SPECIAL REPORT

Research Manitoba

DIFFERENCE MAKERS

MEET FIVE MANITOBA RESEARCHERS WHO ARE WORKING TODAY TO BUILD A BETTER TOMORROW

WHAT'S INSIDE

THE IMPORTANCE OF RESEARCH

Research drives progress. It is the thing that enables us to make enormous strides in every field of human endeavour.

Without research there would be no vaccines to wipe out disease. We would not possess the knowledge and expertise to grow the food needed to feed a hungry world. And we would certainly not be able to stay digitally connected to each other through our smartphones.

Manitoba researchers have made their share of contributions to the world's bank of knowledge. In the field of medicine, for example, Dr. John Bowman played a key role in the development of a treatment for Rh disease in the 1950s. In agriculture, meanwhile, Baldur R. Stefansson helped pioneer the development of canola seed, which has become a major crop on Canada's prairies. And, more recently, Gary Kobinger was part of the team at Canada's National Microbiology Laboratory that developed a potential vaccine for Ebola virus.

Researchers working in Manitoba today are building on that legacy. Whether they labour in the fields of health, natural sciences, social sciences, engineering or the humanities, these researchers are all motivated by one thing: the quest for knowledge.

Their efforts are supported by the Canada Foundation for Innovation (CFI) and Research Manitoba.

Created by the federal government in 1997, CFI strives to build our nation's capacity to undertake world-class research and technology development to benefit Canadians.

Research Manitoba, established last June through the consolidation of several provincial agencies, is responsible for co-ordinating and funding research throughout the province. With an annual budget of $17 million, it supports the research community through funding for equipment, new investigators and students through a variety of programs, including the CFI Matching Fund program. This critical program provides matching funds (40 per cent of project total) for proposals that have been awarded grants through one of CFI's competitions.

This 12-page special report, the first in a series sponsored by Research Manitoba, is intended to highlight some of the work being carried out by researchers who have been funded through CFI and Research Manitoba's CFI Matching Fund program. For more information about this program and other initiatives, visit www.researchmanitoba.ca.

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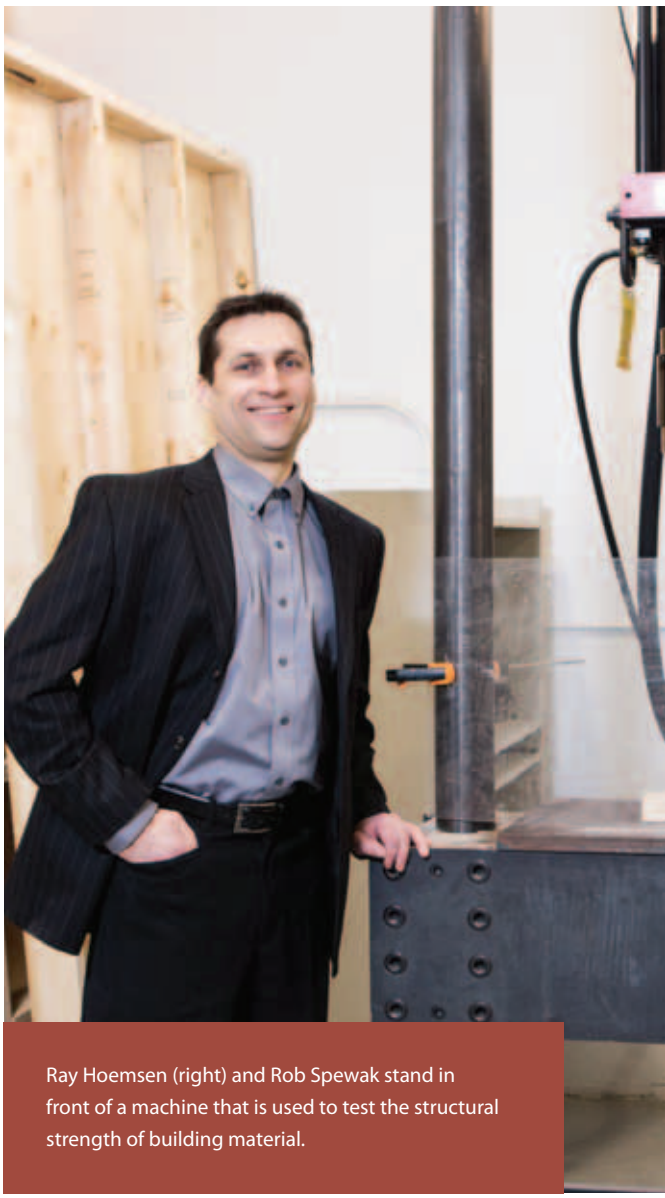
Research Manitoba

BUILDING FOR THE FUTURE

CARSI IS A LEADER IN THE TESTING OF BUILDING PERFORMANCE AND ENERGY EFFICIENT CONSTRUCTION MATERIALS

By Joel Schlesinger



Ray Hoemsen (right) and Rob Spewak stand in front of a machine that is used to test the structural strength of building material.

Few places can compare to Winnipeg for dramatic changes in weather.

Over the course of a typical year, this city's temperatures will swing from a frigid -30 C in winter to a blazing hot 30 C in summer.

Those wild swings from icy cold to sizzling heat combined with heavy rain and snow loads can take a toll, especially on the materials used in the construction of roads and buildings.

Which brings us to Ray Hoemsen and his colleagues at the Centre for Applied Research in Sustainable Development, also known as CARSI. The centre was conceived as a grass roots idea by the School of Construction and Engineering Technologies at Red River College.

Located on the Notre Dame Campus of Red River College, CARSI is one of places in Canada where builders can test materials for building envelopes – the outer walls of a building – to see how they hold up to the forces of Mother Nature.

To that end, the facility features a huge walk-in environmental testing chamber. Large enough for a car, the chamber has a barn-style door and is divided into two compartments, each of which can be independently controlled. On any given day, Hoemsen and his crew can turn the thermostat in either compartment down to -40 C or up to 40 C; wall assemblies can be placed in a common wall opening and tested against temperature and humidity differentials.

Yet the testing done in the chamber is just one of many activities taking place at CARSI. Since opening in 2007, the centre has become one of Manitoba's testing facilities for leading-edge construction techniques and technologies. It is also the province's first dedicated applied research centre at a community college or polytechnic, and one of the first college projects to have received funding from the Manitoba Research and Innovation Fund, now administered by Research Manitoba. The Canada Foundation for Innovation and building industry members also invested in CARSI. "Without this support, we wouldn't have CARSI," says Hoemsen, Director of Applied Research & Commercialization at Red River College.

During its brief existence, CARSI has already had a huge impact on construction in Manitoba. In fact, it's quite possible that Manitoba Hydro Place, the Crown Corporation's office tower located on Portage Avenue near the MTS Centre, would not be one of most lauded and successful environmentally sustainable high-rise buildings in North America if not for CARSI.

That's because one of CARSI's original industry partners was Manitoba Hydro, and its first research project was Hydro's downtown headquarters. In fact, the building that houses CARSI was specifically designed and constructed with a removable east wall to accommodate testing the innovative curtain wall technology used in Manitoba Hydro Place's design.

"Basically, Manitoba Hydro was able to install a double-curtain wall assembly in CARSI similar to the one used in the building downtown to test it for energy efficiency," he says.

The Crown corporation also tested other elements of its building at CARSI, including the efficacy of modular office furniture, acoustic levels and environmentally friendly finishes (paint, carpet, etc.).

In addition to being a testing ground for the province's construction industry when working on large projects, CARSI is also helping to set new standards for building energy efficiency and sustainability. In particular, CARSI has earned a reputation throughout Western Canada for its applied research regarding the testing of building envelopes of existing large buildings and the potential impacts on energy efficiency.

"'Build tight; ventilate right' is the saying they use in the industry for building envelopes," says Rob Spewak,

Research Manager of Applied Research & Commercialization at Red River College.

Funded by Natural Sciences and Engineering Research Council of Canada – or NSERC for short – CARSI's building envelope testing unit specializes in an often overlooked area that can impact energy efficiency: whole building air leakage characteristics of large institutional and commercial buildings, including multi-unit residential buildings.

Spewak and students from Red River's Architectural/Engineering and Mechanical Engineering Technology Departments have tested buildings across the province for air leakage in building envelopes.

However, this is not just a matter of testing how airtight a building is; of equal importance is where the air leakage locations are within a building. A building's materials and assemblies integrity can be impacted on the whole depending on the location of a given leak.

"With stack effect, in a building, warm air rises and there's higher pressure at the top of the building combined with mechanical systems pressurization and wind," says Spewak. "Warm, moist air can seep into cracks and other openings – any imperfection – and it can eventually cause condensation to form within the wall assemblies, which can result in mould growth, corrosion and freeze/thaw cycling, which will expand the water to push the walls apart, leading to building envelope failure."

Examples of envelope failure are numerous in Winnipeg, which has a large stock old buildings built long before controlling air flow and humidity was a design consideration.

Spewak says the former Public Safety Building, the Winnipeg Convention Centre, Concert Hall and even the Winnipeg Art Gallery are four well-known examples of building envelope failure which all required costly repairs and retrofits.

Until CARSI launched its testing project, no mechanism existed for whole building air tightness testing for large building envelopes in Winnipeg, though Manitoba Hydro had done extensive testing on homes and some work on two large buildings.

Yet the need for this kind of testing to assess the impacts on energy efficiency was compelling from a cost perspective. In light of this, Manitoba Hydro provided additional funding to undertake this research in order to gain an understanding of the types of energy savings that could be realized from constructing airtight buildings and performing remedial sealing work for retrofit projects.

The benefits of CARSI to the economy of Manitoba are evident. Thanks to research at CARSI, more than two dozen large structures have been tested so far, and the research unit has developed the expertise to help establish new Canadian and even North American testing protocols and standards for building envelope testing.

This research has complemented other activities at CARSI, such as the monitoring of both existing and new building envelope materials with embedded sensors that monitor the ongoing performance and stability of building envelopes.

CARSI's first work in this area involved the restoration of the old Union Bank Tower in the Exchange District when it was being retrofitted to house Red River's culinary school, the Paterson GlobalFoods Institute.

"The challenge was the building had been there for about 100 years with no insulation and now we were adding insulation as part of the new design," Spewak says.

Realizing the potential problems that might arise due to potential moisture accumulation, architects and engineers working on the project worked with CARSI to install sensors into the building's exterior wall section to facilitate long-term monitoring of moisture and temperature profiles.

Yet beyond helping the construction industry build more sustainably, CARSI has served an equally important purpose by providing cutting-edge training for Red River students, Hoemsen says.

"We've been helping prepare our graduates for the workforce with the latest skills, using the best new applied technologies that will help them forge long, successful careers."

Dr. Yvonne Boyer (centre), Julia Stoneman-Sinclair (left) and Sheyenne Spence are researching how the law affects the delivery of health care to Aboriginal people.

CHANGING THE SYSTEM

RESEARCHER WORKS TO ENSURE INDIGENOUS PEOPLE GET THE HEALTH CARE THEY ARE ENTITLED TO

By Holli Moncrieff

Dr. Yvonne Boyer is a woman on a mission.

As the Canada Research Chair in Aboriginal Health and Wellness at Brandon University, she is determined to change policies that keep Indigenous people from receiving proper health care.

Boyer is uniquely qualified for the task, which she considers to be her calling. Although she has been a lawyer for nearly 20 years, she used to work in the health-care system as a nurse.

She didn't like what she saw.

"I was getting fed up with the health-care system and pretty frustrated with what I was seeing," she says in reference to barriers that prevent Aboriginal people from getting the health care they were entitled to. "I decided I could either keep complaining about it, or I could do something about it."

Determined to acquire legal tools to make changes, she was accepted into law school. Today, her focus involves looking at constitutionally protected Aboriginal and treaty rights from a legal health perspective. "This is one of the reasons I got into law," she says.

The health of First Nations, Metis and Inuit is in crisis, as indicated by the increasingly high rates of diabetes, cardiovascular diseases, HIV/AIDS, mental-health issues and addictions.

One of the biggest obstacles facing Aboriginal people who need to access health care is an outdated federal guardian-and-ward policy. This policy, used as a means to implement institutionalized colonialism, stated that Aboriginal people in Canada were wards of the federal government. Although overturned in 1982, Boyer says it still underpins many of the current policies that are in place today.

"That's what needs to change," she says. "People must realize these dated and racist approaches simply do not work. Corrections can and

should be made, and political will at the provincial and federal level would create significant and important changes."

As an example of how the guardian-and-ward policy still influences health care, Boyer cites the difficulty First Nations face in obtaining a Continuous Positive Airway Pressure (CPAP) machine under the Non Insured Health Benefits (NIHB) regime.

The CPAP machine is a common treatment for obstructive sleep apnea, which causes people to stop breathing during sleep.

"As a non-Indigenous person under the provincial system, you would get a CPAP machine and bring it home. As a First Nations person, you'd have to go through a three-month trial to see if you could take care of it properly." In other words, the First Nation ward must be approved by the nurse or doctor guardian before being given the same machine that any other Canadian citizen would receive without the three-month waiting period for approval. "This is ridiculous," says Boyer.

Until recently, Aboriginal people were forced to accept health care as provided as governments did not recognize Aboriginal and Treaty rights to health. However, recent Canadian court decisions and the United Nations Declaration of the Rights of Indigenous Peoples have changed the legal and policy environment.

The legal landscape has been given a foundational shift with the First Nations Child and Family Caring Society of Canada filing a complaint with the Canadian Human Rights Tribunal, arguing that Canada discriminates against First Nations children by consistently underfunding child welfare on reserves.

"We have poor health care, on- and off-reserve. The whole system needs to be revamped. We're looking at the policies that are detrimental to Aboriginal people, and the racism in the health-care field," Boyer says. "I would like to see proper consultation of the people affected by the laws and that does not seem to be happening."

Boyer suggests that positive change can be implemented immediately when new legislation impacts Indigenous people. For instance, the Family Homes on Reserves and Matrimonial Interests or Rights Act should have an appropriate level of resources to ensure protection for women if they are forced out of their homes due to a family breakdown. These women often have no choice but to flee to the city with their children, where they then live in poverty. "We need to put processes in place to take into consideration the best interests of the children," she says.

"We also need equitable funding for health care in this country. Treaty 6 says the government will provide a medicine chest. This needs to be upheld and recognized – that there is a treaty right to health. I propose that there are treaty rights to health in all of the numbered treaties and Aboriginal rights to health for First Nations, Metis and Inuit in Canada, and that these rights are protected by the Canadian constitution which is the supreme law in Canada," Boyer says. "I am confident we will have a positive impact on developing policies that impact Aboriginal people. I believe all levels of government will be satisfied when this results in better health."

Boyer and her two research assistants, Julia Stoneman-Sinclair and Sheyenne Spence, are working toward improving Aboriginal health in a number of projects that are financially supported by the Canadian Foundation for Innovation, Research Manitoba and the Law Foundation of Manitoba. One pressing issue is the need to gather the evidence and document the interaction between the spiritual and physical aspects of the community, and the resulting impact on the people's health.

Through interviewing Elders and other community members, Boyer and her team hope to start filling this gap in understanding Indigenous health practices and law. The overall purpose of Boyer's research is to provide a comprehensive base of knowledge that will inform further action leading to positive change in health care for all Canadians.

Dr. David Levin holds up a sample of the biodegradebale plastic he and his team have been developing at the University of Manitoba.

SAVING THE PLANET

RESEARCHERS USE BACTERIA TO CREATE BIODEGRADABLE PLASTIC

By Joel Schlesinger

The 10-centimetre disc Dr. David Levin holds in his hand may not look like much. It could be mistaken for a coffee cup coaster.

But to Levin and other researchers in the Department of BioSystems Engineering at the University of Manitoba, this disc potentially represents the Holy Grail of sustainable, environmentally friendly design.

"There's a global effort to find renewable materials from chemicals derived from natural products as opposed to petroleum," says the bioengineering professor.

The disc represents the fruits of the latest research taking place at the university in the quest to develop greener materials that can be used in all forms of manufacturing.

The work is part of a larger initiative called the Microbial Genomics for Biofuels and Co-Products from Bio-Refining Processes Project.

Although the name is a mouthful, the project's work is easy to grasp: using bacteria to make green products – everything from biodegradable packaging for foods to biofuels that reduce gasoline consumption.

The disc is one of its most promising endeavours since the project received funding from Genome Canada in 2009. It is essentially a type of flexible plastic made from a common bacterium found in the soil that feeds on agricultural waste, converting it into basic molecules called monomers. Those basic molecules are then linked together through chemical processes to form more complex ones called polymers.

"It's kind of like Lego," Levin says. "Except, each little Lego brick in this case is actually a monomer, and when you link them together you get a polymer."

Polymers are essentially what plastic and other synthetic materials are made of – only in this case they're naturally derived and biodegradable as opposed to commonly used petroleum-based plastics. What makes them so potentially important is that they could reduce and even eliminate our use of petroleum-based plastics, which is good news for the

health of the planet.

"The Earth is inundated with petroleum-based plastics, which are not biodegradable and accumulate in landfills, and then they break down through erosion into microscopic particles, which end up in places like the ocean," Levin says. "Basically, these beads of plastic are showing up in filter-feeding animals like clams – and they're literally clogging up the ecosystem."

Levin says the development of these new bacteria-derived polymers is a result of years of hard work by several scientists and students at the university. The group includes Dr. Richard Sparling, in the Department of Microbiology, and Dr. Nazim Cicek, in the Department of Biosystems Engineering. Together, these researchers are pushing the envelope of green packaging and other manufacturing processes through their work with bacteria. What they have uncovered is a process to use different bacteria to tailor-make natural plastics for specific applications.

"For the last five years, we've had this large $10-million program doing research into bacteria that uses cellulose (agriculture waste) to produce hydrogen and ethanol, but a smaller component of that large-scale research program focuses on bacteria that can convert industrial or agricultural waste into natural polyester polymers."

While developing green fuel from agricultural waste continues to be a focus, the offshoot research into developing environmentally friendly polymers is perhaps more promising.

It's why their research has attracted national and even international research funding partners alongside continuing financial support from Research Manitoba, responsible for funding research in the province from health care to industrial design.

Levin, Sparling and Cicek's research also involves industry partners, and that's where that little disc comes in. It's a sample fibre that can be tested by stakeholders who may benefit from these new green materials.

Winpak, a Winnipeg-based food packaging manufacturer, is one of those partners now testing the polymer's ability to keep food fresh. Other research partners around the globe are pitching in too, testing the polymer-based material's heat resistance and tensile strength.

The results are pending, but the hope is that these polymers help overcome a number of problems that have stumped researchers around the globe in developing biodegradable materials.

"Most of the naturally derived polymers are not thermal stable," Levin says. "They break down around 50 C, and for manufacturing you really need something that's stable up to 130 C.

Another challenge will come afterward if the polymers hold up to the testing: manufacturing them on an industrial scale.

So far, the research team has produced them in small amounts in test tubes and flasks on the lab bench. "And then we've moved beyond that using bio-reactors where we can grow five to 10 litres of polymers at one time," he says.

The ultimate goal is to manufacture millions of litres of polymers that could hopefully replace petroleum-based plastics altogether. Certainly the natural resources to produce the polymers are abundant.

"Billions of tonnes of waste from agricultural and industrial processes – like making bio-diesel from canola – are produced annually and it has no value right now," he says. "You have to actually pay to get rid of it, so we are hoping to make something out of it that has potentially a great deal of value."

LITTLE LAB, BIG QUESTIONS

MANITOBA CENTRE PROMOTES GROUNDBREAKING MENTAL HEALTH RESEARCH

By Joel Schlesinger

It's the little lab tackling big problems.

Winnipeg's Traumatic Stress Laboratory is less than 700 square feet in size, yet it has established itself as an important hub in advancing mental health care – not just in Manitoba, but around the world.

The facility – located on the fourth floor of the PsycHealth Centre at Health Sciences Centre Winnipeg – doesn't look like a typical laboratory. There are no flasks or lab benches.

Instead, it consists of office space, a conference room, telehealth suites and a host of state-of-the-art computers and web servers.

One of the driving forces behind the centre is Dr. Jitender Sareen. A leading researcher of anxiety disorders and post-traumatic stress disorder, Sareen's work includes efforts to reduce homelessness and initiatives to help address the epidemic of suicide among First Nations youth living on isolated reserves.

The lab has been instrumental in advancing this work, as well as that of other Winnipeg-based researchers working in the mental health field.

"It brings together high-quality personnel in medicine, psychology and epidemiology to work on research projects that are funded by national agencies and the Manitoba government," says Sareen, a professor in the Department of Psychiatry, Psychology & Community Health Sciences at the University of Manitoba.

That alone is important because it addresses a common problem in the research community where scientists work in silos, which can limit the focus of the work and, in turn, the impact of their findings. By bringing together experts from different backgrounds, the lab promotes collaboration and cross-pollination of ideas, and that leads to better research in finding solutions to complex problems.

Yet federal and provincial funding – in large part through Research Manitoba – has not only provided this physical location, it has also allowed the lab to purchase high-powered computers to gather and store data from mental health studies from around the world.

"What's really unique here is that we now house some of the largest population-based surveys found anywhere," says Sareen, who is also Director of Research and Anxiety Services and the Group Leader of Manitoba Population Mental Health Research Group – both headquartered at the lab.

"This essentially helps us advance our knowledge in mental health research here in Manitoba."

The high-speed computer power also has another benefit: crunching big data. This is profoundly important because researchers at the lab can now synthesize vast amounts of data from very large studies from researchers in various countries, including Canada, the United States, the Netherlands and Germany, to quickly to expand the scope of their own work.

"With this lab, we're able to take these complex datasets and ask questions that we would not be able to answer in Manitoba because we do not have the sample size or the time to collect these kinds of comprehensive, large surveys."

Sareen says the lab's computing capacity essentially brings Manitoba's population-based mental health research capacity into the 21st century.

"This kind of research really became possible after the 'data liberation movement' in 1990s when the U.S. government decided to make very large population surveys available via the Internet to researchers around the world."

With the Winnipeg lab able to collect, store and, more importantly, interpret data, local researchers save time and money while expanding the potential benefits of their work in directing better mental health care.

One example of this benefit is Sareen's recent research into anxiety disorders.

His team of graduate students at the U of M was able to expand the scope of its own study using a survey of 5,000 people from the Netherlands that collected data about mental health at three different time points.

"We wanted to understand the relationship between anxiety disorders and suicide risk over time," he says. The Dutch study allowed them to do this. "We could examine causality: Did anxiety disorder put people at risk for suicidal behaviour later on down the road?" he says. "It's similar to how researchers looked at the link between smoking and lung cancer; you need the causal agent to come first – smoking – and the effect later – lung cancer."

This epidemiological approach to studying mental illness has helped research in Manitoba on a number of other fronts, from participating in a nationwide survey examining the relationship between mental illness and homelessness to investigating incidence of PTSD among Canada's soldiers.

The lab has also helped mental health researchers develop and test intervention strategies, including in one of Sareen's areas of focus: suicide prevention among youth in Manitoba First Nations communities.

Suicide risk among Indigenous youth in Canada is five to seven times higher than in non-Indigenous youth, and implementing prevention

strategies has proven challenging in large part because many at-risk youth live in remote areas far removed from mental health services.

For that reason, Sareen says the most effective strategies must involve the communities where the youth reside, so he and other researchers have been working with First Nations leaders to develop intervention strategies, including one for children age nine to 12 before they reach the age when suicide risk is highest.

The lab's high-quality teleconferencing equipment from MBTelehealth has been instrumental in this work, allowing researchers to meet regularly with community stakeholders living in remote areas of Manitoba.

So far, they've worked with communities to design culturally-grounded prevention and early intervention programs. And because the work is being conducted at the research lab, Sareen and other researchers are then able to track the effectiveness of the strategies using data collected from the communities and match the findings with other demographic data collected by Manitoba Health, Manitoba Vital Statistics, and Statistics Canada.

Other research projects underway at the lab include one regarding the connection between homelessness and mental health.

Sareen says the lab is participating in a nationwide study looking at whether it's better to treat homeless people for mental health problems and then address their housing needs – as currently done – or the other way around.

"What the research uncovered so far is that housing people first leads to better outcomes than treatment as usual. These findings have had national and international impact," Sareen says.

While the answer may seem obvious, it's only the evidence-supported ones that will ultimately have a positive impact on mental health care.

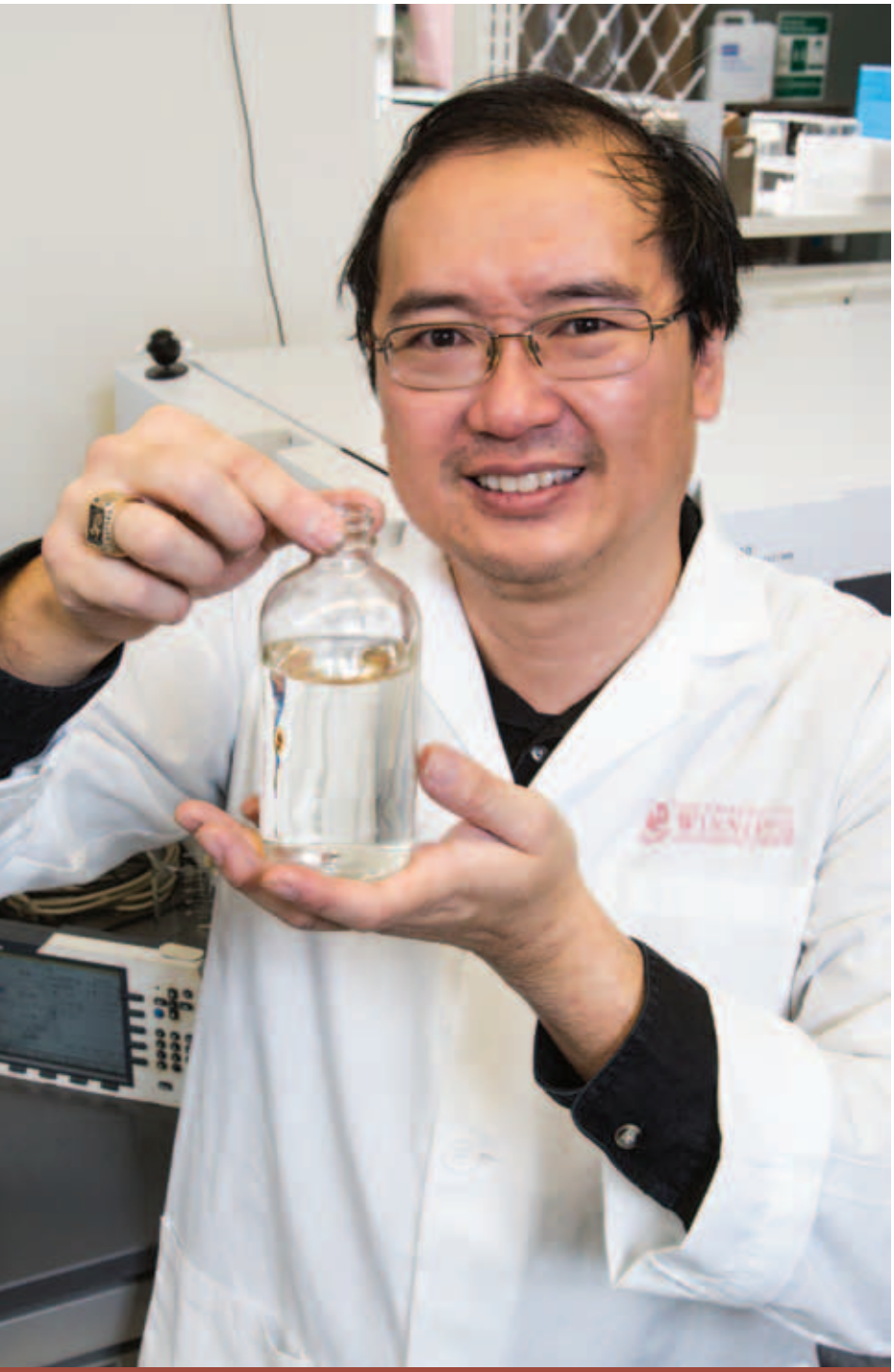
To that end, the Traumatic Stress Laboratory is a vitally important tool.

Dr. Jitender Sareen at his lab on the fourth floor of the PsycHealth Centre.

WATER WATCH

DR. CHARLES WONG IS MONITORING THE HEALTH OF THE RED RIVER

By Susie Strachan



Dr. Charles Wong checks out a sample of water.

In many ways, the Red River is the lifeblood of southern Manitoba.

As it meanders north from the Canada - U.S. border near Emerson before emptying into Lake Winnipeg, the river provides water for agricultural irrigation and is used as a source of recreation by fishers and boaters alike.

As a result, it's important to keep tabs on the Red to make sure it is as healthy as it can be.

That's where Dr. Charles Wong enters the picture. A professor at the University of Winnipeg, Wong is studying how modern agricultural chemicals and other man-made products are affecting the Red.

"We're looking for four dozen different chemicals in the water," says Wong, Canada Research Chair in Ecotoxicology in the Department of Environmental Sciences and Studies and Department of Chemistry at the university's Richardson College for the Environment.

This past summer and fall, Wong's research team deployed devices to collect samples from the river at numerous locations from Emerson to Lake Winnipeg, as well as parts of the Assiniboine River, which feeds into the Red. Each device was placed in the water for two to three weeks, to give the researchers a good look at what flows by.

"We're particularly interested in where chemicals enter the water. The USA is a major source, and then there's not much again until it comes to Winnipeg, which dumps wastewater into the river," says Wong. "You really see the concentrations go up as the Red passes through the city. While the city removes organic solids from wastewater, there are pharmaceuticals and personal care products dissolved in the water, many of which may have a profound effect on biology."

The team uses a $350,000 state-of-the-art liquid chromatograph tandem mass spectrometer – funded by Research Manitoba and the Canada Foundation for Innovation– to identify the chemicals dissolved in the river water samples. "Essentially, the machine separates and blows the molecules apart, so we can identify the chemicals in each sample," he

says. "The machine can process hundreds of samples at once."

The research group is still working on the samples. Once identified, each chemical will undergo further testing to determine its effects in both lab-controlled trials and on real-world ecosystems.

Wong says a herbicide called atrazine is of particular interest. "Atrazine is showing up in low levels in the Red. This is a chemical mostly used on corn crops. We know that this is coming in from the United States, which grows much more corn than we do in Manitoba," he said. This chemical was banned in 2004 in the European Union as it may disrupt normal hormonal systems in animals.

Along with atrazine, Wong says his group has already detected quite a few chemicals dissolved in the Red's water, including agricultural chemicals, personal care products and pharmaceuticals for both human and veterinary use, including antibiotics.

"A lot of these are bioactive. They get into the fish and the entire ecosystem," he says. "Antibiotics, for example, can cause bacteria to become resistant to their use, which has implications we all know about: how antibiotics aren't working as well as in former years."

Another chemical group of interest to Wong and his team are neonicotinoids, which are insecticides applied to seeds for many major agricultural crops. These chemicals have been implicated in honey bee colony collapse disorder, says Wong, so it's important to know if they are in the ground water and in the river at levels high enough to cause problems. "This is part of a world-wide effort to see what is happening to the bees," he says, adding that bees are a very important part of the food chain.

Wong's research group is the first to study the Red River for sources of the chemicals, along with their lifespan and effect on the ecosystem of the river.

The results from his surveys will influence government policy on a variety of issues that affect the health of the Red, including waste water treatment and agricultural run-off. The study will also be forwarded to the International Joint Commission on water quality between Canada and the United States.

Of course, Manitobans can also take action to protect the Red right now, says Wong, who is a member of the Lake Friendly water advisory group and works with the Lake Winnipeg Research Consortium, which is studying the effect of pollutants on the lake's ecology, including toxic algae blooms.

For example, he suggests people not flush old medications down the toilet, which often end up in the river. Instead, take these medications to pharmacies for safe disposal.

People are also encouraged to use biodegradable personal care and house-cleaning products, as these also enter the waste water system and are flushed into the river. Some care and cleaning products can add to the phosphate load, which is helping to kill the ecosystem in Lake Winnipeg.