



RESEARCH
EXCELLENCE
at the Canadian
Arthritis Network



CANADIAN
ARTHRITIS
NETWORK | LE RÉSEAU
CANADIEN
DE L'ARTHRITE

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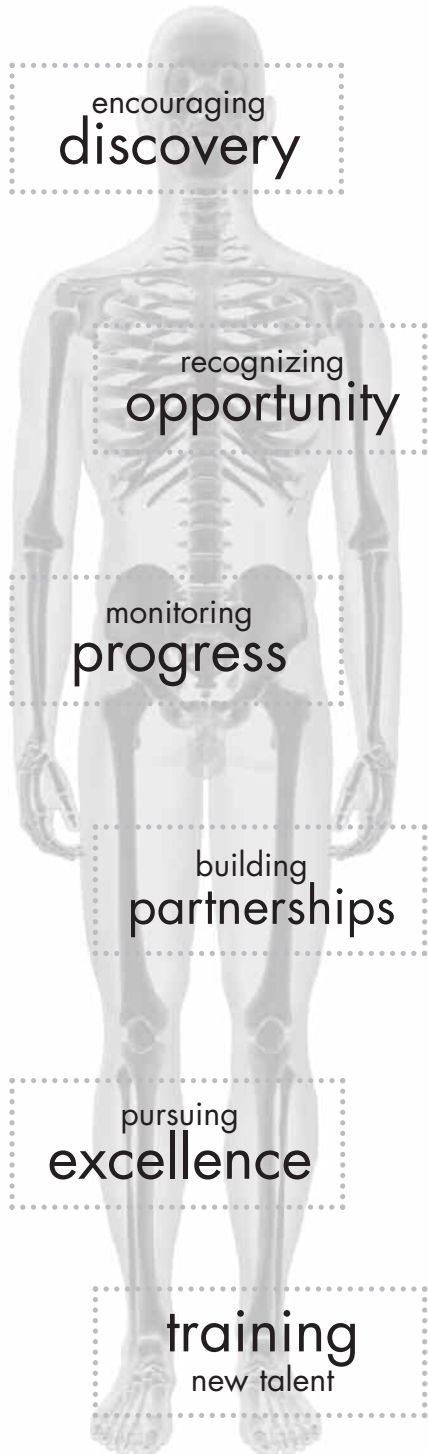


Our Mission

The mission of the Canadian Arthritis Network (CAN) is to maximize CAN's Research and Development (R&D) partnerships involving Network Investigators, industry, consumers and government, to create and translate knowledge and discoveries that will improve the quality of life of people with arthritis, decrease the economic disease burden, promote the growth of the Canadian economy and ultimately cure arthritis diseases.

Our Mission

The Canadian Excellence in Arthritis



Ten years ago, the Canadian Arthritis Network was an ambitious dream conceived out of necessity. Arthritis researchers worked in isolation: consulting with people afflicted by arthritis was rare. Back then, when a small, hopeful group of arthritis stakeholders – led by The Arthritis Society (TAS) – gathered to flesh out the details of a national network that would bring together arthritis stakeholders from across Canada for a shared purpose, they could not have envisioned the organization that exists today.

The Canadian Arthritis Network (CAN) is funded by the federal government’s Networks of Centres of Excellence program to harness excellence in arthritis research in Canada, legally protect and commercialize original thought (i.e. intellectual property) resulting from member research, and to foster new and upcoming arthritis research talents.

Arthritis Network Promotes Research

CAN is making important progress towards accomplishing its vision of *a world free of arthritis*. It has succeeded in making people who have arthritis a meaningful partner in the research process and in supporting multiple teams of arthritis researchers who hail from different institutions and different disciplines to work together, make breakthrough discoveries and continue to evolve our knowledge of arthritis.

We hope this document will provide a snapshot of some of the worthy research being funded by CAN, together with its partner organizations. Science moves slowly, but important progress is being made every day to connect all the different pieces of the arthritis puzzle. The ultimate goal of all arthritis research is to help you.

“THE INTEGRATION OF THE CONSUMER ADVISORY COUNCIL AT ALL DECISION-MAKING LEVELS IS FORWARD THINKING AND COULD BE AN INSPIRATION TO OTHER NETWORKS OF CENTRES OF EXCELLENCE.”

– Network of Centres of Excellence
Selection Committee report, July 2004

“THE CANADIAN ARTHRITIS NETWORK DEMONSTRATES ITS LEADERSHIP AND INNOVATION THROUGH THE FULL INCLUSION OF CONSUMERS IN ALL ASPECTS OF ARTHRITIS RESEARCH DECISION-MAKING.”

– Jay Fiddler, co-chair, CAN’s Consumer Advisory Council, 2004-2007

Osteoarthritis



In 1999, CAN began funding praiseworthy, team-based research focused in three areas: Osteoarthritis, Inflammatory Joint Diseases and Bioengineering for the Restoration of Joint Function (restoring diseased joints).

The initiatives and research projects that follow are a small sample of the work of CAN-funded researchers in these three fields. CAN is proud to support Canada's exceptional arthritis researchers.

Inflammatory Joint Diseases

Bioengineering



The importance of a good night's sleep

Many people with osteoarthritis (OA) experience sleep disturbances at night and fatigue during the day and do not realize that both contribute to arthritis aches and pains. CAN Investigator Dr. Gillian Hawker and her team at Women's College Hospital in Toronto have conducted several studies on sleep and fatigue in people with OA.

Sleepiness and overnight sleep assessments, carried out by Drs. Hawker and Brian Murray with the help of volunteers with OA, suggest that individuals with OA may be experiencing significant daytime sleepiness, but are not aware of the degree of the problem.

Another project, led by Arthritis Community Research and Evaluation Unit (ACREU) Director, Dr. Elizabeth Badley, with Dr. Hawker and CAN funded graduate student Denise Power, is evaluating the relationship between pain, depression,



Dr. Elizabeth Badley

fatigue and OA disability. Many of the symptoms and measures of fatigue – such as lack of energy – overlap with those of depression, so the team must consider the multi-dimensional nature of fatigue to determine if pain, fatigue and depression represent distinct or mixed conditions. Results from both projects will lead to more accurate treatment of these symptoms that have an immense impact on quality of life.



Dr. Gillian Hawker

**CAN's
PROGRESS
& RESULTS**

➤ CAN has offered financial support to 1600 (to March 2006) undergraduate, graduate and post-graduate students and given them the opportunity to work on CAN-funded projects; 90 per cent continued their careers in arthritis research, medicine or veterinary medicine and 78 per cent have remained in Canada.

Working 9 to 5



**Dr. Diane Lacaille and
Dr. Monique Gignac**



Two CAN Investigators are separately studying the very important issues surrounding arthritis in the workplace. As the leading cause of long-term disability in Canada, arthritis has a huge impact on the economy at a cost of \$3.4 billion per year.

Dr. Diane Lacaille is a rheumatologist and assistant professor at the University of British Columbia and a research scientist at the Arthritis Research Centre of Canada. She has developed a program to help people with inflammatory forms of arthritis remain in the workplace. The development and pilot testing of the program involved people with arthritis at all stages of the process. The five week program included group sessions about enhancing self-management of problems at work, and consultations with an occupational therapist and a vocational rehabilitation counsellor. Results from the pilot testing are very promising. It is hoped that once this pilot study is expanded into a large-scale trial to demonstrate its effectiveness, the program will be launched across Canada.

Dr. Monique Gignac is a senior scientist with ACREU at the Toronto Western Research Institute and an associate professor in the Department of Public Health Sciences at the University of Toronto. She studies stress, coping and adaptation to chronic illness and disability. Her research examines the areas related to working when you have arthritis that people find most difficult and stressful and the environments and behaviours that allow some people to successfully cope with their illness at work. This research is extremely important to people living with arthritis who face the fear of losing their source of income and, for many, a defining part of their identity.

Genetic links to osteoarthritis

The human genome consists of approximately 20,000 genes. The activity of some of these genes changes in osteoarthritis (OA), which can lead to the destruction of joint cartilage.

At the University of Western Ontario, CAN Investigator Dr. Frank Beier and his collaborators have undertaken comprehensive analyses of all the genes in a research model of OA and identified over 1,000 genes that change their activities in the disease. Many of these genes have not been previously linked to OA. Current studies will reveal whether the functions of these genes are suitable targets for the development of new drugs to prevent, stop or reverse OA.



Dr. Frank Beier

THE HUMAN GENOME CONSISTS
OF APPROXIMATELY 20,000 GENES.

CAN's PROGRESS & RESULTS

➤ CAN has contributed to the development of a standardized knee examination that was adopted by industry, the Food and Drug Administration and the National Institute of Arthritis and Musculoskeletal and Skin Diseases Osteoarthritis Research initiative in the U.S.

CAN's PROGRESS & RESULTS

➤ CAN and TAS partner on a training program that has resulted in over \$6 million being used to train future scientists, freeing up CAN dollars for other projects.

More than one kind of pain in OA

Is there a difference between on-going pain and movement-induced pain in osteoarthritis (OA)? This question is being answered by the team working in Dr. James Henry's lab at McMaster University in Hamilton.

Using research models of OA, the Henry lab studies the changes in sensory neurons (cells in the nervous system) in the spine that translate nerve impulses from joints when nerve terminals in tissues, called sensory receptors, are triggered. These changes in sensory processing in the spinal cord are linked with some types of chronic pain. The repetitive movement of joints in the research models causes an increase in the activity of these neurons, suggesting a link to the pain that is experienced by people with OA.

Dr. Henry's team has found that there are differences between the spinal pain neurons in diseased models and non-diseased models, meaning that on-going pain and movement-induced pain may each require its own type of treatment. Research in this area could lead to more specific and effective pain treatments.



Dr. James Henry's (centre, front) research team

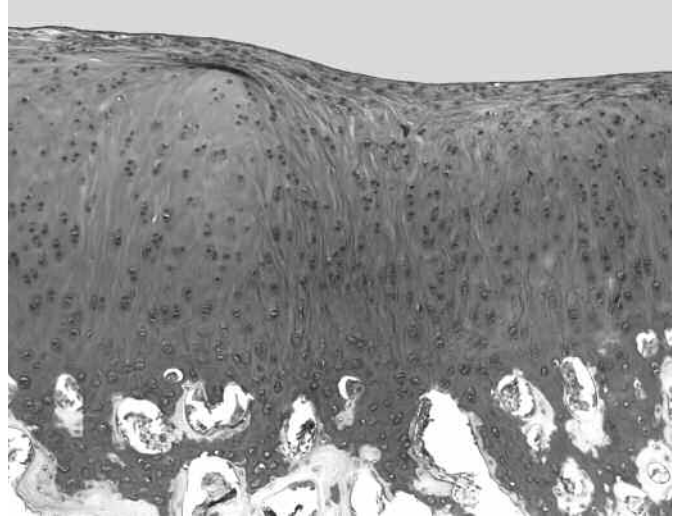
Engineering a promising new technology

Currently in clinical trials, BST-CarGel® is a polymer formulation that, when combined with a patient's own blood, can be implanted into an area of damaged cartilage to stimulate growth and repair. The polymer/blood mixture has unique properties: it sticks to bone and cartilage and solidifies as a stable clot, where it works like a living scaffold to begin cell movement from underlying bone marrow that helps the cartilage rebuild. The product was developed by a team of CAN researchers, led by Drs. Mike Buschmann and Caroline Hoemann at École Polytechnique in Montreal, working with Dr. Mark

Hurtig, a veterinary surgeon in Guelph, and Dr. Marc McKee at McGill University.

BST-CARGel® STICKS TO BONE AND CARTILAGE AND SOLIDIFIES AS A STABLE CLOT, WHERE IT WORKS LIKE A SCAFFOLD TO HELP THE CARTILAGE REBUILD.

A clinical trial, approved in the fall of 2005 by Health Canada, is being conducted by Laval based BioSyntech, a biomedical company that manufactures BST-CarGel®. This medical device shows tremendous promise for completely repairing damaged cartilage.



Cartilage regenerated in an adult sheep cartilage defect, 6 months after treatment with BST-CarGel® above an actively remodeling bone bed (Hoemann et al, Journal of Bone and Joint Surgery, 87:2671-2686, 2005).

CAN's PROGRESS & RESULTS

➤ CAN has established a career development program that includes training rotations at the provincial, national and international level that benefits graduate students, post-doctoral fellows and new independent investigators.



Dr. Tassos Anastassiades

(Man-)Made in Canada solution offers hope

Dr. Tassos Anastassiades of Queen's University has discovered a new, man-made class of compounds that is derived by chemically modifying the glucosamine molecule (glucosamine is a popular, naturally occurring arthritis medication). With CAN's help and advice, a number of patents have been issued to protect these compounds and aid in commercial development. The "lead" compound, Anabu™, has shown striking benefits in the preservation of cartilage and bone in research models of inflammatory arthritis and osteoporosis. Anabu's™ metabolism is different from that of glucosamine and it appears to be very safe, even at large doses. Anabu™ has been licensed to a large veterinary company and Dr. Anastassiades anticipates it will be on the market soon. With CAN's assistance, he is exploring optimal industrial partnership opportunities for human use.

CAN's PROGRESS & RESULTS

► CAN has helped build and promote the success of Canadian biotechnology companies (for example, Anacoti, BioSyntech, Corgene, Ellipsis, IBEX and Transition Therapeutics).

CAN's PROGRESS & RESULTS

► CAN has funded 69 (to 2006) multi-institutional projects.



**CAN's Bioengineering for the Restoration of Joint Function co-chairs:
Dr. Mike Buschmann, Dr. Rita Kandel and Dr. Michael Underhill**

Hip solution to joint replacement surgery

The standard method for treating damaged knee and hip joints is a replacement surgery using man-made implants made of metals and plastic. This surgery is only performed when the damage is very advanced, and unfortunately the implants will eventually fail due to material breakdown.

To keep individuals active for life, Dr. Rita Kandel and her team at Mount Sinai Hospital in Toronto – working with Dr. Robert Pilliar, at the University of Toronto, and Dr. Marc Grynblas (Mount Sinai), as well as Dr. Mark Hurtig at the University of

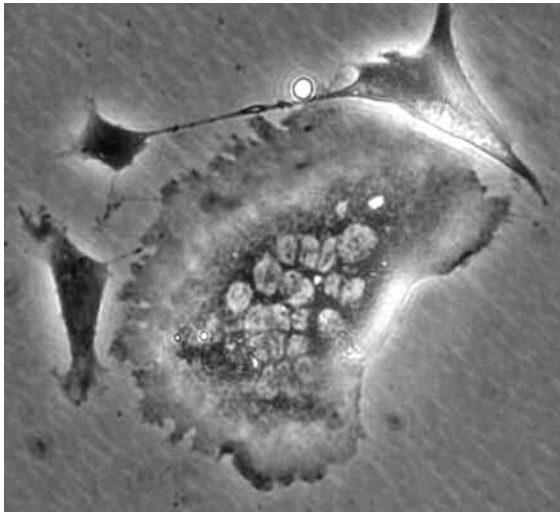
DR. RITA KANDEL HAS DEVELOPED AN ALTERNATIVE TO JOINT REPLACEMENT USING LABORATORY-FORMED CARTILAGE INTEGRATED WITH THE TOP SURFACE OF A NOVEL POROUS BIOMATERIAL

Guelph – have developed an alternative to joint replacement before a synthetic joint becomes necessary. The process consists of generating cartilage in the laboratory that is incorporated onto the surface of a new material and this is then used to fix a surface flaw and replace the damaged region of the joint. After implantation, bone will grow into the pores of the material and

anchor the implant in place. Over time, the implanted material will degrade and be replaced by bone that fuses with the overlying cartilage resulting in full regeneration of the damaged portion of the joint. This approach can be modified to generate a biological joint replacement that could be used instead of an artificial or synthetic joint.

This discovery will allow for earlier treatment of damaged joints, eliminating the pain associated with progressive degeneration of the joint, as well as eliminating or delaying the need for surgery and medication.

Important bone discovery for people with rheumatoid arthritis



Appearance of a living osteoclast “the bone destroying cell” viewed under a microscope.

Scientists have known for over 100 years that acidity in the body causes destruction of the skeleton, but have not understood how this occurs. A team of CAN investigators, located at the University of Western Ontario, solved this mystery thanks to the keen eye of Dr. Svetlana Komarova (now at McGill University). Working with Drs. Jeff Dixon, Stephen Sims, Alexey Pereverzev and dentistry summer student Jonathan Shum, the team made two important discoveries

that pharmaceutical and biotechnology firms can now use to develop new treatments. These new treatments would be targeted at preventing the activation of osteoclasts (bone destroying cells) and the bone loss that results from acidosis (too much acid in body fluids or tissues) without harming those osteoclasts involved in healthy, normal bone remodelling. This is a very significant development for people with inflammatory joint diseases, where joint inflammation leads to a local increase in acidity accompanied by bone loss.

CAN's PROGRESS & RESULTS

➤ CAN has obtained two licenses, issued 20 patents and copyrights, signed 27 confidential disclosure agreements, made 52 invention disclosures, created six spin-off companies and assisted 11 Canadian biotechnology companies in product development and validation.



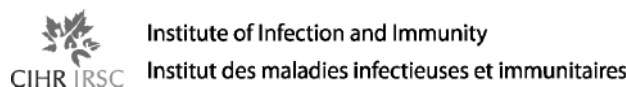
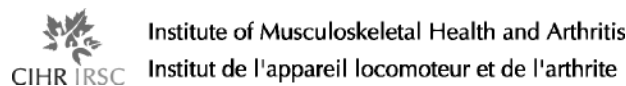
Dr. Alan Rosenberg

Ground-breaking research for Canada's children

In Canada, one in 1,000 babies, toddlers and children below age 16 suffer from Juvenile Idiopathic Arthritis (JIA), a painful form of inflammatory joint disease and one of the most common, chronic, disabling conditions of childhood. CAN has been an early supporter of new research in the area of JIA. One positive outcome has been the award, in 2006, of research funding of over \$1.1 million that was provided by CAN and its partners to Dr. Alan Rosenberg, from the University of Saskatchewan, and his “extraordinary group of Canadian scientists.” The team has been funded to study how the interaction of genes, environment and lifestyle early in the disease can help predict JIA outcomes such as joint damage and diminished quality of life. At one time, JIA was believed to be a form of adult rheumatoid arthritis. With the shift in understanding that JIA is a unique disease, research in this area becomes even more important. As the cause(s) of JIA is unknown, answers provided by this research, which brings us closer to a cure or prevention, are eagerly anticipated.

THE TEAM HAS BEEN FUNDED TO STUDY HOW THE INTERACTION OF GENES, ENVIRONMENT AND LIFESTYLE EARLY IN THE DISEASE PROCESS CAN HELP PREDICT JIA OUTCOMES SUCH AS JOINT DAMAGE AND DIMINISHED QUALITY OF LIFE.

CAN's Partners in JIA Research



EVALUATING THE SAFETY AND EFFICACY OF NEW ARTHRITIS THERAPIES FOR CANADIANS

The Canadian Rheumatology Research Consortium (CRRC) was launched in November, 2003, with support and funding from the Canadian Arthritis Network to create a clinical trials arm for the Network's research program.

CRRC was incorporated as a non-profit network with a mission to enhance the volume and scope of arthritis clinical research in Canada and to improve the access to new treatments for Canadian patients with arthritis. Originally concentrating only on rheumatoid arthritis, CRRC expanded its mandate in 2006 to include psoriatic arthritis, ankylosing spondylitis and osteoarthritis in its repertoire of clinical trial capabilities. Covering the most common types of arthritis increases CRRC's

significance to Canadians suffering from its various forms, and makes its services more attractive to pharmaceutical and biotechnology companies looking to test new treatments for people with different types of arthritis.



Canadian Rheumatology Research Consortium | Consortium canadien de recherche en rhumatologie

CAN'S PROGRESS & RESULTS

> CRRC's membership has grown to 58 community and academic rheumatologists from coast to coast. Since its launch, CRRC has initiated 34 clinical trials to evaluate 26 new therapies, primarily for rheumatoid arthritis. More recently, CRRC received its first clinical trial to assess a disease modifying drug for use in osteoarthritis.

TRAINING FUTURE ARTHRITIS LEADERS

Supporting the training and education of Canada's future arthritis researchers and leaders is a priority for CAN. Encouraging students to consider the field of arthritis for their life's work is also very important to the Network. That is why CAN launched a summer student program that invites medical students and students in the allied health professions – such as nursing, physiotherapy and dentistry – to work in arthritis research. The dedicated group of volunteers serving on CAN's Training and Education Committee ensures that the Network has a training strategy that meets the needs of trainees and the research community in academia and the private sector.



The Arthritis Society (TAS) also recognizes the immense value in supporting trainees by providing \$500,000 each year, since CAN's inception, to CAN for the training program. CAN is very grateful for the support it receives from TAS, which makes funds available to graduate students, research fellows and research scholars to acquire experience in basic science, clinical research, product services and development, and industrial partnering. Matching funds come from industry, federal and provincial governments and agencies, universities and research institutes that result in a million dollar training program to attract, train and establish the careers of Canada's future scientists and arthritis health care providers.



(l to r) CAN Investigator Dr. Caroline Hoemann supervises CAN trainee Dr. Catherine Marchand.

PEOPLE WITH ARTHRITIS HAVE A VOICE AT CAN

Consumers (knowledgeable patients) are represented at CAN through the Consumer Advisory Council (CAC). CAC is a national, volunteer group made up of informed people living with different types of arthritis who represent each of the provinces as well as Northern Canada and the First Nations Peoples. This group is an integral and strategically essential component of CAN's operational structure and a fundamental part of all of CAN's policy and decision-making activities.

CAN's commitment to working with consumers ensures their voice is always heard and that CAN's work is always relevant to people living with arthritis. This model provides researchers, health professionals and decision-makers with the benefit of a consumer perspective in their work, so often overlooked. CAC members work directly with CAN researchers and are involved in deciding research funding. Additionally, the involvement of consumers assists in the identification and prioritization



From left, CAN's Consumer Advisory Council co-chairs Anne Fouillard and Diane Gerhard

of issues, helps to avoid marginalization of vulnerable groups and populations, develops realistic outcome measures and communicates research and development results to a wider audience.

To learn more about CAN's Consumer Advisory Council, please visit www.arthritisnetwork.ca or call 416-586-4770.

CAN's PROGRESS & RESULTS

➤ CAN responded to requests from its Consumer Advisory Council to make fatigue a research priority by including it, along with pain, in our research initiatives and hosting a Workshop on Pain and Arthritis Research. Out of this workshop came three White Papers, one of which is an insightful perspective from consumers.



CAN and its members have much to be proud of, but the important work continues. We are committed to funding and promoting promising arthritis research, encouraging collaborations, partnerships and information sharing between arthritis stakeholders, and protecting and commercializing intellectual property that will benefit Canadians today and in the future.

You can learn more about the Canadian Arthritis Network by visiting www.arthritisnetwork.ca or by calling 416-586-4770.



The Networks of Centres of Excellence (NCE) program is a federal program administered jointly by the Natural Sciences and Engineering Research Council, the Canadian Institutes of Health Research, and the Social Sciences and Humanities Research Council of Canada in partnership with Industry Canada. NCE are unique, multi-disciplinary and nationwide partnerships among universities, industry, government and not-for-profit organizations, aimed at transforming Canadian research and entrepreneurial talent into economic, health and social benefits for all Canadians.

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