CONFIDENTIAL

2022 CANADA GAIRDNER AWARDS RECOGNIZE WORLD-RENOWNED SCIENTISTS FOR TRANSFORMATIVE CONTRIBUTIONS TO RESEARCH IMPACTING HUMAN HEALTH

EMBARGOED UNTIL APRIL 5, 2022 at 12 AM ET

TORONTO, ON (April 5 2022) – The Gairdner Foundation is pleased to announce the 2022 Canada Gairdner Award laureates, recognizing some of the world's most significant biomedical and global health research and discoveries.

"Canadian scientists remain an example to follow as they continue to lead in global health research and discoveries that help create a more resilient society, country, and world. Congratulations to this year's Canada Gairdner Award recipients, your work demonstrates the power of science to improve lives and solve major challenges facing humanity."

– The Honourable Jean-Yves Duclos, Minister of Health

"Congratulations to the 2022 Gairdner Awards recipients for your outstanding discoveries and contributions to medical science! Pleased to see four Canadians among the world's most creative and accomplished biomedical scientists. Your work is revolutionizing our understanding of the human body and how to live longer, healthier lives, right down to the cellular level."

—The Honourable François-Philippe Champagne, Minister of Innovation, Science and Industry

2022 Canada Gairdner International Award

The five 2022 Canada Gairdner International Award laureates are recognized for seminal discoveries or contributions to biomedical science:

Stuart H. Orkin, MD

David G. Nathan Distinguished Professor of Pediatrics, Harvard Medical School and Dana-Farber/Boston Children's Cancer and Blood Disorders Center; Investigator, Howard Hughes Medical Institute, Boston Children's Hospital.

Awarded "For the discovery of the molecular mechanism responsible for the switch from fetal to adult hemoglobin gene expression during human development and translating that knowledge into a novel treatment for the hemoglobin disorders -- sickle cell disease and beta-thalassemia"

The work:
Dr. Stuart Orkin's pioneering work in genetic disorders of hemoglobin spans four decades and has unraveled molecular mysteries behind how blood cells develop and how disorders of blood arise. His most recent studies led to the discovery of the molecular mechanism responsible for the switch from fetal (HbF) to adult (HbA) hemoglobin gene expression that occurs during human development. Capitalizing on genetic clues from human population studies, Orkin and colleagues established that the protein BCL11A acts as the critical silencer of HbF expression in adults. Recognizing that turning HbF expression back on could lessen disease severity of sickle cell disease and beta-thalassemia --genetic disorders affecting HbA production – he proposed downregulation of BCL11A as a therapeutic approach. Dialing down the amount of BCL11A would reactivate HbF expression and effectively substitute for mutant or deficient HbA in these disorders. His group first demonstrated that downregulation of BCL11A expression corrects sickle cell disease in engineered mice, an important proof-of-principle for therapeutic translation. He and colleagues identified a discrete site in a regulatory element within the BCL11A gene itself that, if deleted by CRISPR gene editing in blood stem cells, would impair BCL11A expression only within developing red blood cells, and safely reactivate HbF expression. This work laid the groundwork for highly promising, ongoing clinical trials in patients with sickle cell disease and beta-thalassemia, diseases that affect >5 million individuals worldwide. Reactivation of HbF in patients in these genetic therapy trials has yielded transformative results: freedom from sickle crises and anemia in sickle cell disease and transfusion-independence in beta-thalassemia.

The impact:
Much of what is known about the control of gene expression during blood cell development can be traced directly to Orkin's pioneering studies. His discoveries have paved the way for clinical approaches that will revolutionize the treatment of hemoglobin disorders – sickle cell disease and beta-thalassemia – that affect more than five million people worldwide. Clinical trials that are currently underway establish the therapeutic potential of HbF reactivation. The outcomes of these trials will have significant impact for patients suffering from hemoglobin disorders around the globe, and will encourage the future development of cheaper and more readily accessible therapies for global application.

John E. Dick, PhD, FRS, FRSC

Senior Scientist and Canada Research Chair in Stem Cell Biology, Princess Margaret Cancer Centre, UHN; Professor, Department of Molecular Genetics, University of Toronto

Awarded "For the discovery and characterization of leukemic stem cells, providing insights into the understanding, diagnosis and treatment of acute myeloid leukemia"

The work:
Dr. John Dick made the first discovery of leukemia stem cells (LSC) in an acute myeloid leukemia (AML) patient. This finding established that individual cancer cells in the patient are not equal, rather they are organized as a cellular hierarchy where only rare leukemia cells possess self-renewal, the hallmark stem cell property. This discovery required two experimental components that Dick developed: a xenograft assay to detect LSC based on their ability to generate human leukemia upon transplantation into immune-deficient mice, and a method to

purify leukemia cells into LSC and non-LSC populations. By combining functional LSC assays with genetic analysis, Dick tracked the complex evolutionary pathways of human leukemia development from normal blood stem cells to pre-leukemic stem cells that eventually generate LSC and AML up to a decade later. This work also showed that LSCs that can cause later relapse have already evolved prior to diagnosis, and can survive normal therapy procedures. Thus, LSC were directly linked to therapy failure and relapse in leukemia patients. The properties of LSC as reflected in their gene expression are predictive of therapy response and overall survival. Dick developed a 17-gene 'stemness score' that can be used clinically to determine patient risk of poor outcome and help guide therapeutic choice.

The impact:
Dick's discovery of LSC changed the understanding of the underlying biology of cancer and stimulated exploration of cancer stem cells (CSCs) in other human cancers, including those affecting the breast, brain, colon, pancreas, skin and liver. His work highlighted the importance of investigating the properties of individual cells of the neoplastic clone, rather than bulk cancer cells and that special attention needs to be on the CSC that are the only cells capable of long term cancer propagation. The focus on CSC is revealing a number of properties that enable their survival in the face of therapy including dormancy, stress signaling as well as stemness programs that enable disease recurrence. Dick's work points to the need to ensure that CSC are eradicated when therapy is delivered and the need for new therapies that target CSC vulnerabilities. The discovery that pre-leukemic stem cells are present many years prior to disease appearance and that relapse-fated LSC are already present at diagnosis both offer windows of opportunity to target pre-leukemia and relapse earlier to prevent disease and relapse from occurring, respectively. Dick's findings offer clear direction for improving clinical outcomes in leukemia through LSC targeting and potentially in other cancers that adhere to the CSC model.

Pieter Cullis, PhD

Professor, Department of Biochemistry and Molecular Biology, University of British Columbia

Katalin Karikó, PhD

Senior Vice President RNA Protein Replacement Therapies, BioNTech SE; Professor, University of Szeged; Adjunct Professor, Perelman School of Medicine, University of Pennsylvania

Drew Weissman, MD, PhD

Roberts Family Professor in Vaccine Research; Director Penn Institute for RNA Innovation, Director, Vaccine Research, Infectious Diseases Division; Perelman School of Medicine, University of Pennsylvania

Awarded "For their pioneering work developing nucleoside-modified mRNA and lipid nanoparticle (LNP) drug delivery: the foundational technologies for the highly effective COVID-19 mRNA vaccines"

The work:
Drs. Karikó and Weissman discovered how to engineer mRNA – a molecule that carries instructions for making proteins – so that it could be used to produce the desired protein after introduction into mammalian cells. They overcame the inflammatory activation and rapid degradation of mRNA by modifying the RNA so that it could resist quick breakdown and avoid activating RNA sensors. Despite skepticism from others, Drs. Karikó and Weissman saw the potential of RNA therapeutics for vaccines and other applications and the data kept leading them forward. However, one major challenge remained: how to introduce the mRNA into the body in a way that it would be protected from degradation, and could enter into the cells for protein production.

Dr. Cullis had been working with such packaging systems for the past 50 years. Dr. Cullis is a pioneer in lipid chemistry and the formation of lipid nanoparticles (LNP). From his foundational work, many different clinical applications of LNPs have been developed, such as delivering anticancer drugs to cancer tissues while limiting toxicity in normal tissues. In the case of mRNA the LNP are designed to form a protective bubble around the mRNA and enable delivery to the interior of target cells. The LNP technology is critical to the potency of mRNA vaccines.

Following the emergence of the SARS-CoV2 virus, various teams around the world began working on potential vaccines using the knowledge gained about the mRNA and lipid nanoparticle through decades. The idea for both the Pfizer/BioNTech and Moderna vaccines was to introduce modified mRNA molecules into the body via LNPs to briefly instruct human cells to produce the coronavirus' spike protein. The LNP-activated immune system would recognize the encoded viral protein and develop antibodies and immune memory so that the immune system would attack the coronavirus when entering the body.

The impact:
The work of Drs. Karikó, Weissman and Cullis enabled the rapid availability of highly effective and safe COVID-19 mRNA vaccines, which has become an important tool for the control of COVID-19 pandemic. Importantly their pivotal discoveries also have the potential to revolutionize the future delivery of effective and safe vaccines, therapeutics and gene therapies. The success of the mRNA vaccines for COVID-19 suggests paths forward for similar vaccines for viral threats like influenza or HIV. Clinical trials are already underway to test mRNA vaccines to prevent diseases, caused by Zika virus, chikungunya and rabies infections.

The COVID-19 mRNA vaccines developed by Pfizer/BioNTech and Moderna are built on over 30 years of established scientific research and highlight the importance of basic and applied research, and international collaboration.

2022 John Dirks Canada Gairdner Global Health Award
The 2022 John Dirks Canada Gairdner Global Health Award laureate Is recognized for outstanding achievements in global health research:

Zulfiqar Bhutta MBBS,DCH, FRCP, FRCPCH, FCPS, FAAP, PhD

Robert Harding Chair in Global Child Health, Co-Director, SickKids Centre for Global Child Health, Senior Scientist The Hospital for Sick Children; Professor Department of Pediatrics, Nutritional Sciences, and Public Health, University of Toronto; Founding Director, Center of Excellence in Women and Child Health and Institute for Global Health and Development, The Aga Khan University South-Central Asia, East Africa, United Kingdom

Awarded "For the development and evaluation of evidence-based interventions in child and maternal health for marginalized populations, focusing on outcomes for the 'first thousand days' of life."

The work:
Dr. Zulfiqar Bhutta's career has focused on the improvement of child and maternal health and nutrition among marginalized and rural populations, using evidence based strategies and interventions to improve outcomes in the "first thousand days" of life (pregnancy, childbirth, and the first two years of life). Developing a unique collaboration between centres in Pakistan, United Kingdom and Canada, Bhutta has mobilized cluster randomized effectiveness trials (cRCTs) to gather data used to shape and improve intervention packages for community based maternal and newborn care, nutrition, and early childhood development.

The impact:
Dr. Bhutta's work has been the foundation of multiple international guidelines, including changing WHO policy on the treatment of persistent diarrhea and malnutrition along with establishing lady health workers (LHW) as foundational members of community-based interventions in Pakistan, South Asia and sub-Saharan Africa. Further, his work provided the basis for the "Lancet 10" nutritional interventions used to inform global policy on malnutrition. Over the last two decades, his work on evidence-based interventions has helped guide global action plans to improve newborn health and survival. His rigorous approach to investigation has also challenged conventional wisdom, illustrating both the possibilities and limitations of vital interventions like community health workers.

Dr. Bhutta has worked extensively in low resource areas, using sustainable interventions that are available and affordable to disadvantaged populations. Through systematic investigation and analysis, he has established the foundations for current understandings of maternal and child health in rural, remote and conflict affected regions, and improved the survival and outcomes of world's most vulnerable women and children.

2022 Canada Gairdner Wightman Award
The 2022 Canada Gairdner Wightman Award laureate is a Canadian scientist recognized for outstanding leadership in medicine and medical science throughout their career:

Deborah J. Cook, MD, FRCPC, MSc (Epid), FRSC, OC

Distinguished University Professor of the Departments of Medicine, and of Health Research Methods, Evidence, and Impact of McMaster University; Fellow, Canadian Academy of Health Sciences; Fellow, Royal Society of Canada; Officer, Order of Canada; critical care physician of St. Joseph's Healthcare Hamilton

Awarded "For pioneering research that has developed and defined evidence-based critical care medicine in Canada, informing best practices around the world."

The work:
As the foremost authority in critical care medicine and health research methodology, Dr. Cook's 30-year contributions to the design and the conduct of practice-changing clinical studies have led to major improvements in the care of hospital's sickest patients. Her multi-method multi-disciplinary research interests include advanced life support, prevention of ICU-acquired complications, research ethics and end-of-life care.

She has addressed complex ethical challenges as patients receiving technology transition from life to death through the internationally-adopted '3 Wishes Project'. This unique inter-professional model of end-of-life care encourages clinicians with different backgrounds to improve the dying experience for hospitalized patients by honouring their lives, easing family grief, and fostering humanism in practice. The 3 Wishes Project helps to identify and meet the needs of patients dying in hospital by eliciting and fulfilling final meaningful wishes for them, which has proven particularly helpful during the pandemic as family visits are limited for hospitalized patients, including those at the end-of-life.

Dr. Cook was a founding member of the first successful critical care research collaboration in the world – the Canadian Critical Care Trials Group – which flourished under her leadership as chair and champion of patient-centred investigator-initiated research.

The impact:
Dr. Cook's research has helped to alleviate the enormous human and economic costs of critical illness for patients, families, healthcare systems and society. Dr. Cook has designed and conducted several landmark national and international studies on how best to prevent common and often lethal complications of critical illness such as blood clots, lung infections and gastrointestinal bleeding, providing key evidence for reviews and guidelines used at the bedside worldwide. She has passionately improved the field of critical care, reducing morbidity and saving lives in the ICU, impacting critical care practice across the globe. She has also championed compassionate end-of-life care models that impact families, patients and care providers.

Over her career, Dr. Cook has garnered dozens of national and international honours recognizing her outstanding contributions to critical care research. Her research focuses on creating measurable health, social and economic benefits for patients needing advanced life

support. Her pioneering research has transformed critical care medicine and has had an enduring global impact on patients, practice, and policy.

About the Gairdner Foundation:

The Gairdner Foundation was established in 1957 by Toronto stockbroker, James Gairdner to award annual prizes to scientists whose discoveries have had major impact on scientific progress and on human health. Since 1959 when the first awards were granted, 402 scientists have received a Canada Gairdner Award and 96 to date have gone on to receive the Nobel Prize. The Canada Gairdner Awards promote a stronger culture of research and innovation across the country through our outreach programs including lectures and research symposia. The programs bring current and past laureates to universities across Canada to speak with faculty, trainees and high school students to inspire the next generation of researchers. Annual research symposia and public lectures are organized across Canada to provide Canadians access to leading science through Gairdner's convening power. Gairdner is supported nationally by the Government of Canada.

https://gairdner.org/

For further information please contact:

Sommer Wedlock
Executive Vice President
Gairdner Foundation
Mobile: (647) 293-6785
sommer@gairdner.org

Jordana Goldman
Communications Advisor
Gairdner Foundation
Mobile (647) 554-9157
jordana@gairdner.org