



ANNUAL REPORT

Research Institute
in Oncology and Hematology

APRIL 1, 2019 - MARCH 31, 2020

Research Institute in Oncology and Hematology

Vision

The Research Institute at CancerCare Manitoba and the University of Manitoba will be the leading research institute nationally and internationally for cancer and blood disorders research.

Mission

This will be achieved through integration of all research disciplines in one Research Institute, conducting multidisciplinary research to improve patient outcomes.

Values

Patient-centred research, multidisciplinary teams, excellence in research, state-of-the-art facilities.

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DIRECTOR'S REPORT



Dr. Neil Watkins

Despite the impact of COVID-19 beginning in March of 2020, I am pleased to report that it has been a very successful year for the Institute, with some outstanding achievements, new initiatives and opportunities. Once again, the CancerCare Manitoba Foundation has been an essential partner in our research program. The Institute was privileged to receive \$1.3 million in operating grants and \$2.1 million for research infrastructure and an additional \$200,000 to purchase new equipment for the laboratories and animal facility as part of a strategic expansion of our *in vivo* facilities.

One of the most important ways in which the Institute can build on the support of the Foundation is success in securing external funding. This year has seen tremendous success in national peer-reviewed grant competitions, with a total of 36 external grants awarded. Institute scientists were principal investigators on 21 of these grants, representing \$12.3 million in funding over the next five years, including \$7.9 million from the Canadian Institutes of Health Research.

This was also a very successful year for publications, with a total of 227 peer-reviewed papers from Institute scientists. Of these, 104 were papers in which an Institute scientist was a principal author, with an average impact factor of 4.58 and eight publications with an impact factor above 10.

The Institute now has 26 scientists and senior scientists, 12 affiliate scientists, 14 adjunct scientists and 12 members. We continue to broaden the scope to include researchers working in the entire spectrum of the cancer journey across multiple disciplines and departments within CancerCare Manitoba and the University of Manitoba.

This year, we welcomed five new scientists to our team. Dr. Maclean Thiessen, from the Section of Medical Oncology and Hematology in the Department of Internal Medicine, will be starting a qualitative research program in patient experience. We also welcome two new adjunct senior scientists, Dr. Aaron Marshall, from the Department of Immunology, and Dr. Don Miller, from the Department of Pharmacology and Therapeutics. Finally, two recruits to the University, Dr. Alyson Mahar, from the Department of Community Health Sciences, and Dr. Tanveer Sharif, from the Department of Pathology, joined the Institute as adjunct scientists.

With the recent launch of the Institute's Strategic Plan for 2018-2023, I can now report on specific achievements of the Institute that align with our core **strategic directions**:

1. Developing Multidisciplinary Teams

Over the past 12 months, we have seen major progress in the establishment of new multidisciplinary team research programs at the Institute built around three disease site groups.

Neuro-Oncology

Led by Dr. Marshall Pitz, and supported by a CancerCare Manitoba Foundation team grant, research in brain tumours has broadened its scope to include drug screening, DNA repair, radiomics, radiobiology and advanced imaging technology. This team has members from the Departments of Medical Oncology and Hematology, Radiation Oncology, Anatomy and Cell Science, Surgery, Pathology and Pharmacology and Therapeutics.

Ovarian Cancer

This new project, also supported by a CancerCare Manitoba Foundation team grant, takes a novel approach to improve outcomes for women with ovarian cancer by analyzing the role of chromosomal instability and chemoresistance. This work leverages the expertise of the Manitoba Tumour Bank to build a pipeline for serial tumour sampling led by Dr. Alon Altman in the Department of Obstetrics, Gynecology and Reproductive Medicine. The laboratory team led by Dr. Kirk McManus will generate individualized cell line models to better understand acquired chemoresistance in ovarian cancer.

Lung Cancer

At the cutting-edge of stereotactic radiotherapy, Dr. Julian Kim from the Department of Radiation Oncology is leading a new clinical trial that uses navigational bronchoscopy and digital beacon technology to improve the accuracy and effectiveness of curative radiation in the treatment of early-stage lung cancer. Dr. Kim's team includes

Dr. Shantanu Banerji and Dr. David Dawe from the Department of Medical Oncology and Hematology, and Dr. Biniam Kidane from the Section of Thoracic Surgery, Department of Surgery at the University of Manitoba.

2. Enhancing Infrastructure Platforms

As new cancer research concepts and technologies enter the research and clinical space, investment in infrastructure is essential. Seed investments from CancerCare Manitoba Foundation have allowed the Institute to launch two new platform initiatives.

In Vivo Cancer Models

Advanced genetically engineered and immunodeficient mouse models are an essential pillar for pre-clinical cancer research. In particular, the generation of patient-derived xenograft models as individualized patient avatars offers Manitobans the opportunity to participate in personalized medicine research. Led by Dr. Jody Haigh, the Institute has expanded its small animal capacity, including the addition of 500 individual ventilator cages to house pathogen-free mice to support xenograft and transgenic projects.

Manitoba Cancer Informatics

The “Manitoba advantage” refers to the Province of Manitoba’s ability to track cancer incidence and outcomes as the single provider of cancer services to a population of 1.37 million people. Led by Dr. Marshall Pitz, the Manitoba Cancer Informatics initiative will build a unique data platform that integrates multiple sources of data into a unified data portal for cancer researchers. This ambitious project will harmonize the existing expertise of the Manitoba Cancer Registry with administrative health data from patients across the province in a secure, de-identified environment. This new resource will enhance research projects from across the translational spectrum.

3. Identifying Research Themes

The centralization of cancer care, treatment, population-based screening programs, province-wide cancer registries, and tumour biobanking allows the Institute to research the cancer continuum. Important new developments in the Institute over the past 12 months have led to success in three themes.

Early Detection

Led by Dr. Donna Turner, The Manitoba Tomorrow Project (MTP) is a new population health study that will recruit 10,000 Manitobans between the ages of 35-69 who have not been diagnosed with cancer, and collect self-reported lifestyle and risk information as well as blood and urine samples. MTP researchers will follow up and check in with participants periodically throughout the next 50 years in a similar fashion. This study will be combined with data from 300,000 Canadians from other provinces allowing researchers to begin to better understand how lifestyle, social factors, genetics and the environment contribute to cancer risk.

Precision Medicine

The concept of using next-generation sequencing technology to match patients with cancer to novel targeted therapies is a matter of clinical urgency in advanced disease, where treatment options are limited or have been exhausted. Genome360 is a new next-generation sequencing platform for Manitoba, established through the support of CancerCare Manitoba Foundation and Genome Canada. Led by Dr. Shantanu Banerji, the initiative received over \$2 million in funding to establish a provincial genomics centre for cancer patients and researchers.

Health Care Innovation

Rapid progress in pre-clinical and translational research requires an ongoing commitment to health care innovation. The identification of gaps in the health delivery system and the development of novel strategies will improve quality, patient experience and sustainability. Expansion of the Institute’s program in health care innovation over the past year includes new projects inpatient experience and psychosocial oncology, health economics, and the use of real-world evidence in health care decision making.

Dr. Neil Watkins, MBBS, PhD, FRACP

Director, Research Institute in Oncology and Hematology

Chief of Research, CancerCare Manitoba

Professor, Department of Internal Medicine, Rady Faculty of Health Sciences, University of Manitoba

HIGHLIGHTS



Dr. Versha Banerji was a co-author in a landmark paper published in *The Lancet*. Dr. Banerji was the only Canadian co-investigator on this practice-changing, multicentre study that offers new hope for patients with chronic lymphocytic leukemia. The Institute has a long history of research excellence in this form of leukemia, and Dr. Banerji and her colleagues in the CLL research group continue their national and international leadership in the field [Sharman JP et al., *Lancet*. Accepted Jan 2020].



Dr. Geoff Cuvelier recently appointed as the new head of the Section of Pediatric Oncology and Hematology published two principal author papers in the prestigious journal *Blood*. This work described new insights into improving outcomes for children needing bone marrow transplantation. He continues to play a leading role in PROFYLE, the pan-Canadian approach to genomic testing for childhood cancers supported nationally by the Terry Fox Research Institute, and locally by CancerCare Manitoba Foundation. [Cuvelier GDE et al, *Blood*. 2019 Jul 18;134(3):304–16 and Schultz KR et al., *Blood*. Accepted Jan 2020.]



Dr. David Dawe was awarded a *Canadian Institutes of Health Research Project Geroscience Demonstration Grant* for 2019-2021 of \$450,000. Along with his co-investigators from the Institute, Dr. Versha Banerji, Dr. Spencer Gibson, Dr. Kathleen Decker and Dr. Aaron Marshall, Dr. Dawe's project will explore the importance of age and frailty as factors linked to quality and length of life in patients with cancer. This project will improve our understanding of the biology of frailty, help refine clinical practice, and build a team that can investigate whether the findings are also true for people diagnosed with other cancers and other chronic illnesses.



Dr. Spencer Gibson is one of the leaders of the Terry Fox Research Institute's (TFRI) Prairie Consortium Pilot Project, a new multi-institutional research initiative launched this year. The consortium includes cancer centres in Calgary, Edmonton, Saskatoon and Winnipeg and researchers across Alberta, Manitoba, and Saskatchewan. With matched funding from participating partners including CancerCare Manitoba Foundation, the consortium will share and/or link cancer research resources to strengthen regional expertise and to align with the new TFRI Marathon of Hope Cancer Centres Network.



Dr. Jody Haigh published exciting new work on the genetic basis of acute leukemia in the prestigious journal *Blood*. Dr. Haigh was also awarded a *Canadian Institutes of Health Research Project Grant* for 2020-2025 of \$987,000 to develop new genetically engineered mouse models of leukemia and to test new therapies aimed at differentiating leukemic cells in patients. This represents an opportunity for the Institute to expand its acute leukemia translational research program. [Carmichael CL et al., *Blood*. Accepted March 2020.]



Dr. Kirk McManus was awarded a *Canadian Institutes of Health Research Project Grant* for 2019-2024 of \$807,075 to unlock the genomic events that initiate and drive the progression of colorectal cancer, a major cause of cancer-related death in Manitoba. This project uses cutting edge imaging technology to detect chromosomal instability, a process by which dividing cancer cells can gain a survival advantage when challenged with chemotherapy. This work also has implications for the detection and treatment of ovarian cancer, which is a new direction for Dr. McManus' laboratory and a priority area for the Institute.



Dr. Donna Turner Director of Population Oncology at CancerCare Manitoba led the local team as part of an international cancer benchmarking consortium that studies cancer outcomes across the industrialized world. This project led to a co-author publication in *Lancet Oncology* and provides invaluable insights into how caregivers, health systems and governments can more effectively deliver cost-effective cancer control strategies. This work also exemplifies Manitoba's international reputation for excellence in cancer epidemiology. [Arnold M et al, *Lancet Oncol.* 2019 Nov;20(11):1493-1505.]



Dr. Ryan Zarychanski, along with Institute co-investigators Dr. Marshall Pitz and Dr. Kathleen Decker and colleagues from the University of Manitoba Centre for Health Care Innovation, was awarded a *Canadian Institute of Health Research SPOR iCT Rewarding Success Phase 3 Team Grant* of \$6,108,118; from 2019 to 2023. This award represents a major achievement for Dr. Zarychanski and his team by securing large-scale funding for a unique and highly innovative approach to evaluating cost-effective choices in the health system using real-time clinical data. This approach builds his international reputation in innovative clinical trial design, integration with existing and new data platforms, and collaboration with the provincial government.

PUBLICATIONS

Peer-reviewed Publications

(Institute scientists shown in **bold**)

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227. Vishwakarma R, **McManus KJ**. Chromosome Instability; Implications in Cancer Development, Progression, and Clinical Outcomes. *Cancers*. 2020 Mar 29;12(4):824.

Peer-reviewed Articles In Press

(Institute scientists shown in **bold**)

1. **Kidane B**, Jacob N, Bruinooge A, Shen YC, Keshavjee S, dePerrot ME, Pierre AF, Yasufuku K, Cypel M, Waddell TK, Darling GE. Postoperative but not intraoperative transfusions are associated with respiratory failure after pneumonectomy. *Eur J Cardiothorac Surg*. 2020.
2. Schultz KR, Kariminia A, Ng B, Abdossamadi S, Lauener M, Nemecek ER, Wahlstrom JT, Kitko CL, Lewis VA, Schechter T, Jacobsohn DA, Harris AC, Pulsipher MA, Bittencourt H, Choi SW, Caywood EH, Kasow KA, Bhatia M, Oshrine BR, Flower A, Chaudhury S, Coulter D, Chewning JH, Joyce M, Savasan S, Pawlowska AB, Megason GC, Mitchell D, Cheerva AC, Lawitschka A, Azadpour S, Ostroumov E, Subrt P, Halevy A, Mostafavi S, **Cuvelier GDE**. Immune profile differences between chronic GVHD and late acute GVHD: results of the ABLE/PBMTc 1202 studies. *Blood*. 2020.
3. Bergen RV, **Ryner L**, Essig M. Field-map correction in read-out segmented echo planar imaging for reduced spatial distortion in prostate DWI for MRI-guided radiotherapy applications. *Magn Reson Imaging*. 2020.
4. Habtemariam S, Nabavi SF, **Ghavami S**, Cismaru CA, Neagoe IB, Nabavi SM. Possible use of the mucolytic drug, bromhexine hydrochloride, as a prophylactic agent against SARS-CoV-2 infection based on its action on the Transmembrane Serine Protease 2. *Pharmacol Res*. 2020.
5. Wakeam E, **Kidane B**. Commentary: Picking the winners-Leaning into selection bias. The *J Thoracic Cardiovasc Surg*. 2020.
6. **Dawe DE**, Harlos CH, Juergens RA. Immuno-oncology-the new paradigm of lung cancer treatment. *Curr Oncol*. 2020.
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8. Beacon TH, Xu W, **Davie JR**. Genomic landscape of transcriptionally active histone arginine methylation marks, H3R2me2s and H4R3me2a, relative to nucleosome depleted regions. *Gene*. 2020.
9. Sun Z, Huang S, Jiang P, **Hu P**. DTF: Deep Tensor Factorization for Predicting Anticancer Drug Synergy. Lu Z, editor. *Bioinformatics*. 2020 May 5.
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12. Hedyehzadeh M, Maghooli K, MomenGharibvand M, **Pistorius S**. A Comparison of the Efficiency of Using a Deep CNN Approach with Other Common Regression Methods for the Prediction of EGFR Expression in Glioblastoma Patients. *J Digit Imaging*. 2020.
13. Ripat J, **Woodgate RL**, Bennett L. Attitudes faced by young adults using assistive technology as depicted through photovoice. *Disabil Rehabil Assist Technol*. 2020..
14. Meyers DE, **Banerji S**. Biomarkers of immune checkpoint inhibitor efficacy in cancer. *Curr Oncol*. 2020.
15. Carmichael CL, Wang J, Nguyen T, Kolawole O, Benyoucef A, De Mazière C, Milne A, Samuel S, Gillinder KR, Hedyeh-Zadeh S, Vo ANQ, Huang Y, Knezevic K, McInnes WRL, Shields BJ, Mitchell H, Ritchie ME, Lammens T, Lintermans B, Van Vlierberghe P, Wong N, Haigh K, Thoms JAI, Toulmin E, Curtis DJ, Oxley EP, Dickins RA, Beck D, Perkins AC, McCormack MP, Davis MJ, Bex G, Zuber J, Pimanda JE, Kile BT, Goossens S, **Haigh JJ**. The EMT modulator SNAI1 contributes to AML pathogenesis via its interaction with LSD1. *Blood*. 2020.
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17. Cabasag CJ, Butler J, Arnold M, Rutherford M, Bardot A, Ferlay J, Morgan E, Møller B, Gavin A, Norell CH, Harrison S, Saint-Jacques N, Eden M, Rous B, Nordin A, Hanna L, Kwon J, Cohen PA, **Altman AD**, Shack L, Kozie S, Engholm G, De P, Sykes P, Porter G, Ferguson S, Walsh P, Trevithick R, Tervonen H, O'Connell D, Bray F, Soerjomataram I. Exploring variations in ovarian cancer survival by age and stage (ICBP SurvMark-2): A population-based study. *Gynecol Oncol*. 2020.
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19. **Singh H**, Koomson AS, **Decker KM**, Park J, Demers AA. Continued increasing incidence of malignant appendiceal tumors in Canada and the United States: A population-based study. *Cancer*. 2020.
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21. Jahan S, Beacon TH, Xu W, **Davie JR**. Atypical chromatin structure of immune-related genes expressed in chicken erythrocytes. *Biochem Cell Biol*. 2020.
22. Sokoro A, **Singh H**. Fecal Occult Blood Test for Evaluation of Symptoms or for Diagnostic Testing. *Am J Gastroenterol*. 2020.
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27. Levy J, Gupta V, Amirazodi E, Allen-Ayodabo C, Jivraj N, Jeong Y, Davis LE, **Mahar AL**, De Mestral C, Saarela O, Coburn N, PRESTO Group. Gastrectomy case volume and textbook outcome: an analysis of the Population Registry of Esophageal and Stomach Tumours of Ontario (PRESTO). *Gastric Cancer*. 95 ed. 2020.
28. Jin YW, **Hu P**. Tumor-Infiltrating CD8 T Cells Predict Clinical Breast Cancer Outcomes in Young Women. *Cancers*. 2020.
29. Brun P, Tarricone E, Di Stefano A, Mattiuzzo E, Mehrbod P, **Ghavami S**, Leonardi A. The regulatory activity of autophagy in conjunctival fibroblasts and its possible role in vernal keratoconjunctivitis. *J Allergy Clin Immunol*. 2020.
30. Puig J, Ellis MJ, Kornelsen J, Figley TD, Figley CR, Daunis-I-Estadella P, Mutch WAC, **Essig M**. Magnetic Resonance Imaging Biomarkers of Brain Connectivity in Predicting Outcome after Mild Traumatic Brain Injury: A Systematic Review. *J Neurotrauma*. 2020.
31. Conceição RC, Medeiros H, Godinho DM, O'Halloran M, Rodriguez-Herrera D, Flores-Tapia D, **Pistorius S**. Classification of breast tumor models with a prototype microwave imaging system. *Med Phys*. 2020.
32. Starkman R, Alibhai S, Wells RA, Geddes M, Zhu N, Keating MM, Leber B, Chodirker L, Sabloff M, Christou G, Leitch HA, St-Hilaire E, Finn N, Shamy A, Yee K, Storrington J, Nevill T, Delage R, Elemery M, **Banerji V**, Lenis M, Kirubananthaan A, Mamedov A, Zhang L, Rockwood K, Buckstein R. An MDS-specific frailty index based on cumulative deficits adds independent prognostic information to clinical prognostic scoring. *Leukemia*. 2020.
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34. Mehdizadeh M, Ashtari N, Jiao X, Rahimi Balaei M, Marzban A, Qiyami-Hour F, Kong J, **Ghavami S**, Marzban H. Alteration of the Dopamine Receptors' Expression in the Cerebellum of the Lysosomal Acid Phosphatase 2 Mutant (Naked-Ataxia (NAX)) Mouse. *Int J Mol Sci*. 2020.
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CC.(2020). Mesenchymal Stromal/Stem Cells Modulate Response to Experimental Sepsis-Induced Lung Injury via Regulation of miR-27a-5p. *Thorax* 2020.

37. **Decker KM***, Lambert P, Nugent Z, Biswanger N, Samadder J, **Singh H**. Time trends in the diagnosis of colorectal cancer with obstruction, perforation, and emergency admission after the introduction of population-based organized screening. *JAMA Network Open*. 2020. *Corresponding author.
38. Edechi CA, Ikeogu N, Evangelista de Lima Terceiro L, Uzonna JE, **Myal Y**. Metastasis: a bane of breast cancer therapy. *Eur Med J*. 2020.
39. Landego I, Hewitt D, Hibbert I, Dhaliwal D, Pieterse P, Grenier D, Wong R, **Johnston JB, Banerji V**. Case Series: PD-1 Inhibition in Malignant Melanoma and lack of clinical response in CLL in the same patients. *Curr Oncol*. 2020.
40. Vandamme V, Denecker G, Bruneel K, Akay O, Blancke G, Taminiau J, De Smedt E, Skrypek N, Van Looche W, Wouters J, Nittner G, Köhler G, Darling D, Cheng P, Raaijmakers M, Levesque M, Mallya U, Rafferty M, Balint B, Gallagher W, Brochez L, Huylebroeck D, **Haigh J**, Van Vlierberghe P, Goossens S, Jvan den Oord J, Marine J-C, Berx G. The EMT transcription factor ZEB2 promotes proliferation of primary and metastatic melanoma while suppressing an invasive, mesenchymal-like phenotype. *Cancer Res* 2020.

EXTERNAL PEER REVIEWED GRANTS AWARDED

1. dos Santos C, **Hu P**, Binnie A, Castelo-Branoco P, Evans D, Marshal J, Walley K, Wei X. EpiGen marks for human sepsis. *Canada Institutes of Health Research Project Grant*. \$994,500; 09/2019 – 08/2024.
2. Rosberger Z, **Decker KM**, Franco EL, Gilca V, Guichon JR, Lofters AK, Mayrand M-H, Ogilvie GS, Perez S, Shapiro G, Smith LW, Steben M. Ensuring a successful transition from Pap to HPV DNA testing in primary cervical cancer screening: exploring and listening to Canadian women's needs is critical to effective public policy change. *Canada Institutes of Health Research Project Grant*. \$252,451; 01/03/2019-28/02/2021.
3. Hirst M, **Davie J** et al. Canadian Epigenetics, Environment and Health Research Consortium Network Phase II. *CIHR (Team Operating grant)*. \$1,250,000. 01/04/2019-31/03/2023.
4. **Dawe D, Banerji V, Decker K, Gibson S, Marshall A**, St John P. Linking Inflammation and Metabolism with Frailty in Chronic Cancer. *Canada Institutes of Health Research Geroscience Demonstration Grant*. \$450,000; 01/04/2019-31/03/2021.
5. Coburn N, Compton C, Darling, G, Davis L, Decker K, Gupta, V, Hess K, Hsu A, **Kidane B**, Mahar A, Manuel D, Ringash J, **Turner D**. *Development and external validation of a personalized model to predict survival in esophageal cancer patients*. *Canada Institutes of Health Research Project Grant*. \$100,000; 01/04/2019-31/03/2020.
6. **Mai S**. Targeting telomere maintenance in Hodgkin's Lymphoma. *Leukemia and Lymphoma Society of Canada Operating Grant*. \$200,000; 01/04/2019-31/03/2020.
7. **Kidane B, Banerji S, Kim J**. Organ-Preserving Endoscopic Resection and Concurrent Radiation/immuno-oncology for esophageal cancer: a pilot study. *University of Manitoba Department of Surgery GTF Research Grant*. \$15,000; 01/04/2020-31/03/2021.
8. **Mai S**. Lamin A/C levels in circulating tumor cells. *Prostate Cancer Fight Foundation Ride For Dad Operating Grant*. \$100,000. 01/04/2019-31/03/2020.
9. **McManus KJ**, Baker K, Singh H. Exploring and exploiting reduced USP22 expression in colorectal cancer. *Canadian Institutes of Health Research Project Grant*. \$807,075; 01/04/2019-31/03/2024.
10. **Zarychanski R**, Mutter T, Jacobsohn E, Buduhan G, Falk J, Balshaw R, Christodoulou C, McPherson J, Muirhead B, Haberman C, Horsburgh M. Tranexamic acid use to safely reduce transfusion in major non-cardiac surgery (TRACTION): A pragmatic, registry-based, pilot randomized controlled trial. *Health Sciences Centre Foundation Operating Grant*. \$70,000; 01/05/2019-31/04/2021.
11. **Rimmer E, Zarychanski R, Houston DS**, Wilkins J, Balshaw R, Kumar A. Therapeutic Plasma Exchange in Septic Shock (PLEXIS): A pilot randomized trial. *Winnipeg Health Sciences Centre Foundation Operating Grant*. \$70,000; 01/05/2019-31/04/2021.
12. **Gibson SB, Johnston JB**. Role of exosomes in chronic lymphocytic leukemia. *Leukemia and Lymphoma Society of Canada Operating Grant*. \$200,000; 01/07/2019-30/06/2021.
13. **Banerji S**, Spriggs B. Genome360 Phase II: Manitoba's Provincial Applied Genomics Enterprise Platform. *Genome Canada Regional Priority Partnership Program*. \$2,475,761 total budget, \$500,000 from Genome Canada; 01/07/2019-30/06/2022.
14. **Werbowetski-Ogilvie TE**. Combinatory therapies for SHH medulloblastoma. *Rally Foundation for Pediatric Cancer Research (USA) Operating Grant*. USD\$100,000; 01/07/2019-30/06/2021.
15. **Banerji V, Gibson S, Marshall A**. Draining the batteries: A novel approach to treatment strategies in CLL. *Lymphoma and Leukemia Society Operating Grant*. \$196,000; 01/07/2019-30/06/2021.
16. **Gibson SB**. Targeting lysosome mediated cell death in Prostate Cancer. *Prostate Cancer Foundation Ride for Dad*. \$50,000; 01/06/2019-31/05/2020.
17. **Haigh JJ**. EMT transcription factor corruption of epigenetic regulators in AML. *Canadian Institutes of Health Research Project Grant*. \$990,676. 01/04/2019-31/03/2024.
18. Urquart B, Blydt-Hanson T, Zapitelli M, **Cuvelier GDE**, Adeli K, Lajoie G, Weir M, Boutros P, Gunaratnam L, Nathan P, Welch S, Brundo M, Ho C, Rassekh R, Carelton B, Kuruvilla M, Rieder M, Zorzi A. Metabolomics for the prediction of acute kidney injury: A Canadian multi centre Pediatric and Adult Study. *Canadian Institutes of Health Research Project Grant*. \$1,373,176; 01/04/2019-31/03/2025.
19. **Zarychanski R**, Komenda P, Pitz M, Tangri N, Decker K, Ferguson D, Lix L, Klassen T, Bolton J, Katz A, Lavoie J, Bohm E. Integrating clinical data systems to improve the capacity, performance, and value of Manitoba's healthcare system. *Canadian Institute of Health Research (CIHR); SPOR iCT Rewarding Success - Phase 3 – Team Grant*. \$6,108,118; 01/05/2019-30/05/2023.

20. **Jassal DS.** Flaxseed in the prevention and treatment of anthracycline and trastuzumab mediated cardiotoxicity. *Heart and Stroke Foundation of Canada Operating Grant.* \$254,659.59. 01/04/2019-31/03/2022.
21. **Rimmer E,** Bi J. M-protein response trajectory and survival in newly diagnosed multiple myeloma: A retrospective cohort study. *Richard Hoeschen Memorial Award (Manitoba Medical Services Foundation and St Boniface Research Foundation).* \$2,000; 01/09/2019-31/08/2021.
22. Alison Fox-Robichaud A, Lamontagne F, Garland A, Martin C, Loubani O Wilcox E, **Zarychanski R** My role, Co-investigator; (over 100 broken into 3 teams). Canadian Sepsis Research Network: Improving Care Before, During and After Sepsis. *Canadian Institutes of Health Research Team Grant.* \$5,700,000; 01/12/2019-30/12/2024.
23. **Jassal DS.** Flaxseed prevents broken hearts in breast cancer (CANFLAX) study. *Canadian Agricultural Partnership/Ag Action Manitoba.* \$229,113; 01/04/2019-31/03/2022.
24. **Sharif T.** Deciphering the role of serine biosynthesis in maintaining glioblastoma tumor heterogeneity and chemoresistance. *University of Manitoba - University Research Grants Program (URGP).* \$10,000; 01/01/2020-30/06/2021.
25. Rieger KL, Gazan S, Buss M, Cook L, Copenace S, Garson C, Hornan B, Horton M, Howard S, McPherson K, Rattray J, Bennett, M, Chudyk A, **Hack TF,** Horrill T, Linton J, Martin DE, Phillips-Beck W, Schultz A. Elevating the uses of storytelling approaches within Indigenous health research: A patient-engaged scoping review study involving Indigenous people and settlers. *Canadian Institutes of Health Research Team Grant.* \$100,000; 01/03/2020-08/02/2021.
26. **Hu P,** Kong J. Computational drug repurposing for Alzheimer's disease. University *Collaborative Research Program (UCRP), University of Manitoba.* \$25,000; 01/02/2020-01/02/2022.
27. **Hu P.** Deep learning for prioritizing small molecules candidates for drug repositioning. *NSERC Engage Program.* \$25,000; 01/01/2020–30/12/2020.
28. Cardona S, **Hu P,** Davis R. Identification of novel antibiotic molecules by chemogenetic analysis and machine learning. *Canada Institutes of Health Research Project Grant.* \$799,425, 02/2020– 02/2025.
29. El-Gabalawy H, Wilkins J, Mookherjee N, Peschken C., Marshall A, **Hu P,** Anaparti VV, Lavoie J, Mackay D, O'Neil L, Robinson D, Tanner S, Woods A, Duncan F, Ballantyne F. Prediction and prevention of rheumatoid arthritis in First Nations People. *Canada Institutes of Health Research Project Grant.* \$1,587,776; 01/01/2020 –31/12/2023.
30. Lix L, **Hu P,** Delaney J, Jozani MJ, Wall-wieler E, Banerji S. Harnessing Population-Based Electronic Healthcare Records to Construct Family Health Histories for Accurate Disease Risk Prediction and Heritability Estimation. *Rady Faculty of Health Sciences, 2020 Rady Innovation Fund.* \$100,000, 01/01/2020-31/12/2020.
31. Bram Rochweg, Adhikari N, Belley-Côté E, Zeller M, **Zarychanski R,** D'Aragon F, Mehta S, Alhazzani W, Boyd J, Duan E, Rewa O, Bagshaw S, Burns K, Fowler R, Lauzier F, Scales D, Ball I, Fox-Robichaud A, Tsang J, Lamontagne F, Guyatt G, Meade M, Cook D. Fluids in septic shock (FISSH): a randomized controlled trial. *Canadian Institute of Health Research Project Grant.* \$1,147,501; 01/01/2020-30/06/2023.
32. Lix L, Wall-Wieler E, Jorzani MJ, Delaney J, **Banerji S, Hu P.** Harnessing Population-Based Electronic Health-care Records to Construct Family Health Histories for Accurate Disease Risk Prediction and Heritability Estimation. *University of Manitoba Rady Innovation Fund.* \$100,000; 01/01/2020-01/01/2021.
33. Riel, R, Moussavi Z, El-Gabalawy R, Kredentser M, Hiebert T, **Chochinov HM.** Virtual Reality in Palliative Care. *Centre for Aging and Brain Health Innovation.* \$40,000; 01/04/2019-31/03/2020.
34. Lawler P, Goligher E, **Zarychanski R,** Farkouh M, Dzavik V, Husain M, Marshall J, Slutsky A, Fergusson D, Fowler R, Kumar A, MacDonald E, Turgeon AF, Murthy S, Berry S, Kirwan Bridget-Anne, Rosenson R, Nicolau J. The Antithrombotic Therapy to Ameliorate Complications of COVID-19 (ATTACC) Trial: A multinational randomized, adaptive, controlled clinical trial. *Peter Munk Cardiac Centre Innovation Grant.* \$250,000; 01/04/2020-31/03/2021.
35. Goligher E, **Zarychanski R,** Lawler P. The Anti Thrombotic Therapy to Ameliorate Complications of COVID-19 (ATTACC) Trial: A multinational randomized, adaptive, controlled clinical trial. *FAST – GRANTS: Fast Funding for COVID-19 Science.* \$500,000; 01/04/2020-31/03/2021.
36. **Zarychanski R,** Lothar S, MacKenzie L, Kelly L, Drobot G. Post-exposure Prophylaxis for SARS -Coronavirus-2: A Pragmatic Randomized Clinical Trial. *Manitoba Medical Services Foundation.* \$24,998; 01/04/2020-31/03/2021.

CANCERCARE MANITOBA FOUNDATION GRANTS AWARDED

Infrastructure Grants

1. **Murphy L.** Manitoba Tumour Bank. *CCMF Infrastructure Grant*. \$449,723; 07/01/2019-30/06/2020.
2. **Mai S.** Genomic Centre for Cancer Research and Diagnosis. *CCMF Infrastructure Grant*. \$118,895; 07/01/2019-30/06/2020.
3. **Pitz M.** Clinical research database. *CCMF Infrastructure Grant*. \$262,390; 07/01/2019-30/06/2020.
4. **Decker K.** Health services research. *CCMF Infrastructure Grant*. \$206,310; 07/01/2019-30/06/2020.
5. **Gibson S.** Cell biology laboratory facilities. *CCMF Infrastructure Grant*. \$238,346; 07/01/2019-30/06/2020.
6. **Gibson S, Pitz M.** Research office. *CCMF Infrastructure Grant*. \$374,803; 07/01/2019-30/06/2020.
7. **Pitz M.** Clinical research program. *CCMF Infrastructure Grant*. \$212,644; 07/01/2019-30/06/2020.
8. **Pistorius S.** Medical physics training program. *CCMF Infrastructure Grant*. \$131,000; 07/01/2019-30/06/2020.
9. **Gibson S.** Student training and education. *CCMF Infrastructure Grant*. \$67,500; 07/01/2019-30/06/2020.
10. **Katyal S.** Partnership with Canadian Foundation for Innovation. *CCMF Infrastructure Grant*. \$10,000; 07/01/2019-30/06/2020.

Equipment Grants

1. **Watkins DN.** Cell biology equipment repair and replacement project. *CCMF Equipment Grant*. \$91,000; 07/01/2019-30/06/2020.
2. **Watkins DN.** Upgrades to RIOH animal facility. *CCMF Equipment Grant*. \$100,000; 07/01/2019-30/06/2020.

Operating Grants

1. **Mai S.** Disruption of chromosome territories in multiple myeloma. *CCMF Pilot Grant*. \$50,000; 07/01/2019-30/06/2020.
2. **Haig JJ.** Creation of novel inducible Cas9 models for in vivo cancer and cell differentiation studies. *CCMF Pilot Grant*. \$50,000; 07/01/2019-30/06/2020.
3. **Katyal S.** Identification of novel cannabis-derived therapeutics for the treatment of triple-negative breast cancer. *CCMF Pilot Grant*. \$50,000; 07/01/2019-30/06/2020.
4. **Ogilvie T.** Novel combinatory therapies for SHH medulloblastoma. *CCMF Individual Grant*. \$120,000; 07/01/2019-30/06/2021.
5. **McManus K.** Ogilvie T. Defining and targeting the molecular origins of colorectal cancer. *CCMF Individual Grant*. \$120,000; 07/01/2019-30/06/2021.
6. **Ghavami S.** Mitophagy and Regulation of Non-small Cell Lung Cancer: Bcl2l13 and NSCLC Metastasis. *CCMF Individual Grant*. \$120,000; 07/01/2019-30/06/2021.
7. **Raouf A.** Characterization of therapy resistant cells in estrogen-responsive breast cancer tumours. *CCMF Individual Grant*. \$120,000; 07/01/2019-30/06/2021.
8. **Johnston J.** ATM is a Novel Target for Therapy in Chronic Lymphocytic Leukemia. *CCMF Individual Grant*. \$120,000; 07/01/2019-30/06/2021.
9. **Singh H, Decker H.** Colorectal cancer in young Canadians: examining changes in characteristics, incidence, mortality, and survival over time. *CCMF Individual Grant*. \$60,000; 07/01/2019-30/06/2020.
10. **Kim J.** Surface Transponder Beacon (Calypso) Guided, Flap-Sparing, hypofractionated Radiotherapy for Breast Cancer Patients Treated with Mastectomy and Immediate Autologous Flap Reconstruction: A Phase I prospective cohort study. *CCMF Individual Grant*. \$120,000; 07/01/2019-30/06/2021.
11. **McManus K, Nachtigal M, Altman A.** Examining the biomedical, clinical, and health outcome impacts of homology directed repair (HDR) in high-grade serous ovarian cancer (HGSOC). *CCMF Team Grant*. \$300,000; 07/01/2019-30/06/2021.

PERSONNEL REPORT

DIRECTOR

Dr. Neil Watkins Department of Internal Medicine

SECTION HEADS

Dr. Spencer Gibson Department of Biochemistry and Medical Genetics

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Dr. Shantanu Banerji	Department of Internal Medicine
Dr. Versha Banerji	Department of Internal Medicine
Dr. Harvey Chocinov	Department of Psychiatry
Dr. Jim Davie	Department of Biochemistry and Medical Genetics
Dr. Tom Hack	College of Nursing
Dr. Jody Haigh	Department of Pharmacology and Therapeutics
Dr. Geoff Hicks	Department of Biochemistry and Medical Genetics
Dr. Sara Israels	Department of Pediatrics and Child Health
Dr. James Johnston	Department of Internal Medicine
Dr. Sachin Katyal	Department of Pharmacology and Therapeutics
Dr. Sabine Mai	Department of Physiology and Pathophysiology
Dr. Kirk McManus	Department of Biochemistry and Medical Genetics
Dr. Michael Mowat	Department of Biochemistry and Medical Genetics
Dr. Leigh Murphy	Department of Biochemistry and Medical Genetics
Dr. Yvonne Myal	Department of Pathology
Dr. Mark Nachtigal	Department of Biochemistry and Medical Genetics
Dr. Stephen Pistorius	Department of Physics and Astronomy
Dr. Afshin Rouf	Department of Immunology
Dr. Ryan Zarychanski	Department of Internal Medicine

SCIENTISTS

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Dr. Maclean Thiessen	Department of Internal Medicine

AFFILIATE SCIENTISTS

Dr. Naseer Ahmed	Department of Radiology
Dr. David Dawe	Department of Internal Medicine
Dr. Danielle Desautels	Department of Internal Medicine
Dr. Julian Kim	Department of Radiology
Dr. Rami Kotb	Department of Internal Medicine
Dr. Boyd McCurdy	Department of Radiology
Dr. Saroj Niraula	Department of Internal Medicine
Dr. Alok Pathak	Department of Surgery
Dr. Kristjian Paulson	Department of Internal Medicine
Dr. Emily Rimmer	Department of Internal Medicine
Dr. Lawrence Ryner	Department of Radiology
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Dr. Davinder Jassal	Department of Internal Medicine
Dr. Biniam Kidane	Department of Surgery

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Dr. Alyson Mahar
Dr. Aaron Marshall
Dr. Don Miller
Dr. Tamra Ogilvie
Dr. Tanveer Sharif
Dr. Anuraag Shiravastav
Dr. Harminder Singh
Dr. Roberta Woodgate

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Dr. Geoff Cuvelier
Dr. Darrel Drachenberg
Dr. Don Houston
Dr. Christina Kim
Dr. Len Minuk
Dr. Jason Park
Dr. Jeff Saranchuk
Dr. David Szwajcer
Dr. Donna Turner

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Department of Internal Medicine
Department of Surgery
Department of Internal Medicine
Department of Internal Medicine
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Department of Internal Medicine
Department of Community Health Sciences

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Administrative Assistant, Research Office
Research Assistant, Manitoba Tumour Bank
Information Coordinator, Manitoba Tumour Bank
Health Outcomes Analyst
Translational Research Nurse, Manitoba Tumour Bank
Programmer/Analyst, Clinical Research Database
Coordinator, Manitoba Tumour Bank
Regulatory Affairs

FINANCIAL REPORT

Excludes Adjunct Scientists and Members

Revenue

Abbvie	\$27,186
Canada Foundation for Innovation	\$13,350
Canadian Cancer Society	\$100,000
Canadian Institutes of Health Research	\$1,089,775
CancerCare Manitoba Foundation Infrastructure	\$2,276,604
CancerCare Manitoba Foundation Operating Grant	\$1,195,942
CancerCare Manitoba Foundation Studentship	\$44,100
Janssen	\$81,312
Leukemia and Lymphoma Society of Canada	\$296,530
Manitoba Health	\$150,000
Myeloma Canada Research Network Inc.	\$11,000
Natural Sciences and Engineering Research Council	\$88,000
Research Manitoba	\$500,000
Telus Ride for Dad	\$150,000
Terry Fox Research Institute	\$231,500
University of Manitoba	\$22,500
Various	\$63,430
Total	\$6,341,228

Expenditures

Salaries	\$3,984,139
Consumables	\$1,545,985
Equipment Maintenance/Repairs	\$320,244
Travel	\$106,964
Total	\$5,957,331

