

TWAS/BioVisionAlexandria.NXT 2018

**Science Diplomacy
Voices of the South**

18–19 April 2018

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Participants Abstracts



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Growth of Channel Catfish *Ictalurus Punctatus* Transgenic for Channel Catfish Growth Hormone cDNA Driven by *Opafp* or *Rtmt* Promoter

We will meet a daunting challenge to feed the world in the near future. Aquaculture continues to be the fastest growing animal food producing sectors in the world. There is a great need for genetic improvement of culture fishes to meet this challenge. Gene transfer considers a potential solution to this problem. Growth Hormone (GH) has been considered as a candidate gene for growth and development in teleost fish.

The Growth Hormone (GH) cDNA from channel catfish, *Ictalurus punctatus*, driven by the ocean pout *Zoarces americanus* antifreeze protein promoter (*opAFP*), and the GH cDNA from channel catfish driven by the rainbow trout *Oncorhynchus mykiss* metallothionein promoter (*rtMT*), were transferred to the channel catfish, *Ictalurus punctatus* via electroporation. Transgenic individuals (P1) were mated to produce individuals (F1) that exhibited enhanced growth rate. The inheritance of the transgene by the F1 generation was 10% to 36% dependent on the genotype. The body size of F1 transgenic fish were significantly larger than their non-transgenic siblings ($P < 0.001$). Transgenic channel catfish containing channel catfish growth hormone (ccGH) cDNA, driven by the ocean pout antifreeze protein promoter (*opAFP*), *opAFP*-ccGH, grew 1.4 to 1.6 fold larger than their non-transgenic siblings, and transgenic channel catfish containing channel catfish growth hormone (ccGH) cDNA, driven by the rainbow trout metallothionein promoter (*rtMT*), *rtMT*-ccGH, grew 1.4 to 1.8 fold larger than their non-transgenic siblings.

At 16 weeks old, the largest transgenic *opAFP*-ccGH was 2.3 times that of the average non-transgenic siblings and the largest transgenic *rtMT*-ccGH ranged from 1.9 to 3.5. Transgenic channel catfish containing (ccGH) cDNA GH consumed a significantly higher amount of feed on a daily basis ($P < 0.001$) but due to enhanced growth rates, better feed conversion ratios they achieved target weight gain in a considerably shorter period than their non-transgenic siblings.

The GH transgenic channel catfish grew larger than their non-transgenic siblings. However, in some non-transgenic siblings in one family had the same size of transgenic of another family, perhaps due to the family effect ($P < 0.0001$). So, it is very important to develop the fastest growing we need to combine the GH transgenesis with family selection.

Keywords: Transgenic, Growth hormone, Channel catfish.



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Aflatoxin B1: Preventive Methods Against Its Neurotoxicities in Mice

Mycotoxins are the worldwide food-contaminants concern, and considered among the most dangerous environmental pollutants. They have adverse effects on agriculture, agri-food industry and human and animal's consumers. They can invade the stock of cereals in the field, during pre-storage and final storage, when climatic conditions are favorable for the proliferation of mold toxinogenesis.

Aflatoxin B1 (AFB1) which is the most common toxic form is mainly produced by *Aspergillus flavus* and *A. Parasiticus*. They are classified as class 1 carcinogens. AFB1 is well known for its carcinogenic, mutagenic, teratogenic and immunosuppressive effects. Some researchers, however, have shown that, aside from the liver, other organs could also be targeted for the toxicity of AFB1 such as the lungs, the gastrointestinal tract, the kidney, the heart and various endocrine glands. AFB1 is responsible of anorexia, decreased performance and body weight gain, and delayed growth in farmed breeding animals. As these symptoms are similar to those induced by well-known neurotoxins, acrylamide and methylmercury, repeated administration of AFB1 in rats may also affect the nervous system. There is very little information on the effects of aflatoxins on the nervous system of animals.

In this respect, our work aims to determine the neurotoxicity of chronic ingestion of AFB1 in rats and to invent preventive methods using bio-products such as lactic acid bacteria, plant extracts and clays which are the best substitutes to the chemical products used for this purpose. In order to reuse the crops or animal feed already contaminated by AFB1.

Keywords: Aflatoxin B1, Mice, Nervous system, Lactic acid bacteria.

**ADESULU, Adekemi**

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Nigeria**Molecular Characterization, Technological and Probiotic Potentials of Lactic Acid Bacteria Isolated from Some Traditional Fermented Foods in Nigeria**

Lactic Acid Bacteria (LAB) are beneficial microorganisms commonly isolated from various fermented food products. Appropriate procedures for valid identification are important. This study aimed at the use of polyphasic identification methods for LAB differentiation and also evaluating the probiotic and technological potentials of LAB isolated from traditional fermented food products in Nigeria.

Food samples were obtained from retail producers in Ibadan, Nigeria, during fermentation. LAB isolates with desirable biochemical properties were identified to strain level using molecular techniques. Probiotic potentials were evaluated. Exopolysaccharide (EPS) production was analysed using TLC, HPLC, FTIR and NMR spectroscopic techniques. A total of 94 LAB obtained were genotypically differentiated to strains level using ITS-RFLP, RAPD-PCR and PFGE. The 16S rRNA gene sequence of the representative strains were deposited in GenBank (KU892392-KU892408).

Some of the isolates could survive the acid, bile and simulated gastric transit conditions. Eight LAB produced EPS with different monomer compositions. The FTIR showed different functional groups. Polyphasic taxonomic was useful for the accurate identification of the LAB isolates. *L. plantarum* YO175, OB123 and *Weissella cibaria* GA44 exhibited good probiotic and technological characteristics and can be used as starter cultures in industrial food fermentation. The characterized EPS can also find various applications in food industries.

Keywords: Amplified ribosomal DNA restriction analysis, 16S rRNA, Exopolysaccharide, Lactic acid bacteria, Probiotic.



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Diagnosis of Human Brucellosis by Real Time Polymerase Chain Reaction (RT-PCR)

Human Brucellosis is a zoonotic disease transmittable to human by infected animals, caused by Gram-negative Coccobacilli facultative intracellular pathogen called *Brucella*. There are six *Brucella* species compromising human health, two of them are endemic in Saudi Arabia according to the lifestyle of Saudi people *Brucella abortus* and *Brucella melitensis*, since the *Brucella* clinical picture is not clear according to the non-specific symptoms of the infection and the difficulties on the laboratory diagnosis by the available techniques, immunological examination of the Brucellosis such as serum agglutination test and ELISA, show cross-reactivity with other Gram-negative bacteria, on the other hand, the gold standard test of *Brucella* identification is bacterial culture which is time-consuming and shows false negative results in the relapsed and previously-treated antibiotic cases, in addition *Brucella* culture could threaten laboratory staff by its ability of transmission to humans by aerosols. Molecular diagnosis is a rapid technique showing more accuracy, higher sensitivity with time-saving approximately six hours and better in the safety for the laboratory staff more than other available techniques.

This proposal aims at enhancing *Brucella* diagnosis with RT-PCR that appears to be a more accurate technique able to identify the infection by each species, specifically *Brucella* species alone, more accurately, small quantity of the sample up to 10 fg, shorter time than culture technique maximum six hours without any danger of contamination by *Brucella* species.

Keywords: *Brucella*, RT-PCR.

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Anti-Diabetic Effect of Spirulina Mediated through Mitochondrial Biogenesis

Various nutritional and medicinal potencies have been attributed to metabolites from the cyanobacteria, *Spirulina* (*Arthrospira*) sp. High fat diet/low dose streptozotocin (HFD/STZ) model was adopted and the diabetic rats were orally treated with spirulina in doses of 25 or 50 or 75 mg/kg/day. Spirulina ameliorated the HFD/STZ-induced elevation of fasting blood glucose, insulin, HOMA-IR and hepatic enzymes; namely AST and ALT. Moreover, spirulina corrected successfully disrupted serum lipid profile and showed an anti-inflammatory effect via tumor necrosis factor- α (TNF- α) and adiponectin modulation. On the molecular level, spirulina reduced the expression of sterol regulatory element binding protein-1c (SREBP-1c), confirming its antihyperlipidemic effect.

Furthermore, spirulina amended compromised mitochondrial biogenesis signaling as it significantly increased hepatic peroxisome proliferator-activated receptor- γ coactivator-1 α (PGC-1 α), mitochondrial transcription factor A (mtTFA) and mitochondrial DNA (mtDNA) copy number. To our knowledge, it is the first study to suggest the participation of the SREBP-1c and PGC-1 α /mtTFA/mtDNA pathways in the spirulina effect. Thus, the present results clearly proved that spirulina modulated glucose/lipid profile and showed anti-inflammatory properties and it can be strongly considered as a potential antidiabetic agent and might create the promise for new therapeutic approaches in T2DM patients.

Keywords: Insulin resistance, HFD/STZ, Type 2 diabetic rats, Spirulina, Adiponectin, SREBP-1c, PGC-1 α , mtTFA, mtDNA copy number, Mitochondrial biogenesis.



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Shifting the Electron Distribution in Mixed-Culture Microbial Electrochemical Cells Fed with Wastewater

Microbial electrochemical cells (MXCs) are one of the newest environmental biotechnologies for waste streams treatment. Their main functions can be broken into two main categories: (1) recovery of renewable energy in different useful forms and (2) production of clean treated water that can be discharged safely into water bodies, by removing the biodegradable organic contaminants. Because one of the main goals of an MXCs is to treat wastewater, the final effluent quality has to meet discharge limits (i.e., < 30 mg 5-day biochemical oxygen demand (BOD₅)/L). However, we still lack complete understanding for how MXCs could not produce an effluent with low organic concentration, even though the MXCs were usually operated with very long HRTs (i.e., up to several weeks). Here, we showed that the release of soluble microbial products (SMPs) and/or extracellular polymeric substances (EPS)—during normal biomass metabolism and decay—is the reason for electron losses and high effluent organic matter concentration.

The SMPs concentration in the final wastewater effluent represent up to 30% of the initial organic matter concentration under different operating conditions (i.e., hydraulic retention time and wastewater flow rates). Our results provide insight into the link between the SMP production and the electric current generation and organic matter removal in MXCs, highlighting the importance of the post-treatment step in order to polish the treated effluent for water reuse in agricultural purposes.

Keywords: Microbial electrochemical cells, Renewable energy recovery, Wastewater, Biochemical oxygen demand, Soluble microbial products, Extracellular polymeric substances.



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Mauritius, a Small Island Developing State towards a Blue Economy: A Promise for Sustainable Use and Conservation of Marine Sponges in Drug Discovery

Mauritius is a Small Island Developing State (SID) in the South-West Indian Ocean which aims at becoming Africa's foremost leader in the blue biotechnology sector. Bestowed with one of the world's largest maritime zone, Mauritius Sea represents an untapped reservoir for the bio-prospection of pharmacologically active compounds. In this vein, this project aims to assess the therapeutic effects of some selected Mauritian marine sponge-derived extracts with potential application as antimicrobial and anticancer drugs. Preliminary *in-vitro* bioactive screening have earmarked the sponge *Neopetrosia Exigua* Extract (NEE) with promising antibacterial and antibiotic potentiating activity against *Staphylococcus aureus* and *Bacillus cereus*.

This strongly suggests that sponge-derived antimicrobials may represent an alternative source of novel antibiotics. Current investigations are ongoing on the anti-cancer activity of NEE which displayed pronounced cytotoxicity against liposarcoma, colon, hepatic, oesophageal and HeLa cancer cell lines. Chemical investigations identified the anticancer compound beta-sitosterol as the most significant component of the extract. Currently, our work is focused on delineating the underlying molecular mechanisms by which NEE modulate the interplays involved in cell proliferation, oncogenic transformation and survival. Overall, these insightful results lay a strong foundation to promote aquaculture of the studied Mauritian sponge species and sustainable product.

Keywords: Bioprospecting, Bioactive compounds, Conservation, Marine sponges, Republic of Mauritius, SIDS, Sustainable use.



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The Development and Evaluation of a Novel Hybrid PLGA Nanoparticle-Pheroid® System with the Potential to Improve Tuberculosis Therapy

The application of a Drug Delivery System (DDS) has the potential to alter pharmacological properties of an encapsulated chemical drug, and therefore bring therapeutic value to future healthcare products. Hybrid DDS composed of either biodegradable polymer or a biocompatible lipid-based material have not been adequately studied to transport drugs used to treat infectious diseases that affect poverty-stricken communities in the world. For instance, there is an available treatment for one of the major health threats in South Africa, Tuberculosis (TB); however, it involves extended periods of high daily dosage of drugs, which often leads to poor compliance and the emergence of drug-resistant TB strains.

This study explores the design and evaluation of a hybrid DDS composed of Poly Lactic-co-Glycolic Acid (PLGA) nanoparticles (NPs) as well as Pheroid® vesicles. The physicochemical properties of this hybrid DDS were obtained through Transmission Electron Microscopy (TEM) and Confocal Laser Scanning Microscopy (CLSM), which showed a possible co-localisation of the NPs within the Pheroid® vesicles, proving the successful combination of the two systems and the stability of this hybrid system. The *in-vivo* evaluation showed that this hybrid DDS had an impact on one of most prominent anti-TB drugs, Rifampicin (Rif) distribution to the lung tissue, the primary host organ for the TB bacilli. There was a significant reduction of time to reach maximum concentration (T max) from 11 hours.

Keywords: PLGA nanoparticles, Pheroid® vesicles, Lipid-polymer hybrid nanoparticles, Drug delivery, Tuberculosis, Anti-TB drugs, Rifampicin, Isoniazid.

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Evaluation of the Genetic Diversity of Rice Varieties (*Oryza sativa*) Grown in Mali

The high genetic diversity of rice is based on its huge varieties grown in the world. Knowledge of genetic diversity is important for the conservation and the use of plant genetic resources. In this study, 59 microsatellite markers were used to assess the genetic diversity of 54 intraspecific (*Oryza sativa*) and interspecific (*Oryza sativa* X *Oryza glaberrima*) irrigated rice varieties by PCR-SSR. A total of 251 alleles were detected with an average of 4.25 alleles per SSR (locus). The genetic diversity was ranged from 0.0713 (RM333, RM3744) to 0.8937 (RM251) with an average of 0.4325. The value of the Polymorphism Information Content (PIC) also varied from 0.0688 (RM333, RM3744) to 0.8854 (RM251) with an average of 0.3940.

The varieties were grouped into five clusters (I–V) according to their genetic similarity coefficient. The majority (64.81%) of the varieties were grouped in clusters V. The SK 7-9 variety is highly dissimilar to other varieties and forms cluster III. Varieties of Malian origin have been grouped into clusters II, III, V and VI. The most cultivated and appreciated rice varieties as Kogoni 91-1, Adny11 and BG90-2 have a strong genetic similarity between them and constituted sub-cluster V2. The allelic variability among varieties revealed by SSR markers can help breeding programs to easily identify cultivars and conserve local phylogenetic resources. This study completed the phenotypic characterization made by the Institute of Rural Economy (IER) of Mali.

Keywords: Diversity, Rice, Variete *Oryza sativa* PCR-SSR.

**ED-DAY, Soumia**

Master's degree Student

Unit of Behavioral and Cognitive Neuroscience and Applied Nutrition, Department of Biology, Faculty of Science
Kenitra, Morocco**Impact of *Lepidium Sativum* on Cd-Induced Diabetes and Neurobehavioral Impairment in Rats**

The aim of our study is to investigate the link between the Cadmium Chloride (CdCl_2) exposure, the diabetes induction and their effects on neurocognitive impairment (memory, anxiety, and locomotion). 35 female rats (160± 40) g, 3 months old were divided into five groups: 1) Control group (T): received a distilled water orally, 2) treated group (C): received oral administration dose of CdCl_2 at 10 mg/kg, 3) group (C + L): exposed to CdCl_2 at 10mg/kg of and the aqueous extract of *Lepidium sativum* (20mg/kg) 4) diabetic group (D): is a pancreatectomized group, 5) treated group (D + L): pancreatectomized group + aqueous extract of *Lepidium sativum* (20mg/kg). The rats were daily observed in terms of body weight, food intake and water, temperature. The blood glucose levels were collected, the neurochemical measures of the acetylcholinesterase (AChE) activity and the Acetylcholine levels (ACh) were evaluated in the cortex, hippocampus and cerebellum at the end of the experiment (3 months). All behavioral tests were performed to evaluate, the affective states and the cognitive performances of the tested rats.

Our main expected results will confirm our investigation about the neuroprotective effect of *Lepidium sativum* and the cadmium exposure in rats might be a causal factor of diabetes and that exposure induces the neurochemical and behavioral changes in animals. The chelating effect of *Lepidium sativum* in metal intoxication will be very beneficial into the modulation of the cadmium induced diabetes.

Keywords: Cadmium, *Lepidium Sativum*, Diabetes, Wistar rats, Behavioral tests.

**ELDALY, Sherien**

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Medical Biochemistry Department, National Research Centre
Cairo, Egypt**The Accuracy of Circulating MicroRNAs as Non-Invasive Biomarkers in the Diagnosis of Colorectal Cancer Using a Stepwise Carcinogenesis Mouse Model**

Biomarkers that have a high sensitivity and specificity to monitor changes in disease status are required. The detection of clinically useful non-invasive molecular markers whose expression can predict tumor development process is an important priority for oncologists. A high sensitive and specific biomarker can improve the effectiveness of cancer treatment, but ideally these markers should be relatively non-invasive and affordable allowing serial monitoring of dynamic changes.

Current procedures for diagnosis and examination of colorectal cancer are invasive and unpleasant. Recently, nucleic acid-based markers have come into focus as circulatory diagnostic and prognostic markers. The discovery that non-coding microRNAs (miRNAs) are stable in body fluids such as plasma and serum, presents the opportunity to develop novel strategies taking advantage of circulating miRNAs.

In the present study, we are interested to evaluate the sensitivity and specificity of a circulating miRNA panel in monitoring the stepwise progress of cancer in order to come up with a definite set of miRNAs that can be potentially assigned as non-invasive monitoring tool. Since colon cancer is thought to develop by a multistep process through an adenoma-carcinoma sequence, we thought to use the Azoxymethane (AOM)/dextran sulfate sodium (DSS) mice model that is similar to the pathogenesis of human sporadic colon cancer. Therefore, this model will be of great asset in our search to validate whether the expression of the circulating miRNAs is connected to the stepwise progress in cancer development. We are also monitoring the change in the levels of the currently used serum biomarkers for a comparison to evaluate whether the changes in the suggested miRNAs panel are in concordant or not with changes observed by the other conventional biomarkers. This study is a step forward in the continuous search for non-invasive clinically applied biomarkers which would provide a specific and sensitive readout of tumor behavior.

Keywords: Cancer, miRNAs, Diagnostic Markers, Colorectal Cancer.



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Synergistic Cytotoxic Effect of Combining Two Antisense Oligonucleotides against Telomerase RNA (hTR) and mRNA of Centromere Protein B (CENP-B) in HepG2 Liver Cancer Cells

In this study, we aimed to evaluate the synergistic cytotoxic effect by using two antisense oligonucleotides (ASO) simultaneously targeting human telomerase RNA (hTR) and mRNA of the Centromere B protein on liver cancer cell line (HepG2) and to observe the correlation between the growth inhibition ratio and the expression of certain apoptotic genes (Caspase 3). Effect of antisense treatment on certain cytokine secretion profile was also investigated.

Synergistic cytotoxic effect of combining two antisense oligonucleotides against Telomerase RNA (hTR) and mRNA of Centromere protein B (CENP-B) in HepG2 liver cancer cells. In this study, we aimed to evaluate the synergistic cytotoxic effect by using two Antisense oligonucleotides (ASO) simultaneously targeting human telomerase RNA (hTR) and mRNA of the Centromere B protein on liver cancer cell line (HepG2) and to observe the correlation between the growth inhibition ratio and the expression of certain apoptotic genes (Caspase 3). Effect of antisense treatment on certain cytokine secretion profile was also investigated. Our study, conclusively, demonstrates that using single treatment with ASO hTR or ASO CENP-B led to dose and time-dependent reduction in HepG2 cell viability. Combination of two antisenses (ASO hTR or ASO CENP-B) with different concentrations showed a synergistic effect. ASO hTR 6.25 nmol/l + ASO CENP-B 6.25 nmol/l exhibiting the greatest synergistic effect at both 24 hr and 48 hr. Expression of hTR mRNA in HepG2 cells was totally abrogated by ASO hTR treatment. At the same time, telomerase activity characterizing to liver cancer cells disappeared after treatment with telomerase antisense. Expression of Caspase 3 was increased after transfecting cells with ASO hTR or ASO CENP-B in a dose and time-dependent manner. A significant decrease in TGF- β and TNF-alpha, which are essential for the cancer cell to survive was demonstrated.

Keywords: Telomerase, Centromere protein B, Antisense oligonucleotide.

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Antioxidant Containing Nanoparticles for Management of a Neurodegenerative Disease

Antioxidants are a main category of drugs used for the management of neurodegenerative diseases like Alzheimer's. Among the most powerful of them is the natural flavonoid quercetin, QT, owing to its powerful antioxidant and radical scavenging effects and hence can act as neuroprotectant retarding the progression of Alzheimer's. The use of QT for management of Alzheimer's was due to its extreme insolubility hence failure to formulate and its limited penetration through the CNS. In this work, QT was encapsulated in the core of biodegradable nanoparticles (NPs) formulated using PLGA polymer overcoming the extreme insolubility of QT. Moreover, the NPs were further modified to increase the uptake of the NPs by the blood brain barrier (BBB). For this aim, the NPs were coated with different surfactants namely Tween80 only, Tween80 and polyethylene glycol (PEG) or Tween80 and Pluronic F127. All QT-NPs were formulated using the nanoprecipitation method. The particle size (PS), zeta potential & encapsulation efficiency (EE%) of all the NPs were measured and compared. The stability of the coat was assessed in phosphate buffer saline (PBS) after 1 and 24 hours. The antioxidant activity of the different formulations was measured using the DPPH assay and compared to that of the drug. QT-NPs PS ranged from 143 to 175 nm. The addition of surfactants in the external phase resulted in a decrease in their zeta potential. All the QT-NPs formulations showed EE% higher than 95 %. No change in PS and zeta potential of NPs occurred in PBS after 1 and 24 hours. DPPH assay showed that QT NPs preserved the powerful antioxidant activity of QT. The results of this work make this system a good candidate for brain targeting of QT to be used for the management of Alzheimer's disease.

Keywords: Nanoparticles, Brain delivery, PLGA, Alzheimer's disease.



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Bioactivity Guided Isolation of Natural Antioxidants and Antiglycation Compounds from Promising Sudanese Plants

This study is the first to isolate a new geigerianoloide with four known compounds from *Geigeria alata* (DC) Oliv&Hiern (Asteraceae). Structure of the new compound was identified as (3aR,7aR,8S,9aR)-3,5,8-trimethyl-3a,7,7a,8,9,9a-hexahydroazuleno[6,5-b]furan2,6(3H,4H)-dione(1) using ¹H, ¹³C NMR, mass, and X-ray crystallography. Compounds 2, 4, and 3 exhibited interesting DPPH radical scavenging activity (RSA), with IC₅₀ values of 0.10.01±0.15, 0.00±, and 0.130.00± μM, respectively. Compound (1) was inactive, whereas compounds 2, 3, and 4 demonstrated significant superoxide anion scavenging activity, with IC₅₀ values of 0.14,0.001± 0.00±0.17 and 0.110.006±, μM, respectively, where compound (1) was inactive.

Compounds with promising antioxidant activity were also evaluated for antiglycation properties. Results showed that compounds (2) and (4) exhibited potential antiglycation activities, with IC₅₀ values of 246.970.83± and 262.370.22± μM, respectively, compared to standard Rutin (IC₅₀= 294.501.5± μM). Moreover, compound (5) presented comparable activity to Rutin (IC₅₀= 825.032.30± μM), while compound (4) showed weak antiglycation activity (IC₅₀= 293.281.34± μM), and compound (1) was inactive.

Keywords: *Geigeria alata* (DC), Oliv&Hiern, Geigerianoloide, X-ray crystallography, Antioxidant, Antiglycation.



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Biomonitoring the Microbiome Dynamics of Algal-Bacterial Systems Adapting for Coking Wastewater Treatment: An Orchestration between Microalgae And Bacterial Communities

Three photo-bioreactors (with working volume of nine liters) were established to test the efficiency of using algal-bacterial system in coking-wastewater treatment and to biomonitor the effect of the toxic load and the pollutants variation on the algal-bacterial system.

Photo-bioreactors A, B and C received real coking-wastewater as influent with chemical oxygen demand (COD) of 776 ± 56 , 1229 ± 85 and 2033 ± 27 mg/l, respectively. In phase-1 phenol was added to the influent, while dichlorophenol was added in combination with phenol in phase-2. The treatment efficiency of the algal-bacterial systems was biomonitoring and confirmed in terms of phytotoxicity (plants), *Artemia* toxicity (aquatic micro-animal) and cytotoxicity (mammalian cells). Algal-bacterial ratio, algal settleability, COD removal, phenol and dichlorophenol concentrations were also monitored. All the established systems efficiently detoxified the introduced influents in phase-1. In phase-2, Systems B and C failed to detoxify the influents. The high-throughput Illumina-MiSeq sequencing was used to investigate the dynamics of microbial communities of the algal-bacterial systems treating coking-wastewater. Illumina-sequencing generated 2119749 effective sequences of 16S-rRNA gene from 21 samples collected from different influents and effluents. The number of observed species was significantly lower in effluent samples than influent samples, as some taxa dominated in photo-bioreactors and contributed to the systems' performance.

A significant difference in the microbial diversity between influent and effluent samples was detected. Proteobacteria (78 %), Firmicutes (12 %), Bacteroidetes (5 %) and Deferribacteres (2 %) were the dominant phyla in influent samples. While in effluent samples Proteobacteria (68 %) and Bacteroidetes (25 %) dominated.

Failure in treatment process in systems B and C at phase-2 was accompanied with a significant difference in the microbial diversity. The significant relative abundance of anaerobic bacteria from Deferribacteraceae and Peptococcaceae families in influent samples conformed to the nature of coking-wastewater. The co-culture of microalgae shifted the microbiome and promoted the activity of genera affiliated to Chitinophagaceae, Pseudomonadaceae and Xanthomonadaceae families, which dominated in effluent samples. These bacteria are known for their catabolic diversity that enables xenobiotic degradation. This study confirmed the efficiency of applying comprehensive biomonitoring (chemical assays, biological toxicity assays and microbial community analysis) in algal-bacterial systems with better process control and a cost reduction up to 45 %. The superiority of algal-bacterial systems for coking-wastewater treatment was further confirmed as co-culture of microalgae caused community shift in the core genera of effluent samples, eradicated pathogenic bacteria (*Arcobacter* and *Legionella* genera) in the treated effluent and ensured the treated water quality.

Keywords: Bioassay, Biomarker, Egypt, Illumina-sequencing, Metagenomics Photo-bioreactor.



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Studying Estrogenic and Androgenic Influences on Effects of Anticancer Drugs Using the Hepatocarcinoma Cell Line Hepg2 and Hep 3b

Hepatocellular carcinoma (HCC) is the fourth and ultimate stage of liver disease after earlier hepatitis, fibrosis, and cirrhosis; actually, it is estimated that 80% of patients with HCC have underlying cirrhosis. Additionally, HCC is the fifth most commonly diagnosed cancer and the second cause of death among other types of cancer. Previous studies reported that gender disparity might play a crucial role in preference of development of HCC, with males having a higher risk. Earlier studies reported that estrogens may act as hepatoprotective by multiple ways, such as inhibitory effects on inflammatory processes and significant promotion of antioxidant enzymes, beside down-regulation of IL-6, which is critical for hepatic lesions. Some estrogenic compounds have a significant role in reversing doxorubicin resistance in human breast cancer. Considering the gender disparity on HCC development and outcome, our aim is to study the potential modeling effects of estrogenic and androgenic compounds, such as 17 α -ethinylestradiol (EE2), tributyltin (TBT), and others, alone or in combination with the chemotherapeutic agents, like doxorubicin (DOX) and cisplatin (CISP), using the malignant cell line Hep G2 and Hep 3B as experimental models. Using incubation of 48 h and a range of concentrations of the tested compounds, we start getting the first results. We noticed that EE2 significantly decreased cell viability (at every of four tested concentrations, from 0.01 μ M to 10 μ M), but under the assayed conditions the estrogen did not potentiate the cytotoxic effect of Dox. As for TBT, it seemed to have potentiated the cytotoxic effect of both DOX and CISP, in opposition to EE2. Data are being expanded and refined mechanistically, to unveil insights about the influences of estrogenic and androgenic signaling/effects in the development and therapeutics of HCC.

Keywords: Hepatocellular Carcinoma, Estrogen, Anticancer, Hep G2, Hep 3B.

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Eukaryote Cell Cycle Regulation Meet the Gravitational Alterations

Gravity is a key cue for life on Earth, the only one that has remained constant. Our research aims to develop future life support system through the understanding of the gravitational alterations on Eukaryotes at the molecular/cellular level. This is not only important for space research, including the development of bioregenerative life support systems for space exploration, but also a useful contribution to improving the efficiency of terrestrial agriculture under suboptimal conditions. In this context, our work has been aimed at knowing the cellular mechanisms by which the lack of gravity sensing does affect plant development. Being involved in Multi-space biology projects funded by ESA and NASA to use the state of the art simulated microgravity facilities (GBF-ESA based Project) or for SpaceX 9 mission with NASA (Seedling Growth project).

This work follows a research line focused on root meristematic cells, which are essential for the developmental pattern of the plant. It is an integrative study using an *in vitro* Arabidopsis cell culture synchronized for cell cycle progression, which was incubated in microgravity. A combination of cellular and molecular experimental methods has been used for the complete and accurate analysis of samples. As a result, we have verified the alteration of essential parameters affecting the regulation of processes related to cell proliferation and cell growth induced by the gravitational change, leading to the disruption of meristematic competence. Cell cycle regulators are altered and the cell cycle phases transitions are disrupted cause different alterations on the cell proliferations rates. Moreover, chromatin organization, epigenetics and microRNAs are confirmed to be altered in response to microgravity. The implication of these results for sustainable agriculture on Earth and in Life Support Systems in space is certain.

Keywords: Altered gravity, Cell proliferation, Ribosome biogenesis, Epigenetic changes, Cell culture, Flow cytometry, Transcriptomics, Microarray, Immunofluorescence microscopy, qPCR.

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Fabrication of Polyvinyl Alcohol/Chitosan/*Bidens pilosa*/Citric Acid/Ascorbic Acid Composite Electrospun Nanofibers and Their Enhanced Antibacterial Activities

The research herein has been formulated to address an urgent need in the biomedical sector where hundreds of lives are lost annually due to infections caused by pathogenic bacteria. Many often dangerous chemicals have been, and continue to be, used in sanitization process to disinfect various surfaces, equipment, or directly on human beings which has produced a plethora of challenges both to the lives of the victims, users, and the environment.

This study constitutes the scaffolding of polyvinyl alcohol, *Bidens pilosa*, and Chitosan to produce nanofibers which constituted the use of an electrospinner using high direct current of between 15-24 KV to sequester polymers injected by a syringe at a feedrate of 1mL/hr into minute elongated fibers with diameter in nanometers. The nanofibers were then dissolved in 5% citrus and ascorbic acids stirred overnight and applied in anti-bacterial studies.

These composite nanofiber solution showed enhanced anti-bacterial activity against *E. coli* and *S. aureus* with a control rate of up to 95%. Besides the anti-bacterial studies, anti-corrosion studies were also carried out on iron nails with corrosive agents (Ammonium nitrate) as positive controls, and results revealed near perfect control of corrosion for nails soaked in a solution containing nanofiber solution. This type of study is not reported in literature.

Keywords: Polyvinyl alcohol, Chitosan, *Bidens pilosa*, Citric acid, Ascorbic acid Composite Electrospun Nanofibers.

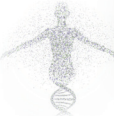
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Survivability of Microencapsulated *Lactobacillus Plantarum* During Storage, Simulated Gastrointestinal and Food Processing Conditions

The survivability of *L. plantarum* microencapsulated with alginate (Alg) combined with skim milk (Sm), dextrin (Dex), denatured whey protein (DWP) or coated with chitosan (Ch) was evaluated under simulated gastrointestinal condition, during storage, after heat treatment and in presence of some food additives (e.g., different NaCl concentrations (1-5%) and different organic acids including citric, lactic and ascorbic acids). The results showed that Alg-Ch and Alg-Sm provide better survival for *L. plantarum* under simulated gastric juice. All the encapsulating agents offer a good survival for *L. plantarum* under simulated intestinal condition. Only Alg-Sm gave thermal stability to the cells at the pasteurization temperature (65 °C for 30 mins). Under freezing storage condition, Alg-DWP and Alg-Sm enhanced the survival of *L. plantarum* for 3 months. Interestingly, storage under refrigeration conditions (8 °C) increased the viability of *L. plantarum* entrapped within all the tested encapsulating agents for 4 weeks. All the microencapsulated *L. plantarum* tolerated NaCl concentrations up to 5%. Tolerance of the microencapsulated cells toward organic acids was varied depending on the type of the organic acid. Generally, Alg-Sm proved to be the most promising encapsulating combination that maintains the survivability of *L. plantarum* under almost all the stress conditions adopted in the current study.

Keywords: Microencapsulation, *Lactobacillus plantarum*, Sodium alginate, Biopolymer, Survivability.

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The Differences between Nano and Normal Tamoxifen and Some Bioactive Components in Experimental Breast Cancer

Breast Cancer is the most common invasive cancer in women worldwide. The aim is to study converting the tamoxifen drug and some bioactive components such as yeast, Isoflavone, and silymarin to nanoparticles and study their different effects on reducing the cancer progress. Fifty-four female Sprague-Dawley rats received a single medication dosage of 7,12-dimethylbenz[a]anthracene (DMBA) intragastrically. The procedure protocol started out after fourteen days after DMBA admission. Finally, all the experimental results were evaluated, tabulated and statistically analyzed. It demonstrated a significant elevation in apoptosis and lipid peroxide was observed in all nano groups in comparison to the same normal groups. Also, a significant reduction in the 8-OHdG level in a group of nano tamoxifen, isoflavone and silymarin appeared in comparison to the same normal groups and significant elevation of 8-OHdG in the nano yeast group in comparison to the same normal group. The nano tamoxifen has demonstrated the best biochemical outcome and positive effects which increase the occurrence and activation of apoptosis process.

Keywords: Apoptosis, Tamoxifen, Bioactive components, Breast cancer, Nanoparticles.



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Optical Nano Sensor for Food Pathogens Detection

Nutrition has a direct influence on human health, whereas healthy food plays a vital role in building a healthy body. Many factors, such as food production, preservation, and transportation affect food quality and food validity. Microbial pathogens and chemical contaminants in food are responsible for human illness or even death.

Outbreaks of foodborne illnesses, caused by microbial pathogens, are very common globally. The conventional methods for microbial identification require cultivation and are laborious. Therefore, there is a need for cultivation-free methods to rapidly identify pathogens. Nanomaterials are promising in the field of microbiology due to their unique size-dependent optical properties. The large surface area of nanomaterials enables attachment of a large number of target-specific molecules of interest for ultra-sensitive detection.

In our previous study, polyaniline nanosensor was prepared and characterized to detect environmental and health chemical contaminants, such as formaldehyde, which is precisely used to preserve and prolong the storage time of food according to the permissible dose. The sensing performance was evaluated, both optically using microplate assay and electrochemically using potentiostat. Results showed that polyaniline nanoparticle is an efficient sensor that detects low concentrations of formaldehyde as a chemical food contaminant. Therefore, polyaniline nanoparticle could be used as a rapid, cheap, stable and sensitive formaldehyde sensor.

In the PhD study, we are going to enhance the selectivity of the previously-prepared polyaniline nanoparticle by functionalizing its surface with specific antibodies to selectively detect some microbial food pathogens that contaminate food and cause severe illness to human beings.

Keywords: Food pathogen.



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Tailored Design of Eco-Friendly and Smart Nano-Marine Antifouling aints

The increased global embargo and restrictions associated with the application of biocide-containing antifouling coatings have motivated the development of eco-friendly alternatives. Non-stick silicone Fouling Release (FR) coatings, specifically Polydimethylsiloxane (PDMS) represent moving targets with conformational mobile surfaces that prevent the adhesion of fouling species. Inorganic-organic surfaces can enhance the silicone self-cleaning and FR ability via designing superhydrophobic surfaces with water contact angle above 150° . Nano-filled PDMS elastomer coatings have gained great attention, owing to their superhydrophobic, self-cleaning and FR performance. Modelling superhydrophobic surfaces depend on the combination of both hierarchical roughness and low Surface Free Energy (SFE). Morphological and surface studies of the polymer nanocomposite were conducted using scanning electron microscopy, transmission electron microscopy, X-ray diffraction techniques. A great interest was given to investigate self-cleaning, such as water contact angle, SFE and atomic force microscopy.

Studying the mechanical and anticorrosive properties is inevitable. Selected micro-foulants were used to investigate the biological inertness and a field test was also conducted in natural sea water for 6 months. The findings are encouraging for their merits, such as simplicity, environmental impacts, benignancy and economy.

Keywords: Nanocomposite materials, Antifouling coatings, Eco-friendly, Superhydrophobic surfaces, Alumina nanorods, Micro-foulants.



