BRAC UNIVERSITY School of Pharmacy

PHARMA HIGHLIGHTS

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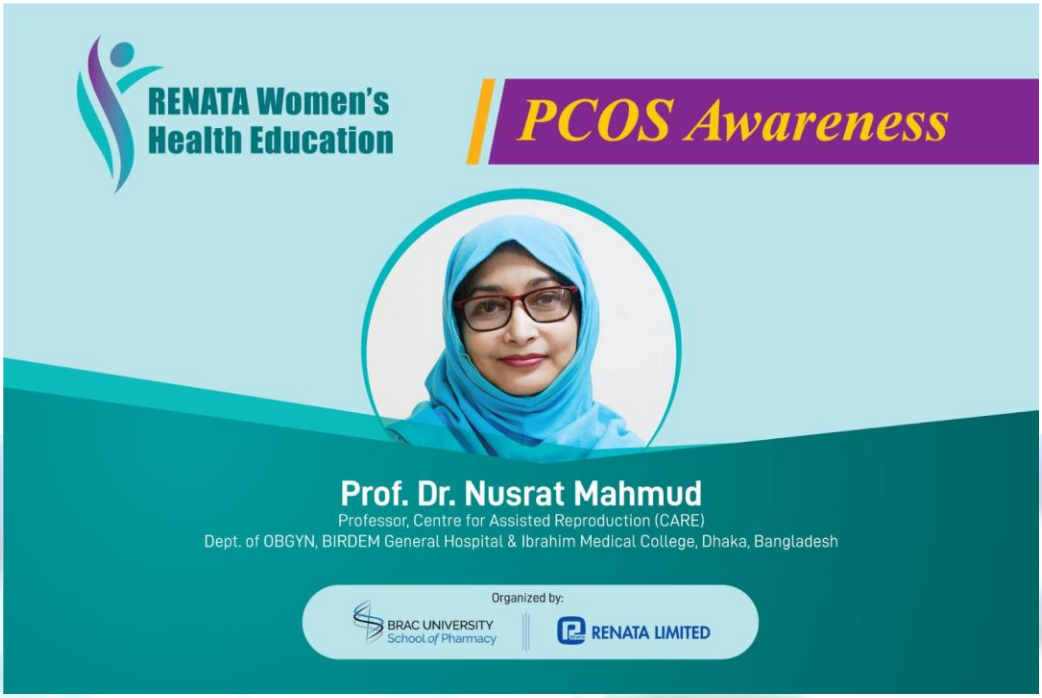
ISSUE 107 | AUGUST 2023

Seminar on Awareness of Polycystic Ovarian Syndrome (PCOS)



Polycystic Ovarian Syndrome (PCOS) stands as a prevalent hormonal disorder among women of reproductive age, affecting around 1 in 10 women globally. The event's purpose was to enhance awareness and empower women to make informed health choices, fostering a deeper comprehension of this condition.

As part of the 'Toolbox for Success' series, a seminar on polycystic ovarian syndrome (PCOS) was organized by the School of Pharmacy, BRAC University. The seminar was held on Thursday, 24th August 2023 in collaboration with Renata Limited at BRACU Auditorium, Building 02 (Ground floor).

PCOS is the most common endocrine disorder in women of reproductive age. The seminar served as a platform to raise awareness about PCOS and its impact on women's health. The seminar was open to all female students, faculty members, and staff of Brac University, as well as individuals from the wider community who were interested in learning about PCOS and its implications. The seminar aimed to increase awareness about PCOS among the public, women and girls, with the goal of improving the lives of individuals dealing with PCOS. It helped them understand their condition better and empowered them to make informed decisions about their health.

Professor Dr. Nusrat Mahmud is a distinguished gynecologist. She is a Professor at the Centre for Assisted Reproduction (CARE), in the Department of OBGYN at BIRDEM General Hospital and Ibrahim Medical College. Professor Dr. Nusrat also holds an honorary role at the School of Public Health, Emory University, Atlanta, USA. For the past eight years, she has represented Bangladesh in ASPIRE, contributing to innovative reproductive health solutions. Additionally, she holds a pivotal position as the Assistant Secretary General of the South Asian Federation of Obstetrics and Gynecology (SAFOG). Her impactful contributions in the field continue to influence and shape women's health on a global scale.

The seminar was moderated by Syeda Maliha Ahmed, Lecturer of the School of Pharmacy at BRAC University. Professor Dr. Nusrat Mahmud's insights during the seminar highlighted the complexities of PCOS, nurturing awareness, and guiding informed decision-making for the advancement of women's health. This event underscored the significance of such conversations in promoting overall well-being.

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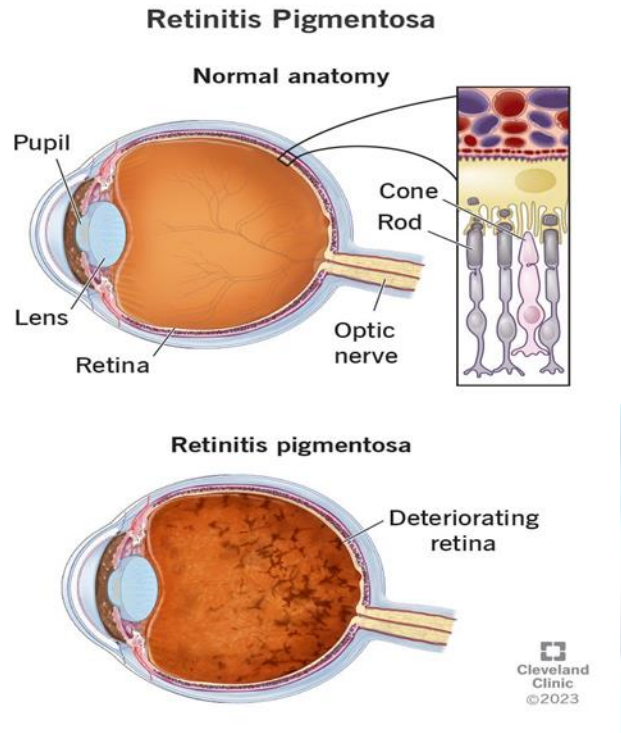
Gene Therapy: A New Era in the Treatment of X-Linked Retinitis Pigmentosa (XLRP)



Retinitis pigmentosa is a genetic disease that was first reported in 1853 and affects 1 in 3,000 people. The Retinitis Pigmentosa GTPase Regulator (RPGR) gene helps produce cells found in X-chromosomes that form the retina. Defects in the RPGR gene result in the absence of RPGR in retinal cells, which ultimately leads to the degeneration of the retina. Over time, the retinal cells begin to die, causing blindness, which affects men and women differently due to women having two X-chromosomes and men having one. If one X-chromosome has a defective RPGR gene, the normal one can compensate for women. This rare disease had no treatment until the advent of gene therapy. This newly developed technique can slow down or halt the degeneration of the retina.

In this technique, normal copies of the defective RPGR genes are reintroduced into retinal cells using a vector that helps restore their effective function. A vector-modified strain of adeno-associated virus is used for this purpose. The RPGR genes are highly susceptible to mutation due to half of the gene being composed of adenine and guanine. The genetic code of the RPGR gene has been reprogrammed by Robert MacLaren to be more stable while retaining its original function. This gene is inserted into the retinal cells using an adeno-associated virus (AAV) vector. To achieve this, the clear internal jelly of the eye is removed through vitrectomy. Subsequently, fluid carrying the AAV vector is introduced beneath the retina using a fine needle. This creates a fluid blister under the retina, which is gradually absorbed, leading to the disappearance of retinal detachment within 24 hours. This correct copy of the gene helps the retina function normally.

On March 20, 2017, the Oxford University Hospital NHS Foundation Trust declared this procedure safe. The first person to receive gene therapy for XLRP did so on March 16, 2016, under the supervision of John Radcliffe Hospital in Oxford. If gene therapy for XLRP proves successful, it could become a future treatment for blindness caused by retinitis pigmentosa.

Written by: Mst. Mahfuja Tabassum Miti (ID: 20346057)

Nanosystems Pave the Way for Revolutionary Oral Insulin Delivery

In the effort to combat one of the most challenging lifelong diseases, diabetes, scientists are harnessing the power of nanotechnology to introduce oral insulin, offering a non-invasive alternative to the traditional injection-based method of insulin administration.

The obstacles associated with administering insulin through oral consumption, including susceptibility to gastric acid degradation, breakdown by digestive enzymes, and obstruction by the mucus layer barrier, have been addressed through nanotechnology (Kalra et al., 2010). In this innovative approach, insulin is encapsulated within nanoparticles that can be absorbed into the bloodstream via the gastrointestinal tract. As illustrated in the figure above, various types of nanoparticles can be created, such as nanoliposomes, nano-solid dispersions, polymer micelles, nanocapsules, nanospheres, microemulsions, and inorganic/organic hybrids. These nanoparticles are formed by dissolving, dispersing, embedding, adsorbing, or coupling medications into carriers (Wang et al., 2022).

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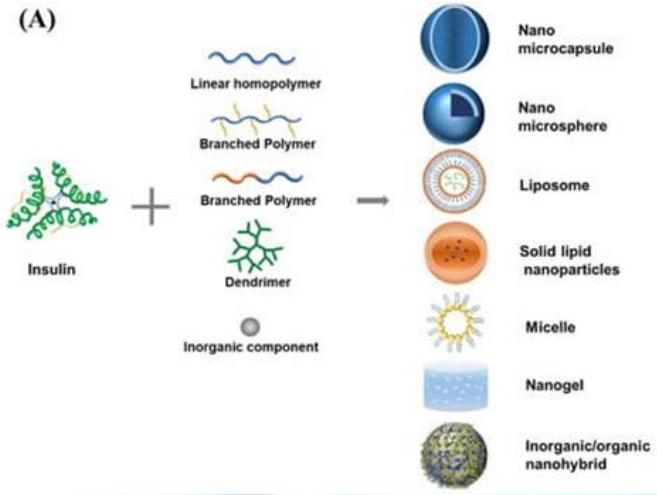

To construct nanosystems for oral insulin delivery, insulin is loaded onto carrier materials. These materials should possess attributes such as pH responsiveness, bioadhesiveness, biocompatibility, biodegradability, modifiability, and ease of processing to ensure medication stability and enhanced bioavailability.

Examples of suitable carrier materials include PLA, MOFs, Chitosan, among others (Wang et al., 2022). The minuscule size of nanoparticles, combined with their intricately designed surface properties, enables them to withstand the harsh acidic conditions of the stomach and reach the small intestine intact, where insulin absorption is optimally facilitated. By utilizing these nanosystems, insulin absorption properties are enhanced, and insulin release is controlled. Insulin nanoparticles emulate the natural secretion of insulin, ensuring a gradual and consistent release into the bloodstream, thereby preventing abrupt spikes or drops in blood sugar levels. Nanotechnology not only addresses the inconvenience of insulin administration but also mitigates storage-related issues associated with insulin, as IV insulin storage demands considerable resources. Despite its numerous benefits, nanotechnology does have limitations, including the fine-tuning of nanoparticle formulations, potential side effects, and regulatory approval challenges.

In conclusion, the advancement of nanosystems for oral insulin delivery holds promise for the future of diabetes treatment. The potential to effectively manage diabetes has never been greater, as researchers continue to refine this technology using various approaches.

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Know Your Family History: Hereditary and Genetic Eye Diseases

Numerous medical conditions, particularly those affecting vision and eye health, have a greater likelihood of developing due to genetics. Among the more than 350 eye conditions, hereditary factors contribute to color blindness, cataracts, glaucoma, night blindness, and retinitis pigmentosa.

Glaucoma stands as a primary cause of adult blindness, arising from increased pressure within the eye that leads to irreversible damage of the optic nerve. Neglecting this condition can result in blindness and vision loss. Genetics play a significant role in various forms of glaucoma. If a family member has been diagnosed with glaucoma, your risk of developing it increases by four to nine times.

Cataracts occur when the eye's crystalline lens becomes clouded due to abnormal clumping of proteins within the lens. Gradually, these clusters obstruct or distort the path of light through the lens, impairing vision. If close relatives have experienced cataracts, your likelihood of developing them is higher than those without such a family history.

Retinitis pigmentosa, a condition involving the gradual deterioration of the retina's light-sensing cells, is attributed to variations in 60 genes affecting the retina.

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This condition leads to vision loss, ultimately causing night blindness and the degradation of both peripheral and central vision, essential for tasks such as reading, driving, and recognizing individuals.

Learning about your family's medical history can provide vital insights into your susceptibility to various eye disorders and visual problems. Many eye conditions, including age-related macular degeneration and glaucoma, may manifest without symptoms initially. Early treatment is critical before these conditions progress. Numerous eye conditions are passed down through generations. The American Academy of Ophthalmology recommends a baseline eye examination at age 40, as many conditions can be identified before symptoms appear. Your eye doctor will determine the frequency of follow-up exams based on these findings.

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Written by: Sajed Sikder (ID: 22146025)

Stem Cell Therapy: A New Hope for Stroke Recovery

Stroke, a condition in which the brain experiences oxygen deprivation due to disrupted blood flow, can result in neuronal death and severe outcomes such as paralysis, speech difficulties, and memory issues. There are two primary types: ischemic (resulting from a loss of blood supply) and hemorrhagic (characterized by bleeding within the brain). However, a promising avenue for treatment exists: stem cell therapy.

Stem cells possess the unique ability to differentiate into various cell types and contribute to tissue regeneration. In stroke treatment, they play a role in aiding brain repair and facilitating recovery.

Among the various types of stem cells explored for stroke recovery, mesenchymal stem cells (MSCs) stand out. These adult stem cells are found in bone marrow, adipose tissue, and umbilical cord blood. MSCs offer significant value as they can mitigate inflammation, modulate the immune response, and promote tissue regeneration.

The objective of stem cell therapy is to harness the distinctive capabilities of MSCs to address the damage caused by stroke. They possess the ability to diminish neuroinflammation, foster tissue regeneration, and stimulate the development of new blood vessels – all crucial components of brain healing post-stroke.

1. Immunomodulation: MSCs possess the capacity to pacify the immune system, thus reducing detrimental inflammation that exacerbates brain damage.

2. Neuroprotection: MSCs release compounds that bolster the survival of nerve cells and encourage the growth of new neurons, facilitating the replacement of impaired brain tissue.

3. Angiogenesis: MSCs play a role in promoting the creation of fresh blood vessels, thereby restoring blood supply to compromised brain regions.

MSCs release growth factors that stimulate cellular growth, alleviate inflammation, and support the brain's inherent regenerative processes. Additionally, they migrate to damaged areas of the brain, aiding in recovery and lessening oxidative stress.

Preclinical studies involving animals have underscored the potential of MSCs. For instance, a study published in "Stem Cells Translational Medicine" (2018) exhibited that rats treated with MSCs derived from bone marrow displayed improved neurological outcomes and reduced brain damage compared to control groups.

Stem cell therapy is not confined to theory; it has been subject to clinical trials to ascertain its effectiveness.

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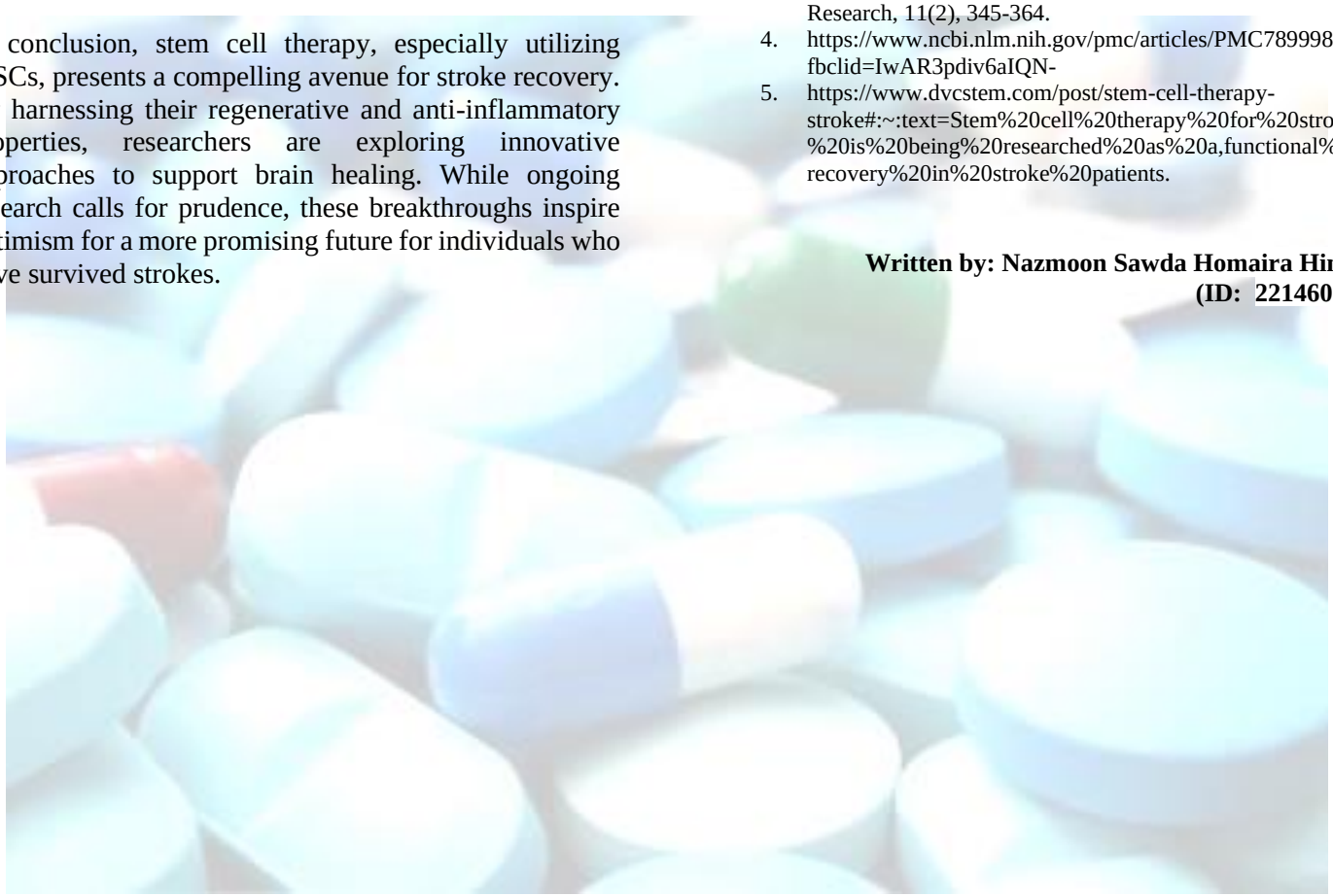
Stanford University employed stem cells obtained from donor bone marrow in stroke patients, yielding remarkable results. Participants exhibited enhanced motor function, with an average improvement of 11.4 points on a stroke-specific impairment test. These enhancements were sustained over the years (David C. Hess et al. 2017).

Another study conducted by the University of California investigated MSCs from allogeneic sources. This trial involved 36 individuals who had experienced ischemic stroke within the six months preceding the study. Findings indicated that MSC injections were safe and showed potential benefits in aiding stroke recovery (Lalu et al. 2020).

In conclusion, stem cell therapy, especially utilizing MSCs, presents a compelling avenue for stroke recovery. By harnessing their regenerative and anti-inflammatory properties, researchers are exploring innovative approaches to support brain healing. While ongoing research calls for prudence, these breakthroughs inspire optimism for a more promising future for individuals who have survived strokes.



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