

Historic Odyssey: The Institute of Cardiovascular Sciences Past, Present, and Future

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The Institute of Cardiovascular Sciences (ICS) at St. Boniface Hospital Albrechtsen Research Center is located in the heart of Winnipeg, Manitoba, Canada. This multidisciplinary organization has been a driving force of cardiovascular research, training, and education since its inception in 1987. The ICS has attained international recognition for its research on heart failure, oxidative stress, diabetes mellitus, cardio-oncology, women's health, tissue engineering, vascular disease, and fibrosis. Our faculty members are dynamically engaged in both the local and international cardiovascular communities through our many public outreach programs. Thus, it is no surprise that the ICS is both the founding home and editorial office for many international journals and book series and the headquarters of the International Academy of Cardiovascular Sciences. The ICS proudly fosters innovation and excellence in research, education, and patient care.

Cultural diversity, a rich heritage, and people unified by arts, sports, and history make Winnipeg one of the most vibrant cities in all of Canada. Winnipeg, whose name was adapted from the Cree word win-nipi meaning muddy water, was first settled by indigenous people at the junction of the Red and Assiniboine Rivers, where the ICS prominently stands today.¹ Although the fourth largest city in Canada, Winnipeg is arguably one of the most dynamic. We have the largest French-speaking population outside of Quebec, which is celebrated annually at our winter Festival du Voyageur. The Winnipeg Art Gallery is home to the largest collection of contemporary Inuit art, and Rainbow Stage is Canada's oldest outdoor theater. Our frozen rivers that comprise the longest skating trails in the world are warmly complimented by our love for winter sports.

Winnipeg's cultural mosaic society has played an instrumental role in its development since the founding of the city in the early 1870s.¹ The Sisters of Charity of Montreal, also known as the Order of Grey Nuns, together with founder, Marguerite d'Youville, established the St. Boniface Hospital in 1871 in the Francophone community of St. Boniface.³ This once 4-bed hospital, built on the banks of the Red and Assiniboine Rivers was the first hospital in Western Canada.³ Today, St. Boniface Hospital has become one of the largest tertiary care centers in Winnipeg and is one of the major teaching hospitals for the University of Manitoba, as well as the only regional center for cardiac care in the province of Manitoba.

In addition to patient care, the founding Grey Nuns mandated that the hospital be engaged in health research. In 1971, the St. Boniface General Hospital Research Foundation was established with the goal of supporting research enterprise and innovation. The G. Campbell MacLean Research Building opened in 1987, making this the first free-standing medical research facility in Western Canada.⁴ In 2016, the newly renamed St. Boniface Hospital Albrechtsen Research Center is an impressive 110 000 square foot state of the art research institute that houses >240 researchers and support staff. The research center was first home to the ICS and was expanded in later years to house other research programs, such as the Division of Neurodegenerative Disorders and the Canadian Center for Agri-Food Research in Health and Medicine. Most recently in 2004, The I.H. Asper Clinical Research Institute is the newest building constructed on the St. Boniface Hospital Campus dedicated to clinical research and cardiac care.

Institute of Cardiovascular Sciences

Winnipeg has been a major hub for cardiac research since the recruitment of Dr Naranjan Dhalla to Winnipeg in 1968. The Division of Cardiovascular Sciences was founded by Dr Dhalla in the Department of Physiology in the Faculty of Medicine at the University of Manitoba. The cardiovascular group initially comprised 5 principal members, including Dr Naranjan Dhalla, Director, Dr Pawan Singal, Dr Grant Pierce, the late Dr Vincenzo Panagia, and Dr Elissavet Kardami. Under the leadership of Dr Dhalla, the cardiovascular group flourished, and through our partnerships with the University of Manitoba and St. Boniface Hospital, the Cardiovascular Division relocated to St. Boniface Hospital in 1987. Notably, the Division of Cardiovascular Sciences achieved institute status by the University of Manitoba becoming the ICS in 1996. The ICS is composed of 15 multidisciplinary basic science and clinical faculty with >120 students and support staff. Individual research programs are directed toward understanding the subcellular basis of cardiac dysfunction and disease. ICS members hold faculty appointments in many departments throughout the University of Manitoba, and several institute members actively collaborate with our Cardiac Sciences Program, part of the Winnipeg Regional Health Authority, which is also located at the St. Boniface Campus in the I.H. Asper Clinical Institute. The ICS has actively developed collaborative research programs with the Mayo Clinic (Rochester, MN), Ben Gurion University (Beer Sheva, Israel),

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(*Circ Res.* 2018;122:1338-1340. DOI: 10.1161/CIRCRESAHA.118.312835.)

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Circulation Research is available at <http://circres.ahajournals.org>

DOI: 10.1161/CIRCRESAHA.118.312835

and has established the Canada–Italy Tissue Engineering Laboratory in partnership with both the University of Rome Tor Vergata (Rome, Italy) and Scuola Superiore (Pisa, Italy). The ICS is recognized as a leading cardiovascular center with both national and international stature.

The mission of the ICS, as envisioned by Dr Dhalla, was to create an environment that promoted excellence in cardiovascular research, education, and training in Winnipeg. The objectives of the institute were to (1) develop multidisciplinary research programs that focus on the pathophysiology and treatment of heart disease, (2) create an environment that fosters excellence in training students and visiting scientists, (3) promote collaborations between basic and clinical faculty to improve patient care, (4) develop and promote networks with other institutions and heart centers worldwide, (5) create opportunities for partnerships with the corporate, private, and government sectors, and (6) serve as a scientific platform for resource sharing with both the local community and cardiovascular healthcare providers.

Strength of the Institute

A major strength of our institute has been the recruitment of highly accomplished faculty.

In fact, the majority of our faculty maintain at least 2 to 3 national research grants, with our main funders being the Canadian Institute for Heart Research, formerly Medical Research Council of Canada, and Heart and Stroke Foundation, as well as salary awards from the Canada Research Chairs Program and St. Boniface Hospital Research Foundation. Notably, through major national funding, the ICS established the Medical Research Council of Canada/Canadian Institute for Heart Research Group in Experimental Cardiology (1993–2004) that was designated by the Canadian Institute for Heart Research as the Center of Excellence for Heart Research in 1996. To honor Dr Dhalla for his lifetime contributions and commitment to cardiovascular research in Winnipeg, the St. Boniface Hospital Research Foundation established the Dr Naranjan Dhalla endowed Chair in Cardiovascular Sciences in 2006. Dr Dhalla served as ICS director for close to 20 years (1987–2007) and Dr Pawan Singal, who provided his leadership and served as Director of the ICS from 2007 to 2017. Early in 2017, I was appointed Director of the ICS, for which I am honored. A complete listing of the profiles of past and present ICS faculty members can be found at our website, <http://www.sbrc.ca/ics>.⁵

Research Activity

The faculty members within the institute are actively engaged in investigating different aspects of heart disease, with a primary focus on heart failure, ischemic injury, cardio-oncology, and vascular disease. Other members study issues related to Women's Health, as well as the effects of functional foods and lifestyle influences on cardiovascular health. Table 1 shows a comprehensive list of our academic achievements and productivity from 1987 to 2016. Several of these landmark studies were published in prestigious journals, such as *New England Journal of Medicine*, *Journal Clinical Investigation*,

Table 1. Research Activities of Institute of Cardiovascular Sciences Members (1987–2016)

	Total
Full-length papers in refereed journals	1259
Full-length papers in books and proceedings	257
Books and monographs	72
Abstracts	1794
Invited Speaker Program	409
Visiting scientists	111
Invited talks at conferences/symposiums	685
Invited talks and different institutions	457

Proceedings National Academy of Science, *Circulation Research*, *Circulation*, *Hypertension*, and others.

Graduate Program

An important aspect of the ICS is our strong commitment to education and training. We have developed a superb training program for undergraduate and graduate students that includes bench-top research, coursework taught by team members, participation by students in conferences, seminar program, and journal club program. The institute has developed an excellent, well-rounded training program in the fields of cardiovascular physiology, pathophysiology, and translational medicine. Several courses dealing with advanced information in cardiovascular sciences for graduate students are offered by our faculty members, including Cardiac Physiology, Cardiac Gene Therapy, Tissue Engineering, Molecular Biology of Cardiovascular Disease, Vascular Physiology, Molecular Aspects of Organ Function, and others. Table 2 outlines the magnitude of students and postdoctoral fellows that have received hands on training, mentoring, and professional development over the last 30 years. Furthermore, the institute has an active visiting seminar program; on average, we invite 12 to 16 distinguished cardiovascular investigators from all over the world each year for a research lecture. All our trainees are encouraged to participate in national and international cardiovascular conferences, including American Heart Association Basic Cardiovascular Science and Atherosclerosis, Thrombosis, and Vascular Biology by awarding trainees modest travel grants. In partnership with the University of Manitoba, the institute established special studentship awards named in honor of Dr Pawan Singal and Dr Grant Pierce to support the research of highly qualified students. Many of our trainees have become internationally recognized and leaders in their own field with independent research programs.

Table 2. Institute of Cardiovascular Sciences Training Program (1987–2016)

	Total
Students graduated (MSc/PhD)	255
Postdoctoral fellows	86
BSc Medicine students	99
Summer students	800

External Service and Contributions by Members

All faculty of the institute play an active role in providing exemplary service to the medical and cardiovascular community. We are grateful to have organized 13 national and international conferences and symposia since 1987, including the International Society for Heart Research World Heart Congress in 2001, which >2000 scientists and health professionals attended. Further, our faculty has been their expertise on peer review grant panels and study sections for local, national, and international funding agencies, including the Canadian Institute for Heart Research, National Institute of Health, Glaxo Smith Kline, American Heart Association, and many others. In addition, several members serve on editorial boards of many prestigious scientific journals, including *Circulation Research*, *Circulation*, *American Journal of Physiology*, *Journal of Clinical Investigation*, *Cardiovascular Research*, *Journal of Molecular and Cellular Cardiology*, *Canadian Journal of Physiology, Pharmacology, and Molecular Cellular Biochemistry*, and others. It is a matter of great prestige for our Institute that Dr Naranjan S. Dhalla was elected President of the International Society for Heart Research in 1987, Dr Pawan Signal was elected Honorary Lifetime President of the Society for Adaptive Medicine in 2000, and Dr Grant Pierce was elected President of the North American Section of the International Academy of Cardiovascular Sciences in 2013.

ICS Dr Naranjan Dhalla Awards Day

Perhaps one of the most exciting features of our Institute is our annual Cardiovascular Awards Day. Since 1999, the Institute has been holding an annual awards day to celebrate excellence in cardiovascular research, education, and training. The Cardiovascular Awards Day was established by Dr Dhalla to honor individuals exhibiting leadership in cardiovascular research, education, as well as their lifetime involvement in the cardiovascular community. Special awards are also given to honor research excellence by trainees at different stages of their careers, as well as achievements of Institute members. The awards day was created to honor individuals who had played a significant role in supporting the institute. During the past 19 years, this landmark event has honored distinguished individuals, including Nobel Prize Laureates Dr Louis Ignarro, Dr Ferid Murad, and Dr Peter Agre, as well as other world-class scientists, Dr Eric Olson, Dr Victor Zau, Dr Roberto Bolli, Dr Antione Hakim, Dr Peipei Ping, Dr Steven Houser, and Dr Lynn Megeney, to name a few. The complete list of awards and honorees can be found at our website <http://www.sbrc.ca/ics/>.⁵

International Scene

The institute has served as the world headquarters for the International Academy of Cardiovascular Sciences since 1987. The academy coordinates the activities of its different world sections and supports scientific conferences on the topics of heart disease prevention and promotion of heart health worldwide. The Institute was both the founding home and editorial office for the *Canadian Journal of Cardiology* (1987–2000), *Canadian Journal of Physiology and Pharmacology* (2002–2016), and *Molecular and Cellular Biochemistry* (1987 to present). Additionally, several book series, including (1)

Developments in Molecular and Cellular Biochemistry, Kluwer Academic Publishers, New York (1990–2003); (2) Progress in Experimental Cardiology, Kluwer Academic Publishers, New York (1997–2009); and (3) Advances in Biochemistry in Health and Disease, Springer, New York (2004 to present), have been edited by members of the Institute.

Future

As the ICS director, I hope to create an environment that will foster research excellence, training, and education that will allow faculty and students to flourish beyond present-day achievements. My goal is to build on our existing strengths in cardiovascular research and increase our capacity for sustainable research funding, through development of translation programs, recruitment of clinical faculty and enhanced training program, with a greater research focus on heart failure, ischemic heart disease, woman's health, cardiovascular education, and drug discovery. It is envisioned that the ICS will continue to flourish as an internationally recognized leader in cardiovascular research.

Conclusion

In summary, the ICS holds international recognition as a leading cardiovascular research center. Our state of the art facility provides a solid platform for leadership in cardiovascular research, education, training, patient care, and community service. We promote cardiovascular health locally and internationally through our collaborations and networks worldwide. Please visit our website (<http://www.sbrc.ca/ics/>) to learn more about the ICS.⁵

Acknowledgments

We are grateful to K. Ryplanski and Drs N.S. Dhalla, P.K. Signal, G.N. Pierce, and P.S. Tappia for critical comments and technical assistance in preparing the manuscript.

Sources of Funding

This work was supported by a Canadian Institute for Health Research Foundation grant to L.A. Kirshenbaum, grants from the Heart and Stroke Foundation I. Rabinovich-Nikitin is supported by a Post-doctoral Fellowship from the Canadian Institute for Health Research. L.A. Kirshenbaum holds a Canada Research Chair in Molecular Cardiology.

Disclosures

None.

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Circulation Research

JOURNAL OF THE AMERICAN HEART ASSOCIATION



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Circ Res. 2018;122:1338-1340

doi: 10.1161/CIRCRESAHA.118.312835

Circulation Research is published by the American Heart Association, 7272 Greenville Avenue, Dallas, TX 75231

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Print ISSN: 0009-7330. Online ISSN: 1524-4571

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World Wide Web at:

<http://circres.ahajournals.org/content/122/10/1338>

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