MEDIC FOUNDATION

OCTOBER 2023

M.E.D.I.C

TECHNOLOGY | CULTURE | HEALTHCARE

OCTOBER 2023

We are the MEDIC Foundation

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INTRODUCING:
THE MEDIC FOUNDATION

The MEDIC Foundation is UBC's non-profit student-led chronic disease research and advocacy hub. Founded and led by UBC biomedical engineering students and partnered with the UBC School of Biomedical Engineering, we are finding new ways to conduct innovative research and solve real-world problems through our projects that look to create devices that tackle different chronic diagnoses.

Our organization was founded by our cofounders Anjali and Madhini, who connected in 2020 on a personal level, having witnessed important people battle and experience chronic disease in their lives. They drew inspiration from the tenacity of their loved ones to drive their own passions with medical care. With the help of faculty mentors and principal investigators across UBC, we are undertaking four research projects targeting various chronic conditions. Our team is only growing and we hope to bring change to patients' lives locally and globally. And we could not do this without the support of all our members and partners! A special thank you to the McKeown Lab, the the AIM Lab, Dr. Rajaratnam, and Open Source Medical Supplies BC who gave us the guidance and space to conduct our research.

Together, we are aspiring to revolutionize the way people approach chronic diseases. Our students are passionate and innovative. We have several exciting initiatives coming this semester, so make sure to stay tuned for future updates and events!

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 is hard at work to begin research on potential biomarker targets. The team is in the process of assessing past successful IBD/Crohn's treatments and determining whether improvements can be made on recent technology. Our team is looking for financial support and sponsorship. If you are interested in working with us, please reach out on our website!

FUTURE EVENTS

Our Fall hiring was a resounding success. We received a wide range of incredibly competitive and motivated applicants, who all showed immense capability and accomplishment. After thorough consideration and productive interviews, we were able to narrow down the applicants to our newest team members. Congratulations to all our successful applicants, and we thank everyone for their consistent interest and belief in the values and goals of our organization.

The Care Companions Program has completed its initial onboarding and hiring. Further hiring for this new team will take place in December. If you are interested in volunteering within the community, keep a lookout for hiring dates, intake interviews, and additional and insightful information about the program

Our first major event of the year will be taking place this January. The Events team has been hard at work preparing and presenting ideas for entertaining activities for participants of all ages. These activities include, but are not limited to, computer engineering, biomedical innovation, and computer coding. Additional information and details about the event will follow soon. Be sure to keep a lookout for additional updates.

CARE COMPANIONS PROGRAM

The highly anticipated Care Companions Program has completed the preliminary round of hiring. We would like to introduce our two Directors of the program, Kellie Vu and Eliana Zhao! Under their steady leadership and determined guidance, the MEDIC Foundation aims to bridge the gap between the community and the elderly population. Students can forsee aiding seniors with tasks such as technology literacy and general companionship. Volunteer intake will begin in mid-December. The program intends a start date in January!

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BREAST CANCER AWARENESS MONTH: RESEARCH TOGETHER

By: Mihika Mishra

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Annually during the month of October, the world comes together to observe Breast Cancer Awareness Month, uniting with the symbolic gesture of wearing pink to show their support.

One dedicated figure in the field of breast cancer research is Dr. Josef Penninger, a renowned immunologist and a Professor at the University of British Columbia (UBC) in Medical Genetics. He also serves as the Director of the Life Sciences Institute at UBC. His immense contribution to the field of cancer research has been pivotal to novel treatments. Dr. Penninger's journey in breast cancer research spans 20 years, beginning when he witnessed his sister-in-law's harrowing battle with breast cancer: “At the end, we all need to ask ourselves the key question: Why do we do biomedical research? For myself, it is to make a difference in the lives of people.”

Dr. Penninger played a pivotal role in the groundbreaking research that identified Denosumab as an effective drug with the potential to address breast cancer. Denosumab is a monoclonal antibody developed by the American biopharmaceutical company Amgen, primarily designed to combat bone loss. It works by binding to and inhibiting the activity of the RANKL protein, which plays a role in bone-resorbing cells known as osteoclasts. By blocking RANKL, Denosumab reduces osteoclast activity, slowing down bone resorption, and enhancing bone density, thereby preventing osteoporosis. As explained by Dr. Penninger, the RANKL protein plays a pivotal role in breast cancer development: “RANKL is the missing link that couples sex hormone action in every woman’s life to the basic breast physiology and

pregnancy. In other words with this system we would die out as a species. This system is the key to how sex and pregnancy hormones remodel the female body in reproductive life and in particular, pregnancy. That is why we believe – and all our data confirm - that this system underlies the key mechanism of how breast cancers form, grow, and metastasize."

Notably, Denosumab has been proven to improve the survival rates of postmenopausal women with hormone receptor-positive (HR positive) early breast cancer who are undergoing aromatase inhibitor treatment. In a long-term clinical trial, it was also found to enhance patients' quality of life by reducing the incidence of broken bones, a common side effect of breast cancer treatment, by 50%.

Dr. Penninger conducted research with knockout mice, genetically engineered to have deactivated genes responsible for producing RANKL. These mice failed to develop lactating mammary glands during pregnancy, a process dependent on sex hormones. Alongside this, the regulation of bone density is also tied to sex hormones. Pregnant mammals activate RANKL to form breast tissue, and as mammary epithelial cells divide, this sustains stem cells that can give rise to breast tumours. This intricate relationship highlights the challenge in treating hormone receptor-positive breast cancer, which typically involves surgery and radiation followed by aromatase inhibitor therapy. While these inhibitors suppress the sex hormones that fuel cancer growth, they can have adverse effects on bone health. In this context, a clinical trial conducted by the Austrian Breast and Colorectal Cancer Study Group demonstrated that administering 6mg of Denosumab every six months led to improved disease-free and bone metastasis-free survival among participants. Furthermore, it significantly reduced the incidence of bone fractures over the long term. Dr. Penninger emphasized that RANKL blockade using Denosumab does not replace proven therapies, but adds to them.

This promising research has positioned Denosumab as a potential candidate for routine clinical use in postmenopausal breast cancer patients undergoing aromatase inhibitor therapy. However, there is still much that needs to be uncovered regarding treatment using Denosumab: "But [Denosumab] does not work for all patients, so there is a lot left to do in terms of "why does it work in the

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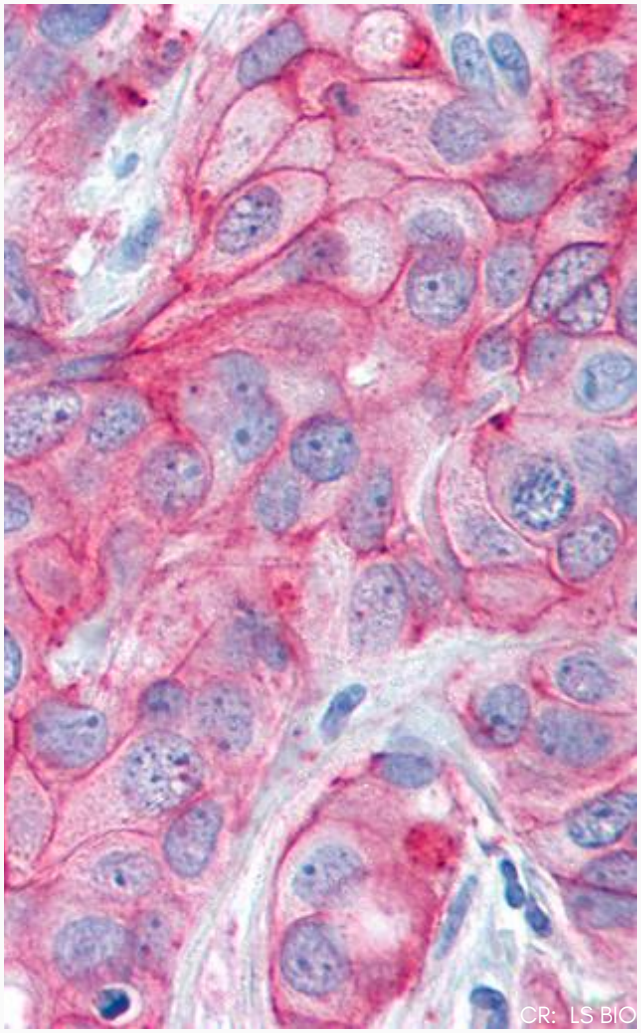
first place (Bone effects? Immunity effects? Direct effects on tumor cells?) and how to improve this." He also highlights the need to further investigate how dormant tumor cells reawaken and form metastases at later stages.

His concluding words act as a poignant reminder of the global impact of breast cancer on women and underscore the critical importance of research: "My sister in law was a very educated person, she ran reading programs for poor and excluded kids in Chicago. She was very scared of what she had to face and hoped it would just go away. It did not go away. I completely understand the psychological dimension and how scary this can be, to all of us, to the best of us. That is why I continue my research, whatever people think or say about me, because maybe my research can contribute to providing treatments and a better understanding of disease. And, of course, if we know that, we can design better prevention strategies and improve the lives of cancer patients."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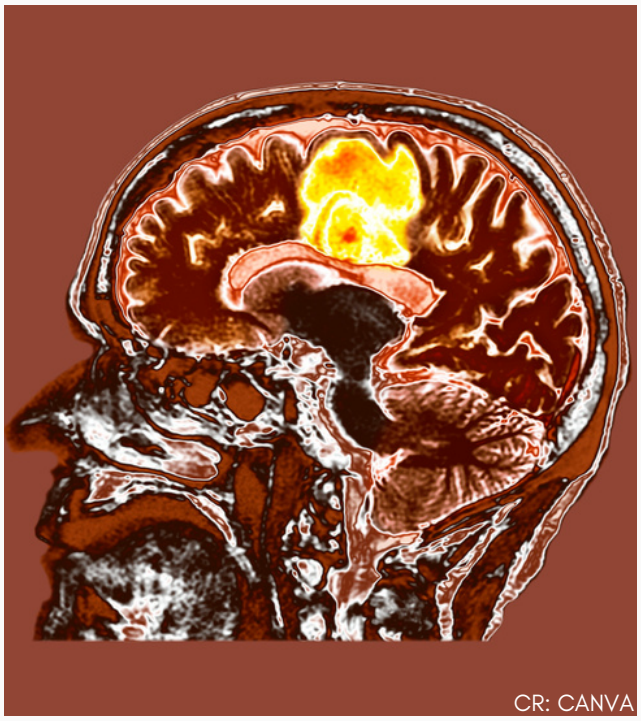
DID YOU KNOW?

Cancer is highly based on genetic predisposition. Up to 10% of cancer is genetics-related. However, inheriting a cancer-related gene does not guarantee the diagnosis of cancer. Cancer treatments are also widely based on genes and family history of a patient. This can be a major obstacle in the synthesis of novel treatments.

Learn more here:
https://www.cancer.gov/about-cancer/causes-prevention/genetics

BRAIN CANCER AWARENESS: THINK FOR A CURE

By: Mihika Mishra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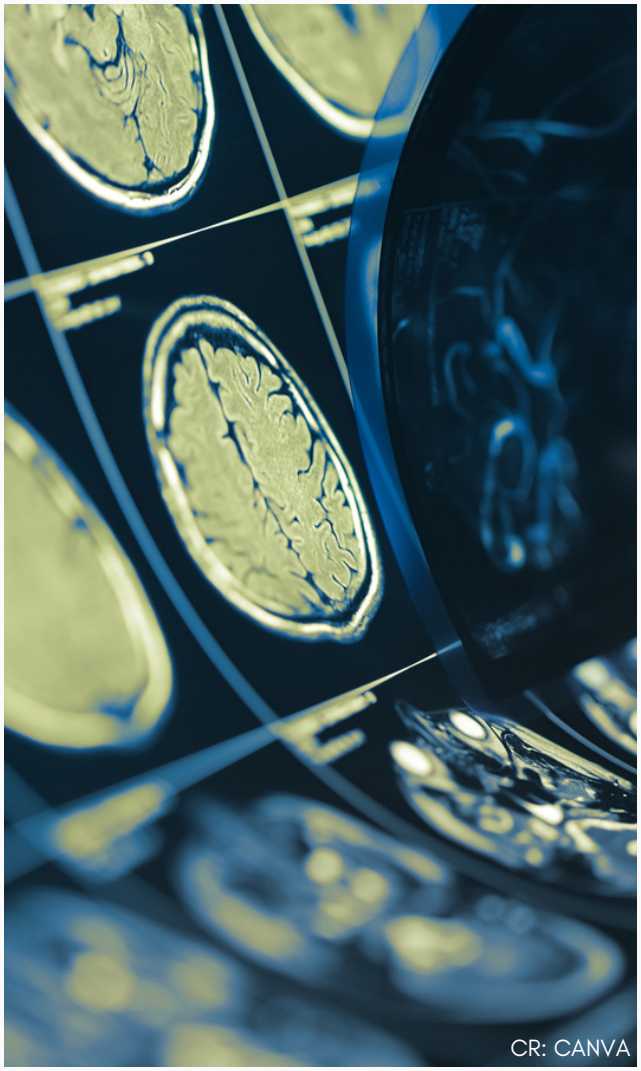
On October 24th, Canada observed its sixth annual Brain Cancer Awareness Day, dedicated to shedding light on the devastating impact of brain cancer and sharing a message of hope. Brain tumors are a growing concern in Canada, with the Brain Tumor Foundation of Canada reporting Canada as having one of the highest brain tumor incidence rates globally and 27 Canadians being diagnosed with brain tumors each day. In light of this concerning progression, the need for dedicated research into brain cancer treatments has never been more pressing.

A major breakthrough in the field of brain cancer research has emerged from the Salk Institute of Biological Studies, where scientists Dr. Susan Kaech, Dr. Dan Chen, and Siva Karthik Varanasi made significant progress in treating glioblastoma, a highly aggressive form of brain cancer, using a novel immunotherapy approach with anti-CTLA-4. This treatment utilises two specialized cells: CD4+ T cells and activated microglia. Traditionally, CD8+ T cells were more commonly studied in place of CD4+ T cells for their direct cancer cell-killing abilities, and microglia's role in tumor destruction was not well-established. The usage of these cells have proven impressively successful. The journey to this groundbreaking discovery began with a comparative study of the treatments anti-CTLA-4 and anti-PD-1 in mice, the latter being a historically employed treatment for brain cancer but ineffective for glioblastoma. Anti-CTLA-4 showed remarkable promise, extending the survival of mice with glioblastoma, while anti-PD-1 had minimal impact. When investigating the effectiveness of anti-CTLA-4, scientists found that this treatment prompted CD4+ T cells to release interferon gamma. This signaling molecule caused tumor cells in the brain to display "stress flags," alerting the immune system and signaling microglia to target the stressed tumor cells. As microglia consumed the tumor cells, they presented parts of the tumor on their surface to CD4+ T cells, ensuring the continued activation of CD4+ T cells and the production of more interferon gamma. This cycle revolving around the collaboration between CD4+ T cells and microglia resulted in the complete destruction of the tumor, significantly prolonging mice survival.

This groundbreaking research was published in the scientific journal "Immunity" in August 2023. The findings suggest that combining anti-CTLA-4 with CD4+ T cells and microglia could pave the way for effective immunotherapeutic treatments against glioblastoma. This research highlights the human body's potential to combat brain cancer using its own immune system.

Researchers are now focused on implementing immunotherapy approaches, including the anti-CTLA-4 and other treatments akin to anti-CTLA-4, in human glioblastoma cases. This will advance our understanding of the disease and potentially revolutionize treatment options for this deadly form of brain cancer. This discovery marks a significant step forward in finding an effective treatment for glioblastoma, bringing hope to those affected by this disease.

Learn more here: https://www.cell.com/immunity/fulltext/S1074-7613(23)00328-X.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INVISIBLE BARRIERS: INCLUSIVITY ATTENTION AT UBC

By: Simone Abraham

Invisible Disabilities Week is an opportunity to shed light on the experiences of individuals with a condition that affects their day-to-day life that may not be immediately apparent to the outside world but can impact their daily lives. The goal of this week was to spread awareness, education, and support around the world for those living with invisible disabilities. It can include a wide range of health challenges including mental health disorders, diabetes, learning disabilities, ADHD, Ehlers-Danlos Syndrome (EDS), and autism.

It is an important week to break down the belief that people with invisible disabilities are “exaggerating” or “faking” their symptoms. When the disability that one has is not as apparent, there is a tendency to diminish the severity of the disease. In the case of an invisible disability, just because it is not necessarily apparent and visible to

others, does not make it any less real or impactful. That is why it is important to raise awareness regarding invisible disabilities and create a safe and welcoming space to make everyone feel comfortable.

UBC recognizes that invisible disabilities can affect the academic performance of students. In an attempt to further even the playing field, the university provides academic concessions such as extended exam time, assistive technology, and note-taking assistance to ensure that students with invisible disabilities also have equal opportunities for success. These concessions are part of a larger, university-wide effort to increase inclusivity and accessibility. In terms of mental health, UBC offers a wide variety of mental health services for its students and staff. These services include wellness workshops, counseling services, and 24/7 online support.

At an institution as large as UBC, it becomes difficult to support a variety of access needs.

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For individuals who face such challenges, it leads to frustrations in their daily lives. Disability is a large category that can encompass a range of impairments and access needs, but not all are necessarily visible. The stigma around mental health can sometimes pose a barrier to seeking support and services. The UBC's Centre for Accessibility is the university's home base for students seeking disability-related resources but during busy time periods, it becomes difficult for students to get help quickly.

This week is a time to pause and reflect on the challenges that many individuals may face and go unnoticed. It essentially serves as a reminder that it is important to understand and support individuals with invisible disabilities as well. It encourages us to be more empathetic, more informed, and more proactive in creating a world that accommodates and uplifts those with invisible disabilities. Everyone's experiences are unique, and empathizing and supporting each other can go a long way in making the space more inclusive. Education can be used as a powerful tool to help raise awareness among the public about invisible disabilities. It is an opportunity to learn more about various invisible disabilities, the unique challenges they present, and the ways in which we can provide support and understanding. This can help reduce any misconceptions and empower individuals with the ability to share their stories and needs. True inclusivity is recognizing and accommodating individuals with a variety of needs which includes those with invisible disabilities.

Learn more here:
https://vancouver.calendar.ubc.ca/campus-wide-policies-and-regulations/academic-concession

WORLD MENTAL HEALTH DAY: A UBC POINT OF VIEW

By: Simone Abraham


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The overall objective of World Mental Health Day is to raise awareness of mental health issues worldwide and to mobilize efforts made to support mental health. It provides an opportunity for the people working on mental health issues to talk about their work and the work that still needs to be done to make mental health care a reality for people worldwide. It is a day to reflect on the importance of mental well-being and the efforts made by institutions like UBC to support students and staff in this aspect.

The theme this year was 'Mental health is a universal human right', to improve knowledge, raise awareness, and drive actions that promote and protect everyone's mental health as a universal human right. Everyone has the right to the highest attainable standard of mental health, which includes the right to be protected from mental health risks, the right to accessible, acceptable, and good quality care, and the right to liberty, independence, and inclusion in the community. Good mental health is important for overall well-being and mental health conditions should never infringe on a person's basic human right or deny individuals involvement in their own health-related decisions. However, across the world, people with mental health conditions experience a wide range of human rights violations. Many are excluded from community life and discriminated against. By joining the World Mental Health Day 2023 campaign, you can learn more about your right to mental health and how to safeguard the rights of others.

Mental health issues affect a wide variety of people and students are no exception. The pressures of academia combined with managing a social life can tend to take a toll on the mental well-being of students. UBC offers a wide variety of mental health services to support its students. This includes wellness workshops, 24/7 online support, and other counseling services aimed at helping students manage stress, anxiety, or any other mental health issues. UBC Counselling Services is the first point of contact for any mental health concerns. The first step is meeting with a wellness advisor, a certified mental health professional who will listen to all your concerns and then give you guidelines on the most appropriate next steps of care for your needs.

In conclusion, this commitment to mental health should be a daily practice. World Mental Health Day is just a reminder that mental health is not to be taken lightly and is important to be taken care of for your overall well-being. UBC provides students and faculty an opportunity to reflect on their own mental well-being and reach out for support when needed. Through the wide variety of resources made available, the university ensures that mental health is a top priority. We should always remember to take care of ourselves and support those around us, thereby helping create a more inclusive space where mental well-being is also taken care of.

Learn more here:
https://www.who.int/campaigns/world-mental-health-day/2023

https://students.ubc.ca/health/counselling-services/mental-health-care-ubc


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HOSPICE CARE: A FINAL GOODBYE IN COMFORT

By: Gina Zhang

There is no more devastating feeling when saying goodbye to a loved one. During times of sickness and health, a good friend or family can be the best source of treatment, or even serve as a curve. However, when the technology has failed, and the treatments that even funding forsakes, many people around the world find themselves turning towards hospice and hospice care help ease the transition into the final days of their life.

Hospice care continues to be a controversial and painful subject for healthcare systems around the world. For some, it is nearly impossible to overlook the incurable factor of a disease. To be admitted to hospice care would be the equivalent of giving up or surrendering, which is an idea few can stomach. For these reasons, hospice care is only given to around 14% of the patients who actually need it.

However, studies have shown that hospice care can contribute greatly to the quality of life of individuals suffering from serious diseases. During medical treatment and response, the human body is subjected to immense stress and turmoil, resulting in weakened immune systems that further contribute to the decline of the patient.

This leads to immense discomfort for the patient, both physically and mentally. In many cases, these exhaustive treatments will result in decreased life expectancies for individuals as a result of the burden experienced by the human systems.

When hospice care is viewed as a destination of resignment, the benefits of its services are underappreciated. Hospice care oftentimes includes around-the-clock care by nurses and medical professionals, the ability for family visitation, and even care offered from the comfort of the patient's own home. Whereas medical treatment focuses on the possibly prolonging of a life, hospice care aims to prioritize the quality of life. For what limited time the patient has left, the service desires to amplify comfort and companionship, allowing both the patient and the family to emotionally and physically prepare for a transition toward the end of life.

To be considered for the service, the patient must first relinquish all medical services and treatments that could possibly prolong their own life. On top of professional care provided by nurses, doctors, and social workers, hospice care also places a special focus on the involvement of the family of the patient. Hospice care believes that support from friends and family can greatly reduce the fear and anguish a patient may feel in the final days of life. The care also believes that the family of the patient merits training in comfort as well, to best prepare these members to say goodbye to a loved one and how to continue living a life without an important figure.

Hospice care requires incredible dedication from a team of professionals who prioritize patient comfort. After a long difficult battle, accepting their care, as many are coming to realize can be a step towards healing.

Learn more here:
https://www.nia.nih.gov/health/what-are-palliative-care-and-hospice-care#:~:text=Palliative%20care%20is%20specialized%20medical,to%20cure%20their%20serious%20illness.


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