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CAN FRUIT FLY RESEARCH HELP TO IMPROVE SURVIVAL OF THE CANCER PATIENTS?

This is recently discovered that tumors in fruit flies release a chemical that compromises the barrier between the bloodstream and the brain, letting the two environments mix -- a recipe for disaster in numerous diseases, including infection, trauma and even obesity. Subsequently tumors in mice that release the same chemical, a cytokine called interleukin-6 (IL-6), also make the blood-brain barrier leaky. More importantly, they were able to extend the lifespan of both fruit flies and mice with malignant tumors by blocking the effect of the cytokine on the barrier.

MINING METAL FROM MICROBES IN SPACE

Microbes can be used like little factories to churn out important or valuable chemicals. Now researchers are learning how to use bacteria to produce important metals. This process, called biomining, could be a practical and affordable way to obtain the crucial materials that will be needed to complete advanced space missions, such as those that will take humans to other planets. The researchers have shown that not only can bacteria mine elements from basalt in space, but they do the job even more efficiently with the altered gravity on a spaceship. Under reduced gravity conditions, microbes biomined as much as 238 percent more vanadium from basalt compared to what they make in Earth's regular gravity. Vanadium is added to commercial steel to make it stronger and help it resist corrosion. That steel might be useful in construction on other planets. This process could be a way to get the materials we need, while avoiding the damage during mining.

SCHIZOAFFECTIVE DISORDER: A CHALLENGING DIAGNOSIS

Schizoaffective disorder is a chronic mental disorder with symptoms of both schizophrenia (hallucinations, delusions, distorted thinking) and major mood disorder (depression, mania) and has an estimated lifetime prevalence of 0.3%.^{1,2} The diagnostic criteria for schizoaffective disorder have strengthened over time. Schizoaffective disorder is among the most frequently misdiagnosed psychiatric disorders in clinical practice. Due to concerns about the reliability and utility of the diagnostic criteria for schizoaffective disorder, some researchers have proposed revisions, while others have suggested altogether removing the diagnosis from the Diagnostic and Statistical Manual of Mental Disorders. ECT is usually a last resort treatment. However, not only has it been used in urgent cases and treatment resistance, but it should also merit consideration in augmentation of current pharmacotherapy. The most common indicated symptoms are catatonia and aggression. ECT is safe and effective for most chronically hospitalized patients.



IDENTIFICATION OF POTENTIAL THERAPEUTIC TARGETS AND INVESTIGATION OF MEMBRANE BINDING PROPENSITY OF α -SYNUCLEIN REPEATS IN PARKINSON'S DISEASE

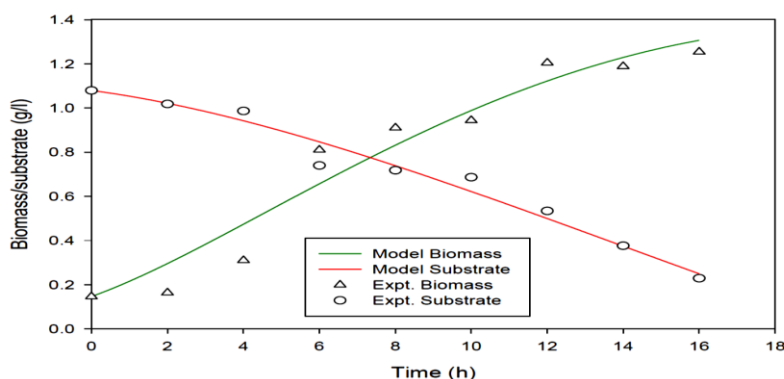
By Gincy George, Doctor of Philosophy (Ph.D)

Parkinson's disease (PD) is a neurodegenerative disorder involving progressive deterioration of dopaminergic neurons in the substantia nigra region. Although few genetic markers for familial PD are known, the etiology of sporadic PD remains poorly understood. We analysed microarray data to prioritize candidate genes by focusing on differentially expressed genes (DEGs) that interact with well-known PD marker genes. Prioritizing genes that interact with already established PD associated genes reduced the probability of spurious protein-protein associations. The identified genes showed involvement in pathways like Parkin-ubiquitin proteasomal system (UPS), neuroinflammation signaling pathway, MAPK signaling apoptosis pathway, movement disorders and development of neurons that are linked with development of PD. Our integrative and network based approach for finding therapeutic targets in genomic data could accelerate the identification of novel drug targets for Parkinson's disease. Also, the network biology approach delineated in this study can be applied to other neurodegenerative disorders for identification of important genetic regulators. Also, we attempted to study the structural propensity of individual 11-mer repeats of α -synuclein which is known to initiate interaction with lipid membrane by performing molecular dynamics simulation. To validate our results, we synthesized all the individual repeats of α -synuclein using solid phase peptide synthesis and studied their interaction with lipid bilayer. This gave us insights on the requirement of minimal number of repeats and/or cooperativity between repeats in the formation of an extended helical conformation by α -synuclein.

MODELING TETRAZOLIUM ASSAY FOR ESTIMATION MICROBIAL TOXICITY IN *E. COLI*

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We have done the introspecting of microbial toxicity of the contaminant through the dynamic modeling of tetrazolium assay. We are doing this experiment to study the microbial toxicity and the effect of toxicant in the microbial culture. We did this experiment without the presence of TTC and with TCC and we also used cupric sulphate as a toxicant. TTC also acts as a toxicant when they are reduced to formazan as they are crystal in structure and this cause the death of the cell but with the help of this quantitative measurement can be done with the help of spectrophotometer at 480nm because the formazan produced are red in color. When we add copper as a toxic component as a result, we find that the formazan concentration is low which means the toxicity is present in the culture. Formulation of mathematical model (microbial growth, substrate consumption, TTC uptake/reduction, toxicity of test compound) and use batch experimental data to estimate toxicity potential of test compound was done.



Experimental and modelled glucose and biomass concentration in set without TTC

STRUVITE RECOVERY FROM DOMESTIC WASETWATER BY CHEMICAL PRECIPITATION METHOD FOR POTENTIAL USE AS FERTILISER

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Struvite precipitation is a promising approach for extracting and recovering phosphorus and nitrogen from wastewater to mitigate both phosphorus depletion from non-renewable phosphorus rock and water eutrophication. The slow release of nutrients and its quality make struvite an environmentally sustainable fertiliser. Struvite efficiency as a fertiliser is determined by its purity depending on the molar ratio of PO_4^{3-} : Mg^{2+} : NH_4^+ and initial pH of the solution for which lab scale experiments and pot trials were carried out to find optimum value of both parameters in this study. Optimum results were observed with initial pH being 9 and molar ratio of PO_4^{3-} : Mg^{2+} : NH_4^+ as 1:1.5:2 and 1:2:4 for struvite formation. Pot trials were carried comparing the formulated struvite fertilisers with commercial phosphorus containing fertiliser. Fourier-transform infrared spectroscopy and SEM with EDAX endorsed the experimental results. In conclusion, Struvite precipitation is an advantageous and effective method for recovering phosphorus and Nitrogen from domestic wastewater and using it as fertiliser.



Struvite product B with Molar ratio of $(\text{PO}_4)_3$: Mg^{2+} : NH_4^+ = 1: 2: 4

ACTIVATED CHARCOAL BASED TOOTHPASTES – GOOD OR BAD?



Recently, toothpastes containing activated charcoal were released on the market of several countries. Because of the encouragement of celebrities on social medias and promises of whitening, remineralization, antimicrobial, antifungal, and antiseptic properties, these toothpastes have gained popularity. In dentistry, the activated charcoal would bind to the tooth surface deposits, and retain these in the charcoal pores, which would then be removed by toothbrushing and allegedly leave the tooth surfaces free of any deposits. Two major concerns arise when considering charcoal-based toothpastes. One is the absence of fluoride in many formulations, which has an appeal of being a natural, organic and eco-friendly product. Noteworthy is that even when fluoride is present, it may be less available, due to the high adsorptive capacity of activated charcoal. This could have a direct impact on the anti-caries and anti-erosive effect of these toothpastes. The other concern is related to the abrasiveness of these toothpastes, which may be high, depending on the method of preparation of the abrasive particles, and their size and distribution.

NANOTECHNOLOGY-BASED DELIVERY OF CRISPR/Cas9 FOR CANCER TREATMENT

CRISPR/Cas9 (Clustered Regularly Interspaced Short Palindromic Repeats-associated protein 9) is a potent technology for gene-editing. Owing to its high specificity and efficiency, CRISPR/Cas9 is extensively used for human diseases treatment, especially for cancer, which involves multiple genetic alterations. Different concepts of cancer treatment by CRISPR/Cas9 are established. However, significant challenges remain for its clinical applications. The greatest challenge for CRISPR/Cas9 therapy is how to safely and efficiently deliver it to target sites in vivo. Nanotechnology has greatly contributed to cancer drug delivery. The action mechanisms of CRISPR/Cas9, its application in cancer therapy and especially focus on the nanotechnology-based delivery of CRISPR/Cas9 for cancer gene editing and immunotherapy is applied to pave the way for its clinical translation. The difficult barriers for CRISPR/Cas9 delivery in vivo and the relative solutions for encapsulation, target delivery, controlled release, cellular internalization, and endosomal escape are also demonstrated.

