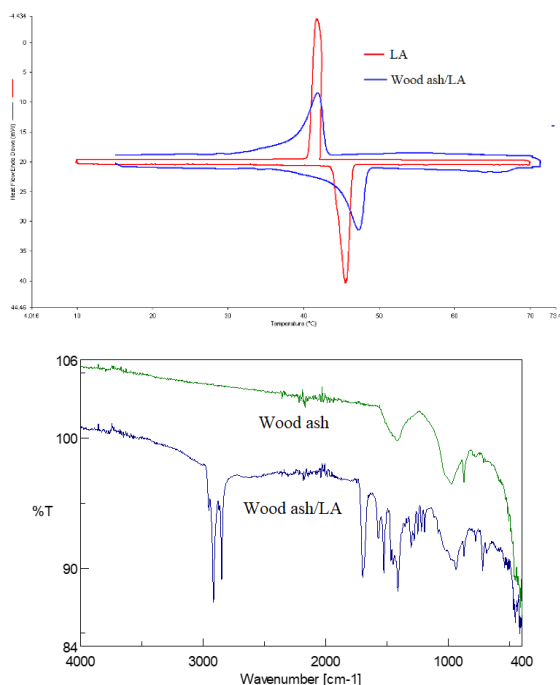
Alper BİÇER^{1*} (Orcid:0000-0001-9138-537X)

^{*1} Gaziosmanpasa University, Department of Chemistry, 60240,Tokat, Türkiye.

*alper.bicer@gop.edu.tr

Abstract

In this study, wood ash, an industrial waste product, was impregnated with lauric acid and a composite phase change material (Wood ash/LA) was synthesized. While synthesizing this composite, the direct impregnation method was used and it reached 32% entrapment rate. DSC, TG and FT-IR analysis methods were used to determine the thermal and chemical properties of the synthesized composite.



The melting temperature and latent heat of the composite prepared according to the DSC analysis were determined as 41.24°C and 60.80 J/g, respectively. The composite has also been subjected to multiple repeated thermal cycling tests and is reported to have high thermal reliability. In addition, the thermal resistance of the prepared phase change composite was determined by thermal gravimetry analysis. Finally, the thermal conductivity value of the synthesized composite was measured and its thermal conductivity was improved by adding carbon nano fiber.

Keywords: PCM, Energy storage, composite, Thermal property

Removal of sirius blue from aqueous solutions by *Craterellus cornucopioides* biomass

Sirin Nuray ÖZSOY^{*1}, Aslı GÖÇENOĞLU SARIKAYA¹, Bilgen OSMAN¹
^{*1}Uludağ University, Faculty of Art and Science, Chemistry Department, Bursa,
Türkiye.
*502209018@ogr.uludag.edu.tr

Abstract

Synthetic dyes have been generally used in the pharmaceutical, textile, cosmetics, paper, food, plastics and rubber industries due to their stability, easy operation and inexpensive cost. However, these industrial effluents are known to be a major source of environmental pollution and can affect the aquatic environment and humans because of their carcinogenic, teratogenic or mutagenic effects [1]. It is very important to remove such dyes from wastewater due to allergen, toxic and carcinogenic effects.

The traditional treatment technologies for the removal of textile dyestuff are chemical oxidation, photodecomposition, chemical coagulation, reverse osmosis and electrochemical treatment [2]. However, these methods are time-consuming and expensive. Biological treatment is the alternative process due to its low cost, ease of operation, and high efficiency among traditional processes [3]. In recent years, metabolically active and metabolically inactive processes have been commonly used as biological methods for the removal of wastes. Biosorption (metabolically inactive) is more attractive than active processes hence living cells can easily be affected by environmental conditions. However, inactive (dead) biomasses can easily be adsorbed and desorbed the effluents, can used repeatedly, low-cost materials and easy to operate. There is a lot of literature that especially fungi are used in wastewater treatment [4].

In this study, biosorption of azo-dye Sirius Blue (SB) was investigated from an aqueous solution by using *Craterellus cornucopioides* biomass as a biosorbent. After the characterization of the biomass, biosorbent dosage; initial pH; initial SB concentration; biosorption temperature and biosorption time were optimized.

Keywords: *Craterellus cornucopioides*, Sirius Blue (SB), Biosorption

Acknowledgement: *This study was supported by Bursa Uludag University Support Project (FHZP-2023-1503).

References

- [1] A. Yıldırım, H. Acay, Biosorption studies of mushrooms for two typical dyes, Journal of Turkish Chemical Society Section A: Chemistry 7 (1) (2020) 295–306,

- [2] O. Türgay, G. Ersoz, S. Atalay, J. Forss, U. Welander, The treatment of azo dyes found in textile industry wastewater by anaerobic biological method and chemical oxidation, *Separ. Purif. Technol.* 79 (1) (2011) 26–33.
- [3] F.C. Drumm, P. Grassi, J. Georgin, D. Tonato, D.S.P. Franco, J.R.C. Neto, M. A. Mazutti, S.L. Jahn, G.L. Dotto, Potentiality of the *Phoma* sp. inactive Fungal biomass, a waste from the bioherbicide production, for the treatment of colored effluents, *Chemosphere* 235 (2019) 596–605, <https://doi.org/10.1016/j.chemosphere.2019.06.169>.
- [4] Bhatia D, Sharma NR, Singh J, et al. Biological methods for textile dye removal from wastewater: a review. *Critical Rev Environ Sci Tech.* 2017;47:1836–1876.

The use of cross-linked sodium alginate hydrogels prepared loaded with tropical fruit wastes as biosorbent

Büşra KARKAR (ORCID: <https://orcid.org/0000-0001-6547-5558>)
Bursa Uludağ University, Faculty of Science and Arts, Department of Chemistry,
Bursa, Türkiye.
*busrakarkar@uludag.edu.tr

Abstract

Biosorption is the passive adsorption of toxic substances, such as heavy metals and dyes, by biological materials. Biosorption is a physicochemical process that utilizes the mechanisms of absorption, adsorption, ion exchange, surface complexation, and precipitation processes [1]. Most of the biosorbents used today are obtained from biomasses of leaves, stems and fruit peels, seeds, flowers, fish scales, algae, bacteria, and fungi. The products derived from plants are usually lignocellulosic (containing cellulose, lignin, and hemicellulose) and consist of various functional groups, such as hydroxyl and carboxyl, which are used as active binding sites for biosorption. Biosorbents with significant cellulose and lignin content show high dye biosorption capacity [2]. Tropical fruits, pineapple, kiwi, and bananas are frequently used in fruit juice production, especially in the food industry, and their peels and leaves generate a significant amount of waste. The most important common feature of these wastes is their high lignocellulosic content. Many studies have reported that pineapple leaves, bananas, and kiwi peels have high lignocellulosic content. Accordingly, they can be used as biosorbents for dye removal.

In this study, the usability of a combination of kiwi and banana peels and pineapple leaves as biosorbents was investigated. In this direction, cross-linked sodium alginate hydrogels loaded with these three materials in combination were developed. The optimum conditions required for maximum dye removal capacity of the obtained hydrogels were determined using Central Composite Design-Response Surface Methodology (RSM-CCD), one of the experimental design methods. Then, biosorption capacity, equilibrium, and kinetic model studies of hydrogels were carried out with the adsorption study carried out under optimum conditions.

Keywords: Biosorption, Adsorption, Hydrogel, Tropical fruit, Waste-product, Optimization

References:

- [1] J. Derco, B. Vrana, InTech, 2018.
- [2] S. Mishra, L. Cheng, A. Maiti, J. Environ. Chem. Eng. 2021, 9, 104901.

The usage of solid-state nuclear track detectors in radon adsorption

Ceren Gündoğdu¹, Caner Taşköprü¹, Mutlu İçhedef¹, Ümit H. Kaynar²,
Süleyman Gülcemal³, Elçin Ekdal Karali¹

^{*1}Ege University, Institute of Nuclear Sciences, 35100, Bornova, İzmir

²Bakircay University, Faculty of Engineering & Architecture, Department of
Fundamental Sciences, İzmir, Turkey

³Ege University, Faculty of Sciences, Department of Chemistry, TR-35100, İzmir,
Turkey

*ceren.95gundogdu@gmail.com

Abstract

As highlighted by international organizations, radon gas accumulation in buildings is the second biggest risk for lung cancer. Therefore, monitoring and reduction of indoor radon concentrations is one of the most important subjects all over the world. It should be noted that a significant factor to find new radon adsorbents is based on efficient methodology. In this study, solid-state nuclear track detectors (SSNTDs) are used to measure the radon adsorption of synthesized materials as a new method. For this purpose, metal organic frameworks (MOFs) were used as radon adsorbent in the study. In order to test the effectiveness of the tested method, measurements were taken with detectors with and without adsorbent inside the radon tank.

Keywords: SSNTDs, Radon, Adsorption, Metal-organic frameworks (MOFs).

Acknowledgement: This study is supported by This study is supported by the Ege University Scientific Research Projects Coordination Unit. Project Number: FM-GAP-2022-23967.

Performance evaluation of anoxic/aerobic treatment unit using disc aerator with surface agitator: Case of Kayseri sugar factory

Alper Solmaz^{1*} (ORCID: <https://0000-0001-6928-3289>)

^{*1} Iskenderun Technical University, Iskenderun Vocational School of Higher Education, Department of Environmental Protection and Control, Hatay, Türkiye.

*alper.solmaz@iste.edu.tr

Abstract

Sugar factories are seasonal businesses that operate approximately 100-150 days per year. During sugar production, approximately 1500-2000 m³ of water is used for 100 tons of beet, and there are sugar and nitrogen derivatives such as albumin, saponin, triethylamine, amino acids in the resulting wastewater. It is essential to treat these wastewaters, which have a high pollution load, because of the toxic and related negative effects that may occur in the receiving environment. Today, aerobic, anaerobic or hybrid (anaerobic-aerobic) treatment technologies are generally preferred for the treatment of these wastewaters. In this study, the treatment efficiency of the orbal treatment unit operating in the oxidation ditch logic with surface mixer of the hybrid wastewater treatment plant of Kayseri Sugar Factory in the years 2021-2022 was investigated. The wastewater consisting of parts where beets are floated and washed, wastewater consisting of brucner sludge, general purpose washing water and cloth/bag washing water within the factory come to the treatment plant. The first part of the plant, which was built in two stages, is the anaerobic treatment unit. In this unit, there are hydrolysis tank, anaerobic continuous stirred tank reactor, degassing tank and plate settling tank. In the second level, there is an orbal pool and a settling pool. There are two levels in this orbal pool, which is designed as an oxidation ditch, and there is an anoxic zone in the first level and an oxic zone following it. The wastewater leaving the system reaches the settling pool, and the bottom sludge is recycled back to the aerobic pool entrance. In the plant operating with a flow rate of 350 m³/h, 6 horizontal shaft (diameter; 1372 mm) disc aerators are used to provide the necessary mixture and oxygen transfer. The aerobic reactor suspended solid concentration (SS) is 4700 mg/L, and the sludge volume index (SVI) is around 45 mL/g under average stable conditions. The treatment efficiency of the plant varies between 72-90% on the basis of chemical oxygen demand (COD), and the treatment efficiency of SS varies between 73-93%. With the submerged disc technology, the treatment efficiency can be further increased by increasing the immersion depth of the discs.

Keywords: Sugar industry, wastewater treatment, oxidation ditch, disc aerator.

Acknowledgement: We would like to thank Kayseri Sugar Factory Environmental Management Unit.

Performance evaluation of continuous stirred tank reactors (CSTR-LESAR): Case of Kayseri sugar factory

Talip Turna^{1*} (ORCID: [https:// 0000-0001-6318-7245](https://0000-0001-6318-7245))

^{*1} Dicle University, Diyarbakir Vocational School of Technical Sciences,
Department of Park and Horticulture, Diyarbakir, Türkiye.

*talipturna@gmail.com

Abstract

In the sugar production sector, which has an important place in the food sector in our country and in the world, 15-20 m³ of water is used per ton of beet during the production process. Since the carbon and nitrogen concentrations are high in the wastewaters from this industry, these wastewaters have great effects on the ecosystem and the environment. If these waters are given directly to the receiving environment, they can cause fish death and eutrophication. In addition, since the Chemical Oxygen Demand (COD) concentration is around 6,000-10,000 mg/L, this high organic carbon load is a good source for methane and hydrogen production. Today, classical aerobic biological nutrient removal system and anaerobic treatment systems or a combination of both are generally preferred for the treatment of these wastewaters. In this study, the purification efficiency of the dual-phase (hydrolysis-anaerobic) unit of the treatment plant, which has a combination of aerobic and anaerobic treatment systems, in the years 2021-2022, belonging to Kayseri Sugar Factory was investigated. The plant consists of two phases, a hydrolysis tank and a fully mixed airless sludge reactor (CSTR). There is an anaerobic reactor with a volume of 10,000 m³ and a hydrolysis tank with a volume of 2,000 m³ operating under mesophilic conditions (35-37⁰C). As it is known, the most important energy input in anaerobic treatment systems is the heating of the system. In this respect, sugar factories are very advantageous in meeting the heat requirement of anaerobic systems. Because there are waste heat sources at many points in the sugar production process. One of them is factory condensate water. The temperature of the water coming to the hydrolysis tank is brought to the desired values by means of the factory condensate water and heat exchangers. The first phase of anaerobic treatment takes place in the wastewater sent from the heat exchangers to the hydrolysis tank. In this part, fermentative and hydrolytic bacteria break down carbohydrates, proteins and fats in an oxygen-free environment and convert CO₂, acetic acid and most of it into soluble volatile organic substances. Afterward, the water stabilized for mesophilic bacteria is transferred to the anaerobic tank. The solids separated from the wastewater in the plate settling tank are returned to the system continuously by means of return pumps. Thus, the amount of active microorganisms required for the reactor is preserved. Organic materials are converted into carbon dioxide (CO₂) and methane (CH₄) in the reactor, which is in a continuous mixture. As a result of the treatment, the biogas obtained at an average flow rate of 180-250 m³/hour is sent to the coal boilers of the factory, thus

contributing to energy savings. The removal efficiencies of the wastewater treatment system on the basis of COD and Suspended Solids (SS) parameters are 90-96% and 78-82%, respectively. The ratio of Essential Fatty Acids (VFA)/Alkalinity is between 0.14-0.4 according to the operating conditions, and the values are in line with the literature. In this context, the energy obtained from the CH₄ gas formed from the wastewater treatment plant contributed to reducing the sugar production cost.

Keywords: Wastewater treatment, sugar industry, CSTR, biogas, anerobic treatment.

Acknowledgement: We would like to thank Kayseri Sugar Factory Environmental Management Unit.

The effects of different extraction methods on the antioxidant activity capacity of *Inula viscosa* L.

Fadim Yemiş, Muammer Tepe, Merve Cümert, Beyzanur Em
Manisa Celal Bayar University, Akhisar Vocational High School, Manisa, Türkiye
*debtepoglu@hotmail.com

Abstract

Inula viscosa L. is a perennial plant in the family Asteraceae. *I. viscosa*, commonly found in the Mediterranean region and known in Turkey as the "Yapışkan andız otu", "Calba" or "Zimerit", is a semi-grassy plant that grows green for four seasons, can grow independently and reach up to 2 meters, and blossoms yellow between July and December. Many different studies on *inula viscosa* has found that it contains bioactive compounds such as guaianolides, sesquiterpenes, triterpenoids, azules, lactones, flavonoids, bone acid, and volatile fats. In Turkey, the fresh leaves of *Inula viscosa* are used as wound healers. Hispidulin, found primarily in *inula viscosa*, is a natural flavonoid widely used in traditional Chinese medicine. *I. viscosa* has attracted great interest in recent years as a natural source of bioactive compounds in its structure. The anti-inflammatory, anti-cancer, and antimicrobial studies of this plant have been conducted. In this study, *I. viscosa* plants were extracted by two different methods. Microwave digestion-assisted extraction (MDAE), homogenizer-assisted extraction (HAE) methods were used as extraction methods. Methanol was used as a solvent in extraction methods. The antioxidant contents of the extracts were also analyzed by using ABTS (2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid)), FRAP (Ferric ion reducing antioxidant power), and DPPH (2,2-Diphenyl-1-picrylhydrazyl). The assays were measured three times to test the reproducibility of the assays. When all analysis data were compared, it was determined which of these two different extraction methods used was more efficient. If we evaluate the results we have achieved, when the MDAE and HAE extraction methods were compared according to the FRAP antioxidant activity results, 91.6 and 62.7 TE/g dry weight results were obtained, respectively. DPPH activity was found 39.6 and 17.9 TE/g dry weight. The ABTS activity capacity of the *I. viscosa* plants was measured at 9.2 and 4.1 TE/g dry weight, respectively. When the analysis data were compared, it was determined that the best antioxidant results were in MDAE>HAE, respectively.

Keywords: *Inula viscosa*, Antioxidant activity, Extraction methods, FRAP, DPPH, ABTS.

Acknowledgement: This study was supported by Tübitak-2209-A University Students Research Projects Support Program.

An investigation of self-organized complexity in one-dimensional atomic chain

Fatimat Bughluyeva^{1*} (ORCID: 0009-0001-8378-2129), Sevda Saltık² (ORCID: 0000-0002-2663-957X), Özgür Afşar³ (ORCID: 0000-0003-4073-858X)

¹Ege University, Faculty of Science, Physics Department, Izmir, Türkiye.

²Dokuz Eylül University, Faculty of Science, Physics Department, Izmir, Türkiye.

³Ege University, Faculty of Science, Physics Department, Izmir, Türkiye.

*91200001349@ogrenci.ege.edu.tr

Abstract

One of the fundamental research topics in the field of "Complexity Science" is to determine the degree of complexity of any dynamical system. Various complexity measures are used to determine the complexity of different regimes in the control parameter space of the dynamical systems. The most common among these are entropy-based complexity measures such as Shannon, Kullback-Leibler, and K-entropy. A recently introduced an entropy-based complexity measure (q-Renormalized entropy) presents a new approach to the study of distinction of the regimes. It considers the entropy difference between two states during a transition (from a renormalized equilibrium state, which is defined by a power law distribution, to any equilibrium/non-equilibrium state) within the framework of self-organized complexity. This approach has been able to accurately determine the different phases of the dynamic system under investigation, and the transition points between them, (Afsar and Tirnakli, 2023). Branching processes and spatial patterns, frequently encountered in dissipative dynamic systems, can also be addressed within the phenomena of self-organization. In this study, the dissipative Standard Map, that can be derived from a model of one-dimensional atomic chain, is examined by means of evolution in the parameter space of the map. We show that energy values of the map possess a period-doubling route to chaos for atom chains generated with randomly selected initial atom positioning. Moreover, the degree of complexity of different phases (periodic/chaotic) through the control parameter evolution of the map are numerically determined by using the q-Renormalized entropy method.

Keywords: complexity measures, q-renormalized entropy, dissipative systems.

References: Afsar, O., and Tirnakli, U. 2023, "Necessary Condition of Self-Organisation in Nonextensive Open Systems." *Entropy* 25(3), 517.

Investigating the ion conductivity of $\text{Li}_{0.29}\text{Sr}_{0.6}\text{Mn}_{0.2}\text{Cr}_{0.1}\text{Ti}_{0.7}\text{O}_3$ as a solid electrolyte for Li-ion batteries

Aylar Narimani^{1,3}, Mohammad Ahangari^{1,3}, Elham Mahmoudi^{1,3}, Jafar Mostafaei^{2,3}, Ali Çoruh³, Nagihan Delibaş^{3*}, Elnaz Asghari², Aligholi Niaei^{1,3}

^{*1}Department of Chemical & Petroleum Engineering, University of Tabriz, Tabriz, Iran

²Department of Physical Chemistry, Faculty of Chemistry, University of Tabriz, Tabriz, Iran

³Department of Physics, Faculty of Art & Science, University of Sakarya, Sakarya, Turkey

*caylak@sakarya.edu.tr, ORCID: 0000-0001-5752-062X

Abstract

Lithium-ion batteries (LiBs) are increasingly being utilized and developed in portable electronic devices, hybrid autos, and electric vehicles. Because of its high energy-storage density and power density, longer cycle life, and reduced self-discharge issue, it is considered as the most favorable and promising energy storage device. The electrolyte, which is the main component of an electrochemical cell, separates the cathode and anode components of the cell to prevent direct connection, while also permitting fast ion transfer and inhibiting internal electron diffusion.

Solid electrolytes in Li-ion batteries have advantages such as high thermal stability, superior safety, wide operating temperature range, and wide operating window, which have attracted the attention of many researchers. In this study, perovskite oxide $\text{Li}_{0.29}\text{Sr}_{0.6}\text{Mn}_{0.2}\text{Cr}_{0.1}\text{Ti}_{0.7}\text{O}_3$ was successfully synthesized as solid electrolyte material in lithium-ion batteries with A-site vacancy by Pechini method with temperature controlling. X-ray diffraction revealed the formation of single-phase perovskite. The vacancy of lithium ions at the A site is highly beneficial for Li-ion transit during the charge-discharge process. The content of Li cation vacancies in the A site is significantly dependent on the B site cations and their oxidation states in the perovskite structure. Presence of different cations with different oxidation states is effective to increase the conductivity and decrease the activation energy, which can provide more lithium ion transport channels. The ionic conductivity obtained for the research compound was $9.32 \times 10^{-6} \text{ S.cm}^{-1}$ at 30 °C. This study found that $\text{Li}_{0.29}\text{Sr}_{0.6}\text{Mn}_{0.2}\text{Cr}_{0.1}\text{Ti}_{0.7}\text{O}_3$ is a promising candidate as solid electrolyte for Li-ion battery and warrants further investigation.

Keywords: $\text{Li}_{0.29}\text{Sr}_{0.6}\text{Mn}_{0.2}\text{Cr}_{0.1}\text{Ti}_{0.7}\text{O}_3$, Li-ion conductivity, Solid oxide electrolyte, Pechini method.

Transition metal substitution effects on structural and electrochemical performance of in high nickel Li-ion cathode material

Erdinc Oz ^{1*} (ORCID: <https://orcid.org/0000-0003-4321-8264>),

Jeff R. Dahn ² (ORCID: <https://orcid.org/0000-0002-6997-2436>)

^{*1} Atatürk University, Faculty of Science, Physics Department, Erzurum, Türkiye.

² Dalhousie University, Faculty of Science, Department of Physics & Atmospheric Science, Department of Chemistry, Halifax, Canada.

*erdinc.oz@atauni.edu.tr

Abstract

The escalating effects of global warming are forcing countries worldwide to take precautionary measures. The foremost among these is the transition from fossil fuels to green energy sources, such as solar and wind. These alternatives are expected to replace fossil fuels in the near future. An important question arises here: Can environmentally friendly energy sources be efficiently utilized? The answer lies in efficient energy storage with rechargeable lithium-ion (Li-ion) batteries leading the way.

Li-ion batteries consist of four components: positive and negative electrodes (cathode and anode, respectively), an electrolyte that facilitates lithium-ion movement, and a separator that prevents electrode contact. During charging, lithium ions move from the cathode to the anode through the electrolyte, whereas electrons travel to the anode through collectors, and the separator prevents a short circuit. During the discharge process, these steps are reversed, and the released electrons power the devices through the collectors.

Lithium-ion battery cathode materials represent a fertile field of study. Their prominence in portable electronic devices and electric vehicles (EVs) has stimulated material development. Among these, lithium metal oxides (LiMO₂) containing elements such as cobalt (Co), nickel (Ni), and manganese (Mn) stand out. Commercial frontrunners, LiCoO₂ (LCO), have favorable theoretical capacity and portability but are not suitable for the large batteries required for electric vehicles. To address this, LiNiO₂ (LNO) has emerged as an alternative that is structurally similar to LCO but eliminates the disadvantages of cobalt. However, challenges include cation exchange during synthesis and stability concerns at high potentials. Researchers have substituted nickel with other cations in various ratios. Examples include LiNi_{1-x-y}Co_xMn_yO₂ (NCM) and LiNi_{1-x-y}Co_xAl_yO₂ (NCA), with the aim of increasing the practicality of Ni-rich materials (>80% Ni) that offer high capacity but with compromised stability.

The project investigated Ni-rich cathode materials, LiNi_{1-x}Mn_xM_yO₂ (M= Ti and Al), synthesized by a continuous stirred-tank reactor (CSTR) technique, aiming to bolster LNO stability. The physical properties of the synthesized materials were investigated in detail using X-ray diffraction (XRD), scanning electron microscopy (SEM), and electrochemical properties by cyclic voltammetry (CV), and battery

performance tests. A detailed analysis showed that a certain amount of Ti and Al doping is comparable to that of standard materials.

Keywords: Li-ion battery, cathode, transition metal, doping, electrochemical performance

Acknowledgment: The authors acknowledge funding from NSERC and TESLA Canada under the Auspices of the Alliance Grants Program. Erdinc Oz was supported by the TUBITAK 2219 International Postdoctoral Research Fellowship Program [grant no:1059B191900554].

Effect of annealing on optical band gap energy of tin oxide thin films

Reşit Özmenteş^{1*} (ORCID: <https://orcid.org/0000-0002-5893-0660>),

^{*1}Bitlis Eren University, Vocational School of Health Services, 13100, Bitlis, Türkiye.

*Corresponding author e-mail: ozmentes@gmail.com

Abstract

Nanostructured tin oxide thin films were coated on a glass substrate at 400 °C by spray pyrolysis method using tin IV chloride precursor solution. XRD measurements showed that the produced films were formed in an amorphous structure. For optical characterization, absorption and transmittance measurements were taken and the optical band gap of the film was calculated as 3.93 eV. In order to examine the effect of annealing time on the optical band gap, the produced films were annealed for up to 2.5 hours at half-hour periods. Optical band gap energy, which was 3.93 eV before heat treatment, was calculated as 3.85, 3.86, 3.97, 3.92 and 3.96 eV after heat treatment, respectively. This fluctuation in the band gap value was attributed to the change in the crystal structure of the tin oxide thin films.

Keywords: Tin oxide, thin film, annealing time, optical band gap

Non-extensive statistical physics analysis of earthquakes

Ahmet Çelikoğlu^{1*} (ORCID:<https://orcid.org/0000-0002-0621-1461>)

¹Ege University, Faculty of Science, Physics Department, İzmir, Türkiye.

*ahmet.celikoglu@ege.edu.tr

Abstract

Earthquakes are natural phenomena that have been a subject of fascination and scientific inquiry for centuries. Understanding their occurrence and impact is crucial for mitigating their potential hazards. Despite all efforts, we still have little information about earthquake dynamics. In recent years, the application of non-extensive statistical mechanics to the study of earthquakes has provided valuable insights into the complex dynamics of seismic events.

Non-extensive statistical mechanics, introduced by Tsallis in the late 1980s, offers an alternative framework for describing systems that do not follow traditional Boltzmann-Gibbs statistics. This approach has proven to be particularly useful in systems with long-range interactions, self-organization, and multifractal properties, characteristics often observed in earthquake dynamics.

In this work, recent studies briefly introduced. In the light of these, Maraş earthquake analyzed from the non-extensive statistical physics point of view.

Keywords: Earthquake, Non-extensive Statistical Physics, Gutenberg-Richter Law, Entropy.

The Usability of Soil Gas CO₂ Anomalies and ²²²Rn/²²⁰Rn Ratios Along the İzmir Fault Zone as Precursors for the definition of fault activity

İlayda SAPMAZ^{1*}, Caner TAŞKÖPRÜ¹, Emre TABAR², Fulsen ÖZEN³, Salvatore Giammanco⁴, Hasan SÖZBİLİR⁵, Mutlu İÇHEDEF¹

^{*1} Ege University, Institute of Nuclear Sciences, 35100, Bornova-İzmir, Türkiye

² Faculty of Science and Arts, Sakarya University, Sakarya, Türkiye

³ Ege University, Faculty of Agriculture, Department of Soil Science and Plant Nutrition, 35100, Bornova-İzmir, Türkiye

⁴ Istituto Nazionale di Geofisica e Vulcanologia - Osservatorio Etneo, Piazza Roma, 2 - 95125, Catania, Italy

⁵ Earthquake Research and Application Center, Dokuz Eylül University, 35160 Buca, İzmir, Türkiye

*Corresponding author e-mail: ilaydaeda19@gmail.com

Abstract

Soil gas measurements make it possible to work on a small piece of land, eliminating the obstacle to field studies. Therefore, soil gas measurements can provide information about natural processes through gases released from the earth's crust in metropolises with excessive urbanization. For this reason, gases in soil gas can be used to get information such as detecting buried and unidentified faults and predicting earthquakes İzmir Fault is one of the most important active tectonic structures in Turkey's Active Fault Map. Due to very intense urbanization, there is not enough information about the fault. Determination of Soil gas CO₂ concentrations and ²²²Rn and ²²⁰Rn activity concentrations were carried out along the İzmir Fault (IF) to get new information on this fault and its activity. This study also discusses the usability of the ²²²Rn/²²⁰Rn ratio together with CO₂ anomalies as geodynamic precursors.

Keywords: Radon, Annual effective dose, Indoor radon, LR-115, SSNTDs, primary schools.

Acknowledgement: This study is supported by the TÜBİTAK 1001 Scientific and Technological Research Projects Support Program: Earthquake Research Call and by Basic Science Research Program-Project No: 121Y404.

The ongoing study on indoor radon levels in primary schools

Gülse MASRUOĞLU^{1*}, Ceren ALTUN¹, İlayda SAPMAZ¹, Mutlu İÇHEDEF¹

^{*1}Ege University, Institute of Nuclear Sciences, 35100, Bornova-İzmir, Türkiye

*mansuroglugulse@gmail.com

Abstract

The intensive increase in population leads to the overcrowding of societies. The rise in confined spaces due to overcrowding results in hazardous situations. Enclosed spaces within buildings contain elements that impact air quality. These include excessive humidity, gases introduced into the environment through fuel combustion, gases released from construction materials and furniture, cleaning products, radon, insulation materials containing asbestos, and outdoor air pollution. Consequently, spending extended periods of time indoors in areas with pronounced population growth brings about significant dangers. One of these dangers is radon gas, which has become prevalent and poses a hidden risk, causing various serious illnesses when unknowingly inhaled in enclosed spaces.

Radon gas is among the most harmful gases that infiltrate buildings, presenting a peril. This colorless, odorless, and tasteless gas goes unnoticed by humans and permeates indoor spaces from the Earth's crust. Radon and its decay products are the primary sources of ionizing radiation exposure for humans. The results of indoor radon measurements in 40 classes of three primary schools in Bornova-İzmir, Türkiye are presented in this paper. The ongoing study was carried out with LR-115 solid-state nuclear track detectors (SSNTDs). The aim of the study is to measure indoor radon levels in schools, calculate the radiation dose (annual effective dose) for students, teachers, and staff members spending time in these schools, and compare the obtained data against international reference values.

Keywords: Radon, Annual effective dose, Indoor radon, LR-115, SSNTDs, primary schools.

Acknowledgement: The significance of the project lies in its potential to benefit other schools and other research endeavors. This study is supported by the TÜBİTAK 2209A University Students Research Projects Support Program.

An extended theoretical study on ${}^6\text{Li}({}^3\text{He},\text{d}){}^7\text{Be}$ reaction

Nazım KARAALI^{1*} (0009-0007-4035-2675), Murat AYGÜN¹ (0000-0002-4276-3511), Zeynep AYGÜN² (0000-0002-2979-0283)

^{1*} Bitlis Eren University, Faculty of Science and Arts, Physics Department, Bitlis, Türkiye.

² Bitlis Eren University, Vocational School of Technical Sciences, Bitlis, Türkiye.
*nazim.karaali@gmail.com

Abstract

${}^6\text{Li}({}^3\text{He},\text{d}){}^7\text{Be}$ transfer reaction is investigated for different density distributions, nuclear potentials, and nucleon–nucleon interactions. The theoretical calculations are performed by using the optical model. The similarities and differences of the theoretical results obtained for the different approaches are evaluated, and alternative density, nuclear potential, and nucleon-nucleon interaction are proposed.

Keywords: Transfer reaction, Density distributions, Nuclear potentials, Nucleon-nucleon interactions

Acknowledgement: This study was supported by the Scientific and Technological Research Council of Türkiye (TUBITAK) with the project numbered 122F275.

A Matlab-based software package for computing 3D similarity transformations

Merve Şimşek¹, Emel Zeray Öztürk^{*1} (ORCID: <https://orcid.org/0000-0002-7498-5258>), Muzaffer Kahveci¹ (ORCID: <https://orcid.org/0000-0001-5380-7164>)

¹Konya Technical University, Engineering and Natural Sciences Faculty,
Department of Geomatics Engineering, Konya, Türkiye.

*ezozturk@ktun.edu.tr

Abstract

As the Global Navigation Satellite Systems (GNSS) become widespread all over the world, the relationship between GNSS and national coordinate systems (datums) should be defined to ensure its effective use on a country basis. Three-dimensional (3D) similarity transformation is one of the methods developed to establish the correct relationship between the GNSS and national coordinate systems. The three-dimensional similarity transformation equation has seven parameters, namely the translations along the t_X , t_Y and t_Z axes, the rotations around the ε_X , ε_Y and ε_Z axes and the scale factor of k . These parameters are computed by the least squares method using identical points in both coordinate systems. In order to perform 3D similarity transformation, the precisely determined transformation parameters between the two data set in both systems should be adjusted with common points that contain more data than the number of unknown parameters. These transformations preserving shape and angles between vectors in space remain unchanged are widely used in the fields of surveying, geodesy, and photogrammetry. In this study, a software package has been developed in the Matlab environment that performs transformations using Helmert, Molodensky-Badekas and Veis methods.

Keywords: Similarity transformations, Seven-parameter transformations, Bursa–Wolf, Molodensky-Badekas, Veis.

A new approach to decision making in multi-fuzzy soft sets

İbrahim ŞANLIBABA (ORCID: <https://orcid.org/0000-0001-8801-464X>),
Nevşehir Hacı Bektaş Veli University, Faculty of Science, Mathematics
Department, Nevşehir, Türkiye.
*ibrahimsanlibaba@gmail.com

Abstract

In this article, firstly, definitions and examples of soft sets and fuzzy soft sets are given. Then, multi soft sets and multi fuzzy soft sets were described and examples were examined. The concept of entropy, one of the instruments measuring uncertainty, was given. A new method was proposed by creating an algorithm. An algorithm to be used in the decision-making process was created and used on the sample. The entropies of multiple fuzzy soft sets were found, converted to matrices and some analysis was done by finding the maximums of their sums. When the analyzes and algorithm results were examined, it was seen that it was the closest result to the best choice. As a result, it was seen that the most accurate selection would be approached by using entropy and algorithm in multi-fuzzy soft sets. As a result, it was seen that the most accurate selection would be approached by using entropy and algorithm in multi-fuzzy soft sets.

Keywords: Uncertainty, soft set, multi fuzzy soft set, decision-making. (Separated with commas)

Modeling of celiac diagnosis with fuzzy logic method in machine learning

Eda Nur Aydın¹, Rukiye Şeyma Şahin¹

^{*1}Ege University, Faculty of Science, Mathematics Department, İzmir, Türkiye.

*edanuraaydiin.16@gmail.com

Abstract

Fuzzy logic is a form of many-valued logic in which the truth value of variables may be any real number between 0 and 1. It is employed to handle the concept of partial truth, where the truth value may range between completely true and completely false. By contrast, in Boolean logic, the truth values of variables may only be the integer values 0 or 1.

Fuzzy logic is based on the observation that people make decisions based on imprecise and non-numerical information. Fuzzy models or fuzzy sets are mathematical means of representing vagueness and imprecise information (hence the term fuzzy). These models have the capability of recognising, representing, manipulating, interpreting, and using data and information that are vague and lack certainty.

Celiac disease (or gluten Enteropathy); It is a digestive system disease that causes the deterioration of structures called villi that provide nutrient absorption in the intestines, thus preventing the absorption of nutrients in food and causing damage to the small intestine.

When people with celiac eat gluten-containing foods, their immune system responds by damaging the small intestines. In particular, the structures that provide absorption in the small intestine called villi, which are very small and finger-like, disappear (flatten and become unable to function). The nutrients in the food pass through these villi and are absorbed into the bloodstream. Person without villi; no matter how much food he eats; cannot be fed. Celiac disease is considered an autoimmune disorder because the body damages its own immune system. However, it can also be classified as a digestive upset due to the inability to absorb food.

Celiac disease may occur with typical symptoms such as vomiting, diarrhea, abdominal distension, loss of appetite, loss of weight and slowing in height growth, as well as with very different symptoms such as anemia, short stature, bone weakness and liver disease of unknown cause, severe abdominal pain, gas problems in later ages.

The definitive diagnosis of celiac disease can only be made by an experienced gastroenterologist with blood tests and small bowel biopsy. The only treatment method that should be followed at the stage after the diagnosis is to be fed with gluten-free foods recommended by your specialist physician. Since gluten is found in wheat, barley, rye and oats, these foods should be avoided for life.

In our research, we wanted to develop a machine learning that can be used in the diagnosis of celiac disease by using the fuzzy logic method. We collected data on

1075 celiac patients for machine learning using fuzzy logic. We analyzed the complaints of the patients during the diagnosis process with these data.

We used the Scikit fuzzy library in this research. Based on the physical findings of individuals with celiac disease in the model we developed, we wanted to present a fuzzy approach to how effective each finding is in diagnosing the disease. The model will analyze the answers given by users about the possibility of having celiac disease. Although this result is not a medical diagnosis, it will lead patients to receive medical support as soon as possible.

Keywords: Fuzzy, Fuzzy Logic, Machine Learning, Celiac, Celiac Diagnosis.

Acknowledgement: Thanks to Associate Professor İbrahim Şentürk,

This study was supported by Tübitak-2209-A University Students Research Projects Support Program

A Matlab-based software package for converting coordinates in different formats and projections

Arzu Şimşek¹, Emel Zeray Öztürk^{*1} (ORCID: <https://orcid.org/0000-0002-7498-5258>), Muzaffer Kahveci¹ (ORCID: <https://orcid.org/0000-0001-5380-7164>)

¹Konya Technical University, Engineering and Natural Sciences Faculty,
Department of Geomatics Engineering, Konya, Türkiye.

*ezozturk@ktun.edu.tr

Abstract

Various coordinate systems are employed in engineering for the determination of positions and geometric calculations. These coordinate systems find applications in different fields, allowing precise position determination, geometric calculations, and successful project implementation. The transformation of the coordinates is widely used in geodetic applications. Coordinate transformation involves converting points with known coordinates from one coordinate system to another. This process allows the calculation of coordinates in the new coordinate system. In this study, a MATLAB-based software package that can convert different coordinate systems to each other has been developed. With this software package, ellipsoidal coordinates from Cartesian coordinates, Cartesian coordinates from geographic coordinates and vice versa can be calculated. In addition, the program can also convert between spherical, cartesian and cylindrical coordinates.

Keywords: Coordinate transformation, software package, Matlab.

A novel deep-learning-based model for breast cancer detection

Abdullah Asım YILMAZ^{1*} (ORCID: <https://orcid.org/my-orcid?orcid=0000-0002-3014-609X>)

^{*1} Atılım University University, Faculty of Engineering, Computer Engineering
Department, Ankara, Türkiye.

*abdullah.yilmaz@atilim.edu.tr

Abstract

Among all cancer forms in recent years, breast cancer is the most prevalent. Different machine learning-based and deep-learning based algorithms for diagnosing breast cancer have been developed recently. A reliable model is still elusive, though. For this reason, this work proposes a new deep learning-based architecture for diagnosing breast cancer. Data normalization, data preprocessing, feature extraction and selection, and classification are the four main steps in the proposed method. Naive Bayes, k-nearest neighbors, random forests, support vector machines, convolutional neural networks, Alexnet and Resnet-152 are used for classification, whereas particle swarm optimization is used to optimize the efficiency of the classification. The empirical findings demonstrate that the suggested method outperforms the other machine learning techniques and has a high detection rate for breast cancer

Keywords: Breast Cancer Detection, Deep Learning, Machine Learning, Convolutional Neural Networks, Alexnet, Resnet-152

Improvement of disaster logistics by independence axiom approach

Ozan ATEŞ^{1*} (ORCID: [https:// https://orcid.org/0000-0003-4178-2603](https://orcid.org/0000-0003-4178-2603))

^{*1}Istanbul Gedik University, Engineering Faculty, Industrial Engineering
Department, Istanbul, Türkiye.

*ozan.ates@outlook.com.tr

Abstract

Disasters can be defined as natural events that may affect a lot of countries or as accidents that result from human mistakes. Especially the first few days after the disaster have vital importance in terms of rescue efforts. Disaster victims have psychologically negative feelings since they suddenly become needy to meet their daily needs. The awareness of the organization should be gained in advance because rescue and aid facilities take time. The earthquake that happened on 6th February 2023 and affected Turkey and Syria showed that organization awareness has not been gained in advance. In accordance with this purpose, a study has been presented so that it can guide the authorities to gather humanitarian aid and transport them to disaster places and finally deliver them to victims. In this study, a separate design related to the process of transporting the aids has been put forward by using the independence axiom, one of the axiomatic designs. The independence axiom has been especially preferred in order not to be late to transport humanitarian aid to victims by taking into consideration that some opportunities cannot be reached in definite time after the disaster. Using the approach of axiomatic design in logistics, especially in disaster logistics is new, therefore, it will bring innovation to the literature. Another distinctive aspect of the study is the interpretation of humanitarian aid logistics with a lean logistics approach. Humanitarian aid logistics operations have a lot of steps because of include all the aspects of logistics. That's why it has been aimed to cleanse the unnecessary steps of this operation that have vital importance by using lean logistics transportation methods. In this study, a comprehensive literature study related to disaster and humanitarian aid logistics that includes the last eleven years has also been presented.

Keywords: Disaster logistics, humanitarian aid logistics, axiomatic design, independence axiom, lean logistics

Emergency shelter location selection using the Novel Sine Trigonometry TOPSIS method based on the Aczel-Alsina function

Veysel Çoban^{1*} (ORCID: <https://orcid.org/0000-0002-7885-1935>)

^{*1}Bilecik University, Faculty of Engineering, Industrial Engineering Department,
Bilecik, Türkiye.

*veysel.coban@bilecik.edu.tr

Abstract

Rapid response to emergencies such as earthquakes, floods, hurricanes, and fires is an important step in minimizing the damage of disasters. The primary task of emergency actions is to transfer the victims of disasters to safe places and to meet their basic needs. Since emergency zones and disaster severity are unknown, identifying the rapid response approaches is shown as an important decision-making problem. Decision makers have to make their decisions quickly and accurately in these uncertain and vagueness conditions. The methods based on fuzzy logic theory are accepted as an important tool for including decision makers' vague and hesitant assessments in the calculation and decision-making process. This study focuses on determining the most appropriate shelter locations as a decision-making problem in emergency situations. The criteria used in determining the most suitable emergency locations are determined as distance from danger (C1), land structure (C2), closeness to the transport network (C3), accessibility to basic vital needs (C4), sanitary infrastructure (C5) and climatic situation (C6) by literature review. All criteria are considered benefit criteria. The novel fuzzy Sine Trigonometry Technique for Order Preference by Similarity to Ideal Solution (ST-TOPSIS) method is recommended for the solution of the decision-making problem defined in uncertain and ambiguous conditions. The sine trigonometry weight calculation method is based on the logarithmic additive weighting and Aczel-Alsina function methods. The validity of the proposed new method is evaluated with a sample emergency case application. In the case study, six experts evaluate three alternative positions with linguistic expressions according to six criteria. Criteria weight calculations based on the fuzzy sine trigonometry based on Aczel-Alsina function determine the order of importance of the criteria as C1, C4, C5, C3, C2 and C6, respectively. The criteria and expert weights are combined with alternative location assessments and the most suitable location (Alternative1) is determined on the basis of TOPSIS. In addition, sensitivity analysis is performed for the criteria used in position determination, and the effects of the criteria are evaluated. The criteria with the highest sensitivity are determined as C2 and C5, and the criterion with the lowest sensitivity is determined as C4.

Keywords: Emergency shelter, location selection, Aczel-Alsina function, logarithmic additive weighting, fuzzy Sine Trigonometry Technique, TOPSIS.

The role of food components in new product development

Zeynep Şebnem Yakar^{1*} (*Orcid: <https://orcid.org/0000-0001-7280-6829>*)

^{*1}Gaziantep University, Naci Topçuoğlu Vocational School, Department of Food Processing, Gaziantep, Türkiye.

*syakar@gantep.edu.tr

Abstract

In order to ensure good competition in the food sector, new products developed must be made acceptable both in quality and in physical, chemical and microbiological means. While the primary concern of food companies is to provide safe products, the calorie, nutritive and functional composition of foods also increases consumer interest in the food industry. The continuity of new product demands to be introduced to the market is significantly affected by its components. It is necessary to understand the functional properties and interactions of ingredients such as proteins, carbohydrates, lipids, minerals, vitamins, polyphenols, flavor compounds and enzymes. Increasing the functions of food ingredients plays an important role in new product development (NPD) studies. It is possible to increase consumer demands by improving the properties of foods such as texture, taste and aroma, appearance, consistency, stability and nutritional value. For example, macromolecules such as protein can be used as a stabilizer in food products, as a flavor enhancer in confectionery, and as a fat replacer in dairy products, in addition to playing important roles in body metabolism. However, these components can undergo changes and losses during food processing. Processes such as mechanical and heat treatments, drying, freezing, pressure, acid and alkali treatments, fermentation and more affect foodstuffs. These processes can significantly affect the components of foods, their chemical composition, their interactions with each other, and consumer health. For this reason, it should be determined how and which functions of the ingredients are affected during the procurement, production, storage and marketing stages of foods and actions should be taken accordingly.

Keywords: New product, NPD, food ingredients, component



POSTER PRESENTATIONS

Development of antivenom through antibody purification for *Mesobuthus gibbosus anatolicus* venom: A promising approach for scorpionism treatment

Gülsen Melis KIRDÖK (ORCID NO: 0000-0003-3395-0574)

Ege University, Faculty of Science, Biology Department, Izmir, Türkiye.

e-mail: meliskirdok@gmail.com

Abstract

Antivenoms are biological products derived from plasma of hyperimmune animals, composed of immunoglobulin fragments. In antivenom studies conducted on *Mesobuthus gibbosus anatolicus* (Schenkel, 1947) (Scorpiones: Buthidae), 6-8 weeks old BALB/c mice weighing 20-25 grams were used in experiments for the antibody production process against the venom used as an antigen. Antibody purification was performed from serum obtained from mouse blood samples, and the electrophoretic profile was determined, identifying immunoglobulins with a molecular weight of 75 kDa. The study results are expected to provide the foundation for the design of a novel antivenom that could be used in the treatment of individuals poisoned by *M.g.anatolicus* venom.

Keywords: *Mesobuthus gibbosus anatolicus*, scorpions, antivenom, antibody purification,

The role of hypoxia-inducible factor-1 alpha in the stem cell protective effect of AT-101

Sabriye Akten^{1*}, Harika Atmaca (ORCID: <https://orcid.org/0000-0002-8459-4373>)

^{*1}Manisa Celal Bayar University, Faculty of Science and Letters, Biology Department, Manisa, Türkiye.

*harika.atmaca@cbu.edu.tr

Abstract

The most interesting area of stem cell research in terms of medical sciences is cell therapies, which include the use of stem cells in the replacement and regeneration of diseased or damaged tissues. Differentiated cells such as neurons, cardiomyocytes, chondrocytes and osteocytes are affected by aging, trauma and degenerative diseases. As a result, they cannot be easily regenerated naturally when severely damaged. Therefore, to ensure regeneration in adult mammals, mesenchymal stem cells (MSCs), which have the potential to differentiate into different cell types such as bone, cartilage, fat and muscle, are used. However, one of the most important difficulties encountered in the use of MSCs transplanted for therapeutic purposes is that they cannot maintain their viability for a long time. Since MSCs are extremely sensitive to hypoxic environments and ROS, they can increase the viability of their cells and differentiation. Novel components are needed to increase their capacity. These components are expected to increase the success rates of MSC transplantation by preventing cellular ROS damage. AT-101 is a phenolic compound obtained from the cotton plant. The aim of this study is to investigate the stem cell protective effect of AT-101. For this purpose, mouse bone marrow mesenchymal stem cells (BMSC) were pretreated with increasing concentrations of AT-101 (0.5-20 μ M) for 1 hour, and then 400 μ M hydrogen peroxide (H_2O_2) was applied to the cells for 24 h. At the end of 24 h, cell viability was measured with the MTT test. The amount of reactive oxygen derivatives (ROS) formed was determined by H2DCFDA staining. The effect of AT-101 on HIF1- α gene expression levels was investigated using real-time quantitative polymerase chain reaction (RT-PCR). It is predicted that treating stem cells with AT-101 before placing them in a transplantation environment where reactive oxygen species are concentrated may help preserve CISC viability and therapeutic properties. It was determined that increasing concentrations of AT-101 had no effect on cell viability ($p>0.05$), and cell viability of BMSCs pretreated with 0.5 μ M AT-101 for 1 hour increased compared to cells treated with 400 μ M H_2O_2 ($p<0.05$). It was determined that the amount of ROS in the BMSC group pretreated with AT-101 decreased compared to the cells that were only treated with H_2O_2 , while the amount of cell differentiation increased. After 0.5 and 1 μ M AT-101 pretreatment, the amount of HIF1- α mRNA levels in BMSCs was higher than that in cells treated with 400 μ M H_2O_2 . HIF1- α levels were decreased by 2.35- and 3.4-fold, respectively ($p<0.05$). This study determined that AT-101 has a protective effect on BMSCs, as it has no

effect on BMSC viability but a decrease in the amount of ROS and HIF1- α in these cells. Treating BMSCs with AT-101 before placing them in a transplantation environment where reactive oxygen species are concentrated will not only preserve the viability of BMSCs but also help preserve the therapeutic properties of the cells.

Keywords: AT-101, stem cells, reactive oxygen species, HIF1- α

Acknowledgement: This study was supported by TÜBİTAK-2209-A UNIVERSITY STUDENTS RESEARCH PROJECTS SUPPORT PROGRAM.

Investigation of antioxidant and cytotoxic activities of some endemic plants of Manisa on breast cancer cells.

Yavuz Han Fırat^{1*}, Harika Atmaca (ORCID: <https://orcid.org/0000-0002-8459-4373>)

^{*1}Manisa Celal Bayar University, Faculty of Science and Letters, Biology

Department, Manisa, Türkiye.

*harika.atmaca@cbu.edu.tr

Abstract

Breast cancer is the most common type of cancer in women, and it is the second deadliest type of cancer after lung cancer. The development of new treatment protocols and the discovery of new cytotoxic agents are of great importance in the treatment of breast cancer, which has different genotypic and phenotypic characteristics in each patient and even in each stage of the disease. The potential use of medicinal plants in the field of pharmacology, both as extracts and pure compounds, has been used since ancient times and has increased recently. Plants used in traditional medicine are considered a starting point for the development of innovations in drug discovery because they contain a wide variety of active substances that can be used in the treatment of various diseases. Our country is one of the richest countries in terms of both the number of species and endemic species. It is known that approximately 3649 of more than 12.000 plant taxa in Turkey are endemic. Although these endemic species are used in the treatment of various diseases among the public, detailed scientific studies have not been conducted. Since plant contents may have different quality and quantity under different geographical and environmental conditions, in this study, ethanol extracts obtained from *Ferulago humilis* Boiss., *Thymus sipyleus* Boiss, and *Silene sipylea* plants endemic to Manisa were investigated against breast cancer (MCF-7) and non-tumorigenic breast cancer (MCF-10A) cells. It was aimed to investigate the cytotoxic and antioxidant effects on breast cancer cells. All tested extracts showed cytotoxic effects on both breast cancer cells in a time- and concentration-dependent manner. *Ferulago humilis* Boiss. and *Silene sipylea* showed a cytotoxic effect on non-tumorigenic MCF-10A cells, however, *Thymus sipyleus* Boiss. was not cytotoxic to MCF-10A cells, indicating a selective cytotoxicity. Ferric reducing antioxidant power (FRAP) and 2,2-Diphenyl-1-picrylhydrazyl (DPPH) assay results showed that all tested endemic plants have high antioxidant capacity. It was concluded that selected endemic plants are a potential source of natural antioxidants and serve as effective free radical scavengers and/or inhibitors. Hence, these endemic plants might be good plant-based pharmaceutical products for several diseases caused by free radicals.

Keywords: *Thymus sipyleus* Boiss., *Ferulago humilis* Boiss, cytotoxicity, antioxidant.

1st International Congress on Solutions in Science (INSCORE)

Acknowledgement: This study was supported by Tübitak-2209-A University Students Research Projects Support Program.

[^{99m}Tc]Tc-dexketoprofen trometamol: radiolabeling and quality control studies

Meliha EKİNCİ^{1*} (ORCID: <https://orcid.org/0000-0003-1319-3756>), A. Alper ÖZTÜRK² (ORCID: <https://orcid.org/0000-0001-9596-0538>), Derya İLEM-ÖZDEMİR¹ (ORCID: <https://orcid.org/0000-0002-1062-498X>)

^{*1}Ege University, Faculty of Pharmacy, Department of Radiopharmacy, Izmir, Türkiye.

²Anadolu University, Faculty of Pharmacy, Department of Pharmaceutical Technology, Eskisehir, Türkiye.

*Corresponding author e-mail: melihaekinci90@gmail.com

Abstract

Non-steroidal anti-inflammatory drugs (NSAIDs), the most commonly used drugs for pain treatment, are known as 'anti-inflammatory analgesics'. NSAIDs exert anti-inflammatory activity by directly suppressing prostaglandin synthesis *via* inhibition of the cyclooxygenase (COX) enzyme, which suppresses inflammation. Dexketoprofen trometamol (DT) belongs to the NSAIDs group and is used for symptomatic treatment of pain. DT is produced in racemic form, which is a mixture of two enantiomers of arylpropionic acid. The S (+) enantiomer has been shown to pharmacologically inhibit COX. This study aimed to radiolabel DT with [^{99m}Tc]Tc under the appropriate conditions to develop an inflammation-imaging agent. In this study, DT was radiolabeled using [^{99m}Tc]Tc radionuclide, and quality control experiments for [^{99m}Tc]Tc-DT were performed using radioactive thin-layer chromatography (RTLC). In addition, the effects of quality control parameters (reducing agent, incubation time, and pH) on radiolabeling were investigated. Subsequently, a stability study of [^{99m}Tc]Tc-DT was performed and the partition coefficient value of [^{99m}Tc]Tc-DT was calculated. According to the obtained results, [^{99m}Tc]Tc-DT was prepared with over 92% labeling efficiency by a novel, easy, and quick direct method with a 15 min incubation time at pH 9.0. To achieve the best radiolabeling conditions, 250 µg DT, 10 µg stannous chloride dihydrate (reducing agent), and 37 MBq [^{99m}Tc]Tc were used. RTLC studies indicated that [^{99m}Tc]Tc-DT was stable for up to 6 h at room temperature. The log*P* of [^{99m}Tc]Tc-DT was found to be -0.48±0.02, indicating hydrophobic properties. Further studies on the biodistribution of radiolabeled complexes in experimental animals are in progress.

Keywords: dexketoprofen trometamol, radiolabeling, radiopharmaceuticals, technetium-99m.

Acknowledgement: The authors would like to thank the Ege University Nuclear Medicine Department for [^{99m}Tc]Tc.

Colchicine drug-induced gingivitis

Melisa Şahin^{1*} (ORCID: <https://orcid.org/0009-0007-3469-1849>),

Dila Özyılkan² (ORCID: <https://orcid.org/0000-0003-4583-0799>),

Ayşe Nil Altay³ (ORCID: <https://orcid.org/0000-0002-6070-3862>)

^{*1} Near East University, Faculty of Dentistry, Department of Pediatric Dentistry,
Lefkoşa, Kıbrıs

* melisa.sahin@neu.edu.tr

Abstract

Introduction and purpose: Familial Mediterranean Fever (FMF) is a disease characterized by bouts of painful, non-infectious inflammation of the serous membranes accompanied by fever, and with the development of amyloidosis over time. Oral aphthous ulcers, caries and periodontitis are among the most common oral findings in diagnosed patients. Colchicine is a drug that is obtained from the drowsy flower and used in the treatment of Gout, Mediterranean Fever and Rheumatological diseases. The main purpose of this case report is to emphasize the gingival discomfort seen in a case with Familial Mediterranean Fever who was using colchicine due to this disease and to draw attention to pediatric dentistry clinical practice difficulties. **Case Report:** A 5-year-old male patient was referred to our clinic with a complaint of pain in his gums, fever and bad breath. In his medical history, it was learned that he was born by cesarean section and had Familial Mediterranean Fever. It was determined that he was using 1 dose of colchicine every day due to his disease. His pediatrician prescribed an antibiotic due to fever. No abnormality was found in the extraoral examination of the patient. Intraoral examination revealed redness of the gums and sensitivity to touch, bad breath, plaque accumulation and caries. At this first session brushing education was given to the child and parents to improve oral hygiene and mouthwash with salted water was recommended to relieve gingival sensitivity. The patient was called back to the clinic 1 week later and scaling and polishing treatment was applied. After the scaling and polishing, improvement in the gums was observed. The family was informed that the patient would be called for a routine check-up every week until the symptoms regressed. **Conclusion:** Children who have been diagnosed with Familial Mediterranean Fever and using colchicine due to this disease are prone to gingival disease, so these patients should visit the dentist regularly and give importance to the oral hygiene of the child. Pediatricians should be informed about the oral findings seen in patients using colchicine due to Familial Mediterranean Fever and pediatricians should refer their patients to a pediatric dentist in such a situation.

Keywords: Familial Mediterranean Fever, Colchicine, Caries, Pediatric Dentistry, Oral Hygiene.

Phenotypic and genotypic effects of fosfomycin resistance on *Escherichia coli* strains

Mustafa ÖKEER¹ ([ORCID](#)), Sabire Şöhret AYDEMİR² ([ORCID](#)), Bayrı ERAÇ^{1*} ([ORCID](#))

¹Ege University, Faculty of Pharmacy, Pharmaceutical Microbiology Department, Izmir, Türkiye.

²Ege University, Faculty of Medicine, Clinical Microbiology Department, Izmir, Türkiye.

*Corresponding author e-mail: bayri.erac@ege.edu.tr

Abstract

Fosfomycin has a different mechanism of action from other antibiotics and does not cause cross-resistance. Also, its activity against many Gram-positive and ESBL-positive Gram-negative bacteria makes fosfomycin a point of interest. It is thought that the use of fosfomycin against *Escherichia coli* isolates, will increase because infections of these microorganisms are difficult to treat due to various virulence factors and increasing antibiotic resistance rates. Therefore, it is important to foresee the possible effects of expanding the use of fosfomycin. In our study, we aimed to examine the possible differences between the virulence factors of fosfomycin-resistant and susceptible *E. coli* strains from a phenotypic and molecular point of view. A total of 78 *E. coli* isolated from different clinical specimens at Ege University Medical Faculty Hospital, were included in the study. The minimum inhibitory concentrations of fosfomycin of the strains were determined by the agar dilution method. 13 (16.66%) of 78 *E. coli* strains were found to be resistant to fosfomycin. Then, fosfomycin-sensitive 2 *E. coli* strains were made resistant by passaging into media containing increasing concentrations of fosfomycin. Then, expression levels of virulence genes, biofilm forming capacities and growth rates of these resistant and susceptible isogenic variants were compared. It was found the expression level of one of the investigated virulence genes decreased on one of the resistant variants by quantitative real-time polymerase chain reaction (RT-qPCR). Biofilm forming capacities of the resistant and susceptible variants were compared with the spectrophotometric crystal violet method and no significant difference was found between them. Fosfomycin resistant and susceptible variants were incubated in broth media for 10 hours, and the growth rates were compared by measuring the absorbance at 600nm wavelength by taking samples from the tubes every 2 hours. On both variant pairs resistant variants showed significantly lower growth rates. The data of our study indicate that although the growth rates of fosfomycin-resistant *E. coli* strains are reduced, fosfomycin resistance didn't pose any significant disadvantage in terms of virulence factors. Therefore the use of fosfomycin should be carefully monitored.

Keywords: Gene expression, *Escherichia coli*, Fosfomycin, Virulence factors, Biofilms

Acknowledgement: The authors are thankful to Ege University Office of Scientific Research Projects for supporting doctoral research of Mustafa ÖKEER with grant #TDK-2020-21813#

Determination of three-dimensional structures of selected TRAF2 protein variants by computational methods

Seda Yüzeren Sağsoy^{1*} (<https://orcid.org/0009-0009-8911-9406>), Cenk Selçuki² (<https://orcid.org/0000-0003-3092-2797>)

¹Ege University, Institute of Health Sciences, Health Bioinformatics Program, İzmir

²Ege University, Faculty of Science, Department of Biochemistry, İzmir
*93190000366@ogrenci.ege.edu.tr

Abstract

Tumor Necrosis Factor Receptor Associated Factor (TRAF) proteins play a role in cell survival by interacting with Tumor Necrosis Factor Receptor (TNFR) and activating the transcription factors Nuclear Factor Kappa B (NF-κB) and Activator Protein-1 (AP-1). There are 6 types of TRAF molecules: TRAF1, TRAF2, TRAF3, TRAF4, TRAF5, TRAF6. TRAF2 regulates the activation of NF- κB and MAPK8/JNK, playing a central role in regulating cell apoptosis. It can directly interact with some TNFRs such as CD30, CD40, CD27 and Epstein Barr oncoprotein- LMP1 and mediate their signal transduction. This study aims to model the 3D structures of the identified variants of the TRAF2 protein by computational methods. The X-Ray structure of TRAF2 was obtained from the Protein Data Bank (PDB) database (PDB ID: 1CZY). Variations in this protein were then obtained from the Uniprot database (Uniprot ID: Q12933). Variations rs972932325, rs776376824, rs1433039502, rs903187722, rs1303746274, which are close to the interaction site with the LMP1 protein, were selected. Afterward, selected variations on the three-dimensional structure of the TRAF2 protein were applied in the MODELLER program. In the Discovery Studio Program, the first structures and the newly created structures were compared. Although there was no change in the secondary structures, the side chains, polarities and hydrophobicity degrees of the modified amino acids were differentiated. Modeling of TRAF2 variants is important in terms of examining the interactions of these variants and LMP1 protein with computational methods in future studies.

Keywords: Epstein Barr, LMP1, Molecular Modeling, TRAF2, Variation

Acknowledgement: Numerical calculations in this research were carried out in TÜBİTAK ULAKBİM, High Performance and Grid Computing Center (TRUBA resources).

This study was supported by Ege University Scientific Research Projects Coordination Unit (BAP) (PROJECT NO 30802).

Effects of fruit and root extracts of *Terminalia citrina* on cell viability and cell migration

Tuba Özdemir^{1*}, Suleyman Ilhan (ORCID: <https://orcid.org/0000-0002-6584-3979>)

^{*1}Manisa Celal Bayar University, Faculty of Science and Letters, Biology
Department, Manisa, Türkiye.
*suleyman.ilhan@cbu.edu.tr

Abstract

Mesir paste is a traditional food from the history of Manisa, a historical Anatolian city in the Aegean Region of Turkey. One of the many kinds of spices it contains is the dried fruits of the *Terminalia* genus. *Terminalia citrina* (*T. citrina*) is also used in traditional folk medicine for the treatment and prevention of some diseases. Various organic extracts are known to be used as bioactive ingredients in therapeutic industries to increase wound healing rate by increasing cell proliferation and free radical scavenging effects. It is aimed to determine the effects of ethanol extracts from roots and fruits of *T. citrina* plant on the viability of fibroblast cells (BJ) and human umbilical cord vascular endothelial cells (HUVEC). Additionally, the effect of *T. citrina* fruit and root extracts on cell migration was investigated by in vitro wound repair analysis. Results showed that at a concentration lower than 1000 µg/mL, *T. citrina* fruit extracts showed no significant toxic effect on BJ and HUVEC cell lines. However, *T. citrina* root extract strongly inhibited the cell viability of BJ and HUVECs. The migratory potential of HUVECs was also enhanced by fruit extracts of *T. citrina*. The present study may provide more detailed information about the underlying mechanisms involved in the wound-healing effect of *T. citrina*.

Keywords: *Terminalia citrina*, cytotoxicity, wound healing, HUVEC.

Acknowledgement: This study was supported by Tübitak-2209-A University Students Research Projects Support Program.

Optimal solvent selection: Development of a spectrophotometric quantification method for plant oil-based SNEDDS formulation

Yalçın Çelik Aydın^{1*} (<https://orcid.org/0000-0001-5549-1087>),

Dilek Mutlu² (<https://orcid.org/0009-0001-7368-1287>)

Emine Esin Çalışkan¹ (<https://orcid.org/0000-0002-8837-1222>)

Emel Öykü Çetin Uyanıkgil¹ (<https://orcid.org/0000-0001-8822-9130>)

^{*1}Ege University, Faculty of Pharmacy, Department of Biopharmaceutics and Pharmacokinetics, İzmir, Türkiye.

²Istanbul University, Faculty of Science, Molecular Biology and Genetics, Istanbul, Türkiye.

* yalcin.celik.aydin@gmail.com

Abstract

Emulsions are mixtures prepared by dispersing water and oil phases within each other. Various surfactants are employed to effectively promote the mixing of the utilized water and oil phases. Self-emulsifying systems represent contemporary pharmaceutical carrier systems that allow the creation of classical emulsions with reduced energy consumption. Within this drug delivery system, the oil phase is accompanied by a surfactant and a co-surfactant or co-solvent, while the water phase is absent. Once the formulated system is applied to the body, it triggers the formation of an emulsion by utilizing available water, at the application site or in the stomach for oral administration. Self-emulsifying systems typically possess droplet sizes in the micro or nano range and are termed accordingly as self-nano emulsifying drug delivery systems (SNEDDS) or self-micro emulsifying drug delivery systems (SMEDDS), denoting their dimensions. In the SNEDDS formulation prepared utilizing sweet almond oil as the oil phase, Tween 80 as the surfactant, PEG 400 as the co-surfactant, and Propylene Glycol as the co-solvent, we employed Berberine as the model active ingredient. Our aim was to develop a spectrophotometric quantification method for Berberine within the self-nano emulsifying drug delivery system (B-SNEDDS) formulation. To achieve this, we sought a solvent that is compatible with spectrophotometric analysis, capable of dissolving the oil phase within the SNEDDS formulation, consequently disrupting the SNEDDS structure, and thereby facilitating the release of loaded berberine from the carrier. Simultaneously, we aimed to identify a solvent wherein berberine's solubility remains high. Within the scope of the planned study objective, ethanol, methanol, acetonitrile, and acetone were employed as solvents. Initially, specific quantities of berberine were dissolved separately in each solvent, and stock solutions were prepared to have a concentration of 100 ppm. Spectrophotometric measurements were conducted using the prepared stock solutions within the wavelength range of 190 to 400 nm to determine the wavelength corresponding to the highest absorbance value. Dilutions were performed from the 100 ppm stock solutions to achieve specific concentrations, and calibration curves were

constructed using these diluted solutions with known concentrations. Subsequently, the B-SNEDDS formulations, prepared separately for each chosen solvent, were dissolved. The amount of berberine within the formulations was determined using the calibration curves established in the previous steps. Consequently, spectrophotometric quantification methods were developed for the SNEDDS formulation using different solvents, and the impact of the solvents on the developed quantification methods was compared.

Keywords: SNEDDS, Spectrophotometry, Berberine, Emulsion

Radiolabeled Antiepileptic Drug: ⁶⁸Ga-ZonisamideYunus Emre Sezgin¹ (ORCID: 0000-0002-4638-4471),Ayfer Yurt Kılçar² (ORCID: 0000-0003-0866-7515)^{*1}Department of Nuclear Applications, Institute of Nuclear Sciences Ege University
35100 Bornova, İzmir, Türkiye.

* 91210000406@ogrenci.ege.edu.tr

Abstract

Zonisamide (ZNS), which is one of the second-generation antiepileptic drugs, is a broad-spectrum drug classified as sulfonamide chemically and completely different from the mechanism of other antiepileptic drugs. 1,2-benzisoxazole-3-methanesulfonamide, ZNS with a molecular weight of 212.23g/mol has been approved for clinical use. It is used in the treatment process of symptoms of epilepsy and Parkinson's disease. The safety, efficacy, and control of ZNS have been widely proven in clinical studies, it has been reported as a drug with low drug-drug interaction potential compared to other antiepileptics and has been recommended as a treatment option in the control of seizures. ⁶⁸Ga is a PET radionuclide whose use has become increasingly frequent in the world and in our country in the last 8 years. In addition to these features, it is an important advantage that it will enable further studies with the theranostic approach. The variety of ⁶⁸Ga-based imaging agents covers a wide range of vectors, from small molecules to macromolecules as well as various nanoparticles. Gallium; it is suitable for marking chemistry, kit type as well as automated radiopharmaceutical production, making it a cost-effective complement to cyclotron-based tracers. Imaging with ⁶⁸Ga has the potential to facilitate the development of practical clinical PET and can support the use of PET for earlier and better diagnosis worldwide, as well as individualized medical practices. In the present study, it is aimed to determine the radiolabeling potential of ZNS with ⁶⁸Ga. For this purpose, radiolabeling and quality control studies using chromatographic methods were carried out. Direct labeling of ZNS with ⁶⁸Ga was succeed in high yields (95<% radiolabeling efficiency). When radiochromatograms were examined, ⁶⁸Ga-ZNS moved towards to the middle of the plate (Rf:0.50), while ⁶⁸Ga alone remained around at the point of administration (0.15). The stability studies demonstrated that ⁶⁸Ga-ZNS was stable at 95% until the first 30 minutes, it decreased to 80% at the end of 1 hour. Although no chelates are used, it has shown a certain stability and it is thought that it can show a more stable structure by means of appropriate chelators. Given the mechanisms of action on epileptic processes, studies have been conducted on the synthesis of imaging radioligands that can act on neurological diseases such as epilepsy by combining anti-epileptic drugs with a radio tracer with imaging properties. Further studies will be planned to investigate the potential of the radiolabeled antiepileptic drug for the imaging of neurological processes.

Keywords: Zonisamide (ZNS), Antiepileptic drugs, Epilepsy, ⁶⁸Ga



E-ISBN-978-605-338-425-0



9 786053 384250