BRAC UNIVERSITY
Inspiring Excellence
Department of Pharmacy

PHARMA HIGHLIGHTS

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New Gene Editing Technology to Combat Hereditary Diseases

SATI (Single Homology Arm donor mediated Intron-Targeting Integration) is a a newly discovered method that can target the critical areas of DNA better. This method may be able to help treat a broad range of gene mutation conditions including Huntington's disease.

CRISPR-Cas9 system is one of the most well-known gene-editing tools. It generally shows effective results in dividing cells, such as those in the skin or the gut, the CRISPR-Cas9-based gene-editing technology, works only on protein-coding regions, which account for only 2% of the genome. These regions, although responsible for making proteins, are outnumbered by non-coding regions, which decide how many proteins are made.

SATI targets these non-coding regions of the DNA. It works by introducing a normal copy of the problematic gene into the non-coding region of the DNA before the mutation site. This new gene then becomes a part of the genome alongside the old gene through one of multiple DNA repair pathways. Over time, this process leaves the person or animal in question without the negative effects of the original mutated gene, and without the risk of having it fully replaced.

SATI was verified on living mice with progeria, a rare premature aging syndrome that also occurs in humans, caused due to a mutation on the LMNA gene. A normal copy of the LMNA gene was inserted into the mice with progeria using SATI. Diminished signs of aging in multiple tissues, including the skin and the spleen was observed. In addition a 45% increase in lifespanwas observed when compared to mice with progeria who were left untreated.

SATI is the first gene-editing technology that targets non-coding regions of DNA in vivo, and is capable of working in multiple tissue types.

Source: Salk Institute, Science Daily

Unprecedented Therapeutic Found Effective for Blood Cancer

A new effective therapeutic agent has been found by Mt. Sinai for patients with a specific type of bone marrow cancer. The cancer is known to be resistant to several standard drugs. Findings showed that testing the drug selinexor combined with dexamethasone treated the cancer in a quarter of patients. Two of these patients went into complete remission. Proteins and messenger RNAs play a critical role in cancer growth. Selinexor was found to inhibit the export of protein and messenger RNAs from the nucleus of the cancer cell to the cytoplasm resulting in cancer cell death. Patients enrolled in the clinical trial, who were treated with selinexor and dexamethasone combination, saw a response within one or two months. Even though no toxicity was present, patients did experience low blood count, nausea, vomiting, and lack of appetite or fatigue. The experiment included the most advanced diagnostic and treatment approaches within state-of-the-art facilities of a National Cancer Institute-designated cancer center. An increasing number of patients have resistance to the standard drugs used in the treatment of multiple myeloma, and the overall survival in these patients is short, sometimes less than three months. This study could be beneficial for patients who haven't had success on multiple other therapies. Selinexor has been approved by the FDA for patients' resistant to multiple therapies.

Source: The Mount Sinai School of Medicine

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Scientists Grow Mini Kidneys to Treat Kidney Disease

Current methods for testing potential treatments for kidney disease do not take into account variation in effectiveness of treatment due to genes. An international team of researchers at Nanyang Technological University, Singapore (NTU Singapore) developed a process by which a genetic variation could be tested to ensure the patient receives the best treatment.

In their lab, the researchers grew "miniature kidneys", or kidney organoids, *in-vitro* from skin cells collected from a person with polycystic kidney disease.

They then reprogrammed these cells to create patient-specific pluripotent stem cells from which they were able to grow kidney organoids that resemble human kidneys in the first three to six months of fetal development. Afterward, they tested two potential treatments for polycystic kidney disease on the organoids to understand their therapeutic effects. In testing for drug efficacy in this way, the researchers hope that treatment plans may become more personalized in the future, as they may be tailored towards each patient for maximum efficacy before starting any treatment in the body. These organoids can aid in understanding the development of nephrons in the kidney. Since being born with a higher number of nephrons is associated with protection against conditions such as hypertension and kidney failure, the researchers hope that their work will help them develop ways to promote a high birth nephron number for fetuses while still in the womb.

Source: Science Daily

MDMA Treats Social Anxiety in Autistic Adults

Social anxiety is more likely to occur in people with autism compared to people without it. At present there are no FDA approved treatments specifically for adults with autism and social anxiety and the existing anti-anxiety medications and therapeutic approaches are quite ineffective in autistic individuals. There is a psychoactive substance known as MDMA or 3,4-methylenedioxymethamphetamine which increases people's capacity to talk openly without the intervention of social pressures and conditioning.

Conditions such as social anxiety, post-traumatic stress disorder and depression can be treated by this method and it was noted as particularly useful for the success of psychotherapeutic treatments. Upon treatment, people may have an increased possibility to be comfortable and can resolve their underlying problems. Despite these promising findings, restrictions placed on MDMA in 1986 made it difficult to conduct further research into its benefits in treating psychological issues. Using the Liebowitz Social Anxiety Scale to measure the participants' social anxiety and social phobia after treatment, the researchers noted that those given MDMA as a part of therapy saw their social anxiety points reduced by 44.1 on average, whereas those on the placebo saw reductions of just 19.3. In conclusion, MDMA-assisted therapy is showing promising signs of being an effective treatment for social anxiety in autistic adults. With both self-reported cases and early clinical trials demonstrating positive results, further research is underway to understand more about the substance's potential to improve outcomes of an otherwise difficult-to-treat conditions.

Source: El Sevier Psychiatry Research