



THE BEAT

A COMPENDIUM OF INFORMATION ABOUT THE UNIVERSITY OF OTTAWA HEART INSTITUTE

HIGHLIGHTS

“...nine modifiable risk factors were responsible for more than 90 percent of heart attacks worldwide.”

(from Society’s Impact on Heart Disease, pages 1–3)

“At least 50 to 60 percent of a person’s vulnerability to heart disease is genetic.”

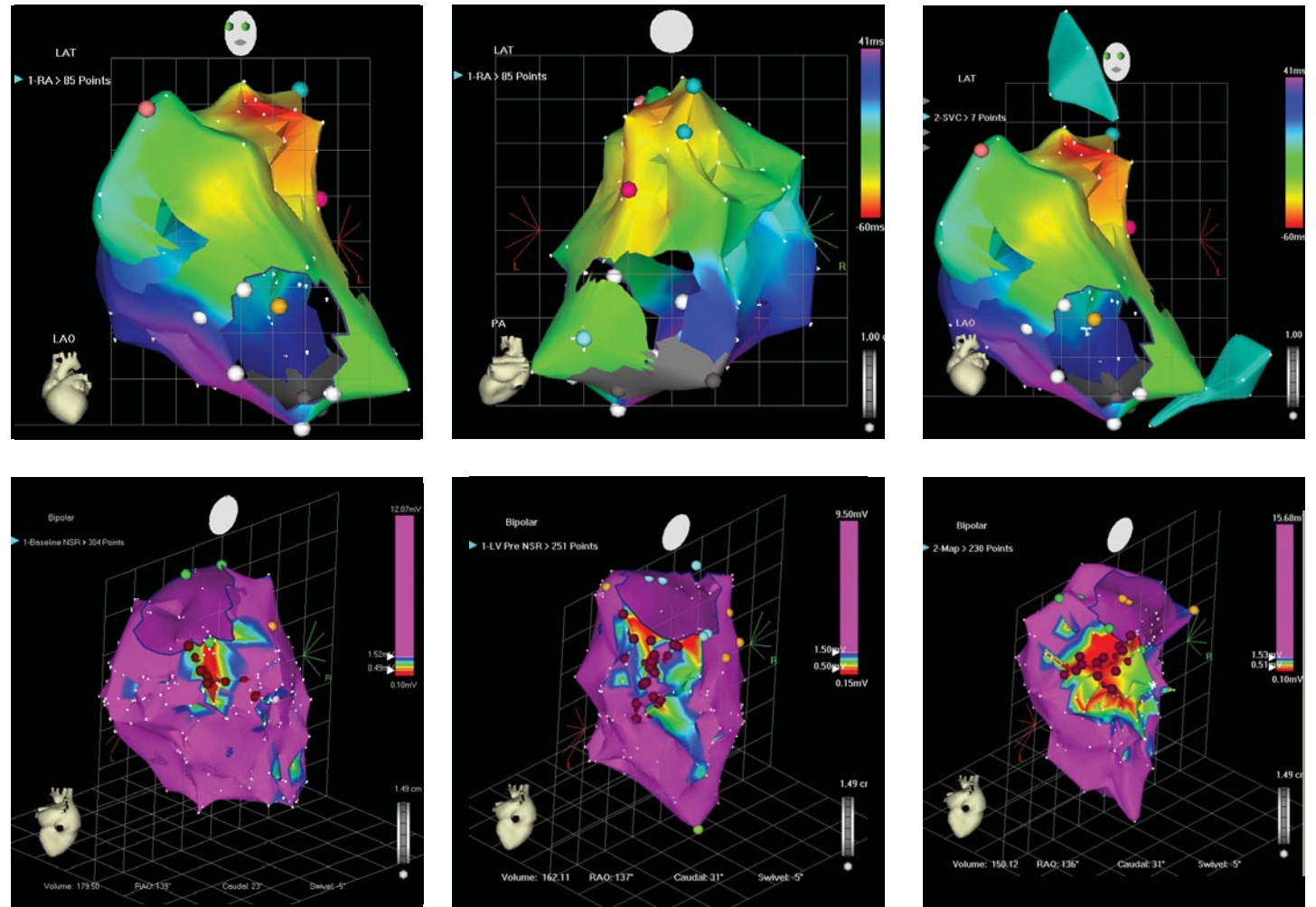
– Dr. Robert Roberts, Heart Institute CEO
(from Research and Prevention are Keys to Eliminating Heart Disease, page 4)

“Women are also 10 times more likely to die from heart disease than from any other disease.”

(from Women and Heart Disease: A Different Set of Challenges, page 5)

“...when young people die suddenly, there’s often a genetic cause that can only be found in the DNA.”

– Dr. Michael Gollob, UOHI’s clinical arrhythmia specialist and geneticist
(Genetic Sleuthing Identifies the Killer, page 7)



Heart imagery from UOHI’s ElectroPhysiology Lab – one of the most advanced in North America – illustrate a new, sophisticated approach to treating heart arrhythmia (irregular heart beat). The top photos show a time sequence of electrical spread through the right ventricle. This indicates that electrical conduction starts at the red region, spreads to the green and then the blue, and finally to the purple region.

The lower series of pictures shows Voltage Maps (potential amplitude) through the left ventricle in a patient with ventricular tachycardia (rapid fast heartbeat). The area in purple represents normal tissue. The area in rainbow colours represents abnormal scarring (previous myocardial infarction). The arrhythmia arises from the margin of scar tissue. The red dots represent ablation (burning) points to eliminate the source of the arrhythmia.

Society’s Impact on Heart Disease

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Genes and factors of surrounding environment are key ingredients that make up the ever-growing presence of cardiovascular disease as a leading worldwide killer.

Scientists such as Dr. Robert Roberts, CEO and President of UOHI, believe that research on both fronts will yield the answers to eliminate or at least significantly beat back heart disease in the

coming decades. With information about genes in specific patients that trigger different forms of heart disease, physicians would be able to prescribe more personalized prevention strategies to reduce the risks of cardiovascular ailments. Science is only just beginning to dig into this area, as Dr. Robert notes.

Just how much personal lifestyle, public health initiatives and environment factors affect the cardiovascular risk remains the subject of substantial epidemiological research. Studies have already yielded enormous data that has helped sway legislative policies in Canada and elsewhere. New and ongoing evidence have provided a foundation for preventive health care programs in recent years. These include recent changes to the

Canada Food Guide, for example. Smoking, diet, exercise and management of stress are among the critical factors.

Tobacco researcher Linda Waverley noted at the Canadian Cardiovascular Congress in Vancouver October 21–25 that it would have been unthinkable to imagine several

decades ago that smoking prevalence could be reduced in Canada to about 20 percent.

Waverley – of the Research for International Tobacco Control for Canada’s International Development Research Centre in Ottawa – showed how cigarette consumption in Canada declined to an average of 169 packages annually per person in 2000 from 223 in 1993. Cigarette

consumption fell as cigarette taxes and price increased. Figures also show that when cigarette prices fell for a brief period in the late 1990s, the tobacco consumption immediately rose. The figures changed course and consumption dropped when higher taxes were imposed. Smoking prevalence declined to 27 percent in 2000

...cigarette consumption in Canada declined to an average of 169 packages annually per person in 2000 from 223 in 1993.

(continued on page 2)

(Society's Impact on Heart Disease, continued)

(and is continuing to drop) from 32 percent in 1993. The figures were much higher in the 1980s and the preceding decades.

Smoking is considered one of the most critical modifiable risk factors associated with the prevention of heart disease. At the Heart Institute, the Prevention and Rehabilitation Centre has adopted a rigorous smoking cessation program tailored for every admitted patient who uses tobacco products. A comprehensive smoking cessation program at UOHI is open to the public at limited cost as a medical service because of the significant impact on public health.

"We now lead the world in terms of the development of institutionalized approaches to smoking cessation for admitted patients," says Dr. Andrew Pipe, Director of UOHI's Prevention and Rehabilitation Centre. "Our 'Ottawa' model is now being replicated in every hospital in the regional district surrounding Ottawa and there is every indication it will be replicated across the country before too much longer."

Other modifiable factors include daily consumption of fruit and vegetables, and regular physical activity. Cardiologist Dr. Salim Yusuf is Director of the Population Health Research Institute at McMaster University in Hamilton. Dr. Yusuf's INTERHEART study, conducted in 52 countries, demonstrated that nine modifiable risk factors were responsible for more than 90 percent of heart attacks worldwide.

Many of these factors can be changed by stronger public health and legislative policies and a conscious effort to alter environment, he says.

Dr. Yusuf cites evidence over the last 50 to 60 years on how dramatically urbanization and contemporary lifestyle have contributed to the incidence of heart disease. Part of the explanation lies in the decrease in other causes of death related to infectious diseases and the spread of infection. But the picture is much more complex,

Dr. Yusuf explained to the Canadian Cardiovascular Congress in Vancouver.

Agriculture subsidy policies to improve grain, dairy and meat programs in the Western world have resulted in an abundance of relatively inexpensive foods from wheat and animal products, which contribute to a new challenge of over-nutrition. Urban transportation and planning policies have led to increased automobile use, decreased activity and increased weight. Obesity is linked with other cardiovascular risks such as diabetes, high blood pressure and high cholesterol.

Urban sprawl is expected to increase in the coming decades. "The issue is how to modify urbanization so that we don't continue to suffer the bad effects on our health and our society," he said at a Cardiovascular Society symposium on preventing cardiovascular disease. Dr. Yusuf noted a number of challenges yet to be addressed, evidence of effective health care strategies, and new studies now under way. These include:

- The Prospective Urban-Rural Epidemiological (PURE) Study of 135,000 people in more than 15 countries who will be followed for at least 10 years. The study will examine people in urban and rural settings, legislated health policies, and measures in place to support or defeat specific patterns. Initial results should be available in two to three years.

In Canada, unlike the developing world, rural populations suffer greater health problems owing to different levels of health education, higher tobacco use, poor dietary habits and a more sedentary lifestyle from increased automation, for example. "A rural lifestyle in Canada is not the same as in Africa," says Dr. Yusuf.

- Redesigning home and work spaces, even furniture, to overcome constraints that prevent daily physical activity. Canada's pioneers were physically active six to eight hours a day and yet

"We now lead the world in terms of the development of institutionalized approaches to smoking cessation for admitted patients."

– Dr. Andrew Pipe

one hour daily seems a stretch for many people. "In future, we will have to think of how to redesign our lives in a completely different way to stay active," says Dr. Yusuf. Perhaps something as simple as sitting on chairs designed as balls at work may help increase activity and burn more calories.

- Using tax policies to improve diet and discourage the use of cars by increasing the use of bicycles, for example. Changing the kinds of food available in supermarkets through food policies could be used to increase consumption of fruits and vegetable and reduce dairy fats, certain meat products and grains. The cost of meat and grain is artificially low and farmers should be supported to switch to crops. Changes in tobacco policies and public health interventions have produced a

successful anti-smoking movement, says Dr. Yusuf. "If we can succeed in tobacco, we can succeed in food and in activity. Hundreds of studies were needed to convince the public of the link between tobacco and disease. Can we take some of these lessons and apply them to other areas?" Improved urban planning could increase physical activity by designing communities closer to shops and offices so that more people could walk to work or to the food market.

- Significant changes in food policy and tobacco restrictions were part of an overall national cardiovascular disease prevention strategy in Finland in the late 1970s. A national cardiovascular risk factors monitoring system was developed to assess the effectiveness of the national strategy.¹ Published

Planning Institute Recognizes Heart Institute Doctor for Work in Promoting Healthy Communities

Dr. Andrew Pipe, Medical Director of UOHI's Prevention and Rehabilitation Centre, has been made an honorary member of the Ontario Professional Planners Institute for his work in promoting healthy communities.

Dr. Pipe is recognized as one of Canada's leading experts in cardiovascular disease prevention, physical activity and health, and smoking cessation. He has addressed audiences in more than 20 countries and is frequently consulted on issues related to tobacco use and smoking cessation, drug use in sport, and physical activity and health. A former chairman of Physicians for a Smoke-Free Canada, which he founded, Dr. Pipe is also a Life Member of the Canadian Council on Smoking and Health.

The Planning Institute represents a wide variety of fields, including urban and rural community development, urban design, environment, transportation, health and social services, housing, and economic development. Dr. Pipe became the Planning Institute's first honorary member in September.

"Many of us at the Heart Institute are very active in advocacy with an array of organizations," says Dr. Pipe. "There is much work under way in health public

policy development – in areas that will secure and support an environment more conducive to a more active and less-likely-to-be obese population."

Public health changes will come slowly and these will gradually occur in areas from municipal recreation policy to urban planning, transportation, education vis-a-vis school curricula, taxation and food subsidization, he says. "All of these aren't going to happen tomorrow but those are elements that will be necessary to be successful."

He cited an Ontario government conference in late November on healthy eating to address obesity. The conference brought together internationally and nationally known experts to examine initiatives and best practices that integrate healthy eating and physical activity. Dr. Pipe was an opening keynote speaker at the conference.

"Obesity can never be solely addressed in hospitals or doctors' offices," Dr. Pipe says. "It will require an environmental, societal and 'ecological' approach, as health promoters would term it. Infectious diseases were reduced in the last century using such an approach. That success occurred as a consequence of the



Dr. Andrew Pipe is the first honorary member of the Ontario Professional Planners Institute for his work in promoting healthy communities

results over the years have shown a decrease in cholesterol levels of both men and women, lower blood pressure levels, a decline in smoking prevalence and a drop in cardiovascular disease deaths. The national policy included a change in food policies aimed at reducing dairy products, salt and animal fats, and increasing vegetables. “We saw a 65 percent decline in cardiovascular disease in an entire country,” says Dr. Yusuf.

- A similar shift was seen in Poland after the fall of the communist regime, where subsidies on grains were removed, so that their prices increased. However, fruits and vegetables were sold more cheaply. “The entire country changed its eating habits and doubled the consumption of fruits and vegetables, and markedly decreased consumption of butters and animal fats.” Researchers found a marked decline in deaths due to heart disease in

Poland since 1991 after two decades of rising rates. The decrease was greatest in the 45–64 age group and has been attributed to changes in type of dietary fat and increased supplies of fresh fruit and vegetables.²

At the Heart Institute, Dr. Roberts notes that food is one commodity that all people are exposed to daily: “A proper diet will be a major preventive weapon in the future.” But these changes are not easy to make, he

adds. For one thing, new directions in public health policy can be difficult because of the challenge of creating long-term plans by governments that are elected every four years. “For certain, we have to do a better job of educating the public. Health care is a very expensive proposition and one way to ease that is to believe in prevention. But prevention is a problem everywhere. It’s a tough sell.”

¹ Cardiovascular risk factor changes in Finland, 1972–1997, Erkki Vartiainen et al, International Journal of Epidemiology 2000; 29:49-56

² Ecological study of reasons for sharp decline in mortality from ischaemic heart disease in Poland since 1991, Witold A Zatorski et al, British Medical Journal 1998; 316:1047-1051

degree to which we transformed the social and physical environment: improved the quality of drinking water, built houses further apart, introduced health and safety laws and an array of other strategies. Such strategies have been successful in Canada in dealing with tobacco problems and need to be applied to societal obesity.”

The Heart Institute has a significant profile in examining and developing physical activity and other preventive programs, he says. “The Institute is developing a reputation around some of these community outreach undertakings. The Heart Institute has one of the top five cardiovascular rehabilitation programs in North America.”

UOHI’s Prevention and Rehabilitation Centre is engaged in a number of major research projects. Research is geared to finding effective ways of encouraging and supporting populations and individuals in the initiation and maintenance of behaviour that improves cardiovascular health. The research focuses on physical activity, smoking, and nutrition habits, as well as remaining engaged in medical care. Projects include evaluating new ways of delivering cardiac rehabilitation and secondary prevention services, including telephone- and

“The Heart Institute has one of the top five cardiovascular rehabilitation programs in North America.”

– Dr. Andrew Pipe

internet-based programs. The programs are part of cardiac rehabilitation at the Heart Institute, and assist heart patients to reduce the risk of future cardiac problems. Other research has investigated differences in the response to cardiac rehabilitation between men and women.

Research and Prevention are Keys to Eliminating Heart Disease

Research and prevention are medicine's greatest hope in defeating heart disease – the No. 1 killer in North America and in much of the developing world, says Heart Institute CEO Dr. Robert Roberts. As the Heart Institute celebrates its 30th anniversary, Dr. Roberts pays tribute to the Institute's founding leadership. His predecessor, Dr. Wilbert Keon, together with the first head of Cardiology, Dr. Donald S. Beanlands, helped build a sterling reputation for the Institute based on excellence in care, education and treatment. Now Dr. Roberts looks ahead to a new era where the Heart Institute must maintain these core strengths while vigorously forging a wider pathway to the future.

The only road to success for the Heart Institute, he says, lies with innovative

sequencing, DNA analysis and GeneChip™ technology, scientists at the Centre are exploring the genetic makeup of CAD.

At least 50 to 60 percent of a person's vulnerability to heart disease is genetic, says Dr. Roberts, a renowned geneticist whose work has isolated the genes related to the Wolff-Parkinson-White (WPW) Syndrome. With this syndrome, the electrical signal to the heart arrives at the left ventricle too early. This electrical abnormality can cause episodes of rapid heart beat, known as tachycardia.

"Until we know the genetic components of heart disease, it's still difficult for us to have comprehensive prevention and it's still difficult for us to have comprehensive treatment for the crisis," he says. Surgical treatments have produced remarkable, life



Research and prevention are medicine's greatest hope in defeating heart disease, says Dr. Robert Roberts.

"We're reaching an era where heart disease will be much more about prevention than treating the crisis."

– Dr. Robert Roberts

research and a strategic prevention regime employing advanced technology and better patient education. With these tools, heart disease could well be eliminated in the next 50 years.

"If the Heart Institute did everything superbly well in delivering health care and taking care of patients, and that's all we did, then we would have to consider ourselves a failure," Dr. Roberts says. Given UOHI's resources, which include talented scientists and teachers, the Institute's obligations to both the medical community and society in general require a major effort to direct future advancements in fighting heart disease.

"We're reaching an era where heart disease will be much more about prevention than treating the crisis," he says. "I want this Institute to be on the cutting edge of prevention. I'm talking about something that you can't visualize. Prevention is not a very sexy thing at all. I'm talking about that young male in his 20s to be properly educated so he doesn't have the crisis in his 50s or 60s. No matter where you are, that is not an easy sale in a world that is built on something quite different."

Research at the Heart Institute has already moved into high gear with the opening last year of the Ruddy Canadian Cardiovascular Genetics Centre, the only one of its kind in Canada and one of just a handful of similar centres around the world dedicated to Coronary Artery Disease (CAD). The centre, made possible by a \$5 million gift from Ottawa business leader John Ruddy and his wife Jennifer, got off the ground several years sooner than Dr. Roberts had expected. With more than \$2 million in highly advanced gene

saving results. But the disease is not cured. "Until we decipher the genetic predisposition, we're unlikely to come with a specific treatment. In a world today with technology, we would like to be able to accelerate that and plan it so we know the specific reason behind the disease."

By understanding the genetic composition of a heart ailment, pinpointing the specific genes and taking aim at a person's genetic predisposition to the disease, then physicians in the future could prescribe a specific, targeted 'preventive' package. That prescriptive package would be enhanced, of course, with other lifestyle factors such as diet, smoking and exercise.

"Heart disease is the result of wear and tear over the decades. We are looking at an era somewhere in the future when your genome will be looked at for a specific variance, then individualized and personalized," says Dr. Roberts. "What you are looking at now in heart disease is the most primitive of warfare. It is tribal compared to what they will be able to do 50 years from now."

Preventive techniques involve new diagnostic technologies at the Heart Institute, such as the first high-volume, state-of-the-art 64-slice scanner in Canada dedicated to cardiac care. The super-speed imaging technology of computerized tomography (CT) uses a computer and x-rays to create cross-sectioned slices of the heart, rendered in 3D images. This 'fast CT' allows for detailed mapping of the vascular system and surrounding soft tissue with a series of data sets for the 3D visuals. The Heart Institute has initiated at least five major studies with the 'fast CT.' One is investigating whether diagnostic cardiac CT, which takes only

Dr. Robert Roberts

"My first priority was to maintain excellence of care. And the Heart Institute has to bring in more quality research in order to move this forward. We're reaching an era where heart disease will be much more about prevention than treating the crisis."

- President, Chief Executive Officer, Chief Scientific Officer UOHI, appointed 2004
- Director, Ruddy Canadian Cardiovascular Genetics Centre, UOHI
- Former Chief of Cardiology, Baylor University, Waco, Tex., former Chairman, Scientific Sessions, American College of Cardiology, Member, Board of Trustees, former Chairman, Grant Review Section, Merck/Pfizer/ACCF
- Specialty: Internationally renowned cardiologist, cofounder of molecular cardiology, an acclaimed leader in Genetics and Molecular Biology of Cardiovascular Disease.
- Regarded as one of the world's 50 most cited authors. Named to America's Top Ten Doctors, 13 consecutive years.
- Research Interests: Genetics and Molecular Biology of Cardiovascular Disease; his working group has identified several genes responsible for hypertrophic cardiomyopathy.

15 to 40 minutes to perform, is precise enough to help select the appropriate therapy for heart patients.

"At one point, someone who has a family history of heart disease can come in, have their genome checked, get their fast CT and have their prescription. You may start with only those people who have high risk factors or family histories. I don't think

there is any doubt that we have to identify their genes, determine their function and get specific about what we want to do. The dietary factor is a major force. But I do think the most important factor is your genetic makeup and how that interacts with the environment will be a comprehensive package somewhere along the way." 🍷

Women and Heart Disease: A Different Set of Challenges

Plans to open a cardiology clinic for women at the Heart Institute are underway, targeting a high risk group that faces specific problems and one distinctive advantage related to coronary artery disease. Heart disease is the primary cause of death in women over the age of 55. Women are also 10 times more likely to die from heart disease than from any other disease.

Women have, however, heard confusing messages about prevention and treatment. Hormone replacement therapy in menopause was once thought to lower the risk of heart attack and stroke for women with heart disease. But research now shows that women with heart disease should not be using hormone therapy.

While researchers at the Heart Institute are investigating several issues related to heart disease and women, Dr. Robert Roberts, President and CEO of the Heart Institute, says women generally have a clear advantage over men when it comes to prevention. Many women simply have the benefit of extra time on their side before reaching a crisis related to heart disease. "The first issue about women is that they are in a more advantageous position than men. Until their 40s, women are relatively protected compared with males."

If women are aware of the risks and adopt preventive measures when they are in their 40s, it is possible to delay the onset of heart disease for 40 or 50 years. "Males don't have that choice unless they discover it in their 20s or decide to do

In a heart attack, general differences exist between men and women. These include:

- Risk factors are different in women than in men.
- Diabetes increases the risk of a heart attack even more in women than men.
- The symptoms of a heart attack in women are somewhat unusual compared to those in men.²

The warning signs of heart attack in men include strong pain in the chest and left arm. In women, symptoms can be more vague. These include:

- tightening and ill-defined pain in the chest that may extend into the neck, jaws and shoulders,
- heartburn,
- nausea and/or vomiting,
- difficulty breathing,
- shortness of breath,
- general feeling of weakness,
- pallor,
- anxiety, and
- sweating.³

Symptoms may appear and then disappear spontaneously. One woman who is having a heart attack may have a few of these symptoms, while another may have all of them at once.

Research at the Heart Institute also suggests that women with heart disease also recover differently from men after leaving hospital. Results of a study by UOHI's Prevention and Rehabilitation Centre showed that men exhibited a better quality of life six months after undergoing cardiac surgery procedures than women who underwent the same

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– Dr. Robert Roberts

something about it in their 20s. The female is in a golden opportunity."

While it is recognized that women have exactly the same protection as men against heart disease, onset of the disease occurs generally 10 or more years later than with men.

Later, however, older women face a greater disadvantage. After menopause, they become more vulnerable, particularly if they smoke and have high cholesterol levels. Many more older women than men live alone and on a lower income – factors that have a negative impact on their health.¹

procedures. The study found men were engaged in 'significantly' more physical activity than women, which resulted in a better outcome.

Other research projects include a study by Dr. Terrence Ruddy, head of Cardiology at UOHI, who is looking at women and ischemia. Women with chest pain are evaluated with various non-invasive tests and are followed to determine the optimal diagnostic testing, resulting in early and accurate diagnosis at reasonable cost. Cardiac ischemia refers to the lack of blood flow and oxygen to the heart muscle. ❧



¹ What about Women and Heart Disease?, the Canadian Health Network web site, online at the Canadian Public Health Agency: <http://www.canadian-health-network.ca/servlet/ContentServer?cid=1001992&pagename=CHN-RCS%2FCHNRResource%2FFAQCHNRResourceTemplate&c=CHNRResource&lang=En>

² Ibid.

³ Ibid.

Weighty Study Aims to Identify Thin Genes

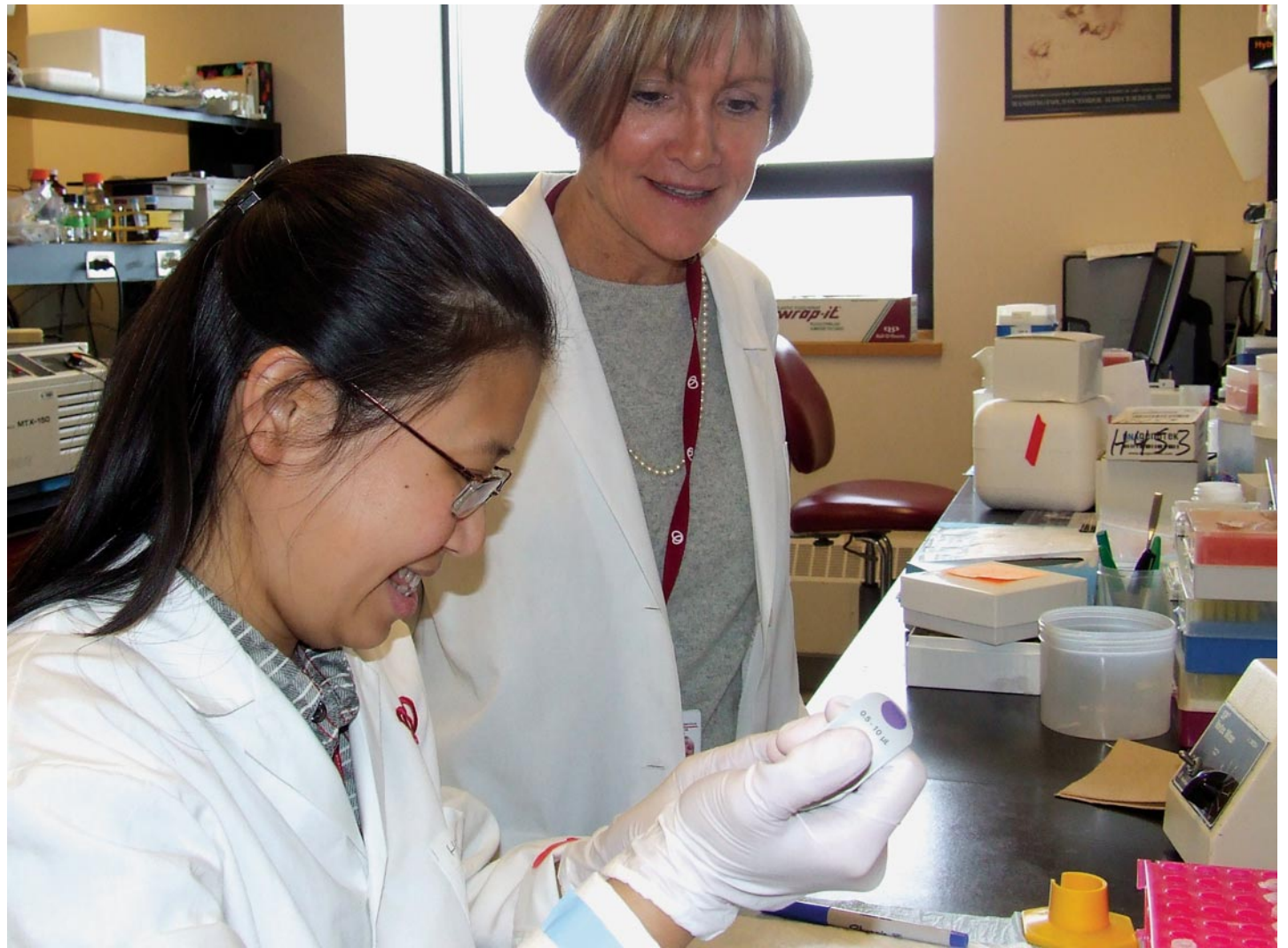
The tendency to gain weight is more than just an exasperating human trait. While emphasis on lifestyle – diet and exercise – is essential, researchers have found variations in some genes that might be important for regulating weight gain and could lead to some answers related to the management of heart disease.

Analysis is currently underway at UOHI as part of the Thin Gene Study, where samples from 1,000 overweight and another 1,000 thin people were collected over two years.

“We have examined 60 genes so far in detail and have new clues as to which genes are particularly important in regulating body weight,” says Dr. Ruth McPherson, of the Heart Institute’s Lipid Clinic and the Lipid Research Laboratory. “For example, a gene called PYY appears to be important and it may be of interest to find ways to upregulate this gene and increase the production of that protein in people who are overweight. The value of genetic studies is not only to discover factors contributing to a disease state but to use this information to develop better treatments.”

The project involves a top team of researchers, including Dr. Robert Dent of The Ottawa Hospital, who has a long interest in the complexities of weight management. Others on the team include Len Pennacchio of the Berkeley National Laboratory and Mary Ellen Harper, a biochemist working in the area of energy metabolism at the University of Ottawa.

The research goes to the heart of dealing with some of the most common risk factors for coronary heart disease. Being overweight is a major cause of adult onset diabetes, says Dr. McPherson. “Diabetes is one of the strongest factors for developing heart disease,” she adds. “But there are many overweight people who have



Dr. Ruth McPherson – seen here with lab technician Paulina Lau – is exploring how genes might regulate weight gain.

normal cholesterol and blood sugar levels and never develop heart disease. On the other hand, some people develop heart disease despite not smoking, exercising and so on. Clearly, there is a strong interaction between genetic factors and lifestyle.”

Dr. McPherson said she had always been cognizant of the fact that many patients who are overweight have tremendous difficulty losing weight. In contrast, there are naturally thin people who don’t even think about what they eat and simply

don’t gain weight. Her ongoing studies are determining what differentiates these two groups of people, including genetic factors, muscle fibre type as well as exercise and dietary habits.

Two papers have recently been published. One, in *Human Molecular Genetics* in February 2006, singles out variation in the PYY gene that might influence human susceptibility to obesity. “We have also found a few genes where there seems to be more variation in the thin group,” says Dr. McPherson.

As a clinician, Dr. McPherson has a busy practice. But laboratory work and particularly genetics research are a major focus of her professional life.

“Clinical questions lead me to the lab to look for what is really regulating a particular disease process,” she says. “We know some of the risk factors for obesity and for heart disease but we don’t always know how they interact with genetics and why a particular risk factor may be more important for one person as compared to another.”

Dr. Ruth McPherson

“What we do in the lab is exciting and is hard work. With research, the time span is very long. The discretion in research is very long. When you see patients, you do something helpful and you do it quickly and efficiently. Working in the two areas is great.”

- Director, Lipid Clinic, Lipid Research Laboratory, University of Ottawa Heart Institute
- Professor, Medicine and Biochemistry, University of Ottawa
- Winner, Queen’s Jubilee Medal, 2002, for her contributions to scientific research.
- Member, Canadian Cardiovascular Society (CCS) Consensus Panel on the Diagnosis and Treatment of Dyslipidemia and Prevention of Cardiovascular Disease

- Former Wyeth-Ayerst/CIHR Chair in Cardiovascular Disease in Women
- Research interests: genetic regulation of HDL receptors, including SR-BI, CETP, and LRP and their role in cholesterol trafficking; clinical research in the areas of atherothrombotic risk factors for coronary heart disease, and the genetic etiology of obesity and obesity resistance. Ongoing work is directed at defining genetic risk factors for the metabolic sequelae of obesity including diabetes and dyslipidemia.

Gene Counselling Helps Patients Understand CAD Implications of Family History

Julie Rutberg is an unusual detective who helps families uncover their most intimate medical details – through DNA. A genetic counsellor, Rutberg applies the skill of a researcher and the compassion of a chaplain to carry out her job. This is especially true in a case where a family member has died suddenly and the cause might be genetic.


“I play a role in education by working with patients to understand the implications of their family history,” says Rutberg. In cases such as a recent sudden cardiac death of a 21-year-old university student, family members are counselled about how their genetic makeup will affect their own future health. “Sometimes, people would prefer not to know,” she says. But in this case, the family continued to pursue the mystery until they found out what caused their daughter’s death. The mother had cardiac testing and agreed to have her blood tested for genetic mutations related to arrhythmias. She was found to have a genetic condition and will now receive

the appropriate medical treatment to reduce her risk of life-threatening arrhythmias. The genetic testing also proved her daughter had died of the same condition, and allowed other family members to decide whether or not they wanted genetic tests.

Samples are sent to a specialized laboratory for gene testing to confirm a familial cardiac disease. The Heart Institute conducts genetic research in several major laboratories such as the Arrhythmia Research Laboratory, where Dr. Michael Gollob is using molecular genetics to investigate family links with arrhythmia. Rutberg also serves as a research coordinator helping to enroll family members and help them understand the implications of the research results. This type of genetic testing is available on a clinical basis and has important implications for medical care.

Genetic research is also underway at the Heart Institute: for instance, in trying to find genes that cause mitral valve prolapse

(MVP), a condition that in rare situations can run in families. If there are several people in a family with MVP, genetic research might be able to track the gene in the family. If the gene for MVP was discovered, it may in turn lead to a better understanding of the condition, and why some people need surgery on their valve at a young age. Some people never develop severe problems despite the MVP. The condition, which is an area of expertise of Chief of Cardiac Surgery Dr. Thierry Mesana, is caused when the valve separating the two left-heart chambers malfunctions. Dr. Mesana specializes in surgical mitral repair, in addition to research involving the condition.

Rutberg joined UOHI after working in genetic programs elsewhere, including Johns Hopkins Hospital. She has a Master’s degree in genetic counselling, and is a member of the Canadian Association of Genetic Counsellors and the National Society of Genetic Counselors. 



Julie Rutberg is a genetic counselor who helps families understand how DNA influences their health

Genetic Sleuthing Identifies the Killer

When a 21-year-old university student immersed in exam studies was found dead in her bed, the family’s pain was compounded by the mystery surrounding the young woman’s sudden death. A standard autopsy added several general findings but did not specify the cause of her death.

It fell to UOHI’s clinical arrhythmia specialist and geneticist Dr. Michael Gollob to solve the riddle by performing a molecular autopsy to examine the student’s DNA. His investigation identified a novel disease-causing mutation in the gene responsible for Long QT Syndrome, which leads to potential fatal irregular heartbeats or arrhythmia.

Dr. Gollob is among Canada’s leading authorities in genetics and arrhythmia. Research led by Dr. Gollob, Director of the Arrhythmia Research Laboratory at UOHI, has revealed that one of the most common forms of heart disease – atrial

At least 35,000 Canadians each year fall victim to Sudden Cardiac Death, many of whom are otherwise young healthy people.

fibrillation – is caused by a mutation in DNA. His breakthrough study was recently published in the *New England Journal of Medicine*.


Dr. Gollob’s findings regarding the university student, however, showed a genetic mutation. The young victim’s mother, who was being treated for epilepsy, agreed to be tested and was shown to have the same genetic mutation. The findings suggest that Canadians at risk of Sudden Cardiac Death may be misdiagnosed and are being treated for other

symptoms. Details of the findings and the consequences for the family were reported to the Canadian Cardiovascular Congress 2006 held Oct 21-25 in Vancouver.

At least 35,000 Canadians each year fall victim to Sudden Cardiac Death, many of whom are otherwise young healthy people. As with the university student, standard autopsy procedures examine whole tissue and cannot explain cause of death.

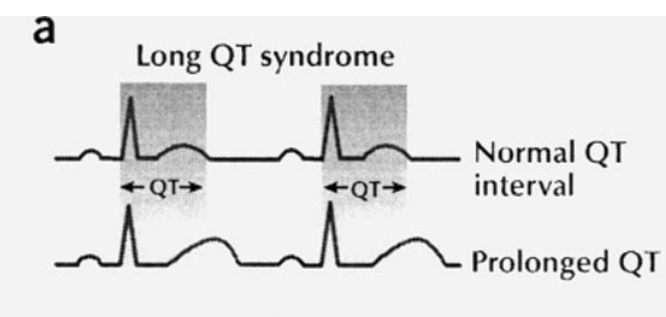
“We know in the arrhythmia field and in genetics that when young people die suddenly, there’s often a genetic cause that can only be found in the DNA,” Dr. Gollob explains. “The only way to see it is to analyze the DNA or the genes that may cause Long QT Syndrome and we found that mutation in the genes.”

Treatments for Long QT Syndrome include medications, such as beta blockers, or surgically implanted defibrillators, which do require replacement. “For a 20-year-old a defibrillator is not necessarily a comfortable option,” says Dr. Gollob. “It has to be replaced, there is risk of infection and young people in particular are very conscious of their body. Ultimately our goal is to understand the physiology better.”

Molecular autopsy provides the immediate twin benefits of explaining the cause of sudden cardiac arrest and of allowing the opportunity for genetic screening of family members to learn whether they have the disease. “If they do carry the genes for the disease, we can implement the appropriate medical surveillance and take necessary preventive measures,” says Dr. Gollob. 



Dr. Michael Gollob undertook a unique molecular autopsy to determine the cause of the mysterious death of a 21-year-old university student



Long QT Syndrome is a form of arrhythmia (irregular heart beat) with a genetic cause

Clinical Monitoring Network Keeps Tabs on Patients

A bed in the cardiac surgical intensive care unit is ready to receive a new patient, who will soon be wheeled in from the operating theatre. At the nursing station, a large LCD screen filled with colour graphs shows flat lines with absolutely no ECG waves. This means the patient has no heart beat. That's a good sign for the nurses, who know the patient is still on a heart-lung bypass machine and surgery is still underway.

The same data feed can be viewed from any monitor within the Heart Institute by medical staff with approved access. "What the nurses in CSU are looking at is exactly the same information the anesthesiologist is looking at in the OR," says Timothy J. Zakutney, Manager of Biomedical Engineering at UOHI's Cardiovascular Devices Division. "They can get a sense of what is happening in the OR with a quick glance at the monitor."

The Heart Institute's Clinical Monitoring Network allows authorized staff to simultaneously view data from any patient connected to a bedside monitor or a telemetry unit. The monitors are set up at every bedside except for day unit areas and the network is complemented by the existing telemetry system, where patients can move around with portable monitoring devices.

Many hospitals have similar monitoring systems in place. But the Heart Institute data is fed through an isolated Intranet network to guarantee no outside interference from imported information or images on UOHI's regular broadband network, says Zakutney, who began the program of replacing bedside monitors in

2001 with the new system. "We could have set it up to sit on the Heart Institute's Internet backbone," he says. "But because there is a lot of other information and large files travelling on the network, this way we have much better reliability and control. It is an extremely important system that cannot be compromised. With an isolated network, there is no other information travelling along this network."



Tim Zakutney is Manager of Biomedical Engineering at UOHI

Monitors are set up at 64 beds across the Heart Institute. The data streams can be programmed for a continuous feed by the second, every few seconds, every few minutes, or any other variation at near-real time. The monitors employ LCD touch-screen technology – the easiest means possible to retrieve data. Nurses and physicians can view multiple patient data feeds or touch the screen to enlarge the information in detail, then review a complete 96-hour history of any particular vital statistic. When patients

move from one unit to another, the data travels with them.

Zakutney, who set up the network with his technology team, also integrated the information technology network with the Heart Institute's new ECG management system. The ECG system is a permanent archive of all recorded ECGs since 2004, acquired both at the Heart Institute and

telemetry units worn by patients on the floor. (Telemetry involves an electronic device that transmits specific data to a remote site. Each telemetry-ready unit at the Heart Institute has a series of small RF antenna hanging from the ceiling, which transmit and receive data from the portable electronic monitor that is not much bigger than a cellular telephone.)

"There are huge benefits," says Zakutney. "Any staff member with the appropriate privileges can go on the Intranet, look at a patient monitor and go back to review historical data over a 96-hour period." In addition to ECG, the monitor provides a continuous feed of other such data as heart rates, arterial blood pressure, pulse and oxygen saturation. Medical staff can review trends, life threatening events and alarms that signal abnormal levels. The recorded data also provides continuity of information, so when patients are moved, the data travels with them.

Because the monitoring data can be viewed simultaneously by other authorized personnel, any medical professional on staff can easily consult with colleagues regardless of their location within the Heart Institute.

The network has been implemented gradually over the last few years. Zakutney plans to run seminars to demonstrate the network, its effectiveness and value to Institute staff. Access to the network requires passwords and access approval by specific administrators. ❀

the nearby Civic Campus of the Ottawa Hospital. "The value is this allows very quick retrieval, so even if a patient comes in five years after the first visit, the ECGs will be readily available on a computer in the Intranet and authorized medical staff can compare the historical data with current records," says Zakutney.

The web monitoring network provides data regardless of the location of a patient, whether in the OR or CSICU. The network also captures data from

So Long, Noella, and Thanks

Noella Leclair, who received Canada's first artificial heart in an historic cardiac procedure at UOHI 20 years ago, has died. Her remarkable journey, from the day she entered the Heart Institute in 1986, is the storied second chance for a woman who dedicated her new life to her family and the community at large.

She suffered a near fatal heart attack at the age of 41, upon which her family gave permission for Dr. Wilbert Keon to implant the Jarvik-7 artificial heart in a 3 1/2-hour operation. One week later, the Heart Institute's transplant team moved swiftly to recover a human heart from a Montreal man who had died after a traffic accident near London, Ont. This new heart was monitored regularly on an outpatient basis to ensure her continued good health.

"We provided her with our services but she returned the services in the many ways in which she contributed to society, and by being able to raise her family with her children – her daughter, her grandchildren and her foster children," says Dr. Ross Davies, her transplant cardi-

ologist from the very beginning. "She required very little hospitalization and remained in very good health."

A wide range of services kicked in after her transplant, from a comprehensive cardiac rehabilitation program to routine diagnostic monitoring through an array of techniques in cardiac radiology.

professionals maintained a close liaison with her family physician.

"She was a wonderful person to work with," says Dr. Davies, President of Heart Institute Medical and Scientific Staff. "Everyone she touched at a patient level and professional level – she put people at ease."

"She served as an example to other patients, in fund raising and becoming a poster child for the Heart Institute."

– Dr. Ross Davies

Cardiac biopsies were used to monitor rejection. Heart function was followed by ultrasound (echo-cardiogram) and coronary angiography. Myocardial perfusion imaging shows how well blood flows to the myocardium (muscle of the heart). While everything from dietary counselling to laboratory blood services took place at the Heart Institute, UOHI

Leclair was an active volunteer and fundraiser at the Heart Institute. She appeared in the annual Telethon, held every February to raise funds in support of research and expanded services for the Heart Institute. "When we had anxious patients, we would ask her to come in and speak to them before and after a transplant procedure," says Dr. Davies. "If

someone was anxious and wanted to know what they were getting into, she would be willing to come in and explain her experience from a patient's point of view."

She participated in patient support groups, served at the annual heart transplant Christmas party and ran a bingo fundraising event for the Institute for nearly 10 years. "She served as an example to other patients, in fund raising and becoming a poster child for the Heart Institute," Dr. Davies adds. "The fact that she was bilingual meant that she could reach out to a wider community that included the region's francophone population."

Leclair died peacefully on Nov. 11 at the Heart Institute. She is survived by her husband Simon and her daughter.

Today, 10 per cent of all heart transplant patients require a bridging device until a donor heart becomes available. Research into mechanical assist devices to aid a failing heart has been a major focus at the Institute since Leclair received her artificial heart. ❀