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جامعة قناة السويس

قطاع الدراسات العليا والبحوث

ملخص الابحاث العلمية المنشورة بالدوريات العلمية العالمية

جامعة قناة السويس

٢٠١٧-٢٠١٨

كلمة السيد الاستاذ الدكتور/ رئيس جامعة قناة السويس

يعد البحث العلمى أداة الأمم للتقدم وصناعة الحضارة والارتقاء بالشعوب وتحقيق رفاهيتها ، ويعد ما تمتلكه أى أمة من أبحاث علمية متقدمة وما تمتلكه من تراث علمى دقيق أحد المعايير المهمة للحكم على تقدم الأمة ، ولذا يشهد العالم سباقا وتعاونا فى هذا المجال حتى يستطيع الانسان تسخير قوى الطبيعة وثرواتها لراحته وسعادته .

كما يعد البحث العلمى الدعامة الاساسية للاقتصاد والتطور وقناة مهمة لاثراء المعرفة الانسانية فى ميادينها كافة ، لذا فإن ما تمتلكه الأمة من علماء يعتبر ثروة تفوق كل الثروات الطبيعية .

ولذلك تحرص جامعة قناة السويس على تشجيع النشر الدولى الذى سيضع الجامعة فى موقع لأئق ضمن التصنيف العالمى للجامعات ، والذى يعتمد من بين معاييره على عدد الابحاث العلمية المنشورة بالدوريات العلمية العالمية ، وتنتهج الجامعة طريقا لتنمية الابداع والتفكير العلمى لدى الشباب حتى يمكن تحقيق التقدم وبناء مستقبل مشرق .

وفقنا الله لما فيه الخير لمصرنا الحبيبة

أ.د/ طارق راشد رحمي

رئيس جامعة قناة السويس

أصبح البحث العلمى واحد من المجالات الهامة التى تجعل الدول تتطور بسرعة هائلة وتتغلب على المشكلات التى تواجهها بطرق علمية حيث ان البحث العلمى فى حياة الانسان ينبع من مصدرين هامين وهما :
المصدر الاول:- يتمثل فى الانتفاع بفوائد تطبيقية حيث تقوم الجهات المسئولة بتطبيق هذه الفوائد التى نجمت عن الابحاث. المصدر الثانى:- يتمثل فى الاسلوب العلمى فى البحث الذى يبنى عليه جميع المكتشفات والاختراعات .

ويعتبر النشر الدولى منتج اساسى للبحث العلمى الجيد لما له من اهمية كبيرة لدى الجامعات والمراكز البحثية على مستوى العالم، والنشر الدولى هو نشر نتائج الابحاث العلمية فى الدوريات العلمية العالمية المحكمة من قبل اساتذة متخصصين فى فروع العلوم والآداب المختلفة بينما المدلول الفعلى والاكثر اهمية للنشر الدولى من وجه نظر الباحثين والعلماء على مستوى العالم هو وصول نتائج الابحاث لكافة المتخصصين والباحثين والعلماء فى ذلك الفرع من العلم .

كما اصبح تمويل المشروعات البحثية فى معظم انحاء العالم يعتمد ايضا على عدد الابحاث الدولية المنشورة للباحثين والمجموعات البحثية ولذلك اتجهت الجامعات المصرية فى الآونة الاخيرة الى تحفيز باحثيها وعلمائها للنشر الدولى بمنح جوائز مالية تعتمد على تصنيف الدوريات العلمية ومعامل تأثير Impact Factor لكل مجلة مما ادى الى زيادة واضحة فى معدل النشر الدولى للباحثين بالجامعات المصرية ، كذلك ومنذ عام ٢٠٠٩ اصبح النشر الدولى فى الدوريات العلمية المحكمة من اهم عوامل تقييم المتقدمين لجوائز الدولة المختلفة (تشجيعية – تفوق – تقديرية) .

ونظرا لموقع جامعة قناة السويس الذى يعتبر الركيزة العلمية الاساسية فى المنطقة والتى تعتبر من اهم المناطق التنموية فى الوقت الحالى ونظرا للخبرات المتعددة للسادة الاساتذة اعضاء هيئة التدريس بالجامعة فى الكثير من المجالات لذا تشجع الجامعة وخاصة قطاع الدراسات العليا والبحوث السادة الباحثين من الشباب على النشر بالطريقة السليمة وذلك من خلال عمل دورات متخصصة فى الموضوعات الاتية :

- طرق الكتابة العلمية المتخصصة
- كيفية النشر العلمى بالطريقة الصحيحة
- كيفية كتابة المشروعات
- اخلاقيات البحث العلمى

ولذا فان الهدف الاساسى للجامعة هو بناء مجتمع مبتكر يمتاز بالقدرات العلمية والتكنولوجية وتوجيه شباب الباحثين الى التطور والابتكار لتحقيق اعظم النتائج .

ا.د/ ماجدة محمد هجرس

نائب رئيس الجامعة للدراسات العليا والبحوث

A Word
by
Suez Canal University President

Scientific Research is considered the tool for achieving progress, making civilization and elevating nations. For that reason, what each nation what each nation gains from advanced scientific research and scientific legacy is one of the important criterions to judge its progress. That is why the world today is witnessing a scientific race, as well as scientific cooperation, so that humans can employ the forces and wealth of nature for both comfort and happiness.

Scientific research is also considered the main pillar for economy and development and an important channel to enrich human knowledge in all its fields.

That is why the Suez Canal University is keen to encourage international publication to have a prestigious position at the international ranking of universities, based on the number of scientific Publications in international peer-reviewed journals, books and conferences, Suez Canal University is well on its way to promote creativity and scientific thinking in the youth, so they can achieve progress and build a bright future.

May Allah guide us to the welfare of our beloved Egypt

Prof. Tarek Rashed Rahmy
Suez Canal University President

The scientific research has become one of the main fields that make the countries develop rapidly and scientifically overcome problems that face them. The scientific research in human life comes from two main resources: -
First resource: - is to benefit from the applied outcomes, and the responsible agencies to apply those resulted benefits.
Second resource: - is the scientific approach in research, upon which all discoveries and inventions are depending.
And the international publication is considered a main production of the good scientific research. Also for the great importance it holds at universities and the research centers all around the world. The international publication is to publish the scientific research in international scientific periodicals, which is being judged by special professors in different science and arts fields. But the main contribution for the international publication, from the scientists and researchers point of view, is to reach all the results of the latest researches for all the specialists, scientists, and researchers all around the globe.
Also the scientific projects finance, everywhere around the world, is depending on the number of published scientific researches for researchers and research groups. And so, recently, the Egyptian universities started to encourage their own researchers and scientists to internationally publish by giving financial awards depending on the periodicals rating and the Impact Factor for each one, which lead to a great increase to the international publication rate for the Egyptian universities researchers. Also since the year 2009, the international publication in judged scientific periodicals has become one of the main qualifications for candidates for different state awards (encouragement – excellence - discretionary).
And for the important position of the Suez Canal university, which is the main educational pillar for a whole region being considered one of the most important development regions in the present, and for the different experiences of the faculty's professors in all different fields, the university, and especially the researches and graduate studies sector, encourages the youth researchers to publish in the right way. And that will be through holding specialized courses in the following subjects: -
- specialized scientific writing methods
- how to correctly publish a scientific research
- how to write projects
- scientific research ethics
And so the main goal for the university is to build an innovative society with scientific and technological capabilities and to direct young researchers to develop and innovate to achieve the greatest results.

Prof. Magda Mohamed Hagras
Vice-President for Postgraduate Studies and Research Suez Canal University

List of Content

Faculty of Medicine

Journal de Pediatria
2018
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Salivary C-reactive protein, mean platelet volume and neutrophil lymphocyte ratio as diagnostic markers for neonatal sepsis.

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Abstract

OBJECTIVE:To assess the applicability of salivary C-reactive protein, mean platelet volume, neutrophil-lymphocyte ratio, and platelet lymphocyte ratio in the diagnosis of neonatal sepsis.
METHODS:Prospective case-control study of 70 full-term neonates, 35 with sepsis (20 with proven sepsis and 15 with clinical sepsis) and 35 healthy controls. Serum and salivary C-reactive protein concentrations were measured by enzyme-linked immunosorbent assay while mean platelet volume, neutrophil-lymphocyte ratio, and platelet lymphocyte ratio were measured by automated blood cell counter.
RESULTS:This study showed statistically significant difference of mean salivary C-reactive protein between septic neonates and controls (12.0±4.6ng/L vs. 2.8±1.2ng/L) respectively. At a cut-off point of 3.48ng/L, salivary C-reactive protein showed 94.3% sensitivity and 80% specificity. Salivary C-reactive protein also showed good predictive accuracy for predicting elevated serum C-reactive protein values in septic neonates. Mean platelet volume and neutrophil-lymphocyte ratio showed significant difference between septic neonates and controls (10.2±1.2fL vs.8.0±0.5fL; 2.9±1.7 vs. 1.6±0.4, respectively). At a cut-off point of 10.2fL, mean platelet volume presented 80% sensitivity and specificity. At a cut-off point of 2.7, neutrophil-lymphocyte ratio presented 80% sensitivity and 57.1% specificity.
CONCLUSION:This study provides support for further studies on the usefulness of salivary C-reactive protein, mean platelet volume, and neutrophil-lymphocyte ratio as diagnostic markers for neonatal sepsis.

Journal of Perinatal Medicine
2018
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Maternal and neonatal vitamin D deficiency and transient tachypnea of the newborn in full term neonates.

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Abstract

AIM:To investigate the association between maternal and neonatal serum 25-hydroxyvitamin D (25-OHD) levels and development of transient tachypnea of the newborn (TTN) in full term infants.

METHODS:This was a prospective case-control study carried out on 30 neonates with TTN and their mothers and 30 control neonates and their mothers. Levels of 25-OHD were measured in maternal and neonatal blood samples that were obtained in the first 12-24 h of postnatal age.

RESULTS:Both maternal and neonatal 25-OHD levels in the TTN group were significantly lower compared to the control group (P=0.0001). A negative correlation was observed between neonatal 25-OHD level and average hospital stay (P=0.0001).

CONCLUSION:We observed that lower maternal and neonatal vitamin 25-OHD levels were associated with TTN development in full term infants.

KEYWORDS:25-Hydroxyvitamin D; maternal; neonatal; transient tachypnea of the newborn; vitamin D deficiency.

The Clinical Respiratory Journal
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Lung ultrasound in diagnosis and follow up of community acquired pneumonia in infants younger than 1-year old

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Abstract

Background: Pneumonia is still a leading cause of illness and death in infants worldwide. Lung ultrasound (LUS) is emerging as an extremely valuable nonionizing radiation diagnostic tool in diagnosis and follow up of multiple paediatric pulmonary diseases.

Objective: To assess the applicability of LUS in diagnosis and follow up of community acquired pneumonia (CAP) in Egyptian infants younger than 1-year old.

Methods: LUS and chest X-ray (CXR) were performed in 50 infants presented with clinical symptoms and signs suggestive of CAP within the first 6 hours of admission in our inpatient department, then follow up LUS was performed 5 days after admission.

Results: This study showed that LUS was superior to CXR in initial diagnosis of CAP in infants. LUS detected pneumonia in 49 (98%) compared to 36 (72%) infants diagnosed by CXR (P<.05). On follow up, 5 days later, consolidation patch disappeared in 13 (26.5%) infants, diminished in size in 27 (55.1%) infants, remained at the same size in 2 (4.1%) infants and increased in size in 7 (14.3%) infants.

Conclusion: This study showed that LUS is superior to CXR in diagnosing infants with CAP who are younger than 1-year old. It also serves as a safe follow up tool and could support the decision of hospital discharge in this category of patients. Further studies with larger sample size and longer follow up duration are recommended to confirm the results of the present study.

Journal of Diabetes Research
2018
13 pages

Assessment of vitamin D binding protein and early prediction of nephropathy in type II Saudi diabetic patients.

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Abstract

Early detection of diabetic nephropathy (DN) represents a great challenge in an attempt to reduce the burden of chronic kidney diseases in diabetic patients. This study aimed to investigate the potential early prediction role of urinary vitamin D- binding protein (uVDBP) for the diagnosis of DN and to examine the possible correlation to serum VDBP, high-sensitivity C-reactive protein (hsCRP) and insulin resistance in these patients. Serum and urine samples were obtained from 40 healthy volunteers and 120 patients with type 2 diabetes divided into 3 groups: normoalbuminuria, microalbuminuria and macroalbuminuria (urinary albumin excretion rate <30, 30–300 and > 300 μg/mg, respectively); n = 40/group. Serum and urinary VDBP levels were quantified by ELISA. Insulin resistance has been assessed by Homeostasis Model Assessment index (HOMAI). Correction for urine creatinine concentration was applied for urinary quantitative measurements. uVDBP levels were significantly elevated in micro- and macroalbuminuria patient groups compared with those of the normoalbuminuria patient group and controls (820.4±402.8 and 1458.1±210.0 compared with 193.1±141.0 and 127.7±21.9 ng/mg, respectively) (P < 0.001). There was significant correlation between serum and urinary levels of VDBP in total patient group. Receiver operating characteristic analysis of uVDBP levels showed optimum cut-off value of 216.0 ng/mg corresponding to 98.8% sensitivity and 80.0% specificity, and an area under the curve of 0.973 to discriminate normo- from microalbuminuria groups. In multivariate analysis, ordination plot showed obvious demarcation between the study groups caused by the higher levels of uVDBP and albumin/creatinine ratio among other variables. The study findings suggested a possible clinical application of uVDPB as an early and a good marker for the detection of early renal disease in type 2 DM Saudi patients. Large-scale validation studies are warranted to confirm the results before including uVDBP with the available list of other conventional biomarkers.

Oxidative Medicine and Cellular Longevity
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12 pages

Longevity-Related Gene Transcriptomic Signature in Glioblastoma Multiforme

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Abstract

Glioblastoma multiforme (GBM) (grade IV astrocytoma) has been assumed to be the most fatal type of glioma with low survival and high recurrence rates, even after prompt surgical removal and aggressive courses of treatment. Transcriptional reprogramming to stem cell-like state could explain some of the deregulated molecular signatures in GBM disease. The present study aimed to quantify the expression profiling of longevity-related transcriptional factors SOX2, OCT3/4, and NANOG to evaluate their diagnostic and performance values in high-grade gliomas. Forty-four specimens were obtained from glioblastoma patients (10 females and 34 males). Quantitative real-time polymerase chain reaction was applied for relative gene expression quantification. In silico network analysis was executed. NANOG and OCT3/4 mRNA expression levels were significantly downregulated while that of SOX2 was upregulated in cancer compared to noncancer tissues. Receiver operating characteristic curve analysis showed high diagnostic performance f NANOG and OCT3/4 than SOX2. However, the aberrant expressions of the genes studied were not associated with the prognostic variables in the current population. In conclusion, the current study highlighted the aberrant expression of certain longevity-associated transcription factors in glioblastoma multiforme which may direct the attention towards new strategies in the treatment of such lethal disease.

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Association of Group-specific Component Exon 11 Polymorphisms with Bronchial Asthma in Egyptian Children and Adolescents

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Abstract

Several studies have investigated the association of Group-specific Component (GC) gene, also known as vitamin D-binding protein (VDBP), and various respiratory disorder susceptibility with conflicting results. In this sense, we aimed to investigate whether rs7041 and rs4588 variants confer susceptibility to bronchial asthma in a sample of an Egyptian population and to elucidate by in silico analysis the structural and functional impact of these variants. Group-specific Component polymorphisms rs7041 and rs4588 were genotyped in 192 Egyptian children and adolescents (96 with asthma and 96 healthy controls) by TaqMan single nucleotide polymorphism genotyping assay. The rs7041 GG genotype showed a significantly elevated frequency among patients under codominant, dominant, recessive and allelic models where the patient group had greater carriage rate of G allele [OR 2.15, CI 95% (1.32-3.50; P = 0.002)], while rs4588 CA and AA genotypes were found to be protective genotypes with controls showing a greater carriage rate of A allele [OR 0.52, CI 95% (0.30 - 0.90; P = 0.02)]. Three haplotype allele combinations were identified with frequencies of GC (44.3%), TC (% and TA (24.5%) in the total study population. GC haplotype was shown to be more frequent in controls, while TC and TA haplotypes were more predominant in the patient group. Only rs7041 variant showed a significant association with family history and pubertal status. In conclusion, both study GC variants could be implicated in childhood bronchial asthma pathogenesis; rs7041 GG genotype and G allele increased asthma risk while rs4588 AA genotype and A allele conferred protection in the study population.

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2018
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Dual biomarkers long non-coding RNA GAS5 and microRNA-34a co-expression signature in common solid tumors.

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Abstract

Accumulating evidence indicates that non-coding RNAs including microRNAs (miRs) and long non-coding RNAs (lncRNAs) are aberrantly expressed in cancer, providing promising biomarkers for diagnosis, prognosis and/or therapeutic targets. We aimed in the current work to quantify the expression profile of miR-34a and one of its bioinformatically selected partner lncRNA growth arrest-specific 5 (GAS5) in a sample of Egyptian cancer patients, including three prevalent types of cancer in our region; renal cell carcinoma (RCC), glioblastoma (GB), and hepatocellular carcinoma (HCC) as well as to correlate these expression profiles with the available clinicopathological data in an attempt to clarify their roles in cancer. Quantitative real-time polymerase chain reaction analysis was applied. Different bioinformatics databases were searched to confirm the potential miRNAs-lncRNA interactions of the selected ncRNAs in cancer pathogenesis. The tumor suppressor lncRNA GAS5 was significantly under-expressed in the three types of cancer [0.08 (0.006-0.38) in RCC, $p < 0.001$; 0.10 (0.003-0.89) in GB, $p < 0.001$; and 0.12 (0.015-0.74) in HCC, $p < 0.001$]. However, levels of miR-34a greatly varied according to the tumor type; it displayed an increased expression in RCC [4.05 (1.003-22.69), $p < 0.001$] and a decreased expression in GB [0.35 (0.04-0.95), $p < 0.001$]. Consistent to the computationally predicted miRNA-lncRNA interaction, negative correlations were observed between levels of GAS5 and miR-34a in RCC samples ($r = -0.949$, $p < 0.001$), GB ($r = -0.518$, $p < 0.001$) and HCC ($r = -0.455$, $p = 0.013$). Kaplan-Meier curve analysis revealed that RCC patients with down-regulated miR-34a levels had significantly poor overall survival than their corresponding ($p < 0.05$). Hierarchical clustering analysis showed RCC patients could be clustered by GAS5 and miR-34a co-expression profile. Our results suggest potential applicability of GAS5 and miR-34a with other conventional markers for various types of cancer. Further functional validation studies are warranted to confirm miR-34a/GAS5 interplay in cancer.

Biomedicine & Pharmacotherapy
2018
102:653-669

Oncogenic long noncoding RNA MALAT1 and HCV-related hepatocellular carcinoma.

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Abstract

Hepatocellular carcinoma (HCC) is the second leading cause of cancer-related mortality worldwide. The oncogenic function of the long non-coding RNA; metastasis-associated lung adenocarcinoma transcript 1 (MALAT1) in HCC remains unclear. We aimed to evaluate MALAT1 serum expression profile in HCC and explore its relation to the clinicopathological features. Quantitative Real Time-Polymerase Chain Reaction was applied in 70 cohorts (30 HCC, 20 HCV, 20 controls). Further meta-analysis of clinical studies and in vitro validated experiments was employed. Serum MALAT1 showed area under the curve of 0.79 and 0.70 to distinguish patients with cancer from normal and cirrhotic individuals at fold change of 1.0 and 1.26, respectively. Expression level was significantly higher in males (P <0.001) and patients with massive ascites (P = 0.005). Correlation analysis showed positive correlation of MALAT1 with total bilirubin (r = 0.456, P <0.001) and AST (r = 0.280, P = 0.019), and negative correlation with the hemoglobin level (r = 0.312, P = 0.009). Meta-analysis showed that the over-expressed MALAT1 was linked to tumor number [Cohen's d = 0.450, 95% CI (0.21 to 0.68)], clinical stage [Cohen's d = 0.048, 95% CI (-0.83 to 0.74)], and AFP level [Cohen's d = 0.354, 95% CI (0.1 to 0.57)]. In silico data analysis and systematic review confirmed MALAT1 oncogenic function in cancer development and progression. In conclusion, circulatory MALAT1 might represent a putative non-invasive prognostic biomarker indicating worse liver failure score in HCV-related HCC patients with traditional markers. Large-scale verification is warranted in future studies.

Respiratory research
2017
18:169

Structure and functional impact of seed region variant in MIR-499 gene family in bronchial asthma.

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Abstract

Background: Small non-coding RNAs (microRNAs) have been evolved to master numerous cellular processes. Genetic variants within microRNA seed region might influence microRNA biogenesis and function. The study aimed at determining the role of microRNA-499 (MIR-499) gene family polymorphism as a marker for susceptibility and progression of bronchial asthma and to analyze the structural and functional impact of rs3746444 within the seed region. Methods: Genotyping for 192 participants (96 patients and 96 controls) in the discovery phase and 319 subjects (115 patients and 204 controls) in the replication phase was performed via Real Time-Polymerase Chain Reaction technology. Patients underwent the methacholine challenge test and biochemical analysis. Gene structural and functional analysis, target prediction, annotation clustering, and pathway enrichment analysis were executed. Predicted functional effect of rs37464443 SNP was analyzed. Results: miR-499 gene family is highly implicated in inflammation-related signaling pathways. Rs374644 (A > G) in MIR499A and MIR499B within the seed region could disrupt target genes and create new genes. The G variant was associated with high risk of developing asthma under all genetic association models (G versus A: OR = 3.27, 95% CI = 2.53–4.22; GG versus AA: OR = 9.52, 95% CI = 5.61–16.5; AG versus AA: OR = 2.13, 95% CI = 1.24–3.46; GG + AG versus AA: OR = 4.43, 95% CI = 2.88–6.82). GG genotype was associated with poor pre-bronchodilator FEV1 (p = 0. 047) and the worst bronchodilator response after Salbutamol inhalation, represented in low peaked expiratory flow rate (p = 0.035). Conclusions: miR-499 rs3746444 (A > G) polymorphism was associated with asthma susceptibility and bronchodilator response in Egyptian children and adolescents. Further functional analysis is warranted to develop more specific theranostic agents for selecting targeted therapy. Keywords: Asthma, Egyptians, miR-499a, miR-499b, Polymorphism, Airway hyper-responsiveness, qRT-PCR

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5-HT7 Receptor Antagonism (SB-269970) Attenuates Bleomycin-Induced Pulmonary Fibrosis In Rats Via Downregulating Oxidative Burden And Inflammatory Cascades And Ameliorating Collagen Deposition: Comparison To Terguride

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Abstract

The neurotransmitter 5-hydroxytryptamine (5-HT) is involved in regulation of local tissue inflammation and repair through a set of receptors (5-HT1-7 receptors), which are expressed in the lung. Considering the protective importance of 5-HT receptor antagonists against development of pulmonary fibrosis, we evaluated whether 5- HT7 receptor antagonist (SB-269970) modulates lung inflammatory and fibrogenic processes in comparison with 5-HT2A/B receptor antagonist (terguride), in bleomycin (BLM)-induced idiopathic pulmonary fibrosis (IPF) model.

IPF model induced by a single dose of intra-tracheal BLM instillation (5 mg/kg), and rats were treated with intraperitoneal injection of SB-269970 (1 mg/kg day) or terguride (1.2 mg/kg/d). The experiment was carried out on two separate sets of rats that were killed at day 7th and day 21st to evaluate the endpoint of the IPF inflammatory and fibrogenic phases, respectively.

During the inflammatory phase 5-HT2A/B and 5-HT7 receptor antagonists attenuated the BLM-induced increase in the lung fluid content, the inflammatory cytokines levels and oxidative stress burden. In the fibrogenic phase, both SB-269970 and terguride reduced the serotonin concentrations in lung homogenates and significantly protected against IPF fibrogenic phase by attenuating collagen deposition and mRNA expression of both transforming growth factor-β1 (TGF- β1), and procollagen type I (PINP). 5-hydroxytryptamine 5-HT7 receptor antagonist showed more benefits than 5-HT2A/B receptor antagonist on the deleterious effects accompanied BLM instillation. The present study showed involvement of 5-HT7 receptor in the pathophysiology of BLM-induced IPF in rats and identified it as a potential therapeutic target in lung fibrotic disorders.

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Cardioprotective and anti-aggregatory effects of levosimendan on isoproterenol -induced myocardial injury in high-fat-fed rats involves modulation of PI3K/Akt/ mTOR signaling pathway and inhibition of apoptosis: comparison to cilostazol

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Abstract

Hyperlipidemia and hypercoagulability states are linked with the increased risks of myocardial infarction (MI). Levosimendan has vasorelaxant and anti-aggregatory properties. The present study evaluated the anti-aggregatory and cardioprotective effect of levosimendan versus cilostazol in high-fat diet (HFD) fed rats subjected to isoproterenol-induced MI.

Rats were assigned to normal, HFD, HFD+ isoproterenol, HFD+ isoproterenol +cilostazol and HFD+ isoproterenol +levosimendan.

The present study investigated the anti- aggregatory effect of both levosimendan and cilostazol and revealed that both drugs attenuated the severity of platelet aggregation. Moreover, both levosimendan and cilostazol revealed effectiveness in attenuating the severity of HFD/isoproterenol-induced myocardial injury as revealed by ECG signs, apoptotic markers and histopathological score via counteracting the oxidative stress burden, increments in the expression of inflammatory mediators and modulating NF-κB and PI3K/Akt/mTOR pathway. It was obvious that levosimendan offered more cardioprotective properties than cilostazol.

The study showed the relations between hyperlipedemia, hyperaggregability state and myocardial injury with the modulation of NF-κB and PI3K/Akt/mTOR pathway.

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Neuroprotective effect of duloxetine in a mouse model of diabetic neuropathy: Role of glia suppressing mechanisms

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Abstract

AIMS: Painful diabetic neuropathy (PDN) is one of the most frequent complications of diabetes and the current therapies have limited efficacy. This study aimed to study the neuroprotective effect of duloxetine, a serotonin noradrenaline reuptake inhibitor (SNRI), in a mouse model of diabetic neuropathy.
MAIN METHODS: Nine weeks after developing of PDN, mice were treated with either saline or duloxetine (15 or 30 mg/kg) for four weeks. The effect of duloxetine was assessed in terms of pain responses, histopathology of sciatic nerve and spinal cord, sciatic nerve growth factor (NGF) gene expression and on the spinal expression of astrocytes (glial fibrillary acidic protein, GFAP) and microglia ($CD_{11}b$).
KEY FINDINGS: The present results highlighted that duloxetine (30 mg/kg) increased the withdrawal threshold in von-Frey test. In addition, both doses of duloxetine prolonged the licking time and latency to jump in the hot-plate test. Moreover, duloxetine administration downregulated the spinal expression of both $CD_{11}b$ and GFAP associated with enhancement in sciatic mRNA expression of NGF.
SIGNIFICANCE: The current results highlighted that duloxetine provided peripheral and central neuroprotective effects in neuropathic pain is, at least in part, related to its downregulation in spinal astrocytes and microglia. Further, this neuroprotective effect was accompanied by upregulation of sciatic expression of NGF.

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Therapeutic efficacy of olfactory stem cells in rotenone induced Parkinsonism in adult male albino rats

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Abstract

Background: Olfactory stem cells (OSCs) are found in the olfactory mucosa and olfactory bulb and have the capacity to proliferate and differentiate along multiple tissue lineages. Rotenone; widely used insecticide has a neurodegenerative effect on the dopaminergic cells of substantia nigra (SN) of midbrain producing Parkinsonism.
The aim of this study is to isolate rat OSCs from olfactory mucosa and olfactory bulb, culture these OSCs in suitable medium to allow for their proliferation to be used in the treatment of Parkinsonism induced by rotenone.
Methods: The characteristics of OSCs, the effects of rotenone on the SN of midbrain and the curative effect of OSCs on the substantia nigra were determined morphologically, immunohistochemically, and by transmission electron microscopy. PKH 26; immunofluorescent dye was used as a cell tracer to locate the transplanted cells in host midbrain.
Results: OSCs were spindle shaped with irregular processes, and were positive for CD44 and Nestin and negative for CD34. Subcutaneous rotenone produced Parkinsonism through producing degeneration of the dopaminergic cells of SN of the midbrain. Transplantation of OSCs produced restoration of the normal structure of SN and dopaminergic cells and improves the clinical manifestations of Parkinsonism.
Conclusion: These results indicate that, the isolated rat OSCs can proliferate and expand in vitro when culture in suitable medium and these cells can exert therapeutic effects in Parkinsonism by recruitment in SN and restoration of the structure and function of dopaminergic cells.

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Role of bone marrow derived mesenchymal stromal cells and Schwann-like cells transplantation on spinal cord injury in adult male albino rats

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Abstract

Background: Spinal cord injury is a considerable health impact accompanied with physical, psychological and economic burden. Bone marrow derived mesenchymal stromal cells (BM-MSCs) transplantation was found to produce neuronal regenerative effects. Schwann-like cells differentiated from BM-MSCs have myelin-forming ability.

Aim of the work: To compare the ability of BM-MSCs versus Schwann like cells to promote recovery of spinal cord injury.

Material and methods: Adult male albino rats were used throughout the study. BM-MSCs were harvested from femora of rats. Sciatic nerves were extracted and used in the preparation of the induction culture medium for
differentiation of BM-MSCs into Schwann-like cells. Rats were divided into control, spinal cord injured (SCI), spinal cord injured plus BM-MSCs transplantation (BM-MSC) and spinal cord injured plus Schwann-like cells transplantation (Sn) groups. BBB scale assessment was performed before and after SCI in all rats. Rats were euthanized at the end of the 7th week and spinal cords were dissected and processed for light and transmission electron microscopic examinations.

Results: Spinal cord sections of SCI group revealed cavitation, necrosis and demyelination. BM-MSC and Sn groups showed both functional and structural improvement compared to SCI group with better BBB score and histopathological features in the BM-MSC group and more expression of S100 in the Sn group.

Conclusion: Transplantation of BM-MSCs and Schwann-like cells improved the structural and functional alterations of spinal cord injury with better improvement in BM-MSC group.

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Assessment of Carotid Intima-Media Thickness and Carotid Plaque Formation among Patients with Ischemic Stroke and Hepatitis C Virus Infection

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Abstract

Background: Cerebrovascular diseases are leading cause of death worldwide. Plaque rupture and embolization account for one-third of ischemic stroke. The causes are not fully known, but inflammation plays a pathogenic role. Recently, HCV infection has been identified as risk of atherosclerosis. HCV replicates within carotid plaques and brain endothelial cells; moreover, HCV patients showed higher levels of inflammation. Objective: To evaluate the role of HCV infection in patients with stroke through assessment of carotid atherosclerosis. Subjects and methods : A cross sectional observational study was conducted on 100 patients, aged 40-60 years old, diagnosed as ischemic stroke, recruited from neuropsychiatry department of Suez canal university hospital. Patients were divided into group 1 (50 subjects with HCV +ve) and group 2 (50 patients with HCV -ve). All Patients were evaluated for HCV and conventional risk of stroke as they underwent complete neurological examination, assessment of vascular risk factors and a complete extracranial neurovascular U/S survey. Variables investigated were isolated elevation of CCA mean IMT, extracranial atherosclerotic plaques. Results: An analysis of stroke patients showed that HCV +ve patients IMT was statistically significantly higher (1.04) than in HCV –ve patients (0.71). The percentage of plaque formation in HCV +ve patients (20%) was insignificantly more frequent than in HCV –ve patients (10%). HCV +ve patients with high viremia had more significant increase in IMT and also in plaque formation. A multivariate analysis showed that HCV infection was an independent risk factor of stroke. Conclusion: HCV infected patients are at higher and earlier risk of stroke. Inflammation is a key mediator. Clinicians in clinical practice and researchers in future trials should take into account these new findings.

Archives of medical sciences
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Is subclinical atherosclerosis associated with visceral fat and fatty liver in adolescents with type I diabetes

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Abstract

Introduction: There is a 3-fold higher prevalence of cardiovascular complications in patients with type 1 diabetes. The aim was to assess the relationship between subclinical atherosclerosis and visceral fat and fatty liver in diabetic adolescents. **Material and methods:** The study was performed on 110 adolescents with type 1 diabetes (T1D) attending the Pediatric Diabetes Clinic of the University Hospital, Ismailia, Egypt. Their mean age was 14.2 ±0.7 years with a mean duration of diabetes 6 ±0.3 years. They were divided into group 1 which consisted of 55 adolescents with T1D and normal carotid intima media thickness (cIMT) and the second group which included 55 adolescents with T1D and subclinical atherosclerosis. All adolescents were normotensive, normo-albuminuric and had no retinopathy. Visceral fat thickness was measured as the distance between the anterior wall of the aorta and the posterior surface of the rectus abdominis muscle. Hepatic steatosis was diagnosed based on enlarged liver size and evidence of diffuse hyper-echogenicity of liver relative to kidneys. **Results:** The mean visceral fat was significantly higher in adolescents with increased cIMT (4.8 ±1.6) than in the normal thickness group (3.9 ±1.4). Liver size was also significantly larger in the former group (13.73 ±2.26 versus 12.63 ±2.20) ($p = 0.022$). After adjusting for other variables, logistic regression demonstrated that glycated hemoglobin (HbA1c) and fatty liver are independent factors affecting cIMT, OR = 1.426 ($p < 0.05$) and OR = 4.71 ($p < 0.05$). **Conclusions:** In the present study, fatty liver and HbA1c were associated with subclinical atherosclerosis in lean adolescents with T1D

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Cognitive functions, electroencephalographic and diffusion tensor imaging changes in children with active idiopathic epilepsy

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Abstract

Introduction: Neurocognitive impairment represents one of the most common comorbidities occurring in children with idiopathic epilepsy. Diagnosis of the idiopathic form of epilepsy requires the absence of any macrostructural abnormality in the conventional MRI. Though changes can be seen at the microstructural level imaged using advanced techniques such as the Diffusion Tensor Imaging (DTI).
Aim of the work: The aim of this work is to study the correlation between the microstructural white matter DTI findings, the electroencephalographic changes and the cognitive dysfunction in children with active idiopathic epilepsy.
Methods: A comparative cross-sectional study, included 60 children with epilepsy based on the Stanford–Binet 5th Edition Scores was conducted. Patients were equally assigned to normal cognitive function or cognitive dysfunction groups. The history of the epileptic condition was gathered via personal interviews. All patients underwent brain Electroencephalography (EEG) and DTI, which was analyzed using FSL.
Results: The Fractional Anisotropy (FA) was significantly higher whereas the Mean Diffusivity (MD) was significantly lower in the normal cognitive function group than in the cognitive dysfunction group. This altered microstructure was related to the degree of the cognitive performance of the studied children with epilepsy. The microstructural alterations of the neural fibers in children with epilepsy and cognitive dysfunction were significantly related to the younger age of onset of epilepsy, the poor control of the clinical seizures, and the use of multiple antiepileptic medications.
Conclusion: Children with epilepsy and normal cognitive functions differ in white matter integrity, measured using DTI, compared with children with cognitive dysfunction. These changes have important cognitive consequences

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The Impact of Health Education Intervention for Prevention and Early Detection of Type 2 Diabetes in Women with Gestational Diabetes.

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Abstract

This study aims to investigate the impact of a health belief model (HBM)-based educational intervention on knowledge, beliefs, self-reported practices, gestational and postpartum weight in women with gestational diabetes mellitus (GDM).
SUBJECTS AND METHODS:
A cluster randomized controlled trial was performed, with randomization at the level of Primary Health Care centers in three Egyptian cities. Eligible women with GDM were enrolled at 24 weeks pregnancy. The intervention group (n = 103) received health education intervention based on the HBM construct. Control subjects (n = 98) received the usual care. The outcomes measured were: women's knowledge, beliefs, self-reported practices, gestational weight gain (GWG), and postpartum weight retention. Patients were investigated at baseline, at end of pregnancy, and at 6 weeks postpartum.
RESULTS:
After the intervention, percentages of women who had high knowledge and beliefs scores had significantly increased from less than 50 % to more than 70 % in the intervention group ($p < 0.001$). More women in the intervention group reported practicing exclusive breast feeding (85.4 %) and screening for T2DM (43.7 %) at 6 weeks postpartum compared to the control group (63.3 and 19.4 % respectively) ($p < 0.001$). More women with excessive body mass index in the intervention group (65 %) compared to the control group (11.6 %) were meeting recommended GWG ($p < 0.001$), and postpartum weight (37.7, and 20.3 % respectively) ($p < 0.01$).
CONCLUSION:
This intervention significantly improved knowledge, beliefs, self-reported practices, and gestational and postpartum weight in patients with GDM. Further research is needed for investigating the effectiveness of applying early, multi-phase, and longer intervention.

Experimental Cell Research
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Maintenance of hematopoietic stem and progenitor cells in fetal intra-aortic hematopoietic clusters by the Sox17-Notch1-Hes1 axis

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Abstract

The aorta-gonad-mesonephros region, from which definitive hematopoiesis first arises in midgestation mouse embryos, has intra-aortic hematopoietic clusters (IAHCs) containing hematopoietic stem cells (HSCs) and hematopoietic progenitor cells (HPCs). We previously reported expression of the transcription factor Sox17 in IAHCs, and overexpression of Sox17 in CD45lowc-KIThigh cells comprising IAHCs maintains the formation of cell clusters and their multipotency in vitro over multiple passages. Here, we demonstrate the importance of NOTCH1 in IAHC formation and maintenance of the HSC/HPC phenotype. We further show that Notch1 expression is positively regulated bySOX17viadirectbindingtoitsgenepromoter.SOX17andNOTCH1wereboth found to be expressed in vivo in cells of IAHCs by whole mount immunostaining. We found that cells transduced with the active form of NOTCH1 or its downstream target, Hes1, maintained their multipotent colony-forming capacity in semisolid medium. Moreover, cells stimulated by NOTCH1 ligand, Jagged1, or Delta-like protein 1, had the capacity to form multilineage colonies. Conversely, knockdown of Notch1 and Hes1 led to a reduction of their multipotent colony-forming capacity. These results suggest that the Sox17-Notch1-Hes1 pathway is critical for maintaining the undifferentiated state of IAHCs.

Toxicology mechanisms and methods
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Renoprotective effect of nifuroxazide in diabetes-induced nephropathy: impact on NFκ-B, oxidative stress, and apoptosis.

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Abstract

The prevalence of diabetes mellitus (DM) is drastically increased worldwide. Diabetic nephropathy (DN) is a microvascular complication of DM and a common cause of end stage renal disease (ESRD). DN has been recently reported as the most common cause among ESRD patients. Shortage of a definitive cure for DN and the social and economic burden of this disease provide considerable impetus for development of new therapies. In the present study, we evaluated the effect of nifuroxazide, a potent inhibitor of Janus kinase/signal transducers and activators of transcription (JAK2/STAT3), on nuclear factor kappa B (NFκB), oxidative stress, and apoptosis in diabetic kidney. Following induction of diabetes by single dose of streptozotocin (50 mg/kg), nifuroxazide was administrated to diabetic rats (25 mg/kg/day, orally) for 8 weeks. Our results showed that nifuroxazide treatment, attenuated diabetes-induced damage in renal structure, ameliorated oxidative stress, triggered antioxidant defense, reduced NFκB nuclear translocation and cleaved caspase-3 expression and down regulated the activity of apoptotic enzymes (caspase-3/caspase-8/caspase-9) in diabetic kidney. In conclusion, nifuroxazide exhibited renoprotective effect in diabetic kidney via dampening NFκB activation, oxidative stress, and apoptosis.

Antiviral Research
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Rational design of antiviral drug combinations based on equipotency using HCV subgenomic replicon as an in vitro model

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Abstract

Combination therapy of directly acting antivirals (DAA's) for the treatment of chronic HCV infections has proven to be a highly effective strategy to cure chronic infections with this virus. Here we studied, using HCV as an example, how to best design in vitro studies that explore the combined antiviral efficiency of combinations of three or more DAA's. To that end we used a HCV NS3 protease inhibitor, a NS5A targeting compound and two non-nucleoside NS5B polymerase inhibitors (each one targeting a different drug binding site). We demonstrate, employing HCV subgenomic replicon containing Huh 9–13 hepatoma cells, that quadruple therapy with these 4 different DAA's each at 1x their EC75, results in a highly efficient inhibition of viral replication. This is further reflected in the rapid clearance of the HCV replicon from the host cell. By contrast, neither equipotent combinations that consist of either molecules alone at 4x EC75 nor triple combinations at 1.33x the EC75 resulted in clearance. In contrast to the quadruple combo, drug-resistant variants emerged under mono-treatment and in most triple combo's. These data thus demonstrate that quadruple combinations at total suboptimal concentrations [i.e. concentrations at which neither mono- nor triple therapy is sufficiently potent] result rapidly in a pronounced antiviral efficacy. Altogether, this work provides an example as to how to design studies to explore the antiviral efficacy of combinations of more than two compounds.

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What Predicts Online Health Information-Seeking Behavior Among Egyptian Adults? A Cross-Sectional Study

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Abstract

Background: Over the last decade, the Internet has become an important source of health-related information for a wide range of users worldwide. Yet, little is known about the personal characteristics of Egyptian Internet users who search for online health information (OHI).
Objective: The aim of the study was to identify the personal characteristics of Egyptian OHI seekers and to determine any associations between their personal characteristics and their health information-seeking behavior.
Methods: This cross-sectional questionnaire study was conducted from June to October 2015. A Web-based questionnaire was sent to Egyptian users aged 18 years and older (N=1400) of a popular Arabic-language health information website. The questionnaire included (1) demographic characteristics; (2) self-reported general health status; and (3) OHI-seeking behavior that included frequency of use, different topics sought, and self-reported impact of obtained OHI on health behaviors. Data were analyzed using descriptive statistics and multiple regression analysis.
Results: A total of 490 participants completed the electronic questionnaire with a response rate equivalent to 35.0% (490/1400). Regarding personal characteristics, 57.1% (280/490) of participants were females, 63.4% (311/490) had a university level qualification, and 37.1% (182/490) had a chronic health problem. The most commonly sought OHI by the participants was nutrition-related. Results of the multiple regression analysis showed that 31.0% of the variance in frequency of seeking OHI among Egyptian adults can be predicted by personal characteristics. Participants who sought OHI more frequently were likely to be female, of younger age, had higher education levels, and good self-reported general health.
Conclusions: Our results provide insights into personal characteristics and OHI-seeking behaviors of Egyptian OHI users. This will contribute to better recognize their needs, highlight ways to increase the availability of appropriate OHI, and may lead to the provision of tools allowing Egyptian OHI users to navigate to the highest-quality health information.

journal of occupational and environmental medicine
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Effect of Chronic Diseases on Work Productivity: A Propensity Score Analysis

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Abstract

Objective: The aim of this study was to evaluate the effect of chronic disease(s) on work productivity. Methods: Using the Health & Work Performance Questionnaire, information was collected from 516 workers on chronic disease status and work productivity. Propensity-score matching was performed to identify matched-pairs of workers. Results: In the propensity-score matched sample, workers with chronic diseases were more likely to have increased absenteeism and presenteeism rates, 6.34 and 2.36 times the rates if no chronic diseases, respectively. In addition, they had greater odds for getting negative critical work incidents and less odds for positive incidents than none or balanced status. Multimorbidity showed more significant increase in absenteeism and presenteeism rates, as well as increased odds for excess negative critical work incidents. Conclusion: Chronic disease(s) can significantly reduce work productivity by increasing absenteeism, presenteeism, and net negative critical incidents.

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Level of Disability, Functioning, and Work Limitation: Association With Chronic Diseases in a Working Population

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Abstract

Objective: Chronic diseases are among the major causes of disability, and are associated with substantial individual and societal economic losses. The objective of this study was to assess the association of the different levels of disability, functioning, and work limitation, with chronic diseases. **Methods:** A total of 516 workers were classified according to chronic disease status, and evaluated for disability, functioning and work Limitation. Quantile regression was performed to assess the associations across the quantiles of the disability, functioning, and work limitation. **Results:** Overall disability was significantly associated with chronic diseases across all quantiles, while work limitation was only significant at the median and higher quantiles. Functioning domains showed a variable pattern of associations across their quantiles. **Conclusions:** Chronic diseases showed a variable magnitude and significance of associations across the levels of disability, functioning, and work limitation.

Keywords: chronic diseases, disability, Egypt, quantile regression, WHO International Classification of functioning, disability, and health, WHODAS, work limitation.

Expert Opinion on Pharmacotherapy
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Pharmacotherapy for erectile dysfunction in diabetic males

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Abstract

Introduction: Numerous studies have highlighted the intimate association between erectile dysfunction (ED) and diabetes mellitus (DM). However, the true pathogenesis of ED among diabetic men has not yet been fully discovered. The treatment of ED in diabetic patients remains an interesting area of research. The last two decades have witnessed phenomenal advances in the management of ED with the efficacy of pharmacotherapy for ED in diabetic patients encouraging, especially with introduction of innovative conservative tools for treatment. Areas covered: The aim of this review is to discuss the currently available information on ED pharmacotherapy in diabetic males and provide an expert perspective on the current treatment strategies.

Expert opinion: Conservative treatment remains the initial step for the treatment of ED in diabetic patients. This kind of therapy consists of different modalities including: oral treatments, intracavernosal pharmacotherapy, and evolving modalities such as soluble guanylate cyclase activators, stem cells (SCs), and alternative treatments such as herbal treatment and transdermal/topical pharmacotherapy. However, it should be noted that the currently available pharmacotherapy is still far from ideal. One hopes to witness new drugs and technologies that may revolutionize ED treatment in the future, especially in such complex cases as DM.

Andrology
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Association between leukocytospermia and semen interleukin-6 and tumor necrosis factor-alpha in infertile men

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Abstract

Seminal cytokines were previously reported to adversely affect process of spermatogenesis and ultimately induce poor semen quality. However, association between both IL-6 and TNF-a and leukocytospermia was not yet settled. The aim of this study was to evaluate the association between leukocytospermia and levels of interleukin-6 (IL-6) and tumor necrosis factor-alpha (TNF-a) in semen of infertile men. This cross-sectional study included 100 age-matched (≥18–45 years.) men. Participants were divided into four groups with 25 patients in each group: Group (A) – infertile patients with leukocytospermia and normal other semen parameters; Group (B) – infertile patients with leukocytospermia and abnormal semen parameters; Group (C) – infertile patients with oligospermia and/or asthenospermia and/or teratospermia but with no leukocytospermia; Group (D) – fertile patients with normal semen parameters and without leukocytospermia. All patients were assessed by detailed medical, sexual, fertility history, and complete physical examination. Laboratory assessment included hormonal and semen analysis and assessment of IL-6 and TNF-a in semen plasma. There were significant differences among the study groups regarding total sperm count, sperm concentration, and progressive motility ($p < 0.05$ for each). There was significant increase in semen WBC counts in groups A and B vs. groups C and D ($p = 0.003$). There were significant associations between increase levels of WBCs ≥ 5/ HPF and decrease levels of total sperm count ($p = 0.023$), sperm concentration ($p = 0.001$), and sperm progressive motility ($p = 0.02$). There were significant upregulations in mean level of IL-6 ($p = 0.001$) and mean level of TNF-a ($p = 0.003$) in groups A and B vs. groups C and D. Overall, leukocytospermia is associated with reduction in sperm count, progressive motility and further upregulation of seminal IL-6 and TNF-a. The effect of treatment of leukocytospermia on the level of seminal cytokines is important point of future research.

Pathogens and global health
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The impact of water crises and climate changes on the transmission of protozoan parasites in Africa

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Abstract

Waterborne protozoa (WBP) are important cause of several outbreaks all over the world. The report system of WBP in Africa is weak. More than one third of African countries (21/54) reported WBP with absent reports in the remaining countries (33/54). The top reported WBP were Cryptosporidium, Giardia, FLA and Entamoeba contaminating different African water resources. Other protozoa were less documented even though it is abundant and robust. More than one protozoa were detected in contaminated African water including drinking sources, a prediction index to popular epidemics and real presence of undocumented WBP outbreaks. Risk factors in Africa were observed to be abundant and multi-factorial 'socioeconomic, governmental, pathogen in water and climate change. Climate change is an important factor impacting Africa. Increasing droughts in Africa with other extreme weather events will lead to water crises. Incidence and transmission of WBP will change, with new manifested strains/species. Recognizing future consequences of water crises in Africa are important. Governments and population unity will be needed to protect against expected raise and spread of WBP diseases and water shortages.

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An overview of methods/techniques for the detection of Cryptosporidium in food samples.

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Abstract

Cryptosporidium is one of the most important parasitic protozoa of concern within the food production industry, worldwide. This review describes the evolution and its development, and it monitors the methodology that has been used for Cryptosporidium in food material since 1984, when the first publication appeared regarding the detection of Cryptosporidium parvum in food materials. The methods that are currently being used for the detection of Cryptosporidium oocysts in food material (mainly vegetables) and all of the other available published methods are discussed in this review. Generating more consistent and reliable data should lead to a better understanding of the occurrence, transport and fate of the oocysts in food material. Improvements in monitoring and developing effective methodology, along with food security, offer more practical possibilities for both the developed and developing worlds.

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Comparison of current methods used to detect Cryptosporidium oocysts in stools.

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Abstract

In this review all of the methods that are currently in use for the investigation of Cryptosporidium in stool material are highlighted and critically discussed. It appears that more qualifications and background knowledge in this field regarding the diagnosis of the Cryptosporidium parasite is required. Furthermore, there is no standardization for the protocols that are commonly used to either detect oocysts in faeces or to diagnose the Cryptosporidium infection. It is therefore necessary to initiate further education and research that will assist in improving the accuracy of the diagnosis of Cryptosporidium oocysts in the faecal micro-cosmos. Where ambient concentrations of oocysts are low in stool material, detection becomes a formidable task. Procedures for ring tests and the standardization of multi-laboratory testing are recommended. It is also necessary to enhance the routine surveillance capacity of cryptosporidiosis and to improve the safety against it, considering the fact that this disease is under diagnosed and under reported. This review is intended to stimulate research that could lead to future improvements and further developments in monitoring the diagnostic methodologies that will assist in harmonizing Cryptosporidium oocysts in stool diagnosis.

Cornea
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37:1143–1150

Evaluation of the Effectiveness of Cross-Linking Combined With Photorefractive Keratectomy for Treatment of Keratoconus

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Abstract

PURPOSE: To evaluate the effectiveness and safety of combined epithelium-off cross-linking (CXL) with photorefractive keratectomy (CXL Plus) for correction of the myopic and astigmatic components of keratoconus.

METHODS: Seventy-nine eyes of 46 patients who underwent CXL Plus were enrolled in this retrospective, multicenter, noncomparative clinical study. Uncorrected distance visual acuity, corrected distance visual acuity, refraction, keratometry, and pachymetry measurements were recorded preoperatively and at 3, 6, 12, and 18 months during follow-up.

RESULTS: The mean (±SD) preoperative uncorrected distance visual acuity and corrected distance visual acuity were 1.00 ± 0.22 logarithm of the minimum angle of resolution (logMAR) and 0.62 ± 0.38 logMAR, respectively, and improved to 0.71 ± 0.36 logMAR and 0.32 ± 0.18 logMAR postoperatively. The mean k value, mean corneal thickness at the thinnest location, and mean myopic and astigmatic components decreased from 46.58 ± 0.97 D, 473 ± 29 μm, 3.65 ± 1.72 D, and 1.83 ± 0.69 D preoperatively to 43.79 ± 1.17 D, 431 ± 38 μm, 1.02 ± 0.78 D, and 1.15 ± 0.26 D, respectively, during follow-up. Eleven eyes had delayed epithelial healing, 2 had stromal opacities, 1 had primary herpes simplex keratitis, and 5 showed progression of keratoconus.

CONCLUSIONS:CXL Plus improved the refractive status of keratoconus during 18 months of follow-up, despite its potential early postoperative complications of delayed epithelial healing and corneal haze. CXL Plus reduced the myopic component more than the astigmatic component of keratoconus. However, the safety and stability of the procedure were offset by longer-term postoperative complications and a high rate of postoperative progression of keratoconus.

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Standard cross-linking versus photorefractive keratectomy combined with accelerated cross-linking for keratoconus management: a comparative study.

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Abstract

PURPOSE: To compare the safety and efficacy of standard 30 min epithelium-off cross-linking (CXL) versus photorefractive keratectomy (PRK) combined with accelerated epithelium-off cross-linking (AXL) for the treatment of progressive keratoconus (CXL-Plus).

METHODS: This study was a prospective multicentre comparative clinical study. A total of 125 eyes of 75 patients with grade 1 keratoconus and documented progression were divided into two groups. Group A included 58 eyes treated with standard CXL. Group B included 67 eyes treated with combined PRK and AXL. The recorded data included UDVA, CDVA, subjective and objective refraction, keratometry and pachymetry using corneal topographies preoperatively and postoperatively at 3, 6, 12 and 24 months of follow-up.

RESULTS: In group A, at 24 months of UDVA and CDVA were improved from 1.12 ± 0.38 and 0.58 ± 0.42 to 0.66 ± 0.20 and 0.20 ± 0.12 (LogMAR±SD). The spherical equivalent was reduced from 4.03 ± 1.18 to 1.78 ± 1.04 D. The cylinder reduction was 0.32 ± 0.19 D. In group B, at 24 months of UDVA and CDVA were improved from 1.26 ± 0.52 and 0.68 ± 0.36 to 0.58 ± 0.28 and 0.20 ± 0.16 (LogMAR ± SD). The spherical equivalent was reduced from 4.23 ± 0.95 to 1.92 ± 0.74 D. The cylinder reduction was ±1.76 D.

CONCLUSION: Surprisingly, standard CXL showed close results to CXL-Plus at the 24th follow-up month. Standard CXL acted as a stabilizing procedure associated with a late myopic component reduction. CXL-Plus acted as a refractive and stabilizing procedure with an early effect on both the myopic and the astigmatic component but no later improvements. Standard CXL seems to be more powerful than AXL in its long-term effect. Therefore, in the future, we want to test the combination of PRK with standard CXL.

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Analysis of the Outcomes of Combined Cross-Linking with Intracorneal Ring Segment Implantation for the Treatment of Pediatric Keratoconus.

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Abstract

PURPOSE:To analyze the visual and refractive outcomes of combined accelerated cross-linking with femtosecond laser intracorneal ring segment implantation for the treatment of pediatric keratoconus.

MATERIALS AND METHODS:This retrospective multicenter noncomparative clinical study included 63 eyes of 37 patients (age, 9-17 years) who underwent between August and September 2016 combined cross-linking with intracorneal ring segment implantation for keratoconus. Preoperative and postoperative (6, 12, and 18 months) uncorrected distance visual acuity (UDVA) and corrected distance visual acuity (CDVA), subjective refractions, keratometry (K), and pachymetry measurements were compared.

RESULTS:The postoperative spherical equivalent refraction was within ±1 D, ±2 D, and ±3 D in 19 (30.2%), 27 (42.9%), and 37 (58.8%) eyes, respectively. Only 27 eyes achieved the attempted preoperative spherical equivalent refraction. The mean spherical equivalent refraction significantly improved from -6.01 ± 2.97 to -3.13 ± 2.78 D postoperatively ($P < 0.0001$). The mean K average reading significantly decreased from 48.75 ± 4.25 to 46.65 ± 3.89 D postoperatively ($P < 0.0001$). The mean postoperative myopic, astigmatic, and spherical equivalent corrections were -2.17 ± 2.19, -1.52 ± 2.03, and -2.93 ± 2.35 D, respectively. The mean UDVA and CDVA showed significant improvements (0.89 ± 0.33 to 0.40 ± 0.28, $P < 0.0001$; 0.35 ± 0.31 to 0.25 ± 0.24, $P = 0.004$; respectively) at 18 months postoperatively. Keratoconus progression, segment migration, and segment extrusion were seen in four (6.4%), one (1.6%), and three (4.7%) eyes, respectively, probably contributing to the lower mean postoperative CDVA.

CONCLUSION:Cross-linking plus is only partially effective for pediatric keratoconus. Despite some improvements in vision and keratometry measures, it resulted in complications such as keratoconus progression, segment extrusion, and segment migration that affected the vision in some patients. These findings suggest an assessment of standard epithelium-off collagen cross-linking as a sole procedure to treat pediatric keratoconus in future studies.

Faculty of Vet.Medicine

Fish and shellfish immunology
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Spirulina (Arthrospira platensis) supplementation improves growth performance, feed utilization, immune response, and relieves oxidative stress in Nile tilapia (Oreochromis niloticus) challenged with Pseudomonas fluorescens

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Abstract

One hundred and eighty Nile tilapia fish were used in eighty-three-day growth trial. Fish were divided into three treatment groups. The first group T0 was given the basal diet without any supplementation and served as the control group. The second group T1 was given the basal diet supplemented by 1% Spirulina. The third group T2 was given the basal diet supplemented by 2% Spirulina. At the end of the growth performance trial, a challenge trial was conducted using virulent strain of Pseudomonas fluorescens. Clinical signs, mortalities, postmortem lesions and histopathological alterations were recorded. Hematological, biochemical, oxidative stress and immunological parameters were measured after challenge with Pseudomonas fluorescens. Growth performance was non significantly improved in tilapia fed the diet with 1% Spirulina supplementation (T1). There were neither signs nor mortalities among fishes belonging to 1% Spirulina challenged group. The results showed that Spirulina has a positive effect on hematological, biochemical parameters, MDA, SOD and CAT at T1 (1% spirulia) rather than T2 (2%spirulia). Moreover, the results indicate that Spirulina 1% enhanced bactericidal, phagocytic and lysozyme activities conferring protection against infection. Our results demonstrated a significant up-regulation of pro-inflammatory cytokine (IL-1β and TNF-α) and a down-regulation of anti-inflammatory cytokine (IL-10).
We concluded that 1% Spirulina supplementation significantly improved immunity of Nile tilapia against Pseudomonas fluorescence than 2% Spirulina supplementation.

Oxidative Medicine and Cellular Longevity
2018
10 pages

Black Seed Thymoquinone Improved Insulin Secretion, Hepatic Glycogen Storage, and Oxidative Stress in Streptozotocin-Induced Diabetic Male Wistar Rats

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Abstract

Diabetes mellitus is one of the metabolic diseases having several complications. Nigella sativa oil (NSO) might have beneficial effects in the treatment of diabetic complications. Thirty-two mature male Wistar rats were equally divided into four experimental groups: control, control NSO 2 mL/kg, streptozotocin- (STZ-) induced diabetic, and diabetic (STZ-induced) treated with oral NSO 2 mg/kg for 30 days. Fasting blood glucose (FBG), insulin, and lipid profile levels were determined. Pancreatic and hepatic tissues were used for catalase and GSH. Histopathology, hepatic glycogen contents, insulin immunohistochemistry, and pancreatic islet morphometry were performed. NSO 2 mL/kg was noticed to decrease ($P < 0\ 05$) FBG and increase ($P < 0\ 05$) insulin levels in diabetic rats than in diabetic nontreated animals. Lipid profile showed significant ($P < 0\ 5$) improvement in diabetic rats that received NSO 2 mL/kg than in the diabetic group. Both pancreatic and hepatic catalase and GSH activities revealed a significant ($P < 0\ 05$) increment in the diabetic group treated with NSO than in the diabetic animals. NSO improved the histopathological picture and hepatic glycogen contents of the diabetic group as well as increased ($P < 0\ 05$) insulin immunoreactive parts % and mean pancreatic islet diameter. NSO exerts ameliorative and therapeutic effects on the STZ-induced diabetic male Wistar rats.

Oxidative Medicine and Cellular Longevity
2018
8 pages

Lycopene: Hepatoprotective and Antioxidant Effects toward Bisphenol A-Induced Toxicity in Female Wistar Rats

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Abstract

Bisphenol A (BPA)—an endocrine disruptor xenoestrogen—is widely spread in the environment. Lycopene (LYC) is an antioxidant phytochemical carotenoid. The hereby study was designed to verify the deleterious effect of BPA on cyclic female rats' hepatic tissue as well as evaluation of the effect of LYC toward BPA hepatic perturbation. Twenty-eight female Wistar rats were allocated equally into four groups: control group, LYC group (10 mg/kg B.wt), BPA group (10 mg/kg B.wt), and BPA + LYC group (the same doses as former groups). The treatments were given daily via gavage to the rats for 30 days. The rats in BPA displayed high activities of serum liver enzymes with low levels of total proteins (TP) and albumin. Moreover, BPA induced hepatic oxidative stress via depletion of antioxidant enzymes concomitant with augmentation of lipid peroxidation, increased comet tail DNA %, and overexpression of caspase-3. Meanwhile, LYC administration reduced the cytotoxic effects of BPA on hepatic tissue, through improving the liver function biomarkers and oxidant-antioxidant state as well as DNA damage around the control values. These findings were confirmed by hepatic histopathological examination. Finally, LYC credited to have a noticeable protective effect versus BPA provoked oxidative injury and apoptosis of the liver tissue.

Small Ruminant Research
2018
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In vitro and In vivo Effects of Tribulus terrestris on Some Immunological Parameters, Lymphocyte Proliferation, and DNA Integrity in Sheep

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Abstract

There are limited studies in which mechanistic action of *Tribulus terrestris* extract (*TTE*) on the immune system of small ruminants have been investigated. This research was carried out on 20 rams divided into control and treated groups (n = 10 each). The treated rams received 1.5 g/head/day of *TTE* for consecutive 45 days. *In vitro*, lymphocyte culturing was carried out using peripheral blood mononuclear cells (PBMCs). *In vivo* and *in vitro* evaluations of lymphocyte transformation, comet assay, IL-6, and TNF-α were performed, as well as *in vivo* serum MDA and GSH. The body weight of rams treated with *TTE* was significantly ($P < 0.05$) greater than that in control. Lymphocyte transformation was significantly induced in treated rams. Interestingly, the 0.5 µl/mL of *TTE* induced ($P < 0.05$) the lymphocyte transformation in PBMC cultured *in vitro* compared to that in control and 1 µl/mL of *TTE* treated cells. A dose of 0.5 µl/mL of *TTE* significantly ($P < 0.05$) induced the level of IL-6 *in vitro* compared to that in control and 1 µl/mL of *TTE* treated cells. TNF-α didn't show a significant change *in vivo* and *in vitro*. The *in vivo* treatment with *TTE* decreased the percentage of lymphocyte DNA in the comet tail in treated rams. Additionally, *in vitro* addition of *TTE* either in 0.5 or 1 µl/mL to the PBMC culture significantly ($P < 0.01$) affected the DNA integrity. Serum MDA was significantly reduced, while GSH were significantly induced in *TTE* treated rams than the control group. In conclusion, *TTE* could modulate the immune functions and induce lymphocyte transformation in rams.

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The Ameliorative Potential of Probiotics and/or Silymarin on Thioacetamide Induced Hepatotoxicity in Rats: Histological and Immunohistochemical Study

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Abstract

SUMMARY: Thioacetamide (TAA) is one of the common fungicidal agents that induce liver injury varying from inflammation, necrosis, and fibrosis to cirrhosis. Many recent studies reported the beneficial effect of probiotics and silymarin on hepatotoxicity regardless the causative agents. Therefore, the present study aimed to evaluate the ameliorative role of probiotics and/or silymarin on TAA induced hepatotoxicity in rats via histological, and immunohistochemical methods. Twenty five male albino rats were used for this experiment and were divided into five groups (n=5 rats/group); group I acts as negative control, group II was orally administrated distilled water for six weeks, then injected with TAA (200 mg/kg b.wt./ 5 ml physiological saline/ I.P.) twice a week for another six weeks, group III was treated with probiotics at a dose of 135 mg/ kg b.wt. orally in drinking water daily for six weeks, then injected with TAA (dosage of group II), twice weekly for another six weeks, group IV was treated with silymarin at a dose of 200 mg/ kg b.wt orally 4 times per week for six weeks, then injected with TAA (dosage of group II), twice weekly for another six weeks and group V was treated with combination of both probiotics and silymarin, at the same dosage in groups III and IV respectively then injected with TAA (dosage of group II), twice weekly for another six weeks. Histologically, TAA induced hepatocytes degeneration, inflammatory cells infiltration, and pseudolobular parenchyma as well as, high apoptosis and low proliferation rates that were proved by immunohistochemical staining for caspase 3 and ki-67 respectively. Probiotics and/or silymarin improved the histological feature of hepatocytes, reduced apoptosis and stimulated proliferation. Based on these results, we concluded that the use of probiotics and silymarin combination ameliorates the hepatotoxic effect of TAA in rats more than the use of probiotics or silymarin alone.

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Use of Zebrafish (*Danio rerio*) Embryos as a Model to Assess Effects of Mercury on Developing Skeletal Muscle: A Morphometric and Immunohistochemical Study

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Abstract

Exposure to mercury in the environment continues to be a significant worldwide concern, especially for developing embryos and fetuses. While extensive research effort has focused on the effects of mercury on the developing nervous system, much less is known concerning adverse effects of mercury on other organ systems, including the development of skeletal muscle. We exposed developing zebrafish embryos to a range of concentrations of mercuric chloride (100 to 400 µg/liter or ppb) and compared them to control embryos (0 µg/L mercuric chloride). Embryos were examined at 48 hours post fertilization (hpf) for morphometry and morphological deformities of skeletal muscle fibers in the trunk and tail. Embryos exposed to 400 ppb mercuric chloride showed decreased trunk and tail areas compared to control embryos. A dose-dependent reduction in muscle fiber length was observed, and exposure to all concentrations of mercuric chloride used in this study resulted in decreased muscle fiber immunohistochemical staining with anti-myosin antibodies. Irregular muscle fiber diameters, twisted muscle fibers, and degenerated muscle fibers were observed in sections of embryos stained with eosin at the higher exposure concentrations. Evidence presented in this study suggests that exposure to even low concentrations of mercuric chloride adversely affects skeletal muscle fiber development or muscle fiber integrity, or both.

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Immunohistochemical expression of apoptosis-related biomarkers in normal tissues of camel (Camelus dromedarius): A survey in a desert-dwelling mammalian model

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Abstract

Programmed cell death is a fundamental event that takes place during organ development and plays an important role in cellular homeostasis. Since various body organs of the camel are under high ecological and physiological stress during food and water deprivation, desiccation, and the long exposure to solar radiation in these desert nomads, we aimed to examine the immunohistochemical expression of apoptosis-related biomarkers in some of its normal body organs to illustrate a basic track for further pathological investigation. Regarding apoptosis, the present study has revealed that the higher expression of cleaved caspase-9 (CC9) [initiator of the intrinsic pathway] and CC3 (effector caspase), and the scanty expression of CC8 (initiator of the extrinsic pathway), highlight the role of the caspase-dependent, intrinsic apoptotic pathway particularly in the intestines and lymphoid organs. The apoptosis- inducing factor (AIF)-immunoexpression was completely missing in the cell nuclei of the examined tissues, indicating the absence of the caspase-independent pathway. The nuclear overexpression of the phospho-histone H2AX (γ H2AX) and the occasional expression of single-stranded DNA, particularly among the CNS neurons, suggest an efficient, protective DNA-repair mechanism in such cells. Thus, despite efficient anti apoptotic mechanisms intrinsic apoptotic pathways exists in brain, intestine and lymph organs of adult desert camels.

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8, 557–564

Autophagy in normal tissues of camel (Camelus dromedarius) with focus on immunoexpression of LC3 and LC3B

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Abstract

Autophagy is a highly regulated intracellular pathway for degradation and recycling of cytoplasmic protein aggregates and entire organelles. The autophagic pathway is stimulated by nutrient starvation, which prompted us to study the desert camel. Various organs of the camel undergo ecological and physiological stress due to food and water deprivation, dehydration and long exposure to solar radiation. We investigated the immunohistochemical expression of specific biomarkers of autophagy under normal conditions as a baseline for later work on stressed individuals. The autophagy-specific biomarkers, microtubule-associated protein1 light chain 3 (LC3), and its cleaved variant, LC3B, were strongly expressed in the cytosol of all tissues examined. The cytosolic immunoreactivity of LC3 was relatively weak, diffuse and vacuolar, while that of LC3B was stronger, punctate and at lower levels.

LC3 appears to be associated with the autophagosomal membranes, either free or lysosomebounded.

LC3B is specific for the autophagosome-lysosome complexes and their degraded, granular contents. Autophagy was strongly expressed in CNS neurons and intestinal neural elements, which suggests a protective function for the nervous system. Autophagic markers also were seen in deformed immune-competent cells with fragmented nuclei in lymph nodes, spleen and gut-associated lymphoid tissue (GALT), which suggests a "suicidal" activity of eliminating unneeded cells. Autophagy, as measured by LC3 and LC3B expression, may participate in a general regulatory mechanism in tissues of the desert camel.

Aquaculture International
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The immune modulatory effect of oregano (Origanum vulgare L.) essential oil on Tilapia zillii following intraperitoneal infection with Vibrio anguillarum

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Abstract

The current study aimed to evaluate the possible effect of Origanum essential oil on innate immune parameters as well as the hematological profiles of Tilapia zillii following challenge with Vibrio anguillarum. Fifty-four of Tilapia zillii weighing 180 ± 10.2 g were randomly distributed into three identical closed recirculating seawater systems. The study included three groups (G1, G2, and G3) repeated in triplicates. Fish of the first two groups were fed on a basal diet without herbs, whereas fish of the last group were fed on a basal diet supplemented with Origanum essential oil at concentration 1 g kg−1 for 15 days. Subsequently, fish of G2 and G3 subjected to a peritoneal inflammation by intraperitoneally injecting V. anguillarum (5.5 × 105 CFU mL−1), whereas fish of G1 injected with saline and served as control. Fish of all groups were then sampled at 4, 12, and 24 h post injection. No mortalities were observed in both basal and Origanum fed groups. However, some specimens of fish fed basal diet showed dorsal fin erosions, eroded mouth, and detached skin. Although the kinetics of RBCs, WBCs, Hb, and differential leukocyte values remained unchanged in fish fed different diets at the beginning of the trial, significant increases in those values were observed in fish fed Origanum essential oil at 12 and 24 h post injection. Similarly, an augmentation of plasma proteases, antiproteases, and lysozyme activities were recorded in fish fed Origanum essential oil at the same particular sampling points. A significant enhancement in plasma bactericidal capacity was only recorded in fish fed Origanum essential oil at 12 and 24 h post challenge compared to those fed basal diet. In conclusion, Origanum essential oil had a pronounced influence on the innate immunity and increased the fish resistance to V. anguillarum. These data gave insight into the potential use of Origanum in prophylactic strategies against threatening pathogens.

Microbial Pathogenesis
2018
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Molecular and phenotypic characterization of Photobacterium damselae among some marine fishes in Lake Temsah

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Abstract

Photobacterium damselae species are one of the most devastating bacterial pathogens in mariculture worldwide. Some species of Photobacterium are pathogenic for marine animals and human. They are the causative agents of photobacteriosis, formerly known as pasteurellosis. A total of (202) marine fishes of three different species were represented as: seabass (Dicentrarchus labrax), seabream (Sparus aurata) and gray mullet (Mugil capitus) randomly collected from Lake Temsah at Ismailia governorate along the parallel Pelagic road to the lake in the governorate from August 2015 to July 2016. The clinical picture and gross lesions of the diseased fishes were recorded.

Isolation and identification of suspected bacteria using traditional and molecular methods. Samples from affected organs were collected for studying the histopathological alterations of these pathogens. Fifty one fishes were found to be infected with Photobacterium damselae subsp. Piscicida. Seabass (Dicentrarchus labrax) was the most infected fish species (23), followed by seabream (Sparus aurata) (18) finally gray mullet (Mugil capitus) was (10). 91fishes were found to be infected with P. damselae subsp. damselae, seabass (Dicentrarchus labrax) was the most infected fish sp. (36), followed by seabream (Sparus aurata) (32), then gray mullet (Mugil capitus) (23). The results indicated that, the total prevalence of P. damselae subsp. piscicida in all examined species (25.24%), the highest seasonal prevalence was recorded in summer season (37.09%) followed by autumn (26%) then spring (20.37%) and winter (11.11%). On the other hand, the total prevalence of P. damselae subsp. damselae in all examined species (45.04%), the highest seasonal prevalence was recorded in summer season (67.74%) followed by autumn (52%) then spring (29.62%) and winter (19.44%). Molecular diagnosis with conventional PCR used to confirm the traditional isolation was applied by using specific primers of two genes (polycapsular saccharide gene and urease C gene). The histopathological studies of naturally infected marine fishes showed severe inflammatory reactions in different organs with accumulation of melanomacrophages and necrosis. The results confirm that P. damselae subspecies damsalea is the most prevalent pathogen between marine fishes, and seabass (Dicentrarchus labrax) was the highly affected marine fishes in this study.

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Identification and prevalence of Anisakis pegreffii and A. pegreffii _A. Simplex (s.s.) hybrid genotype larvae in Atlantic horse Mackerel(Trachurus trachurus) from some North African Mediterranean coasts

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Abstract

Atlantic horse mackerel is one of the most popular fish for North African consumers. Mackerel constitutes a common host for the *Anisakis* species of infective larvae (L3). *A. pegreffii* and *A. pegreffii X A. simplex* (s.s.) hybrid genotype were identified using PCR-RFLP and entire ITS-DNA sequencing protocol. This research investigated the prevalence and mean intensity of *A. pegreffii* and its hybrid form in randomly collected mackerel samples throughout spring to summer seasons from the Libyan western coast. Briefly, 55 out of 240 (22.9%) fish samples were confirmed to be infected and the prevalence of A. pegreffii reached 22.08% with mean intensity of infection 29.13 ± 2.43 parasite/fish, while the prevalence of *A. pegreffii X A. simplex* (s.s.) hybrid genotype was 0.8% with mean intensity of infection 22 ± 0.85 parasite/fish. The prevalence of infection noticeably elevated during the summer season to reach 30.8%. Additionally, female fish samples were heavily infected as the mean intensity of infection was 34.75 ± 1.27 parasite/fish. Furthermore, results indicated that the highest intensity of infection was recorded in older and female mackerel. To sum up, the current study has provided substantial information about the impacts, diversity and epidemiology of *A. pegreffii* and its hybrid form in North African waters.

Mutation Research-Reviews in Mutation Research
2018
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Line-1: Implications in the etiology of cancer, clinical applications, and pharmacologic targets

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Abstract

Long interspersed nuclear elements-1 (Line-1 or L1) accounts for approximately 17% of the human genome. The majority of L1s are inactive, but ~100 remain retrotransposon competent (RC-L1) and able to retrotranspose through RNA intermediates to different locations of the genome. L1 is involved in both disease initiation and progression via retrotransposition dependent and independent mechanisms. Retrotransposed L1 sequences disrupt genetic loci at sites of insertion, while the activities of L1 si/piRNAs, mRNAs, and ORF1 and ORF2 proteins, and have been implicated in the etiology and progression of several human diseases. Despite these relationships, little is known about the clinical utility of L1 as a biomarker of disease initiation and progression, or the utility of small molecules to inhibit and reverse the harmful effects of L1. In this review, we discuss the life cycle of L1, somatic and germline inhibitions, the mechanisms of L1 retrotransposition dependent and independent disease initiation and progression, clinical utilities, and potential of L1s as pharmacologic targets for the treatment of cancer.

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Polymorphism of Prolactin Gene and Its Association with Egg Production Trait in Four Commercial Chicken Lines

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Abstract

Broodiness is a behavioral trait observed in most common breeds of domestic fowl and due to its fundamental role in avian reproduction, it has been of great interest to poultry scientists, breeders and producers of hatching eggs. Prolactin gene (PRL) is generally accepted as crucial to the onset and maintenance of broodiness in birds and thus plays a crucial role in egg production. Therefore, the present study aimed to screen the Single Nucleotides Polymorphisms (SNPs) of prolactin gene in four commercial chicken lines namely Hubbard F15, Lohmann, Cobb500, and Avian48 using PCR and direct sequencing. A total number of forty chickens (ten females from each of the four commercial chicken lines) were used. Blood samples were collected aseptically from brachial (wing) vein of the chickens for genomic DNA extraction. PCR reaction was done using five pairs of primers, one sense (F) and one antisense (R) primer for each of the five exons of prolactin gene. Finally, DNA sequencing and Single Nucleotide Polymorphisms (SNPs) analysis was done using Laser gene Megalign program. The results showed three SNPs in Hubbard F15 chicken line; one synonymous SNP at the position 3838 bp (ACC/ACT-transition) in exon 2 while in exon 5, two SNPs were detected; one non-synonymous single nucleotide polymorphism at the position 7921bp (CCT/TCT-transition) which results in amino acid changes at codon positions 169 (P/S), and one synonymous single nucleotide polymorphism at the position 8187 bp T/ C. The study concluded that this SNP in PRL gene could be used as the potential molecular markers for egg production traits in chicken.

Journal of Poultry Science
2018
(55): 70-77

Microcystin-leucine-arginine Modulates the Expression Patterns of Proinflammatory Cytokines and an Apoptotic Gene in Chicken Liver

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Abstract

Microcystins (MCs) are included in drinking water and a family of cyclic heptapeptide hepatotoxins that have been implicated in the impairment of liver function in various animals. There is scarce information on the effect of MCs on cytokines and apoptotic gene expression and on whether MCs can induce inflammation and apoptosis in avian hepatic tissue. This study investigated the expression ofgenes related to proinflammatory interleukins, apoptosis, and antioxidant function in chicken liver tissues cultured in the presence of different doses of microcystin-leucinearginine (MC-LR). Livers were collected from five hens and liver slices were placed in sterile tubes containing Dulbecco's medium supplemented with 0, 1, 10, or 100 ng/mL ofMC-LR. After 6 h ofcultivation, total RNA was extracted and quantitative PCR analysis was performed for interleukin genes (*IL-1β*, *IL-6*, and *IL-8*), *TNF sf15*, an apoptotic gene (*caspase-3*), and genes involved in antioxidant function ([catalase [*CAT*], glutathione peroxidase [*GSH-PX*], and superoxide dismutase [*SOD*]). Liver tissues in each group were fixed for histopathology. MC-LR downregulated the mRNA levels of *IL-1β, IL-8*, and *TNF sf15* as compared to the control (0 ng/mL) in dosedependent patterns; however, the differences were not significant. The expression of *IL-6* in liver tissues exposed to 100 ng/mL ofMC-LR was significantly ($P < 0.05$) lower than that in tissues exposed to 1 ng/mL. In contrast, MC-LR upregulated the mRNA expression of *caspase-3* and genes involved in antioxidant function in the liver tissues after 6 h, without the difference reaching statistical significance. Hepatocytes showed vacuolar degeneration and focal necrosis according to the dose ofMC-LR. This study highlighted the risk oflow doses ofMC-LR in chicken liver.
Moreover, MC-LR could modulate the transcriptional patterns ofat least *IL-6* in liver-tissue culture ofchicken after 6 h ofexposure.

Cytotechnology
2018
(70): 831–842

Melilotus indicus extract induces apoptosis in hepatocellular carcinoma cells via a mechanism involving mitochondria mediated pathways

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Abstract

Melilotus indicus, is a traditional medicine used as analgesic and emollient. Although Melilotus indicus extract (MIE) has recently been shown to suppress growth of several tumor cell lines, information regarding its antitumor mechanism is completely unknown. Here, we report the mechanism underlying the effects of MIE on human hepatocellular carcinoma cells, specifically HepG2, and SNU-182 cells. Methanolic MIE impaired the proliferation, and induced cell death in both HepG2 and SNU-182 cells but not in normal hepatic L-02 cells. Mechanistically, flow cytometric analysis revealed that MIE induces apoptosis in HepG2, and SNU-182 cells. However, MIE-induced apoptosis were not affected by a pan caspase inhibitor z-VAD-fmk as well as MIE did not stimulate caspase activation. Furthermore we found that MIE-induced apoptosis could be attributed to a mechanism involving mitochondria-mediated pathways evidenced by decrease in the mitochondrial membrane potential (ΔΨm), increase in the Bax/Bcl-2 ratio, and translocation of apoptosis inducing factor (AIF) from the mitochondria to the nucleus. Suppression in AIF expression by siRNA reduced MIE-induced apoptosis which suggested the dependency of MIE on AIF to induce apoptosis in hepatocellular carcinoma cells. To the best of our knowledge this is the first report elucidating the anticancer mechanism of MIE. Our findings suggested that MIE might be a good extract for developing anticancer drugs for human hepatocellular carcinoma treatment.

Reproduction in Domestic Animals
2018
(53): 1013–1015

Changes in plasma concentrations of S100A7 and S100A8 in dairy cows during pregnancy

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Abstract

This study was carried out to examine the changes in plasma concentrations of the Ca-binding antimicrobial proteins S100A7 and S100A8 during pregnancy in dairy cows. Holstein Friesian cows (*n* = 19) were inseminated with Holstein Friesian semen. Blood was collected at days 30, 60, 90, 120, 150, 180, 210, 240 and 270 after insemination. Plasma was used for measuring the concentrations of S100A7 and S100A8. Both S100A7 and S100A8 concentrations showed similar patterns during gestation; they increased during the mid-gestation, between days 90 and 180, and then declined before calving. The findings indicated that plasma concentrations of S100A7 and S100A8 did not change significantly during pregnancy in cows. Further studies are required to determine the roles of S100A7 and S100A8 in physiological function during pregnancy in dairy cows.

Reproduction in Domestic Animals
2018
(53): 137-142

Detection of APAF1 mutation in Holstein cows and mummified foetuses in Japanese dairy herds

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Abstract

Some of the highest genetic merit sires have been shown to harbour recessive mutations affecting fertility, which may spread rapidly in the population through AI. These disorders may result in abortion and decline in pregnancy per insemination in cows. This study was carried out on 240 Holstein-Friesian cows and 15 mummified foetuses. Blood and tissue samples were collected from the cows and mummified foetuses, respectively, for DNA extraction. Allele-specific PCR was designed for the detection of the cows and foetuses carrying the nonsense mutation (C/T) in apoptosis peptide activating factor 1 gene (*APAF1*). The mutant allele frequency of the *APAF1* in carrier cows and mummified foetuses was calculated. Milk samples were taken from the carrier and non-carrier cows for progesterone assay. The allele-specific PCR reaction efficiently distinguished the C/T mutation in *APAF1*. Of 240 cows, seven cows (2.9%) were diagnosed to carry one copy of the mutant allele of *APAF1*. However, the carrier frequency was 33.3% in mummified foetuses (five of 15). The mutant allele frequency was 0.02 and 0.17 in the cows and mummified foetuses, respectively. Concentrations of progesterone did not differ between cows with *APAF1* mutation and non-carrier cows during 45 days post-insemination. This study provided allele-specific PCR for the detection of *APAF1* mutation in cows. Moreover, it reports the carrier and mutant allele frequencies of *APAF1* in dairy cows and mummified foetuses in Japan.

Microscopy Research and Techniques
2018
81(11): 1268-1274

Localization of telocytes in rabbits testis: Histological and immunohistochemical approach

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Abstract

Telocyte (TC) is an interesting unique interstitial cell demonstrated in many human and animal tissues and organs. This study verified, for the first time, the pattern of TC distribution in the testicular tissue of New Zealand White rabbits using histological, immunohistochemical, and electron microscopic tools. Rabbit testicular tissue samples were obtained from three pairs of adult healthy New Zealand white rabbit by surgical procedures. The testicular tissues were stained with hematoxyline– eosin, Crossmon's trichrome and Periodic acid Schiff. The immunohistochemistry was performed using three different antibodies CD34, CD117, and vimentin. The testes were examined by scanning and transmission electron microscopy. Histologically, TCs formed a sheath surrounding the seminiferous tubules. Other TCs were located in the interstitial tissue of the rabbit testis. Immunohistochemically, TCs reacted strongly with CD34, CD117, and vimentin. Scanning electron microscopic findings clearly elucidated the spreading pattern of TCs and their cytoplasmic processes with the interstitial tissue including blood vessels. Both homocellular and heterocellular junctions were demonstrated by transmission electron microscope. On the basis of TCs distribution and connections, the before mentioned data suggested that, TCs may play a potential role in maintaining the testicular construction and regulation. A future work is needed to clarify the actual role played by TCs in monitoring testicular fertility.

Oxidative Medicine and Cellular Longevity
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10 pages

Protective Effect of Boswellic Acids against Doxorubicin-Induced Hepatotoxicity: Impact on Nrf2/HO-1 Defense Pathway

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Abstract

The current study aimed to investigate the potential protective role of boswellic acids (BAs) against doxorubicin- (DOX-) induced hepatotoxicity. Also, the possible mechanisms underlying this protection; antioxidant, as well as the modulatory effect on the Nrf2 transcription factor/hem oxygenase-1 (Nrf2/HO-1) pathway in liver tissues, was investigated. Animals were allocated to five groups: group 1: the saline control, group 2: the DOX group, animals received DOX (6 mg/kg, i.p.) weekly for a period of three weeks, and groups 3–5: animals received DOX (6 mg/kg, i.p.) weekly and received protective doses of BAs (125, 250, and 500 mg/kg/day). Treatment with BAs significantly improved the altered liver enzyme activities and oxidative stress markers. This was coupled with significant improvement in liver histopathological features. BAs increased the Nrf2 and HO-1 expression, which provided protection against DOX-induced oxidative insult. The present results demonstrated that BAs appear to scavenge ROS and inhibit lipid peroxidation and DNA damage of DOX-induced hepatotoxicity. The antioxidant efficacy of BAs might arise from its modulation of the Nrf2/HO-1 pathway and thereby protected liver from DOX-induced oxidative injury.

Acta Parasitologica
2018
63 (2) :412-415

Detection of *Dirofilaria immitis* antigen and antibodies against *Anaplasma phagocytophilum, Borrelia burgdorferi* and *Ehrlichia canis* in dogs from ten provinces of China

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Abstract

Despite the fact vector-borne diseases (VBDs) have been increasingly reported in dogs worldwide, there are only limited reports on VBDs in dogs in China with most being based on molecular detection of active infections. To provide further data on the exposure of dogs in China to VBD agents, we used commercial immunochromatographic assays to test plasma from 637 apparently healthy indoor and breeding colony dogs from 21 veterinary clinics in 10 provinces in China and a commercial dog breeding facility for circulating antigen of *Dirofilaria immitis*, and for circulating antibodies against *Ehrlichia* spp., *Anaplasma* spp., and *Borrelia burgdorferi*. Overall, we found only low levels of exposure to *Ehrlichia* spp. (4.7%; 30/637), *Anaplasma* spp. (1.4%; 9/637), *B. burgdorferi* (0.9%; 6/637) and *D. immitis* (0.2%; 1/637) with most of the positive animals coming from the commercial breeding colony (26/103; 25.2 %) where ectoparasites were most commonly noted. At least one vector-borne agent was found in dogs from 6 of the 10 provinces investigated. Our results confirm exposure of dogs from around China to a variety of VBDs, even indoor pets seldom observed to harbor ectoparasites.

Fish and Shellfish Immunology
2018
(74) : 26-34

Enhancement of immune response and resistance against Vibrio parahaemolyticus in kuruma shrimp (Marsupenaeus japonicus) by dietary supplementation of β-1,4-mannobiose

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Abstract

Supplementation of prebiotic carbohydrates can act as a potent immunomodulator and have the efficacy to induce immune-related genes which are involved in host defense. Pure β-1,4-mannobiose (MNB) showed activation of prophenoloxidase system of shrimp hemocytes in vitro. The resistance of kuruma shrimp Marsupenaeus japonicus against Vibrio parahaemolyticus was examined after the shrimp were fed with 0 (control), 0.02, 0.2, and 2% MNB supplemented diets. The results showed significantly higher survival rates in MNB supplemented shrimp than those of the control one from 2 to 12 days post challenge. In another experiment, the hemocyte count, ROS production, phagocytic, phenoloxidase and bactericidal activities, and expression of immune-related genes were investigated in the control and MNB supplemented groups at day 1, 4, 6, 8 and 11 of the feeding. These immune parameters were significantly enhanced in MNB supplemented groups. Furthermore, the gene expression analysis showed that transcripts of lysozyme, crustin, penaeidin and TNF were significantly upregulated in hemolymph, lymphoid organs and intestines of MNB treated shrimp. Overall, the results provided evidence that MNB supplementation could improve the immune response and increase shrimp resistance against V. parahaemolyticus infection.

Aquaculture
2018
(497) : 431–439

Efficacy of dietary fermented vegetable product on immune response, upregulation of immune-related genes and protection of kuruma shrimp (Marsupenaeus japonicus) against Vibrio parahaemolyticus

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Abstract

The present study was carried out to investigate the effects of dietary fermented vegetable product (FVP) on the innate immune response, immune-related genes expression and resistance of kuruma shrimp Marsupenaeus japonicas against Vibrio parahaemolyticus. Four hundred and eighty healthy kuruma shrimp (15.3 ± 1.15 g) were distributed into four treatment groups and fed with diets containing 0 (control), 0.55, 5.5, and 55 g FVP (kg diet)−1 for 11 days. The results revealed that administration of FVP significantly elevated the innate immune parameters of kuruma shrimp including total hemocyte count (THC), phagocytosis, phenoloxidase activity, reactive oxygen species (ROS) production and bactericidal activity ($P < 0.05$). Furthermore, dietary supplementation of 5.5, and 55 g FVP (kg diet)−1 remarkably up-regulated the expression of antimicrobial peptides (AMPs) and toll-like receptors (TLR) in various tissues, particularly in the intestine. Shrimp groups supplemented with FVP diets showed significantly lower cumulative mortality percentage after being challenged with Vibrio parahaemolyticus ($P < 0.05$). The results suggest that FVP can be recommended as a feed supplement to elevate innate immune response, upregulate immune related genes expression and increase disease resistance in kuruma shrimp.

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The establishment of clonally derived chicken embryonic fibroblast cell line (CSC) with high transfection efficiency and ability as a feeder cell

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Abstract

This study established a single cloned chicken embryonic fibroblast (CEF) cell line. It solves the main problem of the instability of a cultured primary cell and its impact on the experiment. In this study, CEF pass through this crisis and formed a continuous cell line after subculture. We isolated single post crisis CEF by a mouth pipette under a convert microscope then established a single cloned cell line named CSC-1-5, which passaged continuously from 96-well plates to 60mm culture plates. CSC has a normal chicken diploid karyotype, no tumorigenicity, and a high G2/M phase cell ratio. We found that Fugene could mediate the transfection of CSCs efficiently; it was significantly improved compared with the primary cells. It could also promote the proliferation of chicken embryonic stem cell as a feeder layer.

Cell & Bioscience
2018
8:40

NICD mediated notch transduction regulates the different fate of chicken primordial germ cells and spermatogonial stem cells.

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Abstract

Background:Notch signaling is mainly regulated by Notch1 during development of chicken germ stem cells; however, the molecular mechanisms that contribute to generation of these germ stem cells have not been thoroughly investigated.
Results: In our studies, Overexpression of the Notch1 NICD promoted development of the reproductive ridge, but inhibited the formation of seminiferous tubules. The formation efficiency of PGCs in the reproductive ridge following overexpression of NICD (7.5% ± 0.11) was significantly higher than that (4.9% ± 0.17, $p < 0.05$) following inhibition of NICD, While the formation efficiency of spermatogonial stem cells (SSCs) in the testes (12.7% ± 0.08) was significantly lower after NICD overexpression than that after inhibition of NICD (16.3% ± 0.16, $p < 0.05$). Using co-immunoprecipitation, we found that this anomaly stemmed from the reversal of dissociation of the Notch-regulated transcription factor CBF-1/RBP co-suppression complex during the differentiation of PGCs into SSCs. This dissociation of the CBF-1/RBP co-suppressing complex during the differentiation of ESCs into PGCs resulted in the release of HDAC1 and HDAC2 and the recruitment of mastermind-like 1 to form a coactive complex to promote the expression of the downstream transcription suppressor hairy/enhancer of split-1. Dynamic expression of transducin-like enhancer of split 3, TLE4, and C-terminal binding protein 2 during further differentiation of PGCs inhibited the dissociation of the CBF-1/RBP co-suppression complex and inhibited the expression of the downstream genes.
Conclusions: In summary, Notch signaling plays diametrically opposing roles during normal development of chicken PGCs and SSCs, and these functions was determined by the expression of NICD, changes in the CBF-1/RBP complex composition, and histone modification.

Journal of Cellular Biochemistry
2017
118:1379–1386

Regulation of Hedgehog Signaling in Chicken Embryonic Stem Cells Differentiation into Male Germ Cells (Gallus)

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Abstract

The study aims to analyze the key signaling pathways in regulating the process of embryonic stem cells (ESCs) differentiation into spermatogonial stem cells (SSCs). Based on RNA Sequencing result, we further explored the specific regulating mechanisms of Hedgehog (HH) signaling in this process. HH signaling was found to be a crucial signaling pathway participating in the differentiation process of ESCs to SSCs. In Retinoic acid (RA) induced in vitro differentiation assay, the expression of two germ cell marker genes, integrin α6, and integrin β1, was observed to significantly increase, while it decreased dramatically when IHH was knocked down. Fluorescence activated cell sorting analysis showed that the proportion of integrin $\alpha6^+$ and integrin $\beta1^+$ cells in the RA group was significantly higher than that in the RA + siRNA- Indian Hedgehog (IHH) group. In in vivo situations, siRNA-IHH could stably express in fertilized chicken embryos and significantly down-regulate the IHH expression. With real-time quantitative PCR and western blot, we identified that integrin α6 and integrin β1 expression was significantly suppressed along with IHH inhibition in vivo. We concluded that Hedgehog signaling pathway positively regulates the differentiation of ESCs to male germ cells through signal transduction by IHH.

Small Ruminant Research
2018
162 (2018): 85-90

Statistical models for genetic evaluation of some first kidding and lifetime traits of the Egyptian Zaraibi goats

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Abstract

The aim of the present study was to define the best fitting model for genetic evaluation of the Egyptian Zaraibi goats using three statistical models. Models differed based on the inclusion or exclusion of maternal additive genetic effects and the direct-maternal genetic covariance (σam). The models used were; Model 1 (without maternal effects); Model 2 (with maternal effects where $\sigma_{am}=0$) and Model 3 (as in Model 2, but $\sigma_{am} \neq 0$). The evaluated traits were; litter size at birth (LSB, kid), litter size at weaning (LSW, kid), litter weight at birth (LWB, kg), litter weight at weaning (LWW, kg), first lactation milk yield (FLMY, kg), first lactation length (FLL, day), total milk yield in productive life (TMY, kg) and total lactation length in productive life (TLL, day). Data represented some first lactation and longevity traits. A total of 2270 first kidding records produced from 600 does that were sired by 95 bucks. Statistical analyses were done using VCE-6 software. Model selection was built on the value of Akaike information criterion (AIC). Direct heritabilities were higher than maternal heritabilities in all models, and varied between 0.09 to 0.21, 0.05 to 0.22, 0.11 to 0.24 and 0.05 to 0.20 for LSB, LSW, LWB and LWW, respectively. Direct heritability for yield and lifetime traits were low to moderate and varied from 0.16 to 0.18, 0.07 to 0.34, 0.15 to 0.16 and 0.08 to 0.18 for FLMY, FLL, TMY and TLL, respectively. Maternal heritabilities ranged from 0.02 to 0.30 from models 2 and 3. Direct-maternal genetic correlations were low to moderate, negative for most of studied traits and ranged from −0.01 to −0.38. The inclusion of both direct and maternal effects in addition to the covariances between them in statistical models is recommended for the best genetic improvement of Egyptian Zaraibi goats.

Veterinary World
2018
11(3): 259-267

Modeling the potential risk factors of bovine viral diarrhea prevalence in Egypt using univariable and multivariable logistic regression analyses

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Abstract

Aim: The present cross-sectional study was conducted to determine the seroprevalence and potential risk factors associated with Bovine viral diarrhea virus (BVDV) disease in cattle and buffaloes in Egypt, to model the potential risk factors associated with the disease using logistic regression (LR) models, and to fit the best predictive model for the current data.

Materials and Methods: A total of 740 blood samples were collected within November 2012-March 2013 from animals aged between 6 months and 3 years. The potential risk factors studied were species, age, sex, and herd location. All serum samples were examined with indirect ELIZA test for antibody detection. Data were analyzed with different statistical approaches such as Chi-square test, odds ratios (OR), univariable, and multivariable LR models.

Results: Results revealed a non-significant association between being seropositive with BVDV and all risk factors, except for species of animal. Seroprevalence percentages were 40% and 23% for cattle and buffaloes, respectively. OR for all categories were close to one with the highest OR for cattle relative to buffaloes, which was 2.237. Likelihood ratio tests showed a significant drop of the −2LL from univariable LR to multivariable LR models.

Conclusion: There was an evidence of high seroprevalence of BVDV among cattle as compared with buffaloes with the possibility of infection in different age groups of animals. In addition, multivariable LR model was proved to provide more information for association and prediction purposes relative to univariable LR models and Chi-square tests if we have more than one predictor.

Fish and Shellfish Immunology
2018
(72) 291–300

Spirulina (Arthrospira platensis) supplementation improves growth performance, feed utilization, immune response, and relieves oxidative stress in Nile tilapia (*Oreochromis niloticus*) challenged with *Pseudomonas fluorescens.*

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Abstract

One hundred and eighty Nile tilapia fish were used in eighty-three-day growth trial. Fish were divided into three treatment groups. The first group T0 was given the basal diet without any supplementation and served as the control group. The second group T1 was given the basal diet supplemented by 1% Spirulina. The third group T2 was given the basal diet supplemented by 2% Spirulina. At the end of the growth performance trial, a challenge trial was conducted using virulent strain of Pseudomonas fluorescens. Clinical signs, mortalities, postmortem lesions and histopathological alterations were recorded. Hematological, biochemical, oxidative stress and immunological parameters were measured after challenge with Pseudomonas fluorescens. Growth performance was non significantly improved in tilapia fed the diet with 1% Spirulina supplementation (T1). There were neither signs nor mortalities among fishes belonging to 1% Spirulina challenged group. The results showed that Spirulina has a positive effect on hematological, biochemical parameters, MDA, SOD and CAT at T1 (1% spirulia) rather than T2 (2%spirulia). Moreover, the results indicate that Spirulina 1% enhanced bactericidal, phagocytic and lysozyme activities conferring protection against infection. Our results demonstrated a significant up-regulation of pro-inflammatory cytokine (IL-1β and TNF-α) and a down-regulation of anti-inflammatory cytokine (IL-10). We concluded that 1% Spirulina supplementation significantly improved immunity of Nile tilapia against Pseudomonas fluorescence than 2% Spirulina supplementation.

Hypertension Research
2018
41:869–885

Application of laser scanning cytometry in vascular smooth muscle remodeling

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Abstract

Pulmonary artery hyperplasia is the result of proliferation of the pulmonary arterial smooth muscles (PASM). Hypoxiainduced PASM proliferation in the fetus and the newborn is the primary cause of persistent pulmonary hypertension of the newborn (PPHN). This study was performed to characterize the utility of the Laser Scanning Cytometry (LSC) method in elucidating arterial cytoskeletal remodeling in an in vitro model of PPHN. The aim was to demonstrate the following: (a) LSC is a valid method for the analysis of nuclear and cytosolic fluorescence and (b) the cumulative effects of mechanical stretch together with hypoxia promote reactive oxygen species (ROS) formation. The molecular events in response to hypoxia and the mechanical overload of the pulmonary circuit were demonstrated in vitro by subjecting hypoxic cultured primary PASM or human airway smooth muscles (hASM) to repetitive stretch-relaxation cycles at rates comparable to dynamic stretch in vivo. The altered cytoskeleton in the form of filamentous to globular actin (F:G actin) ratio was imaged and quantified at the cellular level by LSC as an endpoint. LSC can remove the nuclear G-actin fluorescence from the total G-actin fluorescence.

Pulsatile stretch was found to significantly increase the total endogenous ROS and superoxide anion release in normoxic and hypoxic conditions in primary PASM fibers. The effect of stretch was predominant in increasing superoxide anion release, only under hypoxic conditions. These findings, obtained by LSC in vitro are amenable to validation in any in vivo model of interest. The in vitro model is clinically relevant to human pulmonary vascular remodeling.

Journal of cellular biochemistry
2018
1-8

A shared comparison of diabetes mellitus and neurodegenerative disorders

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Abstract

Diabetes mellitus (DM), one of the most prevalent metabolic diseases in the world population, is associated with a number of comorbid conditions including obesity, pancreatic endocrine changes, and renal and cardio- cerebrovascular alterations, coupled with peripheral neuropathy and neurodegenerative disease, some of these disorders are bundled into metabolic syndrome. Type 1 DM (T1DM) is an autoimmune disease that destroys the insulin- secreting islet cells. Type 2 DM (T2DM) is diabetes that is associated with an imbalance in the glucagon/insulin homeostasis that leads to the formation of amyloid deposits in the brain, pancreatic islet cells, and possibly in the kidney glomerulus. There are several layers of molecular pathologic alterations that contribute to the DM metabolic pathophysiology and its associated neuropathic manifestations. In this review, we describe the general signature metabolic features of DM and the cross- talk with neurodegeneration.

We will assess the underlying molecular key players associated with DMinduced neuropathic disorders that are associated with both T1DM and T2DM. In this context, we will highlight the role of tau and amyloid protein deposits in the brain as well in the pancreatic islet cells, and possibly in the kidney glomerulus.

Furthermore, we will discuss the central role of mitochondria, oxidative stress, and the unfolded protein response in mediating the DM- associated neuropathic degeneration. This study will elucidate the relationship between DM and neurodegeneration which may account for the evolution of other neurodegenerative diseases, particularly Alzheimer's disease and Parkinson's disease as discussed later.

Behavioural Processes
2018
(146) 34–41

Examining object recognition and object-in-Place memory in plateau zokors, Eospalax baileyi

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Abstract

Recognition memory is important for the survival and fitness of subterranean rodents due to the barren underground conditions that require avoiding the burden of higher energy costs or possible conflict with conspecifics.
Our study aims to examine the object and object/place recognition memories in plateau zokors (Eospalax baileyi) and test whether their underground life exerts sex-specific differences in memory functions using Novel Object Recognition (NOR) and Object-in-Place (OiP) paradigms. Animals were tested in the NOR with short (10 min) and long-term (24 h) inter-trial intervals (ITI) and in the OiP for a 30-min ITI between the familiarization and testing sessions. Plateau zokors showed a strong preference for novel objects manifested by a longer exploration time for the novel object after 10 min ITI but failed to remember the familiar object when tested after 24 h, suggesting a lack of long-term memory. In the OiP test, zokors effectively formed an association between the objects and the place where they were formerly encountered, resulting in a higher duration of exploration to the switched objects. However, both sexes showed equivalent results in exploration time during the NOR and OiP tests, which eliminates the possibility of discovering sex-specific variations in memory performance.
Taken together, our study illustrates robust novelty preference and an effective short-term recognition memory without marked sex-specific differences, which might elucidate the dynamics of recognition memory formation and retrieval in plateau zokors.

Ecology and Evolution
2018
1–13

Function-related Drivers of Skull Morphometric Variation and Sexual Size Dimorphism in a Subterranean Rodent, Plateau Zokor (*Eospalax baileyi*)

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Abstract

Sexual dimorphism is prevalent in most living organisms. The difference in size between sexes of a given species is generally known as sexual size dimorphism (SSD).
The magnitude of the SSD is determined by Rensch's rule where size dimorphism increases with increasing body size when the male is the larger sex and decreases with increasing average body size when the female is the larger sex. The unique underground environment that zokors (*Eospalax baileyi*) live under in the severe habitat of the Qinghai-Tibetan Plateau (QTP) could create SSD selection pressures that may or may not be supported by Rensch's rule, making this scientific question worthy of investigation. In this study, we investigated the individual variation between sexes in body size and SSD of plateau zokors using measurements of 19 morphological traits. We also investigated the evolutionary mechanisms underlying SSD in plateau zokors. Moreover, we applied Rensch's rule to all extant zokor species. Our results showed male-biased SSD in plateau zokors: The body-and head-related measurements were greater in males than in females. Linear regression analysis between body length, body weight, and carcass weight showed significant relationships with some traits such as skull length, lower incisor length, and tympanic bulla width, which might support our prediction that males have faster growth rates than females. Further, the SSD pattern corroborated the assumption of Rensch's rule in plateau zokors but not in the other zokor species. Our findings suggest that the natural underground habitat and behavioral differences between sexes can generate selection pressures on male traits and contribute to the evolution of SSD in plateau zokors.

The Science of Nature
2018
104:64

Repeated exposure to cat urine induces complex behavioral, hormonal, and c-fos mRNA responses in Norway rats (Rattus norvegicus)

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Abstract

Prey species show specific adaptations that allow recognition, avoidance, and defense against predators. This study was undertaken to investigate the processing of a chronic, life-threatening stimulus to Norway rats (Rattus norvegicus). One hundred forty-four Norway rats were tested by repeated presentation of cat urine for 1 h at different days in a defensive withdrawal apparatus. Rats exposed to urine for short periods showed significantly larger defensive behavioral and medial hypothalamic c-fos messenger RNA (mRNA) responses than other groups. These defensive responses habituated shortly after the presentation of cat urine. Serum levels of adrenocorticotropic hormone and corticosterone increased significantly when animals were repeatedly exposed to cat urine. However, the hormonal responses took longer to habituate than the behavioral and molecular responses did. We conclude that the behavioral and c-fos mRNA responses are Bprimed^ for habituation to repeated exposures to cat urine, while the hormonal responses show Bresistance.^ The results support our hypothesis that the strongest anti-predator responses at three levels would occur during short-term exposure to cat urine and that these responses would subsequently disappear on prolonged exposure. This study assists understanding the way in which the different levels of defensive responses are integrated and react during chronic stress.

Marine Biotechnology
2018
20:324–342

Repressible Transgenic Sterilization in Channel Catfish, Ictalurus punctatus, by Knockdown of Primordial Germ Cell Genes with Copper-Sensitive Constructs

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Abstract

Repressible knockdown approaches were investigated to manipulate for transgenic sterilization in channel catfish, Ictalurus punctatus. Two primordial germ cell (PGC) marker genes, nanos and dead end, were targeted for knockdown and an off-target gene, vasa, was monitored. Two potentially copper-sensitive repressible promoters, yeast ctr3 (M) and ctr3-reduced (Mctr), were coupled with four knockdown strategies separately including: ds-sh RNA targeting the 5′ end (N1) or 3′ end (N2) of channel catfish nanos, full-length cDNA sequence of channel catfish nanos for overexpression (cDNA), and ds-sh RNA-targeting channel catfish dead end (DND). Each construct had an untreated group and treated group with copper sulfate as the repressor compound. Spawning rates of full-sibling P1 fish exposed or not exposed to the constructs as treated and untreated embryos were 85 and 54%, respectively, indicating potential sterilization of fish and repression of the constructs. In F1 fish, mRNA expressions of PGC marker genes for most constructs were downregulated in the untreated group and the knockdown was repressed in the treated group. Gonad development in transgenic, untreated F1 channel catfish was reduced compared to non-transgenic fish for MctrN2, MN1, MN2, and MDND. For 3-year-old adults, gonad size in the transgenic untreated group was 93.4% smaller than the non-transgenic group for females and 92.3% for males. However, mean body weight of transgenic females (781.8 g) and males (883.8 g) was smaller than of non-transgenic counterparts (984.2 and 1254.3 g) at 3 years of age, a 25.8 and 41.9% difference for females and males, respectively. The results indicate that repressible transgenic sterilization is feasible for reproductive control of fish, but negative pleiotropic effects can result.

Journal of Visualized Experiments
2018
1–12

Microinjection of CRISPR/Cas9 Protein into Channel Catfish, *Ictalurus punctatus*, Embryos for Gene Editing

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Abstract

The complete genome of the channel catfish, *Ictalurus punctatus*, has been sequenced, leading to greater opportunities for studying channel catfish gene function. Gene knockout has been used to study these gene functions in vivo. The clustered regularly interspaced short palindromic repeats/CRISPR associated protein 9 (CRISPR/Cas9) system is a powerful tool used to edit genomic DNA sequences to alter gene function. While the traditional approach has been to introduce CRISPR/Cas9 mRNA into the single cell embryos through microinjection, this can be a slow and inefficient process in catfish. Here, a detailed protocol for microinjection of channel catfish embryos with CRISPR/Cas9 protein is described. Briefly, eggs and sperm were collected and then artificial fertilization performed. Fertilized eggs were transferred to a Petri dish containing Holtfreter's solution. Injection volume was calibrated and then guide RNAs/Cas9 targeting the toll/interleukin 1 receptor domain-containing adapter molecule (TICAM 1) gene and rhamnose binding lectin (RBL) gene were microinjected into the yolk of one-cell embryos. The gene knockout was successful as indels were confirmed by DNA sequencing. The predicted protein sequence alterations due to these mutations included frameshift and truncated protein due to premature stop codons.

Annual Review of Animal Biosciences
2018
1–12

Catfish Biology and Farming

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Abstract

This article summarizes the biology and culture of ictalurid catfish, an important commercial, aquaculture, and sport fish family in the United States. The history of the propagation as well as spawning of common catfish species in this family is reviewed, with special emphasis on channel catfish and its hybridization with blue catfish. The importance of the channel catfish female × blue catfish male hybrid, including current and future methods of hybrid catfish production, and the potential role it plays in the recovery of the US catfish industry are discussed. Recent advances in catfish culture elements, including environment, management, nutrition, feeding, disease control, culture systems, genetic improvement programs, transgenics, and the application of genome-based approaches in catfish production and welfare, are reviewed. The current status, needs, and future projections are discussed, as well as genetically modified organism developments that are changing the future.

Environmental Science and Pollution Research
2018
25(12):12072-12082

Cytotoxic effect of chlorpyrifos is associated with activation of Nrf-2/HO-1 system and inflammatory response in tongue of male Wistar rats

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Abstract

Repeated administration of chlorpyrifos (CPF), an organophosphate pesticide, can increase the risk of oral cytotoxicity. The current study was designed to assess the mechanism by which CPF mediates its cytotoxic effect on lingual mucosa of rats.
Twenty-four male Wistar rats were used in the present study and divided into three groups: group I: healthy rats (negative control), group II: rats treated with CPF 1/40 LD50 (3.375 mg/kg, orally/daily) for 28 days, group III: rats treated with CPF 1/10 LD50 (13.5 mg/kg, orally/daily) for 28 days. At the end of the experiment, all rats were sacrificed by cervical dislocation under ketamine anesthesia. Tongue samples were dissected out at their base for detection of heme oxygenase-1 (HO-1) and nuclear erythroid 2-related factor 2 (Nrf-2) by western blotting and histopathological and electron microscopic studies. Immunostaining was used to determine cleaved caspase 3 and the nuclear factor kappa B (NF-κB) localization. Structural and ultrastructural examination of treated lingual mucosa with CPF demonstrated degenerative changes that involved both the dorsal and ventral surfaces of the tongue as well as the lingual glands. CPF-treated rats demonstrated a significant increase in the levels of proinflammatory cytokines such as interleukin-1β (IL-1β) and tumor necrosis factor (TNF-α) in addition to a significant dosedependent activation of NF-κB and cleaved caspase 3. Furthermore, CPF activated HO-1 and Nrf-2 pathway in a dose-dependent manner. In conclusion, this data suggests that the CPF-induced cytotoxicity may be explained by NF-κB activated inflammatory cascade. In addition, CPF triggers an adaptive activation of Nrf-2/HO-1 pathway.

Anatomia, Histologia, Embryologia
2018
1-7

Survey of nuclear progesterone receptor expression in the uterus of the cyclic and pregnant camel (*Camelus dromedarius*)

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Abstract

Progesterone receptors (PR) are necessary to mediate the biological effects of progesterone and are integral to the regulation of a number of different aspects of reproduction in mammals including ovulation of the oocyte, implantation of the conceptus and maintenance of pregnancy. This study investigated the expression and localization of progesterone receptors in the uterine wall of both pregnant and cyclic (nonpregnant) camels. Uterine tissue samples were collected from healthy animals and processed for routine histological and immunohistochemical staining techniques to reveal nuclear PR. Demonstration of PR was performed by indirect immunohistochemical techniques using monoclonal antibodies raised against human PR. Immunolocalization of PR was more intense in all four endometrial zones (I–IV) as well as the myometrium of non pregnant (cyclic) animals (animals with newly formed corpus luteum). In contrast, PR immunostaining in both the endometrium and the myometrium was greatly reduced in pregnancy, particularly in the latest stage examined (approximately 366 days of gestation). In conclusion, a better understanding of the expression of steroid hormones and their receptors, including progesterone and the PR is critical to improving the reproductive health and pregnancy in the domesticated dromedary camel.

Cancer Chemother Pharmacol
2017
80:745–753

Allicin ameliorates doxorubicin-induced cardiotoxicity in rats via suppression of oxidative stress, inflammation and apoptosis

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Abstract

Purpose **Doxorubicin (DOX) is a highly active antineoplastic agent; however, its clinical use is limited due to associated cardiotoxicity. This study was performed to evaluate the beneficial effects of allicin, a dietary garlic active constituent against DOX-induced cardiotoxicity.**
Methods **Forty male Swiss albino mice were divided into five groups, which received normal saline, oral allicin (20 mg kg−1 once daily), intraperitoneal DOX (on the 7, 9 and 11th day of the experiment), or DOX plus once daily allicin at 10 or 20 mg kg−1. Sera were collected for evaluation of cardiac injury markers and proinflammatory cytokines. Additionally, heart tissue spacemen were harvested for determination of oxidative stress markers, as well as for histopathological examination and immunohistochemical analysis.**
Results **DOX administration induced significant ($p < 0.05$) reductions in cardiac tissue level of reduced glutathione and activities of antioxidant enzymes (catalase, superoxide dismutase, and glutathione peroxidase). Moreover, it induced significant ($p < 0.05$) elevations in cardiac tissue concentrations of nitric oxide and malondialdehyde as well as serum levels of cardiac injury biomarkers (lactate dehydrogenase, creatine kinase, and creatine kinase-MB) and proinflammatory cytokines (interleukin-1β, and tumor necrosis factoralpha).**
The histopathological examination showed necrotic and degenerative changes in the cardiac tissue, while immunohistochemical analysis revealed marked myocardial expression of activated caspase-3 and cyclooxygenase-2, following DOX adminstration. Allicin pretreatment significantly improved ($p < 0.05$) all examined parameters, and restored the cardiac architecture.
Conclusion **The current study demonstrated that allicin effectively mitigates cardiac oxidative damage, apoptosis and inflammation, induced by acute DOX intoxication.**
Therefore, allicin could be a promising cytoprotective agent against DOX cardiotoxicity.

Samll Ruminant Research
2018
(169) 94–98

Prevalence and molecular characterization of peste des petits ruminants virus from Ismailia and Suez, Northeastern Egypt, 2014–2016

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Abstract

Peste des petits ruminants (PPR) is a severe viral disease of small ruminants endemic in Africa, the Middle East and Asia. The aim of this study was to determine the current circulation of PPR virus (PPRV) and the prevalence of PPR disease among sheep and goats in Ismailia and Suez governorates in northeastern Egypt. PPRV infection was confirmed using virus isolation (VI), conventional and real-time RT-PCR. The overall morbidity and mortality were 54.2% and 8.5%, respectively, and clinical disease was significantly higher in goats and young animals in the Suez compared to the Ismailia. Of the 40 samples tested, the real-time PCR showed the highest diagnostic sensitivity (100%) compared to RT-PCR (93%) and VI (83%). Sequence analyses of N and F genes of three field isolates revealed a 97% and 99% nucleotide homology with the Egyptian strains, respectively and 99% identity with 2010 Ethiopian PPRV. Phylogenetically all the Egyptian sequences cluster in lineage IV. This is the first report of PPR in Suez and confirms the (on-going) PPRV circulation in northeastern Egypt and emphasize the need to perpetuate molecular epidemiological surveillance on a large scale to reduce economic loss.

Food Safety
2018
1-7

Chicken giblets and wastewater samples as possible sources of methicillin-resistant Staphylococcus aureus: Prevalence, enterotoxin production, and antibiotic susceptibility

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Abstract

Staphylococcus aureus is an important foodborne pathogen that constitutes a major health hazard. This study was undertaken to investigate the potential health hazard of chicken products including giblets as a source of methicillin-resistant S. aureus (MRSA). The prevalence of coagulase-positive multidrug-resistant S. aureus in chicken breast meat, wings, giblets (livers and gizzards), and wastewater samples was investigated. Furthermore, expression of mecA in the identified isolates was screened using PCR. In addition, the expression of staphylococcal enterotoxin (SE) coding genes (A, B, C, and D) was investigated. The antibiogram of isolated S. aureus was further tested using the disk diffusion method. Results obtained showed that a 14% prevalence of S. aureus among the examined samples. Interestingly, all isolates were confirmed to be MRSA. SEA had the highest frequency among SEs in MRSA isolates. 78.57% of MRSA isolates showed multidrug resistance profiles.

Practical applications: This study demonstrated that chicken giblets and wastewater samples are potential sources for transmission of methicillin-resistant S. aureus (MRSA) and the heat-resistant staphylococcal enterotoxins to people. Additionally, the isolated MRSA showed variable degrees of antibiotic resistance. Accordingly, strict hygiene protocols should be followed during preparation of chicken products including giblets for human consumption. Furthermore, thorough cooking of chicken meat and giblets must be considered before serving to people.

Journal of Food Quality and Hazards Control
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Prevalence of Multidrug Resistant Shiga Toxin-Producing Escherichia coli in Cattle Meat and Its Contact Surfaces

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Abstract

Background: Shiga toxin-producing *Escherichia coli* (STEC) are group of *E. coli* causing bloody diarrhea. The goal of this survey was to determine the prevalence of multidrug resistant shiga toxin-producing *E. coli* in cattle meat and its contact surfaces.
Methods: Swab samples (n=120) were randomly collected from meat and contact surface of butchery shops in Sharkia province, Egypt. Prevalence of *E. coli* was examined using culture, biochemical, and serological methods. Identification of shiga toxin-encoding genes (*stx1* and *stx2*) in the *E. coli* serotypes was done using multiplex polymerase chain reaction. Screening of multidrug resistance profile was done using the disk-diffusion method. Data were analyzed using JMP statistical package, SAS Institute Inc., Cary, NC.
Results: The prevalence rates of *E. coli* in the chuck, round, masseter muscles, cuttingboards, walls, and floors were 20, 10, 30, 50, 40, and 60%, respectively. Among the isolates, *E. coli* O111:H4 and *E. coli* O26:H11 harbored the two mentioned genes. *E. coli* O86 and *E. coli* O114:H21 harbored only *stx1*; while *E. coli* O55:H7 encoded only *stx2.* Just *E. coli* O124 had no express of *stx1* and *stx2*. The isolated *E. coli* serovars showed amultidrug resistance profile.
Conclusion: Considering the results of this study, strict hygienic procedures should be followed to avoid or reduce carcass cross-contamination. In addition, proper handling and efficient cooking of meat are highly recommended by consumers to reduce the risk of human exposure to STEC.

Food Chemistry
2018
(290) 114–124

Determination of polycyclic aromatic hydrocarbon content in heat-treated meat retailed in Egypt: Health risk assessment, benzo[*a*]pyrene induced mutagenicity and oxidative stress in human colon (CaCo-2) cells and protection using rosmarinic and ascorbic acids

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Abstract

This study was undertaken to estimate the concentrations of the formed polycyclic aromatic hydrocarbons (PAHs) in heat-treated (boiled, pan-fried and grilled) meats collected from Egypt. Dietary intakes and cancer risks of PAHs among Egyptian adults were calculated. Benzo[*a*]pyrene (B[*a*]P)-induced mutagenicity and oxidative stress in human colon (CaCo-2) cell line and mechanisms behind such effects were also investigated. Finally, protection trials using rosmarinic (RMA) and ascorbic acids (ASA) were carried out. The results indicated formation of PAHs at high levels in the heat-treated meats. Calculated incremental life time cancer risk among Egyptian adults were 7.05179E−07, 7.00604 E−06 and 1.86069 E−05 due to ingestion of boiled, panfried and grilled meats, respectively. B[*a*]P-exposed CaCo-2 cells had high abilities for mutagenicity (490.05 ± 21.37 His+revertants) and production of reactive oxygen species. RMA and ASA protected CaCo-2 cells via reduction of B[*a*]P-induced mutagenicity and oxidative stress and upregulation of phase II detoxification enzymes and xenobiotic transporters.

Oxidative Medicine and Cellular Longevity
2018
10 pages

Anti-Inflammatory, Immunomodulatory, and Antioxidant Activities of Allicin, Norfloxacin, or Their Combination against Pasteurella multocida Infection in Male New Zealand Rabbits

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Abstract

The present study investigated the efficacy of allicin as an antibacterial, anti-inflammatory, antioxidant, and immunostimulant agent in reducing the severity of Pasteurella multocida (P. multocida) type B infection in rabbits. Fifty New Zealand rabbits, 5 weeks old, were divided equally into five groups. Except for group 1, all groups were intranasally infected with P. multocida type B (2× 105 colony forming units/ml/rabbit). Then, group 3 rabbits were orally treated with allicin (50 mg/kg BW) for 5 days, group 4 rabbits received a single oral dose of norfloxacin 30% (100 mg/kg BW), while group 5 rabbits were treated with a combination of norfloxacin and allicin. Hematological, serum biochemical, inflammatory cytokine, immunological, and histopathological analyses were performed. Results revealed that rabbits, infected with P. multocida type B, exhibited macrocytic hypochromic anemia and leukocytosis with a significant elevation in the phagocytic percentage and index. Moreover, significant reductions in serum total protein, albumin, globulin, and immunoglobulin (IgG and IgM) levels were observed in infected rabbits. Infected rabbits showed significant increases in serum inflammatory cytokine (TNF-α and IL-6), alanine aminotransferase, alkaline phosphatase, lactate dehydrogenase, and serum bilirubin (total, direct, and indirect) levels. Further, P. multocida infection induced oxidative stress as demonstrated by the significant reduction in serum levels of reduced glutathione and superoxide dismutase enzyme and marked elevation in serum malondialdehyde. Treatment with allicin, norfloxacin, or their combination significantly ameliorated the alterations in all studied parameters. In conclusion, allicin could ameliorate the inflammation and oxidative stress, induced by P. multocida type B infection in rabbits.

Oxidative Medicine and Cellular Longevity
2018
10 pages

Thymoquinone Attenuates Cardiomyopathy in Streptozotocin-Treated Diabetic Rats

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Abstract

Diabetic cardiomyopathy is a diabetic complication due to oxidative stress injuries. This study examined the protecting influence of thymoquinone (TQ) on diabetes-caused cardiac complications. The intracellular means by which TQ works against diabetes-caused cardiac myopathy in rats is not completely understood. In this study, Wistar male rats (*n* = 60) were assigned into four groups: control, diabetic (diabetes induced by IP infusion of streptozotocin, 65 mg/kg), diabetic + TQ (diabetic rats given TQ (50 mg/kg) administered once per day by stomach gavage), and TQ (50 mg/kg) for 12 weeks. TQ supplementation appreciably recovered the cardiac parameters alongside significant declines in plasma nitric oxide concentrations and total superoxide dismutase (T.SOD) activities. Importantly, TQ downgraded expression of cardiacinducible nitric oxide synthase in addition to significantly upregulating vascular endothelial growth factor and erythropoietin genes and nuclear factor-erythroid-2-related factor 2 (Nrf2) protein. TQ normalized plasma triacylglycerol and low-density lipoprotein-cholesterol and significantly improved the high-density lipoprotein-cholesterol levels. Additionally, TQ administration improved the antioxidant ability of cardiac tissue via significantly increased cardiac T.SOD and decreased cardiac malondialdehyde levels. Oral supplementation with TQ prevented diabetic-induced cardiomyopathy via its inhibitory effect on the E-selectin level, C-reactive protein, and interleukin-6. The TQ protecting effect on the heart tissue was shown by normalization of the plasma cardiac markers troponin I and creatine kinase. This experiment shows the aptitude of TQ to protect cardiac muscles against diabetic oxidative stress, mainly through upregulation of Nrf2, which defeated oxidative damage by improvement of the antioxidant power of cardiac muscle that consequently protected the cardiac muscles and alleviated the inflammatory process.

Oxidative Medicine and Cellular Longevity
2018
10 pages

Long-Term Resveratrol Supplementation as a Secondary Prophylaxis for Stroke

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Abstract

Stroke is a leading cause of mortality worldwide, as well as a source of long-term disabilities and huge socioeconomic costs. This study investigates the effects of resveratrol, an antioxidant supplement, on blood pressure, weight status, glucose, and lipid profile in patients who had a stroke in the last 12 months. Two hundred and twenty-eight patients were divided into three groups: group I received only allopathic treatment (control group), while groups II and III received allopathic treatment with a daily supplementation of oral resveratrol (100 and 200 mg, resp.) for 12 months. In all groups, the changes of the studied parameters were monitored at 6 and 12 months from the initial evaluation. In groups II and III, resveratrol induced significant changes ($p < 0\ 05$) in the blood pressure, body mass index, as well as all parameters of the lipid profile, and glucose (in nondiabetic patients), compared to the control group. The supplementation of the allopathic treatment with resveratrol had a beneficial effect on all monitored parameters, which serve as major risk factors for stroke.

Faculty of Pharmacy

Biotechnology Reports
2018
e00275

Antimicrobial activity of bacteria isolated from Red Sea marine invertebrates

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Abstract

Marine invertebrates-associated microorganisms were considered to be important sources of marine bioactive products. This study aims to isolate marine invertebrates associated bacteria with antimicrobial activity from the Red Sea and test their biosynthetic potential through the detection of PKS and NRPS gene clusters involved with the production of bioactive secondary metabolites. In this respect, fifty bacterial strains were isolated from eight different Red Sea marine invertebrates and screened for their antimicrobial activity against standard pathogenic bacteria (Staphylococcus aureus ATCC 25923, Escherichia coli ATCC 25922, Bacillus subtilis ATCC 6633) and yeast (Candida albicans ATCC 10231) using the standard well diffusion assay. Five isolates showed antifungal activity against Candida albicans with no activity recorded against other pathogenic bacterial strains. On the other hand when these isolates were screened for the presence of biosynthetic gene clusters (PKS and NRPS) by PCR using five sets of degenerative primers, 60% of the isolates were shown to contain at least one type of PKS and NRPS gene clusters, which indicates the biosynthetic potential of these isolates even if the isolates didn't express any biological activity in vitro. Moreover the 16S rRNA molecular identification of the isolates reveal the biodiversity of the red sea marine invertebrates associated bacteria as they were found to belong to several bacterial groups present in Alphaproteobacteria, Gammaproteobacteria, Actinobacteria and Firmicutes.

Biotechnology Letters
2018
(40) 1519–1530

Mining of Egypt's Red Sea invertebrates for potential bioactive producers

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Abstract

Result Eleven different samples of marine invertebrates' were collected from Egypt's Red Sea (El-Tor- Sharm El-Sheikh and Hurghada) by scuba diving, and a total 80 isolates of the associated microorganisms were obtained from the cultivation on six different cultural medium. Seven isolates of them showed an antimicrobial activity against five pathogenic reference strains, while the most active antimicrobial agent was isolate number HFF-8 which was 99% identical to Bacillus amyloliquefaciens. HFF-8's extract showed positive results against Gram negative bacteria, Gram positive bacteria and yeast. Moreover, the isolates gave positive bands when screened for the presence of PK synthase (PKS) I and II and NRP synthetase (NRPS) I and II biosynthetic genes, those biosynthetic fragments when cloned and sequenced were primitively predicted as biosynthetic fragments for kirromycin and leinamycin production by NaPDoS program with 56 and 55%, respectively. Conclusion The Red Sea can provide a sustainable solution to combat bacterial resistance. The contribution of this work is that B. amyloliquefaciens was isolated from Heteroxenia fuscescens, Red Sea, Egypt. Moreover, the bacterial extract showed a broad spectrum with a potent antimicrobial activity.

Cellular and Molecular Biology
2018
64 (9):24-32

Antiviral activity of Ribavirin nano-particles against measles virus

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Abstract

Measles virus considers an important cause of child morbidity and mortality in some areas as Africa. Ribavirin's activity as a nucleoside analog can disclose the surprisingly broad spectrum action against several RNA viruses under laboratory cell culture conditions. The Current study aimed to investigate the antiviral activity of ribavirin Nano gold particles (AuNPs) against measles virus on vero cell line. Ribavirin- AuNPs was prepared, characterization and the cytotoxicity of ribavirin, AuNPs and ribavirin -AuNPs were tested on vero cells using MTT assay. Antiviral activiry of ribavirin, AuNPs and ribavirin- AuNPswere determined on vero cells using simultaneous, pre-infection and post-infection protocols. Results indicated safety of ribavirin and ribavirin-AuNPs on vero cells, there was a reduction by 78.1% when vero cells treated with ribavirin -AuNPs at 99.5µg/ml while, the viral reduction was 25.4% when ribavirin 500 µg /ml was used for the same viral concentration. Our results concluded that ribavirin - AuNPs had a higher antiviral activity with lower dose than ribavirin alone and the maximal activity showed when it used after the virus infection.

Biomedicine and Pharmacotherapy
2018
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Raspberry ketone preserved cholinergic activity and antioxidant defense in obesity induced Alzheimer disease in rats

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Abstract

Obesity is a proven risk factor for neurodegenerative disease like Alzheimer's disease (AD). Accumulating evidences suggested that nutritional interventions provide potential for prevention and treatment of AD. The present study aimed to investigate the effect of dietary treatment of obese rats with natural Raspberry ketone (RK) and their relationship with neurodegeneration. Obesity was first induced in 40 male Wistar rats (140–160 g) by feeding high fat diet (HFD) for 16 weeks. Obese rats were then assigned into 4 groups (n=10 each). (O-AD) is obese induced AD group maintained on HFD for another 6 weeks. OCR is obese group received calorie restricted diet for 6 weeks. OCRRK is obese group received calorie restricted diet and RK (44 mg/kg body weight, daily, orally) for 6 weeks and OCRD is obese group received calorie restricted diet and orlistate (10 mg/ kg body weight, daily orally) for 6 weeks. Another 10 normal rats received normal diet were used as normal control group (NC). Body weight, visceral white adipose tissue weight (WAT), lipid profile, oxidative stress markers, adiponectin, cholinergic activity and amyloid extracellular plaques were examined. In addition to histological changes in brain tissues were evaluated.Raspberry ketone (RK) via its antioxidant properties attenuated oxidative damage and dyslipidemia in O-AD group. It inhibited acetylcholinesterase enzyme (AchE) and hence increased acetylcholine level (Ach) in brain tissues of O-AD rats. It is also impeded the upregulation of beta-secretase-1 (BACE-1) and the accumulation of amyloid beta (Aβ) plaques which crucially involved in AD. The combination of CR diet with RK was more effective than CR diet with orlistate (antiobese drug) in abrogating the neurodegenerative changes induced by obesity. Results from this study suggested that concomitant supplementation of RK with calorie restricted regimen effectively modulate the neurodegenerative changes induced by obesity and delay the progression of AD.

International Journal of Systematic and Evolutionary Microbiology
2018
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Natronolimnobius aegyptiacus sp. nov., an extremely halophilic alkalithermophilic archaeon isolated from the athalassohaline Wadi An Natrun, Egypt

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Abstract

An obligately aerobic extremely halophilic alkalithermophilic archaeon, strain JW/NM-HA 15T, was isolated from the sediments of Wadi An Natrun in Egypt. Phylogenetic analysis based on 16S rRNA and *rpoB¢* gene sequences indicated that it belongs to the family *Natrialbaceae* of the order *Natrialbales*. The closest relatives were *Natronolimnobius baerhuensis* IHC-005T and *Natronolimnobius innermongolicus* N-1311T (95.3 and 94.5% 16S rRNA gene sequence similarity, respectively). Genome relatedness between strain JW/NM-HA 15T and its neighbours was evaluated using average nucleotide identity, digital DNA–DNA hybridization and average amino acid identity with the values of 75.7–85.0, 18.1–20.0, and 70.2–71.0%, respectively. Cells were obligately aerobic, rod-shaped, non-motile, Gram-stain-negative and chemo-organotrophic. The strain grew in the presence of 2.57M to saturating Na+ (optimum 3.25–4.60 M Na+), at pH55 _C 7.5–10.5 (optimum pH55 _C 9.0– 9.5), and at 30–56 _C (optimum 52 _C). The major polar lipids consisted of phosphatidylglycerol, methylated phosphatidylglycerolphosphate and two phospholipids. The complete genome size of strain JW/NM-HA 15T is approximately 3.93 Mb, with a DNA G+C content of 64.1 mol%. On the basis of phylogenetic features, genomic relatedness, phenotypic and chemotaxonomic data, strain JW/NM-HA 15T was thus considered to represent a novel species within the genus *Natronolimnobius*, for which the name *Natronolimnobius aegyptiacus* sp. nov. is proposed. The type strain is JW/NM-HA 15T (=ATCC BAA-2088T =DSM 23470T).

Catalysis letters
2018
148:2665–2674

Improvement of activity and thermostability of agar-entrapped, thermophilic, haloalkaliphilic amylase AmyD8

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Abstract

An extremophilic amylase from *Alkalilimnicola* sp. NM-DCM-1 was expressed and purified. The amylase, AmyD8, was extremophilic, with maximal activity at 55◦C, pH 10.5 and 2.4 M NaCl. AmyD8 had a broad substrate utilization spectrum, hydrolyzing branched and linear substrates. AmyD8 was stable and active in nonionic and anionic surfactants. AmyD8 was organic solvent resistant, retaining activity after incubation in benzene, methanol, ethanol and isopropanol. AmyD8 was entrapped in an agar – agar matrix with 89% entrapment yield and no loss in relative activity. Entrapped AmyD8 retained its extremophilic properties. Entrapment enhanced AmyD8's thermal stability, the half-life of the entrapped enzyme nearly doubled after incubation at 50 - 65◦C. Entrapped AmyD8 had excellent recyclability, retaining 58% of initial activity after 16 hydrolysis cycles. These extreme properties give AmyD8 great economic feasibility.

International Journal of Biological Macromolecules
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Biochemical characterization of halophilic, alkalithermophilic amylopullulanase PulD7 and truncated amylopullulanases PulD7ΔN and PulD7ΔC

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Abstract

A pullulanase, PulD7, was identified in the genome of the halophilic, alkalithermophilic isolate *Alkalilimnicola* sp. NM-DCM-1. PulD7 is 701 amino acids large with a carbohydrate binding module (CBM) 48 at the N-terminal. The full length PulD7 and N- and C-terminal truncated versions were cloned, heterologously expressed and functionally characterized. PulD7 displayed maximal activity at 55°C, pH 9.5 and 2 M NaCl. PulD7 had good thermal stability, with a half-life of 693 min at 50°C. PulD7 is an amylopullulanase, hydrolyzing both α-1,4- and α-1,6-glycosidic bonds in soluble starch and pullulan, respectively. PulD7 was resistant to chemical reagents, including organic solvents (dimethyl sulfoxide, methanol, benzene, 20% v/v), reducing agents (β-mercaptoethanol, 5% v/v), surfactants (SDS and Tween 20, 5% v/v), the divalent chelator ethylene diamine tetra acetic acid (5 mM), and the chemical denaturant urea (8 M). PulD7 was not calcium-dependent. PulD7 was able to bind raw starch granules, reaching 52% binding in 3 h. The N-and C-terminal truncated forms of PulD7 had similar biochemical characteristics. PulD7ΔC had higher specific activity and halotolerance. The N-terminally truncated PulD7ΔN hydrolyzed amylose only, indicating that CBM48 is essential for binding branched substrates. PulD7 has unique characteristics giving it strong potential for application in biotechnological industries.

Biomedicine & Pharmacotherapy
2017
(92) 196–206

Cardiotoxic effect of levofloxacin and ciprofloxacin in rats with/without acute myocardial infarction: Impact on cardiac rhythm and cardiac expression of Kv4.3, Kv1.2 and Nav1.5 channels$

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Abstract

Prolongation of QT interval is possible with fluoroquinolones, yet the underlying contributing factors have not been elucidated. Two widely used fluoroquinolone drugs were at the focus of this study in rats with/without acute myocardial dysfunction (AMI) induced by isoproterenol. The effects of levofloxacin and ciprofloxacin on the cardiac mRNA expression of rat Kv4.3, Kv1.2 and Nav1.5 mRNAs were determined. Administration of the two antibiotics produced dose-dependent changes in ECG parameters that were more prominent in rats with AMI than healthy rats; this was accompanied by elevations in serum lactate dehydrogenase and creatine kinase-MB. Histopathological examination indicated some loss of striations, edema and fibrotic changes in rats with AMI; however the two antibiotics did not further exacerbate the cardiac histopathology. mRNA expression of the ion channels was altered in rats with AMI and healthy rats. In conclusion, long-term administration of levofloxacin and ciprofloxacin produced deleterious effects on the ECG pattern of rats with/without AMI. The effect was generally baseline-dependent and therefore, rats with AMI showed greater ECG disturbances and increases in cardiac enzymes. Taken together, these data make it advisable to monitor patients with a history of acute AMI requiring treatment with these antibiotics until data from human studies are available.

Chemico-Biological Interactions
2018
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Nifuroxazide, a STAT3 inhibitor, mitigates inflammatory burden and protects against diabetes-induced nephropathy in rats

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Abstract

Diabetic nephropathy (DN) is a serious complication of diabetes mellitus. Moreover,it is amongst the most common causes of end-stage renal failure. Inflammation is a crucial player in both development and progression of DN. JAK2/STA3 is a pleotropic cascade reported to regulate diverse inflammatory events. Previous studies reported involvement of JAK2/STA3 signal transduction pathway in diabetes-associated renal injury. In the current study, the inhibitory effect of nifuroxazide (25 mg/kg/day, orally) against inflammatory condition associating diabetic kidney progression in rats was evaluated. The underlying hypothesis is mainly via the inhibitory effect of nifuroxazide on STAT3 signaling. Results revealed that nifuroxazide effectively inhibited STAT3 activation in diabetic male rats, improved glomerular filtration function, protected against diabetesinduced histopathological and ultramicroscopic structural alterations. Further, nifuroxazide treatment significantly reduced renal macrophage infiltration and fibrosis and decreased mRNA and protein levels of TNF-α and IL-18 in diabetic renal tissue. The current findings shed the light on nifuroxazide's efficacy as an alternative anti-inflammatory therapy to hinder the development and progression of DN in diabetic patients mainly via STAT3 inhibition.

Life Sciences
2017
(183) 69–77

The anorectic agent, lorcaserin, disturbs estrous cyclicity and produces endometrial hyperplasia without affecting ovarian population in female rats

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Abstract

Aims: The present study aims to investigate the effect of the new anorectic agent, lorcaserin, on estrous cyclicity, reproductive hormones and folliculogenesis in female mature rats.
Materials and methods: Rats were divided into four groups; Group i: control group. Group ii-iv: rats treated with lorcaserin (5, 10 or 30 mg/kg/day, p.o.), respectively. The treatment continued for 28 days.
Key findings: Lorcaserin (5 or 10 mg/kg) caused estrous cycle disturbance in 40% of treated rats while the high dose (30 mg/kg) produced disturbances in 100% of the treated rats. Lorcaserin (5–30 mg/kg) altered some of female hormones where it enhanced estradiol but reduced luteinizing hormone. Minimal edema with congested vessels was observed in the medulla of ovarian sections. Further, epithelial and uterine sections showed hyperplasia.
Significance: Taken together, the present results demonstrated that lorcaserin affected some reproductive hormones, disturbed estrous cyclicity and induced histopathological changes in the ovaries and uteriwithout affecting the ovarian populations. Therefore, lorcaserin should be used with caution in women of child bearing potential until adequate clinical safety data are available.

Chemico-Biological Interactions
2018
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Antitumor activity of a molecularly imprinted nanopreparation of 5- flurouracil against Ehrlich's carcinoma solid tumors grown in mice: Comparison to free 5-flurouracil

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Abstract

Recently, nanotechnology has received great attention in war against cancer. The present study investigated the antitumor efficacy of molecularly imprinted nanopreparation of 5-fluorouracil (nano-5-FU) against Ehrlich ascites carcinoma (EAC) solid tumors grown in mice. Tumor cells were transplanted into female albino mice. Mice were allocated into 5 groups; Group 1: control EAC bearing mice. Groups 2&3: EAC-bearing mice treated orally with 5-FU (5 and 10 mg/kg) twice weekly. Groups 4&5: EAC bearing mice treated with nano-5-FU (5 and 10 mg/ kg) twice weekly. Treatment with nano-5-FU showed higher antitumor effect compared to free 5-FU as indicated by enhanced apoptosis and reduction in tumor weight. Additionally, lower number of mitotic figures and greater area for necrosis were observed in the tumor specimens alongside with a decline in the number of intratumoral proliferating nuclei in comparison to free 5-FU. Furthermore, the results showed a significant down-regulation in tumoral expression of caspase-3 and vascular endothelial growth factor. Together, these results further support the potential of using nanotechnology to enhance anticancer efficacy of 5-FU.

Bioorganic Chemistry
2018
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Molecular modelling and synthesis of spiroimidazolidine-2,4-diones with dual activities as hypoglycemic agents and selective inhibitors of aldose reductase

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Abstract

Novel derivatives of spiroimidazolidinedione were synthesized and evaluated as hypoglycemic agents through binding to sulfonylurea receptor 1 (SUR1) in pancreatic beta-cells. Their selectivity index was calculated against both aldehyde reductase (ALR1) and aldose reductase (ALR2). Aldehyde reductase is a key enzyme in the polyol pathway that is involved in the etiology of the secondary diabetic complications. All structures were confirmed by microanalysis and by IR, 1H NMR, 13C NMR and EI-MS spectroscopy. The investigated compounds were subjected to molecular docking and an in silico prediction study to determine their free energy of binding (ΔG) values and predict their physicochemical properties and drug-likeness scores. Compound 1′-(5-chlorothiophene-2-ylsulfonyl)spiro[cyclohexane-1,5′-imidazolidine]-2′,4′-dione showed IC50 0.47 μM and 79% reduction in blood glucose level with a selectivity index 127 for ALR2.

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2018
(180) 98–108

Regio- and stereoselective synthesis of new spirooxindoles via 1,3-dipolar cycloaddition reaction: Anticancer and molecular docking studies

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Abstract

Owing to their structural novelty and inherent three-dimensionality, spiro scaffolds have been shown indisputable promise as chemopreventive agents. A new series of heterocycles containing spirooxindole and pyrrolidine rings were synthesized by the 1,3-dipolar cycloaddition of an azomethine ylide, which was generated in situ by the condensation of a secondary amino acid (L- proline) and dicarbonyl compounds (isatin), with dipolarophiles.

This method is simple and provides diverse and biologically interesting products. The new series of compounds with a high degree of stereo- and regioselectivity were evaluated against breast cancer cell lines (MCF-7) and leukemia (K562). Among them, compound 4g was identified as the most potent with IC50 values of 15.49 ± 0.04 μM, against breast cancer cell lines (MCF-7) compared to standard drug 5-Fu (IC50=78.28 ± 0.2 μM) and compound 4i IC50 values of 13.38 ± 0.14 μM against leukemia (K562) compared to standard drug 5-fluorouracil (5-FU) (IC50=38.58 ± 0.02). The selective apoptotic effects of 4g were investigated against MCF-12 normal mammary cell and the cytotoxicity of 4g was not associated with any induction of necrosis compared to untreated cells. Molecular docking studies were investigated. From the docking data, these compounds could be act as small molecules that inhibit the MDM2-p53 interaction.

Frontiers in Microbiology
2018

Group B Streptococcal Colonization, Molecular Characteristics, and Epidemiology

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Abstract

Streptococcus agalactiae **or group B streptococcus (GBS) is a leading cause of serious neonatal infections. GBS is an opportunistic commensal constituting a part of the intestinal and vaginal physiologic flora and maternal colonization is the principal route of GBS transmission. GBS is a pathobiont that converts from the asymptomatic mucosal carriage state to a major bacterial pathogen causing severe invasive infections. At present, as many as 10 serotypes (Ia, Ib, and II–IX) are recognized. The aim of the current review is to shed new light on the latest epidemiological data and clonal distribution of GBS in addition to discussing the most important colonization determinants at a molecular level. The distribution and predominance of certain serotypes is susceptible to variations and can change over time. With the availability of multilocus sequence typing scheme (MLST) data, it became clear that GBS strains of certain clonal complexes possess a higher potential to cause invasive disease, while other harbor mainly colonizing strains. Colonization and persistence in different host niches is dependent on the adherence capacity of GBS to host cells and tissues. Bacterial biofilms represent well-known virulence factors with a vital role in persistence and chronic infections. In addition, GBS colonization, persistence, translocation, and invasion of host barriers are largely dependent on their adherence abilities to host cells and extracellular matrix proteins (ECM). Major adhesins mediating GBS interaction with host cells include the fibrinogen-binding proteins (Fbs), the laminin-binding protein (Lmb), the group B streptococcal C5a peptidase (ScpB), the streptococcal fibronectin binding protein A (SfbA), the GBS immunogenic bacterial adhesin (BibA), and the hypervirulent adhesin (HvgA). These adhesins facilitate persistent and intimate contacts between the bacterial cell and the host, while global virulence regulators play a major role in the transition to invasive infections. This review combines for first time epidemiological data with data on adherence and colonization for GBS. Investigating the epidemiology along with understanding the determinants of mucosal colonization and the development of invasive disease at a molecular level is therefore important for the development of strategies to prevent invasive GBS disease worldwide.**

Frontiers in Cellular and Infection Microbiology
2017

Acid Stress Response Mechanisms of Group B Streptococci

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Abstract

Group B streptococcus (GBS) is a leading cause of neonatal mortality and morbidity in the United States and Europe. It is part of the vaginal microbiota in up to 30% of pregnant women and can be passed on to the newborn through perinatal transmission.

GBS has the ability to survive in multiple different host niches. The pathophysiology of this bacterium reveals an outstanding ability to withstand varying pH fluctuations of the surrounding environments inside the human host. GBS host pathogen interations include colonization of the acidic vaginal mucosa, invasion of the neutral human blood or amniotic fluid, breaching of the blood brain barrier as well as survival within the acidic phagolysosomal compartment of macrophages. However, investigations on GBS responses to acid stress are limited. Technologies, such as whole genome sequencing, genome-wide transcription and proteome mapping facilitate large scale identification of genes and proteins. Mechanisms enabling GBS to cope with acid stress have mainly been studied through these techniques and are summarized in the current review.

Pharmacological Reports
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Glutamine up-regulates pancreatic sodium-dependent neutral aminoacid transporter-2 and mitigates islets apoptosis in diabetic rats

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Abstract

Background: Glutamine aminoacid regulates insulin exocytosis from pancreatic b-cells. Liraglutide is a glucagon-like peptide-1 (GLP-1) analogue that has fascinated function in inhibiting b-cell apoptosis and preserving pancreatic b-cell mass. The present study investigated the benefit of adding glutamine to a regimen of liraglutide in diabetic rats focusing on their role in increasing insulin production and upregulation of the expression of sodium-dependent neutral aminoacid transporter-2 (SNAT2). Methods: In the present study, diabetes mellitus was induced in rats using streptozotocin (STZ, 50 mg/kg, ip). Male rats were allocated into 5 groups, (i) vehicle group, (ii) STZ-diabetic rats, (iii) STZ-diabetic rats treated with liraglutide (150 mg/kg, sc), (iv) STZ-diabetic rats treated with glutamine (po) and (v) STZ-diabetic rats treated with a combination of liraglutide and glutamine for four weeks. After finishing the therapeutic courses, the fasting blood glucose value was determined and rats were sacrificed. Pancreases were used for quantification of mRNA expression for SNAT2. Paraffin fixed samples were used for histologic staining and immunohistochemistry for insulin and apoptosis markers (activated caspase- 3, BCL2 and BAX). Results: Treatment with liraglutide and/or glutamine enhanced insulin production and hence glycemic control in diabetic male rats with favorable effects on apoptosis markers. Treatment with glutamine and its combination with liraglutide significantly increased pancreatic expression of SNAT2 by approximately 30–35 folds. Conclusion: Addition of glutamine to liraglutide regimen enhances the glycemic control and may have utility in clinical settings.

Environmental Science and Pollution Research
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25:12072–12082

Cytotoxic effect of chlorpyrifos is associated with activation of Nrf-2/HO-1 system and inflammatory response in tongue of male Wistar rats

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Abstract

Repeated administration of chlorpyrifos (CPF), an organophosphate pesticide, can increase the risk of oral cytotoxicity. The current study was designed to assess the mechanism by which CPF mediates its cytotoxic effect on lingual mucosa of rats.
Twenty-four male Wistar rats were used in the present study and divided into three groups: group I: healthy rats (negative control), group II: rats treated with CPF 1/40 LD50 (3.375 mg/kg, orally/daily) for 28 days, group III: rats treated with CPF 1/10 LD50 (13.5 mg/kg, orally/daily) for 28 days. At the end of the experiment, all rats were sacrificed by cervical dislocation under ketamine anesthesia. Tongue samples were dissected out at their base for detection of heme oxygenase-1 (HO-1) and nuclear erythroid 2-related factor 2 (Nrf-2) by western blotting and histopathological and electron microscopic studies. Immunostaining was used to determine cleaved caspase 3 and the nuclear factor kappa B (NF-κB) localization. Structural and ultrastructural examination of treated lingual mucosa with CPF demonstrated degenerative changes that involved both the dorsal and ventral surfaces of the tongue as well as the lingual glands. CPF-treated rats demonstrated a significant increase in the levels of proinflammatory cytokines such as interleukin-1β (IL-1β) and tumor necrosis factor (TNF-α) in addition to a significant dosedependent activation of NF-κB and cleaved caspase 3. Furthermore, CPF activated HO-1 and Nrf-2 pathway in a dose-dependent manner. In conclusion, this data suggests that the CPF-induced cytotoxicity may be explained by NF-κB activated inflammatory cascade. In addition, CPF triggers an adaptive activation of Nrf-2/HO-1 pathway.

Biomedicine & Pharmacotherapy
2018
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Isolated compounds from *Cuscuta pedicellata* ameliorate oxidative stress and upregulate expression of some energy regulatory genes in high fat diet induced obesity in rats

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Abstract

Background: ***Cuscuta pedicellata*** **and some of its isolated compounds were suggested previously to have an antiobesity effect in rats. This study aimed to investigate the effect of ten isolated compounds from C. pedicellata on insulin resistance, some oxidative stress markers and expression of the mitochondrial uncoupling protein-1 (UCP-1) and Carnitine palmitoyltransferase-I (CPT-1) genes in brown adipose tissue of high fat diet (HFD) rats.**

Methods: One hundred and four male albino rats were divided into 13 groups. Group (1) was considered as normal untreated rats. Obesity was induced in all other groups by HFD. Group (2) served as obese control group and groups (3–11) were treated for four weeks with C. ***pedicellata*** **extract or one of its isolated compounds (naringenin, kaempferol, aromadenderin, quercetin, 3,5,7,30,50-pentahydroxy flavanone, naringenin-7-O-b-Dglucoside, aromadenderin-7-O-b-D-glucoside, taxifolin 7-O-b-D-glucoside, kaempferol-3-O-b-D-glucoside [astragalin], and quercitin-3-O-b-D-glucoside [isoquercitrin]). At the end of the experiment, rats were then sacrificed under anesthesia and their brown adipose tissues were dissected out for determination of UCP-1 and CPT-1 genes using quantitative PCR. Blood samples were collected for determination of blood glucose, insulin, thiobarbituric acid reactive substances (TBARS), superoxide dismutase (SOD) and catalase.**

Results: A significant reduction in homeostasis model assessment-insulin resistance (HOMA-IR) and TBARS levels was observed in rats treated with C. ***pedicellata*** **crude extract and some of its isolated compounds, with a significant increase in SOD and catalase levels and upregulation of UCP-1 and CPT-1 genes expression compared to the obese control group.**

Conclusions: This study suggests a beneficiary role of C. ***pedicellata*** **in reducing insulin resistance, oxidative stress and enhancing energy expenditure.**

Biochemical Genetics
2018

MIR146A rs2910164 (G/C) Polymorphism is Associated with Incidence of Preeclampsia in Gestational Diabetes Patients

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Abstract

Preeclampsia and gestational diabetes are common pregnancy disorders that may be interrelated. MIR146A rs2910164 (G/C) is a functional polymorphism that was associated with several diseases. This study aimed to investigate the frequency of rs2910164 polymorphism and its possible correlation with the incidence of preeclampsia in gestational diabetes patients. The study involved 250 pregnant women divided into 80 healthy control subjects, 85 gestational diabetes patients only, and 85 patients of gestational diabetes combined with preeclampsia. Systolic and diastolic blood pressures, urinary proteins, kidney and liver functions, glucose homeostasis parameters, and lipid profile were determined. Genotyping of the polymorphism was conducted by PCR-RFLP. The frequency of the minor C allele of rs2910164 polymorphism was significantly higher among patients of gestational diabetes combined with preeclampsia compared to the control group (p = 0.012) and the gestational diabetes group (p = 0.014). Patients of gestational diabetes and preeclampsia carrying CC genotype showed higher systolic and diastolic blood pressure, and increased urea, creatinine, urine protein, and dyslipidemia compared to the carriers of GG and GC genotypes. In conclusion, the results of the current study suggest that the rare CC genotype of MIR146A rs2910164 (G/C) polymorphism may be related to increased incidence of preeclampsia in gestational diabetes patients.

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An optimized dose of raspberry ketones controls hyperlipidemia and insulin resistance in male obese rats: Effect on adipose tissue expression of adipocytokines and Aquaporin 7☆

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Abstract

Obesity constitutes a major worldwide problem in which hyperlipidemia and insulin resistance represents adverse metabolic consequences of it. The present study was conducted to elucidate the role of raspberry ketones (RKs) in controlling body weight gain, hyperlipidemia and insulin resistance in male obese rats through affecting the expression of various adipocytokines. As Aquaporin-7 is co-related with the expression of various adipocytokines and has recently emerged as a modulator of adipocyte metabolism, the present study evaluated the effect of RKs on adipose tissue expression of aquaporin-7(AQP7) in high-fat (HF) diet-fed rats. Groups of male rats were assigned to normal, HF diet-fed control rats and RKs-treated (250 and 500 mg/kg) groups. RKs administration effectively abrogated hyperlipidemia and oxidative burden and enhanced insulin sensitivity. In addition, treatment with RKs ameliorated adipose tissue and liver indices and the reduced adipocyte diameters.
Moreover, administration of the low dose of RKs ameliorated the expression of apelin and its receptor, and visfatin with upregulating adiponectin expression compared to HF diet control rats. However, both doses effectively downregulated leptin expression. It was obvious that both RKs doses revealed effectiveness in upregulating the AQP7 expression. The present data suggest the promising therapeutic role of RKs in HF diet-induced obesity that is likely attributable, at least in part, to upregulation of AQP7 expression.

Hypertension in Pregnancy
2018
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Relation of locus 1p13 rs646776 polymorphism with the risk of preeclampsia

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Abstract

Objective: This study aimed to assess the relation of locus 1p13 rs646776 (T/C) polymorphism with preeclampsia in Egyptian women.

Methods: The study included 100 healthy pregnant female subjects and 100 preeclampsia patients. The genotypes of the polymorphisms were assessed. Endothelin-1 level was determined in plasma.

Results: The major T allele of the 1p13.3 genomic region rs646776 polymorphism had a higher frequency in preeclampsia patients. Carriers of C allele had significantly lower endothelin-1 levels, lower systolic and diastolic blood pressure, decreased proteinuria, and increased HDL-C in the patients.

Conclusion: The rare C allele of rs646776 polymorphism in chromosomal locus 1p13.3 is associated with decreased risk of preeclampsia.

Frontiersin Pharmacology
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9:990

Pharmacological Action of aPreganae Glycoside, Russelioside,B in Dietary Obese Rats: Impact on Weight Gain and Energy Expenditure

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Abstract

Background and purpose: Russelioside B (RB) is a pregnane glycoside obtained from *Caralluma quadrangula*; a herb with antidiabetic, anti-inflammatory, and antihyperlipidemic activities. The present experiment tested the possible role of RB in controlling weight gain in rats fed on high fat (HF) diet. Methods: RB was separated from the n-butanol fraction of the crude methanolic extract by chromatographic separation on a Si gel column according to the procedures described previously. The experiment of the biological assessment of RB used 32 male Wistar rats (4 groups, *n* = 8). Group 1 rats were fed with a palatable normal diet. Group 2, 3, and 4 were fed on HF diet for 16 weeks. Group 2 served as the HF diet control group while Group 3 and 4 received daily oral doses of RB (25 and 50 mg/kg) during the last four weeks. Animals' parameters like weight gain, fasting level of blood sugar, serum lipids, and serum liver enzyme activities were measured. Liver or adipose tissue weight was divided by the rat's body weight and multiplied by 100 to obtain the liver or adipose tissue index, respectively. Adipose tissues were processed for histopathological examination, measurement of mRNA expression of visfatin, leptin, adiponectin, uncoupling protein-1 (UCP-1), and carnitine palmitoyl transferase-1 (CPT-1). Furthermore, serum levels of insulin, interleukin-6 (IL-6), IL-1β, tumor necrosis factor-α (TNF-α), leptin, resistin, and adiponectin were assessed using ELISA kits. Results: Rats fed with the HF diet exhibited significant body weight gain, abnormal liver function, disturbed lipid profile, and greater serum level of pro-inflammatory cytokines in addition to greater insulin resistance, adipose tissue and liver indices. Further, rats fed with the HF diet displayed upregulations in the expression of visfatin and leptin with downregulations in the expression of adiponectin, UCP-1, and CPT-1 compared to normal rats. Interestingly, RB (25 or 50 mg/kg) favorably modulated the measured parameters. Conclusion: Data from this study documented the beneficial role of RB in diminishing weight gain, improving the inflammatory perturbations and energy expenditure in HF diet fed rats. Therefore, RB might be a promising candidate for obesity.

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Association of interleukin-1Ainsertion/deletion gene polymorphism and possible high risk factors with non-alcoholic fatty liver disease in Egyptian patients

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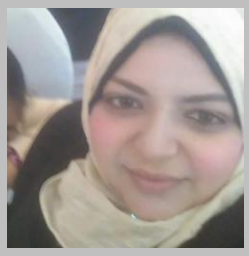
Abstract

Context: IL-1A is a cytokine involved in inflammatory process. IL-1A (rs3783553) gene polymorphism is comprised in the regulation of IL-1A expression.
Objective: This study aims to evaluate association of IL-1A (I/D) gene polymorphism with NAFLD and its component traits among Egyptian populations.
Methods: The study included 75 healthy subjects and 75 patients with NAFLD. Different genotypes of IL-1A (I/D) gene polymorphism were determined by PCR-PAGE technique, serum IL-1A level and other biochemical parameters were measured.
Results: The major D allele was significantly associated with NAFLD patients (p= 0.002). DD genotype showed a significant increase in BMI and decrease in HDL-C. Also serum IL-1A was significantly correlated with the DD genotype. Serum IL-1A showed a significant positive correlation with BMI, triglycerides, total cholesterol, LDL-C, VLDL-C and FBG, and a significant negative correlation with HDL-C.
Conclusions: Major D allele of IL-1A (I/D) gene polymorphism is associated with NAFLD in the Egyptian population.
Keywords: IL-1A insertion/deletion gene polymorphism and Non-alcoholic fatty liver disease.



International Immunopharmacology
2018
(61) 8–19

Renoprotective effect of the isoflavonoid biochanin A against cisplatin induced acute kidney injury in mice: Effect on inflammatory burden and p53 apoptosis

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Abstract

Cisplatin is a potent widely-used chemotherapeutics; however, its clinical use is associated with nephrotoxicity.
Renoprotective approaches are being discovered to halt the tubular cell death due to inflammatory and apoptotic burdens. In the present study, the renoprotective effects of different doses of biochanin A (10, 20 or 40 mg/kg) in mice treated with a single injection of cisplatin (10 mg/kg) were reported. Cisplatin administration resulted in marked increases in serum creatinine and blood urea nitrogen. Further, renal homogenates showed increased level of inflammatory cytokines and upregulation of the expression of p53 up-regulated modulator of apoptosis (PUMA), p53 and caspase 3 but downregulation in Nrf2 expression. Furthermore, cisplatin group showed marked necrosis and degenerated tubular lining epithelial cells with frequently detected apoptotic bodies. Mice treated with biochanin A (10, 20 or 40 mg/kg) for 14 days prior to cisplatin abrogated cisplatin-mediated damage.Furthermore, the elevated serum creatinine and urea levels were lessened by some doses of biochanin A, indicating protection against renal injury. Similarly, the changes in apoptosis and inflammatory markers have ameliorated to significant levels ($P < 0.05$). The results suggest biochanin A as a nephroprotective agent against cisplatin toxicity. Overall, this nephroprotective effect of biochanin A involved anti-inflammatory and antiapoptotic activities.

Journal of Planar Chromatography
2018
6, 469–476

Comparative High-Performance Liquid Chromatographic and High-Performance Thin-Layer Chromatographic Study for the Simultaneous Determination of Dapagliflozin and Metformin Hydrochloride in Bulk and Pharmaceutical Formulation

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Abstract

The discovery of potent antidiabetic drugs is of necessity owing to the rapid prevalence of diabetes worldwide. The investigation of new separation method for simultaneous determination of combined antidiabetic drugs is thus an essential issue to cover the usual demands of simple analytical methods to the routine analysis. Therefore, herein, simple and fast chromatographic methods were established for synchronized determination of metformin (MET) and Dapagliflozin (DAP), a mixture approved recently by FDA for diabetes therapy. In HPLC, a Water-pak C18 column was used as a stationary phase with an isocratic mobile phase composed of 10 mM NaH_2PO_4 (pH 3.5 adjusted by orthophosphoric acid): acetonitrile (65: 35, V/V) containing 0.1% trimethylamine at flow rate 1.2 mL/min and wavelength detector set at 225 nm. In HPTLC, separation was achieved on pre-coated silica gel 60 F-254 aluminum plates using acetonitrile: ammonium acetate 10%: acetic acid (9:0.9:0.1 V/V/V). The proposed methods were validated in the light of ICH guidelines and it was found that the two chromatographic methods are accurate, precise and linear in the range of 2-20 µg/mL, 1-10 µg/spot for DAP and 20-400 µg/mL and 10-100 µg/spot for MET by HPLC and HPTLC, respectively. The methods achieved a reasonable sensitivity as shown by low limit of detection ranged from 0.58 to 6.1 µg/mL and 0.314 to 3.1 µg/spot for HPLC and HPTLC, respectively. The validated methods succeeded in detecting the cited drugs in pharmaceutical formulation without interfering of excipients. Although HPLC method is the most applicable method, HPTLC method showed a superior sensitivity, cheap and fast allowing the determination of large number of samples in due time.

Medicinal Chemistry Research
2018
27:1238–1244

Cytotoxic and anti-inflammatory compounds from Red Sea grass Thalassodendron ciliatum

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Abstract

Chemical investigation of the less polar fraction methylene dichloride–methanol extract of the Red Sea grass Thalassodendron ciliatum led to the isolation of a new phytoceramide molecular species TCC-1, along with four known compounds: 7β-hydroxy cholesterol (10), 7β-hydroxysitosterol (11), stigmasterol glucoside (12), and β-sitosterol glucoside (13). Phytosphingosines with 2-hydroxy fatty acid residues constituted the phytoceramide molecular species TCC-1. Further purification of TCC-1 afforded two new phytoceramides: TCC-1-5 (5) and TCC-1-7 (7) as well as the known ceramide TCC- 1-6 (6). All compounds are reported for the first time from this genus. The chemical structures of the isolated compounds were clarified on the basis of spectroscopic techniques including IR, NMR experiments, mass spectrometry, and chemical methods, in addition to comparison with literature data. All isolated compounds exhibited significant cytotoxicity against two human cell lines (Hep G2 and MCF-7). Moreover, compounds (10–13) have been found to possess significant anti-inflammatory activity in which compound (13) is the most potent.

RSC Advances
2018
8, 21002–21011

Chemical studies on the parasitic plant Thonningia sanguinea Vahl†

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Abstract

Thonningia sanguinea Vahl plays an important role in traditional medicine in many African cultures. A study of the n-hexane fraction of the whole plant of T. sanguinea led to the isolation of two glucocerebroside molecular species TSC-1 and TSC-2, one b-sitosteryl-3b-D-glucopyranoside-60-O-fatty acid ester molecular species, TSS-1, and seven known triterpenes (1–7). The ethyl acetate fraction also afforded five known lignans (8–12) and one known flavanone (13). Their structures were elucidated by means of chemical and spectroscopic methods (methanolysis, NMR and mass spectrometry). Spectral analyses of the glucocerebrosides revealed mainly sphingosine-type (TSC-1) and phytosphingosine-type (TSC-2) cerebrosides, with both possessing mainly 2-hydroxy fatty acid and b-D-glucopyranose moieties. TSS-1 was found to be a b-sitosterol-type with fatty acid methyl esters and b-D-glucopyranoside moieties. The classes of compounds isolated from this plant are well known for their interesting biological activities including antimicrobial, antioxidant, anticancer, antiinflammatory and analgesic. They may therefore be responsible in part or in whole for these activities, hence validating the traditional uses of the plant. To the best of our knowledge, this is the first report on the isolation of all these compounds from T. sanguinea.

Molecules
2018
23, 978

Anti-Helicobacter, Antitubercular and Cytotoxic Activities of Scalaranes from the Red Sea Sponge *Hyrtios erectus* †

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Abstract

The Red Sea specimen of the marine sponge *Hyrtiose rectus* (orderDictyoceratida) was found to contain scalarane-type sesterterpenes. 12-O-deacetyl-12,19-di-epi-scalarin (14), a new scalarane sesterterpenoid, along with fourteen previously-reported scalarane-type sesterterpenes (1–13 and 15) have been isolated. The chemical structures of the isolated compounds were elucidated on the basis of detailed 1D and 2D NMR spectral data and mass spectroscopy, as well as by comparison with reported data. The anti-Helicobacter pylori, antitubercular and cytotoxic activities of all fifteen compoundswereevaluatedtorevealthepotencyofCompounds1,2,3,4,6,7and10.
Amongstthese, Compounds 1, 3, 4, 6 and 10 displayed a promising bioactivity profile, possessing potent activities in the antitubercular and anti-H. pylori bioassay. Compounds 2 and 7 showed the most promising cytotoxic profile, while Compounds 1 and 10 showed a moderate cytotoxic profile against MCF-7, HCT-116 and HepG2 cell lines.

The Journal of Antibiotics
2018
71:1036–1039

A new antitrypanosomal alkaloid from the Red Sea marine sponge Hyrtios sp.

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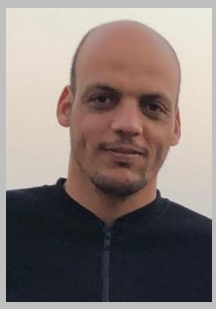
Abstract

The antitrypanosomally active crude extract of the sponge Hyrtios sp. was subjected to metabolomic analysis using liquid chromatography coupled with high resolution electrospray ionization mass spectrometry (LC–HR-ESIMS) for dereplication purposes. As a result, a new alkaloid, hyrtiodoline A (1), along with other four known compounds (2–5) were reported. The structures of compounds 1–5 were determined by spectroscopic analyses, including 1D and 2D nuclear magnetic resonance (NMR) and high-resolution electrospray ionization mass spectrometry (HRESI-MS) experiments, as well as comparison to the literature. We further investigated the antitrypanosomal activity of the five compounds, where compound 1 exhibited the most potent antitrypanosomal activity, with a half-maximal inhibitory concentration (IC50) value of 7.48μM after 72h.



Planta Medica
2018
84: 250–259

Determination of Acid and Neutral Cannabinoids in Extracts of Different Strains of Cannabis sativa Using GC- FID.

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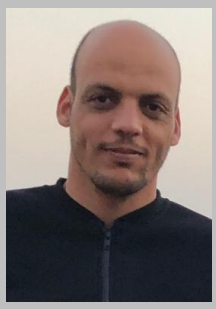
Abstract

Cannabis (Cannabis sativa L.) is an annual herbaceous plant that belongs to the family Cannabaceae. Trans-Δ9-tetrahydrocannabinol (Δ9-THC) and cannabidiol (CBD) are the two major phytocannabinoids accounting for over 40% of the cannabis plant extracts, depending on the variety. At the University of Mississippi, different strains of C. sativa, with different concentration ratios of CBD and Δ9-THC, have been tissue cultured via micropropagation and cultivated. A GC- FID method has been developed and validated for the qualitative and quantitative analysis of acid and neutral cannabinoids in C. sativa extracts. The method involves trimethyl silyl derivatization of the extracts. These cannabinoids include tetrahydrocannabivarian, CBD, cannabichromene, trans-Δ8-tetrahydrocannabinol, Δ9-THC, cannabigerol, cannabinol, cannabidiolic acid, cannabigerolic acid, and Δ9-tetrahydrocannabinolic acid-A. The concentration-response relationship of the method indicated a linear relationship between the concentration and peak area ratio with R2 > 0.999 for all 10 cannabinoids. The precision and accuracy of the method were found to be ≤ 15% and ± 5%, respectively. The limit of detection range was 0.11–0.19 µg/mL, and the limit of quantitation was 0.34–0.56 µg/mL for all 10 cannabinoids. The developed method is simple, sensitive, reproducible, and suitable for the detection and quantitation of acidic and neutral cannabinoids in different extracts of cannabis varieties. The method was applied to the analysis of these cannabinoids in different parts of the micropropagated cannabis plants (buds, leaves, roots, and stems).



Planta Medica
2018
84: 267–271

Detection and Quantification of Cannabinoids in Extracts of Cannabis sativa Roots Using LC- MS/MS.

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Abstract

A liquid chromatography-tandem mass spectrometry singlelaboratory validation was performed for the detection and quantification of the 10 major cannabinoids of cannabis, namely, (−)-trans-Δ9-tetrahydrocannabinol, cannabidiol, cannabigerol, cannabichromene, tetrahydrocannabivarian, cannabinol, (−)-trans-Δ8-tetrahydrocannabinol, cannabidiolic acid, cannabigerolic acid, and Δ9-tetrahydrocannabinolic acid- A, in the root extract of Cannabis sativa. Acetonitrile :methanol (80 : 20, v/v) was used for extraction; d3-cannabidiol and d3- tetrahydrocannabinol were used as the internal standards. All 10 cannabinoids showed a good regression relationship with r2 > 0.99. The validated method is simple, sensitive, and reproducible and is therefore suitable for the detection and quantification of these cannabinoids in extracts of cannabis roots. To our knowledge, this is the first report for the quantification of cannabinoids in cannabis roots.

Environmental Science and Pollution Research
2018
25:18393–18411

Biodegradation tests of mercaptocarboxylic acids, their esters, related divalent sulfur compounds and mercaptans

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Abstract

Mercaptocarboxylic acids and their esters, a class of difunctional compounds bearing both a mercapto and a carboxylic acid or ester functional group, are industrial chemicals of potential environmental concern. Biodegradation of such compounds was systematically investigated here, both by literature search and by experiments (Closed Bottle Test OECD 301D and Manometric Respirometry Test OECD 301F). These compounds were found either readily biodegradable or at least biodegradable to a significant extent. Some related compounds of divalent sulfur were tested for comparison (mercaptans, sulfides, disulfides). For the two relevant monofunctional compound classes, carboxylic acids/esters and mercaptans, literature data were compiled, and by comparison with structurally similar compounds without these functional groups, the influence of COOH/COOR' and SH groups on biodegradability was evaluated. Thereby, an existing rule of thumb for biodegradation of carboxylic acids/esters was supported by experimental data, and a rule of thumb could be formulated for mercaptans. Concurrent to biodegradation, abiotic processes were observed in the experiments, rapid oxidative formation of disulfides (dimerisation of monomercaptans and cyclisation of dimercaptans) and hydrolysis of esters. Some problems that compromise the reproducibility of biodegradation test results were discussed.

JPC-Journal of Planar Chromatography-Modern TLC
2017
4, 299–306

High-performance thin-layer chromatography method for the simultaneous Determination of itopride, pantoprazole, and mosapride in their formulations and spiked human plasma

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Abstract

The combination of itopride (ITP), pantoprazole (PAN), and mosapride (MS) is widely used in the treatment of many gastrointestinal tract (GIT) disorders. For that purpose, a new, simple, precise, accurate, and rapid high-performance thin-layer chromatography (HPTLC) method was developed and validated for the simultaneous determination of ITP, PAN, and MS in their pharmaceutical formulations. The method used Merck HPTLC aluminum plates precoated with silica gel 60 F254 as the stationary phase. The mobile phase consisted of methylene chloride–ethyl acetate–methanol– ammonia (25%) (12:2:0.8:0.2, v/v); this system was found to give compact spot of itopride (Rf value of 0.22 ± 0.008), pantoprazole (Rf value of 0.41 ± 0.006), and mosapride (Rf value of 0.62 ± 0.029). The wavelength of thin-layer chromatography (TLC) scanner was set at 289 nm for both detection and quantitation. The calibration curves were linear over the range of 100–1500 ng spot−1 for ITP and MS, and 70–1500 ng spot−1 for PAN. The detection limits were 32.5, 16.8, and 29.8 for ITP, PAN, and MS, and the quantitation limits were 98.5, 50.3, and 90.5 for ITP, PAN, and MS. The proposed analytical method was validated according to the International Conference on Harmonization (ICH) guidelines, and the results were acceptable. The proposed method has been successfully applied for the determination of the studied drugs in their pharmaceutical preparations as well as in spiked human plasma and it gave excellent percent of recovery. The results showed excellent agreement with the reported method with respect to precision and accuracy

RSC Advances
2017
7, 20936–20946

Resolution and quantification challenge of modern chemometric models in the determination of anti-migraine tablets containing ergotamine, caffeine, acetaminophen, and metoclopramide

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Abstract

This study is a comparison between the performance of five multivariate models in the determination of the unique mixture of ergotamine (ERG), metoclopramide (MET), caffeine (CAF), and paracetamol (PAR) in laboratory-prepared mixtures and in pharmaceutical formulations. Two supervised learning machine methods—artificial neural networks (PC-ANN) preceded by principle component analysis and support vector regression (SVR)—were compared with a spectral residual augmented classical least squares (SRACLS) method, multicurve resolution alternating least squares (MCR-ALS) method, and principle component based method; partial least squares (PLS). The results showed the superiority of linear learning machine methods in handling extremely noisy and complex spectral data, especially during the determination of the challenging mixture under study. ERG (the component with a close to undetectable concentration and with the lowest ratio in the studied dosage form) was only determined using three chemometric models, with root mean squared error of prediction (RMSEP) for the proposed models of 0.0879, 0.0694, and 0.0250 for PLS, SVR and PC-ANN, respectively. In addition, the results suggest that ANN is the method of choice for the determination of mixtures with extreme conditions; for example, components with a very low contribution in the overall spectra, components with narrow informative range, and extremely nonlinear spectral data.

Journal of fluorescence
2017
(3):1149-1160

Comparison between Two Linear Supervised Learning Machines' Methods with Principle Component Based Methods for the Spectrofluorimetric Determination of Agomelatine and Its Degradants

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Abstract

Four accurate, sensitive and reliable stability indicating chemometric methods were developed for quantitative the determination of Agomelatine (AGM) whether in pure form or in pharmaceutical formulations. Two supervised learning machines' methods; linear artificial neural networks (PC-linANN) preceded by principle component analysis and linear support vector regression (linSVR), were compared principle with two component based methods; principle component regression (PCR) as well as partial least squares (PLS) for the spectrofluorimetric determination of AGM and its degradants. The results showed the benefits behind using linear learning machines' methods and the inherent merits of their algorithms in handling overlapped noisy spectral data especially during the challenging determination of AGM alkaline and acidic degradants (DG1 and DG2). Relative mean squared error of prediction (RMSEP) for the proposed models in superiority the determination of AGM were 1.68, 1.72, 0.68 and 0.22 for PCR, PLS, SVR and PC-linANN; respectively. The results showed the of supervised learning machines' methods over principle component based methods. Besides, the results suggested that lin ANN is the method of choice for determination of components in low amounts with similar overlapped spectra and narrow linearity range. Comparison between the proposed chemometric models and a reported HPLC method revealed the comparable performance and quantification power of the proposed models.

Faculty of Agriculture

Postharvest Biology and Technology
2018
(138) 1–10

Short hot water as safe treatment induces chilling tolerance and antioxidant enzymes, prevents decay and maintains quality of cold-stored cucumbers

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Abstract

This study investigated the effects of treating cucumbers with short hot water dipping at 45 (SHW45) and 55 °C (SHW55) for 5 min compared to fruit dipped in 25 °C water (C). The purpose was to alleviate chilling injury, prevent decay, maintain sensory quality and induce antioxidant enzymes during storage. The cucumbers were held at 4 °C for 7, 14 and 21 d and shelf life at 20 °C for 2 and 4 d. Weight loss, appearance, decay, color, firmness, taste, soluble solids content (SSC), chilling injury (CI), total, reducing and non-reducing sugars, phenolics, electrolyte leakage (EL), peroxidase (POD) and catalase (CAT) activity were measured. The results revealed that SHW55 treatment had the lowest weight loss, CI, EL and POD activity, and had the best appearance, color, taste, and the highest CAT activity during cold storage and shelf life compared with C and SHW45. However, no significant effects were found between C, SHW45 and SHW55 on total, reducing sugars and SSC. No decay appeared on cucumber fruit with SHW55 treatment during the storage period. It may be possible to use SHW55 in a packinghouse as a safe commercial treatment to maintain quality, prevent decay and mitigate chilling injury, prolong storage period and possibility to store cucumber fruit at a non-optimal low temperature.

Journal of Food Science and Technology
2018
55(2):523–531

Enrichment of rice-based extrudates with Cactus Opuntia dillenii seed powder: a novel source of fiber and antioxidants

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Abstract

The present study investigated the effects of adding the powder of cactus Opuntia dillenii (O. dillenii) seeds on the functional properties, fiber, antioxidants and acceptability of rice-based extrudates. The control blend consisting basically of rice flour was replaced with O. dillenii seed powder at 2, 4, 6, 8, 10, 15 and 20% then extruded at the optimum processing conditions. The extruded products were evaluated for their chemical composition, functional properties, color attributes, antioxidant activity and sensory characteristics. The results revealed that adding O. dillenii seeds powder enhanced the fiber, phenolics, flavonoid contents and antioxidant activity of extrudates. Expansion, bulk density and breaking strength were significantly decreased, while water absorption index, water solubility index and oil absorption index were significantly increased compared to the control. Furthermore, the mean scores of sensory evaluation indicated clear improvements in all tested sensory attributes, which significantly increased by increasing the level of O. dillenii seed powder up to 15%. The results confirmed that O. dillenii seed powder could be incorporated in rice to develop snack products of acceptable functional, nutritional and sensory properties.

Journal of Food Science and Technology
2018
55(2):489–495

Preparation and physicochemical properties of protein concentrate and isolate produced from Acacia tortilis (Forssk.) Hayne ssp. Raddiana

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Abstract

The composition and physicochemical properties of defatted acacia flour (DFAF), acacia protein concentrate (APC) and acacia protein isolate (API) were evaluated. The results indicated that API had lower, ash and fat content, than DFAF and APC. Also, significant difference in protein content was noticed among DFAF, APC and API (37.5, 63.7 and 91.8%, respectively). Acacia protein concentrate and isolates were good sources of essential amino acids except cystine and methionine. The physicochemical and functional properties of acacia protein improved with the processing of acacia into protein concentrate and protein isolate. The results of scanning electron micrographs showed that DFAF had a compact structure; protein concentrate were, flaky, and porous type, and protein isolate had intact flakes morphology.

Physiological and Molecular Plant Pathology
2018
(103) 16–22

Serratia proteamaculans mediated alteration of tomato defense system and growth parameters in response to early blight pathogen Alternaria solani infection

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Abstract

Early blight caused by Alternaria solani is a devastating tomato plant disease affecting one of the most economically important vegetable crops worldwide. The plant growth promoting rhizobacteria are known to suppress plant pathogens and induce systemic resistance response in infected plants. The objectives of this study were to evaluate the efficacy of Serratia proteamaculans to induce the defense machinery and enhance tomato seedlings growth. Primary in vitro examination revealed a constant suppression of fungal growth. Under greenhouse conditions, bacterial suspensions at rate 50 ml/plant (108 cfu/ml) were incorporated once into pots containing tomato seedlings challenged or not with fungal spores. Results showed that S. proteamaculans was able to alleviate disease symptoms; severity reached 48.75% compared to control. Furthermore, the strain enhanced significantly tomato growth and chlorophyll content. In addition, bacterial treatment enhanced activity of plant defense enzymes and pathogenesis related proteins including guaiacol peroxidase (GPX), superoxide dismutase (SOD), phenylalanine ammonia-lyase (PAL) and β-1,3 glucanase reached 2, 7, 3,2 folds at days 5, 7, 6, 5 respectively. The obtained results suggested that application of S. proteamaculans as soil drench efficiently controlled tomato early blight disease and enhanced plant growth.

Renewable Energy
2018
(133) 307-316

Effectiveness of recyclable aluminum cans in fabricating an efficient solar collector for drying agricultural products

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Abstract

The shortages in conventional fuels along with the continuous rise in their prices have led to an increased emphasis on using solar energy as an alternative source of energy. However, establishing reliable and affordable solar collectors for different applications is a great challenge. Therefore, this study aimed to design and fabricate an efficient and cheap solar air collector from recyclable aluminum cans. Two dryers of different configurations (closed and open modes) were then constructed and examined for drying tomatoes under different operating conditions. The results revealed that the thermal efficiency of the designed solar collectors increased considerably from 25 to 63% when the air-flow rate increased from 15 to 45 m^3h^{-1}. In comparison to the conventional method of open sun drying, the designed solar dryers enhanced both the drying rate and the overall quality of the final product. In the designed solar dryer, over three days of consecutive drying (30 h of drying), the moisture content of tomato wedges was reduced from 19 to less than 1 kg [H_2O] kg^{-1} [dry matter]. The closed-mode dryer configuration, which recirculates the drying air, showed a considerable increase in the drying rate and weigh loss over the traditional sun dryers and open-mode dryer systems. Among all mathematical models, a non-linear quadratic model (Wang and Singh model) has shown a better fit to the experimental drying data compared to the other models.

Journal of Asia-Pacific Entomology
2018
(21) 754–759

Biology of the mason bee Osmia latreillei (Hymenoptera: Megachilidae) under artificial nesting conditions in Egypt

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Abstract

The mason bee Osmia (Helicosmia) latreillei Spinola is one of the dominant species of bees throughout Egypt, and can be found commonly in the Suez Canal Region. The species visits numerous plant species of the family Asteraceae and is considered the most important pollinator of certain crops such as sunflower. This species and some other solitary cavity nesting bees are threatened by fragmentation of their nesting habitats. Several attempts were made to establish and propagate O. latreillei, and success was achieved for re-nesting it in various artificial materials such as wood and polystyrene with rolled paper straws. These artificial nests were established at the conservation area of the Bee Research Centre, Suez Canal University, in order to study the nesting behavior and biology of O. latreillei under artificial conditions and to document their natural enemies. Biologically, there was no significance difference between the life cycle of O. latreillei under natural and artificial nesting conditions. This solitary bee was univoltine, individuals active only during Spring, and attacked by diverse enemies, with Stelis (Stelis) murina Pérez and chrysidid wasps considered the two most major pests of this wild bee species.

ZooKeys
2017
716: 29–41

A new species of the carpenter bee genus *Xylocopa* from the Sarawat Mountains in southwestern Saudi Arabia (Hymenoptera, Apidae)

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Abstract

A new species of the carpenter bee genus *Xylocopa* Latreille (Xylocopinae: Xylocopini) is described and figured from two localities in southern Saudi Arabia. *Xylocopa* (*Koptortosoma*) *sarawatica* Engel, sp. n. is a relatively small species similar to the widespread *X. pubescens* Spinola, but differs in the extent of maculation in males, setal coloration of both sexes, and male terminalia. A revised key to the species of *Xylocopa* in Saudi Arabia is provided.

Food Chemistry
2018
(248) 1–7

Physicochemical properties, nutritional value and techno-functional properties of goldenberry (Physalis peruviana) waste powder concise title: Composition of goldenberry juice waste

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Abstract

Goldenberry waste powder, contained 5.87% moisture, 15.89% protein, 13.72% fat, 3.52% ash, 16.74% dietary fiber and 61% carbohydrates. Potassium (560 mg/100 g) was the predominant element followed by sodium (170 mg/100 g) and phosphorus (130 mg/100 g). Amino acid analysis gave high levels of cystine/methionine, histidine and tyrosine/phenylalanine. Goldenberry waste powder had good levels of the techno-functional properties including water absorption index, swelling index, foaming capacity and stability (3.38 g/g, 5.24 ml/g, 4.09 and 72.0%, respectively). Fatty acids profile showed that linoleic acid was the predominant fatty acid followed by oleic, palmitic and stearic acids. Iodine value (109.5 g/100 g of oil), acid value (2.36 mg KOH/g of oil), saponification value (183.8 mg KOH/g of oil), peroxide value (8.2 meq/kg of oil) and refractive index (1.4735) were comparable to those of soybean and sunflower oils. Goldenberry waste oil exhibited absorbance in the UV range at 100–400 nm.

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Comparative analysis of genetic diversity and differentiation of cauliflower (*Brassica oleracea* var. *botrytis*) accessions from two *ex situ* genebanks

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Abstract

Cauliflower (*Brassica oleracea* var. *botrytis*) is an important vegetable crop for human nutrition. We characterized 192 cauliflower accessions from the USDA and IPK genebanks with genotyping by sequencing (GBS). They originated from 26 different countries and represent about 44% of all cauliflower accessions in both genebanks. The analysis of genetic diversity revealed that accessions formed two major groups that represented the two genebanks and were not related to the country of origin. This differentiation was robust with respect to the analysis methods that included principal component analysis, ADMIXTURE and neighborjoining trees. Genetic diversity was higher in the USDA collection and significant phenotypic differences between the two genebanks were found in three out of six traits investigated. GBS data have a high proportion of missing data, but we observed that the exclusion of single nucleotide polymorphisms (SNPs) with missing data or the imputation of missing SNP alleles produced very similar results. The results indicate that the composition and type of accessions have a strong effect on the structure of genetic diversity of *ex situ* collections, although regeneration procedures and local adaptation to regeneration conditions may also contribute to a divergence. *Fst*-based outlier tests of genetic differentiation identified only a small proportion (<1%) of SNPs that are highly differentiated between the two genebanks, which indicates that selection during seed regeneration is not a major cause of differentiation between genebanks. Seed regeneration procedures of both genebanks do not result in different levels of genetic drift and loss of genetic variation. We therefore conclude that the composition and type of accessions mainly influence the level of genetic diversity and explain the strong genetic differentiation between the two *ex situ* collections. In summary, GBS is a useful method for characterizing genetic diversity in cauliflower genebank material and our results suggest that it may be useful to incorporate routine genotyping into accession management and seed regeneration to monitor the diversity present in *ex situ* collections and to reduce the loss of genetic diversity during seed regeneration.

G3 (Genes, Genomics, Genetics)
2018
(8) 707-718

Genomic Prediction and Association Mapping of Curd-Related Traits in Gene Bank Accessions of Cauliflower

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Abstract

Genetic resources are an important source of genetic variation for plant breeding. Genomewide association studies (GWAS) and genomic prediction greatly facilitate the analysis and utilization of useful genetic diversity for improving complex phenotypic traits in crop plants. We explored the potential of GWAS and genomic prediction for improving curd-related traits in cauliflower (Brassica oleracea var. botrytis) by combining 174 randomly selected cauliflower gene bank accessions from two different gene banks. The collection was genotyped with genotyping-by-sequencing (GBS) and phenotyped for six curd-related traits at two locations and three growing seasons. A GWAS analysis based on 120,693 single-nucleotide polymorphisms identified a total of 24 significant associations for curd-related traits. The potential for genomic prediction was assessed with a genomic best linear unbiased prediction model and BayesB. Prediction abilities ranged from 0.10 to 0.66 for different traits and did not differ between prediction methods. Imputation of missing genotypes only slightly improved prediction ability. Our results demonstrate that GWAS and genomic prediction in combination with GBS and phenotyping of highly heritable traits can be used to identify useful quantitative trait loci and genotypes among genetically diverse gene bank material for subsequent utilization as genetic resources in cauliflower breeding.

Food packing and shelf life
2017
(11) 58-66

Physiological effects of hot water dipping, chitosan coating and gibberellic acid on shelf-life and quality assurance of sugar snap peas (Pisum sativum L. var. macrocarpon)

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Abstract

The effects of chitosan coating (CC), gibberellic acid (GA3), and hot water dipping (HWD) to improve quality and extend shelf-life of chilled pea by reducing chilling injury and postharvest decay were evaluated. Pea pods were subjected to treatments consisting of CC (at 1 and 3%), GA3 (at 1 and 2 mmol L_1), and HWD (at 45 _C for 20 min and 55 _C for 1 min) followed by storage at 4 _C in a refrigerator set at 85–90% relative humidity for 35 d. No decay occurred in pods treated with GA3 at 1 mmol L_1 while CC at 1% resulted in 7% decay compared to 22–55% decay by CC at 3% and HWD treatments. Chitosan coating (1%) and GA3 (1 mmol L_1) reduced titratable acidity by 11.5 and 13.4%, respectively and chilling injury by 0.18 and 0.20%, respectively compared to 7% chilling injury by HWD treatments and the untreated control at the end of the storage period. The HWD treatment enhanced active oxygen-scavenging systems, such as peroxidase and catalase compared to CC and GA3 treatments. The content of reducing sugars was stable in all storage periods. Pods treated with CC and GA3 had the highest amount of total chlorophyll (8.4 and 8.9 mg g_1 FW), vitamin C (1.2 and 1.8% mg 100 g_1 FW), phenolics (1.9 and 1.6 mg g_1 FW), and protein (11.5 and 13.2 mg g_1 FW) at the end of the storage period.

Functional Plant Biology
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(45) 745–759

Enhancing antioxidant systems by exogenous spermine and spermidine in wheat (*Triticum aestivum*) seedlings exposed to salt stress

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Abstract

Plants have evolved complex mechanisms to mitigate osmotic and ionic stress caused by high salinity. The effect of exogenous spermine (Spm) and spermidine (Spd) on defence responses of wheat seedlings under NaCl stress was investigated by measuring antioxidant enzyme activities and the transcript expression of corresponding genes.Exogenous Spm and Spd decreased the level of malondialdehyde, increased chlorophyll and proline contents, and modulated PSII activity in wheat seedlings under salt stress. Spermidine alleviated negative effects on CO2 assimilation induced by salt stress in addition to significantly increasing the activity and content of ribulose 1,5-bisphosphate carboxylase/oxygenase (Rubisco). It appears Spd conferred salinity tolerance in wheat seedlings by enhancing photosynthetic capacity through regulation of gene expression and the activity of key CO2 assimilation enzymes. Exogenous Spm regulated activities of different antioxidant enzymes (catalase, glutathione reductase, dehydroascorbate reductase, ascorbate peroxidase, and superoxide dismutase) and efficiently modulate their transcription levels in wheat seedlings under salt stress. It is likely that Spm plays a key role in alleviating oxidative damage of salt stress by adjusting antioxidant enzyme activities in plants. In addition, exogenous Spd increased transcript level of spermine synthase under salt stress. Salinity stress also caused an increase in transcript levels of diamine oxidase (DAO) and polyamine oxidase (PAO). Exogenous Spd application resulted in a marked increase in free Spd and Spm contents under saline conditions. These results show that exogenous Spd and Spm effectively upregulated transcriptional levels of antioxidant enzyme genes and improved the defence response of plants under salt stress.

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Smart technique for accurate monitoring of ATP content in frozen fish fillets using fluorescence fingerprint

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Abstract

The aim of the present study was to develop a fast and nondestructive method based on fluorescence fingerprints (FFs) to predict the ATP content in frozen fish meat frozen at early stages after death using fillets of horse mackerel (*Trachurus japonicus*) as a model. Fifty-six fish were sacrificed instantly, stored in ice for different periods (0–48 h), and then filleted and frozen. The fluorescence fingerprints of the frozen fillet samples were acquired using fluorescence spectrophotometer with fiber probe installed inside a freezer. Subsequently, the ATP-related compounds of the same samples were determined using HPLC. Finally, four different models based on partial least squares (PLS) were developed to predict ATP contents from HPLC and the FFs data. The best PLS model with a correlation coefficient (R^2) of 0.88 and root mean square error estimated by cross validation (RMSECV) of 0.97 μmol/g was obtained when the most important combinations of excitation-emission wavelengths were used for prediction. This methodology offers a simple and rapid approach to detect the ATP contents in frozen fish nondestructively without thawing the sample during the assessment that could be applied during any stage of fish marketing, facilitating quality control activities and the determination of fishery market price.

Waste Management
2018
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Effect of hydrochar on anaerobic digestion of dead pig carcass after hydrothermal pretreatment

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Abstract

Incineration and burial are the current practices for pig carcasses disposal but are not environmentally friendly. Anaerobic digestion can be a better alternative if the process inhibition by carcass digestion can be ameliorated. This study successfully mitigated the inhibition in anaerobic digestion of carcasses by hydrochar addition and by co-digestion with RS and HRS. Biogas production from SP of the pretreated hydrothermal carcasses was enhanced by 60.7 to 90.8% through hydrochar addition. The highest biogas production of 450 mL/g-VS was obtained at 4 g-hydrochar/L addition. The methane content was also increased from 57.5% to up to 69.8%. Each gram of hydrochar removed 25 mg of ammonium and 50 mg of VFA. Hydrochar addition promoted the conversion of VFA to biogas by strengthening the intensity of functional groups and the immobilization of microbial biomass. Co-digestion of SP with RS or HRS also increased the biogas production, and the optimal production of 428 mL/g VS was obtained at 70% SP and 30% RS. The co-digestion of carcass SP with RS and the addition of hydrochar can be a promising solution for improving biogas production from a pig carcass, and can be potentially developed as a sustainable waste management method.

Bioresource Technology
2018
(259) 54–60

Effect of hydrothermal and Ca(OH)2 pretreatments on anaerobic digestion of sugarcane bagasse for biogas production

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Abstract

The effect of hydrothermal (HTP) and Ca(OH)2 pretreatments on the biogas produced by the anaerobic digestion of sugarcane bagasse (SCB) was studied. HTP, Ca(OH)2 and combination pretreatment had significant effects on hemicellulose and lignin degradation during pretreatment and methane yield through digestion. The highest biogas production observed in combination pretreatment HTP 180+8.5% of SCB reached 318 mL/g Volatile Solids (VS), which were 47% higher than the untreated SCB, with the highest methane content 69% and highest lignin degradation 44%. The functional groups and the structural changes in the pretreated SCB have also been analyzed by Fourier Transform Infrared Spectroscopy (FTIR) and Scanning Electron Microscopy (SEM) analysis.
Kinetic analysis of methane production potential from SCB was determined to compare ultimate methane yields and kinetic constants. The results of this research contribute useful information to improve the efficiency of anaerobic digestion of SCB by pretreatment.

Bioresource Technology
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Evaluation of engineered hydrochar from KMnO4 treated bamboo residues: Physicochemical properties, hygroscopic dynamics, and morphology

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Abstract

In this study, a novel approach was developed to prepare engineered hydrochar from KMnO4 treated bamboo residues through hydrothermal carbonization. The hydrochar yields were within a specified range of 61.8–67.8% at 180 °C and 39.8–45.0% at 260 °C, respectively. The higher temperature led to the higher C content, lower H/C and O/C ratio, whereas the ash content increased with increasing KMnO4 concentration, causing the increase of solid yield as well as the decrease of C content. Pseudo-second kinetic model was optimal to describe bamboo hydrochar's hygroscopic dynamic, and the engineered hydrochar produced at 260 °C and 1.0 wt% concentration obtained the better hydrophobicity of 0.82%. SEM-EDS and XRD analysis confirmed the existence of manganese carbonate on the surface of engineered hydrochar, from which we inferred the chemical complexation between KMnO4 and hydrochar.

Frontiers in Plant Science
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Sweet Scents: Nectar Specialist Yeasts Enhance Nectar Attraction of a Generalist Aphid Parasitoid Without Affecting Survival

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Abstract

Floral nectar is commonly inhabited by microorganisms, mostly yeasts and bacteria, which can have a strong impact on nectar chemistry and scent. Yet, little is known about the effects of nectar microbes on the behavior and survival of insects belonging to the third trophic level such as parasitoids. Here, we used five nectar-inhabiting yeast species to test the hypothesis that yeast species that almost solely occur in nectar, and therefore substantially rely on floral visitors for dispersal, produce volatile compounds that enhance insect attraction without compromising insect life history parameters, such as survival. Experiments were performed using two nectar specialist yeasts (Metschnikowia gruessii and M. reukaufii) and three generalist species (Aureobasidium pullulans, Hanseniaspora uvarum, and Sporobolomyces roseus). Saccharomyces cerevisiae was included as a reference yeast. We compared olfactory responses of the generalist aphid parasitoid Aphidius ervi (Haliday) (Hymenoptera: Braconidae) when exposed to these microorganisms inoculated in synthetic nectar. Nectar-inhabiting yeasts had a significant impact on nectar chemistry and produced distinct volatile blends, some of which were attractive, while others were neutral or repellent. Among the different yeast species tested, the nectar specialists M. gruessii and M. reukaufii were the only species that produced a highly attractive nectar to parasitoid females, which simultaneously had no adverse effects on longevity and survival of adults. By contrast, parasitoids that fed on nectars fermented with the reference strain, A. pullulans, H. uvarum or S. roseus showed shortest longevity and lowest survival. Additionally, nectars fermented by A. pullulans or S. roseus were consumed significantly less, suggesting a lack of important nutrients or undesirable changes in the nectar chemical profiles. Altogether our results indicate that nectar-inhabiting yeasts play an important, but so far largely overlooked, role in plant-insect interactions by modulating the chemical composition of nectar, and may have important ecological consequences for plant pollination and biological control of herbivorous insects.

Pest management science
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Priming of cowpea volatile emissions with defense inducers enhances the plant's attractiveness to parasitoids when attacked by caterpillars

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Abstract

BACKGROUND: The manipulation of herbivore-induced volatile organic compounds (HI-VOCs) via the application of the inducers benzo(1,2,3)thiadiazole-7-carbothioic acid S-methyl ester (BTH) and laminarin (*β*-1,3-glucan) is known to enhance the attractiveness of caterpillar-damaged cotton and maize plants to parasitoids. To test if this is also the case for legumes, we treated cowpea (*Vigna unguiculata* var. *unguiculata*) with these inducers and studied the effects on HI-VOC emissions and the attraction of three generalist endoparasitoids.
RESULTS: After the inducers had been applied and the plants subjected to either real or mimicked herbivory by *Spodoptera littoralis* caterpillars, females of the parasitoids *Campoletis sonorensis* and *Microplitis rufiventris* showed a strong preference for BTH-treated plants, whereas *Cotesia* females were strongly attracted to both BTH- and laminarin-treated plants with real or mimicked herbivory. Treated plants emitted more of certain HI-VOCs, but considerably less indole and linalool and less
of several sesquiterpenes. Multivariate data analysis revealed that enhanced wasp attraction after treatment was correlated with high relative concentrations of nonanal, *α*-pinene, (*E*)-*β*-ocimene and (*E*)-4,8-dimethyl-1,3,7-nonatriene (DMNT), and with low relative concentrations of indole, (*S*)-linalool and (*E*)-*β*-farnesene. Inducer treatments had no significant effect on leaf consumption by the caterpillars.
CONCLUSION: Our findings confirm that treating cowpea plants with inducers can enhance their attractiveness to biological control agents.

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Habitat-specific variation in gut microbial communities and pathogen prevalence in bumblebee queens (*Bombus terrestris*)

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Abstract

Gut microbial communities are critical for the health of many insect species. However, little is known about how gut microbial communities respond to anthropogenic changes and how such changes affect host-pathogen interactions. In this study, we used deep sequencing to investigate and compare the composition of gut microbial communities within the midgut and ileum (both bacteria and fungi) in *Bombus terrestris* queens collected from natural (forest) and urbanized habitats. Additionally, we investigated whether the variation in gut microbial communities under each habitat affected the prevalence of two important bumblebee pathogens that have recently been associated with *Bombus* declines (*Crithidia bombi* and *Nosema bombi*). Microbial community composition differed strongly among habitat types, both for fungi and bacteria. Fungi were almost exclusively associated with bumblebee queens from the forest habitats, and were not commonly detected in bumblebee queens from the urban sites. Further, gut bacterial communities of urban *B. terrestris* specimens were strongly dominated by bee-specific core bacteria like *Snodgrassella* (Betaproteobacteria) and *Gilliamella* (Gammaproteobacteria), whereas specimens from the forest sites contained a huge fraction of environmental bacteria. Pathogen infection was very low in urban populations and infection by *Nosema* was only observed in specimens collected from forest habitats. No significant relationship was found between pathogen prevalence and microbial gut diversity. However, there was a significant and negative relationship between prevalence of *Nosema* and relative abundance of the core resident *Snodgrassella*, supporting its role in pathogen defense. Overall, our results indicate that land-use change may lead to different microbial gut communities in bumblebees, which may have implications for bumblebee health, survival and overall fitness.

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Simultaneous rough rice drying and rice bran stabilization using infrared radiation heating

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Abstract

The objective of this study was to develop a new rice drying method using IR heating followed by tempering. Freshly harvested medium grain rice (M206) samples with different initial moisture contents (IMCs) were used in this study. The samples were dried for one- and two-passes using a catalytic IR emitter to reach rice surface temperature of 60 ºC. After IR heating, the samples were tempered in an incubator at 60 ºC for different durations ranging from 1 to 5 h. The effects of new drying method on moisture removal, milling quality, and shelf life of rice bran were evaluated. High heating and drying rates and good milling quality of rough rice were achieved. It took only 55 s to heat the rice samples to 60 ºC. For one-pass drying and 4 h tempering treatment, the total moisture removals were 3.33, 3.78 and 5.89 g moisture/100 g dry solid for samples with initial moisture contents of 20.06, 25.53 and 32.50 g moisture/100 g dry solid, respectively. IR heating did not generate adverse effects on milling quality of rough rice. Importantly, the storage stability of rice bran from the new drying method was extended to 38 days compared 7 days from current drying practice.

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Degradation kinetics of aflatoxin B1 and B2 in solid medium by using pulsed light irradiation

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Abstract

Pulsed light (PL) is a new potential technology to degrade aflatoxin. The objective of this study was to investigate the degradation characters of aflatoxin B1 (AFB1) and B2 (AFB2) treated under PL irradiation. A kinetic degradation study of AFB1 and AFB2 in solid medium was performed under PL irradiation at different initial concentrations of AFB1 (229.9, 30.7 and 17.8 μgkg−1) and AFB2 (248.2, 32.2 and 19.5 μgkg−1) and irradiation intensities (2.86, 1.60 and 0.93Wcm−2) of PL. A second-order reaction model was applied to describe degradation of AFB1 and AFB2. The results showed that the degradation of AFB1 and AFB2 followed the second-order reaction kinetic model well(R2> 0.97). The degradation rate was proportional to the intensities of PL irradiation and the initial concentrations of aflatoxins. It is concluded that the degradation of AFB1 and AFB2 with the use of PL could be accurately described using the second-order reaction kinetic model.

Food Chemistry
2018
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Influence of infrared drying on storage characteristics of brown rice

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Abstract

The aim of this study was to improve storage characteristics of brown rice by using infrared radiation drying (IRD) through comparison with hot air drying (HAD) and ambient air drying (AAD). After heating by IR from 20 °C to 60 °C within 58 s, 2.17 percentage points moisture of rough rice (initial moisture content is 25.0 ± 0.2% in dry basis) were removed without adverse effect on germination capacity of husked brown rice. Compared with AAD, IRD slowed down the increase in yellowness, water uptake and volume expansion ratio of brown rice by 47.9%, 41.0% and 37.9% after four months of storage, and decreased the temperature range and enthalpy of gelatinization, the peak and breakdown viscosities. These changes might due to the higher stabilization effect of IRD on the microstructure and thermal properties of proteins and starch granules than AAD. IRD is an effective method to improve storage stability of brown rice.

Agricultural Water Management
2017
(182) 1-12

Spectral assessment of drought tolerance indices and grain yield in advanced spring wheat lines grown under full and limited water irrigation

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Abstract

Because wheat varieties exhibit a high genotype × environment interaction, several drought tolerance indices (DTIs) have been developed to assist breeders in selecting genotypes with good performance under contrasting water conditions. We compared the relative yield of advanced breeding wheat lines under both well-watered and limited water irrigation conditions using different DTIs and evaluated how spectral reflectance indices (SRIs), as rapid and non-destructive tools, can effectively monitor DTIs and grain yield. Sixty-five recombinant inbred lines (RILs) developed from a cross between drought-tolerant (Sakha 93) and drought-sensitive (Sakha 61) genotypes were subjected to full irrigation (FI) and limited water irrigation (LWI) in the 2014 (F_6), 2015 (F_7), and 2016 (F_8) growing seasons. Eight vegetation- and water-SRIs calculated from canopy reflectance under FI and LWI, and taken at the heading and middle grain filling stages, were related to the DTIs and grain yield. We found that the yield performance of the RILs was not consistent across the two water regimes. Selection based on the DTIs, the stress susceptibility index and the tolerance index failed to identify RILs that had very low yields under both treatments. However, the mean productivity index (MPI) and the geometric mean productivity index (GMP) enabled us to identify RILs that produced desirable yields under both full and limited irrigation, and these drought tolerance indices further exhibited a high heritability. Across the three years of investigation and at the heading and middle grain filling stages, these DTIs were best described either by the vegetation-based dry matter content index (DMCI) or the water-based normalized multi-band drought index (NDMI), or a combination of both. In conclusion, our results demonstrate that a combination of near infrared (NIR) and shortwave infrared (SWIR)-based SRIs can be used as a fast and low-cost predictor for selecting wheat genotypes with superior yield under different water regimes.

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203:406–428

On the use of spectral reflectance indices to assess agro-morphological traits of wheat plants grown under simulated saline field conditions

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Abstract

Successful breeding of plants for salinity stress tolerance requires realistic growingconditions and fast, non-destructive evaluation techniques for phenotypic traitsassociated with salinity tolerance. In this study, we used subsurface water retentiontechnique (SWRT) as a growing condition and spectral measurements as an evalua-tion method to assess different agro-morphological traits of salt-tolerant (Sakha 93)and salt-sensitive (Sakha 61) wheat genotypes under three salinity levels (control,60, and 120 mMNaCl). The effects of salinity on agro-morphological traits wereevaluated and related with forty-five published vegetation- and water-spectralreflectance indices (SRIs) taken at both the heading and grain milk growth stages foreach salinity level, genotype, and growth stage. In general, the agro-morphologicaltraits gradually decreased as salinity levels increased; however, the reduction inthese traits was more pronounced in Sakha 61 than in Sakha 93. The effect of salin-ity levels and their interaction with genotypes on the SRIs was only evident at thegrain milk stage. The performance of the spectral reflectance indices depicted thatthe closest associations with agro-morphological traits depended on salinity level,degree of salt tolerance of the genotypes, and growth stage. The SRI-based vegeta-tive indices correlated better with growth and yield of Sakha 93 than SRI-basedwater indices and vice versa for Sakha 61. The SRI-based vegetative and waterindices are effective for assessment of agro-morphological traits at early growthstages under high salinity level. The functional relationship between grain yield perhectare and the best SRIs was linear for the high salinity level and Sakha 61; how-ever, the quadratic model was found to best fit this relationship for the control,moderate salinity level, and Sakha 93. The overall results indicate that the useful-ness of the SRIs for assessment of traits associated with salinity tolerance is limitedto salinity level and growth stage.

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Comparative Performance of Multivariable Agro-Physiological Parameters for Detecting Salt Tolerance of Wheat Cultivars under Simulated Saline Field Growing Conditions.

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Abstract

Field-based trials are crucial for successfully achieving the goals of plant breeding programs aiming to screen and improve the salt tolerance of crop genotypes. In this study, simulated saline field growing conditions were designed using the subsurface water retention technique (SWRT) and three saline irrigation levels (control, 60, and 120 mM NaCl) to accurately appraise the suitability of a set of agro-physiological parameters including shoot biomass, grain yield, leaf water relations, gas exchange, chlorophyll fluorescence, and ion accumulation as screening criteria to establish the salt tolerance of the salt-tolerant (Sakha 93) and salt-sensitive (Sakha 61) wheat cultivars. Shoot dry weight and grain yield per hectare were substantially reduced by salinity, but the reduction was more pronounced in Sakha 61 than in Sakha 93. Increasing salinity stress caused a significant decrease in the net photosynthesis rate and stomatal conductance of both cultivars, although their leaf turgor pressure increased. The accumulation of toxic ions (Na^+ and Cl^-) was higher in Sakha 61, but the accumulation of essential cations (K^+ and Ca^{2+}) was higher in Sakha 93, which could be the reason for the observed maintenance of the higher leaf turgor of both cultivars in the salt treatments. The maximum quantum PSII photochemical efficiency (F_v/F_m) and the PSII quantum yield (ΦPSII) decreased with increasing salinity levels in Sakha 61, but they only started to decline at the moderate salinity condition in Sakha 93. The principle component analysis successfully identified the interrelationships between all parameters. The parameters of leaf water relations and toxic ion concentrations were significantly related to each other and could identify Sakha 61 at mild and moderate salinity levels, and, to a lesser extent, Sakha 93 at the moderate salinity level. Both cultivars under the control treatment and Sakha 93 at the mild salinity level were identified by most of the other parameters. The variability in the angle between the vectors of parameters explained which parameters could be used as individual, interchangeable, or supplementary screening criteria for evaluating wheat salt tolerance under simulated field conditions.

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Hyperspectral reflectance sensing to assess the growth and photosynthetic properties of wheat cultivars exposed to different irrigation rates in an irrigated arid region

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Abstract

Simultaneous indirect assessment of multiple and diverse plant parameters in an exact and expeditious manner is becoming imperative in irrigated arid regions, with a view toward creating drought-tolerant genotypes or for the management of precision irrigation. This study aimed to evaluate whether spectral reflectance indices (SRIs) in three parts of the electromagnetic spectrum ((visible-infrared (VIS), near-infrared (NIR)), and shortwave-infrared (SWIR)) could be used to track changes in morphophysiological parameters of wheat cultivars exposed to 1.00, 0.75, and 0.50 of the estimated evapotranspiration (ETc). Significant differences were found in the parameters of growth and photosynthetic efficiency, and canopy spectral reflectance among the three cultivars subjected to different irrigation rates. All parameters were highly and significantly correlated with each other particularly under the 0.50 ETc treatment. The VIS/VIS- and NIR/VIS-based indices were sufficient and suitable for assessing the growth and photosynthetic properties of wheat cultivars similar to those indices based on NIR/NIR, SWIR/NIR, or SWIR/SWIR. Almost all tested SRIs proved to assess growth and photosynthetic parameters, including transpiration rate, more efficiently when regressions were analyzed for each water irrigation rate individually. This study, the type of which has rarely been conducted in irrigated arid regions, indicates that spectral reflectance data can be used as a rapid and non-destructive alternative method for assessment of the growth and photosynthetic efficiency of wheat under a range of water irrigation rates.

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Development of Nutrient-Rich and Blast-Resistant Rice Cultivars through Tissue Culture and Monogenic Lines

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Abstract

The breeding of rice varieties with higher levels of vitamins and the ability to resist disease has become one of the most important goals in plant breeding programmes. In this experiment, 24 F1s were produced through Line × Tester and evaluated with their parents for genotypic variation. Both general combining ability (GCA) variances were highly significant for all twelve characters studied in F1 generations. The most promising hybrid combinations were IRBL3-CP4 × Eg-N-9, IRBL5-M × Sakha101, Sakha106 × Al-Ahsa Type1, and Sakha106 × Al-Ahsa Type2, and these could be involved in breeding programmes. The protein level and nutrient elements; zinc (Zn) and iron (Fe) revealed that the two Saudi varieties; Al-Ahsa Type1, Al-Ahsa Type2 and Egyptian variety, Eg-N-7, had the highest value of protein, Zn and Fe. Therefore, ten genotypes out of fifteen were cultured *in vitro* to induce somaclonal variation. Seven genotypes were successfully induced callus and somaclonal were collected and evaluated for quantitative trait such as; duration, leaf blast, plant height, number of panicles/plant, 1000-grain weight, number of grains/panicle, grain yield and number of sterile grains/panicle and compared with the parents. The differences between the lines were remarkably slight compared with their parents: these lines could be included in breeding programmes as a genetic resource. Regarding the identification of blast- resistant genes, marker assisted-breeding Al-Ahsa Type1 and Al-Ahsa Type2 varieties had different blast-resistant genes. The finding of the study may help development of nutrientrich and blast-resistant varieties of rice.

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Response of Different Date Palm Cultivars to Salinity and Osmotic Stresses using Tissue Culture Technique

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Abstract

Date palm (*Phoenix dactylifera* L.) is moderately tolerant to salinity and drought. However, information about the variation in salinity and drought tolerance among the date palm cultivars is limited. Thus, a method of *in vitro* propagation via somatic embryogenesis from shoot tips of date palm cvs. Barhi and Khalas under polyethylene glycol (PEG) induced osmotic stress or NaCl induced salinity stresses was investigated in this study. Highest induction frequencies of embryogenic calli occurred after 12 months on MS medium supplemented with 10 mg L-1 2,4-D, 3 mg L-1 2iP and 2 g L-1 activated charcoal. Optimum MS medium for higher frequency of matured somatic embryos and plant regeneration was recorded using 0.5 mg L-1 NAA, 3.0 mg L-1 2iP of cv. Barhi and 1.0 mg L-1 NAA, 4.0 mg L-1 2iP of cv. Khalas. The embryogenic callus of both cultivars was cultured on different levels of NaCl or PEG-induced stresses after 12 weeks for three subcultures. There were considerable differential responses between date palm cultivars about tolerance to salinity and osmotic stresses. However, the growth of cv. Barhi was completely ceased at levels above 300 mM NaCl or 25 g L-1 PEG while cv. Khalas continued to grow. This indicated that cv. Khalas is more tolerant to high salinity and osmotic stresses than the cv. Barhi. This study also showed that use of tissue callus is an effective way to monitor the response of date palm cultivars to salinity and osmotic stresses.

In Vitro Cellular & Developmental Biology – Plant
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Micropropagation of virus-free plants of Saudi fig (Ficus carica L.) and their identification through enzyme-linked immunosorbent assay methods

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Abstract

Viral infection is one of the most serious biotic stresses, which disturbs the growth and productivity of many horticultural crops, including that of fig (Ficus carica L.). The production of plants free of viruses, such as fig mosaic virus (FMV), has become a priority in many plant breeding programs. In this study, leaves from plants of two fig cultivars, Kodato and Dattora, infected with FMV were collected from both Mecca and Al-Taif, Saudi Arabia. Transmission electron microscopy of ultrathin leaf sections showed double membrane bodies, characteristic of FMV particles, only in the mesophyll cells of infected samples. Protein analysis using sodium dodecyl sulfate-polyacrylamide gel electrophoresis revealed the presence of a protein band with a molecular weight of 35 kDa, which corresponded to the viral coat protein; and FMV was confirmed by Western blot and enzyme-linked immunosorbent assay (ELISA) tests. To obtain virus-free plants, apical shoot culture was applied. A comparison of various artificial media with different concentrations of growth regulators was evaluated to optimize shoot formation, shoot multiplication, and root formation, and was followed by plant acclimation ex vitro. Direct ELISA analysis of shoots micropropagated from meristem tip explants indicated that there were virus-free shoots, when compared to infected plants (positive control), while there were no significant differences between these explants and healthy samples (negative control). This study demonstrated that in vitro micropropagation of Saudi F. carica infected with FMV virus led to the successful elimination of the virus.

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Risk assessment of some organic contaminants: a case study based on food consumption in Tanta and Ismailia cities, Egypt

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Abstract

The impact of some organic pollutants on some residents of Tanta and Ismailia cities of Egypt through their consumption of vegetables, fruits and fish (Nile tilapia and catfish) was examined. Residues of rganochlorine (OCS) and organophosphorus (OPS) as some polychlorinated biphenyls (PCBS) were compared with pesticides as well maximum residue limits (MRLS).

Probable health risk to consumers was also assessed. P, P′-DDT, P, P′-DDE, P, P′-DDD, endrin, α-BHC, (lindane), and hexachlorbenzene (HCB) were the most detected organochlorine compounds, but did not exceed MRLs.

However, OPS residues were the most frequently detected contaminants. PCBs congeners 28, 70, 52, and 180 were detected in tilapia fish from Tanta, but congeners 28 and 180 were the only detected congeners in samples collected from Ismailia region.

ΣPCBS values in all matrices did not exceed MRLS. Hazard index (HI) exhibited unity for all compounds at 50 the decreasing order: catfish > vegetables > fruits > Nile tilapia in Tanta, while in Ismailia the order was Nile tilapia > fruit > vegetables. Results also revealed that risk values for adults were greater than those of children categories.

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16; 1-10

Gender difference in unconditioned and conditioned predator fear responses in Smith's zokors (*Eospalax smithii*)

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Abstract

Risk taking is imperative for the survival and fitness of animals since they constantly face innumerable threats from various sources. Indeed, the ability of the individual to balance between the costs and benefits of various options and adopt a wise decision is critical for the well-being of the animal. In the current study, we investigated gender differences in risk taking and decision making in male and female Smith's zokors (*Eospalax smithii*), a subterranean rodent species, in the defensive withdrawal apparatus (DWA) under novel, predator and conditioned contexts. Under novel context, males showed more exploratory and less hiding behavior than females especially during the first half of the testing session. However, under predator and conditioned contexts, non-significant sexually dimorphic behavioral differences were observed. Nevertheless, analysis of the performance of each gender separately across the three contexts revealed that males showed strong aversion to the predator and conditioned contexts. By contrast, females did not significantly vary their behavioral responses when exposed to the predator and conditioned cues. Our results suggest that males are more inclined to indulge in riskier exploratory activities while females may be regarded as risk-aversive. The current findings highlighted the functional significance of the trade-off between risk and exploration in the natural environment such that male and female zokors differed in how they gather and process information during risky confrontations that ultimately elicit significant variations in their decision-making and coping strategies to dangerous events.

Science of the Total Environment
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Pine sawdust biomass and biochars at different pyrolysis temperatures change soil redox processes

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Abstract

To date, no investigation has been carried out to explore the effects of biochars produced at different pyrolysis temperatures on the dynamics of redox potential (EH) and pH in a contaminated floodplain soil. Thus, we aimed to quantify the dynamics of EH and pH in contaminated flooded soils treated with 70 t ha−1 of pine sawdust biomass (S&BM) and biochars pyrolyzed at 300 °C (S&BC300) and 550 °C (S&BC550) and pre-incubated for 105 days in an automated biogeochemical microcosmsystem. Microbial community compositionwas also determined via analyzing phospholipid fatty acid (PLFA).We found that BC300 and BC550 treatments substantially decreased (3–6.5%) and BM increased (~37%) the mean of soil EH compared to the untreated contaminated soil (CS).·The largest EH decline in S&BC550 was at the rate of −80 mV h−1 at 10 h while it was observed at 25 h in S&BC300 and 20–25 h in S&BMor CS, respectively. At high EH, a higher total PLFA biomass andmicrobial groups in the CS (71–87%) were found in comparison to treated soils. Higher aromaticity and ash content in BC550 than BC300 and BM led to the greater PLFA biomass and microbial groups which contributed to higher capacity of accepting and donating electrons in soil slurry and were probably one reason for the largest decrease in EH.
Pine sawdust biomass and BCs have a noticeable influence in soil biogeochemical processes relevant to fluctuating redox conditions.

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Biochar Effects on Rice Paddy: Meta-analysis

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Abstract

Rice is staple for nearly half of the world population. Biochar (BC) improves crop yields, reduces greenhouse gas (GHG) emissions, and immobilizes heavy metals in the soil. This study was aimed to meta-analyze the data from the published articles focused on the various BCs' effects on rice yield, soil acidity, GHG emissions, and bioavailability of Cd and Pb. The data of pyrolysis temperature, application rate, and feedstock of BCs were categorized by using the MetaWin software for calculating the mean effect sizes (E) with 5% confidence intervals (CI). Compared to the control, the BCs increased soil pH and rice yield by 11.8%(mediumE+: 0.436 to 0.439) and 16%(large E+: 0.790 to 0.883), respectively.
Applying BCs derived from different feedstocks and pyrolysis temperatures reduced N2O emissions fromrice paddies (large E_:_0.692 to_0.863). The BCs produced at 550–600°C reduced the GHG emission with medium to large negative effects (E_: _1.571 to _0.413). Applications of BCs at a range of 41–50 t ha_1 were the best for rice productivity.
Applications of all types and rates of BCs showed the significant decrease of available Cd by 35.4%–38.0% in a soil and led to the Cd reduction by an average of 43.6% in rice grains compared to the untreated soils. Applying BC is a promising approach to meet the challenges of sustainable global rice production, and the properties of BCs should be fully characterized and designed depending on its needs prior to its application.

Land Degradation & Development
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29:2162–2171

Biochar influences soil carbon pools and facilitates interactions with soil: A field investigation

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Abstract

Biochar promotes the storage of organic carbon (OC) in soils. OC is unevenly distributed in soils among different particle- size fractions showing different structures, functions, and stability. The objective of this study was to investigate the biochar–soil interactions and the redistribution of soil C in different soil fractions based on a 2- year field experiment. Fractionation was done by particle sizes including coarse sand (250–2,000 μm), fine sand (53–250 μm), and silt/clay (<53 μm). Integrated spectroscopic techniques were employed to examine physical characteristics of biochar–soil interactions in different soil fractions. Application of biochar increased OC by 37%, 42%, and 76% in soil particle- size fractions of 53–250, <53, and 250–2,000 μm, respectively.

This was supported by X- ray fluorescence spectroscopy analysis, which showed an increase of C contents by 5–56% with biochar addition. The highest increment in OC was found in coarse sand fraction, and redistribution of OC was detected depending on various soil particle sizes. Results of scanning electron microscopy combined with electron dispersive X- ray spectroscopy analysis showed the interactions between soil and biochar, which could be attributed to oxidized functional groups (O—C¼O, C¼O, and C—O) captured by the X-ray photoelectron spectroscopy. The long-term aged biochar could be beneficial to enhance soil quality by promoting OC storage and facilitating positive biochar–soil interactions.

Faculty of Computing and Information

Computers and Electrical Engineering
2018
(69) 212–223

Data reduction in a cloud-based AMI framework with service-replication

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Abstract

Smart grids use cloud-based Advanced Metering Infrastructure (AMI) systems to ensure high performance in collecting, storing, and processing energy consumption data originating at the smart meters. However, this data is usually huge, so its transmission to the cloud requires stable, high-bandwidth Internet connections, which may be costly or even unavailable. A solution allowing transmission on normal connections is to reduce the data by approximating it at the cloud using forecasting. The problem is that AMI data changes pattern continuously and unexpectedly, due to the constant, uncoordinated addition and removal of loads. This makes predicting the data using a single forecasting method almost impossible. We circumvent this problem by designing an adaptive, multi-method, service- replicated Framework. At any time, the Framework uses a method that is optimal for the current data. Once the data changes pattern, the Framework automatically switches to another method that suits the new pattern. Experimental results show reduction rates up to 55% on real AMI data.

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A New Accurate Numerical Method Based on Shifted Chebyshev Series for Nuclear Reactor Dynamical Systems

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Abstract

A new method based on shifted Chebyshev series of the first kind is introduced to solve stiff linear/nonlinear systems of the point kinetics equations.The total time interval is divided into equal step sizes to provide approximate solutions.The approximate solutions require determination of the series coefficients at each step.These coefficients can be determined by equating the high derivatives of the Chebyshev series with those obtained by the given system. A new recurrence relation is introduced to determine the series coefficients. A special transformation is applied on the independent variable tomap the classical range of the Chebyshev series from [−1, 1] to [0, h].The method deals with the Chebyshev series as a finite difference method not as a spectral method.

Stability of the method is discussed and it has proved that the method has an exponential rate of convergence.Themethod is applied to solve different problems of the point kinetics equations including step, ramp, and sinusoidal reactivities. Also, when the reactivity is dependent on the neutron density and step insertion with Newtonian temperature feedback reactivity and thermal hydraulics feedback are tested. Comparisons with the analytical and numerical methods confirm the validity and accuracy of the method.

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2017
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Generalized trigonometric Fourier- series method with automatic time step control for non-linear point kinetics equations

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Abstract

The trigonometric Fourier-series method (TFS) is generalized to provide approximate solutions for non-linear point kinetics equations with feedback using varying step sizes. This method can provide a very stable solution against the size of the discrete time step allowing much larger step sizes to be used. Systems of the point kinetics equations are solved using Fourier-series expansion over a partition of the total time interval. The approximate solution requires determining the series coefficients over each time step in that partition. These coefficients are determined using the high-order derivatives of the solution vector at the beginning of the time step introducing a system of linear algebraic equations to be solved at each step. This system is similar to the Vandermonde system. Two successive orders of the partial sums are used to estimate the local truncation error. This error and some other constrains are used to produce the largest step size allowable at each step while keeping the error within a specific tolerance. The process of calculating suitable step sizes should be automatic and inexpensive. Convergence and stability of the proposed method are discussed and a new formula is introduced to maintain stability. The proposed method solves the general linear and non-linear kinetics problems. The method has been applied to five different types of reactivities including step/ramp insertions with temperature feedback. The method is seemed to be valid for larger time intervals than those used in the conventional numerical integration, and is thus useful in reducing computing time. Computational results are found to be consistent with the analysis, they demonstrate that the convergence of the iteration scheme can be accelerated and the resulting computing times can be greatly reduced while maintain computational accuracy.

Quality and Quantity
2017
53:207–220

The stackelberg differential Game for Counter-terrorism

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Abstract

The Stackelberg approach of the differential game is important to fight terrorism, that is through government tasks such as education improvement, solving the unemployment problems, justice in the society, knowledge of true religion and the security, this approach is a hierarchical solution of a differential game, leader, and followers. This study is divided into two stages; stage 1: the government is the leader and the terrorist organization is the follower. Stage 2: the terrorist organization is the leader and government is the follower, we study the analytic form of this approach for obtaining the optimal strategy to fight terrorism.

Arabian Journal for
Science and Engineering
2018
16 pages

Feature Selection Using Chaotic Salp Swarm Algorithm for Data Classification

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Abstract

Salp swarm algorithm (SSA) is a recently created bio-inspired optimization algorithm presented in 2017 which is based on the swarming mechanism of salps. Despite high performance of SSA, slow convergence speed and getting stuck in local optima are two disadvantages of SSA. This paper introduces a novel chaotic SSA algorithm (CSSA) to avoid these weaknesses, where chaotic maps are used to enhance the performance of SSA algorithm. The CSSA algorithm is incorporated with the K-nearest neighbor classifier to solve the feature selection problem, in which twenty-seven datasets are used to assess the performance of CSSA algorithm. The results confirmed that the proposed chaotic SSA (especially Tent map) produced superior results compared to standard SSA and other optimization algorithms.

The European Physical Journal Plus
2018
17pages

Dynamical study of a chaotic predator-prey model with an omnivore

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Abstract

In this paper, the dynamics and bifurcations of a three-species predator-prey model with an omnivore are further investigated. The food web considered in this work comprises prey, predator and a third species, which consumes the carcasses of the predator along with predation of the original prey.
The conditions for existence, uniqueness and continuous dependence on initial conditions for the solution of the model are derived. Analytical and numerical bifurcation studies reveal that the system undergoes transcritical and Hopf bifurcations around its equilibrium points. Further, the Hopf bifurcation curves in the parameters' space along with codimension two bifurcations of equilibrium points and bifurcation of limit cycles that arise in the system are investigated. In particular, the occurrence of generalized Hopf, fold Hopf and Neimarck-Sacker bifurcations is unveiled and illustrates the rich dynamics of the model. Finally, bifurcation diagrams, phase portraits and Lyapunov exponents of the model are presented.

Applied Mathematics and Computation
2018
(338) 314–336

Further analytical bifurcation analysis and applications of coupled logistic maps

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Abstract

In this work, we extend further the analytical study of complex dynamics exist in two coupled logistic maps. New results about the occurrence of various types of bifurcation in the system, including flip bifurcation, pitchfork bifurcation and Neimark–Sacker bifurcation are presented. To the best of authors' knowledge, the presence of chaotic dynamics in system's behavior has been investigated and proved analytically via Marotto's approach for first time. Numerical simulations are carried out in order to verify theoretical results. Furthermore, chaos based encryption algorithm for images is presented as an application for the coupled logistic maps. Different scenarios of attacks are considered to demonstrate its immunity and effectiveness against the possible attacks. Finally, a circuit realization for the coupled logistic maps is proposed and utilized in a suggested real time text encryption system.

Journal of Computational and Applied Mathematics
2018
(328) 177–196

On the bifurcation of Marotto's map and its application in image encryption

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Abstract

The aim of this paper is to address the codimension-one bifurcation of Marotto's map and its utility in image encryption. First of all, local stability analysis and local bifurcation analysis of fixed points of the considered map are investigated in details. According to the classical bifurcation theory and the center manifold theorem, the map exhibits various bifurcation types such as transcritical, flip and Neimark–Sacker bifurcations. Second of all, the map is proven to be chaotic in the sense of Marotto. Since image encryption based on chaotic maps is very promising for cryptography, Marotto's map, compound chaos, and spatiotemporal chaos are combined to encrypt and decrypt images. Numerical simulations agree with the analytical framework for the complex dynamics of the map. Furthermore, different test images are used to demonstrate the effectiveness of the method implemented for encryption.

Commun Nonlinear Sci Numer Simulat
2018
(59) 409–423

Qualitative dynamical analysis of chaotic plasma perturbations model

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Abstract

In this work, an analytical framework to understand nonlinear dynamics of plasma pertur- bations model is introduced. In particular, we analyze the model presented by Constanti- nescu et al. [20] which consists of three coupled ODEs and contains three parameters. The basic dynamical properties of the system are first investigated by the ways of bifurcation diagrams, phase portraits and Lyapunov exponents. Then, the normal form technique and perturbation methods are applied so as to the different types of bifurcations that exist in the model are investigated. It is proved that pitcfork, Bogdanov–Takens, Andronov–Hopf bifurcations, degenerate Hopf and homoclinic bifurcation can occur in phase space of the model. Also, the model can exhibit quasiperiodicity and chaotic behavior. Numerical simu- lations confirm our theoretical analytical results.

Journal of Ambient Intelligence and Humanized Computing
2018

Computer aided detection of mammographic mass using exact Gaussian–Hermite moments

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Abstract

Breast cancer is one of the common cancer deaths in women worldwide. Early detection is the key to reduce the mortality rate. Clinical trials have shown that computer aided systems (CAD) have improved the accuracy of breast cancer detection. This paper proposed a highly accurate CAD system based on extracting highly significant features using exact Gaussian– Hermite moments. The obtained feature vector is presented to K-NN, random forests and AdaBoost classifiers. The proposed system is evaluated using two different datasets namely IRMA and MIAS. The evaluation metrics of accuracy, TP, FP and area under ROC curve using 10-fold cross-validation are calculated. The results indicate the usefulness of the proposed exact Gaussian–Hermite moments features for distinguishing between normal and abnormal lesions and the superiority of the moments features compared with the conventional methods.

Journal of Universal Computer Science
2018
(24) , 935-974

Lightweight Adaptive E-Advertising Model

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Abstract

Adaptive online advertising is a rapidly expanding marketing tool that delivers personalised messages and adverts to Internet users. At a time when the Internet is burgeoning, many websites use an adaptation process to tailor their advertisements, however, often in an ad-hoc manner. Thus, a new model that guarantees a systematic integration of adaptive features on existing business websites has become an urgent requirement to satisfy customers. This paper aims to solve this issue, by presenting an innovative model for e-advertising adaptation: the Layered Adaptive Advertising Integration (LAAI). LAAI is building upon previous models and frameworks from different domains, by selecting and adding novel features appropriate for e-advertising. Based on this model, a new adaptation system -AEADS - is developed, to test and evaluate the LAAI model. This research also reports on the perception on the methods towards obtaining generalisation, portability and efficiency, as proposed by the LAAI model, by evaluating how a range of businesses are enabled to adapt their advertisements based on user profiles and behaviours.

Faculty of Engineering – Ismailia

Experimental Thermal and Fluid Science
2018
(91) , 20-34

Experimental and Numerical Investigation of Turbulent Natural convection between two horizontal concentric cylinders at different axis Ratios and Orientation Angles

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Abstract

Turbulent natural convection between two horizontal concentric cylinders with different orientation and axis ratios for the outer cylinder with both open ended has been investigated experimentally and numerically. A Constant heat flux was imposed at the outer cylinder at five different heat fluxes 503, 751, 1002, 1251 and 1508 W/m^2 while the inner cylinder was insulated. The hydraulic diameter was kept constant at 60 mm.
The Rayleigh number *Ra* was varied from 1.017×10^7 to 3.25×10$^{7.}$ The outer cylinder orientation angle,ϕ was varied from 0º to 90º with 15º increment. The influence of the axis ratio (major to minor axis) for the outer cylinder was studied at range from 1.0 to 2.0. A finite difference method for the governing equations related with the standard k-ε model has been utilized. The surface temperature distribution at outer cylinder, the axial velocity and average Nusselt number were estimated at different orientation angles and axis ratios of the outer cylinder. Turbulent intensity and axial velocity distribution were estimated numerically. Both experimental and numerical results for the average Nusselt number show good agreement. The results showed that the heat transfer enhancement starts as the outer cylinder orientation angle increased more than 37º depended on the axis ratio. The maximum increase in the average Nusselt number reached 25% at vertical position and axis ratio at 2 for the outer cylinder.

Engineering Failure Analysis
2018
(91) , 201-215

A three dimensional finite element analysis of insulated rail joints deterioration

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Abstract

Railroad corridors include a large number of insulated joints that act as elements of signalling and broken rail detection systems. Unfortunately, insulated joints are provided with a gap to safeguard electrical insulation causing stiffness discontinuity and stress singularity in rail sections in the proximity of insulated joints. Obviously, these problems will have a profound impact on diminishing the service life of insulated joints, and thus on advancing the maintenance costs.

This research presents numerical simulations to investigate deterioration (both mechanical and electrical) of insulated joints. A parametric study was performed to quantify the effects of vertical wheel load, friction coefficient, joint inclination, and railhead edge filleting as well as the effect of joint width. The finite element modelling assessed that the joint inclination and arc fillet can effectively prolong the lifetime of joints through mitigations of stresses, strains, and reductions of insulating width. In addition, the friction level is severely affecting the mechanical deterioration at the rail surface in the proximity of rail joints. However, at sub–surface the influence of friction coefficient is relatively small. Finally, the effect of joint width was assessed to be trivial for the studied cases.

Journal of Coastal Conservation
2018
22:1143–1156

Analysis of sedimentation at the fishing harbor entrance: case study of El-Burullus, Egypt

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5 Department of Transdisciplinary Science and Engineering, School of Environment and Society, Tokyo Institute of Technology, Tokyo, Japan

Abstract

Sedimentation in artificial ports and harbors is a common issue throughout the world. Based on an assessment of the coastal fishing harbors in Egypt, the El-Burullus fishing harbor has been found to suffer severely from siltation. Sediment deposits are concentrated at the harbor entrance, which threatens navigation through this area. Although the harbor authority has constructed a perpendicular extension on the main breakwater to mitigate these siltation issues, fishing boats are still suffering from the siltation at the harbor entrance. Dredging is required every year to maintain continuity of navigation through the harbor; the cost of dredging is a critical element which impacts the economic feasibility of the harbor. Therefore, the need to investigate new solutions for the siltation issue is critical. In this study, a two-dimensional calibrated and validated model using the Coastal Modeling System package is used to understand the coastal processes within the study area. It is also used to investigate the effects of the proposed breakwater extension on the siltation at the harbor outlet. Field data such as hydrographic surveys, waves, tides, and lake outlet discharge data were collected and included in the model. The results obtained for the current breakwater conditions confirmed the claims of the fishermen that the sedimentation problem still occurs at the entrance. Thus, five possible solutions to mitigate the problem were proposed and simulated considering the following parameters: sediment deposition rate to the west of the main breakwater, the erosion rate in front of the seawall in the eastern part of the harbor, and the morphological changes within the El-Burullus lake outlet. According to the simulation results, reducing the length of the upper edge of the middle jetty by 90 m improves the stability of the harbor entrance. Alternatively, replacing the perpendicular extension by an inclined extension of 60 m in length and shortening the middle jetty by 60 m reduces the accretion and erosion rates around the harbor which promotes the long-term stability for the coastal area in addition to favorable conditions to the El-Burullus harbor entrance.

Ecological Engineering
2018
(122) 207–218

Organic pollutants removal from oily wastewater using clean technology economically, friendly biosorbent (Phragmites australis)

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Abstract

A cost operative and favorable technology has been revealed for the removal of (COD, BOD and Oil & Grease) from oily industrial wastewater effluents. Batch scale studies for the biosorption potential of novel biosorbent Phragmites australis (Reeds). The study was supported at different constraints to obtain prime conditions of biosorbent dose, time of contact, pH, agitation speed and initial organic loads concentration. To dissect the propriety of the procedure and decided amount of organic loads removal, Langmuir and Freundlich isotherms were connected. The ideal estimations of contact time and agitation speed were found at 120 min and 150 rpm respectively. The ideal biosorption limits were seen at pH 7. Both pseudo-first and pseudo-second order models were connected and it was discovered that information fitting best to the pseudo-second-arrange active model.
The outcomes demonstrated that Phragmites australis was an empowering adsorbent for the biosorption treatment of oily derivatives industrial wastewater.

RSC Advances
2018
8, 40511–40528

Regression, kinetics and isotherm models for biosorption of organic pollutants, suspended and dissolved solids by environmentally friendly and economical dried Phragmites australis†

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Abstract

Low cost adsorbents such as P. australis have received considerable interest owing to their low cost and easy availability. The aim of the present study was the evaluation of the removal of chemical oxygen demand (COD), biological oxygen demand (BOD), total suspended and dissolved solids (TSS and TDS) using dried P. australis in influent wastewater to a wastewater treatment plant. The results of the COD and BOD concentration reduction with P. australis at optimum operating conditions were determined for maximum reduction and adsorption isotherms. The maximum reduction of COD, BOD, TSS and TDS concentrations under the optimum operating conditions was 92.27%, 93.89%, 94.38% and 91.61%, respectively. The results demonstrate that the new dried biosorbent is able to adsorb all the aforementioned contamination. It achieved an adsorption capacity for COD of 72.5 mg g_1 and an adsorption capacity for BOD of 43.93 mg g_1. The results were well fitted by the pseudo-second order model with R2 ¼ 0.984.

Applied Energy
2018
(220) 70–86

Assessment of the carbonized woody briquette gasification in an updraft fixed bed gasifier using the Euler-Euler model

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Abstract

This paper reports on the numerical simulation and experimental studies of carbonized woody briquettes gasification employing an updraft fixed bed gasifier. There is a strong industrial stake when it comes to the optimization of this gasification process, in terms of the flexibility of the type of biomass and its conversion efficiency.
The influences of the gasification temperature and the equivalence ratio (ER) on the gaseous production and the tar yield were examined. In order to optimize the operating conditions of the biomass gasification process, a numerical model was developed using the COMMENT code (Combustion Mathematics and Energy Transport). This model is a two-dimensional computer model describing the biomass gasification process in an updraft gasifier using carbonized woody briquettes as fuel. The present study proved that ER significantly influenced the composition of gaseous species and its optimization is important to obtain a higher gasification rate.
The particle size presented considerable effects on the temperature distribution within the gasifier and the syngas compositions produced during the gasification process as well. The numerical model presented was validated by the experimental results and it provided a promising way to simulate the gasification of solid fuel, which is considered to be a versatile and useful computational tool to optimize the biomass gasification process and to design fixed bed gasifiers.

Energy
2018
(142) 862-877

Experimental and modeling studies of Portuguese peach stone gasification on an autothermal bubbling fluidized bed pilot plant

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Abstract

Among the renewable energies available, biomass constitutes an auspicious option, due to its environmental-friendly character allied to its significant energy supply. As a path to maximize biomass energy efficiency, gasification has been reported as an adequate technology. Numerical models that can predict and optimize the experimental conditions as well as the equipment design for biomass gasification are imperative, towards a cost-saving and sustainable performance. This work shows the experimental and numerical results of thermal gasification of Portuguese peach stone. Assays were performed using a thermal gasification pilot plant with a bubbling fluidized bed at temperatures ranging from 750_ C to 850_ C with mass flow rates of 30 kg/h to 60 kg/h. A homemade comprehensive two-dimensional CFD model is proposed to optimize the operating conditions of the biomass gasification process. The numerical model results were compared with experimental data and good agreement was found. A parametric study was performed in order to understand the influence of moisture content, steam to biomass ratio and equivalence ratio in the composition of the producer gas. The results of the study showed a negative impact of moisture and equivalence ratio over conversion efficiency and producer gas quality, and a positive impact for steam to biomass ratio which promotes higher calorific values and overall efficiency for the process.

Energy
2018
(158) 192-203

Parametric studies on corn straw combustion characteristics in a fixed bed: Ash and moisture content

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Abstract

This experiment was conducted on fixed bed combustion in a one-dimensional bench. The effects of ash and moisture content on the combustion characteristics of corn straw were determined. The two parameters directly relate to the burning rate and affect combustion efficiency and the release of gas. The bed temperature distribution, mass loss rate and gas composition were measured in the bed. The results show that the optimum char combustion efficiency was achieved at 10% moisture content of corn combustion. A slight increasing the moisture content to 10% can obtain a higher bed temperature and accelerate the ignition rate in the char oxidation stage, while there is also a slight decrease in the conversion ratio of C to CO. The conversion rate of S to SO2 for 10% moisture content was higher with the temperature zone above 1000 _C. With the increased ash content, there was a slight increase in the average ignition rate; the bottom bed temperature increased with a serious ash slagging. C was converted to CO and presented a slightly increasing trend for higher ash content and the conversion of N to HCN. This work provides an overall understanding of corn combustion for large boiler system.

Energy Conversion and Management
2018
(155) 287–300

Performance of hybrid compression ignition engine using hydroxy (HHO) from dry cell

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d Department of Chemistry, Faculty of Science, Ain Shams University, Cairo, Egypt

Abstract

The high consumption rates of fossil fuel and unburned hydrocarbons pollution in exhaust gases are considered to be the main problems that face the world today. The use of Brown's gas (HHO gas i.e. mixture of hydrogen and oxygen) as a new source of energy, reducing the amount of injected fuel and ensuring complete combustion of the mixture are gaining an increasing interest worldwide. There are two different types of HHO cells; HHO wet cell and HHO dry cell. In this paper, the HHO dry cell was used because it has several advantages, such as its small size and ease to install in engines. The HHO dry cell uses the electrolysis process in order to produce the HHO gas from water, which is ionized by adding NaOH as the electrolyte. Three types of HHO dry cell were used, namely alpha, beta and omega cells. Many measured data were done to choose the best one of the HHO dry cells.

Oxygen sensor, MAP sensor, and MAF sensor were used to control the fuel injection. From the recorded measured experimental data, the beta cell has shown a good performance for the engine. The amount of HHO gas needed to be supplied to a 1500 CC engine is 0.375 LPM. The results also showed that there is a 17% reduction in fuel consumption and a 17% reduction in CO, a 27% reduction in HC, a 15% increase in O2 and a 1% increase in CO2.

Faculty of Science

Ceramics International
2018
(44) 2274–2282

M-CZ composites from Egyptian magnesite as a clinker to RCK refractory lining

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Abstract

Processing of magnesia-calcium zirconate (M-CZ) composites as clinker for manufacturing refractory bricks of rotary cement kilns (RCK) were produced from Egyptian magnesite and zirconia. 4.8–24.8 wt% of zirconia was added as a modifier to Egyptian magnesite. The mixtures were milled, uni-axially formed and fired at 1550 °C for 2 h. Phase composition, microstructure, physical, mechanical thermal properties and wettability by Portland cement clinker of the obtained specimens were investigated. Addition of 9.8 wt% zirconia to Egyptian magnesite gave the highest densification, best homogenous microstructure and the maximum cold crushing strength (174.9 MPa). In addition, no free CaO was recorded. This composite can be strongly nominated for lining the RCK.

Protection of Metals and Physical Chemistry of Surfaces
2018
(54) 934–952

Electrochemical Investigation of Chloride Pitting Attack on Carbon Steel Piping and its Inhibition by Novel Synthesized Cationic Surfactants[1]

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Abstract

The durability of shell and tube heat exchanger working in rich chloride containing formation water was maximized by providing high immunity towards pitting corrosion. Two new cationic surfactants namely OD20 and OD50 were synthesized from oleic acid derivative to evaluate their performance as pitting corro-sion inhibitors for API 5L X 60 type carbon steel alloy. Pitting corrosion technique was executed to evaluate the pitting inhibition performance against pitting attack by studying the anodic cyclic polarization diagram obtained for each synthesized inhibitor. 95.9% inhibition efficiency against pitting growth was reported for OD20 while 89% was measured for OD50. Potentiodynamic polarization measurements and electrochemical impedance spectroscopy were conducted to study the performance of the synthesized inhibitors against uni-form type corrosion. High inhibition efficiency against uniform type corrosion was reported for both of the synthesized inhibitors at 92.2% for OD20 and 95.7% for OD50. The obtained electrochemical results were confirmed by investigation of the surface morphology of carbon steel alloy by scanning electron microscope (SEM).

Journal of Chemical, Biological and Physical Sciences
2018

Corrosion Inhibition of Zinc in Hydrochloric Acid Solution using some organic compounds as Eco-friendly Inhibitors

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3 Chemist, Delta Fertilizers Company in Talkha, Egypt.

Abstract

The effect of some corrosion inhibitors on the corrosion of Zn in 0.5 M HCl have been investigated by using mass loss (ML), potentiodynamic polarization (PP), electrochemical impedance spectroscopy (EIS) and electrochemical frequency modulation (EFM) techniques. Polarization data clearly indicated that these compounds behaved as mixed type inhibitors. The effect of temperature on corrosion inhibition has been studied, the thermodynamic activation and adsorption parameters were calculated and discussed. EIS have used to investigate the mechanism of corrosion inhibition. The adsorption of these compounds on Zn was found to obey Langmuir adsorption isotherm.
The surface morphology of the Zn specimens was evaluated using scanning electron microscope (SEM), Atomic Force Microscopy (AFM) and Fourier transform infrared spectroscopy (FTIR). Quantum chemical calculation was applied to elucidate the adsorption mode of inhibitors molecules onto Zn surface.

Science of the Total Environment
2018
(613–614) 877–885

Geological and Hydrogeochemical Controls on Radium Isotopes in Groundwater of the Sinai Peninsula, Egypt

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Abstract

Radium isotopes (^{226}Ra and ^{228}Ra) were analyzed in 18 groundwater samples from the Nubian Sandstone Aquifer System (NSAS) and the shallow alluvial aquifers overlying the basement complex of the Sinai Peninsula, Egypt. Groundwater samples from deep Nubian aquifer wells (total depths 747 to 1250 m) have ^{226}Ra and ^{228}Ra activities ranging from 0.168 to 0.802 and 0.056 to 1.032 Bq/L, respectively. The shallower Nubian aquifer wells (63 to 366 m) have ^{226}Ra and ^{228}Ra activities ranging from 0.033 to 0.191 and 0.029 to 0.312 Bq/L, respectively. The basement shallow alluvial aquifers have ^{226}Ra and ^{228}Ra activities ranging from 0.014 to 0.038 and 0.007 to 0.051 Bq/L, respectively. Combined Ra activities in most wells were generally in excess of the US Environmental Protection Agency (EPA), the European Union (EU), and the World Health Organization (WHO) maximum contaminant levels (MCL) for drinking water. Radium in groundwater is produced mainly by decay of parent nuclides in the aquifer solids, and observed activities of dissolved Ra isotopes result from a combination of alpha-recoil, adsorption/desorption, co-precipitation/dissolution processes. The observed correlation between Ra activities and salinity indicates that adsorption/desorption processes may be the dominant factor controlling Ra mobility in Sinai groundwater. Radium activities in central and northern Sinai are generally higher than those in southern Sinai, consistent with a gradual increase in salinity and water-rock interaction with increasing groundwater age. Barite is approximately saturated in the groundwater and may limit maximum dissolved Ra concentration. The results of this study indicate that Sinai groundwater should be used with caution, possibly requiring Ra removal from water produced for domestic and agricultural consumption.

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2018
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Continental intraplate volcanism in the Sinai subplate: The Oligo-Miocene basalts of the Gulf of Suez rift

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Abstract

Three major Oligo-Miocene basaltic occurrences in Sinai, along the eastern side of the Gulf of Suez rift (Wadi Tayiba, Wadi Matulla and Gabal Abu Durba), have been chosen to reveal the geochemistry and petrogenesis of the magmatism associated with this newly-formed continental rift. They include riftrelated basaltic/doleritic dikes and sills and isolated basaltic lava flows, belonging to a prolonged persistent magmatic event occurred around 20 Ma, that crosscut older Phanerozoic strata and Precambrian basement. The Gulf of Suez rift (GSR) volcanics show confined range of SiO2 contents (47.51 e52.25 wt%) and Mg# values (31e48) and consist of alkaline basalts, hawaiites, mugearites and transitional tholeiitic basalts. All of the investigated basaltic samples possess explicit Fe-enrichment and sodic nature and are silica-oversaturated (quartz-normative) and metaluminous (diopside-normative and have NK/A<1 and A/CNK <1). The compatible transition elements Ni (9e69 ppm), Cr (14e123 ppm), V(237e453 ppm), Sc (19e43 ppm) are generally depleted relative to primitive lavas, consistent with the evolved nature of these basalts (e.g. low Mg# (<68) and silica-oversaturation). Conversely, these basalts show strong enrichment of most of the incompatible LIL and HFS elements relative to primitive mantle, analogous to ocean island basalts. The GSR basalts have suffered minimal degree of crustal contamination, which was likely a minor contribution from the lower crust that superimposed on crystal fractionation.

The Nb/Ta and Zr/Hf ratios of the studied basalts are comparable to those of OIB and enriched MORB and are suggestive of their derivation from mantle source. The GSR basalts were most probably derived via partial melting of quite deep asthenosphere (>70 km) amphibole-bearing garnet peridotite mantle source.

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343 (3): 283–288

New record of *Chaetomium grande* Asgari & Zare (Chaetomiaceae) for the Egyptian and African mycobiota

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Abstract

The first record of *Chaetomium grande* (Ascomycota, Chaetomiaceae) for the Egyptian and African fungi is reported here. The species was found during an extensive taxonomic and ecological revision of the genus *Chaetomium* supported by Science and Development Technology Fund in Egypt. *Ch. grande* identified phenotypically and was subjected to sequencing for confirmation. The internal transcribed spacer (ITS) 1–5.8 s – ITS2 rDNA sequences obtained were compared with those deposited in the GenBank Database and registered with accession number MF787599 in the NCBI Database. We provide an updated full description and illustration of the species.

Key words: Ascomycota, Endobionts, Saint Katherine Protectorate, Sinai, STDF, Taxonomy

Tetrahedron
2018
(74) 1681-1691

Efficient synthesis of □-substituted-□-arylmethyl phosphonates using trichloroacetimidate CeC coupling method

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Abstract

A simple convenient protocol for the synthesis of diethyl a,a-diaryl methylphosphonate derivatives 5a-f, 6b-f, 7a-f and 8a-f, diethyl a-alkenyl a-aryl methylphosphonates 9a-d and 10a-d and a-(oxoalkyl) a-aryl methylphosphonate 11a-d and 12a-d is described. Trichloroacetimidates 3a-d were treated with activated arenes, styrene, allyltrimethylsilane or silylenol ethers C-nucleophiles in the presence TMSOTf to afford the desired products in good yields and short reaction ti

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2018
(56) 51-59

Convenient Synthesis of Some Novel Pyridazinone-Bearing Triazole Moieties

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Abstract

The chemoselective reactions of 2-(5-mercapto-4-phenyl-4*H*-[1,2,4]triazol-3-ylmethyl)-6-*p*-tolyl-4,5- dihydro-2*H*-pyridazin-3-one (3) with different electrophiles were evaluated. Triazole 3 reacted with alkyl halides in the presence of triethylamine in alcohol to give the corresponding *S*-substituted derivatives. On the basis of *S*-chemoselective reactions of triazole 3, a series of amino acid 10a–d and dipeptide derivatives 12a–d were prepared via azide coupling of the corresponding hydrazides 9 and 15 with amino acid ester hydrochlorides, respectively. *N*-Substituted triazoles 6a–c or 7a–d attached to pyridazin-3-one moiety were successfully formed by the reaction of 3 with activated acrylic acid derivatives or with amines. Antibacterial activities of the synthesized derivatives were investigated through correlation with *Escherichia coli* FabH inhibitory activities using molecular modeling docking software. The antimicrobial activity of synthesized compounds was evaluated, showing best inhibition zone for *N*-substituted carboxylic acid 5a and *N*-substituted nitrile 5c parallel to the molecular modeling studies.

RSC Advances
2018
8, 7385–7395

Efficient synthesis of ether phosphonates using trichloroacetimidate and acetate coupling methods

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Abstract

A series of ether phosphonates have been prepared by trichloroacetimidate and acetate coupling methods. Trichloroacetimidates or acetates were treated with primary and secondary alcohols as O-nucleophiles in the presence of catalytic TMSOTf to afford 21 examples of diethyl alkyloxy(substitutedphenyl)methyl phosphonates via C–O bond formation in 55–90% yields and short reaction time.

Spectrochimica Acta Part A: Molecular and Biomolecular Spectroscopy
2017
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A novel, highly sensitive, selective, reversible and turn-on chemi-sensor based on Schiff base for rapid detection of Cu(II)

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Abstract

In this work, a novel optical fluoro-chemisensorwas designed and synthesized for copper (II) ions detection. The sensor film is created by embedded N,N-Bis(2-hydroxo-5-bromobenzyl)ethylenediamine in poly vinyl chloride (PVC) film in presence of dioctyl phthalate (DOP) as plasticizer. The receptor Schiff base reveals "off-on" mode with high selectivity, significant sensitivity to Cu(II) ions. The selectivity of optical sensor for Cu(II) ions is the result of chelation enhanced fluorescence (CHEF). The optimal conditions of pH and response time atwhich higher efficiency of sensor film is performed was found to be 6.8 and 2.48min. The possible interference of other metal ions in solution was examined in presence of different types of metal ions. This film shows high selectivity and ultra-sensitivitywith lowdetection limit LOD (1.1 × 10−8 M). Thus, these considerable propertiesmake it viable to monitor copper metal ions within very low concentration range (0–15 × 10−6 M Cu(II)) and highly selective even in the presence of different types of metal ions. The sensor reversibility was achieved by utilizing EDTA solution with concentration of 0.1 M solution.

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The Feiran-Solaf metamorphic complex, Sinai, Egypt: Evidence for orthogonal or oblique tectonic convergence?

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Abstract

New structural data collected along five transects across the trend of the Feiran-Solaf metamorphic complex (FSC) in the Sinai, provide a more precise depiction of the macroscopic folds. The two main macrofolds of the complex, the NW-SE trending Feiran and Solaf antiforms, appear to be thrust-related folds with detachments at different stratigraphic levels in the FSC. Contrary to earlier views, there is only one macrofolding event (D2) in the FSC, accompanied by NW-SE trending F2 mesofolds with varying style. While the F2 mesofolds are most commonly open concentric and symmetrical, some of these folds have been modified by inhomogeneous shear strain to become tight "similar" style asymmetric mesofolds in a zone of intense ductile shearing along the SW flank of the Feiran antiform. The recent Najdrelated transpression model for FSC D2 deformation is evaluated. An alternative model for D2 as a product of orthogonal convergence is preferred. The D2 event recorded the collision of the FSC with the Sa'al terrane at ~800 Ma. The Kid arc complex collided with the Feiran and Sa'al complexes during subsequent NNW-SSE convergence at about 620-600 Ma.

Journal of Molecular Structure
2018
(1168) 106-114

Novel acrylamide ionic liquids as anti-corrosion for X-65 steel dissolution in acid medium: Adsorption, hydrogen evolution and mechanism

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Abstract

Adsorption of three polymeric ionic liquids, Corrosion performance and hydrogen evolution rate of carbon steel was tested in 1mol L_1 HCl. The prepared polymers were based on 2-acrylamido-2-methylpropane sulfonic acid (AMPS) through quaternization with different tertiary amines such as triethanolamine, triethylamine and trimethylamine. The chemical structures of the prepared polymers are characterized by FTIR, 1H NMR, 13C NMR and elemental analyses. Hydrogen evolution rate (HER),potentiodynamic polarization (PDP) and electrochemical impedance spectroscopy (EIS) were investigated. After the corrosion tests, the morphology of the metal after immersion in inhibitor were considered by scan electron microscope (SEM). The addition of the prepared inhibitors lead to a resistance in the corrosion process in all cases by delaying the rate of hydrogen generation and reduction in the corrosion rate of carbon steel. In addition, a rise in the inhibition efficiency (IE) was occurred with developing inhibitors concentration. However, the order of inhibitors efficiency is poly-2-acrylamido-2- methylpropane sulfonic acid triethanolamine derivative (P1) > poly-2-acrylamido-2-methylpropane sulfonic acid triethylamine derivative (P2) > poly-2-acrylamido-2-methylpropane sulfonic acid trimethylamine derivative (P3). This inhibition occurred by the adsorbed film created by inhibitor on the steel surface that defend the metal against corrosive procedures.

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2018
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Corrosion and hydrogen evolution rate control for X-65 carbon steel based on chitosan polymeric ionic liquids: experimental and quantum chemical

studies;S. M. Elsaeed, [*a] El Sayed H. El Tamany,[b] H. Ashour,[b] E. G. Zaki,[a] E. A. Khamis[a] and H. A. El Nagy[b];

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Abstract

The corrosion performance of carbon steel was tested in four polymeric ionic liquids (PILs) that differed only in the fatty acid linked to the chitosan (CS) amine group. The measurements were implemented involved the hydrogen evolution rate (HER), gravimetric measurements, potentiodynamic polarization (PDP), electrochemical impedance spectroscopy (EIS), and quantum chemical estimations. The morphology and the elements arranged on the metal were considered by a scanning electron microscopy (SEM) system attached to an energy dispersive X-ray (EDX) system. The addition of polymeric ionic liquids hindered the rate of hydrogen generation. The order of the inhibitors efficiency was CSPTA-lauric > CSPTA-myristic > CSPTA-palmitic > CSPTA-stearic. The polarization method proved that the percentage inhibition efficiency increases with increasing the inhibitors concentration in 1 M HCl, representing a drop in the corrosion rate of carbon steel. On the other hand, the percentage inhibition decreased with the increase in temperature. Quantum chemical calculations revealed that the tested ionic liquids could react with the iron surface via electron transfer from the metal atom to ionic liquid molecule.

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2018
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3(2H)-Furanones promising candidates for synthesis of new fluorescent organic probes

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Abstract

Several novel 3-arylidene-5-(4-methoxy-3-nitrophenyl)-2(3H)-furanones (2a-d) has been successfully prepared and used as precursors for building up of other new heterocyclic architectures such as pyrrolones (4a-c), (5) and unsaturated aroyl-hydrazides (7a-d). These These aroyl-hydrazides have been subsequently converted into pyridazinone derivatives (8a-d) by refluxing in HCl / AcOH mixture. Enentually, benzoylation of the hydrazides (7a-c) with benzoyl chloride affords the corresponding N-benzoyl-3(3H)-pyridazinones (9a-c). The structure of all synthesized compounds have been established using elemental analysis and spectral methods. The photophysical (flurescence and electronic absorption spectra) properties of newly synthesized compounds have also been investigated.

Arkivoc
2018
20-35

Synthesis of quinazolindionyl amino acid and hydrazone derivatives as possible antitumour agents

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Abstract

A series of 1-ethyl-2,4-dioxo-(1H,3H)-quinazolin-3-yl amino acid and hydrazone derivatives were synthesized and tested for their antitumor activity. The alcohol and acid derivatives of quinazolindione were conjugated with the amino acid derivatives at N-3 site via ester or amide bonds by carbodiimide and azide methods. The carbodiimide-mediated amide and esterification steps were performed in the presence of HOBt or DMAP respectively otherwise the side-products N-acyl urea derivatives are formed, instead of the desired derivatives. Nine compounds exhibited encouraging antitumor activity against human liver carcinoma cell line (HepG2).

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2018
165 (12) G3133-G3140

Manganese Oxide/Hemin-Functionalized Graphene as a Platform for Peroxynitrite Sensing

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Abstract

Peroxynitrite (ONOO−, PON) is a powerful oxidizing agent generated in vivo by the diffusion-limited reaction of nitric oxide (NO) and superoxide (O2−) radicals. Under oxidative stress, cumulated peroxynitrite levels are associated with chronic inflammatory disorders and other pathophysiological conditions. The accurate detection of peroxynitrite in biological systems is important, not only to understand the genesis and development of diseases, but also to explore and design potential therapeutics. Herein, a manganese oxide/hemin-modified graphene interface is explored as a platform for peroxynitrite amperometric detection. Heminfunctionalized reduced graphene oxidewas further modifiedwith manganese oxide nanoparticles to provide a composite material with catalytic activity toward the electrochemical oxidation of peroxynitrite. The morphology of the composite material was characterized using scanning electron microscopy, energy dispersive X-ray analysis, X-ray photoelectron spectroscopy, and UV-Vis absorption measurements. We investigated the electrocatalytic oxidation of peroxynitrite on graphite electrodes modified with the composite material using cyclic voltammetry and amperometry. The results showed that the incorporation of manganese oxide nanoparticles into graphene/hemin material enhances the catalytic detection of peroxynitrite compared to graphene/hemin alone.

Luminescence
2017
32:1541–1546

Fluorescence sensing of dichlorvos pesticide by the luminescent Tb(III)- 3- ally- salicylohydrazide probe

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Abstract

A fluorescent probe was developed and characterized, it consisted of terbium(III) with 3- allysalicylohydrazide in ethanol, in which the 1:2 [Tb3+:S1] molar ratio was the best stoichiometric ratio for the probe. The ligand 3- ally- salicylohydrazide (S1) was synthesized, then was confirmed by IR, CHN, LC–MS and 1H NMR. The sensitivity of the probe's fluorescence spectra towards the presence of eight organophosphorus pesticides in ethanolic solution was studied, in which the probe showed marked sensitivity towards dichlorvos pesticide. A tangible enhancement of the probe's fluorescence intensity was observed as a consequence of the gradual addition of dichlorvos pesticide. The calculated limit of detection (LOD) was 1.183 μM and limit of quantitation (LOQ) was 3.94 μM. Further characterization of the nature of forces acting in the interaction of the probe with dichlorvos was performed by calculation of binding constants at different temperatures according to the Benesi − Hildebrand equation, and the thermodynamic parameters ΔH, ΔS and ΔG. In order to assess the analytical applicability of the method, the influence of various potentially interfering anion and cations that naturally occur in water and soil were calculated.

Spectrochimica Acta Spectroscopy Part A: Molecular and Biomolecular 2018
(199) 356–366

Plasma impact on structural, morphological and optical properties of copper acetylacetonate thin films

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Abstract

The influence of plasma exposure on structural, morphological and optical properties of copper (II) acetylacetonate thin films deposited by thermal evaporation technique was investigated. Copper (II) acetylacetonate as-grown thin films were exposed to the atmospheric plasma for different times. The exposure of as-grown cu $(acac)_2$ thin film to atmospheric plasma for 5 min modified its structural, morphological and optical properties. The effect of plasma exposure on structure and roughness of $cu(acac)_2$ thin films was evaluated by XRD and AFM techniques, respectively. The XRD results showed an increment in crystallinity due to exposure for 5 min, but, when the exposure time reaches 10 min, the film was transformed to an amorphous state. The AFM results revealed a strong modification of films roughness when the average roughness decreased from 63.35 nm to ~1 nm as a result of interaction with plasma. The optical properties of as-grown and plasma exposured $cu(acac)_2$ thin films were studied using spectrophotometric method. The exposure of $cu(acac)_2$ thin films to plasma produced the indirect energy gap decrease from 3.20 eV to 2.67 eV for 10min exposure time. The dispersion parameters were evaluated in terms of single oscillator model for as-grown and plasma exposured thin films. The influence of plasma exposure on third order optical susceptibility was studied.

Spectrochimica Acta Spectroscopy Part A: Molecular and Biomolecular 2018
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Influence of post-deposition annealing on structural, morphological and optical properties of copper (II) acetylacetonate thin films

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Abstract

In this study, the effect of thermal annealing under vacuum conditions on structural, morphological and optical properties of thermally evaporated copper (II) acetylacetonate, $cu(acac)_2$, thin films were investigated. The copper (II) acetylacetonate thin films were deposited using thermal evaporation technique at vacuum pressure ~1×10^{-5} mbar. The deposited films were thermally annealed at 323, 373, 423, and 473 K for 2 h in vacuum. The thermogravimetric analysis of $cu(acac)_2$ powder indicated a thermal stability of $cu(acac)_2$ up to 423 K. The effects of thermal annealing on the structural properties of $cu(acac)_2$ were evaluated employing X-ray diffraction method and the analysis showed a polycrystalline nature of the as-deposited and annealed films with a preferred orientation in [-101] direction. Fourier transformation infrared (FTIR) technique was used to negate the decomposition of copper (II) acetylacetonate during preparation or/and annealing up to 423 K. The surface morphology of the prepared films was characterized by means of field emission scanning electron microscopy (FESEM). A significant enhancement of the morphological properties of $cu(acac)_2$ thin films was obtained till the annealing temperature reaches 423 K. The variation of optical constants that estimated from spectrophotometric measurements of the prepared thin films was investigated as a function of annealing temperature. The annealing process presented significantly impacted the nonlinear optical properties such as third-order optical susceptibility $\chi^{(3)}$ and nonlinear refractive index n_2 of $cu(acac)_2$ thin films.

Desalination journal
2017

Comparative performance evaluations of nanomaterials mixed polysulfone: A scale-up approach through vacuum enhanced direct contact membrane distillation for water desalination

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Abstract

Doping of multi-walled carbon nanotube (MWCNT), silicon dioxide (SiO_2), titanium dioxide (TiO_2) and zinc oxide (ZnO) into polysulfone (PSf) flat sheet membranes was prepared by phase inversion process. The char- acterizations of the PSf and PSf-MWCNT, PSf-SiO_2, PSf-TiO_2 and PSf-ZnO membranes were achieved using Fourier transform infrared spectroscope, contact angle measurement, dynamic mechanical analyzer, thermo-gravimetric analysis and scanning electron microscope. Vacuum enhanced direct contact membrane distillation unit was used for evaluating the efficacy of prepared membranes in water desalination. Optimizing the opera- tional procedures and water characteristics ensured a high slat rejection of 99.99% using the prepared mem- branes. The highest permeate flux obtained in the order of MWCNT (41.58) > SiO_2 (38.84) > TiO_2(35.6) > ZnO (34.42 L/m^2·h) with optimized concentration of 1.0, 0.5, 0.75, 0.5 wt% relative to PSf weight, i.e. 15%. The optimum operational conditions included feed and permeate temperatures 60 °C and 20 °C, respectively, synthetic NaCl feed water with salinity was 10,000 ppm.

Nanoscale Research Letters
2017
12:231

Gold Nanoparticles as a Direct and Rapid Sensor for Sensitive Analytical Detection of Biogenic Amines

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Abstract

A new optical sensor was developed for rapid screening with high sensitivity for the existence of biogenic amines (BAs) in poultry meat samples. Gold nanoparticles (GNPs) with particle size 11–19 nm function as a fast and sensitive biosensor for detection of histamine resulting from bacterial decarboxylation of histidine as a spoilage marker for stored poultry meat. Upon reaction with histamine, the red color of the GNPs converted into deep blue. The appearance of blue color favorably coincides with the concentration of BAs that can induce symptoms of poisoning. This biosensor enables a semi-quantitative detection of analyte in real samples by eye-vision. Quality evaluation is carried out by measuring histamine and histidine using different analytical techniques such as UV–vis, FTIR, and fluorescence spectroscopy as well as TEM. A rapid quantitative readout of samples by UV–vis and fluorescence methods with standard instrumentation were proposed in a short time unlike chromatographic and electrophoretic methods. Sensitivity and limit of detection (LOD) of 6.59 × 10−4 and 0.6 μM, respectively, are determined for histamine as a spoilage marker with a correlation coefficient (R^2) of 0.993.

Arabian Journal of Chemistry
2018

Novel and highly effective composites of silver and zinc oxide nanoparticles with some transition metal complexes against different microorganisms

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Abstract

Novel composites of Ag and ZnO nanoparticles with prepared transition metal com- plexes were obtained. The transition metal complexes are obtained by the interaction of the ligand N,N0-bis(salicylaldehyde)-o-phenylenediamine(H2B) with some transition metal ions (Co(II), Ni (II), Cu(II) and Zn(II)). The structures of the ligand and the formed complexes were characterized by elemental analysis, FTIR, UV–Vis, 1H NMR, mass spectra, thermal (TG/DTA), magnetic and conductivity measurements. The obtained complexes have the molecular formula [MB(H2O)x]. yH2O. The found conductivity revealed the non-electrolytic behavior of the formed complexes. The magnetic susceptibility and UV–Vis spectra indicated the octahedral structure of the formed complexes. The thermodynamic and kinetic parameters are estimated for the formed complexes. The interaction of the formed compounds with the FM-DNA was tested. The evaluation of the binding constant (Kb) using Bensi-Hildebrand plot, revealed the moderate interaction with electro- static behavior. Silver and zinc oxide nanoparticles were prepared and characterized by XRD, UV– Vis, FTIR spectra and TEM analysis.

International Journal of Earth Sciences
2017
106:2817–2836

Tectonic evolution of kid metamorphic complex and the recognition of Najd fault system in South East Sinai, Egypt

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Abstract

A low-to medium-grade metamorphic belt of a volcano-sedimentary succession occurs in the eastern side of South Sinai as a part of the northernmost extension of the Arabian–Nubian Shield in Egypt. The belt is known as the Kid metamorphic complex. It is considered as one of the major belt among the other exposed metamorphic belts in South Sinai. Here, we detect and investigate the signature of the Najd Fault system in South Sinai based on detailed structural analysis in field and digital image processing. The enhanced satellite image and the geo-spatial distributions confirm that the Kid belt is essentially composed of nine Precambrian units. Field relations and geometrical analysis of the measured structural data revealed that the study area underwent four successive deformational phases (D1–D4). D1 is an upright tight to isoclinal large-scale folds that caused few F1 small-scale folds and a steeply dipping S1 axial plane foliation. The second deformational event D2 produced dominant of sub-horizontal S2 foliation planes accompanied with recumbent isoclinal folds and NW–SE trending L2 lineations. The main sense during D2 was topto-the-NW with local reversals to the SE. The third folding generations F3 is recorded as axial plane S3-surfaces and is characterized by open concentric folding that overprinting both F1 and F2 folds and has a flexural-slip mechanism. F3 fold hinges plunge to the west–northwest or east–southeast indicate north–northeast–south–southwest shortening during D3. The fourth deformational event D4 is characterized by NE plunging open concentric folding overprint the pre-existing fold generations and formed under flexural slip mechanism reflecting coaxial deformation and indicating change in the stress regime as a result of the change in shortening from NE–SW to NW–SE. This phase is probably accompanied with the final assembly of east and west Gondwana. The dextral NW–SE shear zone that bounded the southwestern portion of the metamorphic belt is probably related to reactivation of the Najd fault system during Oligo-Miocene in South Sinai.

Journal of Coastal Conservation
2018
22:721–743

Hydrometeorological hazards assessment of some basins in Southwestern Sinai area, Egypt

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Abstract

The assessment of hydrometeorological hazards in the mountainous area of Southwestern Sinai area (SWSA) necessitates reliable and accurate information about natural hazards, especially flash floods. Flash floods are the main dangerous hazards that threaten lives and any sustainable development planning in and around the rugged topography areas. The SWSA receives occasional heavy rainstorms every two or four years, triggering destructive floods that runoff towards the Gulf of Suez. The present study aims to extract, evaluate, integrate and map the potential flash flood hazards by applying remote sensing, GIS tools and by statistically analyzing the geomorphometric parameters. Moreover, assessing the flash flood hazard risk ranks was carried for the three main basins (W. Baba, W. Sidri, and W. Nukhul). The drainage networks and basins were extracted from DEM then, delineated into seventy-two sub-basins and then the morphometric parameters of these sub-basins were estimated. The analysis of the various morphometric parameters of the three main basins shows that they have different effects on flash flood hazards. Depending on the statistical analysis of the commutative weights of the important geomorphometric parameters and GIS functions; the studied basins were categorized into three risk ranks; namely: high, moderate and low flash flood risk. The integration of the different controlling parameters revealed that the zones of high flash flood hazard risk are characterized by the low probability of groundwater recharge which should be put into consideration to help the decision makers avoid risks which are considered to be one of the most dangerous obstacles to the sustainable development of the study area.

Synthetic Metals
2018
(245) 223–236

Effect of illumination intensity on the characteristics of Cu(acac)2/n-Si Photodiode

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Abstract

Thermally evaporated copper (II) acetylacetonate $Cu(acac)_2$ thin film deposited on the n-Si wafer was used for light detection. The microstructural properties of copper (II) acetylacetonate thin film were investigated using high-resolution transmission electron microscope technique. A polycrystalline nature of $Cu(acac)_2$ film with a clearly resolved lattice fringes were obtained. The optical properties of the thin film deposited on an n-type silicon substrate were investigated using spectroscopic ellipsometry technique which suggested UV and visible light absorption of copper (II) acetylacetonate. The I-V characteristics of the fabricated photodiode were investigated in dark and under different light illumination intensities. The main diode parameters were determined using the Thermionic emission theory and modified Norde's method. The present architecture showed a good response to halogen lamb light, where the estimated values of rise and fall time at 80 mW/cm^2 were about 339 ms and 1046 ms, respectively. Furthermore, C-V measurements for the fabricated device were performed in dark at different frequencies.

Current Applied Physics
2018
(18) 1496–1506

Fabrication and performance evaluation of ultraviolet photodetector based on organic /inorganic heterojunction

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Abstract

Organic/inorganic ultraviolet photodetector was fabricated using thermal evaporation technique. Organic/inorganic heterojunction based on thermally evaporated copper (II) acetylacetonate thin film of thickness 200 nm deposited on an n-type silicon substrate is introduced. I–V characteristics of the fabricated heterojunction were investigated under UV illumination of intensity 65 mW/cm^2. The diode parameters such as ideality factor, n, barrier height, Φ_B, and reverse saturation current, Is, were determined using thermionic emission theory. The series resistance of the fabricated diode was determined using modified Nord's method. The estimated values of series resistance and barrier height of the diode were about 0.33 KΩ and 0.72 eV, respectively. The fabricated photodetector exhibited a responsivity and specific detectivity about 9 mA/W and 4.6×10^9 Jones, respectively. The response behavior of the fabricated photodetector was analyzed through ON-OFF switching behavior. The estimated values of rise and fall time of the present architecture under UV illumination were about 199 ms and 154 ms, respectively. Finally, enhancing the photoresponsivity of the fabricated photodetector, post-deposition plasma treatment process was employed. A remarkable modification of the device performance was noticed as a result of plasma treatment. These modifications are representative in a decrease of series resistance and an increase of photoresponsivity and specific detectivity. The process of plasma treatment achieved an increment of external quantum efficiency from 5.53% to 8.34% at −3.5 V under UV illumination.

Biological Rhythm Research
2018
(49) 175–185

β-carotene ameliorates CUS-induced circadian alternations of locomotor activity and melatonin patterns in rats

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Abstract

Circadian and stress systems have a crucial role in adaptation of organisms to environmental challenges. This study investigates the ability of *Oscillatoria brevis* (*O. brevis)* β-carotene extract (βC) in modulating the circadian alternations of locomotor activity (LA) and serum melatonin (M) rhythms under chronic unpredictable stress (CUS) in rats. Twenty rats (5 rats/group) were used in monitoring LA using running wheels. Eighty rats (20 rats/group) were used in observing circadian serum M profile. Rats were randomly divided into four groups, viz. control, βC-treated, CUS-exposed, and "βCtreated& CUS-exposed" groups. CUS-exposure was applied for 21 days.

One hour before exposure, βC was daily administered (10 mg/kg), intraperitoneally (IP). Blood was sampled at 6-h intervals for 5 rats/ time point at Zeitgeber (ZT) 3, 9, 15, and 21. Results demonstrated that unstressed rats exhibited circadian M pattern and nocturnal LA rhythm with acrophase around ZT 21 and ZT 15, respectively. CUSexposure revealed a disturbance in these patterns. Phase shifting of M and LA profiles was recorded. A decrease M acrophase and a significant decrease in LA ($p < 0.05$) were recorded at ZT 9. Daily βC administration in stressed rats modulates the CRs alternation induced by CUS. It may be concluded that βC ameliorated the induced alternations in circadian rhythms.

Biomedicine & Pharmacotherapy
2017
(91) 602–610

Ameliorative effect of vitamin E and selenium against oxidative stress induced by sodium azide in liver, kidney, testis and heart of male mice

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Abstract

The study purported to define the effects of daily administration of vitamin E (Vit E) and selenium (Se) on antioxidant enzyme activity in mice treated with high doses of sodium azide (SA). Male mice were randomly split into nine groups. Groups 1, 2 and 3 were injected daily with saline, Vit E, and Se, respectively, while groups 4, 5 and 6 administrated with different doses of SA (low, medium and high, respectively). The mice in groups 7, 8 and 9 received 100 mg/kg Vit E, 17.5 mg/kg Se, and a combination of Vit E and Se, respectively before the SA-treatment. Hepatic, renal, testis and heart, antioxidant enzymes as well as levels of lipid peroxidation and total antioxidant capacity levels were determined. Vit E alone affected on the antioxidant parameters of the examined tissues. Se had a preventive effect on the decrease of antioxidant parameters caused by SA and improved the diminished activities of all of them. The study demonstrates that a high dose of SA may alter the effects of normal level antioxidant/oxidative status of male mice and that Se is effective in reducing the SA-damage. Se acts as a synergistic agent with the effect of Vit E in various damaged caused by SA.

Human and Experimental Toxicology
2017
36(11) 1212–1221

The beneficial effects of L-cysteine on brain antioxidants of rats affected by sodium valproate

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Abstract

Oxidative stress caused by sodium valproate (SV) is known to play a key role in the pathogenesis of brain tissue.
The present study was designed to evaluate the protective effect of L-cysteine (LC) on the antioxidants of brain tissue of rats. The animals were divided into six groups: control group 1 was treated with saline as vehicle, groups 2 and 3 were treated with low and high doses of SV (100 and 500 mg/kg, respectively), group 4 was treated with LC (100 mg/kg), and groups 5 and 6 were treated with low-dose SV þ LC and high-dose SV þ LC, respectively. All the groups were treated orally by gastric tube for 30 successive days. Some antioxidant parameters were determined. Brain tissue (cerebral cortex) of SV-treated animals showed an increase in lipid peroxidation (LPO) and reduction in activity of enzymatic antioxidant and total antioxidant levels. Histopathological examination of cerebral cortex of SV rats showed astrocytic swelling, inflammation, and necrosis. After 4 weeks of the combination treatment of SV and LC daily, results showed significant improvement in the activity of cathepsin marker enzymes and restored the structure of the brain. LC was able to ameliorate oxidative stress deficits observed in SV rats. LC decreased LPO level and was also able to restore the activity of antioxidant enzymes as well as structural deficits observed in the brain of SV animals. The protective effect of LC in SV-treated rats is mediated through attenuation of oxidative stress, suggesting a therapeutic role for LC in individuals treated with SV.

International Journal of Pharmacology
2018
36(11) 1212–1221

The Influence of L-carnitine on Aspartame Toxicity in Kidney of Male Rats

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Abstract

Background and objective: Aspartame (ASP) one of the famous artificial sweeteners used as substitution of the sugar in foods and beverages. The study was aimed to investigate the oxidative responses and histopathological changes induced by ASP on the kidney of rats and the ameliorative role of L-carnitine (LC) to prevent the toxicity. Materials and Methods: Rats were split into six groups (n=8) as follow: control, ASP (low dose, LD) (75 mg/Kg), ASP (high dose, HD) (150 mg/Kg), 10 mg/Kg of LC, ASP-LD + LC and ASP-HD + LC, all groups treated for successive 30 days. Results: ASP marked decreased the renal levels of reduced glutathione (GSH), activities of antioxidant enzyme markers and increased lipid peroxidation levels. DNA damage was significantly increased in ASP-LD and ASP-HD groups as compared to control animals. LC prevented the ASP-induced kidney damage as specified by ameliorating all the above-mentioned parameters. Histopathological changes were parallel with the biochemical alternation in ASP groups. Conclusion: the renal toxicity induced by ASP in rats could be improved by LC through different protective mechanisms.

Arabian Journal of Geosciences
2018
11:553

Structural and facies modeling of the lower cretaceous Alam El Bueib reservoirs in the Shushan Basin, western desert, Egypt

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Abstract

The Qasr oil and gas field is located in the eastern part of the Shushan Basin in the northernWestern Desert of Egypt. Sandstones of the Lower Cretaceous Alam El Bueib Formation are the main oil-bearing reservoirs in the field, and these reservoirs cannot be seismically detected. Consequently, modeling is important to predict the extension of the reservoirs. The present study adopts two types of modeling: structural and facies. Structural modeling is the incorporation of interpreted faults, horizons, and zones into a three-dimensional (3D) grid, while facies modeling distributes lithologic facies within the previously constructed 3D structural grid. All available geological information is utilized in facies modeling, including lithological interpretations from well logs, and sedimentary core and ditch cutting descriptions from mud logs. The structural analysis of the Alam El Bueib Formation in the Qasr Field showed several E-W to WNW-ESE fault systems. The geologic structure, combined with stratigraphy and facies architecture, establishes the framework for traps in this field. Lithology interpretation using electric well logs and mud logs showed four main facies: (1) channel sand, (2) flood plain siltstone, (3) lagoonal shale and mud, and (4) marine carbonates. Facies modeling of the six major units that comprise the Alam El Bueib Formation show variable sand channels deposited in fluvial to mixed deltaic and tidal environments. These channels are oriented N-S to NE-SW and form 20 to 100-ft-thick sandstone reservoirs.

Journal of alloys and compounds
2018
(744) , 701-711

Promising method for preparation the PVA/Ag nanocomposite and Ag nano-rods

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Abstract

Both the PVA/Ag nanocomposite films and the Ag nano-rods were successfully prepared by using the γ irradiation method. The PVA/Ag nanocomposite films prepared at different γ irradiation doses (25, 50, 75 and 100 KGy). The Ag nano-rods prepared at a specific conditions at (125 KGy). For the PVA/Ag nanocomposites, the UV-Vis spectrophotometer and PL spectrophotometer were used to characterize the films. The optical absorption spectra for all samples over the wavelength range 190–800 nm were recorded. There are two absorption peaks were observed. One peak at 200 nm which attributed to (n-π*) transition for PVA and another peak at 427 nm for the formed Ag nanoparticles. Photoluminescence showed a peak at 646 nm and its intensity increase with increasing the γ doses. For preparing the Ag nano-rods, the SEM images of the films revealed the presence of two types of silver particles one is $AgNO_3$ and the other Ag nanoparticles on the front surface of the (0 KGy) nanocomposite films. With increasing the gamma doses until 125 KGy the Ag nanoparticles appears on the back surface as a nano-rods. The SEM images showed that the obtained Ag nano-rod of different length: diameter (1.813 μm: 89.125 nm) and (2.912 μm: 88.851 nm) with aspect ratio (length: diameter = 16:1 to 32:1). The effect of the PVA concentration on the formation of Ag nanoparticles was confirmed by using SEM images, and we obtained that the length of Ag nano-rods on the back surface increase with increasing the PVA concentration at γ irradiation dose 125 KGy.

Bulletin of Engineering Geology and the Environment
2018

Spatial prediction of landslide-susceptible zones in El-Qaá area, Egypt, using an integrated approach based on GIS statistical analysis

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Abstract

The spatial prediction of landslide susceptibility locations is a crucial task to support risk management and development plans in mountainous areas, such as El-Qaá area. The study aims to delineate landslide-susceptible zones that can cause enormous damage to property, infrastructure, and loss of life. An innovative integrated approach using remote sensing, geographic information systems, and geophysical techniques was used in the current work to evaluate landslide susceptibility locations. Magnetic data were supported by information derived from geologic, geomorphologic, topographic, and seismic data to reveal the landslides- prone zones. Several factors contributing to landslide susceptibility in El-Qaá area were determined, such as distance to faults, lithology, stream power index, slope, density of earthquake events, distance to epicenters, tilt derivative of magnetic data, distance to drainages, aspect, and topographic wetness index. A unique landslide susceptibility model (LSM) was developed in this study by integration all the spatial data that represent the contributing factors. The bivariate statistical index method was constructed to assign logic ranks and weights for the causative factors and their classes representing their realistic relations with landslide susceptibility in El-Qaá area. The landslide susceptibility map classifies El-Qaá area into five relative susceptibility zones: very high, high, moderate, low, and very low. The very high- and high-susceptibility zones are distributed in the eastern side of El-Qaá area where structurally controlled channels, steep topography to downhill lands, and Precambrian basement rocks are located. The resulting susceptibility map was tested and validated using the landslide locations that were delineated from field survey and satellite images at high resolution. The integrated methodology shows a more realistic landslide susceptibility map and adds a powerful tool to design a fruitful management plan in mountainous areas.

Journal of African Earth Sciences
2018
(138) 1e13

Static reservoir modeling of the Bahariya reservoirs for the oilfields development in South Umbarka area, Western Desert, Egypt

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Abstract

3D static reservoir modeling of the Bahariya reservoirs using seismic and wells data can be a relevant part of an overall strategy for the oilfields development in South Umbarka area (Western Desert, Egypt).
The seismic data is used to build the 3D grid, including fault sticks for the fault modeling, and horizon interpretations and surfaces for horizon modeling. The 3D grid is the digital representation of the structural geology of Bahariya Formation. When we got a reasonably accurate representation, we fill the 3D grid with facies and petrophysical properties to simulate it, to gain a more precise understanding of the reservoir properties behavior. Sequential Indicator Simulation (SIS) and Sequential Gaussian Simulation (SGS) techniques are the stochastic algorithms used to spatially distribute discrete reservoir properties (facies) and continuous reservoir properties (shale volume, porosity, and water saturation) respectively within the created 3D grid throughout property modeling. The structural model of Bahariya Formation exhibits the trapping mechanism which is a fault assisted anticlinal closure trending NW-SE.
This major fault breaks the reservoirs into two major fault blocks (North Block and South Block). Petrophysical models classified Lower Bahariya reservoir as a moderate to good reservoir rather than Upper Bahariya reservoir in terms of facies, with good porosity and permeability, low water saturation, and moderate net to gross. The Original Oil In Place (OOIP) values of modeled Bahariya reservoirs show hydrocarbon accumulation in economic quantity, considering the high structural dips at the central part of South Umbarka area. The powerful of 3D static modeling technique has provided a considerable insight into the future prediction of Bahariya reservoirs performance and production behavior.

Journal of Petroleum Science and Engineering
2018
(167) 120–130

3D seismic characterization of the polygonal fault systems and its impact on fluid flow migration: An example from the Northern Carnarvon Basin, Australia

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Abstract

We used high-resolution 3D seismic data and applied seismic attribute analysis to geometrically interpret and characterize the polygonal fault systems in the Paleocene-Eocene sequence of the Rankin Platform Sub-basin, Northern Carnarvon Basin, Australia. The polygonal faults were identified in a stratigraphic sequence dominated by calcareous clay with minor calcilutite at its lower section that changes to argillaceous calcilutite and calcareous claystone at its upper section. Seismic sections and time slices, through multi-attribute (coherence, energy ratio similarity, and curvature) volumes display a dense distribution of normal faults with polygonal shape and small throws in the plain view. The polygonal fault systems (PFS) exist in two well-defined tiers, which can act as pathways for the fluid flow migration. The first tier coincides with the upper section (Early- Middle Eocene Wilcox Formation) with a few faults and the second one coincides with the lower section of the sequence (Paleocene Lambert and Dockrell formations) with a greater number of faults. Proper understanding and interpretation of the polygonal fault systems as non-tectonic extensional faults are a critical issue in assessing the migration pathway for hydrocarbon (gas) through the Paleocene-Eocene sequence in the Northern Carnarvon Basin, and elsewhere in the world.

Environmental Earth Sciences
2018
77:270

Riverbank filtration in Cairo, Egypt—part I: installation of a new riverbank filtration site and first monitoring results

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Abstract

To cope with the increasing water demand in Cairo, the Holding Company for Water and Wastewater drilled 6 pumping wells to assess the applicability of riverbank fltration (RBF) for the waterworks in Embaba. Results from well drilling and subsequent monitoring of water levels and water quality were used to assess site conditions. Hydrogeology and surface water quality are typical for RBF sites. The aquifer is more than 60 m thick and has a hydraulic conductivity of 6×10−4 m/s. The Nile River is cutting through the upper clay cap that covers the aquifer and is hydraulically connected with the aquifer. Piezometric heads indicate a natural recharge of the aquifer by river water. Thus, the site seems to have high potential for water production. Water quality of the Nile River is feasible for natural treatment via RBF, TOC is

Comb Chem High Throughput Screen
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21(3):222-231

Extraction, Identification and Biological Activities of Saponins in Sea Cucumber Pearsonothuria graeffei

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Abstract

AIMS AND OBJECTIVES: Secondary metabolism in marine organisms produces a diversity of biologically important natural compounds that are not present in terrestrial species. Sea cucumbers belong to the invertebrate Echinodermata and are famous for their nutraceutical, medical and food values. They are known for possession triterpenoid glycosides (saponins) with various ecological roles. The current work aimed to separate, identify and test various biological activities (antibacterial, antifungal, antileishmanial and anticancer properties) of saponins produced by the holothurian Pearsonothuria graeffei from the Red Sea, Egypt.

MATERIALS AND METHODS: The structures were identified by 1D and 2D NMR (1H, 13C, TOCSY, COSY, HSQC, HMBC, and ROESY) experiments and acid hydrolysis. The crude and purified fractions was analyzed using matrix-assisted laser desorption/ionization mass spectrometry (MALDI-MS)/MS to identify saponins and characterize their molecular structures. Partially purified fraction, mainly containing compounds 1 and 2, was screened for its antifungal activity against three clinical isolates of Candida albicans (Candida 580 (1), Candida 581(2) and Candida MEO47228. Antileishmanial activity against Leishmania major and toxicity on colon cell-line were also evaluated.

RESULTS: Two lanostane type sulfated triterpene monoglycosides were isolated from the Holothurian Pearsonothuria graeffei from the Red Sea, Egypt. Holothurin A (1) and echinoside A (2) triterpene saponins were separated by reversed phase semi-preparative HPLC. LC50 values (µg/mL); calculated for the fraction containing saponins 1 and 2 as major constituents; against Candida albicans, Leishmania major and colon cell-line were 10, 20 and 0.50, respectively.

CONCLUSION: Consequently, this study demonstrated the potential use of sea cucumber Pearsonothuria graeffei not only as appreciated functional food or nutraceuticals but also as the source of functional ingredients for pharmaceutical products with antifungal, antileishmanial and anticancer properties.

Marine and Freshwater Research
2018
69(10) 1557-1568

Evaluation of the heavy metals threat to the Yanbu shoreline, Red Sea, Saudi Arabia

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Abstract

The coastline of Yanbu was studied for sediment contamination at nine locations (north and south Yanbu) using inductively coupled plasma mass spectrometry. The metal ions detected were copper, nickel, zinc, cadmium, chromium and lead, with concentrations of 1.35–73.0, 1.73–94.62, 5.88–241.10, 0.05–1.81, 4.81–201.01 and 0.08–23.33 μg g^{-1} respectively. The standard deviation observed ranged from ±0.5 to ±0.53 for the analysis. The CVs ranged from 0.938 to 1.0, indicating the interdependence of the metal ions. Risk assessment indices (geo-accumulation, potential ecological risk and potential toxicity risk response) revealed that Site 9 was moderately polluted with copper, chromium and zinc and was severally polluted with cadmium. Cadmium was the highest accumulated metal, whereas lead was the least accumulated. The results indicated Site 9 had higher levels of heavy metals than sediments taken from the northern Yanbu sector. The southern site was polluted due to its proximity to the Yanbu industrial complex and sewage discharge point. Comparing the results of the present study with those of other national and international studies revealed comparable results, except at Site 9, where the concentrations of the metal ions were higher. Management strategies are suggested for the study area, which can also be used in other areas to avoid permanent threats to marine ecology.

Journal of Materials Science: Materials in Electronics
2018
29:8456–8464

Humic acid-derived graphene–SnO2 nanocomposites for high capacity lithium-ion battery anodes

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Abstract

Humic acid obtained from wood, soil, and coal provides a naturally occurring highly oxidized carbonaceous two-dimensional material. Humic acid obtained from Leonardite coal and tin(II) chloride were used to synthesize graphene–SnO2 nanocomposites using scalable, thermal treatment processes. The humic acid-derived graphene–SnO2 nanocomposites showed the presence of graphene sheets with a unique crumpled and wrinkled morphology and SnO2 nanoparticles. The graphene–SnO2 nanocomposites were tested as anodes for lithium-ion batteries and showed high reversible specific capacities (641 mAh g−1).

In addition, the graphene–SnO2 nanocomposites also exhibited high capacity retention upon cycling which is attributed to the interaction of SnO2 nanoparticles with the humic acid-derived graphene nanosheets that allows accommodation of highly reversible volumetric changes upon Li-ion insertion/de-insertion within the structure. In comparison, humic acid treated without the incorporation of SnCl2 during the synthesis process resulted in stacking of the nanosheets leading to low surface areas and low specific capacities. The scalable production of graphene nanocomposites from earth-abundant precursors opens up significant opportunities for low-cost and high performance materials for numerous energy storage and conversion devices.

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Modifications of Graphite and Multiwall Carbon Nanotubes in the Presence of Urea

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Abstract

The effect of high-energy ball milling on two carbon allotropes, graphite and multiwall carbon nanotubes (MWCNT) in the presence of urea has been studied. Samples were investigated using Raman spectroscopy, x-ray diffraction, scanning electron microscope (SEM) and x-ray photoelectron spectroscopy (XPS). Nitrogen-doped graphene has been successfully synthesized via a simple scalable mechanochemistry method using urea and graphite powder precursors. XPS results revealed the existence of the different nitrogen atoms configurations including pyridine, pyrrodic and graphitic N. SEM observations showed that the graphene nanosheets morphology become more wrinkles folded and crumbled as the milling time increased. The ID/IG ratio also increased as the milling time rose. The presence of both D¢ and G + D bands at 1621 cm_1 and 2940 cm_1, respectively, demonstrated the nitrogen incorporation in the graphene lattice Two factors contribute to the used urea: first it helps to exfoliate graphite into graphene, and second it preserves the graphitic structure from damage during the milling process as well as acting as a solid-state nitrogen source. Based on the phase analysis, the d-spacing of MWCNT samples in the presence of urea decreased due to the mechanical force in the milling process as the milling time increased. On the other hand, in the graphite case, due to its open flat surface, the graphite (002) peak shifts toward lower two theta as the milling time increase. Such findings are important and could be used for large-scale production of N-doped graphene, diminishing the use of either dangerous chemicals or sophisticated equipment.

Applied Surface Science
2018
(435) , 512-520

Formation of periodic size-segregated stripe pattern via directed self-assembly of binary colloids and its mechanism

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Abstract

Convective self-assembly, well known for producing highly ordered monolayer structures, has been used in this study to create novel surface patterns using the binary mixture of colloids. We demonstrate that different patterns form, based on the size ratio (Small/Large) of the particles, and particles volume ratio. Surprisingly, certain binary particle mixtures resulted in spontaneous size based segregation. In some cases, the particle separation occurred along the direction of the meniscus contact line, and by the mere design of the process, we created periodic stripe patterns with controlled width. The particle volume fraction, size differences, surface tension, and the curvature of the meniscus played a crucial factor in the segregation process as well as in determining the width of each of the stripes. Furthermore, based on both empirical and numerical analysis, a mechanism for size-based segregation of particles via directed self-assembly is proposed.

Journal of Basic Microbiology
2018
(9):720-729

Isolation and molecular characterization of Frankia strains resistant to some heavy metals

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Abstract

Frankia strains isolated from Saudi Arabia, reported for the first time, were identified based on the morphological and molecular tools compared to those isolated from Egypt. All strains displayed typical morphological characterization of Frankia strains represented by branched hyphae, production of vesicles and sporangia. The phylogenetic analysis and relationships among Frankia strains were investigated by comparing 16S rRNA gene sequences. The analysis revealed three genetic groups which formed two clusters. The first cluster was composed of eight Frankia strains subdivided into two genetic groups (one group containing five strains; CgIT3L2,CgIS3N2, CgIS1N1,CgIT7N2, and G5; the other group included of three strains:CgIT5L3, CgIS1N2, and CcI13). The second cluster was composed of only one genetic group of Frankia strain CgIS3N1. The strains in each genetic group exhibited similar genetic distances. All Frankia strains were able to reinfect their host of Casuarina species. For ability of these strains to resist heavy metals, our results proved that all Frankia strains isolated can resist Cu, Co, and Zn at low concentration except Pb which exhibit highly toxic effect at the same concentration used. Frankia strain G5 was proved to be the most resistant strain for heavy metals tested.

Computers & Mathematics with Applications
2017
(73): 1134-1154

Simulation of the approximate solutions of the time-fractional multi-term wave equations

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Abstract

In this paper, simulations of the approximation solutions of time-fractional wave, forced wave (shear wave), and damped wave equations are given. The common finite difference rules besides the backward Grünwald–Letnikov scheme are used to find the approximation solution of these models. The paper discusses also the effects of the memory, the internal force (resistance) and the external force on the travelling wave. The Von-Neumann stability conditions are also considered and discussed for these models. Besides the simulations of the time evolutions of the approximation solutions, the stationary solutions are also simulated. The numerical results are obtained by the Mathematica software.

Open Chemistry
2017
15: 344–351

Bio-concentration of Polycyclic Aromatic Hydrocarbons in the grey Mangrove (Avicennia marina) along eastern coast of the Red Sea

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Abstract

There are numerous sources of chemical pollutants which can impact the mangrove ecosystem through adjacent waters, industrial and sewage discharges and air depositions. Polycyclic aromatic hydrocarbons (PAHs) are semi volatile ubiquitous anthropogenic pollutants detected in all environmental compartments.

In the monitoring framework for the mangrove ecosystem along the Red Sea coast of Saudi Arabia, nine mangrove stands were examined for the accumulation of PAHs.

Polycyclic aromatic hydrocarbons were measured using Gas Chromatography-Mass Spectrometry (GC-MS). The mean values detected for total PAHs in sediments, roots and leaf were 2.98, 8.57 and 23.43 ng/g respectively. The trend of the total PAHs concentration in all sites showed the descending order: leaf > roots > sediments. Beside the sandy nature of the sediments, the presences of all stands in remote areas fare from the direct anthropogenic effects lead to these relative low values. PAH bio-concentration factors for leaf are two to three magnitudes higher than that in roots, suggesting atmosphere deposition /leaf uptake mechanism in addition to the sediment/root mechanism.

The diagnostic ratios revealed that the sources of PAHs are mainly pyrogenic.

Marine Biodiversity
2017
47:995–1008

Spatial variation in the phytoplankton standing stock and diversity in relation to the prevailing environmental conditions along the Saudi Arabian coast of the northern Red Sea

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Abstract

Variations in phytoplankton biomass and diversity in relation to the changing environmental parameters have been studied extensively during the summer season from three different regions (Al Wajh, Duba and Al Khoraeyba) on the northern Red Sea coast of Saudi Arabia. The temperature fluctuated between 25.2 and 31.5 °C with a salinity level between 39.58 and 40.16 PSU. The nutrients did not show any wide fluctuation between the regions and always remained, low which directly influenced the chlorophyll a (0.038–1.87 mg m−3).

The higher phytoplankton densities were observed from stations A6 to A15 (average 4738 ± 2351 × 103 cells m−3) in Al Wajh due to the proliferation of diatom species (Hemiaulus hauckii, Proboscia alata and Thalassiothrix longissima). A total of 283 phytoplankton species was encountered from the whole area (129 diatoms, 152 dinoflagellates and 2 cyanophytes) of which 118 species were new to the Red Sea. Maximum species diversity was observed from Al Wajh (267) followed by Duba (113) and Al Khoraeyba (97). Of these species, 7 diatoms and 20 dinoflagellates have been previously reported to produce harmful algal blooms worldwide.Trichodesmium, which is a dominant diazotrophic genus in the Red Sea, was present at the majority of the stations.

Marine Biodiversity
2017
47:1093–1109

Biodiversity of the community associated with Pocillopora verrucosa (Scleractinia: Pocilloporidae) in the Red Sea

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Abstract

The symbiotic community associated with a scleractinian coral Pocillopora verrucosa has been studied along the Red Sea coast of Saudi Arabia from Al Wajh to the entrance of the Gulf of Aqaba. Forty colonies have been sampled from 2- to 15-m depth in 2 areas, southern and northern. Thirty-six associated species were found, including 15 symbionts and 21 species with uncertain status (SUS). The number of recorded symbiotic species was close to the statistically expected value, while SUS were rare and did not reach the value expected from the Chao 2 model. Species number and abundance positively correlated with the colony volume. Mean abundance of all species and symbionts and the number of SUS per covariate colony volume were higher in the northern area than in the southern area. This may be related to a higher habitat diversity of the surrounding reefs and to the presence of colonies with partially dead tissues in the north. These two factors have a weak impact on symbionts, but strongly affect SUS. The diversity of the pocilloporidassociated communities range from 36 to 127 species along the Indo-Pacific and Tropical East Pacific, with 9 to 19 of them being symbionts. The total species diversity varies owing to the SUS number, while the core of true symbionts includes much fewer species and is less variable. The diversity of Pocillopora symbionts in the Saudi Arabian coast (15 species) is among the highest for the studied areas in the Indo- Pacific.

Botanical Studies
2018
59:6

Acetylsalicylic acid enhance tolerance of *Phaseolus vulgaris* L. to chilling stress, improving photosynthesis, antioxidants and expression of cold stress responsive genes

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Abstract

Background: High and low temperatures constitute the most damaging type of abiotic stress and limit the survival, and productivity of plants. The present study aimed to evaluate the role of exogenous applications of acetylsalicylic acid (ASA) in reducing the deleterious effects of cold stress. *Phaseolus vulgaris* L. seedlings were treated with foliarsprayed ASA at concentrations of 0–3 mM and then subjected to chilling stress at 4 °C for 2 or 4 days.
Results: Growth, photosynthesis, biochemical alterations, oxidative damage and antioxidant enzyme activities as well as the expression of cold-responsive genes (CBF3–COR47), were monitored during the experiment. ASA applications substantially improved several growth and photosynthetic parameters, including shoot biomass, dry weight, and photosynthetic pigments, of *P. vulgaris* seedlings exposed to different durations of chilling stresses. The ASA foliar spray treatments significantly ($p < 0.05$) rescued the growth and photosynthetic pigments of *P. vulgaris* seedlings under different chilling stresses. The total soluble sugars markedly increased during 0–4 days of chilling stress following ASA foliar spraying. The exogenous application of ASA significantly ($p < 0.05$) increased the accumulation of proline in *P. vulgaris* seedlings under chilling stress. At the gene expression level, ASA significantly ($p < 0.05$) upregulated the cold-responsive genes CBF3 and COR47.
Conclusions: As a result, we speculate that, the application of exogenous ASA alleviated the adverse effects of chilling stress on all measured parameters, and 1 and 2 mM ASA exhibited the greatest effects.

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2017
174, 336-352

Control of compressional transfer zones on syntectonic and post-tectonic sedimentation: implications for hydrocarbon exploration

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Abstract

The northern Sinai inverted basins exhibit superb outcrop examples of compressional transfer zones and display the control of these zones on syntectonic and post-tectonic sedimentation. Two main types of transfer zones, hard- and soft-linkage transfer zones, were identified at different scales. Hard-linkage transfer zones form inward and outward fault kinks whereas the soft-linkage transfer zones are expressed by plunging anticline–syncline pairs between overlapping positively inverted fault segments. An example of a wrench-related compressional transfer zone is also displayed by a restraining-bend anticline formed within the strike-slip fault system of the Sinai hinge belt. The displayed examples of compressional transfer zones invariably exerted fundamental control on deposition of syn- and post-tectonic sediments, flow directions of drainage systems, locations of sediment entry points, and the intensity of erosion patterns of the structurally high sediment source areas. This study highlights the close relationship between the transfer zones and hydrocarbon accumulations in clastic syntectonic reservoirs in inverted and wrench basins.

Geomicrobiology Journal
2018
35, 91–99

Bioleaching of Uranium From Egyptian Rocks Using Native Actinomycete Strains

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Abstract

Bioleaching is an economic, novel practice for extraction of metals from their sources by microorganisms. The current study aimed to extract uranium from Egyptian ores using native strains of actinomycetes. Two types of rocks and one ore sample were collected from west-central Sinai, Egypt. Major oxides of the samples and fourteen heavy metals, including uranium, were determined. X-ray diffraction analysis proved that uranium was present in the samples in various structures. Uranium was present in different concentrations, 220, 770, and 550 mg/kg in sandstone, granite, and manganese ore, respectively. Thirtyfour actinomycete isolates were recovered from the studied samples using four different isolation media. Acid production capabilities were employed to select isolates for further leaching experiments. Bioleaching experiments were carried out using sterile and non-sterile ore samples. Using sterile ore samples, the highest solubilization percentages of U3O8 were 44.5, 38.55, and 16.76% from sandstone, manganese ore, and granite sample, achieved by isolates UA12, UA5, and U7, respectively. Lower solubilization percentages of U3O8 were recorded by using non-sterile ore samples. Investigating the factors affecting the bioleaching abilities of the tested organisms revealed that 10 days of incubation with 4% pulp density were the best conditions for U3O8 solubilization. The most efficient isolates were identified using 16S rRNA gene sequence analysis. UA12 identified to be Streptomyces bacillaris, while UA5 could not be identified, and U7 was assigned as uncultured bacterium clone. Scanning electron microscope examination of the bioleaching experiment showed different growth intensity within the active isolates. For larger-scale extraction purposes, a kilogram of sandstone, containing 220 mg of U3O8, was used in the form of a truncated cone in a heap leaching experiment. After 20 cycles, 14.72 mg/l (6.7%) of U3O8 was leached by S. bacillaris, while 19.36 mg/l (8.8%) of U3O8 was leached by chemical leaching using sulfuric acid. The results of this study prove that the extraction of uranium using actinomycetes could be exploited as less polluting, more economical, and more effective than traditional chemical extraction especially from low-grade ores or mining wastes.

Rendiconti Lincei. Scienze Fisiche e Naturali
2018
29:81–86

Silver nanoparticles: characterization and antibacterial properties

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Abstract

(Ink Ag-NPs), were characterized for studying their antibacterial activity. The X-ray diffraction (XRD) and high resolution transmission electron microscopy (HRTEM) were used to determine the crystal structure, shape and size of Ag-NPs. The bactericidal effects of these nanoparticles were investigated against gram positive and gram negative bacteria at two different concentrations, 10 and 50 µg/disc, by the disk diffusion method using Mueller–Hinton Agar to display good microbial culture growth. Antibacterial experiments results revealed that *Escherichia coli* (ATCC25922) and *Bacillus subtilis* (ATCC6633) inhibited by Ink Ag-NPs more than Sigma Ag-NPs. Both *Salmonella typhimurium* (ATCC14028) and *Staphylococcus aureus* (ATCC25923) were resistant to both sources of Ag-NPs, while *Pseudomonas aeruginosa* (ATCC27853) was resistant to Ink Ag-NPs and inhibited by Sigma Ag-NPs. This experiment showed that characteristics and suspension stability of Ag-NPs affect its antibacterial activity against some pathogenic bacterial strains.

Food Chemistry
2018
269: 519-526

CO_2 enrichment can enhance the nutritional and health benefits of parsley (*Petroselinum crispum* L.) and dill (*Anethum graveolens* L.)

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Abstract

The functional food value of herbal plants is greatly related to their contents of valuable phytochemicals. Regarding its impact on primary and secondary plant metabolism, CO_2 enrichment could be a candidate strategy to modulate the levels of nutritionally and medicinally interesting phytochemicals in herbal plants. Herein, the concentrations of 81 metabolites and minerals were evaluated in shoot tissues of parsley and dill grown under two levels of CO_2, ambient (378 ± 25 µmole CO_2 $mole^{-1}$ air, aCO_2) and elevated (627 ± 24 µmole CO_2 $mole^{-1}$ air, eCO_2). Regardless of the plant species, eCO_2 improved the levels of soluble sugars, starch, organic acids, some EAAs, most of USFA, total phenolics, total flavonoids and vitamins A and E. However, notable variations in the metabolites responsiveness to eCO_2 were recorded among the tested plant species. Moreover, considerable improvements in the total antioxidant capacity, antiprotozoal, antibacterial and anticancer activities were recorded for parsley and dill in response to eCO_2.

Journal of Plant Physiology
2018
224-225: 121-131

Elevated CO2induces a global metabolic change in basil (Ocimum basilicum L.) and peppermint (Mentha piperitaL.) and improves their biological activity

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Abstract

Many studies have discussed the influence of elevated carbon dioxide (eCO2) on modeling and crop plants. However, much less effort has been dedicated to herbal plants. In this study, a robust monitoring for the levels of 94 primary and secondary metabolites and minerals in two medicinal herbs, basil (Ocimum basilicumL.) and peppermint (Mentha piperitaL.), grwon under both ambient (aCO2, 360 ppm) and eCO2 (620 ppm) was performed. We also assessed how the changes in herbal tissue chemistry affected their biological activity. Elevated CO2 significantly increased herbal biomass, improved the rates of photosynthesis and dark respiration, and altered the tissue chemistry. Principal Component Analysis of the full data set revealed that eCO2induced a global change in the metabolomes of the two plants. Moreover, Hierarchical Clustering Analyses showed quantitative differences in the metabolic profiles of the two plants and in their responsiveness to eCO2. Out of 94 metabolites, 38 and 31 significantly increased in basil and peppermint, respectively, as affected by eCO2. Regardless of the plant species, the levels of non-structural carbohydrates, fumarate, glutamine, glutathione, ascorbate, phylloquinone (vitamin K1), anthocyanins and a majority offlavonoids and minerals were significantly improved by eCO2. However, some metabolites tended to show species specificity. Interestingly, eCO2 caused enhancement in antioxidant, antiprotozoal, anti-bacterial and anticancer (against urinary bladder carcinoma; T24P) activities in both plants, which was consequent with improvement in the levels of antioxidant metabolites such as glutathione, ascorbate andflavonoids. Therefore, this study suggests that the metabolic changes triggered by eCO2in the target herbal plants improved their biological activities.

Science of the Total Environment
2018
643: 946–956

Effects of ocean acidification on the levels of primary and secondary metabolites in the brown macroalga Sargassum vulgare at different time scales

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Abstract

Most of the studies regarding the impact of ocean acidification on macroalgae have been carried out for short term periods, in controlled laboratory conditions, thus hampering the possibility to scale up the effects on long-term. In the present study, the volcanic CO2vents off Ischia Island were used as a natural laboratory to investigate the metabolic response of the brown algae Sargassum vulgare to acidification at different time scales. For long-term effects, algal populations naturally growing at acidified and control sites were compared. For short-term responses, in sit reciprocal transplants from control to acidified site andvice-versawere performed. Changes in the levels of sugars, fatty acids (FAs), amino acids (AAs), antioxidants, and phenolic compounds were examined. Our main finding includes variable metabolic response of this alga at different time scales to natural acidification. The levels of sugars, FAs, and some secondary metabolites were lower in the natural population at the acidified site, whereas the majority of AAs were higher than those detected in thalli growing at control site. Moreover, in algae transplanted from control to acidified site, soluble sugars (glucose and mannose), majority of AAs, and FAs increased in comparison to control plants transplanted within the same site. The differences in the response of the macroalga suggest that the metabolic changes observed in transplants may be due to acclimation that supports algae to cope with acidification, thus leading to adaptation to lowered pH in long time scale.

Chem Electro Chem
2018
5, 1056–1063

DOPA and Adrenaline Oxidation Kinetics and Intermediates Identified by Electrospray Ionization Mass Spectrometry in Real Time

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Abstract

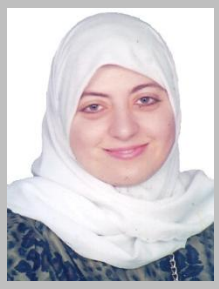
DOPA and adrenaline (Adr) oxidation intermediates were identified using electrospray ionization mass spectrometry (ESIMS) by exploiting electrochemical oxidation reactions that occur during ESI. In addition, on-line MS monitoring of the oxidations allowed evaluation of DOPA and Adr oxidation kinetics with approximately 3 ms time resolution. Kinetic information was confirmed by on-line electrochemistry/ESI MS (EC/ESI MS).

Application of an EC cell voltage in EC/ESI MS increased the oxidation rates and MS detection sensitivity of intermediates.

During ESI and EC/ESI MS, oxidation rates were DOPA < Adr dopamineðDAÞ, cyclization rates of quinone oxidation products were Adr DOPA > DA, and cyclic leuco-chrome oxidation rates were DA>Adr>DOPA. Formation of radical semiquinones of Adr and DOPA through OH*

Radical-initiated oxidation pathways was indicated, as reported for DA.

Images of catecholamine oxidation pathways obtained with high time resolution, using MS, underscore the differences between the reactivity of DOPA, Adr, and DA.



Arabian Journal of Chemistry
2018
(13), 2628-2648

Novel and highly effective composites of silver and zinc oxide nanoparticles with some transition metal complexes against different microorganisms

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Abstract

Novel composites of Ag and ZnO nanoparticles with prepared transition metal complexes were obtained. The transition metal complexes are obtained by the interaction of the ligand N,N′-bis(salicylaldehyde)-o-phenylenediamine(H2B) with some transition metal ions (Co(II), Ni(II), Cu(II) and Zn(II)). The structures of the ligand and the formed complexes were characterized by elemental analysis, FTIR, UV–Vis, 1H NMR, mass spectra, thermal (TG/DTA), magnetic and conductivity measurements. The obtained complexes have the molecular formula [MB(H2O)x]. yH2O. The found conductivity revealed the non-electrolytic behavior of the formed complexes. The magnetic susceptibility and UV–Vis spectra indicated the octahedral structure of the formed complexes. The thermodynamic and kinetic parameters are estimated for the formed complexes. The interaction of the formed compounds with the FM-DNA was tested. The evaluation of the binding constant (Kb) using Bensi-Hildebrand plot, revealed the moderate interaction with electrostatic behavior. Silver and zinc oxide nanoparticles were prepared and characterized by XRD, UV–Vis, FTIR spectra and TEM analysis. The biological activity of the synthesized composites of Ag and ZnO nanoparticles with the prepared transition metal complexes were tested against some Gram positive and Gram negative bacteria as well as Fungi. The obtained inhibition zone supported the enhancement in the activity of the prepared compounds towards the target microorganism after forming the composites. Also, the interaction with the E. coli protein (FabH, PDB code: 1HNJ) was tested and evaluated using the docking operation with aid of some computational chemistry software. The obtained results agreed well with our experimental work

Bioorganic & Medicinal Chemistry
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(26), 4047-4057

Synthesis and Characterization of some Atypical Sphingoid Bases

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Abstract

Sphingolipids are ubiquitous and abundant components of all eukaryotic and some prokaryotic organisms. Sphingolipids show a large structural variety not only between the different species, but also within an individual cell. This variety is not limited to alterations in the polar headgroups of e.g. glycosphingolipids, but also affects the lipophilic anchors comprised of different fatty acids on the one hand and different sphingoid bases on the other hand. The structural variations within different sphingoid bases e.g. in pathogens can be used to identify novel biomarkers and drug targets and the specific change in the profile of common and uncommon sphingolipids are associated with pathological conditions like diabetes or cancer. Therefore, the emerging field of sphingolipidomics is dedicated to collect data on the sphingolipidome of a cell and hence to assign changes therein to certain states of a cell or to pathological conditions. This powerful tool however is still limited by the availability of structural information about the individual lipid species as well as by the availability of appropriate internal standards for quantification. Herein we describe the synthesis of a variety of 1-deoxy-sphingoid bases. 1-DeoxySphingolipids have recently acquired significant attention due to its pathological role in the rare inherited neuropathy, HSAN1 but also as predictive biomarkers in diabetes type II. Some of the compounds synthesized and characterized herein, have been used and will be used to elucidate the correct structure of these disease-related lipids and their metabolites.

Analytical Chemistry
2018
90(8):5343-5351

Differential-Mobility Spectrometry of 1-Deoxysphingosine Isomers: New Insights into the Gas Phase Structures of Ionized Lipids

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Abstract

Separation and structural identification of lipids remain a major challenge for contemporary lipidomics. Regioisomeric lipids differing only in position(s) of unsaturation are often not differentiated by conventional liquid chromatography-mass spectrometry approaches leading to the incomplete, or sometimes incorrect, assignation of molecular structure. Here we describe an investigation of the gas phase separations by differential-mobility spectrometry (DMS) of a series of synthetic analogues of the recently described 1-deoxysphingosine. The dependence of the DMS behavior on the position of the carbon-carbon double bond within the ionized lipid is systematically explored and compared to trends from complementary investigations, including collision cross-sections measured by drift tube ion mobility, reaction efficiency with ozone, and molecular dynamics simulations. Consistent trends across these modes of interrogation point to the importance of direct, through-space interactions between the charge site and the carbon-carbon double bond. Differences in the geometry and energetics of this intramolecular interaction underpin DMS separations and influence reactivity trends between regioisomers. Importantly, the disruption and reformation of these intramolecular solvation interactions during DMS are proposed to be the causative factor in the observed separations of ionized lipids which are shown to have otherwise identical collision cross-sections. These findings provide key insights into the strengths and limitations of current ion-mobility technologies for lipid isomer separations and can thus guide a more systematic approach to improved analytical separations in lipidomics.

Journal of lipid research
2018
(11):2126-2139

Tsc3 regulates SPT amino acid choice in Saccharomyces cerevisiae by promoting alanine in the sphingolipid pathway

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Abstract

The generation of most sphingolipids (SPLs) starts with condensation between serine and an activated long-chain fatty acid catalyzed by serine palmitoyltransferase (SPT). SPT can also use other amino acids to generate small quantities of noncanonical SPLs. The balance between serine-derived and noncanonical SPLs is pivotal; for example, hereditary sensory and autonomic neuropathy type I results from SPT mutations that cause an abnormal accumulation of alanine-derived SPLs. The regulatory mechanism for SPT amino acid selectivity and physiological functions of noncanonical SPLs are unknown. We investigated SPT selection of amino acid substrates by measuring condensation products of serine and alanine in yeast cultures and SPT use of serine and alanine in a *TSC3* knockout model. We identified the Tsc3 subunit of SPT as a regulator of amino acid substrate selectivity by demonstrating its primary function in promoting alanine utilization by SPT and confirmed its requirement for the inhibitory effect of alanine on SPT utilization of serine. Moreover, we observed downstream metabolic consequences to Tsc3 loss: serine influx into the SPL biosynthesis pathway increased through Ypk1-depenedent activation of SPT and ceramide synthases. This Ypk1-dependent activation of serine influx after Tsc3 knockout suggests a potential function for deoxy-sphingoid bases in modulating Ypk1 signaling.

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Electrochemical and spectroscopic studies on the interaction of europium-(9-acridine carboxylate) 2 complex with calf thymus DNA

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Abstract

A new europium-acridine-9-carboxylate (Eu(III)-(9-ACA)2(NO3)) was synthesized and characterized. The interaction of calf thymus DNA (ct-DNA) with Eu(III)-(9-ACA)2(NO3) has been investigated using UV-visible and fluorescence spectroscopic and electrochemical techniques including cyclic voltammetry and differential pulse voltammetry (DPV) on the GCE. UV-absorption spectroscopic techniques were employed to investigate the interaction between the Eu(III)-(9-ACA)2(NO3) and ct-DNA. Based on electrochemical and spectroscopic data, the mode of binding of Eu(III)-(9-ACA)2(NO3) to DNA through intercalation interaction was concluded. The stoichiometric coefficient (n) and apparent binding constant (β) were calculated to be 1.4 and 9.1 x 10^4 M^{-1}, respectively. The antibtumor activity of the complex against MDA-MB-231 (mammary cancer) and PC-3 (prostate carcinoma) cell lines was evaluated and the results showed promising activities.

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