The background of the cover is a blurred image of a chalkboard with chemical structures and the word 'GENE' visible. In the foreground, a hand holds a ball-and-stick molecular model with a red sphere, a black sphere, and white spheres. Another molecular model is visible in the lower right. Two thick red diagonal stripes cross the cover from the top-left to the bottom-right.

MEDIC FOUNDATION

APRIL 2024

MEDIC'S MAGAZINE

SNEAK PEEK INTO THE LAB

LOW-COST DIABETES MEDICAL TECHNOLOGY

Our Diabetes team has moved into the second phase of the project, with the goal of developing a non-invasive and continuous monitoring system to detect early diabetic ketoacidosis (DKA). The team is working on compiling a scope review to highlight the lack of existing research in biomarkers which can be used for early DKA diagnosis.

GALVANIC VESTIBULAR TECHNOLOGY

GVS is a non-invasive brain stimulation technique that affects the firing of the vestibular system by conducting an electrical current to the mastoid process behind the ears through electrodes (2-pole system). The research has since evolved into a 3-pole system and our team aims to determine if 3-pole GVS induces improvement in motor performance when compared to 2-pole GVS.

MULTIMODAL CANCER PROFILER PRECISION MEDICINE

Our Cancer Research Team (CREPE) is contributing to work that attempts to identify biological patterns within cancer patients of various types. The team is progressing a software pipeline that works with pathological image representations from different types of cancer, which supports future analysis of the images to discover underlying patterns.

IBD/CROHN'S MONITOR PREDICTION SYSTEM

Our Crohn's and IBD Team have completed the preliminary rounds of research and have been hard at work contacting doctors and professors for stakeholder engagement. Biomarker research is currently being done to establish and identify adequate detection tools for target. Our team is currently being trained on technical skills and generating concepts for the device.

FUTURE EVENTS

The MEDIC continues its hard work to finish off the academic year strong. Despite the obstacles faced by teams throughout the year, there have been successful attempts at perseverance and hard work, making the achievements of the organization possible.

Recently, the IBD team has switched gears in development to work towards treating patients from a more holistic perspective. There continues to be research done on the subject to ensure

that the most effective aid can be delivered to people in need. Throughout the year, teams have been working reverently to help innovate new technology for patients with autoimmune diseases.

The Care Companions program will continue throughout the summer! With the help of the coordinators and volunteers, care homes throughout the area are receiving companionship from students.

The Events team has been hard at work at creating and executing a successful case competition program! Through the participation of several teams, a novel case was created that focused on the care of the elderly in the community. See below for more details on how some bright innovators created incredible ideas on how to provide help!

MEDIC ORGANIZATION: DAY OF APPRECIATION

As the academic year comes to a close, our team had a record number of expansion of new members. On April 3rd, we celebrate the efforts and contributions of all the teams through an appreciation night. Our members have all been continuously adding to the vision of the organization. MEDIC has seen leaps and bounds of innovation over the past year, and we are hopeful that the future will bring more success. We thank everyone for their hard work!



FUTURE INNOVATORS CHALLENGE

The Future Innovators Challenge was an event that was enacted successfully by the Events team. With the participation of several teams, incredible ideas of innovation were sparked from the several-day program. Participants received customized training and coaching on how to refine ideas and apply them to a visual and oral presentation.

Through careful judging by our panel of experts, all teams were incredibly innovative with their ideas. Participants

gained crucial insight into the inner workings of a case competition, an oral presentation, and a question-and-answer portion as well. Through this practice, participants can readily prepare for future competitions of a similar degree.

This year, the focus was on how to ameliorate both the mental and physical well-being of seniors, an issue that has plagued the recent aging generation. Participants were given the case file and several days to form a team and prepare a resolution to several problems. These problems included expansion on mobility aids, increasing senior interaction, and improving the overall mental wellness of the older population. Each team then received a workshop on their proposition and presented to a panel of judges.

Thank you to all our hardworking volunteers, staff, and participants. See all the photo highlights below!





WORLD HEMOPHILIA DAY: BLEEDING TRIALS OF MEDICINE

By: Simone Abraham

Every year, the 17th of April is recognized as World Hemophilia Day and is recognized worldwide to increase awareness of Haemophilia, and other inherited bleeding disorders. This disorder can be treated with antifibrinolytics, but the short life of such drugs limits their use for on-demand treatment. Recent research done by Strilchuck and colleagues resulted in the discovery that a single dose of packaged small RNAs against plasminogen into lipid nanoparticles resulted in a reduction of circulating plasminogen and suppressed fibrinolysis for several weeks in mice.

Fibrinolysis is a crucial process that clears blood clots from the vasculature and plays a pivotal role in maintaining hemostasis – the process of preventing and stopping bleeding. However, when dysregulated, fibrinolysis can worsen bleeding disorders as seen in conditions like HA. HA is characterized by deficient factor VIII levels which leads to abnormal clot formation and increased susceptibility to fibrinolysis, resulting in spontaneous bleeding episodes and excessive bleeding post-injury.

Earlier research has focused on antifibrinolytics such as Tranexamic Acid (TXA) and Epsilon-Aminocaproic Acid (EACA), however, their short half-life limits their efficacy for prophylactic use, requiring the exploration of alternative strategies. The study done by Strilchuck and colleagues explored a novel approach that



evaluated the use of small interfering RNA-loaded lipid nanoparticles (siRNA-LNPs) as a way to inhibit hepatic plasminogen expression, to achieve long-lasting suppression of fibrinolysis. This demonstrated that siRNA LNPs effectively depleted circulating plasminogen, a key component of the fibrinolytic pathway for extended periods after a single administration in both mice and dogs, offering a potential solution for prophylactic therapy to maintain hemostasis in conditions like HA. Importantly, prolonged siRNA-mediated plasminogen knockdown in mice did not induce adverse effects associated with plasminogen deficiency such as the safety and efficacy of this approach in maintaining hemostasis. Furthermore, in animal models of hemophilia, siRNA-mediated plasminogen knockdown was particularly useful in reducing bleeding events and stabilizing clots, highlighting the potential clinical utility of this

approach in managing bleeding disorders.

When tested in canine models with hemophilia A, siRNA-mediated plasminogen proved to be as effective as TXA in stabilizing clots, and thereby reduced bleeding events over a sustained period. This approach showed no adverse effects associated with prolonged plasminogen depletion, offering a potential long-term solution for managing bleeding disorders.

This study highlighted the relevance of these findings to humans, suggesting that siRNA-mediated plasminogen knockdown could offer similar benefits in individuals with bleeding disorders. Unlike TXA, which has a short duration of action, siRNA-LNPs hope for improved outcomes and quality of

life for individuals living with these conditions. provided prolonged efficacy that lasted for weeks after administration potentially offering significant advantages in clinical practice.

The development of innovative therapeutic strategies like the siRNA-mediated plasminogen knockdown, represents a significant step forward in the management of these conditions. By targeting specific components of the fibrinolytic pathway such as plasminogen with siRNA-mediated gene silencing, researchers have opened new avenues for long-term prophylactic treatment, offering

Learn more here:

<https://www.science.org/doi/10.1126/scitranslmed.adh0037>





WORLD AUTISM DAY: A PERSONAL APPROACH

By: Simone Abraham

Every year, April 2nd is observed as World Autism Awareness Day, a time to reflect on and celebrate the diversity within the autism spectrum. The day is observed as a means to affirm and promote the full realization of all human rights and fundamental freedoms for autistic people on an equal basis with others. As we strive to create a more inclusive society, it becomes crucial to recognize the unique abilities and challenges faced by people with autism and work toward fostering a more understanding and supportive environment for them.

Autism spectrum disorder is a complex neurodevelopmental condition that affects how people interact with others, communicate, learn, and behave. Autism can manifest differently in each individual. Despite the diversity within the autism community, one common thread is the



desire for acceptance and inclusion. The theme of World Autism Awareness Day revolves around spreading awareness and understanding of autism. Through increased awareness, we can challenge misconceptions and stereotypes surrounding autism and promote a more inclusive environment.

One of the key objectives of World Autism Awareness Day is to advocate for the rights of individuals with autism. It could involve promoting policies and initiatives that support the needs of individuals with autism and their families. By advocating for their rights, we can empower individuals with autism to live independent and meaningful lives.

Another important aspect of World Autism Awareness Day is promoting early

intervention and supporting individuals with autism. Early diagnosis and intervention can help both the individual with the condition and support families in accessing appropriate services and reducing stress, significantly improving outcomes and providing them with the tools and support they need to thrive. It can help in the use of more targeted interventions, better social outcomes, and increased independence in adulthood. By raising awareness about the importance of early intervention, we can ensure that individuals with autism receive the assistance they need as early as possible.

Each individual's journey is shaped by a combination of genetic, environmental, and neurological factors resulting in a

spectrum of strengths, challenges, and perspectives. Some individuals may excel in areas such as mathematics, music, or art while others may struggle with social interactions, communication, or sensory sensitivities.

The goal through this day is to create communities where every individual can thrive. By promoting understanding, acceptance, and support we can create a brighter future for individuals with autism and ensure that they have the opportunity to thrive and succeed.

Learn more here:

<https://www.cdc.gov/ncbddd/autism/features/living-with-autism-spectrum-disorder-anita.html>



DID YOU KNOW?

Autism, or autism spectrum disorder (ASD), refers to a range of conditions characterized by challenges with social skills, repetitive behaviours, speech, and nonverbal communication. It affects individuals differently and to varying degrees, often manifesting in early childhood. Autism is not a single disorder but a spectrum of closely related disorders with a wide variation in symptoms and severity. Although usually diagnosed at a young age, people with autism can go their entire lives without a diagnosis. Autism is not something that can be treated, as there is usually no need for treatment.

Learn more here:

<https://www.autism.org.uk/advice-and-guidance/stories>












IMMUNIZATION WEEK: BEING PROTECTED

By: Mihika Mishra

Immunization Awareness Week will be observed from April 22nd to April 30th in 2024, commemorating the strides made in the field of vaccination and emphasizing the role vaccines play in global health.

The journey of immunization began centuries ago, with practices like variolation documented as far back as 200 BCE. Variolation involved exposing individuals to small amounts of material from smallpox sores, resulting in milder illness compared to the otherwise severe infection. In the 18th century, Edward Jenner's work led to the development of the first vaccine against smallpox, marking a pivotal moment in medical history.

The 19th century witnessed significant progress in vaccine development, including Louis Pasteur's creation of the first laboratory-produced vaccine for fowl cholera and his success in preventing rabies through post-disease-exposure vaccination. These breakthroughs became the foundation for modern vaccines, which utilise antigens derived from the pathogen or "produced synthetically to represent components of the pathogen". These antigens induce immune responses which are the basis for protection against the infection or disease. Vaccination is one of the most effective public health interventions, preventing approximately 4 million deaths worldwide each year. The World Health Organization has

Type of vaccine		Licensed vaccines using this technology	First introduced
Live attenuated (weakened or inactivated)		Measles, mumps, rubella, yellow fever, influenza, oral polio, typhoid, Japanese encephalitis, rotavirus, BCG, varicella zoster	1798 (smallpox)
Killed whole organism		Whole-cell pertussis, polio, influenza, Japanese encephalitis, hepatitis A, rabies	1896 (typhoid)
Toxoid		Diphtheria, tetanus	1923 (diphtheria)
Subunit (purified protein, recombinant protein, polysaccharide, peptide)		Pertussis, influenza, hepatitis B, meningococcal, pneumococcal, typhoid, hepatitis A	1970 (anthrax)
Virus-like particle		Human papillomavirus	1986 (hepatitis B)
Outer membrane vesicle		Group B meningococcal	1987 (group B meningococcal)
Protein-polysaccharide conjugate		Haemophilus influenzae type B, pneumococcal, meningococcal, typhoid	1987 (H. influenzae type B)
Viral vectored		Ebola	2019 (Ebola)
Nucleic acid vaccine		SARS-CoV-2	2020 (SARS-CoV-2)
Bacterial vectored		Experimental	-
Antigen-presenting cell		Experimental	-

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estimated that more than 50 million deaths could be prevented through immunization between 2031 and 2030, highlighting its impact on global health outcomes. The COVID-19 pandemic underscores the importance of continued investment in vaccine research and development.

Despite progress in the actual development of vaccines, challenges still persist in ensuring equitable vaccine access and addressing vaccine skepticism. During Immunization Awareness Week, it is essential to pursue commitment to protecting communities through vaccination, not just through the actual creation of them, but also through raising awareness, promoting education, and advocating for equitable vaccine access.

Learn more here:

<https://www.unicef.org/immunization>



IRRITABLE BOWEL SYNDROME: A REAL PUNCH IN THE GUT

By: Mihika Mishra

April marks Irritable Bowel Syndrome (IBS) Awareness Month, an opportunity to shed light on a condition affecting millions of individuals worldwide. With an estimated 13-20% of Canadians, approximately 5 to 7.5 million individuals, living with IBS, it is imperative to foster understanding, encourage seeking medical help, and support potential treatments.

IBS is a chronic, often debilitating, gastrointestinal disorder characterized by symptoms such as abdominal pain, bloating, and altered bowel behaviors, including constipation, diarrhea, or alternating between the two. The primary symptoms of IBS are encapsulated by what is termed the "ABCDs of IBS": Abdominal pain, Bloating, and Constipation and/or Diarrhea. These symptoms can vary in intensity and duration which makes diagnosis and management challenging.



One of the complexities of IBS lies in its subtypes, each presenting with distinct characteristics. IBS-D involves rapid bowel movements while IBS-C is marked by slow bowel movements. Additionally, IBS-M manifests as a fluctuation between diarrhea and constipation, sometimes within the same bowel movement.

Despite its prevalence and impact on quality of life, effective treatments for IBS have yet to be developed. However, a recent ATLANTIS trial explored the efficacy of amitriptyline in alleviating IBS symptoms. Led by researchers at Universities of Leeds, Southampton, and Bristol and funded by the National Institute for Health and Care Research (NIHR), this trial revealed promising results. Amitriptyline, a tricyclic antidepressant,

had been hypothesized to be a treatment for IBS, but has now demonstrated actual efficacy in improving IBS symptoms. Importantly, researchers noted that the medication's beneficial effects were primarily gastrointestinal, rather than through its antidepressant properties. This suggests a potential avenue for addressing IBS symptoms through targeted therapeutic interventions.

The mechanisms underlying the benefits of tricyclic antidepressants in IBS are multifaceted, involving alterations in gut motility, visceral sensitivity, and pain regulation. By influencing these pathways, medications like amitriptyline have the potential to provide relief for the

debilitating symptoms of IBS. During IBS Awareness Month, it is crucial to spread awareness and advocate for research into effective treatments like amitriptyline. By elevating understanding of IBS, we can empower individuals living with IBS to lead healthier and more fulfilling lives.

Learn more here:

<https://badgut.org/information-centre/a-z-digestive-topics/ibs-awareness/>

<https://www.bristol.ac.uk/primaryhealthcare/news/2033/amitriptyline-helps-relieve-ibs-symptoms.html>

<https://badgut.org/information-centre/a-z-digestive-topics/ibs/>



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GREEN JERSEY DAY: A DAY THAT CHANGED A NATION

By: Gina Zhang

April 6th, 2018. A typical day when the sun shone down on the ten provinces and three territories of the nation of Canada. Twenty-eight young hockey players, coaches, athletic trainers, and sports analysts loaded onto a bus that would whisk them to the next stop following an anticipatory playoff run. To them, the championship was in view this year, and with it came a thirst and belief of victory.

All this would come to a stark halt in an intersection in Saskatchewan. In a moment, sixteen lives were taken and thirteen more were irrevocably altered forever. What ensued was a period of mourning from a nation so deeply touched and devastated by the story of a hockey team that woven its threads so deeply into the fabric of the Canadian tapestry.

Response to the accident was immediate. The notoriously dangerous intersection has been long deemed unsafe, however, little has been done to reduce this harm. First responders worked tirelessly to save any victims at the scene, however, little could be done to resolve such irreversible carnage and pain.

Within days, a record-breaking \$15,000,000 dollars had been raised in support of the team, donations stemming from nations around the world. In tribute, countless Canadians began leaving hockey



sticks on verandahs and porches in memory of the players who had passed. Professional leagues dedicated memorials to the victims of the accident. Every Canadian tried to do their own part to help support in the aftermath of devastation.

In the months after the crash, life slowly began to revert back to harmony. The league resumed its schedule, however, a new team of Humboldt Broncos took the ice. Survivors of the crash, either unable to skate ever again or too emotionally scarred to do so, were in the presence of an arena that had once housed a team's dream of victory. Now, it serves as a stark reminder to the loved ones they had lost. A small town in Saskatchewan of less than 7000, that would usually be passed over by any expert hands of a cartographer, was now known for a tragedy that should have never even happened. Throughout the history of the hockey, there are few other events that have united a nation.

Despite the tragedy, there are stories from such as the tragedy that can be regarded as hopeful, a beacon of the beating nature of the indomitable community spirit. Take Jacob Wasserman, a goaltender of the team who sustained life-altering wounds as a result of the accident. However, in the years that would pass, he would focus on qualifying for the Olympics. For the 2024 Games, he will be on Team Canada's rowing squad, competing alongside the finest athletes in the world. Despite the relentless recovery route, Wasserman is a symbol of the fierce culture that ruminates in the team, even nearly 6 years after the accident.

The legacies of the Humboldt Broncos continue to inspire Canadians and people across the globe. Logan Boulet, a young player for the team, lost his life in the

accident. However, he had registered to be an organ donor, thereby saving six other lives. During the weeks after this news, organ donations across the nation increased to the thousands. By the actions of this young man, countless other lives have likely been saved. In commemoration, April 7th is now known as Green Shirt Day, a day that encourages a positive impact on the living world beyond life itself. As the years pass by, Canadians are constantly reminded of the Broncos, a team of dreamers who simply wanted to play a game of hockey, but paid so much more to unite the hearts of a nation.

Learn more here:

<https://www.cbc.ca/sports/paralympics/summer/para-rowing/survivor-humboldt-broncos-crash-paralympic-rowing-1.7159446>





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