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BIOLUMIERE

Newsletter by the Department of Biotechnology

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Graphics

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COVID-19-RELATED HOSPITAL COST-OUTCOME ANALYSIS

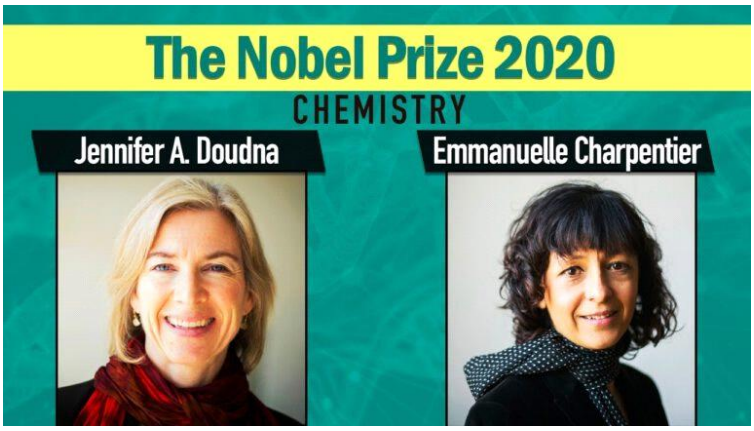
The average cost of the 3254 admissions (51.7% of which involved intensive care unit stays) was US$12,637.42. The overhead cost was its main component. Sex, age and underlying hypertension (US$14,746.77), diabetes (US$15,002.12), obesity (US$18,941.55), chronic renal failure (US$15,377.84), and rheumatic (US$17,764.61), hematologic (US$15,908.25) and neurologic (US$15,257.95) diseases were associated with higher costs. Age strata >69 years, reverse transcription polymerase chain reaction(RT-PCR)-confirmed COVID-19, comorbidities, use of mechanical ventilation or dialysis, surgery and outcomes remained associated with higher costs.

A New DNA Editor Hidden in a Microbial Jumping Gene

The technology for CRISPR originated in a bacterial immune defense system. Now, the team of one of the researchers who helped pioneer the CRISPR technology, Dr. Feng Zhang, has identified a new type of DNA modifying protein that can be programmed. The IscB proteins are probably the ancestors of the DNA-cutting bacterial enzyme Cas9. The investigators found that IscB could cut double-stranded DNA in human cells. The team also identified TnpB, another programmable enzyme that can cut RNA, and is probably the ancestor of the Cas12 enzyme. Both IscB and TnpB proteins are on mobile genetic elements known as transposons and are guided to their targets with guide RNA molecules. Transposons are sometimes called jumping genes because they move around the genome so easily. These gene editors could be incredibly abundant, and are much smaller than Cas9, making them attractive for use in molecular research.

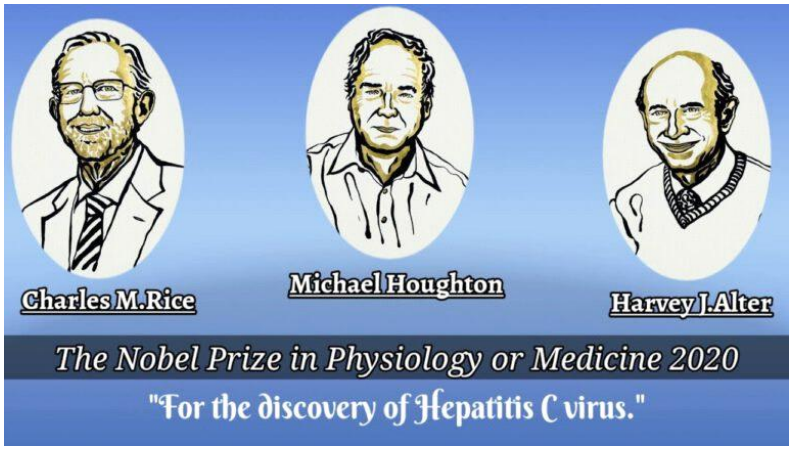
NOBEL PRIZE AWARDED FOR THE DISCOVERY OF CRISPR/CAS 9 TECHNOLOGY

Emmanuelle Charpentier, now at the Max Planck Unit for the Science of Pathogens in Berlin, and Jennifer Doudna, at the University of California, Berkeley were awarded the Nobel Prize in Chemistry 2020 for discovering one of gene technology's sharpest tools: the CRISPR/Cas9 genetic scissors. Emmanuelle Charpentier who was studying a bacteria called Streptococcus pyogenes, noticed a previously unknown molecule called tracrRNA. Further studies revealed that this tracrRNA was part of the bacteria's immune system and it helps the bacteria destroy viral DNA. She published this discovery in 2011. The same year, along with Jennifer Doudnathey, she succeeded in recreating the bacteria's scissors and reprogramming it. Charpentier and Doudna then proved that they can now use these scissors to cut any DNA molecule at a required site.



NOBEL PRIZE AWARDED FOR THE DISCOVERY OF HEPATITIS C VIRUS

Alter, Hepatitis C is a blood-borne virus and causes Hepatitis C disease which affects the liver. According to WHO, "globally, an estimated 71 million people have chronic hepatitis C virus infection and a significant number develop cirrhosis or liver cancer." In 2016, This new virus could not be isolated for several years using the traditional techniques for virus isolation. Michael Houghton and his team created a collection of DNA fragments from the blood of an infected chimpanzee and thoroughly searched it. They found a novel RNA virus belonging to the Flavivirus family and named it the Hepatitis C virus. Charles M. Rice used genetic engineering, generated an RNA variant of the virus and injected it into the liver of chimpanzees. The virus was detected in the blood and the chimpanzees exhibited changes similar to those seen in humans with the disease. This was the final proof that the virus alone was the cause behind the unexplained cases of transfusion-mediated hepatitis. The discoveries by the three Nobel laureates have helped design sensitive blood tests that have eliminated the risk of transfusion-transmitted hepatitis. Their discovery also helped develop antiviral drugs directed at hepatitis C. This has now raised hopes of eradicating the virus from the world population.



GENERATION AND CHARACTERIZATION OF ANTI-JAPANESE ENCEPHALITIS VIRUS ANTIBODIES RAISED IN WHITE LEGHORN CHICKEN

R.PREETHI UR16BT014

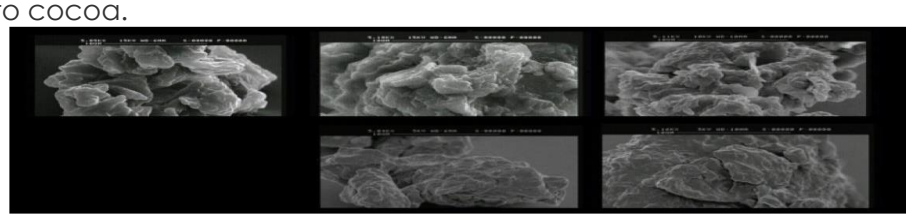
Japanese encephalitis virus is a flavivirus. It can affect both humans and animals. It is spread by mosquitoes *(Culex* species).These mosquitoe species breeds in rice fields. Pigs are the main carriers of Japanese encephalitis. There is no treatment or cure for Japanese encephalitis. Monoclonal antibodies are very useful in treating diseases. They are highly reproducible. IgY is produced in immunized chickens in their egg yolk and blood. Orally these chicken antibodies can be taken. These antibodies can even be applied over the skin surface. The purity and concentration of monoclonal antibody is higher. One of its advantages is, it is an noninvasive method (collecting antibodies from egg yolk).Antibodies can be derived from either mammalian or avian sources. In case of mammalian sources, antibodies need to be collected for the serum of the animal which requires the animal to be bled. But in the case of avian sources, in specific- chicken antibodies accumulate in the yolk of the egg. Thus there is no harm caused to the bird. Antibodies are required in large amounts which are specific, viable and need to be obtained in a humane way. Chicken antibodies seem to fit the task perfectly. This project is on the isolation and characterization of chicken antibodies against Japanese encephalitis virus.

Immunization of chicken and dialysis using dialysis membrane for purification of antibodies

"Ceratonia siliqua"-An Alternative source for Cocoa Powder

GNANA SUNDARI P UR16BT003

The biochemical, physical and baking properties of caroubin, the main protein in the carob bean, were characterized. The biochemical properties of caroubin were analyzed using reversed-phase high performance liquid chromatography (RP-HPLC), size exclusion chromatography coupled with multi-angle laser light scattering (SEC-MALS) and micro-fluidics analysis. The physical and baking properties of caroubin were characterized via SE-HPLC, laser scanning confocal microscopy, farinograph mixing, and texture profile analysis. Using a modified Osborne fractionation method, carob germ flour proteins were found to contain ~32% albumin and globulin and ~68% glutelin with no prolamins detected. When divided into soluble and insoluble protein fractions under non reducing conditions it was found that caroubin contained (~95%) soluble proteins and only (~5%) insoluble proteins. The increasing demand for cocoa and search for ingredients rich in bioactive compounds encouraged us to investigate the possibility of replacing it by carob powder in the nutritional energy bar containing rolled oats , honey ,unsalted butter , chia seeds and flaxseeds. There was 25%addition of carob powder to the mixture . Moreover, the addition of carob powder resulted in good sensory quality. The high content of phytosterols, genistein and improved antiradical properties proved carob to be a source of bioactive compounds. The results show that carob powder may be used as valuable alternative to cocoa.



SEM image of commercial cocoa powder

ONE-STEP PRODUCTION OF BIODIESEL FROM WET AND UNBROKEN MICROALGAE BIOMASS USING DEEP EUTECTIC SOLVENTS

One-step and Two-step methods were studied for lipid extraction from wet and unbroken (water content is 65–67%) *Chlorella* sp. and *Chlorococcum* sp. (GN38) using deep eutectic solvent (DES) treated microalgae cells. Further we optimized the extraction process and studied on its underlying mechanism. Among all DES, Choline chloride-Acetic acid (Ch-Aa) DES treatment showed optimal conditions at the mass ratio of DES: methanol-H_2SO_4 (2.00%) mixture: algae biomass was 60:40:3 with reaction time was 60 min, and the optimum temperature was 110 °C (*Chlorococcum* sp.) and 130 °C (*Chlorella* sp.) respectively. The total content of FAME by One-step method with DES treatment was improved by 30% compared with Two-step method. This process is effective on wet and unbroken paste of microalgae biomass, so the FAME extracted using one-step with DES process is feasible for microalgae based biodiesel production.

NANOBIOTECHNOLOGY IN HEALTH SCIENCES: CURRENT APPLICATIONS AND FUTURE PERSPECTIVES

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