دانشگاه علوم پزشکی قم

انجمن علمی بهداشت محیط ایران
Iranian Association of Environmental Health (IAEH)

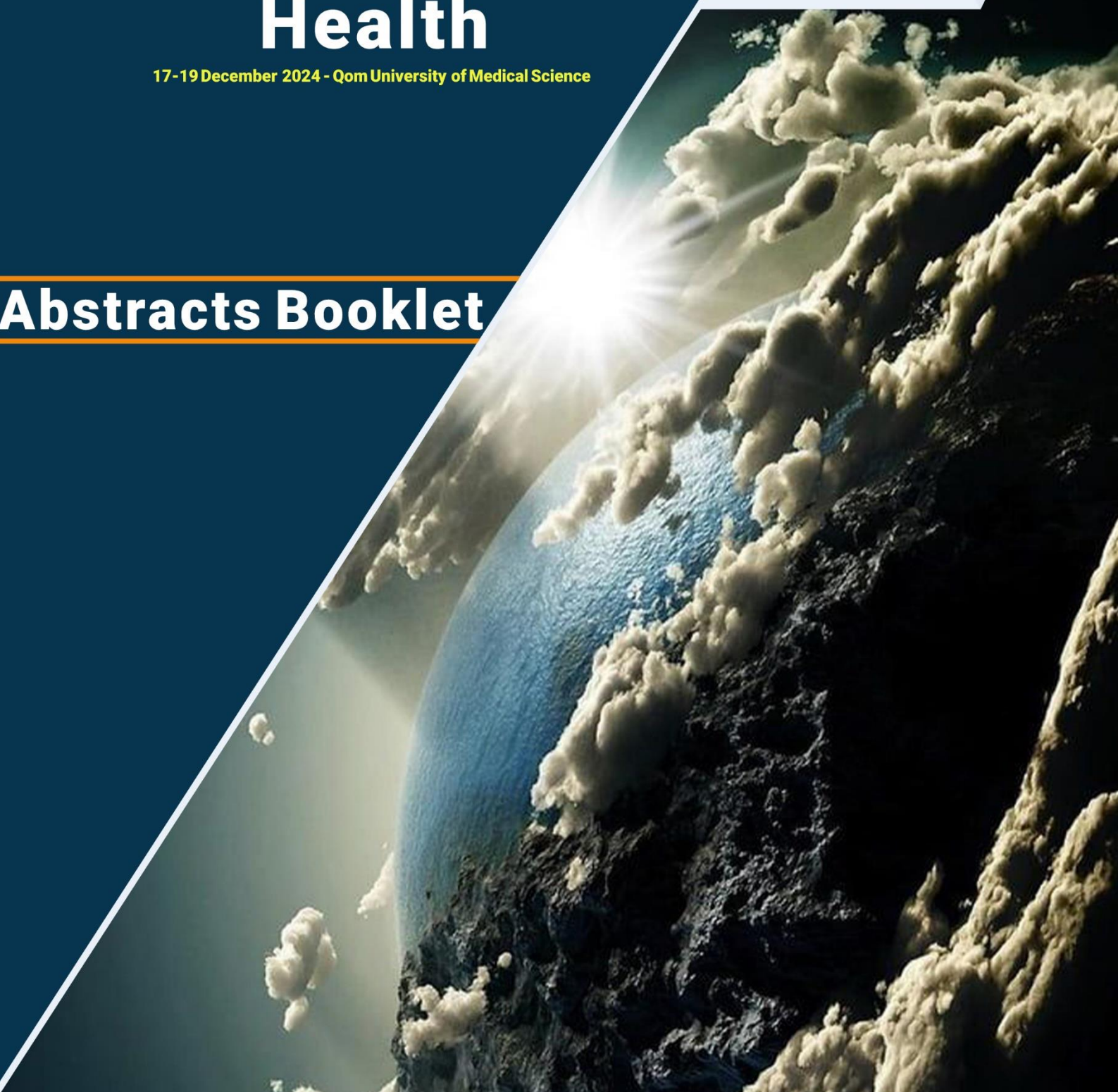
دانشگاه علوم پزشکی قم
مرکز تحقیقات آلاینده‌های محیطی

جمهوری اسلامی ایران
وزارت بهداشت، درمان و آموزش پزشکی

The 27th National and the 8th International Conference on Environmental Health

17-19 December 2024 - Qom University of Medical Science

Abstracts Booklet



THE 27th NATIONAL AND THE 8th INTERNATIONAL CONFERENCE

ENVIRONMENTAL HEALTH

COFERENCE BOOKLET

Agenda & Abstracts

Prepared by:
Dr. Azam Nadali (PhD)
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Qom, Iran
17-19 Dec., 2024

Organized by:
Qom University of Medical Science
Iranian Association of Environmental Health (IAEH)

In Coorperation with
International Society for Fluoride Research

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Keynote Speakers

Dr. Bruce Spittle
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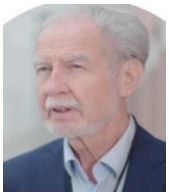
Title: Fluoride Induced-Toxicity



Prof.Jorg Spitz
Akademie für Menschliche Medizin GmbH, Krauskopfallee 27, 65388 Schlangenbad, Germany
Wiesbaden Municipal Hospital, Nuclear medicine, University of Mainz
Title: It is not the germ, but the environment, which makes us ill

Dr. Hamidreza Kamalan
Title: Recycling energy from waste

Prof. Sina Dobaradaran
Professor of Environmental Health Engineering, Systems Environmental Health and Energy Research Center, Bushehr University of Medical Sciences, University of Duisburg-Essen, Germany, Instrumental Analytical Chemistry and Centre for Water and Environmental Research (ZWU), University of Duisburg-Essen, Universitätsstr. 5, Essen, Germany
Title: Environmental complications of cigarette butts

Prof. Mohammad Mosaferi
Professor of Environmental Health Engineering, Department of Environmental Health, School of Health, Health and Environment Research Center, Health Management Research Institute, Tabriz University of Medical Sciences
Title: The need for changing the approach to urban and rural drinking water supply in Iran, considering water quality challenges

Eng. Mahdi Nazarzadeh
Supervisor of water and sewage company of Qom province
Title: Studying the Development of Dual Urban Water Distribution Networks (Case Study of Qom City)

	**Prof. Kazem Nadafi** Professor of Environmental Health Engineering, Department of Environmental Health Engineering, School of Public Health, Center for Air Pollution Research, Institute for Environmental Research Tehran University of Medical Sciences **Title:** The contribution of unconventional water resources in Iran's water roadmap with emphasis on wastewater from urban wastewater treatment plants
	**Prof. Masoud Younesian** Professor of Epidemiology, Department of Environmental Health Engineering, School of Public Health, Center for Air Pollution Research Institute for Environmental Research, Tehran University of Medical Sciences **Title:** Criticism of the National Air Pollution Standard and the Possible Necessity of Its Revision
	**Prof. Gholamreza Goudarzi** Professor of Environmental Health Engineering, Department of Environmental Health, School of Health, Air Pollution and Respiratory Diseases Research Center, Ahvaz Jundishapur University of Medical Sciences **Title:** Climate change and its impact on health
	**Dr Mohammad Aligol** Associate Professor of Health Education and Promotion, Department of Health Promotion and Education, School of Health, Research Center for Environmental Pollutants, Qom University of Medical Sciences **Title:** Laws, regulations, and approaches to tobacco control in public places
	**Dr. Mohammad Fahiminia** Instructor of Environmental Health Engineering, Department of Environmental Health, School of Health, Research Center for Environmental Pollutants, Qom University of Medical Sciences **Title:** Current status and roadmap for waste management in urban and rural areas of Iran and lessons learned from the comprehensive waste plan for Tehran

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Helia Shams

Fatemeh Ashtari

Bahareh Hosein-nia

Zeinab Janati

Fatemeh Samani poor

Roghayeh Ghaleh Nasiri

Conference schedule

Time	08:00-09:45		10:15-12:00	12:00-13:30	13:30-15:00		15:15-17:00	17:00-18:30	Extra-schedule 19:00-21:00
Tuesday 17 Dec. 2023	On-Line workshop		On-Line workshop	'		Inauguration ceremony (Time: 14:00-15:30)	Honoring the distinguished professor Dr AhmadAmeri (Time: 15:45-17:00)	Dinner Scientific Session 1 Strategic council of network of environmental health research and technology	-
Wednesday 18 Dec. 2023	Platform Session 1 Water Oral presentation Poster presentation -	Refreshment	Platform Session 2 Wastewater Oral presentation Poster presentation Workshop	Lunch and prayers Qom University	Platform Session 3 Environmental Pollutants Monitoring Oral presentation Poster presentation workshop	refreshment	Platform Session 4 General environmental health 1 Oral presentation Poster presentation -	Annual general assembly of scientific society of Environmental health	Symbolic dusting of the holy shrine and dinner
	Scientific Session 2 Future planning of the field of environmental health in Iran with the 3rd and 4th generation university approach				Scientific Session 3 Science-based economy in environmental health				
Thursday 19 Dec. 2023	Platform Session 5 Air pollution Oral presentation Poster presentation Workshop	refreshment	Platform Session 6 Solid Waste and soil protection Oral presentation Poster presentation workshop	Lunch and prayers Qom University	Platform Session 7 General environmental health 2 Oral presentation - workshop	refreshment	Closing ceremony and honoring the selected presenters 14:30-16:00environmen		-
	Scientific Session 4 Executive Management in Environmental Health; Challenges and New Approaches				Scientific Session 5 Challenges and Solutions for Environmental Health Management in Qom Province				

Contents

Platform session 1:
Water

Panelist Members
Prof. Mohammad Hassan Ehrampoush (Panel Moderator**)** Professor of Environmental Health Engineering Department of Environmental Health, School of Public Health Research Center for Food Hygiene and Safety Shahid Sadoughi University of Medical Sciences
Dr. Amir Hossein Mahvi Department of Environmental Health Engineering, School of Public Health, Center for Solid Waste Research, Institute for Environmental Research, Tehran University of Medical Science
Dr. Ali Naghizadeh Professor of Environmental Health Engineering Department of Environmental Health, School of Health Medical Toxicology and Drug Abuse Research Center(mtdrc) Birjand University of Medical Sciences
Dr. Vali Ali Pour Professor of Environmental Health Engineering Department of Environmental Health, School of Health Tobacco and Health Research Center Hormozgan University of Medical Sciences

Oral Presentation

Prediction and modeling of the concentrations of THM compounds at drinking water using an Artificial Neural Network (ANN) model

Zeynab Baboli[1], Ali Akbar Babaei[2], Yaser Tahmasebi Birgani[2], Marziye Doraghi[3*]

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Abstract

Trihalomethanes (THMs) are recognized as the primary disinfection by-products (DBPs) in drinking water and are classified as potentially carcinogenic compounds due to their carcinogenic potential. Monitoring the formation of THMs during the water chlorination process is essential to ensure compliance with health standards and guidelines. Mathematical modeling can serve as a useful tool for simulating DBPs and predicting THM formation. This simulation requires the development of both mathematical and empirical relationships between THM concentration data in treated water and the water quality factors as well as operational parameters influencing THM formation. The presence of THMs in chlorinated water depends on several factors, including pH, water temperature, contact time with chlorine, type and amount of disinfectant, bromide ion concentration, and the characteristics and concentration of natural organic matter. This study utilized data on the water quality characteristics and operational parameters to evaluate and model THM formation using an Artificial Neural Network (ANN) model across five water distribution networks and the Karun River in Khuzestan province. The research was conducted during the period from October 2014 to September 2015. The results showed that the total THM concentration in the water distribution networks of Shushtar, Ahvaz (Networks 2 and 3), Mahshahr, Khorramshahr, and the Karun River varied from the beginning to the end of the intake points, with ranges of ND- 9.39 µg/L, 7.28-123.60 µg/L, 38.67–156.0 µg/L, 17.90–149.46 µg/L, 15.29–143.99 µg/L, and N.D–156.0 µg/L, respectively. Using correlation equations, the influencing parameters on THM formation, including DOC concentration, water temperature, pH, bromide ion concentration, UV254 absorption, and residual chlorine, were examined in the water distribution networks. Analysis of the R^2, MSE, and RMSE coefficients of the ANN model demonstrated a strong correlation between the measured and simulated data, indicating the model's appropriate capability in estimating THM concentrations in the studied samples.

Keywords: Trihalomethane, water quality, water distribution network, artificial neural network, Karun River.

The Accuracy Assessment of Subscribers' Water Meters in Reducing Uncounted Water in the Water Distribution Network and its Control in the City of Gorgan

Yousef Dadban Shahamat[1*], Zeynab Khalilinezhad[2], Zeynab Alimoradi[3]

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3- M.Sc. of Water and Wastewater Engineering, Lamei Gorgani Higher Education Institute, Gorgan, Iran

Abstract

Population growth and climate change are making water shortages more severe, pushing international organizations to focus on reducing water losses in distribution networks. These losses come from factors like temporary population surges, growing populations, aging infrastructure, leaks, system failures, and even water theft. This study aims to assess how accurately water meters in Gorgan are measuring unaccounted-for water.

To do this, we examined pressure zones 9 and 10 in Gorgan over the first eight months of 2023, where 26 monitoring stations were set up. We measured the volume of water produced, consumed, and lost, and explored how meter accuracy was affected by things like hydraulic pressure, water turbidity, flow rate, and the age of the meters. Data analysis was done using SPSS 25 software.

The findings show that 42% of the water went unmeasured during this period, with the highest loss happening in July (63%) and the lowest in May (5%). The results also revealed a significant link between meter accuracy and factors such as the age of the meters, maximum and average hydraulic pressure, and water turbidity. However, no significant relationship was found between water flow rate and meter accuracy.

Based on this, it's clear that investing in water quality control, acquiring better equipment like more accurate meters, adjusting network pressure, detecting leaks, and preventing water theft could help reduce unaccounted-for water in Gorgan

Keywords: uncounted water, water meter, water loss, water distribution network.

Situation Analysis and Assessment of Water, Sanitation, and Hygiene (WASH Services) and Costed Road Map of Healthcare Facilities of I.R. Iran

Mohammad Khazaei[1*], Mona Khaleghy Rad[2], Jafar Jandaghi[3], Sonia Chavoshi[1], Rahim Taghizadeh Asl[2], Tayebeh Elahi[3], Maryam Sheikholeslam[3], Lida Rafati[4], Alireza Rahmani[1], Hossein Mahjoub[1], Maryam Roshani[1]

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4- Environment and Work Health Management, Vice-Chancellor for Health, Hamadan University of Medical Sciences, Hamadan, Iran

Abstract

Individuals visit healthcare centers not to become ill, but rather to recuperate, give birth, and receive vaccinations. To maintain health and prevent disease transmission in primary healthcare centers, safe drinking water, proper sewage disposal, effective waste management, and consistent environmental cleaning are vital. This study evaluated over 740 healthcare facilities (HCFs) across 20 provinces using a national online inspection system. Phase 1 involved a questionnaire based on a Serbian study and the SARA method to assess service availability and readiness. Phase 2 included field evaluations of WASH conditions, while Phase 3 focused on baseline evaluation, analysis, and reporting. Phase 4 utilized stakeholder analysis and SWOT matrices to develop strategies for enhancing WASH components in HCFs. Iranian healthcare facilities, including hospitals and primary healthcare centers, were found to have varying WASH service provisions. Over 90% of hospitals and 75% of healthcare centers had functional water sources of sufficient quality and quantity. Additionally, more than 75% of HCFs had functional toilets and handwashing facilities. However, rural areas in eastern and southern Iran face the most significant challenges. Despite regional differences, the priorities for addressing WASH issues remain consistent. The study complements previous data and highlights aspects such as accessibility, usability, and management of WASH services. It demonstrates the utility of baseline JMP surveys and extended WHO indicators in obtaining detailed information on WASH service delivery.

Keywords: Sanitation, Waste Management, WASH Services, Healthcare Facilities, Road Map

Investigating the presence and fate of microplastics in water treatment plants in Iran: a case study of the cities of Sari and Gorgan

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Abstract

There are serious concerns about the potential health effects of microplastics (MPs) from consumption through drinking water. This research was conducted with the aim of investigating the abundance of microplastics in two water treatment plants in the north of Iran. Samples were collected from incoming water, water after passing through different treatment units, final treated water and also from the sludge of two drinking water treatment plants (DWTP) in the cities of Sari (DWTP1) and Gorgan (DWTP2). The microplastics in the samples were counted and identified after extraction using a stereomicroscope and microraman spectroscopy. The average abundance of microplastics in incoming water and treated water of DWTP1 was 0.44±0.19 and 0.11±0.06 MPs L-1, respectively. Also, the frequency of these particles in the inlet and treated water of DWTP2 was 0.19±0.06 and 0.07±0.02 MPs L-1, respectively. The average abundance of MP in dry sludge of DWTP1 and DWTP2 was 136.35±67.199 MPs and 55.26±10.72 respectively. In terms of size, 71% of microplastics in DWTP1 influent and 65% in DWTP2 influent were smaller than 1000 µm. In terms of shape, fibrous microplastics were the most abundant in terms of shape. In addition, the most common polymers found were polyamide, polyethylene terephthalate and polyvinyl chloride. Sedimentation and filtration steps had the most effect in removing MPs. This study shows that microplastics were present in the influent and treated water of both treatment plants and a significant fraction of MPs were effectively removed during the treatment processes with an average removal rate of 75% in DWTP1 and 63.16% in DWTP2.

Keywords: Microplastics, Drinking water treatment plant, Water, Sludge

Micellar Enhanced Ultrafiltration (MEUF) of Fluoride Using Cationic Surfactants and Process Optimization

Ali Jafari[1]*, Seyyed Ali Reza Mousavi[1], Sodabeh Heidar nejad[1]
Mohammad Javad Shokoohizadeh[1]

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Abstract

Fluoride removal from aqueous solutions is one of the logic an accepted method to prevent consequent out comes of fluoride exposure. Through the technique, some are more attractive due to some advantage but need to be deeply investigated and developed. In this work, micellar-enhanced ultrafiltration (MEUF) was used for fluoride removal from water via design the experiments, find out the optimal condition and develop a quadratic model through response surface methodology (RSM) and Box-Behnken method.

The influencing independent variables such as pH (4-10), fluoride concentration (4-10 mg/L) and cationic surfactant, Cetyltrimethylammonium bromide, (CTAB) (1-1.5 mM/L) were investigated. The experiments were carried out through a dead-end set up at a constant operating pressure of 1 bar for a constant filtration period of 10 min. the experiments were designed via design expert software and the data was analysis via ANOVA test.

Statistical analysis of variance (ANOVA) showed a fitness between the obtained data and the developed model with the regression coefficient (R^2) of mora than 0.9 for both fluoride rejection and flux responses. According to the results, increasing CTAB and decreasing of fluoride content, resulted in fluoride removal enhancement. Accordingly, the optimal removal (>99 %) was occurred at values of (pH=7, the initial concentration of fluoride=5 mg/L and CTAB concentration of 1.3 mM/L). All the influencing parameters namely pH, CTAB concentration and fluoride content, the interaction and quadratic effect were statistically significant (value <0.01) on fluoride removal efficiency. The result showed that flux was influenced by changing the levels of influencing variables. As the CTAB increase the flux increased but at higher values (1.5 mM/L) the flux reach a nearly steady state. Finally, confirmatory experiments showed a close removal efficiency to the predicted values by the built model and reveled a good compliance with the developed model.

The findings of this work showed that this promising method could be applied at low-pressure for real filed conditions to prevent fluoride release from industries to the environment and reject fluoride from different waters.

Keywords: Ultrafiltration, Cationic surfactant, Fluoride, Box-Behnken, Water

Poster Presentation

Comprehensive Investigation of THM Formation Potential in Drinking Water Networks and Health Risk Assessment

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Abstract

Trihalomethanes (THMs) are formed through reactions between disinfectants and organic matter in water. High concentrations of THMs within water distribution networks (WDNs) may pose significant health risks to consumers. Therefore, this research aimed to examine THM concentrations in the WDNs of Maragheh, Iran, focusing on spatial and temporal variations. It also compared THM levels between new and old WDNs and assessed the health risks associated with exposure to THMs through various exposure routes. The results indicated that Chloroform, with a mean concentration of 44.28±18.25 µg/L, was the predominant compound among THM species (>72% of total THMs (TTHMs)). The average TTHMs concentration in summer (69.89 µg/L) was significantly higher than in winter (50.97 µg/L) ($p < 0.05$). Except for bromoform, concentrations of other THM species in the new water distribution network (WDN) were considerably lower than in the old WDN ($p < 0.05$). The mean lifetime cancer risk (LTCR) rates for oral and dermal exposure routes to THMs were negligible and within acceptable risk levels. However, the LTCR mean values for inhalation exposure routes to THMs in winter and summer were within low and high acceptable risk levels, respectively. Inhalation exposure presented the highest cancer risk among the various exposure routes. The hazard index values for oral and dermal contact with THMs were less than 1. Finally, sensitivity analysis revealed that the ingestion rate and exposure duration of THMs had the most significant positive effect on chronic daily intake (CDI) values and cancer risk.

Keywords: Trihalomethanes, Water distribution network (WDN), Old and new WDN, Health risk assessment

Title of the Article: Enhancing Reverse Osmosis Membrane Performance Using Plasma Polymerization: A Comprehensive Review on Hydrophilicity, Anti-fouling, and Filtration Efficiency

Mahsa Maleki[1*]

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Abstract

Water scarcity has amplified the significance of seawater desalination reverse osmosis (RO) has emerged as the favored option due to its efficiency and minimal environmental impact. Nevertheless, fouling poses a significant challenge, resulting in higher operational expenses and reduced lifespan of membranes. This paper examines the use of plasma technology to enhance the performance of RO membranes by enhancing their hydrophilicity, anti-fouling properties, and overall filtration efficiency. Plasma modification, particularly through plasma polymerization, has displayed considerable potential in producing extremely thin polymer films with strong crosslinking that enhance membrane surface properties without compromising structural integrity. The synthesis of key research works underscores how plasma treatment can reduce contact angles, improve water flux, enhance salt rejection, and bolster resistance to biofouling and scaling. This review highlights the interaction of plasma technology and polymerization to advance RO membrane performance, offering a pathway toward more sustainable desalination solutions.

Keywords: Plasma, Polymerization, Reverse Osmosis, RO, membrane.

Investigating changes in the chemical quality of drinking water in Jahrom city from 2006 to 2022

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Abstract

The physicochemical and microbial characteristics of drinking water according to type and amount are the basis for judging the potability and the effect of each of the above components on improving quality, increasing acceptability or threatening the health of its consumers. The purpose of this research is to investigate the chemical quality of drinking water in Jahrom city from 1385 to 1401 and compare it with the national standard 1053 and the EPA standard.

This cross-sectional descriptive study was conducted in order to monitor the quality of water resources, and the data related to the physicochemical parameters of 2112 samples were collected from the water laboratories of Jahrom city, and the chemical parameters were analyzed and statistically analyzed, and the results were compared with the existing standards in order to check water quality.

The average of the performed parameters in the order of electrical conductivity 656.58 Microsimens/Cm, Turbidity 0.507 NTU, PH 7.59, Total Dissolved Solids 330.42, Nitrate 12.18, Fluorine 0.62, Total Hardness 218.309, Calcium Hardness 54.07, Magnesium Hardness 13.44, Chlorine 59.88, Sulfate 79.37, Iron 0.87, Manganese 0.047, Copper 0.064, Nitrite 0.1, Ammonia 0.51 and Chromium It was 0.01 mg/Liter.

According to the obtained results, the parameters were within the permissible range of the national standard, although a significant difference was observed among some elements with the national standard. Also, the sanitary quality of the water distribution network of Jahrom city in the urban area was not a problem and was within the standard range.

Keywords: Chemical quality of water, National water standard, Rainfall, Drinking water

Investigating the methods of rapid assessment and detection of pollutants in urban water supply networks and designing an online monitoring network in order to implement non-active defense and increase urban security in the field of providing safe and healthy drinking water

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Abstract

Maintaining the security of water supply facilities and taking necessary measures to prepare for crisis situations and sabotage operations are the main concerns of security officials in every country. The need to monitor water quality online due to the harmful effects of polluted and toxic water on human health has always been the focus of public opinion and security systems of countries. Continuous and online monitoring of water quality can be a suitable tool to protect treatment plants and water network equipment. Also, comprehensive investigation and attention to urban water supply facilities with regard to the principles and basics of passive defense has a greater effect on establishing urban protection and security. This study aims to investigate online monitoring technologies for the rapid measurement and detection of pollutants in water and also to investigate the rapid detection methods of water quality pollution in the city's water supply network (Sari city as an example) in order to better understand the principles of non-agent defense in identification, control and crisis management as well as terrorist attacks were discussed. In this study, the polluting agents were first identified and then the sensors that can detect chemical, biological and radioactive changes were selected based on the factors of accuracy, range, sensitivity, stability and durability, maintenance and compatibility, and based on the urban water distribution network. Sari was located. The sensors available in the country that can measure residual chlorine, pH and ORP, EC, (electrical conductivity) and radon online were identified and the design of the monitoring station was selected based on the sensitive and vulnerable points of the network.

Keywords: Water supply network, Pollutant, Online diagnosis, Non-active defense, Drinking water

The effect of fluoride concentration in drinking water on pathogenic (non-carcinogenic) factors in Hamedan villages

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Abstract

This study aimed to investigate the effect of fluoride concentration in drinking water on pathogenic factors (anemia during pregnancy, low birth weight, neurological problems, chronic cognitive impairment and dementia, thyroid hormone metabolism disorders, and infertility problems) and was conducted based on available information related to examinations of two areas with low and high fluoride in the rural area of Hamadan in 1400.

This cross-sectional-analytical study was conducted in Hamadan. In order to investigate the amount of fluoride in water from different villages, 20 wells were selected and after evaluating the fluoride concentration, two areas were selected as areas with high and low fluoride levels. Then, the relationship between fluoride in drinking water and the mentioned pathogenic factors was investigated in areas with fluoride levels above the standard and areas with fluoride levels below the standard. The results were analyzed using the Smirnov-Kolmogrov and Chi-square tests with a significance level of less than 0.05. SPSS version 23 software and frequency, Chi-square, ANOVA, and binary regression tests were used to analyze the data of this study.

In the village with normal fluoride, the frequency of elderly people was significantly higher than the frequency of these people in the other two villages ($p<0.001$). No significant differences were observed between the villages in terms of body mass index and smoking. The highest number of diabetic patients was in the village with high fluoride ($p=0.002$). Also, the frequency distribution of people in terms of kidney failure was significantly different ($p=0.013$), but no significant differences were observed in terms of the prevalence of heart attack, stroke and high blood pressure in all three villages. Also, the probability of developing blood pressure in areas with normal water fluoride is 36 percent (OR = 1.362) higher than in areas with low fluoride. The odds ratio for diabetes in areas with low water fluoride is 2.31 times higher than in areas with normal fluoride (OR = 2.309, $p < 0.001$). The odds of diabetes decrease by 3.4%

with each year of age. The mean BMI score among men is 2.172 points lower than that among women (B = -2.172, P = 0.002).
According to the results of the risk assessment, non-cancerous diseases (anemia during pregnancy, low birth weight, neurological problems, chronic cognitive impairment and dementia, thyroid hormone metabolism disorders, and infertility problems) in areas with high fluoride levels are directly related to fluoride in drinking water.

Keywords: Fluoride, Drinking Water, Pathogenesis (Non-cancerous), Hamadan

Photocatalytic Removal of Tartrazine from Aquatic Environments Using a New Chitosan-PVA/ZnO/CuO Nanocomposite with Central Composite Design (CCD)

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Abstract

Tartrazine is one of the most dangerous pollutants posing a significant threat to human health and the environment. Wastewater containing this dye, in addition to its toxic effects, can cause side effects such as hyperactivity, asthma, migraine, eczema, thyroid cancer, and lupus. Moreover, due to its complex composition, this compound has very low biodegradability. Therefore, the aim of this study was to investigate the efficiency of removing tartrazine dye from aqueous environments using the Chitosan-PVA/ZnO/CuO nanocomposite. In this study, the effects of important variables such as initial dye concentration in the range of (10-50 mg/L), nanocomposite dosage (0.1-1.5 g/L), pH (3-12), and contact time (10-90 minutes) were investigated using the Design of Experiments (DOE) software. The characteristics of the synthesized nanocomposite were also studied using FTIR, TEM, FESEM, EDX, and XRD techniques. The results of this study showed that increasing the nanocomposite dosage, contact time, and decreasing the dye concentration increased the removal efficiency. The maximum removal percentage of tartrazine dye was 98% after 70 minutes at a nanocomposite dosage of 1.15 g/L, pH = 5.25, and a tartrazine concentration of 20 mg/L under optimal conditions. Therefore, according to the results, the advanced oxidation process using the Chitosan-PVA/ZnO/CuO nanocomposite had a high efficiency in removing tartrazine dye from aqueous environments. Consequently, this method can be effectively used in the treatment of colored wastewater.

Keywords: Chitosan-PVA/ZnO/CuO Nanocomposite, Photocatalytic Degradation, Tartrazine Pollutant, Design Expert

Investigating the removal efficiency of ciprofloxacin antibiotic using pomegranate wood biosorbent in water environment

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Abstract

Ciprofloxacin is one of the most important fluoroquinolone antibiotics, which has harmful effects on the environment and humans. Due to its high resistance and low degradability, ciprofloxacin accumulates in the aquatic environment and can cause bacterial resistance and environmental damage.

In this study, activated carbon was produced from pomegranate wood waste and the effect of various parameters such as pH, reaction time, initial concentration of ciprofloxacin and amount of adsorbent on the removal of ciprofloxacin was investigated.

The results showed that the highest absorption efficiency (100%) was obtained at pH (7.2), time 30 minutes with an initial concentration of 50 mg/liter of ciprofloxacin and adsorbent dose of 0.4 g/liter. Increasing the amount of adsorbent also improved the removal efficiency.

These findings show the high potential of using biological absorbents such as activated carbon from pomegranate wood in removing pharmaceutical pollutants from polluted water.

Keywords: Antibiotic, Ciprofloxacin, Activated carbon, Bioabsorbent

Photocatalytic removal of tetracycline antibiotic using Cu-TiO_2/CQD hybrid composite under visible light from aqueous media: synthesis, characterization and operation parameters

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Abstract

Antibiotics are non-degradable organic substances that are found in different concentrations from nanograms to micrograms in water sources, and their high resistance to decomposition makes it difficult to remove them from water environments. In this study, the performance of the solar photocatalyst process in the removal of tetracycline antibiotic from aqueous environments and the parameters affecting the process were investigated.

In this study, Cu-TiO_2/CQD hybrid composite was synthesized for tetracycline removal. The characteristics of the synthesized photocatalyst were determined through SEM, DRS, FTIR and XRD analyses. The reactor used in this research was of batch type and the effect of effective parameters on the process such as pH, initial antibiotic concentration, photocatalyst dose and reaction kinetics were investigated.

The results of the research showed that the highest removal rate of tetracycline antibiotic at a concentration equal to 20 mg/L and a contact time of 60 minutes, at pH=7 and a photocatalyst dose of 0.8 g/L was achieved above 99%. The elimination process of tetracycline followed Pseudo-first-order kinetics.

The results showed that the synthesized photocatalyst is significantly capable of removing tetracycline from aqueous solutions under visible light and in a short period of time. Therefore, it can be used as an effective photocatalyst to remove antibiotics.

Keywords: Tetracycline, Photocatalyst, Solar reactor, Carbon quantum dot

Catalytic ozonation process to remove cephalexin using activated carbon modified with ammonium chloride and iron nanoparticles

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Abstract

Antibiotics are one of the most widely used pharmaceutical compounds used to treat many diseases. Contamination with antibiotics is seen in soil, surface water, groundwater and even drinking water. In this study, the effectiveness of the catalytic ozonation process with activated carbon modified with ammonium chloride and iron nanoparticles was evaluated for the removal of cephalexin from aqueous solutions. In this study, an ozone pilot with a volume of 200 ml was used. In each experiment, a cephalexin solution at the desired concentration was poured into the pilot. The effect of several variables, including solution pH, contaminant concentration, catalyst dose and interaction time, was investigated for the removal of cephalexin. After the experiment was completed, a sample was taken from the pilot and the remaining sample was analyzed by HPLC to determine cephalexin. The results showed that catalytic ozonation under optimal conditions of pH = 8, ozone dose of 0.8 mg/min, catalyst weight of 100 mg L^{-1}, and contact time of 15 min was able to remove 88% of cephalexin. The synergistic effect of carbon and ozone on the removal of this pollutant is high. The results of catalytic ozonation with activated carbon modified with ammonium chloride and iron nanorods as catalysts showed that it is a suitable and economical method for the removal of pharmaceutical pollutants from water and wastewater.

Keywords: Activated carbon, Iron nanoparticles, Cephalexin, Catalytic ozonation, Advanced oxidation

Investigation the performance of loaded graphitic carbon nitride on porous silica nanoparticles in the photocatalytic degradation of the antibiotic tetracycline from aqueous solutions

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Abstract

Tetracycline (TC) is the second most common group of antibiotics in terms of global production and consumption. This study was an experimental-applied research conducted intermittently at a laboratory scale with the aim of synthesizing and identifying a graphite-silica carbon nitride nanocomposite for the photocatalytic removal of tetracycline in the presence of ultraviolet light. In this study, the graphite-silica carbon nitride nanocomposite was first synthesized, and its properties were identified using various techniques. Then, the effects of different parameters such as pH, the amount of synthesized nanocomposite, initial tetracycline concentration, and contact time on the photocatalytic removal of tetracycline by this nanocomposite were investigated. Based on the obtained results, it was found that the highest removal efficiency (92.98%) was achieved at pH=3, a nanocatalyst dose of 0.2 g/L, a reaction time of 120 minutes, and an initial TC concentration of 10 mg/L. According to the results, the g-C_3N_4/KCC-1 nanocomposite has a high capability for degrading tetracycline in the UV/g-C_3N_4/KCC-1 photocatalytic process and can therefore be used as a suitable and highly efficient option for the removal of tetracycline from aqueous solutions.

Keywords: Antibiotics, Photocatalytic degradation, g-C_3N_4/KCC-1 nanocomposite, Tetracycline

Activation of periodate by chlorine: application for reactive blue 19 dye degradation

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Abstract
Reactive Blue 19 is a complex aromatic anthraquinone organic compound commonly used in the textile industry, primarily as a raw material for producing polymeric dyes. This study investigates the advanced oxidation process of periodate (PI) activation by chlorine (Cl^-) for the degradation of Reactive Blue 19. Five parameters influencing the advanced oxidation process were examined in a single-step approach: initial and final concentrations of Reactive Blue 19, pH of the solution, dosage of periodate, dosage of chlorine, and reaction contact time. Additionally, the effects of various anions and scavengers on the removal efficiency through chlorine and periodate processes were analyzed. The results demonstrated that the combination of chlorine and periodate significantly exhibits a synergistic effect (SF) in degrading Reactive Blue 19, with a synergy value of 12.05. Under optimal conditions for the chlorine and periodate process (pH 7, periodate dosage of 0.25 mmol, chlorine dosage of 2 mmol, and reaction time of 60 minutes), the removal efficiency reached 94.36%. In contrast, the degradation efficiencies with only periodate and only chlorine were 10.24% and 54.6%, respectively. Severe acidic (pH<4) and alkaline (pH>10) conditions led to a reduction in the degradation efficiency of Reactive Blue 19. Bicarbonate ions were identified as the primary inhibitor in the degradation process. Radical scavenging tests indicated that the dominant reactive species in the degradation of Reactive Blue 19 were $^{\cdot}IO_3$ and $^{\cdot}O_2^-$ radicals. The advanced oxidation process using chlorine and periodate is proposed as a powerful, stable, and environmentally friendly system for treating wastewater containing dye compounds, including Reactive Blue 19.

Keywords: Advanced oxidation, Periodate, Chlorine, Reactive Blue 19

A review on the resilience of drinking water supply systems against biological threats: requirements, challenges, and solutions

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Abstract

One of the concerns about water supply sources in the future and the present is its safety and the possibility of serious incidents including chemical and biological terrorism and natural hazards. Vulnerability is a characteristic of the design, implementation, or operation of critical infrastructure that makes the facility susceptible to destruction or incapacitation by a threat. Vulnerabilities may include flaws in security procedures, software, internal system controls, or infrastructure installations that may affect the integrity, confidentiality, responsiveness, or availability of data or services. This review article examines different categories of water supply system vulnerability and types of threats, including possible biological and chemical weapons that can be used to create public panic, along with threat assessment, vulnerability using various methods, and discusses strategies to reduce them. gives After evaluating existing countermeasures, current risks associated with threats, additional countermeasures and prioritization are recommended based on risk mitigation analysis and future proposals.

Keywords: Drinking water treatment, Bioterrorism, Biological threats, Iran

Degradation of ceftriaxone from aqueous solution by photocatalytic process using synthesized heterogeneous magnetic nanocatalyst

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Abstract

Recently, the use of nanoparticles as nanophotocatalysts in photocatalytic based advanced oxidation processes has attracted the attention of researchers due to their unique physical and chemical properties, including high specific surface area, high chemical stability, effective generation of oxidizing species, and high degradation efficiency. The present study investigated the efficiency of the photocatalytic process using $AgCuFe_2O_4$@MWCNT/ZnO nanocatalyst to degradation of ceftriaxone (CFT). The catalyst was synthesized using the microwave-assisted chemical coprecipitation method as a simple, fast and environmentally friendly method. FESEM, EDS, Mapping, Line scan, FTIR, XRD, BET, DRS, TGA and VSM analyzes were employed to identify the physical and chemical properties of nanophotocatalyst. The effect of key operational parameters including initial pH of solution, catalyst dosage, ceftriaxone concentration and irradiation time on ceftriaxone degradation was evaluated. Radical scavengers were used to identify reactive species in the degradation of ceftriaxone. Under the optimal conditions of the photocatalytic process including pH of 7, 5 mg/L of ceftriaxone, 0.24 g/L of catalyst and 60 minutes of irradiation time, the removal efficiency of ceftriaxone was 90.1%. The presence of radical scavengers indicated that hydroxyl radicals ($^{\bullet}OH$) and superoxide ($^{\cdot}O_2^-$) were the dominant reactive oxygen species in ceftriaxone degradation by photocatalytic process. The results of toxicity assessment using the germination of lettuce and basil seeds indicated significant detoxification of the treated wastewater containing ceftriaxone compared to the untreated wastewater. This study presents $AgCuFe_2O_4$@MWCNT/ZnO as an effective, stable and environmentally friendly catalyst to increase the efficiency of the photocatalytic process for the degradation of pharmaceutical pollutants.

Keywords: Ceftriaxone, Photodegradation, Wastewater, Catalyst, Toxicity

Optimizing the photocatalytic process with rGO/Fe^0/Fe_3O_4@TiO_2 nanocomposite in the removal of penicillin G antibiotic from aqueous environments with central composite design

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Abstract

Unsuitable treatment of pharmaceutical and hospital wastewater, due to its medicinal compounds, especially antibiotics, has led to studies on the use of advanced oxidation processes. The aim of the study was to optimize the photocatalytic process efficency in the presence of rGO/Fe^0/Fe_3O_4@TiO_2 nanocomposite in the removal of penicillin G antibiotic from aqueous. The specifications of nanocomposites based on high resolution scanning electron microscopy (FESEM) techniques with X-ray diffraction (EDS) spectroscopy, VSM, X-ray diffraction (XRD) and M spectroscopy Fourier transform red (FT-IR) was determined. The photocatalytic activity under different conditions of pH (4-8), nanocomposite concentration (10-20 mg/L), pollutant concentration (50-100 mg/L) and reaction time (30-60 min) in the removal of penicillin G was optimized by central composite design (CCD) method and response surface methodology (RSM). Experimental design, statistical data analysis and optimization were performed using R 3.5.3 software. The synergies effect of mechanisms, kinetics of process, COD and TOC and the effect of different light wavelength on efficiency were studied. Moreover, based on P-Value and F-Value indices equal to 0.0001 and 162.95, respectively, the selected model is significant. The efficiency of antibiotic removal was 81%, at pH = 6.18, catalyst dose = 18.5 mg / L and penicillin G concentration = 50 mg / L at 55 minutes. The COD and TOC removal was less than the antibiotic. Based on results, the photocatalytic process in the presence of rGO/Fe^0/Fe_3O_4@TiO_2 nanocomposite has a good ability to degradation of penicillin G antibiotic.

Keywords: Photocatalytic process, rGO/Fe^0/Fe_3O_4@TiO_2 Nanocomposite, Penicillin G Antibiotic, Aqueous

Investigating the photocatalytic degradation of humic acid using a $ZnFe_2O_4@TiO_2$ nanocatalyst, which was synthesized through a green method utilizing methanolic extract from elder tree bark

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Abstract

Humic and fulvic acids are natural organic polyelectrolytes and are the most abundant soluble organic substances found in aquatic systems. During the drinking water disinfection process, humic acid present in water sources reacts with chlorine disinfectants, leading to the formation of mutagenic, defective, and carcinogenic by-products, such as trihalomethanes and haloacetic acids. In this research, we used a methanolic extract of elder tree bark to green-synthesize a $ZnFe_2O_4@TiO_2$ nanocomposite. We then analyzed the properties, structural elements, and diagnostic features of the nanoparticles. The results indicated that the $ZnFe_2O_4@TiO_2$ nanocomposite has an average crystal size ranging from 250 to 65 nm. We investigated the effects of various pH levels (ranging from 3 to 11), nanoparticle dosages (from 0.005 to 0.1 g/L), and humic acid concentrations (from 2 to 15 mg/L) over a period of 120 minutes to determine the optimal conditions for the highest removal efficiency. The highest removal percentage, approximately 100%, was achieved under optimal conditions: pH of 3, a nanocomposite dose of 0.05 g/L, and an initial humic acid concentration of 2 mg/L. The results also showed that at the maximum humic acid concentration studied (15 mg/L), the nanocomposite still maintained an impressive removal efficiency of about 95.6%. Therefore, we conclude that this nanocomposite is not only affordable and environmentally friendly but also highly effective in removing humic acid from aqueous solutions.

Keywords: Elaeagnus angustifolia, Green synthesis, Humic acid, Photocatalytic degradation, $ZnFe_2O_4@TiO_2$

Efficient removal of nitrate from aqueous environments using magnetic graphene oxide nanocomposite doped with iron oxide nanoparticles: Kinetics, isotherm, modeling and process optimization

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Abstract

Nitrate removal from water resources is considered as one of the most important environmental challenges. The aim of this research is to optimize the process of nitrate absorption from water using a new combined system including ultrasound and magnetic graphene oxide nanoparticles. By using the response surface method, the effect of parameters (pH, contact time, adsorbent dose, initial concentration of pollutants and temperature) on the absorption efficiency was investigated and isotherm, kinetic and thermodynamic models of the process were also determined.

In this research, magnetic graphene oxide nanoparticle adsorbent was synthesized by co-precipitation method as an efficient adsorbent for nitrate removal from aqueous environments. Comprehensive characterization of this nanoabsorbent was done using X-ray diffraction spectroscopy (XRD), scanning electron microscope (SEM), transmission electron microscope (TEM), specific surface area measurement by BET method and vibrating sample magnetometer (VSM). All adsorption experiments were performed in discontinuous conditions. In order to determine the optimal operating conditions, the test design method based on the response level was used. After optimization, isotherms, kinetics and thermodynamics of adsorption were studied.

The results of the analyzes confirmed the successful synthesis of graphene magnetic oxide nanocomposite. The maximum efficiency of nitrate absorption in these conditions reached 89.94%. Kinetic studies showed that the absorption balance in the period of 33.409 minutes resulted in The experimental data of the adsorption isotherm were more consistent with the Langmuir isotherm model and the kinetic data with the pseudo-quadratic kinetic model. The

thermodynamic study showed that ΔH and ΔS are equal to 154 and 0/842 kJ/mol, respectively, which indicates that the process is endothermic. The results of this research show that the nanadsorbent used has a high ability to adsorb nitrate from water and the adsorption mechanism is based on physical and chemical interactions. This adsorbent has a high potential for purifying water from other pollutants

Keywords: Adsorption, Magnetic graphene oxide nanoparticles, Iron oxide, Nitrate, Response surface approach

Evaluating the effectiveness of nanopumice adsorbent modified with hexadecyl trimethyl ammonium bromide surfactant in removing the widely used antibiotic metronidazole from aqueous environments: modeling and optimization using response surface method, isotherm and kinetic studies

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Abstract

In recent years, concerns have been increasing due to the presence of antibiotics in water resources, which is due to the discharge of untreated or completely untreated wastewater from pharmaceutical industries into aquatic environments. Metronidazole is used as one of the most widely used antibiotics in the treatment of infections caused by anaerobic bacteria and protozoa. It has been reported that this drug has carcinogenic and mutagenic potential due to damage to the DNA of lymphocytes. Natural and modified pumice has been successfully used as an adsorbent to remove various water pollutants, including the color, hardness of calcium and magnesium, chromium, humic acid, and other organic and inorganic compounds. Although pumice is widely used as an adsorbent, there are very few studies that investigate the effectiveness of pumice on a nanoscale in the absorption process. In this study, the removal of metronidazole from aquatic environments by this adsorbent was investigated. The present study was carried out on a laboratory scale in a discontinuous system. The effect of input variables including pH, contact time, chitosan dose, and metronidazole concentration was investigated in the majority of an experimental design of central points based on response procedure methods on absorption efficiency. Isotherm and kinetic studies were carried out after optimizing the input variables. In order to measure the remaining concentration of metronidazole, a DR 5000 spectrophotometer was used at a wavelength of 320 nm. SEM, XRD, BET, and FTIR analyzes confirmed the characteristics of nano pumice. The results showed that the absorption process follows a quadratic polynomial model with F-value and p-value values of 990.936 and $p<0.0001$, $R^2=0.9989$, and Adj-$R^2=0.9979$ respectively. The optimal conditions were pH = 4.74, contact time = 60 min, chitosan dose = 5.1 g/L, and metronidazole concentration = 20 mg/L, and the highest removal efficiency of 94.5% was obtained under these conditions. Also, the absorption process follows the Langmuir isotherm and pseudo-first-order kinetics, with R^2 values of 0.9965 and 0.9859, respectively. In this study, it was observed that nano pumice has a high efficiency in absorbing metronidazole. Therefore, nano pumice can be proposed as a natural adsorbent with high potential for absorbing metronidazole and other similar antibiotics from aquatic environments.

Keywords: Absorption, Aquatic environments, Metronidazole, Nano pumice

Investigating the effectiveness of graphite carbon nitride (g-C_3N_4) modified with alcohol/acid and doped with tungsten metal to remove reactive Black 5 dye from aqueous solutions

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Abstract

Reactive Black5 (RB5) dye is indeed one of the most commonly used dyes in various industries, particularly in textiles, leather, and paper manufacturing. Despite the known carcinogenic and mutagenic properties of RB5 dye, as well as its potential harmful effects on human health and the environment, it continues to be widely used in the textile and leather industries. Therefore, the aim of this study is to investigate the efficiency of g-C_3N_4 modified with alcohol and acid and doped with tungsten metal as an adsorbent in removing the RB5 dye from aqueous solutions. In this study, the efficiency of g-C_3N_4 doped with tungsten metal in removing the RB5 dye has been investigated. This study was carried out in three general stages, the first stage of adsorbent preparation, the second stage of test design with the help of R software and conducting absorption tests, and the third stage of data analysis. In this study, the maximum removal efficiency of RB5 dye was 97.1%, which in optimal operating conditions includes: 0.125 g L^{-1} adsorbent cycle, pH equal to 7, contact time 92.5 minutes and dye concentration 14 mg L^{-1}. Results such as p-value (2.2×10^{-16}), high F-value (560.633), multiple R^2 (0.9929), R-squad. Adjusted (0.9882) and the non-significance of the lack of fit model (0.147) showed that the reduced second-order model is very significant for the removal of the RB5 dye by the adsorbent. Also, the results show that the pseudo second-order kinetic model is the most suitable model for dye absorption on g-C_3N_4 adsorbent modified with alcohol and acid and doped with tungsten metal, and the adsorption behavior of RB5 dye on the adsorbent is from the Freundlich model. Complies with R^2=0.9955. In total, the results of the experiments demonstrated that g-C_3N_4 adsorbent, modified with alcohol and acid and doped with tungsten metal, can be utilized as an effective and cost-efficient method for removing RB5 dye from aqueous solutions.

Keywords: Absorbent, tungsten nanoparticles, RB5 dye, Graphite carbon nitride (g-C_3N_4)

Evaluating the presence of E. coli in the drinking water of Tafresh (Markazi) and Damavand (Tehran) cities based on Iranian standards

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Abstract

The total count of bacteria in water is not very important and many waters that are completely healthy may have a large number of bacteria. One of the most important health problems of water is the presence of pathogenic agents in it. Identifying these factors and eliminating them are important water health issues. In diagnostic methods, Escherichia coli bacteria are used as an indicator to check the contamination of water with feces and sewage. The purpose of the present study is to investigate the determination of total E in drinking water in the cities of Damavand (Tehran Province) and Tafresh (Markazi Province) and compare it with the Iranian standard. This research is a non-interventional, descriptive and analytical study, the purpose of which was to investigate coliform bacteria, Escherichia coli as the indicator bacteria of common microbial contamination of drinking water in Damavand and Tafarsh cities. The coliforms test was done using the three-tube or five-tube method in accordance with the Iranian standard number 437 for the identification and counting of coliforms in food. It is recommended with 2% bile. Identification of indicator bacteria is one of the best ways to evaluate the efficiency of water disinfection methods. The most important indicator bacteria include Escherichia coli, other thermophilic coliforms and coliforms in order of importance. The presence of these bacteria in water indicates the inadequacy of the purification process as well as the intermittent and recent contamination of water with human and animal feces. The city of Damavand with a population of about 50,000 people is located in Tehran province, and the city's water needs come from 23 wells, and the city of Tafresh, with a population of 24,000 people, is located in the central province, and the water needed by this city comes from 6 large aqueducts and Haftian springs. is provided. In this study, there were 15 samples for each city, which were sampled from 5 wells selected based on the population of the city. All the samples were taken by the staff in the fall of 1402. The obtained results indicate that no Escherichia coli was observed in any of the samples taken and all the samples were positive.

Keywords: Drinking water, E. coli, Coliform, Tafresh, Damavand

Definitive and probabilistic risk assessment of Arsenic (As) using Monte Carlo simulation and sensitivity analysis, investigation of concentration by using Geographical Information Systems (GIS) in the bottled waters, Iran

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Abstract

Due to the lack of water resources in the world, bottled water among communities has become one of the most popular sources of drinking water. Various contaminants can contaminate bottled water supplies. Exposure of these sources to pollutants such as heavy metals can have an adverse effect on human health. The aim of this study is quantitative evaluation and carcinogenic risk assessment of As for four groups: infants, children, teenagers and adults at the bottled waters in Iran. 71 brands of high consumption bottled waters were collected and analyzed. Risk assessment was done using of 2 methods: 1. definitive approach; 2. probabilistic approach by Monte Carlo simulation and sensitivity analysis. The average of As concentration was 0.8 µg/L. The concentration of As was at the range of national and international standards. The average of CR definitive risk assessment for at the infants, children, teenagers and adults groups was 0.00002. In the probabilistic approach, the highest 0.95 percentile value was observed was 0.00009. Sensitivity analysis results showed that the most effective parameters in carcinogenic risk at all groups was the concentration of As and the consumption of bottled water. Carcinogenesis risk assessment for As was observed in the infants, children, teenagers and adults group.

Keywords: Concentration, Heave metals, Carcinogenic risk assessment, Bottled water, Monte Carlo simulation

Investigating the effect of mining on groundwater pollution in Bafaq city

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Abstract

In today's world, the problem of fresh water is one of the biggest concerns of mankind. This problem is seen more colorfully in hot and dry countries. Unfortunately, due to its special geographical location, Iran has a dry and semi-arid climate, and this doubles the importance of paying attention to underground water. The purpose of this study is to investigate the effect of mining on groundwater pollution in Bafaq city. In order to carry out the research, the scientific resources, statistics and available information were first collected, and in the next step, in order to determine the effect of mining and tailings dam on the quality of underground water tables and to prepare a zoning map of groundwater pollution, sampling and water pollution index tests were carried out. On drinking, industrial and agricultural water wells and surface waters of the region. In the next step, the collected data were entered into descriptive tables (Attribute Table) and analyzed with excel software. The results showed that the underground water resources of Bafaq city are not currently facing quality challenges

Keywords: Mining, Pollution, Underground water, Bafaq

Health Risk Assessment of Trihalomethanes in Drinking Water in Gonabad City in 2021

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Abstract

Sources of drinking water supply (including rivers, wells, springs, dams, etc.) are contaminated with microbes and microorganisms that make it impossible for us to use this water without going through water purification and disinfection processes. In urban water treatment plants, chlorine is added to water for the purpose of water purification. The use of chlorine for urban water purification has disadvantages and advantages. Among the advantages of chlorination in water treatment stages, it can be noted that the mentioned process is not only low-cost, but due to the residual effects of chlorine in the water, the relative health of the water in the piping and water supply is guaranteed. Chlorination of drinking water causes the formation of halogenated organic compounds (THM) in the water, some of which are suspected of being carcinogenic.

In this cross-sectional-analytical study, 20 water samples were collected from 20 points in the Gonabad drinking water distribution network, then some physical and chemical parameters (chlorine, pH, temperature, total carbon, turbidity) were measured on site according to the standard method. The samples were sent to the reference laboratory to measure the concentration of Trihalomethanes (chloroform, Bromoform) with a GC device while maintaining standard transfer conditions. Also, statistical data processing was performed using SPSS and Excel software.

The average concentration and standard deviation of Chloroform and Bromoform in the Gonabad urban water distribution network were 0.04, 0.031, 0.0029, and 0.000096 mg/L, respectively, and the average pH was 32.8 mg/L. The average water temperature was 18°C, and the average total chlorine was 0.88 mg/L. The results of SPSS analysis also showed that the relationship between Chloroform and physicochemical parameters was not significant, but the relationship between total chlorine and residual chlorine was inverse and significant.

The results indicated that there was no statistically significant difference between the values of Chloroform and Bromoform with national and international standards, and the values were completely desirable and lower than the permitted standards, and consumers were not at risk of cancer from exposure to Trihalomethanes.

Keywords: Drinking water, Trihalomethanes, health risk assessment, urban water network

Freshwater to Microplastics: Production Sources, Effects, Control

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Abstract

The present study was written with the aim of investigating freshwater to microplastics in the world and Iran in the form of a review study. Based on the information obtained, the presence of microplastics is observed in freshwater and seawater, however, freshwater to microplastics compared to water is still a research area that needs further studies. And it is accurate. In recent years, studies have been conducted in the field of investigating freshwater to microplastics in different parts of the world and in some freshwater sources in Iran. The results showed that the production sources, chemical and chemical, and health and environmental characteristics of microplastics in freshwater sources are different. The topics that raise various challenges in the field of freshwater to microplastics are. Many researchers have also stated that due to the characteristics of plastic, its production and consumption per year is. After the production and production of microplastics, in turn, it causes health and environmental problems. In order to reduce them, control should be taken to prevent the consumption of freshwater to microplastics through proper waste management, reduction of plastic production, regulation of laws and regulations, public awareness about excessive consumption of plastic, etc.

Keywords: Microplastics, Freshwater, Characteristics, Effects, Production Sources

Development of a Random Forest Regression Model for Predicting Groundwater Resources Quality Parameters in the Kashan Region

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Abstract
Groundwater is affected by various pollutants, especially chemical pollutants. Rapid detection of pollution can protect groundwater resources from serious consequences. Ensuring their quality and quantity is very important for sustainable management of water resources. However, groundwater testing can be expensive and time-consuming. Therefore, using modeling to predict the chemical parameters of groundwater resources is considered an efficient and cost-effective method. In this study, the random forest (RF) regression model was investigated for predicting the quality parameters of groundwater resources in arid regions using the R programming language version 4.2.1. R^2 and RMSE values were calculated to evaluate the accuracy and prediction error. The random forest regression model showed high performance in developing predictive models for water quality. This approach can be efficient in the field of effective management and protection of groundwater resources and allows for the assessment of risks associated with water resources.

Keywords: Chemical Pollutants, Groundwater, Random Forest Regression Model, Water Quality

Evaluation of Qualitative Indicators and zoning of groundwater pollution risk Using GIS-Based SINTACS Model (Case Study: Hamedan–Bahar Aquifer)

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Abstract

Investigating groundwater vulnerability is very important to assess aquifer contamination, guide strategies, and effectively managing water resources. Numerous methods and models exist for identifying and assessing areas susceptible to contamination. In this study, the SINTACS vulnerability model was used in a geographic information system (GIS) environment to evaluate the vulnerability of the Hamedan–Bahar aquifer. The principles of the SINTACS model are based on hydrological and hydrogeological parameters affecting the transfer of contamination. This model is based on seven input layers including: water table depth, net recharge, aquifer media, soil media, unsaturated environment, topography, and hydraulic conductivity. These layers after weighting and classification in GIS were integrated to produce aquifer vulnerability zones.

The significance of each parameter in the SINTACS model was examined for the study area using sensitivity analysis methods, including map elimination and single-parameter elimination. To validate the efficiency of the model, the nitrate concentration map of the area was used, the correlation between the nitrate map and the model used was 7%. Results revealed that areas with very high vulnerability in the SINTACS model cover approximately 5% of the total area, while regions with moderate vulnerability account for 75.4% of the total area. The most vulnerable areas of the aquifer are located in the northern and northwestern half of the aquifer, which correspond with the nitrate zoning map.

Keywords: Vulnerability, Groundwater, SINTACS, Hamedan–Bahar Aquifer, Sensitivity Analysis

Investigating the presence of Anionic detergents in the drinking water resources of Hamedan and Human Health Risk Assessment

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Abstract

Detergents are one of the most important pollution sources of surface water, drinking water and urban sewage. Linear Alkylbenzene Sulfonates (LAS) are a major group of anionic surfactants. This study was conducted in Ekbatan Dam and Shahid Beheshti Water Treatment Plant in Hamadan and sampling from January 2022 to July 2022 from 22 every two weeks it took. At each time, the LAS concentration of the samples was recorded according to the laboratory instructions and by the DR-6000 machine made by the American HACH company, and pH and EC were also measured. In this study, the concentration of LAS measured in each of the sampling stations was lower than the limit of pollution determined by the EPA for surfactants in drinking water. There is no significant difference between the concentrations of LAS in the initial part of the lake, the middle part and the end part of the lake of Ekbatan Dam in Hamedan. there is no significant difference between the concentration of LAS entering the treatment plant and the concentration of LAS leaving the Shahid Beheshti treatment plant in Hamedan. the results of LAS risk assessment calculation showed the absence of risk in the age group of children and adults in this study. there is a positive and significant correlation between LAS and temperature. The correlation between LAS and precipitation is negative (inverse) and significant. There is a positive and significant correlation between LAS and pH. Also, the correlation between LAS and EC is negative (inverse) and there is no significant correlation between them. The findings of this study showed that the concentration of LAS in Ekbatan Dam Lake in Hamedan did not exceed the EPA pollution limit and the results of LAS risk assessment showed the absence of risk in the age group of children and adults.

Keywords: Drinking water, Anionic surfactant, LAS, Children, Adults

Platform session 2:
Wastewater

Panelist Members
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Oral Presentation

Comprehensive Risk Assessment of Biogas Hazards: Modeling Toxic Release Scenarios in Urban Wastewater Treatment Plants

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Abstract
The increased use of biogas in urban wastewater treatment plants as a renewable energy source raises serious Health and environmental concerns due to its potential for toxic releases. This study aimed to evaluate the consequences of potential biogas-related incidents using consequence modeling technique. The potential hazards of biogas storage tanks, including toxic release scenarios, were modeled using PHAST 7.2 software. Meteorological data and site-specific parameters were integrated into the model to simulate worst-case scenarios and assess the potential impact. The findings revealed that in a catastrophic tank rupture scenario, toxic gas concentrations extended up to 3788.94 meters (100 ppm), 128.86 meters (500 ppm), and 91.72 meters (1000 ppm) downwind from the source. Given the dense urban environment surrounding the treatment plant, biogas release could expose a large population to hazardous conditions. Implementing control measures based on consequence modeling results and establishing emergency response plans are essential for mitigating such risks.

Keywords: Biogas, Risk Assessment, Consequence Modeling, Toxic Release, Wastewater Treatment Plant.

Selective Removal of NSAIDs from Aqueous Solutions Using a Molecularly Imprinted Photocatalyst based on BlackTiO_2 under Visible Light Irradiation

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Abstract

The occurrence of pharmaceutical compounds in the environment has created serious risks for public and environmental health. Non-steroidal anti-inflammatory drugs (NSAIDs), are the most common compounds detected in environment due to their widespread consumption worldwide. In this study, a multi-template molecularly imprinted polymer (MIP) based on BlackTiO_2 nanoparticles (BlackTiO_2-MIP) was synthesized to achieve simultaneous and selective removal of NSAIDs in aqueous media. The characterization results of FTIR, XRD, BET, TEM and FE-SEM revealed the successful imprinting process on the surface of BlackTiO_2 nanoparticles. The removal efficiency of Diclofenac (DCF) and ibuprofen (IBP) was obtained 95% and 83.5%, respectively. The synthesized mesoporous nanocomposite exhibited excellent fit with the pseudo-second-order kinetic model ($R^2 \geq 0.99$). Moreover, the experimental data demonstrated a good fit with the Langmuir isotherm model ($R^2 = 0.99$). The findings imply that the binding sites are homogeneous and indicate monolayer chemical adsorption on the adsorbent. The results revealed that the synthesized BlackTiO_2-MIP nanocomposite had higher adsorption capacity, enhanced photodegradation performance, and better selectivity for the target pollutants compared to non-imprinted BlackTiO_2 nanocomposite(BlackTiO_2-NIP). The results implied that the integration of molecular imprinting and photocatalysis processes exhibits high effectiveness in the selective removal of contaminants. This approach holds promise as an effective solution for addressing the challenge of drug residues in aqueous samples.

Keywords: Molecularly imprinted polymer, BlackTiO_2, Adsorption-photodegradation, Pharmaceutical

Recovery of Municipal Wastewater Treatment Sludge through Simultaneous Conversion into Catalyst and Green Biodiesel Fuel: Neural Network Modeling, Optimization, and Process Thermodynamics

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Abstract

The dependence of scientific and technological development on energy, along with the excessive consumption of fossil fuels, has led to the energy crisis being regarded as the greatest challenge of the current century. This study investigates the potential of municipal wastewater sludge for the simultaneous production of catalysts and biodiesel as a renewable and environmentally friendly energy source. For this purpose, activated carbon granules were first prepared from municipal wastewater sludge and functionalized through an arylation process. Subsequently, empirical relationships among operational reaction parameters were modeled and optimized using developed artificial neural network (ANN) models and evolutionary algorithms. Accordingly, the maximum density of functional groups within the catalyst structure (1.49 mmol/g) was obtained via the PSO-ANN model under optimal conditions (temperature of 55°C, reaction time of 13 minutes, and sulfanilic acid to granule mass ratio of 10.7). The process modeling in this study indicated a positive effect of variable optimization, leading to a 39% enhancement in the density of functional groups within the catalyst structure. Furthermore, the potential of biodiesel production from sludge in the presence of the synthesized catalyst was examined, yielding a maximum biodiesel yield (15.18 wt% of sludge) after 12 hours at 70°C, a methanol-to-lipid ratio of 40 mL/g, and a 20% catalyst loading. Additionally, the chemical stability of the synthesized catalyst during the biodiesel production reaction demonstrated a reduction of 24.7% and 29% in the functional group density after the fifth and eighth reaction cycles, respectively. Catalyst reusability assessments revealed a biodiesel yield reduction of approximately 22.3% by the end of the ninth cycle. Finally, the kinetic and thermodynamic analysis of the biodiesel production reaction showed that at the optimal temperature of 70°C, the reaction rate constant, activation energy, Gibbs free energy, enthalpy, and entropy were 0.133 (h^{-1}), 23.18 kJ/mol, 97.75 kJ/mol, 37.42 kJ/mol, and -0.1798 kJ/mol, respectively. These results indicate that biodiesel production from sludge using the synthesized catalyst is not energy-intensive and can be economically feasible for commercial-scale applications.

Keywords: Wastewater Sludge, Green Fuel, Biodiesel, Catalyst, Artificial Neural Network.

Poster Presentation

Removal of chloramphenicol antibiotic from aqueous solutions using green synthesized nanocomposites: A review study

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Abstract

Despite the acute effects of chloramphenicol on human health and its toxicity in the environment due to excessive use, it is often detected in various water sources (such as groundwater, surface water, wastewater effluents, etc.). Although extensive research has been conducted to develop effective treatment methods for the sustainable removal of chloramphenicol from aquatic environments, there is still no comprehensive review of studies on the photocatalytic removal of the antibiotic chloramphenicol from aqueous solutions using green-synthesized nanocomposites. The results of this study indicate that using this method as one of the advanced oxidation processes could be a promising approach for the degradation of chloramphenicol in water. This review may provide a valuable roadmap for researchers by highlighting existing gaps in the conducted studies within this field.

Keywords: Photocatalytic removal, Chloramphenicol, Nanocomposite, Synthesis Green, Aqueous solutions

Investigation of Effective Factors in the Electrocoagulation Method for Reducing Chemical Pollution in Simulated urban runoffs

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Abstract

In urban areas, due to the increased proportion of impermeable surfaces relative to naturally permeable surfaces, a significant portion of rainfall is converted into runoff. This runoff, by transporting pollutants from urban surfaces, creates various concerns and problems in urban regions and is considered a major source of contaminants. The concern regarding the quality of this runoff increased when its negative impacts on downstream rivers and lakes, as well as surrounding areas, became evident, particularly during the first rainfalls after a dry period when pollutant concentrations in this runoff intensified. This issue can lead to organic shock in conventional wastewater treatment systems, such as the activated sludge process. Electrocoagulation, as an electrochemical process, is considered an effective and rapid method for treating soluble salts in water. In this study, the effect of parameters such as time, voltage, and pH on the reduction of COD levels in runoff collected from the busy streets of Torbat Heydarieh was investigated. The research results indicated that under optimal conditions (reaction time of 60 minutes, pH around 10.4, and voltage of 30 volts) and using iron electrodes, this process was able to remove COD, BOD, and turbidity with maximum efficiencies of approximately 80%, 82%, and 92%, respectively, although the removal rates varied for different collected samples (before the speed reducer, at the field margin, and at the main street margin). By examining the variable of operation time, it was determined that at a voltage of 10, the majority of COD is removed in the first 15 minutes. Furthermore, the highest metal consumption was reported at a voltage of 20, amounting to (g/cm) 0.9. This study demonstrated that the electrocoagulation method can be utilized as a robust pretreatment technique for urban runoff prior to its delivery to conventional wastewater treatment processes or receiving waters.

Keywords: Runoff, Electrocoagulation, COD

The Antibacterial and Catalytic Activity of Iron Magnetite Nanoparticles in the Removal of Ciprofloxacin

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Abstract

Antibiotics are crucial in various scientific fields, including human and veterinary medicine, and are widely utilized medicinal compounds. Ciprofloxacin is a widely used antibiotic in the treatment of infections, most of which is excreted unmetabolized and finally enters water sources through the discharge of sewage and effluents. Even at low concentrations, ciprofloxacin in sewage and effluents can cause ecological harm and pose significant risks to human health. It is crucial to devise effective solutions for the removal of this antibiotic. Advanced Oxidation Processes (AOPs) are a promising method for the future removal of antibiotics, particularly in aquatic solutions, due to their potential to effectively remove ciprofloxacin. This study investigated the antibacterial and catalytic activity of synthesized magnetite nanoparticles (MNPs) (Fe_3O_4) in removing ciprofloxacin.

Fe_3O_4 magnetic nanoparticles (MNPs) were prepared using the co-precipitation method. The nanoparticles were then examined for their physical and structural characteristics using scanning electron microscopy(SEM), X-ray powder diffraction (XRD), transmission electron microscopy (TEM), and BET technique. Fe_3O_4 magnetic nanoparticles (MNPs) were initially synthesized, and their properties were determined. We performed separate investigations to assess the effectiveness of various methods for removing ciprofloxacin. This included evaluating ultrasound alone (US), hydrogen peroxide alone, magnetite nanoparticles alone (MNPs), and combinations such as ultrasound with hydrogen peroxide, hydrogen peroxide with magnetite nanoparticles, and magnetite nanoparticles with ultrasound. All tests were conducted under the same conditions. The first step assessed the catalytic activity of synthesized nanoparticles for ciprofloxacin through the Fenton process. In this study, experimental parameters such as Fe_3O_4 catalyst dosage, initial pH of the solution, Hydrogen peroxide concentration, reaction time, and initial antibiotic concentration were investigated. In the second step, the antibacterial efficacy of synthesized nanoparticles against *Escherichia coli* and *Staphylococcus aureus* was determined *via* the Broth Macro dilution method.

The examination of the characteristics of synthesized nanoparticles showed that the average size of magnetite nanoparticles is approximately 20-30 nm. TEM results confirmed that the synthesized nanoparticles have a uniform size and structure. The combined process of MNPs/hydrogen peroxide/US exhibited the highest removal efficiency at 88.36%. This high efficiency can be attributed to the direct effect of the reaction between Fenton agents and ultrasonic waves, leading to the generation of numerous hydroxyl radicals. The maximum removal of ciprofloxacin was achieved in 0.5 g/L catalyst, pH=3, five mM hydrogen peroxide concentration, 550 W ultrasonic power, and 60 min reaction time. For *Escherichia coli* and

Staphylococcus aureus, the Minimum Inhibitory and Minimum bactericidal concentrations were 3.125, 6.25, and 1.56, 3.125 µg/mL, respectively.
Synthesized iron magnetite nanoparticles have high antibacterial properties against bacterial strains and many catalytic properties in the Sono Fenton process to remove ciprofloxacin, so this process can be an effective method for eliminating hospital and pharmaceutical wastewater.

Keywords: Ultrasound, Fe_3O_4 nanoparticles, Antibacterial properties, Ciprofloxacin

A review of three-dimensional electrochemical degradation methods in the removal of emerging organic pollutants from aqueous media

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Abstract

Water pollution by emerging organic pollutants is a serious worldwide concern. Three-dimensional (3D) electrochemical techniques have attracted interest among the many treatments approaches due to their affordability, high removal efficiency during brief treatment periods, and compatibility with the environment. This research investigated the use of 3D electrochemical methods for the elimination of organic and pharmaceutical contaminants from water. 3D electrochemical processes using particle electrodes provide increased surface area and mass transfer efficiency, outperforming two-dimensional approaches in terms of efficiency and speed, according to a review of 12 research conducted between 2010 and 2023. However, despite the fact that performance is affected by variables such as temperature, pH, current intensity, electrolyte concentration, and electrode spacing, the three-dimensional electrochemical technique continues to be an alternative that is both cost-effective and ecologically sustainable. When appropriately optimized, it offers significant economic and environmental advantages as a workable substitute for conventional water and wastewater treatment techniques.

Keywords: Three-dimensional electrochemical, Particle electrode, Activated carbon, Organic pollutants, Antibiotic

Review of the Performance of Electro-peroxone Process in Wastewater Treatment: A Systematic Review Study

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Abstract

The electro-peroxone process, an advanced oxidation technology, is gaining attention for its effectiveness in wastewater treatment and pollutant removal. This process combines electrochemical oxidation with the in situ generation of hydrogen peroxide through electrolysis, significantly enhancing contaminant degradation. This study aims to systematically review relevant research on the electro-peroxone process. A thorough search was conducted in reputable databases such as Scopus, PubMed, ScienceDirect, and Web of Science. Key parameters including pollutant type, optimal pH, initial concentration, reaction time, cathode and anode type, flow rate, and current density were carefully analyzed. Out of 297 articles screened, 72 met the criteria. These studies reported pollutant removal efficiency exceeding 50%, with some achieving up to 100% removal. These findings highlight the effectiveness of the electro-peroxone process in eliminating pollutants and its potential to improve current wastewater treatment methods. This article is a valuable resource for researchers and engineers in water and wastewater treatment, opening doors for future research opportunities.

Keywords: Advanced Oxidation, Electro-Peroxone, Systematic, Removal

Nano-pumice derived from pumice mine waste as a low-cost electrode catalyst for microbial fuel cell treating edible vegetable oil refinery wastewater for bioenergy generation and reuse

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Abstract

This study aimed to assess nano-pumice (NP) from pumice mining waste as a local, cost-effective anode catalyst in microbial fuel cells (MFCs) for treating edible vegetable oil refinery wastewater (EVORW) and generating bioenergy. Pumice mining waste was converted into nano in three stages: crushing up to <3 cm, reducing the size of the previous step particles to 150 µmand converting the previous step particles to <100nm, Nano-pumice prepared was coated on the carbon cloth (CC) to increase anode surface area of MFC. Two MFCs were utilized, with MFC-1 serving as a control and MFC-2 incorporating a CC electrode coated with nano-pumice. The surface morphology, elemental and chemical composition, and textural characterization of CC, pumice, NP, and CC coated with NP were analyzed using FE-SEM, EDX, XRF, and BET techniques. MFC-2 achieved a maximum power density of 30±4W/m³ at a current density of 55±5A/m³. The MFC-1 reached a maximum power density of 18±4W/m³ at a current density of 35±6A/m³. In MFC-2, the EVORW treatment achieved maximum removals of COD (94±2%), NH_4^+-N (85±4%), TP (76±5%), SO_4^{2-} (68±6%), TSS (81±2%), and TDS (73±1%). MFC-1 achieved removal efficiencies of 66±3% for COD, 57±6% for NH_4^+-N, 48±3% for TP, 45±3% for SO_4^{2-}, 65±3% for TSS, and 61±1% for TDS. MFC-2 power density rose significantly, reaching 61±3% (1.6 times) higher than MFC-1and it also demonstrated a superior ability to improve raw wastewater quality compared to MFC-1. The MFC with the CC/NP anode exhibited both excellent power production and high COD removal efficiency, making nano-pumice a suitable anode catalyst for MFC applications.

Keywords: Pumice mine waste, Microbial fuel cell, Electrode surface area, Anode catalyst, Industrial wastewater

Feasibility Study of the reuse of waste water from Saveh waste water treatment plant in agriculture

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Abstract

Today, in most of the developing countries, wastewater treatment and reuse has been proposed as one of the available solutions to compensate for the lack of water resources as well as the management of produced wastewater. Treated wastewater can be used to provide drinking water, agricultural irrigation, washing streets, car washes, supplying water for flushing toilets, parks, washing vehicles, green spaces, and firefighting. Feasibility of reusing the treated wastewater of Saveh city for agricultural irrigation. In this study, sampling was done randomly and instantaneously from the inlet and outlet of the Saveh City wastewater treatment plant during the summer season in 2024. Necessary samples were taken based on standard sampling methods and transferred to the laboratory of Saveh University of Medical Sciences under appropriate sampling conditions in terms of time and temperature. Then different physical, chemical and biological parameters were examined and analyzed. The findings of this research showed that the SAR index for treated wastewater in Saveh city is 5.28, which according to the relevant standards, the risk of sodium in it is low for the soil of agricultural land and the water quality is excellent. Also, the amount of Na% index for treated is 53, which is allowed according to the relevant standards for the quality of treated wastewater for agricultural lands. The microbial quality of the treated wastewater of Saveh city is higher than the standard and its use for agriculture has many risks. Calculations showed that 194 hectares of land for wheat cultivation can be irrigated using treated wastewater. The quality of the treated wastewater of Saveh city is within the standard range in terms of many physical and chemical parameters and therefore has the potential to be used for agriculture, but it does not meet the necessary standards from a microbial point of view and it is dangerous to use it for agriculture unless the necessary measures are taken, including disinfection with UV and ozone or additional treatment such as coagulation and filtartion should be considered to reduce microorganisms.

Keywords: Wastewater treatment, Reuse, Saveh City, Agricultural irrigation

Grey Water Footprint of Textile Wastewater Treatment Using Polyaluminum Chloride, Chlorine, and Lime

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Abstract

By 2025, nearly half the global population will face water stress, making sustainable water resource management a critical issue. The textile industry, a major water consumer, releases significant pollutants through dyeing. This study investigates the grey water footprint (GWF) of textile wastewater treatment in Isfahan, focusing on the use of polyaluminum chloride (PACL), chlorine (Cl_2), and lime (CaO) in the coagulation and flocculation process. Experimental analysis was conducted on 20 liters of wastewater from a textile factory. The study measured total suspended solids (TSS) and chemical oxygen demand (COD) before and after treatment in three scenarios: Scenario 1) utilizing solely PACL (known as Sc.1), 2) using PACL and CL_2 simultaneously (known as Sc.2), and 3) using three additives such as PACL, Cl_2, and CaO at the same time (known as Sc.3). Based on the obtained results, COD-based GWF in Sc.1 by consuming 1.0, 1.5, and 2.0 gr/L of PACL determined 5,610 m^3/month, 5,346 m^3/month, and 5,280 m^3/month respectively. Results showed that using 1.0 gr/L of PACL reduced COD-based GWF by 87% compared to raw wastewater. This number for the TSS was a 97% reduction. Results revealed that the GWF reduction is equal to the removal efficiency for pollutant concentration (e.g. on average 91% for COD and 97.6% for TSS). The study highlights the importance of monitoring industrial pollutants and suggests that the GWF index is a valuable tool for assessing environmental impacts. Effective wastewater treatment can mitigate water shortages and environmental pollution, making it crucial for sustainable industrial practices.

Keywords: Grey water footprint, Textile wastewater, Polyaluminum chloride, Chlorine

A review of the effectiveness of anaerobic digestion in the treatment of sugarcane industry wastewater

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Abstract

The sugarcane industry has expanded in certain parts of the world due to the climatic conditions that are suitable for its growth. Waste of the sugarcane industry is the wastewater from the bagasse storage method, usually created after treatment for rewetting the bagasse. One of the advantages of using anaerobic digesters is the possibility of producing biogas, so determining the most optimal combined method of wastewater treatment from the sugarcane industry was also investigated in this meta-analytical review.

All studies that investigated the effectiveness of anaerobic digesters in the treatment of sugarcane industry wastewater were retrieved and collected from popular databases. To search the keywords Sugarcane industry, Anaerobic reactor and treatment, the search strategy was determined and used: Sugarcane OR Saccharum industry, Anaerobic Reactor OR Anaerobic Digester, Treatment OR Therapy OR Therapeutic Wastewater OR WasteWater, Efficiency. Additional related articles were also evaluated by examining citations from other publications most of the researchers used combined treatment methods. The analysis of the results showed that the combined biological-physical treatment method had an efficiency of 83%. The combined biological-chemical method has an efficiency of 73%, which is more efficient than the biological method.

If the goal is to achieve high efficiency in the treatment of these wastewaters. It is better with anaerobic digester combine with physical purification methods.

Keywords: Sugarcane industry, Anaerobic digester, Review

Enhanced Growth of White Rot Fungal Consortium by Dairy Wastewater: A Sustainable Approach to Treat Recycled Paper and Cardboard Mill Wastewater

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Abstract

The paper and cardboard industry is considered one of the most important industrial sectors in the world due to its significant contribution to a country's economy. Various organic and inorganic pollutants are present in the wastewater from these industries, which can have adverse effects on aquatic ecosystems. Therefore, the discharge of wastewater from these industries into surface water sources necessitates the removal of these pollutants. Given that white rot fungi can continue to grow and function even under adverse conditions and have the ability to remove certain wastewater pollutants, including color and persistent compounds, this study investigated the efficiency of a white rot fungal consortium in the biological treatment of recycled paper and cardboard mill wastewater, both in the presence and absence of carbon and mineral sources.Initially, two fungal species, *Bjerkandera adusta* and *Phanerochaete chrysosporium*, were cultured in a specialized potato dextrose broth medium. These fungi were then introduced into two aeration reactors along with recycled paper and cardboard mill wastewater, with and without the addition of dairy wastewater as a source of carbon and minerals. Parameters such as COD and color were regularly monitored, lignin content was measured, and the Phytotoxicity of the treated effluent was assessed using the seed germination method with *Phaseolus mungo*. The degradation by the white rot fungal consortium, with the addition of carbon and organic sources, achieved the highest removal efficiencies of COD at 46.95% and color at 61.57%. Additionally, the lignin removal rate was determined to be 56.52%. The Phytotoxicity Index using seed germination indicated a reduction in the toxicity of the treated wastewater by the fungal consortium. The results obtained indicate that these fungi can be integrated into the biological treatment systems of wastewater treatment plants for industries such as paper and cardboard. They are a suitable option for enhancing the biodegradability of organic compounds

and increasing the potential for treated wastewater recycling in the production processes of the recycled paper and cardboard mill. This study underscores the importance of utilizing white rot fungi for not only pollutant degradation but also for promoting sustainable practices in industrial wastewater management.

Keywords: Bioremediation, Dairy Wastewater, White Rot Fungi, Recycled Paper and Cardboard Mill Wastewater

A Review of the Processes of Removing Pharmaceutical Substances in Constructed Wetlands

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Abstract

Emerging organic micro-pollutants, particularly pharmaceutical residues, pose a significant threat to water resources, and natural wastewater treatment systems lack the necessary efficiency for their complete removal. One proposed option for eliminating these pollutants is the use of constructed wetlands. This review article examines the effectiveness of constructed wetlands in removing these pharmaceutical pollutants and the impact of vegetation cover on treatment efficiency. The results indicate that vegetated beds perform better in removing pharmaceutical compounds from wastewater compared to non-vegetated beds. Specifically, the removal efficiencies of carbamazepine, ibuprofen, and sulfadiazine in vegetated reactors were 89.23%, 89.50%, and 67.20%, respectively, while in non-vegetated reactors, the efficiencies were 95.94%, 94.73%, and 93.68%. Additionally, the recycling of effluent has been recognized as an effective strategy for improving drug removal rates. These findings underscore the importance of developing treatment methods and wastewater management strategies using constructed wetlands, especially in water-scarce regions that require sustainable solutions to maintain water quality. Given the challenges posed by climate change and population growth, there is increasing pressure on water resources, making the need for innovative technologies like constructed wetlands even more critical. Furthermore, future research should focus on selecting suitable plant species and optimizing the design of these systems to enhance their effectiveness in removing micro-pollutants. This approach not only contributes to environmental sustainability but also provides a viable solution for managing pharmaceutical contaminants in wastewater, ultimately protecting aquatic ecosystems and public health.

Keywords: Pharmaceuticals, Constructed wetlands, Wetland, Wastewater treatment

Application of artificial intelligence in wastewater treatment: challenges and opportunities – a review

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Abstract

Water is the most vital resource for the survival of organisms. In the past decades, increasing demand and misuse of water resources have put a lot of pressure on water resources. In addition, many countries are also facing serious water pollution problems. Currently, wastewater treatment and reuse of wastewater is necessary to maintain public health, protect the environment, prevent water resource pollution, reuse wastewater for industrial and agricultural purposes, and deal with drought and water scarcity problems. Population growth and lack of water resources in recent decades have doubled the importance of paying attention to wastewater treatment and optimal use of its effluent. Artificial intelligence not only acts as a powerful tool to reduce the difficulties and complications associated with wastewater treatment but also reduces costs and optimizes the use of chemicals, which in turn reduces the cost of the wastewater treatment process. In this research, we reviewed the articles published in this field. Our emphasis is on the opportunities and challenges of using different artificial intelligence techniques in the field of wastewater treatment. In this review study, to find articles related to the research, PubMed, Science Direct, and Google Scholar databases were checked. After selecting the articles related to the research, the types of artificial intelligence techniques used in the articles, the frequency of each method, and their application in wastewater treatment were examined. Then the challenges and opportunities of using these techniques in the field of wastewater treatment were investigated. After examining the articles extracted from the databases and references of the 142 articles, 52 articles were selected for use in the study, and other unrelated articles were excluded from the study. Utilizing AI techniques has proven effective in tackling existing problems.

Keywords: Artificial intelligence, Wastewater treatment, Machine learning, Challenges, Opportunities.

Wastewater Treatment Systems in Iran and the World: A systematic review of UV-based Advanced Oxidation Processes

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Abstract

As global municipal wastewater production rises, effectively treating complex wastewater has become increasingly challenging. Ultraviolet (UV)-based Advanced Oxidation Processes (AOPs) offer a promising solution by efficiently degrading pollutants. The aim of this study was to systematically review and evaluate the application and effectiveness of UV-based AOPs in wastewater treatment (WWT) systems, comparing practices in Iran with those globally to identify successful strategies and areas for improvement. This systematic review examined research articles and cross-sectional studies on UV-based AOPs in WWT, focusing on both Iran and global practices. Articles published up to August 2024 were retrieved from the databases ScienceDirect, PubMed, Google Scholar, Web of Science, and Scopus using keywords "wastewater", "wastewater treatment", "advanced oxidation process", "AOP", 'UV", "UV-based", "world", "globally", and "Iran". This study utilized Endnote X7 software for managing references and identifying duplicates. This study revealed that UV-based AOPs effectively degraded a wide range of wastewater contaminants, including pharmaceuticals and dyes, with removal efficiencies often exceeding 90%. Studies from China, the United States, and Iran showed the success of systems like UV/Cl_2, UV/free chlorine, and UV/H_2O_2 for contaminants such as Iopamidol, Carbamazepine, and Acetaminophen. Similarly, research in Belgium, Germany, and Australia demonstrated the effectiveness of UV/PS, UV/Chlorine, and UVC/H_2O_2 in removing Ciprofloxacin, trace organic chemicals (TOrCs), and color. Despite these promising results, challenges such as high operational costs, toxic by-products, and inefficiencies in high-turbidity waters remain. In conclusion, UV-based AOPs improve WWT by effectively breaking down contaminants and enhancing water quality. Despite high costs and potential by-products, their integration with advanced technologies promise significant environmental and economic benefits.

Keywords: Advanced oxidation process, Ultraviolet, Wastewater treatment, Iran, World

Evaluation of the performance of Chlorellavulgaris microalgae in color removal from textile industry wastewater

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Abstract

A group of textile industries produce wastewater containing high amount of dyes. If these wastewaters enter the environment raw, they would threat the living organisms. The application of microalgae aiming the biological removal of color, is considered; due to its compatibility with the environment, high absorption capacity, no need for chemicals, low sludge production, less energy consumption, and subsequent uses of the produced biomass as a biological purification method. Wastewater samples were obtained from a textile industry(factory) located in Qazvin. After determining the qualitative characteristics of wastewater, preliminary experiments were conducted in order to appoint the range of each independent variable, including initial COD, initial color concentration, photoperiod and cultivation time. Then, the design of the experiments was done using the Box-Benken method. The tests were performed according to the design matrix and then the amount of remaining color of the samples was measured by spectrophotometric method in terms of ADMI and the color removal efficiency was calculated. The obtained data were subjected to analysis of variance and regression, and the prediction equation of color removal results was obtained. At the percentage of 95% confidence level, the main effects of independent variables including initial COD concentration, initial color concentration, culture duration, length of lighting period, as well as their interaction and quadratic effects were considerable except for C2 in color removal. The value of the error of fit of the second order model was 0.1847, which confirms the good fit of the data on the grade correction model. In the best circumstansec, the color removal efficiency was about 82%. The results showed that chloralvolgaris has a good efficiency in removing the residual dye from the textile industry and can be used as an environmental friendly method to reduce the the amount of colored pollutants from textile wastewater.

Keywords: Biological treatment of wastewater, Wastewater from textile industries, Color reduction, Chlorella vulgaris algae, Response surface method

Application of zero-valent iron nanoparticles in Fenton sonolysis to remove amoxicillin from aqueous media

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Abstract

high concentration of antibiotics in aquatic environments reduces the quality of water and brings risks due to its low toxicity and biodegradability. Conventional treatments are often insufficient to remove these compounds. This study investigates the effectiveness of zero iron oxide nanoparticles (nZVI) along with hydrogen peroxide and sonolysis to remove amoxicillin from water. Zero iron nanoparticles were synthesized by reducing iron chloride with sodium borohydride ($NaBH_4$). Identification was done using scanning electron microscopy (SEM), transmission electron microscopy (TEM), X-ray diffraction (XRD) and vibrating sample magnetometry (VSM). Pseudo-Fenton process was used to treat artificial wastewater containing amoxicillin in concentrations of 100 to 500 mg/L. Key parameters include frequency (35 and 130 kHz), contact time (15 to 120 minutes), hydrogen peroxide concentration (0.5%, 1% and 3%), zero concentration of iron nanoparticles (0.05, 0.1, 0.5 g/L) and pH. (3 to 5), was systematically investigated. In optimal conditions (pH 3, 3% hydrogen peroxide, frequency 130 kHz, and 0.5 g/L nZVI), the removal efficiency of amoxicillin at an initial concentration of 100 mg/L reached 99.7% within 120 minutes. The results show that the $NZVI_2O_2US/H$ method is very effective for removing environmental pollutants such as amoxicillin and a significant amount of removal is achieved. This approach can be a suitable solution to deal with antibiotic contamination in water sources.

Keywords: Amoxicillin (AMX) antibiotic, Pharmaceutical compounds, Hydrogen peroxide, Ultrasonic waves (US), Fenton-like

The removal of Diazinon Residues from Apple and Pear by Ozone-Ultrasounic Treatment

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Abstract

In the present study, we introduced an effective and applicable process comprising of ozone and ultrasound irradiation (US/O_3) for removing Diazinon residues from apple and pear samples. To optimize the removal condition, the effect of different operating parameters including ozone concentration (1, 2 mg/L), ultrasound frequency and intensity (40, 70 kHz, 80 W) and contact time (5-30 min) were evaluated. The US/O_3 process showed excellent performance in the removal of diazinon residues. Accordingly, under the optimum conditions the US/O_3 process was able to remove 100% and 89.81% of diazinon residues from apple and pear samples, respectively. So, the application of US/O_3 is highly beneficial and recommended for removing diazinon residues from apple and pear fruits.

Keywords: Ozonation, Ultrasound, Apple, Pear, Pesticide Removal.

Investigation of Activated Persulfate-Mediated Chemical Oxidation of Tinidazole in Aqueous Solutions: Kinetic Characterization, Thermodynamic Assessment, and Evaluation of Mineralization

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Abstract

This study investigates the application of heat-activated persulfate (HAP) as a chemical oxidation strategy for the removal of the antibiotic tinidazole (TNZ) from aqueous solutions. The research systematically assessed the influence of several operational parameters, including the initial concentration of TNZ (20 µM), the initial dosage of persulfate (PS) ranging from 0.2 to 2 mM, solution pH (3 to 11), temperature (20 to 60 °C), and reaction duration (10 to 120 minutes). Results indicated that sulfate radicals were the primary species responsible for TNZ degradation. Increasing temperature and persulfate concentration significantly enhanced the removal efficiency, whereas elevated pH values and higher initial TNZ concentrations impeded the process. Under optimal conditions—specifically, an initial TNZ concentration of 20 µM, pH 7, an initial PS concentration of 1 mM, a temperature of 60 °C, and a reaction time of 120 minutes—the study achieved a removal efficiency of 91.15% and a mineralization rate of 85.8%. Kinetic analysis suggested that the degradation of TNZ adhered to a pseudo-first-order reaction model, demonstrating a superior fit compared to alternative models. Furthermore, the process was determined to be exothermic and spontaneous, as indicated by a negative Gibbs free energy change, affirming its thermodynamic viability. In conclusion, the study highlights HAP as a highly effective and economically viable method for the remediation of TNZ-contaminated water. The technique's operational simplicity and the absence of additional chemical requirements or complex waste management make it a promising advanced oxidation process for tackling antibiotic contamination in aquatic environments.

Keywords: Tinidazole, Heat-activated persulfate, Chemical oxidation, Advanced oxidation

Degradation of fluoroquinolone antibiotic using advanced oxidation processes

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Abstract

Antibiotics can be a threat to the environment, ecological stability and human life. Therefore, in order to deal with environmental pollution and preserve human health, it is necessary to find ways to remove these substances from the environment. In this study, the degradability of fluoroquinolone antibiotics from aqueous solutions in the advanced oxidation process under the influence of antibiotic concentration, oxidant concentration and pH at three levels was investigated with the help of the response surface methodology and the design of the central composition in a period of 60 minutes. The results show a high effect of pH and oxidant concentration on degradation (R2=0.97). The rate of antibiotic removal followed the first-order equation and some cases followed the second-order equation. In general, a significant reduction of antibiotics from aqueous solutions was confirmed with the help of this study.

Keywords: Advanced Oxidation, Aqueous Solution, Modeling

Investigation of Chemical Analysis and Novel Applications of Condensate Water from Air Conditioners in Iranshahr City

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Abstract

In this study, the chemical quality of condensate water from air conditioners, which is considered a potential water source, was examined in the city of Iranshahr, Sistan and Baluchestan. The aim of this study is to identify the potential for reusing condensate water for irrigation and other conventional uses. Samples were collected from 13 air conditioning units, and to enhance reliability, sampling was repeated over three different time periods. The chemical analysis of the collected samples included measurements of pH, total dissolved solids (TDS), electrical conductivity (EC), turbidity, hardness, and specific ions (chloride, sodium, potassium, calcium, and magnesium). The results indicated that the concentrations of sodium and chloride ions in the water samples were 287 mg/L and 220.77 mg/L, respectively, both exceeding acceptable drinking water standards. Additionally, the EC analysis revealed that regarding suitability for drinking and irrigation purposes, 69.3% of the samples fell into the excellent category (up to 250 microsiemens per centimeter), 23% into the good category (250-750 microsiemens per centimeter), and only 7.7% into the moderate/conventional category (750-2250 microsiemens per centimeter). Data analysis showed that the chemical composition of condensate water from different units varied significantly. Furthermore, compared to World Health Organization standards, the Water Quality Index (WQI) calculated at 22.2 indicated suitable quality for the condensate water samples. The findings confirmed the potential for reusing condensate water; however, further studies are recommended to determine its chemical, biological, and physical quality for various applications.

Keywords: Chemical analysis, Condensate water, Air Conditioner, Water quality index, Iranshahr

Can microplastics/nanoplastics be effectively removed by electrocatalysis? A short review of the role of electrode material on the oxidants generated

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Abstract

Microplastics (MPs) and nanoplastics (NPs) are inherently stable particles with adverse effects on human health and the environment. The pollution of the environment with microplastics is constantly intensifying and maybe one day we will consider it as a global environmental problem like ozone layer depletion and climate change. One of the main strategies to reduce the release of MPs, especially in water sources, is to treat wastewater containing MP particles. Successful physical methods and chemical processes have been studied for the separation/removal and destruction of MPs. Among them, the electrochemical strategies for removing MPs/NPs from water have recently attracted attention, however, the number of research is still limited. On the light of the existing literature, the research and development of the electrochemical approaches have revealed significant impact to degrade/separate MPs/NPs via the applicability of the electrochemical advanced oxidation processes (EAOPs) based on active (e.g., RuO_2 and IrO_2) and non-active (e.g., PbO_2, SnO_2 and BDD) anodes. The results of the studies have evidenced that, on the one hand, the efficiency of EAOP types to remove MPs/NPs still does not meet expectations, and there is a need to improve and upgrade the process or to couple them with other oxidation processes. In this short review, the latest studies and their results are summarized and presented here, emphasizing the investigations have allowed to understand the role of the electrode materials and the oxidants electrogenerated by them.

Keywords: Electrochemical advanced oxidation processes, Microplastics, Anodic oxidation, Electro-peroxidation.

Removal of Reactive Blue 19 using Oxidation Fenton from Aqueous solution

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Abstract

Evacuating wastewater containing reactive paints to water sources leads to health hazards. Colors, due to carcinogenicity, mutagenicity, toxicity and coloration in water, can cause harmful effects on the natural environment. Environmental degradation can be attributed to the destruction of living organisms and the increased BOD. The purpose of this study is to determine the removal of reactive Blue 19 by using the Fenton process. This research is an experimental study and the effectiveness of Fenton in color removal was investigated. The factors influencing this process were parameters such as pH, color concentration, Fenton ratio and contact time. Finally, after determining the optimal concentration of color, pH, Fenton ratio and time, the residual adsorption rates in the samples were measured by direct photometry by spectrophotometer apparatus with a wavelength of 594 nm. The results showed that the rate of 3pH = and the concentration of 2 mg / L, the ratio of Fenton 1: 5 and the contact time equal to 10 minutes at 25 ° C, had the highest removal efficiency. The Fenton process is able to remove the reactive color of the Blue 19 with different concentrations. This process has the best removal efficiency in acid pH and decreases the efficiency of the call time.

Keywords: reactive blue 19, color, Oxidation process, Fenton

Advanced Magnetic Nanobiocomposite: Synthesis, Characterization, and Adsorption of Para-Nitroaniline from Aqueous Solutions

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Abstract

In this study, a magnetic nanobiocomposite, $CoFe_2O_4$/Activated Carbon with Chitosan ($CoFe_2O_4$/AC@Ch), was synthesized using the microwave method for the effective adsorption of P-nitroaniline (PNA). The physicochemical properties of this nanobiocomposite were thoroughly examined using various analyses, including FESEM/EDS, BET, FTIR, XRD, and VSM. The results indicated the successful synthesis of this nanobiocomposite, and its point of zero charge (pH_{ZPC}) was determined to be 6.4. The adsorption performance of PNA was evaluated under various conditions, including changes in PNA concentration (between 10 and 40 mg/L), adsorbent concentration (10 to 200 mg/L), contact time (2.5 to 22.5 minutes), and solution pH (3 to 11). Through optimization, the best conditions were achieved at an adsorbent concentration of 200 mg/L, pH of 5, PNA concentration of 10 mg/L, and a contact time of 22.5 minutes, resulting in a PNA adsorption efficiency of 98.6%. The magnetic nanocomposite was recovered and reused over four cycles, achieving an adsorption rate of 86%, demonstrating the good stability of the magnetic nanocomposite for wastewater treatment. In summary, these experimental results confirm the potential of the synthesized magnetic nanobiocomposite as a recyclable and effective adsorbent for the removal of PNA from aqueous matrices.

Keywords: Adsorption, P-nitroaniline, Magnetic nanocomposite, $CoFe_2O_4$/Activated carbon@Chitosan

Enhancing the Performance of Microbial Fuel Cells in Bioenergy Production with Modified Bioanode Electrode

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Abstract

The configuration and composition of the anode electrode in the microbial fuel cell system are factors influencing the electricity generation and process performance. This study aims to investigate the efficacy of a bioanode electrode, enhancemented with nickel nanoparticles, in bioelectricity production via an MFC. A dual-chamber MFC, equipped with a Nafion 117 membrane and bare graphite plate and nickel-coated graphite plate electrodes, were established under consistent temperature and navigation conditions. The maximum voltage, current density, and power generated by the MFC were evaluated. The structural and surface characteristics of the electrodes were analyzed using Field Emission Scanning Electron Microscopy (FE-SEM), X-ray Diffraction (XRD), and Energy-Dispersive X-ray Spectroscopy (EDX). The FE-SEM, EDX, and XRD analyses show that nickel is properly doped on the anode electrode, resulting in enhanced electron transfer speed and increased power generation. The open circuit voltage curve, observed over four loading stages using different anode electrodes, demonstrated the reactor stability and resistance. The maximum generated voltage using Ni@GP was 422 mV, marking a 28.67% increase compared to GP. The maximum power density and current using the modified electrode were 3.94 times higher than GP, reaching 106.58 mW/m^2 and 730 mA/m^2, respectively. The findings suggest that the incorporation of nickel nanoparticles in modifying the surface of anode electrodes enhances compatibility with the biofilm layer, conductivity, and extracellular electron transfer. This leads to an increase in output power and improved performance of MFCs in bioelectricity production.

Keywords: Microbial Fuel Cell, Bioanode, Nickel Nanoparticles, Bioenergy

Removal of Congo Red dye using industrial carbon nanotube as an efficient and cost-effective adsorbent: Isotherm, Kinetic, and Thermodynamic Studies

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Abstract

Congo red (CR), an anionic azo dye, poses significant threats to human health and the environment due to its high toxicity, solubility, and non-biodegradability. In this study, industrial carbon nanotubes (CNTs) were employed as adsorbents for the removal of Congo Red from aqueous solutions. A response surface methodology (RSM) based on a central composite face-centered design (RSM-CCFc) was utilized to optimize the adsorption process by considering pH, adsorbent dosage, and contact time as variables. Structural characterization of the nano-adsorbent was performed using SEM (Scanning electron microscopy), XRD (X-ray diffraction), BET (Brunauer–Emmett–Teller), FTIR (Fourier Transform Infrared Spectroscopy) and DLS (Dynamic light scattering) analyses. The low P-value (0.0001) and high R-squared value (0.937) of the model, along with a relative standard deviation (RSD) of 2.53, indicated a strong correlation between the experimental and predicted results. Under the optimized conditions, including pH of 2.89, adsorbent dosage of 9.75 g, and contact time of 90 min, maximum Congo Red removal efficiency and adsorption capacity were obtained as 89.93% and 133.76 mg/g, respectively. The adsorption process followed the Langmuir isotherm (R^2 = 0.9999) and pseudo-first-order kinetics (R^2 = 0.9916). The positive values of enthalpy and entropy, coupled with the negative values of Gibbs free energy, suggested that the Congo Red adsorption process was spontaneous and endothermic. The removal efficiency of Congo Red using industrial carbon nanotubes decreased to 72.65% after ten adsorption cycles. Ultimately, it can be concluded that industrial carbon nanotubes demonstrate high efficiency in adsorption of Congo Red from aqueous solutions

Keywords: Congo Red, Industrial carbon nanotubes, Adsorption, Central Composite Face, Response surface method

Ultrasound-assisted catalytic reduction of hexavalent chromium in water matrices by CuO-PET based RSM methodology: Kinetics, Cost analysis and Mechanisms

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Abstract

Hexavalent chromium (Cr^{6+}) is considered to be a harmful industrial pollutant that poses a serious threat to health. This study has focused on the development and evaluation of the sonocatalytic activity of a copper oxide-polyethylene terephthalate (CuO-PET) nanocomposite for the Cr^{6+} reduction. This nanocomposite (NC) was prepared using a facile co-precipitation route and characterized by FT-IR, XRD, SEM, EDX-Map and pH_{pzc} techniques, which results confirmed the successful synthesis of the NC. The established RSM model has predicted the optimum experimental factors for Cr^{6+} reduction as catalyst dosage of 1 g L^{-1}, initial Cr^{6+} concentration of 10 mg L^{-1}, pH of 5 and sonication time of 60 min with ultrasonic (US) frequency of 37 kHz. The ANOVA results of the polynomial model prove that the model is quite meaningful (F-value> 0.001 and P-value< 0.0001). The sonocatalytic reduction of Cr^{6+} followed the pseudo-first order kinetics (PFO). Further, estimated electrical energy per order consumption (E_{EO}) for US/CuO-PET system was calculated as 197.85 kWh m^{-3} with operational cost (OC) utilization of 117.37 USD kg^{-1} that was revealed this process is highly feasible and economic comparing with other sonocatalytic processes (US/CuO, US/PET, and US). Besides, the composite preserved excellent stability after 5 consecutive tests. The CuO-PET presented agreeable sonocatalytic facility in the refinement of real water matrix. The obtained results confirmed the capability of the US/CuO-PET process as a promising method for treating contaminated water.

Keywords: Cr^{6+}, Sonocatalytic, CuO-PET, Kinetic, Cost analysis.

Efficient sonocatalytic degradation of phenol from aquatic matrices over CuO-PET in the presence of H_2O_2: Kinetics, Cost analysis and Mechanisms

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Abstract

Phenol-containing wastewater is typical organic wastewater, and its treatment is hard. The current study aims to investigate the efficiency of low-frequency ultrasound in degrading a phenol solution by means of copper oxide-polyethylene terephthalate (CuO-PET) and hydrogen peroxide (H_2O_2). CuO-PET nanocomposite was analyzed by FT-IR, XRD, SEM, EDX-Map and pH_{pzc} techniques. Then, different parameters influencing the degradation were studied and optimized. When pH was 5, the degradation rate of 20 mg L^{-1} phenol solution with CuO-PET (0.1 g L^{-1}) and H_2O_2 (2 mM) could reach 94.26% within 60 min. The sonocatalytic degradation of phenol followed the pseudo-first order kinetics (PFO). Further, estimated electrical energy per order consumption (E_{EO}) for ultrasonic (US)/CuO-PET/H_2O_2 system was calculated as 467.39 kWh m^{-3} with operational cost (OC) utilization of 61.53 USD kg^{-1} that was revealed this process is highly feasible and economic comparing with other sonocatalytic processes (US/CuO-PET, US/CuO/H_2O_2, US/PET/H_2O_2, US/H_2O_2 and US). Six cycle experiments confirmed that the CuO-PET propounded a satisfied stability and recycling potency. The probable mechanism of phenol degradation by sonocatalyst was the oxidation of phenol caused by hydroxyl radicals produced during the reaction between H_2O_2 and CuO-PET under ultrasonication process. The main intermediate products during the US/CuO-PET/H_2O_2 embracing benzoquinone, pyrocatechol, resorcin, hydroquinone, fumaric acid, maleic acid, formic acid, succinic acid, and oxalic acid are formed in the path of phenol degradation.

Keywords: Phenol, Sonocatalytic, CuO-PET, Kinetic, Cost analysis.

Application of artificial intelligence in optimizing urban water and wastewater management: challenges and opportunities

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Abstract

Optimal management of urban water and wastewater is one of the basic challenges in the field of environmental health and sustainable urban development. Due to population growth, expansion of urbanization and climate changes, the need for new and smart solutions to improve performance and reduce costs in this field is felt more and more. Artificial intelligence (AI), as one of the most advanced technologies of this century, has significant potential in optimizing the management of water and sewage systems. This article examines the applications of artificial intelligence in predicting water leakage, optimizing energy consumption in treatment plants, intelligent management of sewage networks, and water quality assessment. Also, key challenges in implementing this technology are discussed, including the need for advanced infrastructure, security and privacy issues, and high initial costs. In addition, the future opportunities resulting from continuous advances in machine learning and data mining and the positive economic and environmental impacts of these technologies are also considered. The purpose of this article is to provide a comprehensive view on the capabilities and obstacles of using artificial intelligence in the management of urban water and sewage systems, in order to provide a basis for the promotion and development of this technology in order to improve environmental health and urban productivity.

Keywords: Artificial intelligence, Optimization of energy consumption, Intelligent management, Urban sewage, Sustainable urban development, Climate change.

Platform Session 3:
Environmental Pollutants Monitoring

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Oral Presentation

Examining the changes of ammonium in the Abbas-Abad River using integrated modeling

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Abstract

Examining water quality based on ammonium changes is very important in managing the quality of surface water such as rivers. This study examines the trend of ammonium (NH_4) pollution changes in the Abbas-Abad River with a length of 7.033 km in the year 2021. In this regard, river segmentation was done using HEC-RAS model and then entered into QUAL2Kw model. The calibration and validation of the QUAL2Kw model was done using the data of May and August 1400 and the results show the appropriate accuracy of the model. Ammonium changes along the river show an increasing trend in ammonium concentration with about 8.40% in the non-cultivation season. Due to the use of chemical fertilizers and pesticides during the cultivation season, the concentration of ammonium increases by approximately 38%. Therefore, Abbas-Abad River has an unfavorable quality in terms of ammonium concentration, and it is recommended to adopt management measures to prevent pollutants from entering the river bed.

Keywords: HEC-RAS, Pollution, QUAL2Kw, Water Quality

Effects of co-contamination of polycyclic aromatic hydrocarbons and heavy metals on environmental matrices in a chronic petroleum polluted region in Iran: Ecological and Human Health risk assessment

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Abstract

Oil spills from pipeline accidents can result in long-lasting health effect in the people living in a polluted region. In this study, the level of the USEPA priority PAHs and heavy metals (HMs) have been analyzed in environmental matrices of a region with frequent oil pipeline accidents in Iran. The results showed that the mean concentration of ΣPAHs and ΣHMs decreased from the upstream to the downstream and also the levels were higher in the wet season than those in the dry season. The average concentration of HMs in sediments was higher than that in other environments. The 3- ring and 4-ring PAHs were dominant in all of the studied matrices with the average values of 32.61% and 45.85%, respectively. The ecological risks of PAHs and HMs were medium and high in all matrices, respectively. In wet season, the total cancer risk (TCR) related to PAHs in agricultural soil was greater than 10-4, whereas it's very close to the threshold for HMs in water. This study offers a reference for assessing the long-term impact of oil spills in contaminated environmental matrices. The results is crucial for developing effective strategies to mitigate oil pollution impacts and protect environmental and public health.

Keywords: Polycyclic aromatic hydrocarbons, Heavy metals, Ecological risk, Human risk, Oil pipeline accident, Environmental matrices

Poster Presentation

Assessment of emission situation of electromagnetic wave from BTS telecommunication towers in Ilam city

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Abstract

Mobile phone is one of the most important technological products, which due to the increasing demand and widening of its services, has caused the increase of BTS telecommunications towers in different places; So that, along with its beneficial effects, its possible biological effects require further investigation. Therefore, the present study was performed with the aim of determining the state of microwave emission from the BTS telecommunication towers in Ilam city.

This cross-sectional study was performed on the telecommunication towers of selected areas of Ilam city, including 50 BTS antennas, by census method. According to IEEE 95.1 TC standard, the power density of electromagnetic waves around the antennas was measured in two near fields (less than 20 meters) and far fields (more than 20 meters). Then, the effect of humidity, temperature, traffic conditions and the type of facades of the surrounding buildings on the density was investigated.

In this study, there was a significant difference between the power density in different distances (15, 50, and 100 m) ($p<0.001$). No significant difference was observed in the median density at 15 m in clear and rainy weather conditions ($p=0.324$), while there was a significant difference at 50 and 100 m ($p<0.05$). Also, no significant difference was observed in the effect of temperature and time on density ($p>0.05$). In investigating the effect of different materials in the buildings around the telecommunication masts, the effect of stone facades on wave attenuation was greater than that of cement and brick facades.

The power density of BTS antennas in all stations is much lower than the threshold limits and follows national and international standards. With the increase of the distance, the amount of electromagnetic waves emission has decreased; In other words, there was the highest amount at 20 m and the amount decreased in the following distances; So that this reduction rate is much higher in rainy conditions and high air humidity.

Keywords: Microwave waves, BTS antenna, Electromagnetic field, Power density

Investigation of plastic residues in waters of Mashkid Dam (the study area of Sistan and Baluchestan)

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Abstract

The increasing pollution of plastics has caused a lot of concern among people and environmental researchers. Today, research on microplastic pollution, especially in fresh water, has attracted the attention of researchers all over the world. In the summer of 2023, 20 points of fresh water of Mashkid Dam were sampled. The samples were analyzed using a two-step separation method based on density, acid digestion and visual counting with a microscope. Micro Raman analysis was done to identify the type of polymer and SEM-EDX analysis was done to check the morphology and surface contamination of the particles. Finally, in order to have a clear picture of the dangers of these particles, risk assessment indices such as Pollution Load Index (PLI), Integrated Pollution Index (IPI), Polymer Hazard Index (PHI) and Potential Environmental Hazard Index (PERI) were calculated. The most found forms of fibers and parts were due to their use in fishing nets, clothes, toys, packaging and bottles. The most common color in all the samples was white due to its widespread use in the clothing of the people of the region, fishing nets, the body of fishing boats, and the most polymers found were PS, PET and PA due to its widespread use in packaging, textiles and fishing nets. The values of Pollution Load Index (PLI), Integrated Pollution Index (IPI), Polymer Risk Index (PHI) and Potential Environmental Risk Index (PERI) were in the low and medium range, which is due to the low population and human activity. It was the area. According to the obtained results, measures should be taken regarding the production and consumption of plastics, such as establishing environmental laws, reducing consumption and, if possible, replacing them with other materials.

Keywords: Plastic, Microplastic, Polymer, Water, Mashkid Dam**.**

Biomonitoring of monohydroxylated polycyclic aromatic hydrocarbons in people living in a region with frequent oil pipeline incident in Iran: Probabilistic Health risk assessment

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Abstract

Oil spills from pipeline accidents can result in long-lasting health effect in the people lived in a polluted region. Assessing the potential health risks of these accidents is crucial for effective environmental health management. In this study, concentration of 2-OHNAP in urine and hair have been analyzed as biomarkers of PAHs exposure in the residents of a region with frequent oil pipeline incident in Iran. In this study, 50 pairs of hair and urine samples were collected from residents of studied region. In addition, demographic information and dietary habits of the participants were collected using a questionnaire. The concentration of 2-OHNAP was analyzed using high performance liquid chromatography coupled with fluorescence detector (HPLC-FLD). 2-OHNAP was detected in 100% and 88% of the urine and hair samples, respectively. The mean concentration of 2-OHNAP in urine was 16.65 ± 21.98 µg/g creatinine and in hair was 8.16±7.62 ng/g dry weight (dw). However, there was no significant correlations between urine and hair for 2-OHNAP. The mean values of HQ and CR were below 1 and 10-6, respectively. Moreover, some simulated health risk indices were near the threshold levels, and the carcinogenic risk above 70% of the simulated CRs were above 10-6 as well. Therefore, the health risk attributed to the exposure to the parent compound of 2-OHNAP in the study area is currently acceptable, but it is not negligible and may be worsened in the future. This study provides a valuable scientific information for regional decision makers about human health and identifying environmental health priorities.

Keywords: Human biomonitoring, Oil pipeline incident, Hydroxylated polycyclic aromatic hydrocarbons, Hair, Urine, Risk assessment

Monitoring of heavy metals in the domestic effluent and groundwater used for irrigation in the southeastern area of Shiraz

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Abstract

Nowadays, the growing population and shrinking water resources have led to the utilization of wastewater from treatment plants, especially for agricultural irrigation. However, if this wastewater fails to meet the required standards, its pollutants, including heavy metals, can accumulate in the soil and even find their way into agricultural products.

In this study, the levels of heavy metals (Iron, Zinc, Nickel, Arsenic, Cadmium, Manganese, Chromium, Cobalt, Copper, and Lead) in the wastewater used for irrigating agricultural lands in the Gerdkhoon region were monitored and compared with the level of heavy metals in groundwater employed for agriculture in the Shorghan region. After sample preparation, the concentration of heavy metals (iron, zinc, nickel, arsenic, cadmium, manganese, chromium, cobalt, copper and lead) was measured using an ICP-OES device.

The study findings indicated levels of iron and zinc was higher than other metals in both regions. Concentration of iron and zinc in Gerdkhoon were 1.87 and 1.39 mg/liter, respectively, whereas in Shorghan, these levels were measured at 0.195 and 0.068 mg/liter. The concentrations of other metals were chromium (0.01 mg/L), nickel (0.008 mg/L), arsenic (0.008 mg/L), magnesium (0.008 mg/L), cobalt (0.005 mg/L), lead (0.003 mg/L), copper (0.003 mg/L), and cadmium (0 mg/L), respectively. The concentrations of all metals in the two regions were lower than the Iranian water and wastewater standard for irrigation water.

Continuous and precise monitoring is essential not only for safeguarding human health and the environment but also for refining wastewater treatment systems. It plays a pivotal role in maintaining stringent quality control measures in agricultural and urban areas, thereby ensuring the safety and integrity of our ecosystem.

Keywords: Effluent, Heavy metals, Irrigation, Groundwater, Shiraz.

Determination of aflatoxin M1 in Cow Milk on the Retail Dairy Market in Gorgan, Iran

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Abstract

Milk and milk products are the main nutritional foods for all age groups, especially forinfants and children. Milk may be dangerous to consume due to the presence of a harmful substancecalled Aflatoxin M1 (AFM1). The objective of this study was to assess the levels of AFM1 in milk, particularly those that exceed the standards set by the European Union (50 ng/L), the Food and DrugAdministration (500 ng/L), and the Iranian National Standards Organization (100 ng/L). The studyincluded one hundred and eighty samples of raw cow's milk from various retail dairy markets inGorgan, with 45 samples collected during each season. The level of Aflatoxin M1 in the samples wasmeasured using the enzyme-linked immunosorbent assay (ELISA) technique. AFM1 was detected in139 (72.2%) raw cow milk samples with a range of 3.5–357 ng/L. All of the samples collected hadAflatoxin M1 concentration levels that were below the maximum limit of 500 ng/L set by the FDA.However, 41 samples (22.7%) exceeded the EU's limit of 50 ng/L, and 26 samples (14.4%) exceededthe INSO's limit of 100 ng/L for Aflatoxin M1 in raw cow's milk. The lowest nd highest AFM1 levelsof contamination were detected in the summer and winter seasons, which constituted 32 (71.1%)and 38 (84.4%) samples, respectively. The consumption of raw cow milk can lead to health risks forindividuals from various age groups because regulatory limits are not being followed.

Keywords: Aflatoxin M1, ELISA, Gorgan, Iran, Raw milk

The defense mechanisms of plants to heavy metals in the environment

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Abstract

Today, the use of plants as a desirable and environmentally friendly approach to combat the presence and destructive effects of pollutants such as heavy metals has attracted a lot of attention due to their high efficiency, ability to absorb various pollutants, and their different resistance. Therefore, conducting scientific studies on the ability to absorb and understand the various responses of plants when exposed to these pollutants is of great importance in order to exploit their potential. Therefore, this study investigated the defense mechanisms of plants in dealing with environmental stresses and pollutants such as heavy metals. In this regard, the findings indicated that plants, when exposed to heavy metals, employ a complex network of defense strategies to prevent them from entering their organs and also to detoxify them. The first defense mechanism of plants is biophysical barriers, such as the use of certain morphological structures and symbiosis with microorganisms, to prevent metals from entering their organs. But sometimes heavy metals pass through the plant's biophysical barriers, resulting in metal ions entering the plant's cells and tissues. In order to reduce or eliminate the adverse effects of pollutants, plants initiate various cellular and biochemical defense mechanisms, including the production of various cellular biomolecules such as low molecular weight metallochaprones, metallothioneins, heat shock proteins, and specific amino acids. However, when these strategies are unable to reduce, eliminate, or limit the toxicity of metal pollutants in plants, the balance of cellular redox systems in plants is disrupted, leading to increased production of reactive oxygen species (ROS) in the plant. This causes the creation of free radicals within the plant and paves the way for further damage to the plant. At this time, plants activate their enzymatic and non-enzymatic antioxidant defense mechanisms, such as the production of superoxide dismutase enzymes, catalase peroxidase, or compounds such as metallothioneins, proline, etc., in order to protect and combat oxidative stress and prevent cell death.

Keywords: Enzymatic antioxidants, Reactive oxygen species, Environmental pollutants, Heavy metals, Plant defense mechanisms

Assessment of emission situation of electromagnetic wave from BTS telecommunication towers in Ilam city

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Abstract

Mobile phone is one of the most important technological products, which due to the increasing demand and widening of its services, has caused the increase of BTS telecommunications towers in different places; So that, along with its beneficial effects, its possible biological effects require further investigation. Therefore, the present study was performed with the aim of determining the state of microwave emission from the BTS telecommunication towers in Ilam city. This cross-sectional study was performed on the telecommunication towers of selected areas of Ilam city, including 50 BTS antennas, by census method. According to IEEE 95.1 TC standard, the power density of electromagnetic waves around the antennas was measured in two near fields (less than 20 meters) and far fields (more than 20 meters). Then, the effect of humidity, temperature, traffic conditions and the type of facades of the surrounding buildings on the density was investigated. In this study, there was a significant difference between the power density in different distances (15, 50, and 100 m) ($p<0.001$). No significant difference was observed in the median density at 15 m in clear and rainy weather conditions ($p=0.324$), while there was a significant difference at 50 and 100 m ($p<0.05$). Also, no significant difference was observed in the effect of temperature and time on density ($p>0.05$). In investigating the effect of different materials in the buildings around the telecommunication masts, the effect of stone facades on wave attenuation was greater than that of cement and brick facades. The power density of BTS antennas in all stations is much lower than the threshold limits and follows national and international standards. With the increase of the distance, the amount of electromagnetic waves emission has decreased; In other words, there was the highest amount at 20 m and the amount decreased in the following distances; So that this reduction rate is much higher in rainy conditions and high air humidity.

Keywords: Microwave waves, BTS antenna, Electromagnetic field, Power density

Lentinus edodes Laccase: A Promising Biocatalyst for Environmental Pollutant Detection, Monitoring, and Remediation

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Abstract

Lentinus edodes laccase, an enzyme derived from *shiitake* mushrooms, holds significant promise for applications in environmental monitoring and remediation. This versatile enzyme features broad substrate specificity, high catalytic efficiency, and stability across diverse environmental conditions. By catalyzing the oxidation of pollutants such as phenolic compounds, aromatic amines, and heavy metals, *Lentinus edodes* laccase offers a sustainable and eco-friendly approach for pollutant detection, monitoring, and mitigation. Its applications include biosensor development, water and soil quality monitoring, and the bioremediation of contaminated environments. Despite challenges such as stability in extreme conditions and substrate limitations, ongoing research is working to enhance laccase-based technologies for efficient environmental management.

Keywords: Lentinus edodes, Laccase, Environmental pollutants, Enzyme

Investigating radiation accidents and incidents in radiation therapy centers and how to deal with it: an evidence-based review report

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Abstract

Radiation accidents are unusual and abnormal overexposure to radiation, but they can have long-term health consequences. Radiations are used in various applications, the main sectors include various industries, medical and hospital cases, and military industries.

In this review study, by searching for articles from 2009 in Science direct, Scopus, PubMed and some library sources, the necessary scientific information and data about radiation accidents and incidents and how to deal with them have been collected and in this review study It has been discussed and concluded. Single and combined keywords such as radiation accidents, radiation therapy centers, radiation exposure, and radiation accident management were used to search for articles.

One of the lessons learned in the Lilo radiation incident is that the presence of radiation sources and contamination with radioactive materials should always be considered as a potential hazard, especially in an unknown environment, the International Atomic Energy Agency has developed the "Code of Conduct on the Safety and Security of Radioactive Resources" and "Guidelines for the Import and Export of Radioactive Resources.

Management of radiation accidents is a very challenging process. Nuclear medicine physicians must be well organized to provide appropriate management of any type of radiation incident, including rapid triage of injured persons, rapid diagnosis of radiation casualties, and prompt initiation of specific treatment procedures**.**

Keywords: Radiation accidents, Radiation therapy centers, Radiation exposure, Radiation accident management.

Occurrence of microplastics in the most popular sausage brands in Iran

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Abstract

Microplastic (MPs) pollution, as a novel environmental contaminant, has recently entered human life and the food chain. The main objective of this study was to investigate the presence of microplastics in various brands of Iranian sausages.

Qualitative and quantitative analyses of microplastic particles were conducted using stereo and fluorescence microscopy, Fourier Transform Infrared spectroscopy (FT-IR), and X-ray diffraction spectroscopy with scanning electron microscopy (SEM-EDS). Samples were collected from popular sausage brands in Iranian markets.

The findings showed that the various sausage brands contained an average abundance of 25.7 ± 21.68 (range 10–70) and 55.45 ± 45.5 (range 10–175) particles/kg based on optical and fluorescent microscopy analyses, respectively. Predominantly, MPs were identified in fiber form (77–89 %), with a smaller proportion present in fragmented form (11–23 %). Polymer analysis using FT-IR identified polyethylene (PE) and polystyrene (PS) as the primary constituents. These results emphasize the potential of MPs contamination to penetrate into different food products including sausages through processing routes, which can threaten human health.

Keywords: Food contamination, Microplastics, Processed food, Sausage

Assessment of the non-carcinogenic risk of exposure to triclosan through urban tap water in Isfahan

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Abstract

Triclosan is an antibacterial compound that is considered as an emerging pollutant in the environment. It is used in the formulation of cosmetics, detergents, and toys. After entering the wastewater, it is transferred to the municipal wastewater treatment plants. Since these treatment plants are not capable of removing it completely, it will come out the water sources. Then, it come in the human body through ingestion, dermal absorption, and inhalation during the consumption of drinking water. Human exposure to this pollutant causes endocrine disorders, weight gain, skin irritation, fertility reduction, and so on.

Aims: In the present study, the non-carcinogenic risk of triclosan was assessment through urban tap water consumption (ingestion, dermal absorption, and inhalation routes) in Isfahan city.

A total of 30 water samples were collected from the different zones of Isfahan in 2022. Moreover, the concentration of triclosan was determined by a gas chromatograph equipped with mass spectrometry (GC/MS). A questionnaire was completed by the citizens to determine the body weight, the ingestion rate of water, and so on. Finally, the non-carcinogenic risk was determined by the risk coefficient (HQ).

The results showed that the average total HQ for male was 7.79×10^{-5}, 4.97×10^{-4}, and 4.97×10^{-5}, and for female was 3.31×10^{-5}, 2.11×10^{-4}, and 2.11×10^{-5} based on reference doses (RFDs). According to the results, the concentration of triclosan in water and the ingestion rate of water had the highest effect on the risk changes. This study recommends promotion water treatment plant processes to remove emerging pollutants by applying advanced processes.

Keywords: Triclosan, Organic micropollutants, Municipal tap water, Health risk assessment, Isfahan

A Systematic Review and Meta-Analysis on the Soil Heavy Metals in Iran

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Abstract
The presence of heavy metals (HMs) in the soil can pose risks to human health via ingestion and dermal absorption. This systematic review and meta-analysis study focused on the concentration of six HMs (As, Cd, Cr, Cu, Pb, Zn) in the soil of different Provinces of Iran. Articles were selected in the Web of Science and Scopus from 2000 to August 2021. The study was carried out according to Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guideline. Based on the inclusion and exclusion criteria, finally 32 studies were reviewed which the ranking of mean concentrations of the studied metals followed as: As > Zn > Cr > Pb > Cu > Cd. Mean concentration of Cd and As calculated via meta-analysis in the studied Provinces was found to be more than Iran's environment protection agency (EPA) guideline values. Other HMs met guideline values. Hence, we can conclude that Cd and As are important heavy metals from the health aspect and control of their release in the environment and remediation of polluted sites through novel approaches is recommended.

Keywords: Arsenic, Cadmium, Heavy metal, Soil pollution.

Knowledge, attitude, and practices toward Microplastics: implications for minimizing use and pollution

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Abstract

This study aims to evaluate knowledge, attitude, and practice (KAP) of people towards Microplastics (MPs). Data were collected from 500 residences in Kerman City, southeast Iran, in 2023 through a questionnaire that was designed and validated by the authors. More respondents were female (65%), 18–30 years old (43%), undergraduate (48%), and students (35%), and 63% of respondents sorted garbage. Respondents had good knowledge towards general information, but not towards expert information. The highest percentage of respondents with correct answers to the knowledge questions (80%) had the knowledge about environmental pollution to MPs, causing diseases in humans. The maximum percentage of respondents agreed to the attitude questions (57%) agreed with the point that food sellers should recommend cloth bags to shoppers instead of plastic bag, and 60% of them would like to know more about MPs. In terms of practice, 41% of the respondents stated that they usually leave plastic waste in the environment. The current study showed that there is limited information about MPs in books and among the public. Education and offering free reusable bags were considered as the effective policies to reduce MPs pollution. Also, less environmental awareness and poor management were considered as challenges to reduce emission of MPs.

Keywords: Microplastics, Environmental Pollution, Public Health, Kerman City.

Assessment of Bacterial and Fungal Contamination in Refrigerators at Ghaem Hospital in 2021

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Abstract

Microorganisms are ubiquitous in nature, their presence in a certain place and suitable conditions such as refrigerator dictates for reproduction, pathogenicity or otherwise. The aim of this study was to investigate the microbiological load in hospital refrigerators. Sterile swab sticks moistened with peptone water were used to swab the refrigerator parts of interest. The swabs were aseptically transferred to appropriate culture media and the cultures incubated at 37°C for 24 hours. A 200 samples were obtained from 100 h refrigerators and in each of the first group, 30 refrigerators were checked completely randomly, while in the second group, 70 refrigerators were checked randomly. The prevalence of microbial pathogens in the refrigerator samples assessed. Bacteria had the highest prevalence (100%) followed by fungi (63%). the evaluations showed that the bacteria identified in the refrigerator include Staphylococcus aureus, Escherichia coli, Shigella, Pseudomonas aeruginosa, Aeromonas hydrophilia, Klebsiella pneumoniae, Salmonella type, Streptococcus pyogenes, Proteus mirabilis, Candida albicans, and Aspergillus flavus. The dominant bacterial species in the refrigerator were Staphylococcus aureus, Escherichia coli, and Shigella. The dominant fungal species were Aspergillus and Candida albicans. The presence of these organisms, including potential pathogens in hospital refrigerators, has serious implications for the health of patients and staff. The need to maintain appropriate food storage and refrigerator management, and proper hand hygiene is recommended.

Keywords: Microbial, Pathogens, Refrigerators, Hospital

Monitoring of Glyphosate Concentration in Women Urine with Breast Cancer

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Abstract

In this study, glyphosate concentrations were monitored in Isfahan city water sources as well as in the urine of women with breast cancer and compared with those of healthy women.

A descriptive-analytical case-control study was conducted in which 88 urine samples was collected from women with breast cancer (case group) and healthy women (control group). The liquid chromatography (LC/MS) was used to quantify the concentrations of glyphosate and its metabolite (aminomethylphosphonic acid). This study also collected information about economic and social characteristics (education, income, job) from the participants through a questionnaire.

Women with breast cancer had median concentrations of glyphosate and AMPA in urine samples equal to 0.877 and1.09×10^{-3} µg/g of creatinine, and healthy subjects had median concentrations equal to 0.863 and 9.01×10^{-4} µg/g of creatinine. The logistic regression test was conducted to identify a relationship between glyphosate concentration and breast cancer in the presence of AMPA variables. The results showed that the concentration of glyphosate and AMPA did not significantly correlate with the risk of breast cancer

In spite of the fact that glyphosate concentration in the urine of the two groups was not significantly different, exposure to glyphosate can increase breast cancer risk.

Keywords: Glyphosate, Aminomethylphosphonic acid, Breast cancer, Urine

Assessing the deterministic and probabilistic health risk of glyphosate due to surface and underground water consumption

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Abstract

As the usage of pesticides for both agricultural and non-agricultural uses increases, it is more important than ever to employ probabilistic methods rather than deterministic ones to calculate the danger to human health. The current work demonstrates the application of deterministic and probabilistic approaches to assess the human health risk related to glyphosate during the consumption of surface and groundwater by different population groups. To that aim, the concentration of glyphosate pesticide in the surface and groundwater was measured and human health risk for three population groups including children, teens, and adults was evaluated. The probabilistic approach via Monte Carlo simulation showed a valid result for the estimation of human health risk and determination of dominant input parameters. The health risk of glyphosate exposure during water consumption for various population groups were evaluated using deterministic and probabilistic methods. The modeling is performed by Crystal Ball (11.1.2.4) software, as open access software, and requires a limited number of inputs. The probabilistic method could reliably assess the risks of glyphosate by considering the variability and uncertainty in input variables. For children, teens, and adults, the HQ values were calculated using a deterministic method using and to assess the possible human health risk of glyphosate during surface and groundwater consumption. the HQ values for all population groups are less than 1, indicating that there is no risk to human health from glyphosate during surface and groundwater consumption. However, the findings showed that children have higher HQ levels than teens and adults. the estimated HQ value using the deterministic and probabilistic approaches are relatively closed, indicating that the Monte Carlo simulation may be utilized successfully for HQ estimation. The percentiles in the probability distribution of HQ produced with the probabilistic technique were irregular, the HQ values estimated with the deterministic approach might understate the risks of glyphosate to human health This work confirms the HQ estimation by probabilistic approach via Monte Carlo simulation is valid for the estimation of human health risk and determination of dominants input parameters

Keywords: Glyphosate, Surface water, Groundwater, Risk assessment, Monte Carlo simulation, Sensitivity analysis, Drinking water quality index (DWQI)

Microbial Communities in the Plastisphere and Their Role in the Biodegradation of Microplastics in Aquatic Environments

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Abstract

Plastic pollution, especially microplastics, is recognized as a serious environmental challenge for aquatic ecosystems and human health. The increasing use of plastic has led to the deposition of these materials and their transformation into microplastics, which act as global pollutants, causing toxicity and disrupting biogeochemical cycles. This study examines microbial communities in the plastisphere and their role in the biodegradation of microplastics. Microorganisms attached to microplastics can use them as substrates for growth. These surfaces are typically colonized by "plastisphere microbes," forming biofilms in the water. Microbes such as Nostoc, Scytonema, Navicula, and Cyclotella act as primary colonizers. Groups like Gammaproteobacteria and Alphaproteobacteria are also dominant and can degrade microplastics by secreting catabolic enzymes. This research is a review study that investigates microbial communities in the plastisphere and their role in the biodegradation of microplastics in aquatic environments. It involved searching reputable Iranian and international databases, including Google Scholar, PubMed, Embase, Science Direct, and SID, using keywords such as Microplastic, Plastisphere, Biodegradation, human health, and Microbial Communities. Among the reviewed articles, 23 were selected and included in the study. These articles, published in reputable journals up to 2024, were carefully compared and analyzed to achieve a more comprehensive understanding of the current situation. This article provides deeper insights into the distribution, transport, and biological degradation of microplastics. It also examines the mechanisms of colonization and microbial interactions in the plastisphere and their impact on the degradation processes of microplastics. Future research is suggested to focus on the geographical distribution of microplastics and the development of biodegradable materials.

Keywords: Microplastics, Plastisphere, Microbial Communities, Biodegradation

Urinary concentration of parabens in an Iranian population and Its Association with Personal Care Product Use and dietary habits

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Abstract

Despite the widespread use of parabens as antimicrobial preservatives in personal care products (PCP) and foodstuffs, recent studies show that exposure to parabens could result in endocrine disruption. We evaluated the relationships between the use of individual personal care products (PCPs) and food items with the urinary Methylparaben (MP), Ethylparaben (EP), Propylparaben (PP) and Butylparaben (BP) among 178 Iranian adults. The urinary concentrations of parabens were found to be significantly different between low, medium, and high users of PCPs ($P<0.05$). The frequency of personal care product use was associated with higher urinary levels of MP, PP and BP concentrations and the frequency of food product use was associated with higher urinary MP and EP concentrations. The urinary concentration of parabens was higher in individuals who used body wash, makeup base, shaving cream and, lotion in the past 24 hours compared to non-users. Consumers of cookies and dairy products had significantly higher urinary MP and jelly consumers had higher urinary MP and PP concentrations than non-consumers. Our findings indicated that certain types of foods and PCPs could be important sources of exposure to parabens. These findings can serve as a basis for more extensive studies to investigate the extent of exposure to parabens, and to apply appropriate strategies for reduction of their exposure.

Keywords: Urinary parabens, Personal care products, Biomonitoring, Foodstuffs, Exposure

A comparative study of the protective status, safety and attitude on the received dose among people working in the radiology and radiotherapy departments of Tabriz hospitals in 2019

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Abstract

Ionizing rays are one of the harmful factors in work environments that can cause serious harm to exposed people. Radiation workers are people who are may be exposed to high amounts of radiation compared to other members of society. The purpose of this study is to compare the protection and safety status of radiology and radiotherapy departments of hospitals, as well as to evaluate the knowledge and attitude of radiation workers and the amount of dose received among them. In this cross-sectional study, the radiology and radiotherapy departments of 8 hospitals with 303 employees were examined using a checklist of data related to safety conditions and the status of compliance with health requirements. The results of the safety attitude survey showed that the average safety attitude score among 216 out of 303 participants in this part of the study was more than 75 out of 100. The average overall score obtained for compliance with the checklist items in all hospitals, on average, in the three departments of radiation safety, public safety and emergency situations, respectively, were 75.5±10.22, 88.23±8.57, and 05.10±59, respectively. It is 47. In this study, the safety attitude of people was more than average, and therefore it shows the positive attitude of radiation department employees towards compliance with safety items. Due to the positive attitude of the employees and compliance with safety principles, the amount of dose received by most people was within the standard range. Therefore, it can be concluded that a positive attitude, compliance with safety and health principles can have positive effects on the health of employees in these departments.

Keywords: Radiology, Radiotherapy, Radiation workers, Health, Safety, Hospital

Contamination by four harmful elements in children's Product in Iran

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Abstract

Toys are the most important tools for children's entertainment teaching, as well as for learning. Non-standard entertainment products contain metals such as zinc, lead and cadmium. Large quantities of lead are used in kids' toys as paint dryers or stabilizers. Exposure to high concentrations of these metals can have adverse health effects. In this descriptive-analytical study, aimed at to investigating harmful elements in children's Product in Iran. Twenty Iranian samples (13 play dough samples, 6 finger paint, and 1 face paint sample) from different cities of Iran (North, South, East, west and Central Iran) and 10 imported samples (4 play dough samples, 4 finger paint samples and 2 face paint samples) were bought. After preparation and digestion of the samples in the laboratory, the concentrations of the aforementioned heavy metals in samples were determined using atomic absorption spectrophotometer (AAS). SPSS software (version 25) was used for data analysis, the significant level was 0.05. There was no statistically significant difference in the mean concentrations of arsenic, cadmium, chromium and lead between domestically produced and imported play dough, face and finger paints ($p > 0.05$). According to the results of the study, the maximum concentrations of harmful elements in the toy samples produced in Iran were chromium (5.41 ± 6.2 mg/kg) and lead (2.12 ± 7.58 mg/kg), respectively. Also, the mean concentrations of the harmful elements were not higher than the guideline values recommended by Iranian National Standards Organization and the European Commission

Keywords: Cadmium, Children products, Toys, Potentially toxic elements, Finger paint, Face paint

Review of Physical Methods for the Removal of Diazinon Pesticide from Aqueous Solutions: A Systematic Review

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Abstract

The widespread use of Diazinon pesticide in agriculture poses a significant risk to both human health and the environment, highlighting the need for effective removal from water sources. The introduction of this compound into aquatic ecosystems can have detrimental effects on ecosystems and living organisms. As a result, this study aims to explore physical methods for eliminating diazinon from aqueous solutions. A thorough search was conducted across reputable databases such as Scopus, PubMed, ScienceDirect, and Web of Science to gather relevant information. Key factors including authorship, publication year, adsorbent type, optimal pH levels, initial pollutant concentration, ideal contact time, maximum adsorption capacity, adsorption isotherms, and removal efficiency were carefully analyzed. Out of 820 articles reviewed, 87 were selected based on inclusion and exclusion criteria, providing essential insights into the removal of diazinon from water solutions.

Keywords: Diazinon, Removal, Systematic review, Aqueous solution

Assessment of Non-Carcinogenic Risks and Spatial Distribution of Heavy Metals in Drinking Water Across Rural Areas in the Northern Half of West Azarbaijan Province, Iran

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Abstract

Exposure to heavy metals in drinking water can lead to serious health issues. This study aimed to analyze the concentration and spatial distribution of arsenic (As), chromium (Cr), cadmium (Cd), and lead (Pb) and to assess the associated non-carcinogenic risks in eight cities within the West Azerbaijan province of Iran. A total of 85 water samples were collected from randomly selected wells in these cities, and the concentrations of the heavy metals were determined using standard analytical methods. Maps depicting the concentration distribution were created, and non-carcinogenic health risks related to ingestion and dermal exposure were evaluated for four age groups: infants, children, teenagers, and adults. The results indicated that arsenic had the highest measured concentration (84.7 ± 68.99 µg/L), while cadmium had the lowest (0.01 ± 0.004 µg/L). The health risk assessment findings revealed that dermal exposure to heavy metals does not present significant non-carcinogenic risks. However, the calculated risks for oral exposure to arsenic were alarmingly high. The highest hazard quotient for oral exposure to arsenic was recorded in city G (82.64). Immediate action is recommended to ensure the provision of safe drinking water in the affected areas.

Keywords: Arsenic, Cadmium, Chromium, Lead, Risk assessment, Groundwater, West Azarbaijan

Natural Ventilation in Iranian Traditional Bakeries: Public Health Implications During Viral Outbreaks, such as COVID-19

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Abstract

Respiratory viruses, such as COVID-19, are primarily transmitted via airborne respiratory droplets produced during breathing, coughing, and sneezing. This poses a substantial infection risk. While mechanical ventilation is crucial, natural ventilation offers a sustainable, affordable alternative, particularly in resource-limited settings. This study assessed natural ventilation practices in 142 traditional bakeries in Semnan province, Iran, to evaluate adherence to Iranian ventilation standards during respiratory virus outbreaks and identify areas for improvement in health guideline compliance.

This descriptive-analytical study used stratified random sampling to select bakeries. Measurements included airflow rate (dm^3/s per m^2), airflow per person (dm^3/s per person), and air changes per hour (ACH). Data analysis was performed using Excel 2019.

The results showed only 40.8% of bakeries met the recommended ACH of 20 changes per hour. While 94.4% met the Iranian ventilation rate recommendations of 14.1 dm^3/s per person and 3.5 dm^3/s per m^2, the average airflow was 134.29 ± 78.75 dm^3/s per person and 17.89 ± 9.69 dm^3/s per m^2.

This study highlights the need for improved ventilation in traditional bakeries to mitigate respiratory virus transmission. Although many bakeries meet basic airflow standards, insufficient ACH levels raise concerns about worker and customer protection during outbreaks. Future efforts should focus on implementing design modifications or installing ventilation systems to ensure compliance with health guidelines and enhance pandemic preparedness. Further research should investigate cost-effective ventilation solutions tailored to the specific needs of traditional bakeries.

Keywords: Respiratory infections, Airborne transmission, Epidemic, Building ventilation

Platform session 4:
General Environmental Health

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Oral Presentation

Environmental Health Challenges and the Need for Collaboration Among Universities, Government Institutions, and Society to Enhance Public Health

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Abstract

This study aims to investigate the role of governance and social responsibility in improving environmental health and its impact on public health. Given the importance of environmental health in maintaining well-being and preventing diseases, the research focuses on the role of scientific centers, particularly schools of public health, in enhancing the effectiveness of environmental health programs and services. This research is a review study, and to collect documented information, it utilizes reputable scientific databases such as Google Scholar, PubMed, Scopus, and ResearchGate, along with internal databases, three decades of field experience, governance resources, and internal field reports. The information obtained from these sources, combined with scientific field experiences in the country, has been analyzed in the context of enhancing environmental health.The findings indicate that the state of environmental health in the country, across various sectors, including water resources and consumption, wastewater management, air quality, waste management, food safety control, environmental mapping, land subsidence, fuel management, leachate and septic systems, polluted water, river and sea management, forests and natural resources, hazardous industrial waste management, industrial and hospital wastewater management, pollution monitoring, and other environmental aspects, reflects the consequences of a weak governance system, lack of academic presence in the social arena, and ineffectiveness of academic and scientific centers in the health system. A comprehensive governance system based on social responsibility can contribute to the sustainable development of environmental health services. The findings of this study emphasize the importance of the social responsibility of universities and scientific centers in providing effective environmental health solutions. The development of research structures and the formulation of a scientific and operational roadmap for environmental health, along with the establishment of effective collaborations with executive bodies, are prerequisites for improving quality of life and protecting the environment in society.

Keywords: Environmental Health, Challenges, Governance, Social Responsibility

Assessing human health and ecotoxicity impacts of agricultural pesticide use in Iran

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Abstract

The human health and ecotoxicity impacts of agricultural pesticide use in Iran in 2022 were estimated. The impacts of agricultural pesticide use in Iran by pesticide, crop, and province were assessed based on the USEtox model in terms of disability-adjusted life year (DALY) for human health and potentially disappeared fraction of freshwater ecosystem species (PDF) for ecotoxicity. The annual mass of agricultural pesticide use in Iran in 2022 was 17,188 tons, consisting of herbicides (46.2%), insecticides (30.0%), and fungicides (23.8%). The DALYs and DALY rate (per 100,000 people) of agricultural pesticide use in Iran were determined to be 25,140 and 29.4, respectively. The ecotoxicity impact of agricultural pesticide use in Iran was calculated to be $3.35\times10^{+12}$ PDF.m^3.d. Over 79% of the human health and ecotoxicity impacts of agricultural pesticide use were attributed to six pesticides (chlorpyrifos, deltamethrin, ethion, phosalone, thiodicarb, and abamectin) and eight crops (pistachio, apple, fig, vegetables, date, orange, wheat and barley, and cotton). While the contributions of the pesticides to the human health and ecotoxicity impact were not the same, chlorpyrifos ranked highest in both human health (28.8%) and ecotoxicity (49.9%) impacts. The highest provincial human health and ecotoxicity impacts of agricultural pesticide use were observed in Tehran (4201 DALYs) and Fars ($3.66\times10^{+11}$ PDF.m^3.d), respectively. The provincial human health and ecotoxicity impacts were mainly driven by population and cropland area, respectively. Given the considerable human health and ecotoxicity impacts, developing national and provincial action plans for more sustainable use of pesticides in Iran is strongly recommended.

Keywords: Ecotoxicity impact, Environmental health, Exposure assessment, Food safety, Pesticide

Using fuzzy Delphi Technique to identify and prioritize health indexes of the pastoral nomadic tribespeople in Iran

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Abstract

The unique migratory lifestyle of Iran's nomadic pastoral tribes (NPT) poses significant challenges for health service delivery, compounded by the absence of an appropriate health infrastructure tailored to their needs. To ensure health equity and support sustainable development, it is essential to address the health needs of all segments of Iran's population, including NPTs, alongside urban and rural residents. This study began by extracting health indicators relevant to NPTs from existing literature. Using the Fuzzy Delphi and TOPSIS methodologies, indicators were then assessed for their relevance to NPTs based on three main criteria: economic efficiency, measurability, and simplicity. The study ultimately analyzed 13 key health components and their respective indicators. Fuzzy Delphi analysis revealed that mental health had the lowest score across all three criteria, indicating significant challenges in assessing this area for NPTs. Conversely, child care was found to be the most cost-effective, and vaccination scored the highest in terms of measurability and simplicity. TOPSIS results highlighted vaccination, maternal care, and child care as the top priorities for NPT health improvement, with scores of 0.976, 0.897, and 0.825, respectively. These findings underscore the importance of focusing on these indicators to enhance health outcomes for nomadic populations in Iran.

Keywords: Nomadic Pastoral Tribespeople, Nomadic Community, Health Indexes, Fuzzy Delphi, Iran.

Investigating the presence of Mucorals in hospital environments: strategies for effective environmental monitoring

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Abstract

Mucormycosis is an invasive fungal infection (IFD) that primarily affects immunocompromised patients, such as those with COVID-19, leading to significant morbidity and mortality in hospital settings. This underscores the critical need for infection prevention and control in healthcare facilities to protect vulnerable patients. Recognizing environmental surveillance as a valuable tool in identifying potential sources of Mucormycosis within hospitals, this study aimed to investigate the role of the hospital environment in the dissemination of Mucorales in the air, on surfaces of air conditioning exhausts, and in the water and biofilms of drinking water distribution systems in the intensive care units (ICUs) of hospitals in Isfahan. The investigation revealed that Mucorales were not detected in air samples or the water and biofilm samples from the drinking water distribution system of hospitals, with detection occurring in only 17% of the air conditioning exhaust surface samples. Among Mucorales, *Rhizopus* was the dominant species identified. Sensitivity testing of the species to common disinfectants showed that 100% of the isolates were resisted common disinfectants. The findings of this study show that the hospital environment, particularly the air conditioning exhaust, may act as an important reservoir for agents causing fungal infections. This highlights the importance of environmental monitoring in preventing and controlling nosocomial fungal infections.

Keywords: Nosocomial infection, Mucorales, Disinfectants, Environmental monitoring.

Poster Presentation

Assessment of health risk and burden of disease associated with dietary exposure to pesticide residues through foodstuffs in Iran

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Abstract

The health risk and burden of disease associated with dietary exposure to pesticide residues in foodstuffs in Iran were assessed. The pesticide residue levels (109 pesticides) in foodstuffs (43 food items) by pesticide-foodstuff pair (340 pairs) in the country were determined through systematic review of three international databases (PubMed, Scopus, and Web of Science) and meta-analysis. The non-carcinogenic risk, carcinogenic risk, and attributable burden of disease from pesticide residues in foodstuffs were estimated in terms of hazard quotient (HQ), incremental lifetime cancer risk (ILCR), and disability-adjusted life year (DALY), respectively. The meta-analysis outputs revealed that 58% of the pesticide-foodstuff pairs did not have Codex maximum residue levels (MRLs), while 34% of the cases had pesticide levels below these limits and 8% of the cases exceeded them. Based on the average HQ values, two foodstuffs (onion and tangerine) and two pesticides (haloxyfop-R-methyl and cyhalothrin) exhibited unacceptable non-cancer risk values (> 1.0). The average ILCR values of pesticide residues by foodstuff ranged from 1.5×10^{-8} (negligible risk level) for grape to 8.9×10^{-5} (tolerable risk level) for cucumber. The average ILCR value of lindane was assessed to be at the unacceptable level (1.4×10^{-4}). The total annual disease burden values attributable to pesticide residues in foodstuffs were assessed to be 295 for cancer incidence, 0.36 for cancer incidence rate (per 100,000 people), 242 for death cases, 0.29 for death rate, 13,792 for DALYs, and 16.1 for DALY rate. The three food items with the highest attributable DALY rates from pesticide residues were cucumber (5.9), fish (3.9), and date (2.1), accounting for approximately 74% of the total burden of disease. Given the significant disease burden attributed to pesticide residues, it is recommended that national and provincial action plans for managing the dietary exposure risk, particularly for high-risk foods and pesticides, be implemented.

Keywords: Environmental burden of disease, Environmental risk factor, Exposure assessment, Food safety, Health risk assessment

Evaluation of the automotive industry using an innovative circular economy model (Case study of Saipa Automobile Company)

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Abstract

The resources in the world are limited and the future of the industry depends on the "circular economy" because by applying the concepts of the circular economy materials are reused, products are shared and components are recycled at the end of life. Optimizing the vehicle life cycle by adopting circular economy approach can be profitable in the value chain and increase the environmental benefits by 1.5 times. The automobile industry can earn 15 to 20 times the sales value of a car with the circular economy approach and recycling and final recovery of materials, remanufacturing, repair, rental and sharing. The purpose of this article was to evaluate the circular economy of Saipa Automobile Company based on the innovative model (enablers and results) and pay attention to the weaknesses and strengths obtained.

In this research, first, an evaluation model was prepared based on the influential sectors of the circular economy in the automobile industry, and after studying the life cycle of the products, the evaluation of the circular economy in the Iranian automobile industry was done based on the innovative model. Based on the evaluation of the proposed model, the average acquisition score of circular economy in SAIPA automotive industry in the criteria of enablers Including: strategy and innovation, skills and people, operations, external interaction with stakeholders 45% and results criteria including: products and materials, 39%, services 54%, factory, property and equipment 40%, water 60% and energy 14% were obtained. This research shows that it is very important to pay attention to the proper use of resources and its reuse in the industries of our country.

The results of circular economy evaluation in Saipa company showed that Saipa company pays proper attention to various aspects of water recycling and the use of all fresh water (60%), but in the field of energy and optimal use of materials and products, it needs development in the field of circular economy.

Keywords: Evaluation, Recovery, Circular economy, Automotive industry

Association between cutaneous leishmaniasis incidence and the environmental health parameters

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Abstract

Leishmaniasis is a tropical disease that significantly affects countries in the developing world. This study evaluated the environmental factors and building conditions associated with Cutaneous Leishmaniasis (CL) in the northeast of Iran. A population-based case-control study was performed between July 1, 2018, and March 1, 2021, in the southeast of Iran; two controls were selected for each case. Patients and controls were compared for environmental factors, building conditions, and demographic characteristics. There were 170 confirmed Leishmaniasis cases during the study period. Familiarity with people with active Leishmaniasis in open areas of the body more than 2-fold increase the odds of getting the disease (Odds Ratio (OR)=2.41, 95% CI: 1.18-4.93). In the case group, the history of contact with animals, such as sheep, goats, cows, mice, and camels, was significantly higher. The housewives (OR=0.08, 95% CI: 0.02-0.27) and self-employed people (OR=0.22, 95% CI: 0.07-0.70) were less likely to become infected. The individuals who lived in houses with asbestos cement roofs were 4.77 times (OR=4.77, 95% CI: 1.34-16.91) more likely to become infected compared to those who lived in houses with bituminous waterproof. Cases of the disease were reported over the years that corresponded to a native disease transmitted continuously over time. The most significant risk factor identified in the present study was the housing roof conditions, with a significant relationship with Leishmaniasis incidence. Housing construction improvement is a vital measure to prevent Leishmaniasis in the northeast of Iran; thus, it would be necessary for health authorities to implement appropriate controlling strategies with the cooperation of housing and urban planning authorities to prevent the disease.

Keywords: Environmental Health, Leishmaniasis, Tropical disease

Self-Control and Pro-Environmental Behavior: The Role of the New Ecological Paradigm (NEP) in Promoting Pro-Environmental Behavior

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Abstract

This research was conducted with the aim of investigating the relationship between self-control and environmentally friendly behaviors and the role of the new ecological paradigm (NEP) in relation to environmentally friendly behavior in the operators of public places and food preparation and distribution centers. This descriptive-analytical study was conducted on 341 caretakers of Khodabande city in 1402. Sampling was done by accessible method and data was collected using standard questionnaires of environmental attitudes using the new ecological paradigm tool and the short version of self-control and environmentally friendly behaviors. Data analysis was done using SPSSAMOS23 software and path analysis. Based on the findings of the study, the highest and lowest mean score of attitude was respectively in the dimensions of opposition to anthropocentrism and growth restriction. Also, the highest average score of behavior was assigned to the dimensions of energy consumption and water conservation, and the lowest average score was assigned to the dimension of environmental activities. The results of the path analysis showed that self-control (β=0.36) and the new ecological paradigm (β=0.24) have a positive and significant effect on environmentally friendly behaviors. Age has an inverse and significant relationship with the attitude towards the environment based on the new ecological paradigm (β = -0.14). The findings of the study showed that self-control, attitude towards the environment and environmentally friendly behaviors are at the average level and people with higher self-control and positive attitude have better environmental behaviors. Also, environmental behaviors are influenced by factors such as age, gender, and education. Women's behaviors were more influenced by self-control and men's behaviors were influenced by self-control and attitude towards the environment. It is suggested to focus on strengthening self-control skills to empower women in environmental behaviors and organize campaigns for men to strengthen positive environmental attitudes and create social norms.

Keywords: Behavior, Attitude, Environment, Food preparation and distribution, Public places

Circular Economy Based on Biofuel Production from Wastewater Treatment Plant By-Products: The Latest Findings

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Abstract

With the increasing demand for energy resources and environmental pollution caused by the use of fossil fuels, by-products from wastewater treatment plants are being utilized as a promising source for biofuel production. A systematic review approach was adopted to collect studies related to this research. For this purpose, a search was conducted for the period from 2020 to 2024 in five electronic databases, including Scopus, ScienceDirect, Web of Science, Google Scholar, and PubMed. The search strategy was based on keywords such as wastewater, biomass, biofuel, sludge, biomethane, biogas, bioethanol, and others. The search focused on articles published in English. The Initial search yielded 114 studies, which, after matching the Inclusion criteria, resulted in 78 studies being selected and evaluated. In biofuel production, most studies have been conducted in India and China, with the primary raw materials being municipal and industrial wastewater, especially those from food and agricultural industries such as rice farms and dairy industries. These wastewaters, due to their organic content and suitable nutrients, have the potential to be converted into biogas or bioalcohols. The obtained data indicate the widespread use of by-products such as sludge, algae, etc., which can help reduce greenhouse gas emissions, decrease dependency on fossil fuels, renew resources, manage waste, promote economic development, increase energy efficiency in wastewater management systems, and optimize resource utilization. However, biofuel production, according to studies, also faces technical barriers such as the unfeasibility of harvesting techniques, low conversion process efficiency, high harvesting process costs, and others. Research in this area indicates the high potential for biofuel production from wastewater by-products and a reduction in dependency on fossil fuels, which could serve as an effective solution to environmental and energy challenges in the future.

Keyword: Biofuel, Wastewater, Biofuel, Bioethanol, Biomethanol

Risk assessment of exposure to SARS-CoV-2 RNA among wastewater treatment plant's staff

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Abstract

The rising concerns about SARS-CoV-2 RNA transmission via aerosols have prompted extensive research in this area. This study aimed to investigate the concentration of SARS-CoV-2 RNA in ambient air samples from two wastewater treatment plants (WWTPs) utilizing diffused and mechanical surface aeration systems. A total of 48 air samples, both passive and active, were collected at distances of 1.5, 10, and 50 meters from the aeration tanks of conventional activated sludge (CAS) and sequencing batch reactor (SBR) systems. A quantitative microbial risk assessment (QMRA) model was employed to evaluate the infection risk of SARS-CoV-2 for WWTP staff. The results showed that 100% of active and passive samples from the CAS system tested positive for SARS-CoV-2 RNA at a distance of 1.5 meters, while only 5% of passive samples from the SBR system were positive. The QMRA model indicated an annual infection risk of SARS-CoV-2 for WWTP staff of 3.6×10^{-1} (95% CI: 1.8×10^{-7} - 10×10^{-1}) per person per year (pppy), which is approximately 2 to 3 log higher than the WHO (10^{-3} pppy) and EPA (10^{-3} pppy) recommended values. Although the calculated infection risk was high, the infectious potential of SARS-CoV-2 RNA in WWTP bioaerosols remains unclear. Further research is needed to clarify the infectious versus non-infectious nature of SARS-CoV-2 RNA in these bioaerosols.

Keywords: SARS-CoV-2, WWTP, Bioaerosols, Risk assessment, QMRA

Assessment of requirements and challenges of supervision and control at public places and foods production in the field of environmental health and distribution centers by SWOT approach and presenting appropriate strategies, Hamadan city, 2018

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Abstract

Considering the food hygiene and monitoring, control of public places is important for the health of the community. These goals will not be achieved unless the supervisory forces have the necessary scientific and practical capability to do so in this regard, it is one of the duties of the universities of medical sciences and health services throughout the country to control and supervise the centers of procurement, distribution and sale and public places, which is the important task of this body in charge of environmental health inspectors. Failure to provide them with the necessary legal and administrative facilities and tools, and lack of adequate support, will face obstacles and challenges in fulfilling this task. The purpose of this study was to investigate the requirements and challenges of supervision and control of public places and food supply and distribution centers in the field of environmental health by SWOT method and presenting appropriate strategies in Hamadan, 1977. This is a descriptive-analytical a questionnaire study. The research population included environmental health inspectors working in Hamadan Health Center. Data collecting tools were interviews and questionnaires. Qualitative analysis (SWOT) and descriptive statistics were used to analyze the data. The results showed that the obtained scores in the evaluation of internal and external factors at the department of environmental health engineering of Hamadan Health Center is in the place of integration strategy strategic problems can be reduced credits, lack of staff, the lack of incentives for environmental health inspectors to supervise food distribution and distribution centers and public places, weak legal action in the event of a health violation, the lack of training of some operators and workers in food supply and distribution centers pointed to the low level of education. The results of this study showed that environmental health inspectors of Hamadan's health center are at the integration strategy and can overcome the internal weaknesses of the organization using the opportunities available. But there are still problems that require strategic planning and vision that seize on the strengths and opportunities.

Keywords: Challenges, Public Places, SWOT, Strategy, Hamadan

Formulating environmental health strategies in the automotive industry based on SWOT method (case study of Saipa Company)

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Abstract

Foresight in environmental health requires strategy development in every organization, and one of the most important tools for strategy development is the SWOT method. In this article, an attempt has been made to formulate and prioritize the environmental health strategies of an automotive industry using the SWOT method. In the first stage, internal and external factors related to environmental health in Saipa Company were identified and compiled by expert experts. Then the internal factors were divided into 2 categories of weaknesses and strengths and the external factors into two categories of opportunities and threats. In the next step, for each of the factors, a weighting factor and a score were assigned based on the degree of agreement and the factors were weighted. In the next step, each and every factor of weakness, strength, threat, and opportunity was compared with each other and the factors with the highest score were selected as environmental health strategies of the industry in order of priority. Among the strategies extracted in the SWOT method, according to the priority, the item "Implementation of the integrated waste management system of the group companies" was extracted as the most important item for the automotive industry. The SWOT analysis method is a useful analytical model that systematically identifies each of the strengths and weaknesses, opportunities and threats, and examines strategies appropriate to the current situation of the organization. Forward-looking organizations can use this efficient method to formulate their environmental health strategies.

Keywords: Strategy, Environmental health, Prospective, SWOT

Evaluation of cardiovascular health impacts attributed to exposure ambient PM_{10}, SO_2, NO_2, and CO in two metropolises of Iran

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Abstract

In Urmia and Tabriz, two metropolises in Iran, excessive emissions of pollutants from industrial activities, as well as intra-city transportation and heavy traffic, have been causing smog on most days of the year. Additionally, the inflow of dust from Iraq and winds carrying salt particles from Urmia Lake, exacerbated by drought conditions, have worsened the climatic conditions in these cities. Therefore, this study utilized the $AirQ_{2.2.3}$ model software to evaluate the impact of PM_{10}, SO_2, NO_2, and CO on mortality and hospitalization rates due to cardiovascular diseases and acute myocardial infarction in both Urmia and Tabriz. According to the estimates, in both Urmia and Tabriz, the highest cases of mortality and hospitalization due to cardiovascular diseases were attributed to exposure to PM_{10}. In Tabriz, there were 109.8 excess cases of mortality (with an attributable proportion of 2.94) and 207.3 excess cases of hospitalizations. In Urmia, there were 106.3 excess cases of mortality (with an attributable proportion of 5.66) and 200.6 excess cases of hospitalizations attributed to PM_{10} exposure. Notably, after PM_{10}, the highest cases of mortality and hospitalization due to cardiovascular diseases in Tabriz and Urmia were attributed to the NO_2 and SO_2, respectively.

Keywords: Air Pollution, AirQ software, Cardiovascular diseases, Tabriz, Urmia

Neurotoxicity following exposure to micro and nanoplastics

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Abstract

The widespread presence and enduring nature of micro and nanoplastics in the environment make their exposure to humans and aquatic animals unavoidable. Research shows that these small plastic particles can be absorbed by aquatic organisms as well as mammals. Once absorbed, micro and nanoplastics have the potential to penetrate the brain, although the quantity that reaches the brain and the subsequent neurotoxic effects remain under-explored. Previous research has shown that metal and metal-oxide nanoparticles, such as those made of gold (Au) and titanium dioxide (TiO_2), have the capability to enter the brain and cause various neurotoxic effects. Considering the chemical similarities between inert metal (oxide) nanoparticles and plastic particles, this review intends to summarize existing reports on the neurotoxic impacts of micro and nanoplastics across different species and in vitro environments. The available evidence, although incomplete, suggests that being exposed to micro and nanoplastics may trigger oxidative stress, potentially leading to cell damage and a heightened risk of developing neurological disorders. Moreover, such exposure could result in the suppression of acetylcholinesterase activity and alterations in neurotransmitter levels, which might play a role in observed behavioral changes. There is currently a lack of systematic comparison concerning the neurotoxic effects resulting from various particle types, shapes, and sizes at differing concentrations and durations of exposure. Understanding these factors is crucial to further assessing the neurotoxic hazard and risk associated with micro and nanoplastics.

Keywords: Neurotoxicity, Microplastic, Nanoplastic, Oxidative stress, Nanoparticles.

Evaluation degradation of bisphenol A and its derivatives by *Trametes trogii* laccase enzyme using molecular docking

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Abstract

One of the biggest challenges in the field of environmental pollution is the increase in the content of bisphenol compounds. Therefore, it is very important to remove these compounds and prevent environmental hazards and their negative effects on human health. The laccase enzyme of the basidiomycete Trametes trogii can be very effective in reducing these contaminants and has the potential to degrade these compounds. The aim of this study is to investigate the degradation of bisphenol A and its derivatives by the laccase enzyme of Trametes trogii using molecular docking methods. In this study, the three-dimensional structure of the protein and compounds were downloaded from the PDB and PubChem database, respectively, to investigate the binding of bisphenol A compounds and their derivatives to the active site of the enzyme. They were then prepared and optimized using AutoDock tools and HyperChem software. Molecular docking and final analysis were performed using AutoDock Vina, PyMOL and LigPlot software, respectively. The results showed that molecular docking and its derivatives can bind to the active site of the laccase enzyme with an energy level between -5.7 and -0.7 kcal/mol. As a biotechnological solution, the laccase enzyme of this fungus can therefore be considered as a biologically valuable decomposer to remove bisphenol A compounds and their derivatives from water sources and the environment. In future studies, the effect of this enzyme on bisphenol compounds will be investigated and analyzed under laboratory conditions.

Keywords: Bisphenol A, Laccase enzyme, Molecular docking, Trametes trogii

Investigating the index of pollution and leakage of heavy metals from cigarette smoke to the urban environment of Behbahan city

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Abstract

Each year, over 5 trillion cigarette butts are produced globally, and these hazardous wastes are considered one of the most significant environmental pollutants. The aim of this study was to assess the density and distribution of cigarette butts in urban areas and to estimate the pollution leakage from them into the environment. The cigarette butt pollution index was used for 14 locations. Observations were conducted monthly at each site over the course of a year, and the study included both weekdays and weekends. The leakage of heavy metals was estimated based on the average weight of the cigarette butts and the metal leakage ratio under different weather conditions. The results showed that the annual average index for the studied locations ranged from 1.36 (SD 0.11) to 10.6 (SD 1.23). Accordingly, 28.5% of the locations had low pollution levels, while 42.8% were in significant or worse pollution categories. The index decreased by an average of 32.3% during weekends across all locations, and the average index in spring and summer was 26.2% higher than in autumn and winter. The average leakage of heavy metals, including chromium, cadmium, zinc, lead, copper, and nickel from discarded cigarette butts in commercial, residential, and recreational areas was estimated to be 0.27, 0.079, and 0.17 micrograms per square meter, respectively.

Keywords: Cigarette butts, CBPI, Heavy metal leakage, Behbahan.

Verifying the germicidal power of common disinfectants used in hospitals

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Abstract

The increase in hospital infections is one of the problems of health centers worldwide. Therefore, the importance of hygiene and the use of antiseptics and disinfectants in humanity's daily lives is increasing. This study aims to determine the phenolic coefficient of common disinfectants used in Ilam hospitals. In this study, Rideal Walker, Chick Martin, and Kelsey-Sykes tests were used to determine the phenolic coefficient. In these tests, phenol as a basic disinfectant and 6 common disinfectants (Glutaraldehyde, Hyside S-125, SeptiSurface, Kenz, CyaSept, CyaSeptHI) used in Ilam hospitals with germicidal power at 3 low, medium, and high levels was used Salmonella Typhi and E. Coli were used as indicator microorganisms.

Finally, the strength of each disinfectant was measured in comparison with phenol. The obtained results show that the highest and lowest performance in Rideal Walker method was related to Hyside S-125 and Glutaraldehyde disinfectants, in Chek Martin's method, Hyside S-125, and Kenz, and Kelsey-Sykes method, regular CyaSept and Glutaraldehyde. The presence of organic substances can affect the performance of the disinfectant. So except for the high-level disinfectant Hyside S-125 and CyaSept HI, other disinfectants had a lower performance in the presence of organic substances.

Keywords: Hospital, Hospital infection, Disinfectant, Phenolic coefficient.

Detection of addictive substances: wastewater-based epidemiology

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Abstract

The essay addresses wastewater-based epidemiology (WBE), a cutting-edge method in public health surveillance, for the detection of addictive substances. In WBE, drug usage habits within a population are tracked by examining the chemical makeup of raw sewage. This technique is a non-invasive and economical tool for real-time monitoring since it detects the presence of medicines and their metabolites that people defecate. The introduction draws attention to the growing concern about drug usage and how it affects societal growth, public health, and security. Despite their value, traditional methods like surveys and biomonitoring have drawbacks such sample biases, moral dilemmas, and exorbitant expenses. WBE, on the other hand, offers a workable answer by analyzing drug residues in wastewater, which represent the community's overall substance use. Keywords including "addictive substance*," "wastewater-based epidemiology," "wastewater," "sewage epidemiology," and "drug*" were searched across international electronic databases, including PubMed, Science Direct, Web of Science, Scopus, and Google Scholar, in order to write this review article. There were no temporal limits on the search, and all pertinent publications up to 2024 were included. Twenty-two publications in all were chosen and examined for the review after irrelevant studies were eliminated. Since its initial proposal in 2001, the approach has been used in a number of research, particularly during the COVID-19 pandemic. WBE makes it possible to monitor not just the use of illegal drugs but also the use of alcohol, tobacco, and prescription drugs, as well as exposure to environmental pollutants such pesticides and heavy metals. WBE has demonstrated efficacy in detecting trends and patterns in drug use across several locations, although certain drawbacks, including the unreliability of biomarkers in sewage and challenges in calculating the population number served by a treatment plant. The results showed that the use of addictive substances in the population can be monitored effectively using wastewater analysis.

Keywords: Addictive substance, Wastewater-based epidemiology, Wastewater, Drug

Sonophotocatalytic degradation of Diazinon using g-C_3N_4/NH_2-UiO-66 (Zr) catalyst from aquatic media

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Abstract

In this study, g-C_3N_4/NH_2-UiO-66 (Zr) catalyst was adopted to sonophotocatalytic degradation of Diazinon (DZN) under ultrasonic and visible light. Initially, the catalyst was prepared and its characteristics were determined by XRD, FTIR, SEM and UV-Vis. The effect of different parameters, including dosage of catalyst, concentration of pollutant, pH and US power density on the degradation efficiency has been evaluated. Maximum Diazinon degradation was observed under optimum conditions pH 7, contaminant concentration 5 mg/L, the catalyst dosage of 0.4 g/L, and ultrasound power, 200 W/m^2. In addition, the scavenger experiments demonstrated that $OH^{\cdot}$ and $O_2^{\cdot-}$ radicals played a key role in the sono-assisted photocatalytic degradation process. Reusability of the catalyst indicated that g-C_3N_4/NH_2-UiO-66 (Zr) had a high stability and reusability. In conclusion, integration of g-C_3N_4/NH_2-UiO-66 (Zr) composite and visible light and ultrasound irradiation for catalytic degradation system can be introduced as a successful and promising technique, due to excellent catalytic activity, high efficiency, high durability and recycling potential.

Keywords: Diazinon, Sonophotocatalytic, Aquatic media.

Pathology of Environmental Health in Religious Occasions: Executive Solutions for Improvement

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Abstract

This study aims to provide a comprehensive and precise examination of the challenges of environmental health during religious ceremonies and occasions. Environmental health is of particular importance during these times, as large gatherings can lead to the spread of diseases and environmental pollution. Assessing the state of environmental health in mosques, religious centers, and pilgrimage sites such as Karbala, Mecca, Medina, Shahcheragh Shrine, and the shrine of Hazrat Masoumeh is one of the primary objectives of this research. Given the significance of health in maintaining public safety and disease prevention, this study explores the role of social responsibility of institutions and individuals in promoting environmental health during these ceremonies. This research is descriptive-analytical, collecting data through a review of scientific literature, field reports, and direct observations during religious ceremonies. To this end, credible scientific and field resources were utilized, and experiences collected from various ceremonies over recent years were analyzed. Additionally, interviews were conducted with organizers and health officials at these centers to gather their opinions and experiences regarding environmental health. The analysis of the data aided in identifying the strengths and weaknesses of the health systems during these periods. The findings indicate that the state of environmental health during many religious ceremonies, especially during Muharram and Ramadan, is severely inadequate. Poor management of environmental health, unlicensed food distributors lacking necessary testing, and animal slaughter conducted without adhering to hygienic principles were identified as major issues. Furthermore, the condition of sanitation facilities and hygiene amenities in these centers is often below required standards. Lack of control over the entry of sick individuals into gatherings and the use of plastic containers for serving hot water and milk are additional problems. Given these issues, the findings suggest that an effective governance system based on social responsibility can help improve environmental health during these ceremonies. In light of the identified problems, this study emphasizes the need for careful and comprehensive planning to improve environmental health at religious ceremonies. It is recommended that relevant institutions, in collaboration with universities and scientific centers, work towards developing hygiene infrastructure, establishing effective monitoring systems, and providing necessary training to food distributors and event organizers. Improving the state of environmental health not only contributes to public safety but also enhances the quality of religious ceremonies. Ultimately, fostering effective cooperation between government institutions, universities, and the community can support the sustainable development of environmental health services during these times.

Keywords: Environmental health, Challenges, religious ceremonies, Social responsibility, Health management, Public health

A Model for Ranking of Pest Control Service Companies (Organizational Case Study)

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Abstract
This organizational case study uses a quantitative decision-making approach to identify indices for ranking pest control service companies in public and household settings. These companies operate under commercial law and are supervised by the Ministry of Health, following guidelines from the Environmental and Occupational Health Center. Fifteen experts from the Health Deputy of Medical Sciences Universities nationwide were chosen using purposive sampling. Based on inclusion and exclusion criteria, nine participated to identify key performance indicators during brainstorming sessions and to complete the pairwise comparison matrix utilizing the Analytical Hierarchy Process (AHP). After two brainstorming sessions, we identified the indices (subcategories) and categories, and created a decision tree to design pairwise comparison tables. To determine the relative weights of the indices, experts completed the pairwise comparison tables, which were then analyzed using Expert Choice software. Thirty-two indices were identified and ranked across six categories: Services and Performance (0.207), Regulations and Laws (0.205), Violations (0.184), Management and Personnel (0.181), Physical Space and Equipment (0.147), and Training and Research (0.077). With a consistency rate of 0.03, the experts' judgments are deemed acceptable.

Keywords: Service companies, Ranking, Hierarchy

Identifying and prioritizing the components of good governance in the healthcare sector of Zanjan province

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Abstract

The current research was conducted with the aim of identifying and prioritizing the components of effective governance in the healthcare sector of Zanjan province. The research method in the present study is quantitative-survey, which is practical in terms of purpose and in terms of data collection, library and field type. The data collection in this research was done with a questionnaire. For this purpose, a questionnaire according to the Analytical Hierarchy Method (AHP) was designed and it was made available to 50 senior and middle managers of Zanjan Medical Sciences Organization in an unlikely way. In line with the use of hierarchical analysis, 6 criteria and 24 sub-criteria were identified, and through a survey of the aforementioned statistical population, the criteria and sub-criteria of good governance in the health sector of Zanjan province were prioritized with the help of Expert Choice software. The results of this research showed that among the determined criteria, the transparency criterion is the most important (0.446). After that, accountability criterion with importance coefficient (0.255) in second priority, corruption control criterion with importance coefficient (0.129) in third priority, participation criterion with importance coefficient (0.092) in fourth priority, regulation quality criterion with The importance coefficient (0.045) is in the fifth priority and the role and tasks effectiveness criterion with the importance coefficient (0.032) is in the sixth priority.

Keywords: Governance, Good governance, Healthcare, Hierarchical analysis, Zanjan.

The impact of covid-19 on hospital waste management: a case study in Hazrat Rasool Akram Hospital-Tehran

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Abstract

Medical waste management is a critical concern due to the dangers of environmental hazards and their impact on human health. The main objective of the present study is to analyze the production and management of medical waste before, during and after the pandemic, as well as to investigate the impact of post Covid-19 on waste production. This study was conducted in one of the largest referral hospitals in Tehran. This study was conducted in Hazrat Rasool Akram (PBUH) Hospital in Tehran with 868 approved beds and bed occupancy rate more than 80%. Before the epidemic, of the total amount of waste generation, non-infectious, infectious chemical and pharmaceutical waste percent was 42.1%, 56.4%, and 1.48%, respectively. There was a 10.2% reduction in infectious waste with the implementation of the post-COVID-19 waste management program. Before the epidemic, the medical waste management approach was to reduce the infectious waste fraction. With the onset of the epidemic, the culture of separation and its importance was shaken. After the end of the epidemic, returning to the previous conditions and creating a culture of segregation as an institutional behavior required reprogramming. Along with the internal efforts of medical centers, updating some laws can be very effective as a driving lever. On the other hand, improving the hospital's support infrastructure in food distribution and laundry will be effective in reducing the total waste of food containers and replacing cloth items instead of disposable items and improving the quality of food.

keywords: Medical Waste, Hospital Waste Management, Epidemic, Covid-19

Investigation of bacterial and fungal contamination of timex devices in hospitals affiliated to Babol University of Medical Sciences

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Abstract

Due to daily contact with the hands of many employees, timex devices are likely to be infected with various microorganisms, and as a result, employees and personnel can unintentionally transfer many bacterial and fungal agents to each other through their hands and cause the spread of diseases. Therefore, this study was conducted with the aim of investigating the types of bacterial and fungal contamination of timex devices in hospitals affiliated to Babol University of Medical Sciences. By referring to the hospitals affiliated to Babol University of Medical Sciences, using sterile swabs that were moistened with sterile physiological serum, sampling was done from the surfaces of the timex device and on the blood agar culture medium to identify bacterial contamination and Saburo dextrose agar for fungal contamination was cultured. In this study, 131 samples taken from the timex devices in hospitals, all the samples were positive for bacterial contamination, and in all the samples, Staphylococcus genus was grown, of which 77.30% related to Staphylocoagulase negative species and 22.69% related s Staphylococcus aureus strain. Bacillus bacteria were also detected in 11.26% of the samples. Also, 8.33% of the fungal samples were positive for fungal contamination and the strains were Candida albicans species. According to the results obtained from the culture samples taken from the surface of timex machines of the studied hospitals, it was found that there were pathogenic bacterial and fungal contaminations on them, which can cause and spread microbial and fungal diseases among employees and other members of society. Therefore, in order to prevent and control related diseases, continuous and daily disinfection of these devices is recommended.

Keywords: Bacterial & fungal contamination, Hand hygiene, Hospital, Timex device

Investigating people's awareness and performance regarding the contents of food labels

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Abstract

Paying attention to the written information on food labels is important from the point of view of social health literacy and can help people make informed decisions in buying standard packaged foods. This study was conducted with the aim of investigating the level of awareness and performance of people regarding the essential information required to be included on food labels. In this study, 1140 food buyers participated in food supply and distribution centers, and for each of them, a questionnaire related to demographic status and awareness and performance related to food labels was completed. After collecting the data, it was summarized and statistically analyzed through descriptive statistical methods. Based on the results of this study, it was found that nearly 80% of people pay attention to food labels when shopping, and their main motivation is to see the product price, production and consumption date listed on the product label, and a small percentage of them with the purpose of obtaining information. Nutrition, observing the weight of the product, obtaining information about the presence of additives and artificial colors, pay attention to the information on the labels of packaged foods. The results of this study showed that the level of people's awareness regarding nutritional information contained on food labels is low, and considering the high impact of nutritional awareness on people's performance in this field, the need to pay attention to continuous nutritional education, training to pay attention to the information contained on It seems necessary to look at food labels and benefit from them in order to achieve a healthy nutritional pattern and promote social health literacy.

Keywords: Food labels, Awareness, Performance, Food buyers

Investigation of Hydrogen Peroxide Levels in Oils Used in Food Preparation and Distribution Centers in Gorgan City in 2023

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Abstract

Food safety and hygiene are crucial for ensuring the health of our meals throughout their journey from production to storage and cooking. Frying is a popular cooking method, but it can lead to the formation of harmful compounds, such as peroxides, especially when oils are heated to high temperatures. This can increase the risk of serious health issues, including cancer and premature aging. In 2022, we conducted a descriptive-cross-sectional study in Gorgan to assess the quality of cooking oils used in 50 food preparation and distribution centers. We randomly selected samples from four different food sectors and evaluated the oils for peroxide value and total polar compounds (TPM). The collected data were analyzed using SPSS software.

Our results showed that fast-food outlets represented the largest portion (39.6%) of the centers, while kitchens had the highest acidity levels. Interestingly, pastry workshops exhibited the highest levels of total polar compounds and operating temperatures. Over 74% of the centers sold their used oils to soap manufacturers. We also found a significant correlation between oil consumption and its quality indicators. This study indicates that the quality of cooking oils in most centers is within acceptable limits, reflecting improvements compared to earlier assessments. However, it highlights the ongoing need for stricter monitoring of oil usage and greater public awareness about the health risks associated with fried foods.

Keywords: Hydrogen Peroxide, TPM, Edible Oil, Food Safety.

The Effect of Toxic Metals on Cardiovascular Diseases in Southwest Iran (With Machine Learning Approach)

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Abstract

Heavy Metals (HMs) have been recognized as extremely dangerous and hazardous to the environment. HMs may cause cardiovascular diseases by several mechanisms, including generating reactive oxygen species that cause DNA damage, oxidizing lipids, and oxidative stress, among others. Therefore, this study aims to obtain a high-value biomarker associated with machine learning methods that can facilitate the effect of HM on the incidence of CVD. 188 people, including 94 healthy people and 94 people with cardiovascular disorders, were selected from the list of CVD patients of the cohort center, and enrolled in the study. The statistical tests used in this research include logistic regression to show the probability of cardiovascular diseases in the presence of heavy metals and machine learning algorithms such as Decision Tree (DT), K-nearest Neighbor (KN), Support Vector Machine (SVM), Gaussian Naïve Bayes (GNB), Multi-Layer Perceptron (MLP), Gradient Boosting (GB), Linear Discriminant Analysis (LDA) and Logistic Regression (LR). The results showed that the effective heavy metals reported according to the waterfall plot, ROC curve, and Graphic shape include Pb, Sr, Fe, Al, Zn, Sr, and Cd. Also, our results showed that Fe (OR: 0.912; 95% Cl: 0.896 - 0.920), and Zn (OR: 0.965; 95% Cl: 0.963 - 0.966) have a protective effect on the heart, but As (OR: 1.16; 95% Cl: 1.11-1.19), Al (OR: 1.14; 95% Cl: 1.09 – 1.16), Pb (OR: 1.15; 95% Cl: 1.11 - 1.17), Sr (OR: 1.16; 95% Cl: 1.14 - 1.21), and Cd (OR: 1.25; 95% Cl: 1.21-1.30) have destructive effects on the heart. The outcomes of the present study showed a correlation between the amount of HMs in participants' urine and their probability of suffering from CVD. A rise in the concentration of these compounds (Pb, Sr, and Cd) in the urine is associated with an increased risk of CVD.

Keywords: Cardiovascular Disease, Heavy metals, Urine, Machine learning

Subsidence, the hidden death of the earth

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Abstract

Land subsidence is a global phenomenon that has serious impacts on infrastructure, ecosystems, and human communities. This research investigates the causes and consequences of land subsidence, particularly in urban and agricultural areas. The findings indicate that excessive groundwater extraction is a key factor contributing to land subsidence. This phenomenon primarily arises from sediment compaction and a decrease in water pressure in aquifers. In cities such as Beijing, Tehran, and Mexico City, the rate of subsidence has significantly increased, causing severe damage to urban infrastructure. Additionally, climate change and fluctuations in precipitation and evaporation patterns further exacerbate this issue. This study identifies subsidence patterns and their effects on daily life and emphasizes the importance of sustainable water management to prevent land subsidence. By providing recommendations for future research, this paper aims to develop advanced models for monitoring and managing land subsidence and to enhance public awareness regarding the significance of protecting water resources. The results of this research can assist policymakers and water resource managers in implementing effective measures to control this phenomenon and prevent further problems. Ultimately, this study underscores the need for serious attention to the issue of land subsidence and its consequences while focusing on the development of sustainable management strategies.

Keywords: Land subsidence, Groundwater, Over-extraction, Climate change

Making a quick detection kit for microorganism contamination of water based on bioluminescence

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Abstract

Fast and reliable methods for monitoring the microbial quality of water, especially drinking water, are necessary and vital to protect the health of society. Adenosine triphosphate (ATP) can be used as an online parameter to detect the entry of microbes into drinking water contaminated with surface water or sewage. In this study, a microbial contamination detection kit for drinking water was designed based on ATP and bioluminescence process using luciferase enzyme. For this study, drinking water has been contaminated with E. coli bacteria with different concentrations and the amount of RLU number has been measured in a luminator device, and in parallel with that, bacterial culture work has been done to examine and compare the sensitivity of the designed kit. The results showed that the sensitivity of the designed kit is similar to the general counting methods (Total direct count) (TDC), Heterotrophic plate counts (HPC 22°C) (HPC 37°C) and Coilert-18 method. Continuous sampling along with ATP measurement allows continuous monitoring of the microbial quality of water. The ability to measure ATP to detect the entry of microbes is influenced by two factors: 1- ATP from pollution and the concentration of ATP in drinking water. This problem can be solved by using two kits.

Keywords: Water pollution, Adenosine triphosphate, CFU, RLU

The relationship between heavy metal concentrations in drinking water and mortality from some diseases in Hamedan Province

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Abstract

One of the important pollutants affecting the quality of drinking water is heavy metals, the amounts of which exceeding the permissible limits cause various diseases. Therefore, the present study was conducted with the aim of investigating the amount of heavy metals in drinking water in Hamadan province in 2020 and its relationship with mortality due to diabetes, congenital anomalies, and cancer related to these pollutants. In this study, data on the mortality rate due to diabetes, congenital anomalies, and cancer, and data on the concentration of heavy metals Pb, Cd, Cr, Cu, Ni and Hg in drinking water in Hamadan province were received from the Health Office of Hamadan University of Medical Sciences. The data were analyzed using SPSS version 26 software and appropriate statistical methods. Also, the Poisson regression model was used to investigate the relationship between the amount of heavy metals and the mortality rate due to various diseases in Hamadan province. The results showed that there is a statistically significant relationship between the concentration of metals such as Pb, Cd, Cr, Cu, Ni and Hg in drinking water and mortality due to various types of diabetes ($P<0.001$). According to the results, with a one-unit increase in the average concentration of Pb, with the condition that the average concentration of other heavy metals is constant, the average mortality rate due to diabetes increases by 5.034 units. There was a statistically significant relationship between the average concentration of metals such as Cr and Hg and the average number of deaths due to congenital anomalies ($P<0.001$). According to the results, with a one-unit increase in the average concentration of Hg, with the condition that the average concentration of other heavy metals is constant, the average number of deaths due to congenital anomalies increases by 6.105 units. The results of this study indicate a significant effect of the concentration of some heavy metals in drinking water and mortality due to cancer, diabetes and congenital anomalies. As a result, it emphasizes the need to develop stronger policies to reduce heavy metal contamination in drinking water and improve health surveillance. These measures can be effective in reducing the burden of diseases caused by heavy metals, especially in areas with high risk of contamination.

Keywords: Heavy metals, Drinking water, Mortality, Disease, Hamadan

Investigation of antibacterial activity and photocatalytic properties of green cerium oxide nanoparticles for the removal of tetracycline from aqueous solutions

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Abstract

Cerium oxide nanoparticles (CeNPs) are multifunctional oxide metal nanoparticles that have been considered by many due to their unique properties, including antimicrobial, antifungal, semiconducting, and photocatalytic activity. In this research, CeNPs nanoparticles were synthesized using a natural sweetener glycoside in the aqueous crude extract of Stevia rebaudiana
that acted as an excellent bio-reductant.
The prepared nanoparticles were further characterized by Raman spectroscopy, X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR), and field emission-scanning electron microscopy (FE-SEM). The FE-SEM results confirmed that the CeNPs nanoparticles were nano-size (10-50 nm). The antibacterial activity of CeNPs against Pseudomonas aeruginosa and Enterococcus faecalis has shown that the minimum inhibitory concentration (MIC) was 6.25 and 12.5 µg/mL and Minimum Bactericidal Concentration (MBC) were 12.5 and 25 µg/mL respectively. In the presence of CeNPs (under optimal conditions: catalyst dosage = 0.75 g/L, TC concentration = 5 mg/L, pH=10), about 80.68% of tetracycline (TC) was degraded after 45 min UV-irradiation that it is indicative of the acceptable photocatalytic property of CeNPs.

Keywords: Cerium oxide, Biosynthesis, Antibacterial activity, Photo degradation, Stevia rebaudiana, Tetracycline

Investigating strategies to attract private sector participation in environmental protection

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Abstract

The environment is the place where humans live. If the place of residence is in trouble, it will affect human life. Governments have limited access to financing for large projects, it tries to solve its financial problems by using the private sector. Public-private partnership approaches differ in developed and developing countries. These solutions depend on: socio-economic, political, and cultural conditions, the type and severity of educational challenges, and expectations regarding the amount and type of private sector participation. This study was conducted through a systematic review of reputable scientific books and articles and the following results were obtained. Ways to attract private participation include: 1- Developing a culture of participation in society 2- Motivation (creating motivation in people, especially the private sector) 3- Formulating and implementing a comprehensive urban development plan 4- Creating and strengthening an entrepreneurial environment 5- Improving the urban management structure 6- Using intellectual consulting 7- Informing 8- Privatization 9- Attracting non-governmental capital

Keywords: Privatization, Partnership, Environment, Private Sector

Smart Shrimp Farming: A Solution for Reducing Pollution and Improving Environmental Health

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Abstract
The overexploitation of marine resources and the damage to aquatic ecosystems due to population growth and the increasing demand for seafood have been the main causes of the formation and expansion of aquaculture worldwide. Among aquatic products, shrimp is a highly nutritious product with adequate protein, making it very popular for farming. With the expansion of shrimp farming sites, concerns and criticisms regarding the detrimental effects of shrimp farming on the surrounding environment have emerged. To address these concerns, smart shrimp farming using technological tools for better resource management and pollution reduction has been introduced. This article examines several of these technological methods through library research and a review of reputable scientific articles, as well as a comparison between traditional and smart methods. Finally, the role of smart shrimp farming in reducing pollution and waste, its impact on the quality and quantity of shrimp production, as well as productivity and better resource management, is analyzed, and practical solutions for implementing smart shrimp farming are presented.

Keywords: Aquatic ecosystems, Pollution reduction, Environment, Resource management, Smart and automated control

Platform session 5: Air Pollution

Panelist Members
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Oral Presentation

Effect of different operating parameters on the n-Hexane decomposition using non-thermal dielectric barrier discharge plasma technology

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Abstract

Volatile organic compounds (VOCs) are considered one of the most important air pollutants that are detrimental to both human health and the environment, either directly through toxicity and malodorous nature or indirectly as precursors of tropospheric ozone, photochemical smog and secondary organic aerosols. The non-thermal plasma (NTP) is an efficient method for VOC abatement. The aim of this study was to investigate the Effect of different operating parameters on the n-Hexane decomposition using non-thermal dielectric barrier discharge plasma technology. This research was an applied-experimental study that was conducted on a pilot scale in a laboratory. in order to investigated the effect of each of the operational parameters (discharge voltage, initial concentration, inlet gas flow rate and relative humidity), the interaction of their effects on the response variables the central composite design method based on the surface response was used and the n-hexane removal efficiency, CO_2 selectivity, and by-product (ozone) production were investigated. The highest removal efficiency, selectivity of CO_2 and O_3 produced were 91.15% and 58.32%, and 141.15 mg/m^3, respectively. According to the results of the study, the discharge voltage as the first component, followed by the initial concentration, relative humidity, and inlet gas flow rate, respectively, were the most important independent components affecting the n-hexane removal process in the NTP process.

Keywords: Volatile organic compounds (VOC_s), Non-thermal plasma (NTP), Dielectric barrier discharge, *n*-Hexane

Examination of Antibiotic Resistance in Airborne Bacteria in Hospital Departments and their Relationship with Environmental Parameters (Case Study: Qom City)

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Abstract

Indoor air quality is a critical concern in sensitive environments, such as healthcare centers. Microbiological monitoring and control of indoor air quality in hospitals are currently essential and integral components of strategies to prevent hospital-acquired infections. The objective of this study is to examine airborne bacteria and their antibiotic resistance in Qom's hospitals. Microbial sampling using the Anderson method was done thrice in different sections of three hospitals. Environmental factors like temperature, humidity, and indoor particle levels were measured with an Air Quality Detector. Antibiotic resistance against five types was assessed using the Kerbi-Baer method. The data were reported descriptively, and SPSS version 22 was used to analyze parameter correlations. Bacteria were found in all samples, with the highest prevalence (33%) being Bacillus licheniformis. Emergency and radiology departments in all three hospitals showed the most and least bacteria. The highest resistance was to gentamicin (8.36%), and the lowest was to cefazolin (5.10%). No resistance was found to amikacin and ceftriaxone. Some bacteria (3.26%) were sensitive to amikacin, ceftriaxone, and gentamicin, and 8.15% were sensitive to cefazolin. No sensitivity to vancomycin was observed. Additionally, 6.31% were partially sensitive to amikacin, and 8.15% were partially sensitive to vancomycin. There was no significant relationship between bioaerosols and temperature, humidity, $PM_{2.5}$, the number of active individuals, and the number of beds in each department, and the area of the departments ($P>0.05$). There is a risk of antibiotic-resistant bacteria spreading in the hospitals of Qom, but this can be controlled through proper measures, such as installing adequate ventilation, implementing effective disinfection protocols, and ensuring timely cleaning of the wards.

Keywords: Airborne bacteria, Hospitals, Antibiotic resistance genes, Indoor air quality

Investigating the effect of potential sources of indoor air pollution on leukocytes telomere length of umbilical cord blood of newborns

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Abstract

The harmful effects of indoor air pollution (IAP) on health are known to some extent. However, the relationship of these contaminations with telomere length in cord blood has not been well investigated yet. This study aims to investigate the relationship between exposure to these pollutants and telomere length of the umbilical cord. 188 participants contributed in this cross-sectional study in Isfahan. Telomere length was measured by qRT-PCR. Linear mixed effect models were used to evaluate the relationship between air pollution indices and telomere length. Frequency of use of degreasing spray (times per month) (β = − 0.047, 95% (CI: 0.09, − 0.05, P-value = 0.02), use of air freshener spray (β = − 0.26, 95% CI: − 0.5, − 0.02, P-value = 0.03) and the frequency of using insecticides (times per month) (β = − 0.025, 95% CI: − 0.047, − 0.003, P-value = 0.02) was significantly associated with shorter telomere length (in adjusted models). There was a positive and significant relationship between the frequency of using the cleaning spray (times per month) and the telomere length. In addition, shorter telomere length was associated with direct association with home parking, as well as frequency of using barbecue (times per week). No statistically significant relationship was observed for other indicators. Overall, this study showed a negative association between prenatal indoor air pollution exposure during pregnancy and umbilical cord telomere length.

Keywords: Biological marker, Indoor air pollution, Cell age, Umbilical cord, Newborns

Investigating the effect of particulate matter ($PM_{2.5}$) contents on cardiovascular system function in healthy individuals

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Abstract

Since there is limited evidence of the impact of $PM_{2.5}$ content on cardiovascular biomarkers, the primary objective of this study is to investigate the impact of $PM_{2.5}$ mass concentration, heavy metal composition, and oxidative potential in ambient air on biomarkers that assess cardiovascular function in healthy adults residing in two distinct regions: high-traffic and industrial areas. We conducted a cross-sectional study on 89 healthy adults from October 12 to November 21, 2021. Cardiovascular biomarkers (NO, sICAM-1, and sVCAM-1) were measured in the blood samples of subjects. Seven consecutive days before biological sampling, the 24-hour concentration of $PM_{2.5}$ was measured in two separate areas. The concentrations of metals, PAHs, and oxidative potential (OP) were determined using ICP-MS, GC-MS, and dithiothreitol (DTT), respectively. A generalized linear model was used to examine the association between $PM_{2.5}$ toxicities and each health endpoint. Our findings indicated that daily $PM_{2.5}$ concentrations exceeded the WHO-recommended level by approximately sevenfold. We found that $PM_{2.5}$ exposures was associated with adverse cardiovascular outcomes. Moreover, exposure to $PM_{2.5}$ mass, total PAHs, and certain trace metals (Ni, Fe, V, As, and Pb) resulted in a significant decrease in serum NO levels. In contrast, OP exhibited a mild correlation with NO level increases. Positive associations were observed between $PM_{2.5}$ and its chemical constituents (PAHs, As, Cu, OP) and adhesion molecules at different lag times. Consequently, our findings suggest that different $PM_{2.5}$ chemical compositions exhibit diverse behavior in biological responses.

Keywords: Air pollution, Particulate matter, Oxidative potential, Cardiovascular diseases, Biomarkers.

Poster Presentation

Environmental and Health Impacts of Heavy Metal Contamination in Air and Soil of Northern Lake Urmia, Iran

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Abstract

This study addresses the potential impact of Lake Urmia on heavy metal concentrations in the air and soil of the northern region of Lake Urmia in north west of Iran, highlighting significant environmental and health implications. By analyzing levels of Arsenic (As), Cadmium (Cd), Chromium (Cr), and Lead (Pb) in soil and settled dust particles near Lake Urmia, the research reveals varying concentrations; with some areas exceeding recommended thresholds for Cr and Pb. Spatial distribution analysis indicates that local factors significantly affect contamination patterns, emphasizing the need for targeted interventions.

The study employs enrichment factor (EF) assessment and potential ecological risk (PER) index to identify pollution sources and evaluate associated ecological risks. Results indicate moderate to severe pollution levels in specific regions, particularly for Pb and Cd. Health risk assessments suggest that non-carcinogenic risks are generally below hazardous levels; however, concerns remain for Cr and As exposure.

Future research should focus on long-term trends, source apportionment methodologies, and health effects of heavy metal exposure to develop effective pollution management strategies. Collaborative, interdisciplinary approaches will be crucial in mitigating heavy metal pollution and protecting human and environmental health.

Keywords: Lake Urmia, Health Risk, Settled Dust, Heavy Metal

Quantifying the health impact of PM2.5 using the AirQ model in the metropolitan Isfahan, Iran, in 2018-2019

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Abstract

The Middle East Dust Storms (MEDS) phenomenon has been causing issues in many Iranian cities including Isfahan, as a result, the air quality in those cities has deteriorated over the recent years. The purpose of this study is to quantify the health impacts of $PM_{2.5}$ on human health by applying the AirQ model approach in the metropolis of Isfahan during 2017–2018. This study used AirQ 2.2.3 model software to evaluate the human health effects of $PM_{2.5}$ for residents of Isfahan. The average annual concentration of $PM_{2.5}$ was 31 $\mu g/m^3$ and 26 $\mu g/m^3$ during 2018 and 2019 years. The attributable proportion (AP) of total mortality attributable to $PM_{2.5}$ was predicted to be 3.11% and 2.37% (95 % confidence interval (CI)) of the total mortality, and the cases of excessive deaths were estimated to be 339.7 and 264.4 persons, respectively. These estimates were based on the resolved baseline incidence (BI) and relative risk (RR) rate. This study offers extra information for decision-making in the formulation of plans to diminish indoor air pollution, which will enhance the quality of the air.

Keyword: Air pollution, $PM_{2.5}$, AirQ model, Mortality, Isfahan.

Study on Carbon Dioxide Absorption Using Monoethanolamine Nanofluid

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Abstract

Controlling and reducing emission of carbon dioxide (CO_2) in order to deal with global warming and climate change is very important. The aim of this research was to determine the amount of CO_2 absorption by monoethanolamine (MEA) nanofluid solution and to determine the effect of absorbent and CO_2 concentration on CO_2 removal. In this research, the absorption of CO_2 in concentrations of 500, 2000 and 5000 ppm from the air of a closed environment using monoethanolamine absorbent solution was compared in two cases containing TiO_2 nanoparticles (nanofluid) and without nanoparticles (base fluid). An impinger containing absorbent solution was used as a reactor. The duration of the absorption test was one hour, and every ten minutes the concentration of CO_2 in the air inside of closed chamber was measured and recorded by the CO_2 ND-IR analyzer. The values of pH, electrical conductivity (EC) and inorganic carbon (TIC) of the solutions were measured before and after CO_2 absorption. Inorganic carbon concentration was measured by TOC analyzer. CO_2 absorption in monoethanolamine nanofluid was 15% higher than base fluid without nanoparticles. With increasing CO_2 concentration, the amount of CO_2 absorbed increased. By increasing the concentration of adsorbent solution, the average absorption efficiency increased by about 20%. The average amount of total inorganic carbon (TIC) in nanofluid increased by about 30% compared to base fluid. The average reduction of EC in nanofluid was about 25% higher than the base fluid. Adding TiO2 nanoparticles to the absorbent solution increases the efficiency of CO_2 removal.

Keywords: Nanofluid, Monoethanolamine, Adsorption, Carbon dioxide

Predictive Modeling of $PM_{2.5}$ Under Future Climate Scenarios Using ANN-NARX

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Abstract

As the effects of climate change intensify, forecasting air quality becomes essential for crafting public health and environmental policies. This research investigates changes in $PM_{2.5}$ levels using the Shared Socioeconomic Pathways (SSPs) from the Climate Model Intercomparison Project Phase 6 (CMIP6). Historical climate data from 1998-2014 were used to establish a baseline, while variables like maximum and minimum temperatures, precipitation, and radiation were gathered from the Iran Meteorological Organization for 2013-2022. $PM_{2.5}$ data for this period were also incorporated. The LARS-WG 6.0 tool was used for statistical downscaling, and IPSL-CM6A-ATM-ICO-LR models projected future climate scenarios based on three SSPs from the IPCC AR6 report: SSP1-2.6 (optimistic), SSP2-4.5 (intermediate), and SSP3-7.0 (pessimistic). The ANN-NARX model predicted $PM_{2.5}$ concentrations for 2023-2053, with climatic factors as inputs. All scenarios forecasted rising $PM_{2.5}$ levels, particularly under SSP3-7.0, most notably in the summer. The ANN-NARX model performed well, with RMSE values of 14.14, 16.86, and 15.48, and correlation coefficients of 0.91, 0.92, and 0.91 for SSP1-2.6, SSP2-4.5, and SSP3-7.0, respectively. This emphasizes the need for proactive air quality and climate adaptation measures in regions like Abadan.

Keywords: Particulate Matter, Shared Socioeconomic Pathway, Nonlinear Autoregressive with Exogenous Input, Long Ashton Research Station Weather Generator, Climate Change

Investigation of airborne fungi of public transportation systems

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Abstract

This study examines fungal contamination in transportation systems in Ahvaz city and assesses the relationship between fungal concentration, PM levels, and environmental factors. The average concentration of total fungi in outdoor air, indoor air, and vehicle air was found to be 447.59–942.29, 630.15–1280.95, and 456.42–559.48 CFU/m³, respectively, indicating a potential presence of sick building syndrome. The levels of PM_1, $PM_{2.5}$, and PM_{10} also showed unfavorable conditions in the three mentioned environments. Results revealed that the fungal concentration in outdoor air is higher than that in indoor air. These findings contribute to understanding the role of airborne fungi in indoor air quality and related health impacts, identifying environmental factors affecting fungal concentrations. The results emphasize measures to reduce the health effects of bioaerosols in Ahvaz and other polluted cities in the Middle East, such as improving public transportation, ensuring adequate ventilation, replacing outdated vehicles, and properly paving roads. Additionally, health preparedness measures, including ventilation and diagnostic testing during pandemics, and using personal protective equipment, can mitigate the health effects of air pollution. These actions can enhance public health in crowded and enclosed environments, prioritizing strict indoor air control.

Keywords: Airborne fungi, Indoor air, Outdoor air, Public transportation system, Ahvaz.

Assessment of respiratory exposure to airborne microplastics deposited in the city of Qom

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Abstract

Exposure to airborne microplastics via the respiratory route has become a global concern due to their deposition in the respiratory system and adverse health effects. However, there is limited information on the assessment of respiratory exposure to microplastics. In this study, the international standard ASTM-D1739 method was used to sample airborne microplastics deposited in Qom city in 1402. Samples were collected from five urban locations monthly and were separated and counted using an extraction method based on the density of microplastics. A total of 60 samples were obtained. Microplastics were found in all samples. Fibers were 92.8%, fragments were 3.3%, and films were 3.3%. The predominant size of microplastics was 250-500 µm. The average flux of airborne microplastics deposited was 116.11 microplastic MP/m^2/d and the respiratory exposure of individuals ranged from 576333 MP/year for the 11-16 age group to 195297 MP/year for children under one year of age. This significant exposure highlights the potential threat of these particles to the environment and human health.

Keywords: Qom, Health Risk, Annual Exposure, ASTM-D1739

Seasonal variation of the oxidative potential of water-soluble components in ambient air PM_1 and $PM_{2.5}$ of Tehran, Iran

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Abstract

According to the findings of recent studies, the measurement of the oxidation potential of particles is considered more appropriate than the measurement of PM mass concentration. The cell-free assay is widely used for particle oxidation potential which, requires less controlled environments and offers faster readout of PM oxidative potential. In the present study, to observe the seasonal variations of the OP of the particulate matter of different sizes (PM_1, $PM_{2.5}$), using (DTT) assay, the OP was measured during spring, summer, and autumn in the ambient air of Tehran city, the capital of Iran from 2021/4/17 to 2021/12/6. PM_1 samples were collected with Sioutas cascade impactor using low-volume air samplers operating at a flow rate of 9 L/min, with high-volume air samplers (operating at a flow rate of 1.415 m^3/min) used for $PM_{2.5}$. PM_1 and $PM_{2.5}$ mass concentrations in ambient air were within (13.8 -111.2) and (18.4 – 148.2) $\mu g/m^3$ respectively. The findings of the current study showed that the organic carbon aerosol particle (OP) of PM_1 generally exhibited higher values compared to $PM_{2.5}$. Furthermore, these values were observed to be higher in autumn when compared to spring, and in spring when compared to summer. Notably, a significant correlation was found between the mass concentration of $PM_{2.5}$ and OPDTTm during both the total period and spring, with R^2 values of 0.64 and 0.81, respectively. Additionally, a significant correlation was observed between the mass concentration of $PM_{2.5}$ and OPDTTv during summer, with an R^2 value of 0.63.

Keywords: Oxidative potential, Acellular assay, DTT, Ambient air, Particulate matter

Investigating the Association between Traffic-related Air Pollution ($PM_{2.5}$ and Benzene) and the Risk of Asthma: A Systematic Review and Meta-analysis

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Abstract

Asthma is a chronic disease that causes respiratory system inflammation. Recently, traffic-related air pollution (TRAP), especially $PM_{2.5}$ (particulate matter) and benzene, has been considered a factor that may increase the risk of asthma. This study investigated the association between TRAP ($PM_{2.5}$ and benzene) and asthma risk. In this systematic review and meta-analysis, the relevant published data were collected by searching the Cochrane Library, Web of Science, Science Direct, Scopus, PubMed, and Google Scholar databases up to November 2022. The study quality was evaluated by the Newcastle-Ottawa Scale (NOS) checklist. Data analysis was performed using Stata software (version 14), and the significance level in this meta-analysis study is considered to be <0.05. In the first search, 4909 and 4825 studies were extracted for $PM_{2.5}$ and benzene, respectively. After evaluating and considering the search criteria, 25 and 4 studies remained for $PM_{2.5}$ and benzene, respectively. For $PM_{2.5}$, the odds ratio (OR) for developing asthma in the group exposed to TRAP compared to the unexposed group was 1.11 (95% confidence interval (CI): 1.04-1.19; P-value=0.002). For benzene, the OR of developing asthma in the exposed group compared to the unexposed group was 1.19 (95%CI: 1.10-1.29, p-value<0.001). Based on this review study, there is a positive association between TRAP exposure and the development of asthma. The results showed that $PM_{2.5}$ and benzene increase the risk of asthma.

Keywords: Asthma, Air pollution, Benzene, Particulate matter, Traffic-related pollution

Comparative investigation of interleukin-6 biomarker among the studied subjects in dusty and non-dusty days

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Abstract

Airborne PM is one of the main pollutants related to health. On the other hand, the occurrence of dust storms in recent years is related to the increase in the concentration of PM in the air and their effectiveness. Therefore, this research was conducted with the aim of investigating the concentration of interleukin-6 (IL-6) as a biomarker in EBC among two groups of healthy and asthmatic people and comparing its relationship with the concentration of PM. In this panel study, 46 teenagers between the ages of 15 and 17 were selected and placed in two groups consisting of healthy and asthmatic people. In order to investigate the effect of PM on the subjects, the concentration of the biomarker interleukin-6 (IL-6) in EBC samples of subjects was measured using ELISA kits and the relationship between them was compared and analyzed statistically. Average daily concentrations of PM on dust days were about 5 times higher than normal days. The results of this study showed that the concentration of the studied biomarker was higher in asthmatic people compared to healthy people and asthmatic people are more susceptible to exposure to airborne PM compared to healthy people.

Keywords: Exhaled breath condensate (EBC), Particulate matter (PM), Biomarker, Interleukin-6

The Effects of Climate Change on the Spread of Insects and Vectors

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Abstract

Climate refers to variable atmospheric conditions such as temperature and precipitation. Industrial activities have altered the chemical composition of the atmosphere, leading to changes in the global climate. To find relevant references for writing the article, databases including Google Scholar, Noormags, and Elmnet were searched using keywords such as climate change, insects, vectors, and environment. The searches were conducted for the period between 2018 and 2024. Initially, the titles retrieved by the search engines were reviewed for relevance to the topic. Approximately 200 references were evaluated. After the review, based on the PRISMA framework, 33 articles were ultimately included in the research. According to studies, global warming is showing an increasing trend, with 2023 being the hottest year on record. Additionally, natural climatic disasters, such as droughts and heavy rainfall, are expected to increase in many regions of our country, indicating unpredictable climate behavior. These changes represent one of the most serious human threats to the environment, as they not only have direct impacts on biodiversity but also exacerbate other human-induced threats. The consequences for species conservation and biodiversity could be severe. Insects, in particular, are among the groups most likely to suffer significant harm. This article aims to identify the dimensions of these effects and provide necessary warnings to decision-makers for a better understanding of the impacts of climate change on insects and for achieving a sustainable environment.

Keywords: Climate change, Insects, Vectors, Environment

Assessment of the Impact of Climate Change on Food Insecurity: A Systematic Review

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Abstract

Climate change, as one of the fundamental challenges of the present century, seriously threatens global food security. This study examines the impacts of climate change on food security, focusing on challenges related to food production, distribution, and accessibility. The aim of this paper is to review and analyze existing studies, propose solutions to address these challenges, and assess the links between climate change and food insecurity based on recent research. This study is a systematic review. Databases such as Google Scholar, PubMed, Scopus, and Web of Science were searched for articles published between 2009 and 2023 using keywords like "Climate Change," "Food Insecurity," "Impact of Climate Change on Agriculture," "Food Security," "Climate Change and Food Production," and "Environmental Changes and Food Systems." The results show that climate change has led to reduced agricultural yields, changes in rainfall patterns, increased temperatures, and alterations in marine ecosystems. These factors, in turn, have caused rising food prices, reduced access to food resources, and worsened malnutrition. To counter these threats, appropriate policies in sustainable agriculture, water resource management, and modern agricultural technologies are essential.

Keywords: Climate Change, Food Insecurity, Impact of Climate Change on Agriculture, Food Security, Climate Change and Food Production.

Investigating ways to manage and remove polycyclic aromatic hydrocarbons from indoor air, a systematic study

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Abstract

Air pollution is the second leading cause of death from noncommunicable diseases. Air pollution can be related to indoor or outdoor environments, and since people spend most of their time indoors today, indoor air pollution is of great importance. One type of indoor pollutant is polycyclic aromatic hydrocarbons (PAHs); which are mostly released through cooking, fuel burning, and smoking indoors and affect everyone present in the closed environment. PAHs are known to be carcinogenic, teratogenic, and genotoxic compounds, and also increase the risk of asthma, lung infections, skin diseases, and allergies. European Union policies are trying to reduce the concentration of PAHs, but studies on the management and reduction of this important health-threatening substance from indoor environments are limited. This study attempts to systematically review the research on methods for managing and removing PAHs from indoor environments and provide the results to researchers for further studies on the removal of this pollutant from indoor environments.

The databases used in this systematic study included "google scholar", "science direct", "Springe", and "Scopus", and the time period was considered from January 1, 2020 to August 17, 2024. Among the 13,465 articles found, 12 of them were closely related to the topic of this study and wereselected and reviewed. Based on the research conducted, ZnO/PAM-PVA photocatalyst, carbon nanotube membranes, ornamental plants, and CuZnFeAl–S adsorbent can be effective in removing PAHs, and the highest removal efficiency is related to the quartz filter with titanium dioxide coating and the lowest removal efficiency is related to electrostatic precipitators. Studies show that treatment with photocatalysts is a suitable method for buildings contaminated with polycyclic aromatic hydrocarbons.

Keywords: Indoor air Pollution - Removal - Polycyclic Aromatic Hydrocarbons (PAH)

The impact of climate change on the growth and malnutrition of children in Chaharmahal and Bakhtiari provinces

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Abstract

challenges of our time. These changes affect human health in various ways, including changes in crop production, increased heat stress, changes in access to fresh water, the spread of some infectious diseases such as malaria, dengue, and cholera. It is estimated that climate change causes approximately 154,000 deaths. In the year 2000, almost half of them were due to malnutrition. Available experiences show that climate change has had an impact on children's malnutrition in recent years. For this purpose, the electronic health records of all children under 5 years of age in Chaharmahal and Bakhtiari provinces between 1399 and 1402 were examined and the indicators of Emaciation and severe emaciation Severe, underweight, severe underweight, short stature and severe short stature were extracted in the province. The results showed that according to the climatic changes in the province, the index of emaciation and extreme emaciation has increased from 10.2% to 18.8%, underweight and severe underweight from 4.3 to 7.4, and the index of short stature and extreme short stature has increased from 3.7 to 6.4%. Considering the existing conditions and solutions such as promoting health education, improving access to healthy foods and proper nutrition, increasing the use of water resources, protecting nature and promote sustainable agriculture. Also, measures such as increasing food security, monitoring and evaluating children's health and nutrition conditions, and formulating effective policies in the field of climate and its changes can also be effective in this field.

Keywords: Children، Impact of climate change

The psychological effects of climate change on the citizens of Mazandaran province

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Abstract

The study aimed to examine the psychological effects of climate change on citizens in Mazandaran Province in 1403 (2024). It utilized a descriptive-analytical approach, focusing on residents who have lived in the province for over ten years. The sample size was determined to be 380 individuals based on Morgan's table. Data collection involved the Clayton Climate Change Anxiety Questionnaire, which consists of 22 items assessing climate change anxiety across four dimensions. The content validity of this questionnaire has been confirmed, and its reliability was reported at 0.959. Specifically, the Cronbach's alpha coefficients were 0.941 for cognitive and emotional disturbances related to climate change, 0.863 for behavioral engagement, 0.931 for personal experiences of climate change, and 0.890 for functional impairment. The questionnaire was distributed online, with a link sent to citizens of Mazandaran Province. A convenience sampling method was used to randomly select participants from the study population. Scoring was based on responses ranging from 1 to 5, yielding total scores between 24 and 120.Results indicated that the average score reflecting the psychological effects of climate change anxiety among respondents was 49.2360, suggesting a moderate level of anxiety related to climate change. Significant differences were found between groups with university education and those with a high school diploma or lower regarding cognitive and emotional disturbances, behavioral engagement, and personal experiences (p-value < 0.05). However, no significant difference was observed between the two groups concerning functional impairment (p-value ≥ 0.05). To lessen the adverse impacts of climate change on mental health, it is essential for policymakers and public health authorities to implement initiatives that enhance awareness, education, and access to suitable counseling services in this area. Furthermore, bolstering social and economic infrastructure can improve community resilience in facing the challenges brought about by climate change. Ultimately, addressing the psychological dimensions of climate change must be a fundamental component of strategies aimed at tackling environmental crises.

Keywords: Climate change, Psychological effects, Cognitive and emotional disorders, Behavioral conflict, Personal experience, Functional disorder

Increase in Mortality due to Exposure to Heatwaves in Iran: Systematic Review and Meta-analysis

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Abstract

Despite the frequent occurrence of heat waves in the Middle East, there is a lack of evidence regarding the overall estimates for the effect of heat waves on mortality in this region. This systematic review and meta-analysis study was aimed to review all the studies conducted in Iran about the effect of exposure to heat and cold waves and daily cause-specific mortality. Four electronic databases (Scopus, PubMed, Web of Science, and Embase) were searched. The titles, abstracts, and full-texts of the articles were carefully reviewed by two independent researchers. Once eligible studies were identified, the required data were extracted. Separate meta-analyses were conducted based on the gender, age group, and health endpoint combinations when at least three studies were available. According to the meta-analysis, heat waves had a statistically significant effect on all-cause mortality with an RR of 1.23 (CI 95%: 1.08, 1.39). Cardiovascular mortality significantly increased in heat waves with an RR of 1.08 (CI 95%: 1.05, 1.10). However, the increase in respiratory mortality was not statistically significant (1.09; CI 95%: 0.84, 1.34). This study can be beneficial in developing response or adaptation plans for heat waves. Future studies should focus on other specific health endpoints like ischemic heart disease, chronic obstructive pulmonary diseases, etc. and other outcomes such as hospitalization and emergency visits.

Keywords: Heat wave, temperature, Death, Climate change, Public health, Abnormal temperature

Estimation of VOC emissions using the AERMOD model from sugarcane industrial with a management approach

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Abstract

Air pollution is the contamination of the indoor or outdoor environment by any chemical, physical, or biological agent that modifies the natural characteristics of the atmosphere. Air pollutants are usually a mixture of dangerous and non-hazardous compounds. One of the air pollutants is volatile organic compounds (VOCs). The AMS/EPA Regulatory Model (AERMOD) is a modern, steady-state Gaussian air dispersion model based on planetary boundary layer theory. In this study, the low-flow SKC sampling pump was calibrated by a rotameter the samples were analyzed using a gas chromatography-mass spectrometer equipped with a DB-5Jandw column. analysis of the samples were determined in the GC-MS machine. AERMOD software, version 8.3 was used for modeling. The results showed that only in the sample 16 km northeast of the smelly polluting industry, the sources are similar. It is evident that 34% of the winds in this area have a speed between 2-3.60 m/s, but the fastest winds account for only 2%. The mechanical analysis of the samples of this source showed that only methane gas is produced during the peak activity of the factory, which has a publishing rate of 0.25 grams per second. The main pollutant of agriculture and industry in Daabal Khazai is cotton gas and methane, among which Vinasse evaporation ponds have the highest amount of cotton gas emission.

Keywords: Modeling, VOC, AERMOD, Agriculture and industry.

Assessment of Indoor and Outdoor Air Suspended Particulate Concentrations in Mashhad Elderly Care Centers

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Abstract

The elderly populations spend relatively more time indoors and they are more sensitive to air pollution related health risks but there is limited information on the quality of the air they breathe inside their residences. The objectives of this study were to determine the concentration of $PM_{2.5}$ and PM_{10} in elderly care centers of Mashhad in Iran, determine the relationship between the concentration of $PM_{2.5}$ and PM_{10} in the indoor and outdoor air of elderly care centers and evaluate the effect of different parameters on the $PM_{2.5}$ and PM_{10} concentration in indoor air. The objectives were achieved by measuring $PM_{2.5}$ and PM_{10} concentrations in both indoor and outdoor air of 18 elderly care centers in Mashhad, Iran. Particle Mass Counter TES-5200 was used to measure the $PM_{2.5}$ and PM_{10} concentrations, temperature and relative humidity. Our results showed the mean of indoor and outdoor $PM_{2.5}$ concentration measured 5.12 and 3. 5 µg/m3, the mean of indoor and outdoor PM_{10} concentration measured 23.23 and 39.6 µg/m3 respectively. The $PM_{2.5}/PM_{10}$ ratio in the indoor air of elderly care centers was 0.22, clearly suggesting a significantly high exposure to coarse particles by the elderly. The results showed a significant relationship between the concentration of suspended particles in indoor and outdoor air ($P<0.05$). This represented a penetration of outdoor particles into the indoor air of the elderly care centers. Our findings suggest controling indoor and outdoor sources in the elderly care centers to limit adverse health effects of particulate matter on elderly.

Keywords: $PM_{2.5}$, PM_{10}, Indoor and Outdoor Air, Elderly Care Centers

A review of the pollutants caused by plastic in dust and its effects on human health

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Abstract

Health Implications of Phthalates, Bisphenol A (BPA), and MicroplasticsThis article examines the health risks associated with phthalates and Bisphenol A (BPA), prevalent chemicals in plastic production. As plastic usage is projected to double by2050, the need to address the implications of these substances becomes increasingly critical. Phthalates are primarily used to enhance the flexibility and durability of plastics, while BPA is utilized in various applications, including food packaging and consumer goods. Research highlights a range of health effects linked to exposure, including several cancer types (liver, gastrointestinal, breast, and skin), reproductive disorders, and male reproductive health issues such as reduced sperm count and testicular anomalies. Additionally, prenatal exposure to phthalates has been implicated in genotoxicity, resulting in DNA alterations that may contribute to conditions like type-2 diabetes and tumor development. Despite growing evidence of these substances' harmful effects, regulatory action has been slow, reflecting ongoing debates among scientists and policymakers regarding the adequacy of existing data to justify intervention. Increased consumer awareness has prompted a shift towards safer product alternatives, influencing manufacturers to reconsider their formulations. This article underscores the urgent need for comprehensive research and proactive regulatory measures to mitigate the health risks posed by phthalates, BPA, and microplastics, ultimately promoting public health and environmental safety.

Keywords: Microplastics, Dust, Review, BPA.

Examination of The Concentration of Selected Heavy Metals in Settled Street Dust of Shushtar City

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Abstract

Dust serves as a significant source of heavy metals in urban environments. The heavy metals present in airborne dust are among the most perilous pollutants, posing a serious threat to human health and the environment. The objective of this study is to examine the level of heavy metal pollution (Aluminum, Arsenic, Cadmium, Chromium, Copper, Nickel, Lead) in street dust in Shushtar city. To achieve this objective, 25 samples of street dust were collected from the main streets of Shushtar and analyzed using Inductively Coupled Plasma Optical Emission Spectrometry (ICP OES). The level of heavy metal pollution was assessed based on the Geoaccumulation Index (Igeo) and Pollution Index (PI). The average concentrations of Aluminum, Arsenic, Cadmium, Chromium, Copper, Nickel, and Lead are 1763.5, 1.2, 3.0, 99.28, 53.53, 86.37, and 35.57, respectively. The concentrations of all heavy metals, except Aluminum, Arsenic, and Chromium, in Shushtar city's dust samples were higher than the background levels (concentration in the Earth's crust). According to the Geoaccumulation Index (Igeo) and Pollution Index (PI), Lead and Cadmium exhibit very high pollution in the study area. The results obtained from pollution indices indicate that human activities such as traffic and the combustion of fossil fuels are the sources of pollution for the studied metals in Shushtar city's dust.

Keywords: Heavy metals, Street dust, Pollution index, Geoaccumulation index.

Concentration and Risk Assessment of Inhalable $PM_{2.5}$-Bound Polycyclic Aromatic Hydrocarbons in the Air of Tehran

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Abstract

Air pollution represents one of the most critical environmental and public health challenges in major urban centers, particularly in Tehran. This study focuses on the concentration of polycyclic aromatic hydrocarbons (PAHs) bound to fine particulate matter ($PM_{2.5}$) and the associated inhalation risk in Tehran's atmosphere. Data were collected from four monitoring stations across the city during the period of October to December 2021. Following sample extraction and analysis via gas chromatography-mass spectrometry (GC-MS), PAH concentrations and health risk indices—encompassing both carcinogenic and non-carcinogenic risks—were quantified. The mean total PAH concentrations varied between 65.92 and 142.76 ng/m³. The findings revealed that certain PAH compounds, such as dibenzo[a,h]anthracene, exhibited significant carcinogenic potential, while the non-carcinogenic risks were within acceptable limits. These results underscore the necessity of reducing PAH emissions from anthropogenic sources, particularly vehicular exhaust and industrial activities, to safeguard public health.

Keywords: Particulate matter, Polycyclic aromatic hydrocarbons (PAHs), Health risk, Monte Carlo simulation

The Impact of Climate Change on Selected Meteorological Variables in Provincial Centers of Iran from 1993 to 2022

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Abstract

Climate change, as a global challenge, has significantly affected atmospheric systems and ecosystems, especially in regions with distinct geographic features. This study aims to examine the impact of climate change on meteorological parameters across Iran over the past 30 years. The selected parameters included average wind speed, maximum sustained wind speed, and dew point temperature, which were carefully validated and analyzed using linear regression method and drawing on the map in terms of time and place in the centers of Iranian provinces. The results showed that climate change has significantly affected Iran. In the meantime, the northern and northwestern regions of the country have seen an increase in the average and maximum wind speed, while in the southwestern and southern regions, a significant decrease in these parameters has been observed. The decrease in dew point temperature in some cities indicates a decrease in atmospheric humidity and drier weather conditions, which have negative effects on human life and ecosystems. The magnitude of these changes has also varied across cities and regions, with some regions affected more than others. This shows the different influence of different regions of the country on climate change.

The results underscore the importance of a region-specific approach to climate change planning and policy-making in Iran. Furthermore, the adoption of preventive measures in water resource management and public health programs appears essential to address the future climate challenges facing Iran.

Keywords: Climate change, Meteorology, Mean wind speed, Maximum sustained wind speed, Dew point temperature

Invivo and Invitro Antifungual activity of thyme (Thymus vulgaris) and rosemary (Salvia Rosmarinus) essential oil nanoemulsion

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Abstract

Antifungal activity of thyme and rosemary nanoemulsions against *Nattrasia. mangiferae, Peacilomyces. variotii* and *Cytospora. cincta*, were evaluated. The flavour compounds of extracted thyme and rosemary nanoemulsions were determined using GC-MS The main components of rosemary essential oil (REO) were Alpha_terpinolene (37.71%), camphor (33.18 %), phenol (22. 20%).and of rosemary essential oil(TEO) were Thymol (37.64%), Linalool (29.85%) and Carvacrol (24.3%). The antifungal activity of Essential Oils (Eos) against plant pathogens was evaluated by using the agar dilution method. The TEO inhibited mycelium growth 100 % in N. mangiferae, P. variotii and C. cincta 0.25 %petri dose. while Bardo Mix in the same concentration had no effect on fungal growth. Also, rosemary essential oil had complete inhibition in N. mangiferae and C. cincta at a concentration of 0.25%, while it had 66% inhibition on P. variotii at the same concentration. The results showed that non-purified thyme-based nanoemulsions were more effective than rosemary on all three fungi. Our findings suggested the use of these essential oils can prevent fungal infections on plants as alternatives to synthetic ones.

Keywords: Nanoemulsion, Thymus vulgaris, Salvia rosmarinus, Nattrassia mangiferae, Paecilomyces variotii Cytospora cincta.

The double threat of *Pseudomonas aeruginosa*: antibiotic resistance, impact of disinfection and related risks

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Abstract

Pseudomonas aeruginosa is a common cause of nosocomial infections, particularly in moist hospital environments such as sinks, showers, and medical equipment. This study investigated the prevalence of P. aeruginosa in various hospital settings and assessed its resistance to antibiotics and disinfectants. A total of 227 samples were collected from water, biofilms, air, and surfaces in hospitals located in Isfahan, Iran. The presence of P. aeruginosa was confirmed using culture-based methods and PCR. Antibiotic susceptibility testing was performed using the disk diffusion method, and resistance to disinfectants was evaluated by exposing the bacteria to different concentrations of chlorine and common surface disinfectants. P. aeruginosa was detected in approximately 8% of biofilm samples, 6% of water samples, and 9% of air samples. The highest resistance was observed against beta-lactam antibiotics. Isolates also exhibited significant resistance to commonly used surface disinfectants, including quaternary ammonium compounds, hydrogen peroxide, and phenol. Moreover, all P. aeruginosa strains isolated from water systems were resistant to 0.5 ppm chlorine. The detection of antibiotic and disinfectant-resistant P. aeruginosa in hospital environments raises concerns about the potential for infections in hospitalized patients. This study emphasizes the need for enhanced infection prevention and control measures to address the growing challenge of antimicrobial resistance.

Keywords: Pseudomonas aeruginosa, Antibiotic resistance, Disinfection, Hospital-associated infections

An Examination of Environmental Factors Influencing the Viability of SARS-CoV-2 and Their Contribution to the Transmission Dynamics of COVID-19: A Review

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Abstract

Recent studies show mixed results about how the environment affects the survival and spread of SARS-CoV-2, the virus that causes COVID-19. The key factors affecting the severity of the disease are the way the virus interacts with the host, its stability in different conditions, the amount of virus present, social behaviors and health measures. The persistence of the virus is affected by factors such as temperature, humidity, pH, salinity and sunlight, and temperature and humidity are particularly important. In addition, social health factors, such as access to health care and underlying health issues, have significantly influenced the spread of COVID-19. Therefore, tackling these health-related issues is crucial to control disease outbreaks globally. However, specific environmental triggers for COVID-19 remain largely unknown. Understanding these factors is essential to rapidly respond to new virus types and develop sustainable strategies for control. This review examines how environmental conditions and health factors contribute to the spread of SARS-CoV-2.

Keywords: environmental health, COVID-19 outbreak, SARS-CoV-2 spread, ambient conditions, SARS-CoV-2 survival and transmission

Platform Session 6:

Solid Waste Management and Soil Protection

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Co-composting of oily tank sludge via chicken manure and sawdust on a laboratory scale

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Abstract

The improper disposal of oil sludge, resulting from the accumulation of hydrocarbons in storage tanks, poses a significant threat to the environment due to the presence of toxic substances. Additionally, the high volume of poultry manure production requires comprehensive and efficient management. This study investigates a laboratory-scale solution by co-composting oil sludge, poultry manure, and sawdust to mitgorigate these issues. Physicochemical, biological, and microbiological parameters were evaluated to determine the optimal treatment and maturity time. In this study, changes in physicochemical parameters (temperature, pH, electrical conductivity (EC), total organic carbon (TOC), total Kjeldahl nitrogen (TKN), C/N ratio), a biological parameter (germination index (GI)), and a microbiological parameter (total and fecal coliform bacteria) were evaluated in four different treatments involving varying ratios of oil sludge, poultry manure, and sawdust: Treatment 1 (5:0:95), Treatment 2 (10:20:70), Treatment 3 (12:28:60), and Treatment 4 (16:34:50). The parameters were monitored over a period of 91 days. Data analysis was performed using SPSS version 26 and Excel 2016. Additionally, Pearson correlation coefficients were calculated and interpreted to assess the linear relationships between these parameters. The composting process was successful in significantly reducing TOC, TKN, C/N ratio, and coliform bacteria. The pH increased from acidic to neutral or slightly alkaline. Additionally, the results indicated a gradual increase in EC. Based on C/N ratios of less than 25, week 8 was determined as the appropriate time for stabilization in treatments 2, 3, and 4. Furthermore, according to the GI values greater than 90, the maturity stage for treatments 3 and 4 was estimated at week 10 and for treatment 2 at week 12. Correlation analysis revealed a significant positive correlation between pH and EC with GI, as well as between TOC and TKN. Conversely, a significant negative correlation was observed between GI, EC, pH, with TOC. The results of this study have shown that treatment 4 with the mixing ratio (50% oil sludge: 34% chicken manure: 16% sawdust) is the best treatment with the degree of stability and maturity in terms of maturity evaluation indicators from the eighth week onwards. The top was selected. Also, by comparing its physicochemical, biological and microbial parameters with the national standards of Iran and other countries, it can be concluded that this compost is classified as B grade.

Keywords: Co-compost, Oil sludge, Chicken manure, Sawdust, Maturity

Association of Endotoxin Exposure and Serum Immunoglobulin E Levels among Workers in Waste Processing and Disposal Facilities

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Abstract

Waste processing facilities are a source of different types of bioaerosols, and the effect of these bioaerosols on human health in municipal solid waste management is a major concern worldwide. In this study, which was carried out in the Arad kouh waste processing and disposal complex in Tehran, the level of serum immunoglobulin E (IgE) was measured in the workers of this complex and its relationship with exposure to some bioaerosols such as endotoxin was evaluated. Total serum IgE level was measured by luminescence electrochemistry method and the results were reported in IU/ml. According to the level of exposure to Endotoxin, people were divided into three groups with high (processing group), medium (composting group) and low (staff group) exposure. The average serum level of IgE in the compost and processing groups were 290 and 197 IU/ml, respectively, which was found to be lower in the administration group (84 IU/ml). According to the Kruskal-Wallis test, a significant difference in IgE concentration was observed between both high and medium exposure groups and administrative group. Investigating the relationship between exposure to bioaerosols and health effects has serious challenges, and adequate exposure monitoring is a top priority for those working in this field. Due to the high concentrations measured in different sites of Arad Koh complex, it is recommended to consider some preventive corrective measures, such as using measures to control dust and personal protective equipment to reduce the exposure of workers at an acceptable level.

Keywords: Waste, Exposure, Bioaerosol, Immunoglobulin E

Evaluating the Efficiency of Aerobic-Anaerobic Hybrid Bacterial Reactor in Removing Heavy Metals from Landfill Leachate

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Abstract

Considering the challenges in landfill leachate treatment, which often lead to low effluent quality, investigating the efficiency of anaerobic baffled reactor (ABR) with an aerobic section can provide new solutions in improving the treatment process. Therefore, the aim of this study was to "Evaluating the Efficiency of Aerobic-Anaerobic Hybrid Bacterial Reactor with Anaerobic Filter (AABR-AF) in Removing Heavy Metals from Landfill Leachate". In this study, two glass reactors were used: the AABR-AF with 6 independent chambers, of which only the third chamber was aerobic and the sixth chamber served as an AF, and the ABR- AF, which was used as a control reactor without an aerobic chamber. The leachate was injected into the reactors at a constant flow rate. The system was evaluated at Hydraulic retention times (HRTs) of 24, 36 and 48 hours and Organic loading rates (OLRs) of 1, 2, 4 and 10 kg/m^3.d. All the tests were done according to standard methods for the examination of water and wastewater. The results showed that the outlet pH in both reactors decreased compared to the inlet pH, but this value remained in the appropriate range for anaerobic digestion (6.5-8.5). Also, the best removal efficiency for all heavy metals was measured at OLR of 10 kg/m^3.d. Removal efficiency at OLR of 10 kg/m^3.d were observed 32.44, 78.80, 24.64, 89.57, 76.42, and 32.28 percent in AABR-AF and 25.53, 70.76, 18.01, 85.91, 38.10, and 29.12 percent in ABR-AF respectively for mercury, arsenic, iron, manganese, zinc and nickel. The results showed that the heavy metals removal in AABR-AF and ABR-AF is highly dependent on HRT and OLR, and the AABR-AF, with an aerobic cell in the entire system, has shown high efficiency (higher than the ABR-AF) in heavy metals removal from the landfill leachate.

Keywords: Landfill Leachate, Anaerobic-Aerobic Hybrid Bacterial Reactor, Anaerobic Baffled Reactor, Anaerobic Filter, Heavy Metals

Evaluation of dry anaerobic digester in biogas production in mesophilic conditions

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Abstract

Anaerobic digestion, as an environmentally friendly method, can be an effective technology in waste management for energy production and purifying the organic part of waste by producing methane gas. Therefore, the current study aims to evaluate the dry anaerobic digester in biogas production in mesophilic conditions using wastewater treatment sludge and plant waste produced in the Shiraz Petrochemical Complex. The present study was conducted on a pilot scale in an anaerobic reactor with a volume of 24 liters in 30 days for three ratios of 20, 25, and 30 carbons to nitrogen (C/N) using of sewage sludge and tree foliage. The reactor wall was designed to maintain the wall temperature at 35°C. During the process, temperature, pH, and C/N were measured. Measurement of produced gases was measured using a gas chromatography device (GC). The results showed that the average pH in C/N ratios of 20, 25, and 30 was 5.6, 5.9, and 5.77 respectively. The highest percentage of produced gas was observed in the C/N ratio of 25; The percentages of CH_4, CO_2, H_2S, and NH_3 produced in this ratio are 24.33, 30, 0.07, and 0.37 respectively. In mesophilic conditions, the amount of biogas produced using plant waste and sewage sludge is efficient for dry anaerobic digestion.

Keywords: Biogas, Renewable Energy, Dry Anaerobic Digestion, Mesophilic

Evaluation of the performance of a synthesized metal-organic framework based magnetic nanocomposite (mag-MOF(Cu)) derived from copper recovered from electrically printed board waste for the extraction of Diazinon from aquatic solutions

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Abstract

Printed circuit boards make up the main source of e-waste, which contain substantial quantities of precious metals including Copper. This study is aimed at the preparation of a metal organic framework-based magnetic nanocomposite (mag-MOF(Cu)) whose Cu had been recovered from electrically printed board waste and its efficiency in extraction of diazinon from aquatic solutions. The recovery of Cu from electrically printed board waste was achieved using an electrochemical method under the potentiostatic mode (0.25 to 0.35 V). Then, the mag-MOF(Cu) nanocomposite was synthesized with the Cu recycled from printed circuit boards. Thereafter, a magnetic solid phase extraction process (MSPE) was employed for the extraction of Diazinon using the above-mentioned nanocomposite. The results of the metal recovery from electrically printed board waste indicated that Cu is the most abundant metal in the leaching solution. According to the results, at 0.25 V, the electrochemically Cu deposits were in state of relatively high purity. The results showed that the optimal conditions for the magnetic solid phase extraction method using mag-MOF(Cu) nanosorbent is equal to solution pH, 7; nanosorbent amount, 15 mg; extraction time, 15 min; elution solvent, methanol. The respective limits of detection (LOD) and quantification (LOQ) were measured to be 1.9 and 5 μg/L. Besides, the mag-MOF(Cu) was applied for the extraction and determination of Diazinon in tap water, surface water, well water, and treated waste water samples with the recoveries ranging from 84.0 to 105.5% (RSDs = 3.8–9.6%). The obtained results showed that the synthesized mag-MOF (Cu) nanocomposite whose Cu had been recovered from electrically printed board waste, could be applied as an efficient sorbent with a great potential for the preconcentration and extraction of the pesticides from aqueous media.

Keywords: Printed circuit board waste, Copper recovery, Metal-organic framework, Extraction, Diazinon

Quantitative evaluation of generated wastes in the active sugar industries in Iran and determination of estimation coefficient for types of generated wastes

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Abstract

Iran ranks 18th and 11th in the world in sugar and sugar beet production, respectively. This indicates the establishment of numerous sugar processing factories in the country. As a result of the production activities of these factories, various waste materials are generated, including sugar beet pulp and filter cake, the improper management of which can lead to various environmental challenges and be considered a threat to the environment and public health. Therefore, this study aims to investigate the amount of the mentioned waste produced in the active sugar industries of the country. For this purpose, the necessary information was obtained from the Association of Sugar Factories of Iran, and the data related to nominal capacity (tons per day), sugar beet consumption (tons per year), operating duration (days), percentage of sugar beet pulp and filter cake production from the input raw material were analyzed. Based on the obtained information, 29 sugar beet factories in the country operate on average for 52 to 140 days a year. The results showed that the amount of sugar beet pulp produced in comparison to filter cake in the factories is significantly high. Although the large volume of produced waste may be considered a threat to the environment, from a broader perspective, appropriate strategies can not only turn this threat into an opportunity but also create economic benefits. On the other hand, for each of these wastes, there are various methods to reduce environmental impacts and also to revalorize them.

Keywords: Sugar industry waste, Agro-industrial waste, Waste production rate, Waste management

Designing of integrated leachate management plant for Qom city solid wastes

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Abstract

Now, 690 tons of waste is produced daily in the domestic sector of Qom city, which is collected and transported to the Alborz waste disposal site (with an area of 200 hectares) by 80 truck and small machines. As a result, a large amount of leachate is produced daily in different parts of the waste management system of this city, especially in the Alborz site. Due to the lack of provision for the necessary measures to collect the leachate inside the landfills and the lack of a plan for the final management of this leachate, the present study was conducted under the title of "Examination of the management and disposal methods of the leachate in the Alborz site of Qom and providing implementation solutions" to provide the solutions to reduce the amount of production leachate and also determine the executive and operational solution to collect and purify the production leachate should be provided. For this purpose, quantitative and qualitative sampling of production leachate in Alborz site and waste transfer station in Qom city was done in two seasons, and the necessary tests were carried out according to the standard method book. Then, solutions to reduce leachate production in the waste management process, as well as methods of final leachate management at the Alborz site (taking into account the requirements notified by the Iran Environmental Protection Organization) were formulated. The results of the study showed that 45 cubic meters of leachate is produced daily in the waste management system of Qom, and its COD and BOD_5 values are 45,560 and 19,135 mg/liter, respectively. Also, due to the lack of capacity of the existing storage pool at the Alborz site, it is not possible to use the evaporation method for the final disposal of production leachates, and a dedicated leachate treatment plant with a capacity of 45 cubic meters per day should be built. Due to the qualitative characteristics of the leachate and its difference in strength compared to urban wastewater, this treatment plant requires physical, chemical, and biological (aerobic and anaerobic) units. In addition, in order to reduce the amount of leachate production in this site, sanitary burial cells equipped with geomembrane layer and cover soil should be constructed. Also, the effluent from this treatment plant can be used to supply moisture to composting masses and create a green belt around this site.

Keywords: Leachate, waste, Management, Qom, Alborz site

Investigating the application of the Iranian matrix in the biological environment assessment (EIA) of Qaen waste landfill

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Abstract

The aim of this study is to evaluate the environmental impacts of the landfill site in Qaen city using the Iranian Leopold Matrix method. This study identifies physical-chemical, biological, economic, and social effects while analysing the site's positive and negative effects on the environment, economy, and society. GIS software, environmental monitoring instruments, and assessment forms were used in the methodology to analyse both qualitative and quantitative data. A numerical scale from -5 to +5 was used to score the impacts. The results show that the project's detrimental effects—such as soil and water contamination and biodiversity loss—outweigh its beneficial effects. The majority of the benefits were restricted to social and economic elements, like the creation of jobs. Given the significant negative effects, the discussion and conclusion imply that fundamental reforms are necessary in order to continue landfill operations under the current circumstances. To lessen adverse effects and enhance waste management in the area, recommendations include enhancing infrastructure, putting in pollution control devices, and implementing alternate techniques like composting and recycling.

Keywords: Environmental impact assessment (EIA), waste landfill, Leopold matrix, Qaen.

Treatment of compost plant leachate using a combined method of coagulation, flocculation, advanced oxidation, and extended aeration

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Abstract

Modifying and enhancing treatment methods is essential to meet effluent standards for treating compost facility leachate. This study investigated the treatment of leachate generated from compost facilities using coagulation, flocculation, advanced oxidation, and extended aeration processes. The effects of different coagulant doses and pH values on coagulation processes were compared for the treatment of compost facility leachate. The treatment procedure was analyzed to determine the impact of varying concentrations of potassium persulfate ($K_2S_2O_8$) and hydrogen peroxide (H_2O_2) on the results after coagulation with $FeCl_3$. The biological stages of the extended aeration process were studied using a sludge retention time (SRT) of 23 days, while the effects of hydraulic retention time (HRT) of 18 and 36 hours were also assessed to optimize the overall treatment efficiency. The experimental findings reveal that within the pH range of 5–8, reducing the pH substantially enhances treatment efficiency. The introduction of 0.8 g L^{-1} of $FeCl_3$ resulted in a 57% reduction in chemical oxygen demand (COD). Furthermore, the combination of 2.5 g L^{-1} of $K_2S_2O_8$ and 1.5 g L^{-1} of H_2O_2, along with UV-C (15 W) treatment for 70 minutes at pH 7, was able to achieve an impressive 87% removal of COD. In the extended aeration phase utilizing activated sludge, an 86.5% reduction in COD was accomplished under optimal conditions, which consisted of a hydraulic retention time (HRT) of 36 hours and a sludge retention time (SRT) of 23 days. The comprehensive hybrid treatment system maintained high removal efficiencies, achieving 99.3%, 99%, 94%, 87.6%, and 81.8% for COD, biochemical oxygen demand (BOD), total suspended solids (TSS), turbidity, and total Kjeldahl nitrogen (TKN), respectively. This highlights the process's effectiveness for treating leachate from compost facilities. This study demonstrates that combining flocculation-coagulation, advanced oxidation processes (AOP), and extended aeration constitutes an effective treatment strategy for municipal solid waste leachate. This integrated approach significantly improves pollutant removal efficiencies and offers a practical solution for managing leachate from compost facilities.

Keywords: Compost, Waste Management, Oxidation, Coagulation Process, Leachate

Investigation of the Efficiency of Advanced Oxidation Processes (AOP) in Leachate Treatment with a Focus on the Impact of Hydroxyl and Sulfate Radicals

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Abstract

The management of urban waste leachate treatment poses a great challenge to environmental and public health due to the presence of organic particles and hazardous pollutants. This study aimed to investigate the efficiency of advanced oxidation processes (AOP) in the final treatment of leachate. In this study, municipal solid waste leachate was treated using primary processes such as coagulation, flocculation, and sand filtration. The final treatment was then carried out using activated sludge/extended aeration. In the second phase, the separate effects of ultraviolet (UV) radiation and heat on COD removal were examined in six advanced oxidation processes including UV-PS, UV-H_2O_2, UV-PS/H_2O_2, Heat-PS, Heat-H_2O_2, and Heat-PS/H_2O_2. The results obtained from the experiments indicate that the use of various advanced oxidation methods (AOP) has a significant impact on reducing COD. The UV-PS process achieved a COD removal efficiency of 66%. Additionally, the efficiency of this process combined with H_2O_2 reached 43%, demonstrating its high effectiveness in removing pollutants. The combination of UV-PS and H_2O_2 yielded the best results, increasing COD removal efficiency to 89%. On the other hand, the Heat-PS process succeeded in removing 58% of COD. Meanwhile, the combination of Heat-H_2O_2 recorded an efficiency of 34%, indicating the positive effect of heat in conjunction with the oxidant. Finally, the combined method of Heat-PS/H_2O_2 exhibited a noteworthy performance with a 75% removal efficiency. The combination of processes and the use of hydroxyl and sulfate radicals significantly contributed to increased treatment efficiency and resulted in a remarkable improvement in leachate treatment processes.

Keywords: Leachate, Oxidation, Waste, Sulfate Radical, Hydroxyl

Investigating the removal efficiency of tetrabromobisphenol A (TBBPA) by nanoparticles based on (Fe-S)

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Abstract

TetrabromobisphenolA (TBBPA) is the most common group of brominated flame retardants (BFRs). TBBPA is an emerging micropollutant, extremely persistent, friendly and bioaccumulative. Human exposure to TBBPA through inhalation, ingestion, dermal, dust, and occupational exposure can lead to adverse health outcomes. Therefore, degradable methods to remove TBBPA are of great importance. In this study, the removal efficiency of TBBPA by magnetic nanocomposite based on iron sulfide (Fe-S) was investigated, which had a very high capacity and efficiency in pollutant removal. Magnetic nanocomposite based on iron sulfide (Fe-S) was synthesized and characterized by XRD, FTIR, EDX, FESEM, and VSM analyses. The number design, combination of test steps and extraction solutions in the removal of TBBPA by the synthesized magnetic nanocomposite, including pH, adsorbent dose and contact time, were analyzed by desinexpert software according to the central compound design (CCD). The highest absorption efficiency was approximately 95% in optimal conditions with Fe-S/CuS nanocomposite, pH was 7 and reaction time was 15 minutes. The kinetics of the reaction follows the quasi-quadratic equation and the adsorption isotherm follows the Freundlich model.
The results of the study and attention to the effectiveness of magnetic nanocomposite in the process of removing TBBPA, as well as its relatively simple synthesis and easy separation with a magnet, can be used to remove TBBPA pollutants.

Keywords: Tetrabromobisphenol A, Nanocomposite, Adsorption, Pollutants.

Investigating the Management of Chemical-Pharmaceutical Liquid

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Abstract

Many chemicals and drugs used in healthcare institutions are hazardous (toxic, carcinogenic, corrosive, flammable, reactive, explosive, etc.). They are low in medical waste, but because of their potential The aim of this study was to investigate the management of pharmaceutical chemical wastes in urban hospitals of Bozvarzvar with the aim of providing appropriate information for comprehensive and proper planning and improving the quality of health services in the future. This descriptive cross-sectional study was performed in 4 months in four public hospitals of Shahr-e-Bozvar (Emdad, Mobini, Heshmatieh, Vasei hospitals) during two months. For the purpose of this study, checklist design, interviews, observations, visits, measurements, production, separation, collection, storage, safety, transportation and disposal of pharmaceutical chemical wastes were obtained. Total number of approved beds was reported in 4 hospitals, 859 beds and 609 active beds. Total occupancy rate was 71%. In the present study, 4 hospitals in Sabzevar produced 1500 kg / day of waste, of which 613 kg / day and 613 kg / day waste, 41% normal waste 873 kg / day 58.1% and 14 kg / day chemical waste produced 0.9% total waste. In the studied hospitals, the management of pharmaceutical chemical wastes (identification, separation, collection, storage, disposal, etc.) had drawbacks, so a thorough review of the waste management practices and compliance with the chemical and pharmaceutical waste management guidelines at the health centers is essential.

Keywords: Pharmaceutical chemical liquid waste, Waste management, Sabzevar hospitals

Awareness, Attitude, and Practice of Citizens of Tabriz Regarding Pharmaceutical Waste Management

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Abstract

Pharmaceutical waste imposes an economic burden on national health systems and threatens ecosystems. It is also considered a danger to the survival of humans and other organisms. Studies have shown that pharmaceutical products contain biologically active and often toxic substances, and if disposed of improperly, they pose significant environmental risks. This study aimed to evaluate the knowledge, attitudes, and practices of households in Tabriz-Iran regarding the disposal of expired and unused medications. In this descriptive-analytical cross-sectional study, 633 households from different areas of Tabriz were selected using a cluster sampling method. Data was collected using a researcher-made questionnaire from February to May 2024. The results showed that the mean age of the participants was 42.8 years. The majority of respondents were individuals with a bachelor's degree (25.6%), housewives (38.3%), and four-person households (33.7%). About 37% of households had one or more patients in the family. Pain relievers and antibiotics were the most common medications found in homes. Medication side effects (46.8%) and overprescription by physicians (43.9%) were the most important reasons for drug accumulation at home. The mean knowledge and attitude scores were 58.82 and 71.85, respectively. The results showed that despite moderate awareness and a relatively positive attitude, households' performance in the proper disposal of drugs was not satisfactory, and more than half of them disposed of expired medications in an unsafe manner. Municipalities can effectively establish medication return programs in collaboration with pharmacies to reduce the harmful environmental and public health impacts.

Keywords: Pharmaceutical waste management, Environmental hazards, Expired drugs, Unused drugs, Disposal

Investigating the effect of compost obtained from agricultural residues on strawberry plant growth

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Abstract

In this research, in order to investigate the production of compost from the remains of different plants and the effect of biocompost produced and enriched with elements Zn and Mn on the growth performance of strawberry plants. For this purpose, 5 treatments including an equal mixture treatment of produced biocomposts and four separate treatments of biocomposts obtained from the remains of studied plants enriched with zinc and manganese elements at the rate of 1 kg per square meter in all treatments in the form of a completely randomized design with Three replications were performed in greenhouse conditions. The results of the research showed that the biocompost produced with rapeseed, eggplant, cucumber and wheat and enriched with zinc and manganese at the rate of 1 kg per square meter on the parameters related to the quantitative and qualitative performance of strawberries such as vitamin C, total phenol, activity Antioxidant, total anthocyanin, total flavonoid, ellagic acid, pH, etc. have a significant effect. The results of the research showed that this amount in treatment 5 (rapeseed biocompost enriched with zinc and manganese at the rate of 1 kg per square meter) was more than other treatments, this effect is significant ($p \leq 0.01$). The results indicated that the use of biocompost had positive results on strawberry growth indicators and that biocomposts produced individually (not in combination) can be used to increase the appropriate growth performance of strawberry plants**.**

Keywords: Biocompost, Agricultural waste, Strawberry, Environment

Application of Internet of Things in municipal solid waste management

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Abstract

The management of municipal solid waste currently requires serious attention to ensure the best socio-economic principles, such as environmental protection, economic sustainability, and reducing human health issues. Given that smart waste management systems can lead to significant savings in time, costs, travel distance, and vehicle usage, this study examines the application of the Internet of Things (IoT) in the field of solid waste management.

This study was conducted by reviewing databases and using keywords such as municipal solid waste, Internet of Things, smart city, and sustainable development.

The results of this review indicate that the use of IoT in this area includes smart waste management models, smart bins, optimization of waste collection processes, automatic waste sorting, and smart waste disposal. One of the key applications of IoT in this area is the use of sensors to monitor the status of waste bins. These sensors can identify when bins are full and transmit necessary information to urban management systems, thereby optimizing the time and costs associated with waste collection. Additionally, smart systems can provide necessary training to citizens and improve their environmental behaviors.

These approaches contribute to sustainable development by improving efficiency, reducing costs, and minimizing environmental impacts. Recent advancements in IoT technology and the widespread use of sensors, smart devices, and intelligent algorithms have led to more efficient and environmentally friendly waste management.

Keywords: Urban solid waste, Internet of Things, Smart city, Sustainable development

Hydrothermal carbonization of food waste by landfill leachate substitution as reaction medium: optimization and by-products evaluation

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Abstract

The organic fraction of municipal solid waste (OFMSW) is a controversial and unmanaged resource that can be converted into renewable energy and value-added products by hydrothermal carbonization (HTC). In this study, the landfill leachate (LL) was used as an alternative liquid source for reaction medium to overcome global concern of water scarcity. The HTC optimization for food waste (FW) via LL substitution was conducted to study the effects of reaction temperature (180-260 ℃), residence time (2-6 h), biomass to liquid (B/L) ratio (10-20 wt.%) and LL COD (10000-20000 mg/L) on mass yield (MY) and higher heating value (HHV) of hydrochar using the Box–Behnken design of response surface methodology (RSM). The hydrochar properties, process water and outlet gas products characterization were evaluated under the optimal conditions. According to the results, Optimal conditions were determined at 225 °C, 4.5 h, 20 wt.% B/L ratio and 10000 mg/L COD, with 55.30 % MY and 30.15 MJ/kg HHV. The COD and TOC of the process water were very high, which is one of the main environmental challenges of the HTC process. Also, process water is rich in nutrients and contains a very small amount of heavy metals. The gaseous products of the HTC process mainly consist of CO_2 and a small amount of CO. The results showed that the substitution of landfill leachate as the liquid source of the reaction medium is technically feasible and can significantly upgrade the sustainability of the HTC process. The resulting hydrochar can be considered as an alternative to coal fuel due to its high energy content and calorific value.

Keywords: Hydrothermal carbonization process, Optimization, Landfill leachate, Hydrochar, Food waste.

Investigating the Effectiveness of Geosynthetic Clay Liners (GCL) in Controlling Acidic Waste Leachate

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Abstract

In many industries, the high acidity, elevated concentrations of sulfate, and toxic metals in industrial waste have led to the leakage of acidic leachate, wind erosion, and contamination of soil and groundwater. Nowadays, geosynthetic clay liners (GCLs) have garnered significant attention due to their relatively low cost, ease of installation, and excellent performance against leachate infiltration. GCLs generally consist of a layer of granular or powdered bentonite placed between two geotextiles. This study aims to assess the resistance of domestically produced GCLs, the only available and economical option in this category, against the leakage of hazardous waste leachate. This experimental study was conducted on a laboratory scale using a permeameter consisting of five cylindrical plexiglass columns, each 65 cm in length. In each analysis, four columns contained leachate with different pH levels, while one column contained deionized water. The liquid column was placed on a GCL layer, supported by a perforated bottom plate. Analyses via FESEM, XRD, EDX, and FTIR revealed that the morphology of bentonite particles after contact with leachate changed from spherical and non-uniform to flat and angular. Hydraulic conductivity results indicated that as the pH increased, the hydraulic conductivity of both the leachate and deionized water decreased. Additionally, a pHzpc value of 4.1 was obtained. The results of this study suggest that due to the acidic nature and high concentration of heavy metals in leachate from industrial waste disposal sites, such as copper smelting plants and some mining wastewater, the effectiveness of GCLs in sealing these disposal sites is diminished.

Keywords: Heavy metals, Acid Leachate, Geosynthetic Clay Liners, Hydraulic Conductivity, Sodium Bentonite

Evaluation and Comparison of Physicochemical and Microbial Parameters of Compost Produced from Sewage Sludge of a Paper and Cardboard Treatment Plant with the National Compost Standards of Iran

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Abstract

A significant amount of waste is generated annually in the industrial sector, resulting in substantial costs and often inadequate management, leading to irreparable environmental impacts on humans and other organisms. The paper and cardboard industry, as one of these sectors, continuously produces large quantities of wastewater and sludge during the paper production or recycling process. By recycling these materials into valuable products, an environmental threat can be transformed into an opportunity. This study aims to examine and compare the physicochemical and microbial parameters of compost produced from the sewage sludge of a paper and cardboard treatment plant against the national compost standards of Iran. Initially, a biological reactor containing sewage sludge from the paper and cardboard treatment plant was designed with poultry manure as a treatment. Composting was carried out by loading appropriate weight ratios of these materials into the reactor. To monitor the process, physicochemical parameters (moisture, pH, electrical conductivity, organic carbon, volatile solids, ash, carbon-to-nitrogen ratio, germination index), microbial parameters (fecal coliforms, Salmonella, Parasite Egg), and heavy metals (lead, copper, chromium, cadmium) were examined during the composting process (60 days). At the end of the process, the quality of the final product was assessed according to the Iranian national standard No. 10716. The findings indicated that the quality of the final product fully complied with the Iranian national standard No. 10716 (the national standard for compost category one and two), with 86% classified as category one and 14% classified as category two.

Keywords: Compost, Sludge, Paper and cardboard, National Standard

Awareness, Attitude and Performance in Waste Segregation: A Study of Yazdi Households and Related Ecological Factors

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Abstract

The most critical challenges of waste management are generating and recycling waste. Regarding this approach, household waste segregation of the source is the most suitable and affordable component in waste management. This study was conducted in Yazd City to determine household awareness, attitudes, and performance toward waste segregation and related ecological factors. This study, conducted in 2019, involved 386 households in Yazd city, selected through simple random sampling. The data were obtained using a researcher-made questionnaire. Advanced non-parametric tests such as Mann-Whitney and Kruskal-Wallis were employed to investigate the relationship between ecological factors, awareness, attitude, and performance. All analyses were conducted using spss-24 software, with a significance level set at 5%. Of the households surveyed, 53.6% actively segregated their recyclable waste. The study determined several ecological factors that influenced participation in waste segregation. Key factors included the cooperation of family members, sufficient space for waste storage, awareness of environmental protection, timely information about collection schedules, regular garbage collection by the municipality, wait times for garbage collection, and the execution time of these services. Additionally, the practical education provided by municipal authorities impacted residents' engagement in waste segregation. Yazd citizens have a medium awareness and performance regarding waste segregation. Ecological factors are influential, and increasing education is needed to boost participation. It is also advisable to entrust critical aspects of waste management to private companies.

Keywords: Waste Segregation, Ecological Factors, Citizen Participation

Investigating the Health Effects of Microplastics on Human Health: Exposure pathway, Accumulation, and Toxicity Effects

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Abstract

Microplastics are plastic particles, films, and fibers with a diameter of less than 5 mm. Due to their prolonged presence in the environment and the alarming increase in annual emissions, concerns have been raised regarding the potential health risks of microplastics to humansTherefore, this study aims to better understand the health effects of microplastics on humans by reviewing existing literature on the pathways of entry, accumulation, and adverse effects of microplastics on different body organs.This research constitutes a review study. A search for scientific literature was conducted on “Google Scholar” and “Science Direct” using the keywords: microplastics, exposure pathways, toxicity, and health risks. Eligible studies were reviewed and those not published in English were excluded. Microplastics present in the environment enter the human body through dietary intake, drinking water, and airborne inhalation. To date, microplastics have been reported in human samples such as feces, blood, placenta, lower airways, and lungs, leading to adverse health effects, including the induction of intracellular oxidative stress, genotoxicity, reproductive toxicity, and inflammatory responses. The results indicate that the human body primarily absorbs microplastics through inhalation, with drinking water and dietary intake are ranked next. Once inside the body, these particles can result in health effects and toxicity in target organs. Therefore, increasing awareness of this crisis, implementing immediate and practical measures to reduce microplastic pollutants in the environment, and conducting further studies on the quantity and potential hazards of these particles are essential.

Keywords: Microplastics, Exposure routes, Health hazard, Toxicity

Management of industrial and hazardous wastes produced in Kermanshah industries

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Abstract

The improper disposal of hazardous waste, coupled with the absence of effective industrial and hazardous waste management regulations, has led to environmental crises and poses a significant threat to human health. This research was conducted based on field visits, designing and completing a researcher-made questionnaire and analyzing the results. Waste separation was implemented in 70% of industries, primarily through separation by origin. Temporary storage of regular waste occurred mainly in closed areas and open spaces, accounting for 48% and 36%, respectively. The condition of regular waste storage areas was isolated in only 25% of industries. The primary means of transporting industrial waste to disposal sites were vans and trucks, accounting for 65% and 10%, respectively. The predominant methods of disposing of regular, industrial, and hazardous waste include: sale, burning and sale, and burial with urban waste, with shares of 35%, 30%, and 15%, respectively. In the case of industrial waste, the methods included purification, recycling, and sale, with recycling accounting for 28%, sales for 25%, and purification for 20%. Industrial solid waste was reused in 70% of industries. In 86% of the industries, hazardous industrial waste was not dehazarded, and in 96% of the industries, minimization was not implemented. The separation of waste at the source and the reuse of solid industrial waste have reached a relatively acceptable level of 70%. However, industrial units should be mandated to establish designated areas for the temporary storage of waste. This study indicates that the current methods for minimizing and decontaminating industrial and hazardous waste are not optimal. Therefore, hazardous industrial wastes must undergo volume reduction, separation, and detoxification through formal programs before sanitary disposal.

Keywords: Waste management, Industrial waste, Hazardous industrial waste, Industries, Kermanshah

Examining the characteristics and potential of recycling and waste management produced in the campus of Hamadan University of Medical Sciences

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Abstract

Over recent decades, the challenge of waste production and management has intensified for many societies. University campuses, in particular, require specialized and comprehensive solutions for waste management and recycling due to the diverse types of quasi-household and hazardous waste they generate. As a prominent scientific institution, Hamedan University of Medical Sciences plays a critical role in advancing science and public health. However, the varied waste outputs, especially from medical schools and affiliated hospitals, underscore the need for detailed and scientific waste management programs. This research examines the characteristics, volume, and recycling potential of waste produced on the university campus, offering solutions for more sustainable waste management. The study analyzed waste characteristics and management on the Hamedan University campus through three stages. First, field data was gathered via interviews and the ISO 14001 waste management checklist. Second, waste samples were collected, segregated, and physically analyzed. Third, the waste's physicochemical properties, including density, calorific value, moisture content, and ash percentage, were calculated. Recommendations for improving waste management were then proposed. The university campus comprises nine faculties, three dormitories, two sports halls, a conference hall, a headquarters building, a canteen, and a comprehensive research lab, with 1,890 staff and 6,475 students. The campus produces various types of waste, including infectious, chemical, pharmaceutical, sharp, and quasi-household wastes, totaling 1,620 kg daily. The per capita daily waste production is 0.191 kg. Food waste constitutes 41.9% of the total, followed by plastic (22%) and cardboard (10.3%). Overall, 89.6% of the waste is recyclable or compostable, indicating significant potential to divert waste from landfills with proper management. The waste density is 116 kg/m^3, with a moisture content of 20% and an ash percentage of 8.34%. The calorific value is 14,588.68 kJ/kg. Given the high recyclability and compostability of campus waste, it is possible to prevent landfill disposal by source separation and establishing recycling and composting facilities. Additionally, the waste's physicochemical properties suggest that incineration could be a viable method for waste management and energy production on campus. Effective hazardous waste management requires continuous employee training, specific guidelines, and proper implementation oversight.

Keywords: Waste Management, Recycling, Compost, Laboratory Waste, Scientific Institutions, Universities

Application of an educational intervention and its effect on reducing hospital waste production (case study: Kamali Karaj Hospital, Alborz Province)

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Abstract

Hospital waste Due to the presence of infectious, chemical and dangerous substances, it needs specialized and efficient management methods. In this context, training is known as an essential tool in improving hospital waste management. The waste management process in Kamali Hospital is perfect. The present study is a quasi-experimental intervention with before and after analysis to compare the effect of the educational intervention based on the blended model on the knowledge, attitude and performance (rate of production and separation of waste) of the personnel of Kamali Hospital in Karaj. 17 groups of 30 people with a total of 480 personnel were involved in waste management. The educational intervention consisted of two conventional and remote methods. To collect information, the standard questionnaire of Sadeghi et al.'s study (2019) was used. Data analysis was done using Kolmogorov-Smirnov and t tests and Excel and Spss.12 software. The findings showed that with the educational intervention based on the blended method, the total amount of waste production could reach 34,160 kg per month from 40,638 kg per month after the intervention. The greatest reduction in the amount of waste is infectious, chemical, pharmaceutical and normal. It was estimated at 26%. The results indicated the positive effect of this educational intervention in cognitive, attitudinal and functional areas, which shows that an educational program with a blended model with a suitable structure can significantly improve the amount and separation of waste and sustainability. To promote the environment in the hospital environment.

Keywords: Environmental education, Blended learning, Hospital waste management, Medical training centers, Kamali Hospital

Comprehensive Review of Waste-to-Energy Technologies: Challenges and Opportunities in Waste Management

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Abstract

In recent decades, with the exponential growth of population, the volume of waste has also increased dramatically. Wastes such as biodegradable waste, kitchen waste, and agricultural waste can be processed through biomethanation (the reverse reaction of methane vapor conversion) and composting technology. However, non-biodegradable materials such as plastics and rubber require more robust methods such as incineration and gasification to convert these materials into useful energy. Although incinerators pose challenges in controlling greenhouse gas emissions, gasification is recognized as an efficient technology in converting waste into gases such as carbon monoxide and hydrogen and providing energy with high calorific value. Different gasification methods include steam gasification, catalytic gasification, and the use of different fuel blends. This paper provides a theoretical review of various waste-to-energy technologies, hydrogen enhancement in synthesis gas, and various methods of waste disposal and hydrogen enrichment.

Keywords: Waste treatment technology, Gasification, Steam gasification, Waste management, Hydrogen-rich syngas

The most important factors affecting the increase of citizens' participation in waste separation at the source using fuzzy DEMATEL technique (Case study: Shahr-Qaem Neighborhood-Qom)

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Abstract

With the development of cities and population growth, the necessity of paying attention to the collection and disposal of waste from the citizens' living places and its recycling has been raised. Since the participation of citizens is the guarantee of the success of plans and programs, therefore, knowing the factors affecting the increase of citizens' participation in waste separation at the source becomes more important. The aim of the present study is to identify the factors affecting the increase in citizen participation in waste separation at source (in the case of Shahrak Ghaem neighborhood) using the brainstorming technique and the fuzzy DEMATELtechnique. The research is applied in terms of its purpose and combined in terms of its method (quantitative and qualitative) and based on the pragmatism approach and its strategy is sequential-exploratory. The statistical sample of the study is formed by 30 experts and trustees related to the research topic. The fuzzy DEMATEL technique was used to achieve the research objective. The results of the study show that the variables of "support of the law supporting the implementation of the project", "existence of environmental and software advertising", "providing transparent statistics regarding the results of participation", "direct economic profitability for the household", "awareness of the economic value of waste for the city", "regular and timely activity of waste collection agents", "availability of collection stations and locations", "recommendation of elders and trustees to participate" and "membership of associations and NGOs" are, respectively, the main factors affecting the increase in citizen participation in waste separation at source. Three variables (individual satisfaction with urban management performance), (social value creation for project participants), and (individual awareness of the importance of participation) were also identified as factors in this study.

Keywords: Participation, Waste Management, Ghaem Town, Qom Metropolis, Dimetal Technique

Investigating the amount of weed in raw manure and animal compost produced by the windrow method

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Abstract

Considering that the use of unprocessed animal manures causes the expansion and development of the weed population in the fields and the increase of the soil seed bank, this research was conducted to evaluate the effects of the composting process on the germination of weed seeds. The experiment was conducted as a completely randomized basic design with two treatments and four replications in the laboratory of the Department of Agriculture and Research Greenhouse of the Faculty of Agriculture of Ilam University in 2024. The treatments included unprocessed manure (manure) and processed manure (compost). The results showed that the number of weed species grown in unprocessed manure was 1.6 times that of compost. The highest density of green weeds (41 plants) was obtained in the untreated manure treatment. Manure processing reduced the density of broadleaf weeds by 92.8%. In general, compost reduces the density of green weeds; therefore, the composting process can achieve weed control.

Keywords: Agriculture, Soil, Weed, Manure, Compost

Impact Assessment of biochar on composting indicators of food waste: a systematic review

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Abstract

The attention towards managing food waste (FW) and transforming it into compost has significantly increased in recent years, driven by the potential advantages it offers for sustainable agriculture and waste reduction. Biochar, a carbon-rich amendment derived from biomass through pyrolysis, has gained significant attention due to its potential benefits to enhance compost quality. This systematic review analyzed 11 studies to assess the role of biochar in optimizing FW composting. Studies revealed several benefits of biochar addition, including shortening of the time to reach the thermophilic stage and an increase in composting temperature. Biochar also improved compost quality by maintaining nitrogen content, reducing ammonia emissions, and promoting a favorable pH for microbial activities. Its porous structure created a suitable habitat for microbes, potentially accelerating organic matter degradation. Additionally, biochar's high cation exchange capacity (CEC) helped immobilize potentially toxic metals, reducing their availability in the final compost. However, our knowledge of biochar's benefits in improving compost quality remains incomplete. The reviewed studies neglected to evaluate the microbial quality of the resulting compost and the cost-effectiveness of biochar application. Future research should prioritize long-term studies to assess plant uptake from soils amended with biochar. Additionally, investigations into the optimal biochar-to-compost ratio, as well as the most effective timing and methods for land application, should be undertaken. Addressing these knowledge gaps is crucial for optimizing the utilization of biochar in FW composting, thereby leading to sustainable waste management practices and enhanced soil fertility.

Keywords: Compost, Food waste, Biochar, Waste management

Obligation to Reduce Plastic Bag Usage: An Assessment of the Current Situation and a Comparative Study with Other Countries

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Abstract

Plastic bags, due to their high accessibility, low cost, and practical features, have become one of the most widely used polymer products. However, these products pose a serious threat to the environment and natural ecosystems due to their low recycling rates and very slow biodegradability. This research aims to examine the environmental impacts of plastic bags and evaluate the policies prohibiting and limiting their use in various countries around the world. The results show that in many countries, the implementation of stringent laws to ban or reduce the consumption of plastic bags has led to a significant decrease in the use of these products. Studies indicate that countries successful in enforcing these laws have managed to reduce consumption by up to 80 percent and bring per capita plastic bag usage down to low levels. This research also addresses the challenges associated with implementing these laws, including the need for public awareness, the establishment of supportive infrastructures, and the promotion of sustainable alternatives. Ultimately, this study emphasizes that success in reducing plastic bag consumption is only possible through collaboration among governments, industries, and consumers, along with the development of comprehensive strategies for managing plastic waste. This research highlights the importance of coordinated and joint actions in addressing plastic pollution as a fundamental priority for environmental protection.

Keywords: Plastic bag, Prohibition, Plastic waste, Environmental pollution

Microplastics in the Environment: A Review of Sources of Emission and Potential Effects on Human Health

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Abstract

Microplastics are small plastic particles that arise from the breakdown of plastics and are present everywhere in nature, affecting both the environment and human health. Microplastic pollution has become a global concern due to the extensive production of waste and plastic products that are difficult to biodegrade. These pollutants have been identified in many marine species, as well as in drinking water and various foods. Exposure to microplastics can also occur through inhaled air. Microplastics can strongly adsorb hydrophobic organic pollutants, persistent organic pollutants, and heavy metals, acting as both a substrate and a vector for their transfer into the human body. Therefore, this article discusses the current status of microplastics, their types, some sources of emissions, various new and established detection techniques, their effects on human health, and strategies to mitigate their impacts.

Keywords: Micro Plastics, Plastic Pollution, Sources of Micro Plastics, Public Health

Investigating the impact of traffic caused by Arbaeen ceremonie on the enrichment of metals in street dust in Mehran city and health risk assessment

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Abstact

Urban traffic is one of the main reasons for the enrichment of metals in urban soil. In recent years, there has been a lot of traffic for the religious procession of Arbaeen through the Mehran border, and during these days there is a lot of traffic on the roads leading to this city. In this study, heavy metal concentrations of cadmium, lead, nickel, zinc, arsenic, and chromium were investigated in street dust samples collected from Mehran city. The samples were taken under normal traffic conditions before the Arbaeen ceremony, as well as after the return of pilgrims, which is the peak traffic time, and their metal content was measured by acid digestion method by ICP-OES. Also, geo-accumulation index, enrichment factor, potential ecological risk index (PER), and health risk assessment were evaluated. The findings showed a significant increase (Pvalue<0.05) in the amount of heavy metals during high traffic times compared to low traffic times. The highest enrichment values of lead and cadmium in Mehran Street dust were observed during peak traffic hours, and the average environmental risk assessment value for all sampling points increased to 138.24, indicating a potential ecological risk at this time. Based on the health risk assessment, it was found that the hazard index (HI) for all samples was below one and the incremental lifetime cancer risk (ILCR) was less than 10^{-6}, indicating that the population is not at significant risk of health problems. Despite the heavy traffic during the Arbaeen ceremonie in this area and the high enrichment of heavy metals along with potential environmental hazards, no significant health risks were observed for people exposed to street dust. However, it is important to note that the continuation of this trend could lead to significant problems in the future if traffic is not managed properly.

Keywords: Heavy metals, Street dust, Ecological index, Geo-accumulation index, Enrichment factor, Ecological risk, Health risk assessment, Mehran city, Arbaeen

Design of an Integrated Waste Management System for Arbaeen

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Abstract

Considering that in recent years, the number of pilgrims and participants in the Arbaeen pilgrim walking has increased, therefore, many necessary infrastructures in the field of waste management and some other areas are still not available. Obviously, the absence of a written program in this area leads to the loss of capital and the reduction of the efficiency of activities. Therefore, considering the importance of preserving the health of the participants in the Arbaeen pilgrim walking and in order to improve the level of providing health services to these people, the present study was conducted for designing an integrated Arbaeen waste management system. This study was a descriptive and analytical study that was conducted for six months on the remains of the Arbaeen pilgrim walking. The implementation steps of the study were:

1- Collecting information on the current status of different stages of the Arbaeen waste management cycle

2- Determining the quantitative and qualitative characteristics of Arbaeen waste

3- Determining the human and equipment requirements of Arbaeen waste management (based on the waste fate cycle model)

4- Arbaeen waste management system design

The results of the study showed that an average of 7,000 tons of waste is produced daily along the 80-kilometer route of the Arbaeen pilgrim walking, of which 1,132 tons are food waste and 4,111 tons are plastic waste. In other words, 87.5 kg of waste is produced per meter of the route daily, which requires the installation of compactors in the “Amoods” determined in the study, quick collection of waste and transfer to the compactors, and then transfer to the waste separation factories (inside or outside of Iraq) is the most effective method of waste management on the Arbaeen pilgrim walking. For this purpose, 8,712 workers, 12,500 waste storage bins, 290 waste collection trucks, 72 compactors and 6 trailers are needed.

Keywords: Arbaeen Waste, Integrated Management, System

Health Risk Assessment of Heavy Metals in Edible Vegetable Oils: A Case Study of Sabzevar City

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Abstract

The investigation of heavy metal contamination in vegetable oils is crucial for ensuring consumer health. This study aims to quantify heavy metal levels in various vegetable oils and assess the associated health risks. In this study, 72 vegetable oil samples were collected, and the concentrations of heavy metals in these samples were measured using a microwave plasma atomic emission spectrometer (MP-AES). The non-carcinogenic risk (HQ) and lifetime cancer risk (LTCR) associated with the consumption of these oils were then evaluated using the Monte Carlo simulation (MCS) method. The highest concentrations of heavy metals in vegetable oils were observed for Cu and Fe (0.143 and 0.847 mg/kg) in rapeseed, for As (0.090 mg/kg) in sunflower, and for Pb (0.058 mg/kg) in sesame. Non-carcinogenic risk assessment indicated that consuming these vegetable oils did not pose a health risk in terms of exposure to Pb (HI = 0.146), Cu (HI = 0.022), and Fe (HI = 0.01). However, the non-carcinogenic risk associated with As (HI = 1.905) was significant. Regarding carcinogenesis, the population consuming these oils was determined to be within a safe range. Nonetheless, the risk of carcinogenesis caused by As was found to be 100 times higher than that of Pb. The findings of this study suggest that while the overall carcinogenic risk posed by vegetable oil consumption is low, continuous monitoring of these products is essential to safeguard consumer health.

Keywords: Vegetable oils, Heavy metals, Risk assessment, Sabzevar

The Impact of Spiritual Health on Environmental Behavior of Citizens in 2023: A Case Study of Yazd City

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Abstract

In light of the increasing environmental problems resulting from human activities, examining the factors that influence human environmental behavior has become essential. Since spirituality is recognized as one of the most important dimensions of human existence, the aim of this research was to investigate the relationship between spiritual health and environmental behavior among the citizens of Yazd. This study was conducted in 2023 using a descriptive-analytical cross-sectional design, focusing on Yazd residents. A total of 425 participants were selected through quota-based simple random sampling, and the questionnaire was distributed online. Data were analyzed using SPSS software (version 2020) and statistical tests including Pearson correlation, Chi-square, t-test, and Analysis of Variance (ANOVA). The results indicated that the average spiritual health among Yazd residents was 86%, while the average environmental behavior was 54%. A significant relationship was found between age ($p < 0.47$), gender ($p = 0.021$), education level ($p = 0.006$), income level ($p = 0.001$), and occupation ($p = 0.041$) and environmental behavior. Specifically, the younger and middle-aged groups exhibited higher environmental behavior scores compared to the adolescent and elderly groups (over 60 years). Additionally, women demonstrated higher environmental behavior than men, and households with incomes exceeding 5 million Toman showed significantly higher environmental behavior compared to households with lower incomes. Furthermore, individuals with education levels higher than high school showed better environmental behavior compared to those with lower education levels. Given the positive relationship between spiritual health and environmental behavior, enhancing the spiritual health of citizens can be considered an effective factor in promoting environmental behavior and preserving the environment. Improving spiritual health in society requires strengthening religious and social culture, which can directly influence environmental awareness and behavior. Therefore, it is crucial to implement appropriate programs in educational institutions to promote spiritual health, thereby increasing public participation in environmental conservation efforts.

Keywords: Public Participation, Environmental Behavior, Religious Culture, Citizens of Yazd, Spiritual Health

Appendices


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