



RIDING FOR THEIR LIVES

GREAT CYCLE CHALLENGE

2023 PROGRESS REPORT



A MODEL FOR CHANGE

How a SickKids researcher is fine-tuning testing for better treatments.

GENETIC SEQUENCING has led to breakthrough findings in cancer research. But how do we translate these discoveries into tangible, targeted patient treatments? That is what SickKids cancer researcher, Madeline Hayes, is trying to figure out—using zebrafish. Hayes completed her training at SickKids and honed her skills in developing genetic models of human disease in zebrafish to uncover the mysteries of cancer development and metastasizes on a cellular level.

“Treating patients with specific genetic changes with standard therapy is not always effective. But there is a lot of biology that needs to be understood to develop safe and effective targeted therapeutic approaches that will be more effective than the current standard of care,” says Hayes.

To deepen her understanding, Hayes is working with the KiCS (SickKids Cancer Sequencing) program and alongside colleagues like Dr. Meredith Irwin, Oncologist and Chief of Paediatrics at SickKids, to model newly identified genetic abnormalities that lead to tumour formation, growth and metastases in high-risk metastatic neuroblastoma and other paediatric cancers. “The abnormalities we are currently focused on suggest that certain classes of drugs may provide improved cures for patients, but these treatments are poorly understood in paediatric cancers,” Hayes explains. “Our work could be the catalyst for kids being screened and receiving personalized therapy for their disease.”

To test treatments, the team engineers zebrafish strains that are susceptible to cancer and transplant tumour cells from patients into zebrafish.



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“OUR WORK COULD BE THE CATALYST FOR KIDS BEING SCREENED AND RECEIVING PERSONALIZED THERAPY FOR THEIR DISEASE.”

Zebrafish are an ideal model to promote novel cancer drug discovery because they are easy to manipulate, dose with drugs and develop many human tumour types through the same gene pathways. Importantly, zebrafish models can provide cost-effective and reliable evidence before considering new drug combinations for patients.

Great Cycle Challenge (GCC) participant and donor support of this foundational research is enabling the preclinical data necessary to translate discoveries into the new hope-inspiring treatments patients need.

TRIALS TO TREATMENTS

Researching and testing better drugs is how SickKids saves lives.

Children with cancer who have exhausted all treatment options turn to SickKids for innovative therapies unavailable elsewhere. These therapies are tested in cutting-edge clinical trials—clinical research studies designed to determine a promising therapy’s effectiveness.

SickKids conducts more clinical trials than any other paediatric centre in Canada, many of them cancer trials, and the number continues to increase yearly. GCC support has helped fund breakthrough research that informs these cancer clinical trials. Now, your support is being used to test this research in the lab through investigator-led clinical trials and through opportunities presented by the international Pediatric Brain Tumor Consortium (PBTC), of which SickKids is the only Canadian member. SickKids advocates for equal access and opportunities to participate in and run world-first trials that can lead to world-first therapies. Thank you for supporting such an essential part of our commitment to care.



BY THE NUMBERS:

ABOUT 1,000 CANADIANS YEARLY UNDER THE AGE OF

15

ARE DIAGNOSED WITH CANCER

APPROXIMATELY

84%

OF CHILDREN IN CANADA SURVIVE THEIR CANCER DIAGNOSIS AFTER FIVE YEARS

BRAIN TUMOURS ARE

20%

OF PAEDIATRIC CANCER CASES, AND THE DEADLIEST KIND OF CANCER

AN ESTIMATED

2/3

OF SURVIVORS HAVE AT LEAST ONE CHRONIC OR LATE-OCCURRING EFFECT FROM CANCER TREATMENT THAT CAN BE SIGNIFICANT, SERIOUS OR LIFE-THREATENING

THE SEVERE MENTAL HEALTH CHALLENGES RATE IN PAEDIATRIC CANCER SURVIVORS IS NEARING

50%

LEADING TO REDUCED EDUCATIONAL ATTAINMENT, LOST OPPORTUNITIES FOR ECONOMIC SUCCESS, AND A LIFETIME OF STRUGGLING WITH ANXIETY, DEPRESSION, AND POST-TRAUMATIC STRESS DISORDER.

MEET QAIS

We fight for kids like him.

QAIS WAS TWO years old when he and his siblings had the flu. His siblings got better, but Qais' fever persisted. His mom, Sumayya, took him to their local hospital for testing where doctors discovered a mass in his chest. Qais underwent a complicated 10-hour surgery at SickKids to remove the tumour. The pathology confirmed Qais had ganglioneuroblastoma, a tumour that develops in nerve tissue. They are classified as intermediate tumours, ones that have both malignant and benign cells.

Qais was kept under close watch for the next several years. He had regular MRIs, which gradually decreased in frequency. Qais' final MRI was scheduled for December 2021. But in the fall of that year, Qais became weak, began losing weight and complained of intermittent leg pain. Although the MRIs showed no growth in his chest, the urinalysis results told a different story. Further testing revealed many tumours throughout Qais' little body. He was diagnosed with neuroblastoma, a cancer of the nerve tissue. Qais began an intensive chemotherapy regimen and received a stem cell transplant. He also endured radiation treatment and multiple rounds of immunotherapy.

Sumayya describes Qais as loving and caring -kind and has a good sense of humour. The hospital admissions are difficult because he misses his large and tight-knit family. Qais' battle with neuroblastoma is far from over. Thank you for supporting the fight for patients like Qais and their families.

QAIS UNDERWENT A COMPLICATED 10-HOUR SURGERY AT SICKKIDS TO REMOVE A TUMOUR IN HIS CHEST.



Qais, SickKids patient

THE COMPETITIVE ADVANTAGE

When researchers pursue their big ideas, big change happens.

Last year, GCC funds helped fund the research for the winner of the Garron Family Cancer Centre's annual competition called the Big Ideas in Functional Genomics competition. This is an opportunity for researchers to explore out-of-the-box, potentially life-changing projects that harness the latest technologies to identify the roles of genetics or epigenetics in paediatric cancer. This year's competition winner was Dr. Zhenya Ivakine, Scientist in Genetics & Genome Biology at SickKids. Your support helped fund this incredible project.

Dr. Ivakine has dedicated his career to applying genome engineering tools and strategies to develop therapies for genetic conditions and diseases. He uses complementary genetic, biochemical, molecular and genome engineering approaches to understand how mutations lead to genetic disease and envisions new treatment at the DNA level.

Worldwide, scientists are collecting samples from tumours and analyzing them for mutations using a DNA analysis technology called whole genome

sequencing. They are trying to decipher what changes in DNA can be connected to tumour development or cancer progression. But it can be difficult to link individual mutations in individual genes to cancer. "We're trying to fill the gap with a technology we developed that allows us to look at the genes known to be associated with cancer and introduce multiple mutations into the gene to determine if there's a high likelihood for that mutation to lead to cancer or not," explains Dr. Ivakine. The advantage of this approach is in the numbers. Dr. Ivakine and his team can introduce about one hundred mutations at once. "If a mutation in a gene leads to a protein that is non-functional there is a high likelihood that this mutation will be associated with cancer, and if it's functional, it's less likely," explains Dr. Ivakine. "It's survival of the fittest in a petri dish."

This classification project is the beginning of what Dr. Ivakine hopes to be a precision child health reference table for physicians to gain insight into the genetic basis of a patient's cancer and identify the right drugs to help treat it.



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THANK YOU.



Thank you for making such a profound difference for patients diagnosed with cancer. With GCC support, SickKids can be nimble in allocating funds to the most promising breakthrough cancer research and care that will propel new life-saving treatments forward.

For more information, please contact:

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