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Newsletter by the Department of Biotechnology

Association Board

Editorial Board

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CURBING ADVERSE CARDIOVASCULAR OUTCOMES THROUGH INFLUENZA VACCINE

Influenza is a severe infectious disease. According to the Centers for Disease Control and Prevention the H1N1 strain of Influenza infected an estimated one-third of the world's population in 1918 and caused 50 million worldwide fatalities. 675,000 of these fatalities occurred in the United States. Without a vaccine, individuals were at the mercy of this deadly virus. Adults with cardiovascular disease are at a much higher risk of developing complications post-infection. Heart disease is the leading cause of death in the United States and is highly costly. Observational studies and population-based studies have both shown an increase in acute cardiovascular events associated with Influenza infection. The results strongly support efforts to advance the Influenza vaccine as a vital component of any comprehensive secondary prevention program to prevent adverse cardiovascular outcomes.

Whole Genome Sequencing for Cancer Diagnostics

A recent study published in The Journal of Molecular Diagnostics developed an optimized whole genome sequencing procedure which generated over a 95% success rate. The single whole genome sequencing procedure detected numerous mutations and variants that otherwise require several different diagnostic panels and laboratory assays. Importantly, this optimized diagnostic procedure takes ten or less days to complete. The study concludes that whole genome sequencing of tumors will help to understand how current therapies work, promote the discovery of new cancer biomarkers, and facilitate the development of new targeted therapies.

2 SCIENTISTS WIN $3 MILLION 'BREAKTHROUGH PRIZE' FOR MRNA TECH BEHIND COVID-19 VACCINES

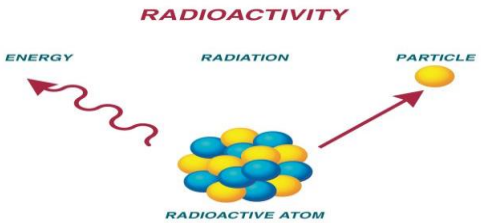
This year, one of three prizes in the Life Sciences category will go to Katalin Karikó and Dr. Drew Weissman, whose work over the last few decades led to the development of the technology needed to deliver mRNA into cells, paving the way for today's COVID-19 vaccines, specifically those produced by Pfizer-BioNTech and Moderna.

In essence, Karikó and Weissman figured out how to quiet alarms from the immune system long enough for synthetic messenger RNA to slip into cells, send commands to the cells to make proteins, and be broken down harmlessly once those instructions were delivered. That process enabled the COVID-19 vaccines that have been administered to more than 360 million people in the U.S., alone, and millions more in countries around the world — and the technology could pave the way for gene therapies and cancer treatments, in the future. The Breakthrough Foundation wrote in a statement. "Convinced of the promise of mRNA therapies despite widespread skepticism, they created a technology that is not only vital in the fight against the coronavirus today, but holds vast promise for future vaccines and treatments for a wide range of diseases including HIV, cancer, autoimmune and genetic diseases."

"There's huge potential for the future of modified RNA," Weissman, an immunologist and professor of vaccine research at the University of Pennsylvania's Perelman School of Medicine, told Live Science.

How radioactive is the human body ?

Many isotopes and radioactive elements occur naturally in the environment, where they get into plants and water. So, every time a person eats food or drinks water, they may be imbibing tiny amounts of radioactive isotopes. The biggest sources of radiation in our bodies are trace amounts of carbon 14 and potassium 40, said Mike Short, an associate professor of nuclear science and engineering at MIT. Though these isotopes make up most of our body's radiation, we take in only about 0.39 milligrams of potassium 40 and 1.8 nanograms of carbon 14 a day. Radioactive isotopes, like carbon 14 and a hydrogen isotope known as tritium, are the "daughter" products of heavier elements decaying. When heavier nuclei, like those of uranium atoms, break apart because they are unstable, the constituent parts they break into are often other isotopes. Some foods have higher concentrations of radioactive isotopes — like bananas, which contain a small amount of potassium 40, and Brazil nuts, which contain radium. Of course, the amounts of these foods an average person consumes does not significantly increase radiation-related health risks, according to the U.S. Environmental Protection Agency.



MOLECULAR DOCKING STUDY TO FIND THE INTERACTION OF ALLICIN, B-SITOSTEROL AND ALL-TRANS-RETINOIC ACID ON HPV ONCOPROTEINS

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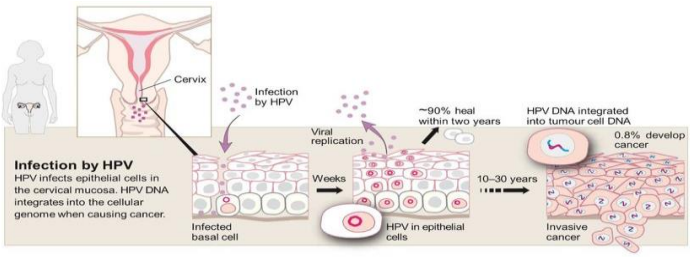
Cervical cancer is caused due to the Human papillomavirus (HPV) infection. Human papillomavirus encodes eight genes in which E6 and E7 are responsible for the malignant conversion. Each oncoproteins can cause cell proliferation; E6 inhibits p53 and cause loss in cell cycle regulation. These oncoproteins can interact with signaling pathways and other factors thus inhibit its activity and promote cell proliferation. L1 and L2 capsid proteins have crucial role in the proliferation of cells. There are so many natural and synthetic bioactive compounds have been extracted and prepared to treat the cervical cancer. Some bioactive compounds isolated from natural source include Allicin, Gingerol, Withaferin A, Curcumin, Flavanoids, Bryophillin A. These particular compounds have the ability to interact with the HPV oncoproteins and inhibit its activity through different pathways. This study focuses to identify the interaction between drug compounds (Allicin, β-sitosterol, ATRA (All-trans retinoic acid with HPV oncoproteins using Computer-aided drug designing (CADD). Allicin is an important bioactive compound extracted from garlic (Allium sativum) and identifies as a best source for the cancer prevention. β-sitosterol is a synthetic compound and have protective effect against different types of cancer also used to lower the cholesterol in our body. ATRA has the therapeutic interaction with the cervical cancer cells also used in creams and gels. Each of these drug compounds shown different kinds of bonding (H-bond, Electrostatic, electrophilic) with the E7 oncoproteins and L1 capsid protein, But hydrogen bond is the strongest bond.

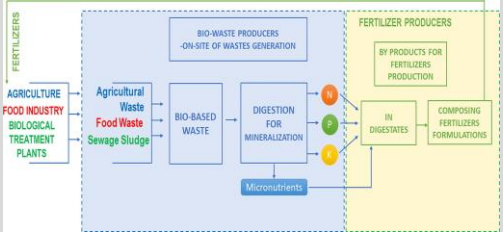


PREPARATION OF MARINE ALGAL BASED HERBAL CHEWING GUM FORMULATION TO COMBAT PERIODONTITIS

VISHNU RAJ. S UR17BT048

Periodontitis is an inflammatory disease of the periodontal tissue which is characterized by loss of support of the affected teeth, specifically the periodontal ligament fibers and the bone into which they are inserted that is known as the socket. Clinically, periodontitis lesions may be associated with varying degrees of gingival redness and swelling. However, periodontal tissue damage may affect the tissues deeper, leading to progressive loss of the alveolar bone as well as the periodontal ligament. Finally, the destruction of these supporting tissues results in the loss of teeth, and accounts for the major cause of tooth loss in adults. Currently, the primary cause of periodontitis is considered to be long-standing bacterial infections, the composition of which may vary from individual to individual and to lesser extent from site to site. Although over 300 species of bacteria are currently identified in the oral cavity, only 5% of these are considered to be strongly associated with periodontitis, with 1% present in over 90% of all cases of periodontitis (Slots, personal communication).Unfortunately, the complexity of the flora, the intermittent nature of episodes of disease activity, and relatively large variances in the data obtained within and between the subjects have combined to hamper the identification of the causative agents of the disease in humans.

BIO-BASED FERTILIZERS: A PRACTICAL APPROACH TOWARDS CIRCULAR ECONOMY



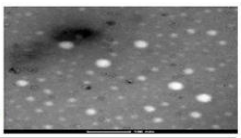
Although for the past 100 years, fertilizer technologies have increasingly used renewable resources, the majority of manufactured products are still based on mineral deposits and fossil fuels. The European Commission has set a goal of 30% reduction of non-renewable resources in fertilizer production. This can only be accomplished if there are incentives for wastes valorization and fines for making use of non-renewable raw materials. This will enable the reduction of eutrophication of surface waters due to the presence of nitrogen and phosphorus, originating from agricultural fields fertilizers. The use of biological waste is a practical solution to recover valuable fertilizer components. In order to effectively implement technologies based on biological resources, it is necessary to construct small wastes solubilization or fertilizer installations at the site of waste generation, which will solve the problem of waste transport or sanitary hazards.

BIODEGRADABLE NANOPARTICLES FROM PROSOPISYLATED CELLULOSE FOR ENHANCED ORAL BIOAVAILABILITY OF POORLY WATER-SOLUBLE DRUGS

Bio-inspired nanotechnology-based strategies are potential platforms for enhanced dissolution and oral biovailability of poorly water-soluble drugs. In this study, a recently patented green biopolymer (*Prosopis africana* gum, PG) was compatibilized with microcrystalline cellulose (MCC), a conventional polysaccharide, *via* thermo-regulated coacervation to obtain PG-MCC (1:0, 1:1, 1:2, 2:1, and 0:1) rational blends and the nanoparticles developed with optimized (1:1) biocomposites (termed "prosopisylated cellulose") by combined homogenization-nanoprecipitation technique was engineered as a high circulating system for improved oral bioavailability of griseofulvin (GF), a model Biopharmaceutics Classification System (BCS) Class-II drug. Additionally, the nanoparticles showed good entrapment efficiency (86.51 ± 0.93 %), and marked improvement in griseofulvin dissolution when compared to free drug, with significantly ($p < 0.05$) higher GF release in basic than acidic PEG-reinforced simulated bio-microenvironments. These results showed that prosopisylated cellulose nanoparticles would be a facile approach to improve oral bioavailability of BCS class-II drugs and can be pursued as a new versatile drug delivery platform.

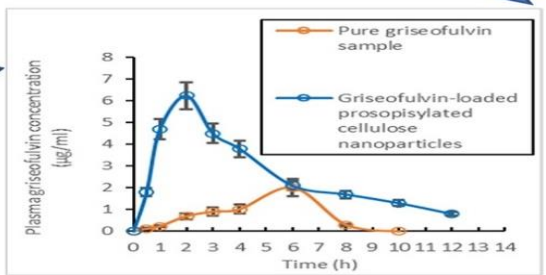
Picture of *Prosopis africana* dried seeds

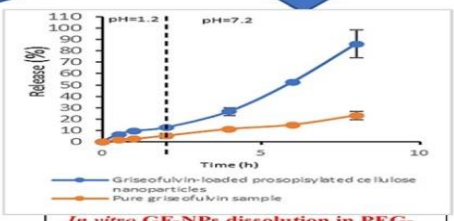
Extraction of prosopis gum + MCC + Thermo-regulated Coacervation+ Characterization + Nanoparticles formulation



TEM of GF-loaded prosopisylated cellulose NPs

In vivo bioavailability of GF-loaded prosopisylated cellulose nanoparticles





***In vitro* GF-NPs dissolution in PEG-reinforced simulated gastric and intestinal bio-relevant media (pH 1.2 and 7.2).**