BRAC UNIVERSITY
Inspiring Excellence
Department of Pharmacy

PHARMA HIGHLIGHTS

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CRISPR Short Course

CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats)/Cas-mediated genome editing techniques method is based on a natural system used by bacteria to protect themselves from infection by viruses. When the bacteria detect the presence of virus DNA, it produces two types of short RNA, one of which contains a sequence that matches with that of the invading virus. These two RNAs form a complex with a protein called Cas9. When the matching sequence known as a guide RNA, find its target within the viral genome, the Cas9 cuts the target DNA, disabling the virus. The technique has already revolutionized gene editing.

The Department of Pharmacy, Brac University in partnership with Merck KGaA, Germany organized a 2-day CRISPR short course which was held on December 21 & 22, 2019 in Bistro Central, Dhaka. The venue was ideal for a balanced theoretical vs. hands-on introduction to CRISPR.

The two-day course on CRISPR/Cas-mediated genome editing techniques were offered for all levels of scientists interested in the field. The course covered basic concepts and practical aspects through lectures and hands-on training sessions. The course was conducted by Dr. Md. Zulfiquer Hossain, Merck KGaA, Germany.

The course encompassed various aspects of CRISPR/CAS technology; from its initial discovery as part of the adaptive bacterial immune response, CRISPR-mediated gene modulation, targeted integration, experimental workflow, bioinformatics for genome editing, and case studies in cell line engineering in the field of molecular biology and medical sciences. The first and most critical step of gene editing experiments using CRISPR/Cas9 is designing a single guide RNA (sgRNA) to target a certain gene. The participants were divided into small groups and had hands-on training of designing. The groups explored various web-based tools available for sgRNA design. Each group also presented their choice of sgRNA and discussed the merits and demerits of their choice.

Source: Department of Pharmacy

Using a Cancer Drug to Fight Antibiotic-Resistant Pathogens

Researchers have been searching for effective and safe new antibiotics, and a team of scientists has now shown that a drug that's already approved as a cancer treatment can also combat microbial pathogens that are resistant to multiple drugs. The findings have been reported in Nature Chemistry. The researchers chemically altered the cancer drug sorafenib to enhance its efficacy against methicillin-resistant Staphylococcus aureus (MRSA). The molecule they created, called PK150, is now ten times more effective after modification. Like many antibiotics, PK150 can have a deleterious impact on the bacterial cell wall, which can lead to cell death. It acts in a different way than other antibiotics, however. It is more indirect; it disrupts the production of proteins, causing bacteria to add too many proteins to the cell wall. The wall becomes too thick on the outside, making the cell burst. PK150 also interferes with an important protein that plays a role in energy metabolism in bacteria.

When the researchers tested PK150 in a mouse model, it did not cause resistance to develop. As a result of the chemical changes to the molecule, PK150 no longer binds to human kinases, but acts very specifically against bacterial targets.

Source: Nature Chemistry

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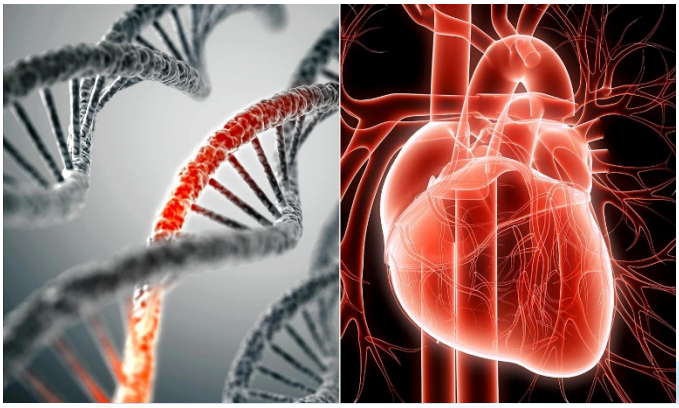
Healthy Sleep May Offset Genetic Heart Disease Risk



Researchers analyzed the SNPs from blood samples taken from more than 385,000 healthy participants in the UK Biobank project and used them to create a genetic risk score to determine whether the participants were at high, intermediate, or low risk of cardiovascular problems. The researchers followed the participants for an average of 8.5 years, during which time there were 7,280 cases of heart disease or stroke. It was found that compared to those with an unhealthy sleep pattern, participants with good sleeping habits had a 35% reduced risk of cardiovascular disease and a 34% reduced risk of both heart disease and stroke.

Researchers say those with the healthiest sleep patterns slept 7 to 8 hours a night, without insomnia, snoring, or daytime drowsiness.When the researchers looked at the combined effect of sleep habits and genetic susceptibility on cardiovascular disease, they found that participants with both a high genetic risk and a poor sleep pattern had a more than 2.5-fold greater risk of heart disease and a 1.5-fold greater risk of stroke compared to those with a low genetic risk and a healthy sleep pattern.

This meant that there were 11 more cases of heart disease and 5 more cases of stroke per 1,000 people a year among poor sleepers with a high genetic risk compared to good sleepers with a low genetic risk. However, a healthy sleep pattern compensated slightly for a high genetic risk, with just over a two-fold increased risk for these people.

A person with a high genetic risk but a healthy sleep pattern had a 2.1-fold greater risk of heart disease and a 1.3-fold greater risk of stroke compared to someone with a low genetic risk and a good sleep pattern. While someone with a low genetic risk, but an unhealthy sleep pattern had 1.7-fold greater risk of heart disease and a 1.6-fold greater risk of stroke.

Source: European Heart Journal

An Antioxidant Found in Green Tea Can Fight Tuberculosis

In 2018, around ten million people around the globe were sickened by tuberculosis (TB) and about 1.5 million people were killed by tuberculosis (TB). The disease is caused by a bacterium called Mycobacterium tuberculosis, which tends to affect the lungs. Researchers at Nanyang Technological University, Singapore have discovered that an antioxidant called epigallocatechin gallate (EGCG), which is found in the green tea plant, can inhibit the growth of the bacterium that causes TB.

The scientists determined that EGCG binds to an enzyme that helps provide energy to bacterial cells. If EGCG is attached to the enzyme, there is less energy for critical processes that contribute to the stability and growth of this bacterial pathogen.

The researchers have also found the places on the enzyme where the EGCG compound binds and dampens energy production. The researchers also wanted to know how to disrupt the bacterial ATP synthase to limit energy. They found that if ATP synthase was genetically altered in two microbes that are similar to *M. tuberculosis*, called *Mycobacterium smegmatis* and *Mycobacterium bovis*, cell growth was slowed and their shape was altered.

The team then looked for molecules that could potentially bind to ATP synthase to disrupt its activity, and analyzed their efficacy. The best candidate they identified was EGCG, which is a natural antioxidant found in large amounts in green tea. It was able to lower the levels of bacterial energy. Now the scientists want to improve EGCG activity so it will more potent in the fight against the tuberculosis pathogen.

Source: Nanyang Technological University, Scientific Reports