



Greetings from the Scientific Director

IMHA Applauds Award Winning Researchers



Dr. Cyril Frank
Scientific Director

Welcome to the fall/winter issue of IMHA on The Move - which also just happens to be our annual awards issue. In this special issue, IMHA and its partners are proud to recognize

excellent researchers from across the country who are not only advancing the science of musculoskeletal, oral and skin diseases, but improving the quality of life of thousands of Canadians.

While we applaud all of our award winners, who we are recognizing for their scientific excellence, I would also like to take this opportunity to tell you about two new awards programs - our Summer Studentship in Musculoskeletal Research and the Peter Lougheed/CIHR New Investigator Award - that support on-going capacity building.

Today, despite all of our best efforts, musculoskeletal, oral and skin diseases cost taxpayer over \$22 billion per year, and are in the lead in terms of their economic impact on society. While this economic burden is indeed staggering, it doesn't even come close to capturing the real life pain and suffering caused by these diseases and conditions. As an Institute, we feel it is vital that we endeavor to address this issue at the source by developing programs that will help build research capacity. What that means is creating programs that are designed to train and support the next generation of researchers.

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Researchers Recognized for Advancing the Science of Musculoskeletal, Oral and Skin Diseases and Conditions

IMHA's 2004/05 Quality of Life Research Awards

The Institute of Musculoskeletal Health and Arthritis (IMHA) announced the winners of its prestigious "Quality of Life Research Award" at an Open Researcher/Stakeholder Forum at Université Laval on March 3, 2005.

"Today, half-way through the bone and joint decade, we need to step up our efforts to address the economic burden of illness (over \$22 billion) associated with a broad range of musculoskeletal, oral and skin disorders," said IMHA's Scientific Director, Dr. Cy Frank. "Our Quality of Life Research Awards were created to recognize the efforts of researchers who are conducting investigations across our six foci and three strategic priorities towards the ultimate eradication of the pain, suffering and disability caused by these diseases and conditions."

The following provides a brief overview of the excellent work being conducted by this year's award winners including Dr. Barry Sessle (IMHA's overall award winner with the highest peer review ranking across all six foci); Dr. Jeff Dixon; Dr. Graham King; Dr. Lucie Germaine; Dr. James Wright and Dr. Jérôme Frenette.

OVERALL AWARD WINNER: Dr. Barry J. Sessle, University of Toronto
Title of Research: Neural Mechanisms of Orofacial Function
Research Category: Oral Health - Pain, Disability and Chronic Diseases
Co-Investigators: Drs D.Yao and J. Lee (U.Toronto), K. Adachi (Nihon U., Japan), R.Martin (U. Western Ontario), G. Murray (U. Sydney, Australia), and L.Arendt-Nielsen, K.Wang and P.Svensson (U.Aalborg and U.Arhus, Denmark). Graduate students (U. Toronto) include L. Avivi-Arber, G.Bejat, and S.Boudreau

RESEARCH SUMMARY

Dr. Barry Sessle from the University of Toronto, Faculty of Dentistry has launched a study designed to help clarify the role of the sensorimotor area of the cerebral cortex in adaptive mechanisms associated with an altered oral environment. Through his previous research, Dr. Sessle and his colleagues have demonstrated the critical role in the control of orofacial movements that is played by the cortical region that represents orofacial sensory and motor functions. They have succeeded in providing a scientific underpinning for explaining why cortical damage (e.g. from a stroke) can severely impair orofacial sensory and motor functions. Dr. Sessle's latest research in animals and humans will further examine these cortical mechanisms by recording cortical nerve cell activity or by

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microstimulation in this region of the cerebral cortex. Through this research, Dr. Sessle plans to determine whether sensory inputs to this cortical region from the tongue and from other parts of the oral environment can influence these cortical mechanisms and thereby modify oral sensorimotor function. His team will specifically examine the effects of lingual sensory loss as well as the loss of teeth and/or their restoration by dental implants. Damage to nerves supplying the tongue and especially loss of teeth through gum disease or dental decay are common and are associated with reduced chewing efficiency, disrupted speech, and sometimes even neurosensory disorders and chronic pain. Indeed, in Canada, reduced quality of life stemming from tooth loss is a major problem, with 20 per cent of senior adults estimated as "orally disabled". However, what is still unknown are the neural mechanisms underlying altered oral function associated with tongue sensory impairment or tooth loss, or restoration of function, and what role, if any, the sensorimotor cortex plays. Understanding the cortical mechanisms associated with changes in the oral sensory environment is crucial for clarifying the adaptive mechanisms associated with these changes. Dr. Sessle commented that "this IMHA Award underscores the importance of my research for improving our understanding of the cortical mechanisms defining how humans learn to chew and speak as they develop during infancy and how they adapt their oral sensorimotor function if the oral environment is altered or damaged. The Award also recognizes the clinical potential of this research in providing insights essential for the development of new and improved clinical rehabilitative approaches that target these mechanisms in humans suffering from oral sensorimotor deficits."

Award Winner Dr. Jeff Dixon University of Western Ontario
Title of Research: Ion transport and signaling in skeletal cells: P2 nucleotide receptor function in bone
Research Category: Bone - Tissue Injury, Repair and Replacement

RESEARCH SUMMARY

Throughout life, the skeleton is constantly turned over by the coordinated actions of osteoclasts (cells that remove bone) and

osteoblasts (cells that form bone). An imbalance between rates of removal and formation leads to bone loss in metabolic diseases such as osteoporosis, and inflammatory diseases such as periodontitis (gum disease) and rheumatoid arthritis. Working with a team of dedicated staff, talented trainees and expert collaborators, Dr. Jeff Dixon plans to examine the actions of a class of cell surface receptors that bind extra cellular nucleotides. Within cells, small molecules called nucleotides serve a variety of biochemical functions. However, in response to mechanical stimulation or inflammation, nucleotides are released from cells. Once outside the cell, these nucleotides take on brand new roles - serving as signals that influence the activity of neighboring cells. The team's research will examine the ways in which extra cellular nucleotides act through P2 nucleotide receptors to regulate the activity of osteoclasts and osteoblasts. Through collaborations with biotech and pharmaceutical companies, the team hopes to develop new drugs that act on P2 receptors to prevent the removal and promote the formation of bone in osteoporosis and inflammatory bone diseases.

Award Winner: Dr. Graham King, University of Western Ontario
Title of Research: Kinematics and Stabilizers of the Elbow
Research Category: MSK Rehabilitation - Physical Activity, Mobility and Health
Co-Investigators: Dr. Jim Johnson

RESEARCH SUMMARY

Musculoskeletal disorders of the upper limb are second only to low back pain as a cause of disability and time lost from work. In spite of their frequency, current treatments are often empirical with little scientific justification. As a consequence, their outcome remains suboptimal. In his research, Dr. Graham King and Dr. Jim Johnson from the University of Western Ontario have established a comprehensive program to study motion and stability of the elbow and forearm. Taking a "bench-top to bedside" approach, the major thrust of their research has been the development of a joint testing device which simulates motion and function in a cadaver specimen. Using this system, a number of rehabilitative approaches and surgical techniques have been evaluated in their laboratory and subsequently implemented clinically. The objective of their research

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With this in mind, we met with our partner, Pfizer Canada, to explore how we might make a difference. The outcome was the creation of the "Summer Studentships in Musculoskeletal Health Research". Straight out of the gate, this innovative pilot project gave 35 undergraduate students a chance to work side-by-side with established health investigators across the country, who are conducting some of today's leading edge musculoskeletal research. With this experience behind them, we hope that these young people will not only develop a keen interest in science, but a desire to establish a career in musculoskeletal research. In "Recruiting the Researchers of the Future", you will meet four of these energetic students who may just turn out to be tomorrow's research super stars.

The five-year Peter Lougheed/CIHR New Investigator Award, co-funded by the Peter Lougheed Medical Research Foundation, also seeks to build research capacity by recognizing Canada's brightest young researchers at the beginning of their careers. In so doing, it also provides an additional incentive for young researchers to pursue their work in Canada. This year, IMHA was encouraged to see this prestigious award presented to one of its own, Dr. Shanti Johnson, whose research falls under our strategic research priority - Physical Activity, Mobility and Health. An associate professor in nutrition and dietetics at Acadia University, Dr. Johnson is currently developing a research program for the frail elderly that focuses on a combination of nutrition and exercise. Dr. Johnson hopes that this approach will lead to a reduction in the number of injuries occurring in this population by improving functional capacity.

We at IMHA believe that the creation of these new programs is certainly a step in the right direction. While there is no panacea, programs like these are critical if we are to attract, encourage and support our future research leaders - those who will be called upon one day to take up the challenge.

What's Hot at NIH

NIDCR Science News in Brief

Reproduced in cooperation with The Friends of the National Institute of Dental and Craniofacial Research (FNIDCR)

IMMUNE MECHANISM DISCOVERED

Cytokines are a unique family of growth factors that are secreted primarily by immune cells called leukocytes to mount a protective response against invading pathogens. Of the many cytokines in the human body, one of the most actively studied is tumor necrosis factor-alpha (TNF-a). In the April 5 issue of the Proceedings of the National Academy of Sciences, a team of NIDCR grantees led by Salomon Amar discovered a protein called LPS-induced STAT6(B) that directly interacts with the so-called LITAF protein, forming a two-protein complex that relocates to the cell nucleus and regulates the transcription of TNF-a and other cytokines. This important mechanistic discovery will offer fresh insights into how the faulty transcription of certain cytokine genes might play a role in many immune disorders, including periodontal disease and atherosclerosis.

ADVANCE IN GENETICS OF CLEFT LIP AND PALATE

Cleft lip and/or palate remains one of the most common birth defects in the world. It occurs when the sides of the face fuse abnormally in a developing baby, resulting in a malformed lip and/or roof of the mouth. Although clefts can be repaired to varying degrees with multiple surgeries, researchers have long pursued a more detailed understanding of the developmental process to learn how to prevent the condition or more efficiently treat it. Toward this end, scientists have compiled a growing list of genes and their protein products that, when altered, play a role in causing clefts. In the March 15 issue of the journal Development, NIDCR grantees and colleagues report the discovery of two genes that are likely to be involved in human clefting. The genes are: Bmp4, a member of the so-called bone morphogenetic protein (Bmp) family that regulate intercellular communication during fetal develop-

ment, and Bmpr1a, the receptor for the Bmp4 protein. The scientists also report that Bmp signaling in general has distinct functions in forming the lip and secondary palate. In the lip, the Bmp signaling seems to act as a survival signal to influence the timing of programmed cell death. In the secondary palate, Bmp signaling regulates the proliferative capacity of cells that are destined to form the roof of the mouth.

STUDY SUGGESTS WHY EATING SALMON MIGHT BE GOOD FOR YOU

Most Americans have listened to news stories extolling the anti-inflammatory health benefits of a diet rich in oily fish, such as salmon and mackerel, and their constituent polyunsaturated fat, omega-3 fatty acids. But left unanswered in these reports is how omega-3 fatty acids protect against heart disease, periodontitis, arthritis, and other inflammatory conditions. As published in the March 7 issue of The Journal of Experimental Medicine, NIDCR grantees and colleagues reported they have discovered that our bodies break down omega-3 fatty acids to yield important byproducts called resolvins, a newly discovered class of dietary fat. The scientists found that the subtype resolvin E1 in particular helps to stop the migration of certain immune cells to sites of inflammation, thereby modulating the severity of the immune response and reducing the risk of serious disease. Previously, the



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researchers found that aspirin also seems to prompt our bodies to produce resolvins, and, in this current study, they show that people who took low doses of aspirin and consumed dietary omega-3 fatty acids had measurable levels of resolvins in their bloodstream. The scientists say they now are trying to develop scale synthetic versions of resolvins for future studies and possibly one day for use in people.

MEASURING TOUGHNESS OF DENTIN-ENAMEL JUNCTION

Nature has brilliantly engineered our teeth to transfer mechanical stresses, such as chewing, to a thin, supportive region below the surface of the tooth, where our bony dentin and rigid enamel meet. This biologically complex region, known formally as the dentin-enamel junction, or DEJ, has captured the interest of dental researchers in hopes of better characterizing its stress-resistant capacity and unique ability to halt developing cracks in the outer enamel from spreading throughout the tooth and causing fractures. Despite the long-term research interest, largely missing from the scientific literature has been a comprehensive and technologically sophisticated analysis of structural variations and stress resistance across the DEJ, information of great benefit to the dental community. As published in the March issue of the journal *Nature Materials*, NIDCR grantees and colleagues provide this broad structural analysis and, based on their data, provide a new estimate on the toughness of the DEJ, characterizing the region as up to 10 times tougher than enamel but 75 percent less tough than dentin. They also conclude that a tooth's ability to stop the spread of cracks resides in the mantle dentin itself, not the DEJ. ■

Recruiting the Researchers of the Future

Summer Studentship in Musculoskeletal Research

While musculoskeletal diseases and conditions are rarely life threatening, it may surprise you to know that health issues falling under IMHA's mandate - musculoskeletal, oral and skin diseases and conditions - carry the highest economic burden of illness costing Canadian taxpayers over \$22 billion per year. What's even more disturbing is that, with our aging population, this economic burden is only going to increase. So what are we to do to address this disturbing issue? As an Institute, one of the most fundamental things we can do is make a concerted effort to build research capacity by recruiting the researchers of the future. And that's exactly what we did by joining with our partner, Pfizer Canada, to create the "Summer Studentships in Musculoskeletal Research".

The new Summer Studentships program is designed to provide undergraduate students with an opportunity to become involved in MSK research under the leadership of established health researchers. By providing such an experience early on in their academic career, IMHA and Pfizer hope that these students will be keen to pursue MSK research after their training is completed. Launched as a pilot project in February 2005, the Studentship provided funding for 35 students to enter a 12-week term position, to be completed between May 1 and August 31, 2005, at a variety of Institutions across the country. The following offers a brief "in their own words" summary of what this new initiative means to four students currently enrolled in the program.

STUDENT: KATE AMIEL
Institution: Montreal Neurological Institute/Hospital
Mentor: Dr. George Karpati

As medicine and biomedical research have long been two of my personal interests and career areas I hope to pursue, receiving a summer studentship in musculoskeletal research from the Canadian Institutes of Health Research (CIHR) this year was a great honour. This award was especially appreciated because it has given

me the chance to combine these two fields at a world class health facility the Montreal Neurological Institute/Hospital.

Working with Dr. George Karpati, a leading neurologist and researcher in neuromuscular disease and gene therapy, is an incredible opportunity that I do not take for granted. The caliber of his team as well as his personal success make this a perfect place for an undergraduate student to absorb all that there is to know about medical research. I have learned a great deal about the research process this summer through my project on the dysferlin gene (mutated in limb girdle muscular dystrophy type 2B). Though my own job seems rather small in the grand scheme of things, I am always motivated by the great clinical implications of our work. Currently muscular dystrophy patients have few, if any, treatment options, therefore it will be thrilling for me to make even a tiny contribution to this field.

This experience has certainly opened my eyes to the incredible patience, expertise and dedication of all of the researchers working to find the answers to their many questions. Research positions for undergraduate students are often limited, hence without the generosity of the Canadian Institutes of Health Research's Institute of Musculoskeletal Health and Arthritis, I would likely not have had this incredible opportunity. This experience has been invaluable to me and undoubtedly to my future in the medical field. Thank you to the CIHR for allowing me to explore my interests, contribute to musculoskeletal research and for further motivating me to pursue my goals.

STUDENT: ASHLEY AIMONE
Institution: Hospital for Sick Children Research Institute
Mentor: Dr. Deborah O'Connor

As a future Master of Science degree candidate, the overall goal for my CIHR summer studentship is to gain initial experience in clinical research by taking ownership of a defined aspect of an ongoing research project. I also plan to take

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Averting Falls in the Frail Elderly

Peter Lougheed/CIHR New Investigator Award

Every year, about one in three Canadians aged 65-plus experiences a fall, and among those aged 80-plus, the prevalence soars to one in two. Injuries (such as concussions, upper-limb fractures and hip fractures) are associated with significant morbidity and mortality - especially among the frail elderly. And while removing environmental hazards (electric wires, throw rugs, etc.) remains a basic step in fall prevention, it's by no means a complete solution. More often than not, it's the individual's own frailty that leads to an unintentional fall. Thus, any effective intervention resides within the person and will require some type of behaviour modification.

Last February, Dr. Shanthi Johnson, an associate professor in nutrition and dietetics at Acadia University in Wolfville, Nova Scotia, received the five-year Peter Lougheed/CIHR New Investigator Award to study the problem. An avid basketball player during her student days, Johnson began her career in sports nutrition - working to increase performance through dietary modification - but then, as she says, "my interest changed from improving athletic performance to improving quality of life. I started working with the elderly, a field where we can make significant changes in people's quality of life."

While at the University of Western Ontario, Johnson worked with the Canadian Centre for Activity and Aging, developing exercise programs for all types of elderly people, from the fit and independent to those confined to nursing homes. "Even in short-term interventions we could significantly improve functional capacity, especially among frail elderly," says Johnson. "We weren't trying to make them marathon runners or anything like that. Participants showed a significant improvement in their

ability to perform self-care." After moving to Wolfville, she began to think about how dietary modification might improve the response to an exercise program designed for the frail elderly: "It's a population that is not only functionally compromised but also nutritionally compromised. So the idea developed to look at the synergistic impact of exercise along with nutritional intervention."



"Even in short-term interventions we could significantly improve functional capacity, especially among frail elderly,"

Johnson contacted all the major services and agencies that deliver services to the frail elderly in King's County, who responded enthusiastically by holding a "think tank" involving some 40 representatives on how to implement the research project in the community. For six months, Johnson will be following 154 volunteers who have been randomly assigned to one of four study groups: exercise only, nutrition only, combination of exercise and nutrition and a control. The nutrition groups will receive two cans daily of Ensure® dietary liquid as a supplement to their normal food intake. Falls will also be tracked.

After the intervention period, the study groups will be monitored for another six months to capture performance and compliance data. "What we want to know is, after six months of continuous monitoring, if they are left on their own, will they continue with exercise and nutritional intervention?" says Johnson. Later, she would also like to develop a new project that would examine and compare retrospectively the various groups' demands for health-care services and the resulting expenditures.

The think tank will reconvene once the data has been analyzed to assess whether any service programs should be adjusted in light of the findings. ■

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is to provide a scientific rationale for the non-operative and operative treatment of degenerative and traumatic disorders of the elbow. Using their upper limb testing device, they will evaluate common soft-tissue and bone diseases, and reconstructive procedures of the elbow that are not completely understood. The results of their research should lead to an improved understanding of these disorders and result in more effective patient treatments.

Award Winner:
Dr. Lucie Germain, Université Laval
Title of Research: Differential regeneration of human skin: Cutaneous stem cell differentiation pathways
Research Category: Skin - Tissue Injury, Repair and Replacement

RESEARCH SUMMARY

Holder of a Canada Research Chair in Stem Cells and Tissue Engineering at Université Laval, Dr. Lucie Germain and her team have initiated a study that will examine regeneration of human skin and the mechanisms of post-natal stem cell (cells responsible for tissue regeneration) differentiation. As the epidermis renews itself every 28 days, the skin is an organ that is continuously producing new cells. Using specific markers such as Keratin 19, Dr. Germain will examine the stem cells of human skin and evaluate their capacity to regenerate cutaneous structures. Stem cells will subsequently be used to improve skin reconstruction by tissue engineering in vitro. One of the short-term objectives of the study is to improve the treatment of damaged skin (i.e. ulcers and burns). At the Laboratory of Experimental Organogenesis (LOEX) cultured epidermis is transplanted to burn wounds. Through analysis of stem cells in culture, sheets of epidermis and reconstructed skin of improved quality can be produced that can be grafted onto patients. An analysis of the mechanisms that control the balance of growth and differentiation of normal skin cells will also help improve our understanding of diseases, such as psoriasis and cancer, that involve extensive and abnormal proliferation. As a long-term objective, the study will seek to understand how stem cells can be used to effectively

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facilitate gene therapy. Ultimately, new approaches can be developed to treat hereditary diseases, by transferring the normal gene into the cells carrying the deficient gene, and later re-implanting them into the human body.

Award Winner: Dr. James Wright, Hospital for Sick Children (Toronto)

Title of Research: Investigating Physician Bias as a Possible Explanation for Gender Disparity in the Utilization of Knee Arthroplasty Surgery

Research Category: Arthritis - Tissue Injury, Repair and Replacement

Co-Investigators: Cory Borkhoff, Gillian Hawker, Peter Coyte, Nizar Mahomed, Hans Kreder, Richard Glazier, and Pamela Hudak

RESEARCH SUMMARY

Total joint arthroplasty for osteoarthritis of the hip and knee results in substantial and sustained improvement in patients' function and quality of life. Despite an exponential increase in the numbers of Canadians receiving joint arthroplasty, prior research suggests that many patients who are suitable candidates are not receiving this procedure. Surprisingly, the majority of these patients are women. Although women receive more joint arthroplasties than men, and the consensus among Ontario physicians is that sex has no bearing on their recommendations, it turns out that the unmet need is still three times greater in women than men. One potential explanation for the apparent gender disparity in access to joint arthroplasty surgery could be physician bias regarding if and when to refer for, or perform, total joint arthroplasty. To address this issue, Dr. James Wright and his colleagues at the Hospital for Sick Children in Toronto plan to examine how patient sex affects a physicians' decision-making behaviour. To do this, they plan to send men and women with comparable levels of arthritis into physicians' offices to establish their recommendations for total knee arthroplasty. "We need to ensure complete and equal access to these procedures that provide such a tremendous improvement in quality of life," says Wright. "Our research is directed towards understanding what occurs during the patient-doctor interaction so we can remove any barriers to care that

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Sponge full of Stem Cells a Surprise Hip Therapy

Originally Published in The Vancouver Sun, April 8, 2005

A tiny sponge made of biodegradable material and stuffed with stem cells that grow human bone is being hailed by researchers at the University of British Columbia as a major breakthrough for patients who require hip-replacement surgery. Dr. Helen Burt of the faculty of pharmaceutical sciences, and Dr. Tim Durance, with the faculty of agricultural sciences, have teamed up along with an engineer, orthopedic surgeon and stem-cell researcher to create the special sponge. The research is part of a \$1.5-million grant from the Canadian Institutes of Health Research.

The result could mean an easier time for patients who receive artificial hip implants. According to Burt one of the problems of the surgery is that after 20 years or more the implant can fail due to a severe loss of bone surrounding the implant. When that happens a second surgery is required. Tiny bone chips taken from cadavers and cemented in place with an adhesive are then used to secure the new implant in place.

Burt was looking for a way to replace the bone-chip method -- which can leave a patient subject to infection -- with a biodegradable sponge or "scaffold" filled with bone-growing stem cells. She said her research team knew they needed the scaffold to be porous, providing room for

the stem cells to grow and divide into bone. At the same time, the scaffold needed to disintegrate when it was no longer needed.

The sponge approach is currently part of a hot scientific field of tissue engineering in which scientists are growing human cartilage and blood vessels using a similar technique. Burt said it was only by "amazing coincidence" she teamed up with Durance. Durance was looking for new applications for a specialized technique he developed to dehydrate food. The technique produces sponge from almost any material, and allows the organic structure of the material to be maintained, even though it is dehydrated.

He had already used the technique to produce fat-free chips and had started work on developing an AIDS-fighting prophylactic sponge for women, in conjunction with the New York Blood Center. But he knew the technique had wider potential. "Especially in the medical-materials field."

The team will spend the next five years refining the project and hope to have it available for clinical application by 2010. Currently, said Burt, the sponges are not tough enough to take a weight-bearing joint such as the hip. But, she added, "We're only in year one." ■

The 2004 Sports Information Resource Centre (SIRC) Awards

IMHA was a silver sponsor of SIRC's 2004 Research Awards program. This year's award winners were presented in May as follows:

The Impact of Applied Research on Athletic Excellence - High Performance Category: Dr. Martin Gibala from McMaster University for his research project entitled: "Skeletal Muscle Metabolic and Performance Adaptations to Short Sprint Interval Training."

The Impact of Sport on the Community Award: Dr. Krista Chandler from the University of Windsor for her project entitled "Imagery Use in Youth Sport An Examination of Development Differences."

Building a Better Team

ICE and CFI are the right tools

One of the best ways to help build Canadian research capacity is to support funding programs that foster collaboration. In supporting the Interdisciplinary Capacity Enhancement Teams (ICE) program, IMHA set out to do just that, and we are now beginning to see the results of our efforts. The experience of researchers like Dr. Tom Oxland and Professor David Wilson is an excellent example of how ICE funding can catapult research teams to the next level.

IMHA's "ICE grant really helped us bring together the right people and develop as an effective research unit," says Prof. David Wilson, a mechanical engineer and senior team member of the Division of Orthopaedic Engineering Research (DOER) at the University of British Columbia. An earlier groundbreaking decision at UBC's Faculty of Medicine designed to make orthopaedics a full stand-alone department provided plenty of incentive for more innovative thinking within the department. Thus, alongside divisions including Spine Surgery and Orthopaedic Trauma, the Orthopaedics department also created DOER, a dedicated research division overseen since 1997 by director Dr. Tom Oxland, also a mechanical engineer and the principal investigator on the 2003 ICE (Interdisciplinary Capacity Enhancement) team grant sponsored by IMHA.

"Our growth as a group certainly coincided with receiving the ICE grant," recalls Wilson who joined DOER in 2002, "and I think the process of getting together to work out what we would do under the ICE grant - to structure it - was very important in our growth as a group." Oxland and Wilson are experts in the biomechanics of the spine and the knee, respectively, but both are branching out into new fields of inquiry as a result of the influx of new talent onto the team. Typical is Dr. Peter Wild, a mechanical engineer from the University of Victoria, who "is a leading research engineer who has made some fantastic developments in sensor technology, but has not done much in the way of bio

mechanics before," according to Wilson. Together, they are working "on adapting new strain-gauge technology for applications in biomechanics." Wilson is also using sophisticated MRI techniques to measure the mechanics of the knee joint in vivo: "Most medical images are a snapshot. We're trying to produce a movie, because joints are designed to move and transmit load. To do this, we've developed some devices that are placed in an MRI scanner to position the knee correctly and allow the subject to apply a controlled load to the joint. What we're able to do is measure with substantial accuracy the movement of the kneecap relative to the femur in a loaded moving knee joint."

Making the most out of an ICE grant by assembling a multidisciplinary team and working out different streams of collaboration - the hard intellectual work needed to forge a cohesive vision - calls for one kind of funding, but the facilities and hardware to carry out the research requires a different kind of grant. And that's where the infrastructure funding of the Canadian Foundation for Innovation (CFI) comes in - a perfect complement to the talent-recruiting objectives of ICE grants.

The CFI is an independent corporation created by the federal government to fund research infrastructure. Its mandate is to strengthen the capacity of Canadian universities, colleges, research hospitals, and non-profit research institutions, which will then carry out world-class research and technology development. With a budget of \$3.65 billion, the CFI funds up to 40 per cent of a project's infrastructure costs. These funds are invested in partnership with eligible institutions and their funding partners from the public, private, and voluntary sectors, which provide the remaining 60 per cent of a project's cost.

Under CFI's Innovation Fund and with matched dollars from BC's Knowledge Development Fund, DOER researchers and their collaborators successfully applied for a major infrastructure grant.

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individuals or subsets of the population may experience." Through Dr. Wright's efforts, we will hopefully gain important information necessary to design and subsequently test strategies to improve the delivery of total joint arthroplasty.

Award Winner: Dr. Jérôme Frenette, Université Laval

Title of Research: Inflammatory cell recruitment and function in skeletal muscles following hind limb unloading and reloading: New strategies to prevent muscle atrophy and dysfunction

Research Category: Muscle - Tissue Injury, Repair and Replacement/Pillar 1

Co-Investigators: Dr. Claude H. Côté

RESEARCH SUMMARY:

Skeletal muscles are seriously affected by the absence of gravity or immobilization. With this in mind, Dr. Jérôme Frenette and his colleagues are conducting a study that will hopefully lead to a better understanding of how inflammatory cells are recruited and what role leukocytes play in muscle injury, as well as to identify new molecules to prevent muscle dysfunction. His study will involve submitting mice knock-outs to a 10-day hind limb unloading followed by reloading for various periods. Contractile function of calf muscles will be assessed and tissues will be sectioned for different immunohistochemical analyses. These experiments will enable them to investigate the specific function of both adhesion proteins and inflammatory cells in muscle injury and repair. They will also determine whether the daily administration of a molecule that can prevent osteoporosis can also reduce muscle atrophy and improve muscle regeneration following modified loading periods. One experiment will also be performed on mast cells in culture to determine if mechanical loading can stimulate the expression of pro-inflammatory molecules, thereby establishing a link between mechanical loading and leukocyte recruitment. The results of this study are sure to underscore the importance of inflammatory cells in the mechanisms governing muscle recovery and provide promising new avenues for the treatment of muscle atrophy and dysfunction. ■

CADR-IMHA Student Research Award Winners

The Canadian Association for Dental Research (CADR) and the Institute of Musculoskeletal Health and Arthritis (IMHA) announced the winners of their 2005 student awards for research excellence in oral health and dentistry at the annual joint meeting of the International, American and Canadian Associations for Dental Research in Baltimore, Maryland on March 11th, 2005. The award winners are as follows:

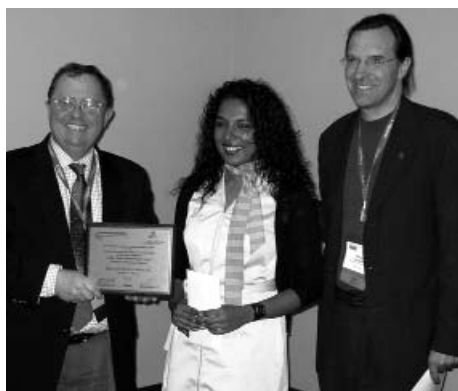


Katia Savignac being presented her award by Dr. Don Brunette (University of British Columbia), President of CADR, and Dr. Gilles Lavigne (University of Montreal), Vice-President

JUNIOR CATEGORY

First prize in the junior category went to Ms. Katia Savignac, an undergraduate dental student at Université Laval for her project entitled "Effect of Human Beta-Defensins on Candida albicans". Ms. Savignac's research, supervised by Dr. Mahmoud Rouabhia, was supported by NORTH, a CIHR strategic training program for dental undergraduates.

The second prize winner was awarded to Mr. Olivier Bédard, who is also a dental student at Université Laval. Mr. Bédard's project, entitled "Embryonic origins of facial bones in the upper jaw", was carried out at the University of British Columbia under the supervision of Dr. Joy Richmond, and was also supported by NORTH.



Dilani Senadheera being presented her award by Drs. Brunette and Lavigne

SENIOR CATEGORY

Ms. Dilani Senadheera, a Ph.D. student at the University of Toronto, received the first prize in the senior category.

Ms. Senadheera's project entitled "Streptococcus mutans VicX Controls Biofilm Formation, Stress Tolerance and Competence" was supervised by Dr. Dennis Cvitkovitch. She was supported by a U of T Faculty of Dentistry Harron Scholarship and a fellowship from the CIHR Strategic Training Program 'Cell Signaling in Mucosal Inflammation and Pain' ('Cellsignals').

The second prize was awarded to Dr. Chrissy Cheretakis, a Ph.D./ Orthodontics student at the University of Toronto. Ms. Cheretakis project, entitled "An oral neutrophil assay to monitor engraftment and neutrophil function following Bone Marrow Transplantation (BMT) in children" was supervised by Dr. David Locker and Dr. Michael Glogauer. Dr. Cheretakis was also supported by a Harron Scholarship and a fellowship from 'Cellsignals'.

POSTDOCTORAL CATEGORY

First prize in the postdoctoral category was awarded to Dr. Carlos Flores-Mir. Dr. Flores-Mir's project entitled "Longitudinal study of TMJ disc status and craniofacial growth" was carried out at the University of Alberta under the supervision of Dr. Paul Major. ■

RECRUITING RESEARCHERS OF THE FUTURE *continued from page 4*

advantage of this opportunity to pursue the leading edge of health research by utilizing the knowledge of my mentors and establishing a network of communication with other health professionals with similar research interests.

The project that I am working on this summer is part of a pilot study recently launched by a research team at the Hospital for Sick Children Research Institute in Toronto, Ontario. The purpose of the research is to observe the effects of feeding a powdered human milk fortifier (HMF) on the growth and development of premature infants after initial hospital discharge. My primary responsibilities involve collecting body composition data from dual energy x-ray absorptiometry (DXA) scans and compiling it into a database for analysis and comparison with current literature values. I will also participate in on-going subject recruitment from neonatal intensive care units (NICUs) in the Greater Toronto Area.

In addition I will attend home and clinic visits to assist in the collection of anthropometric and DXA scan measurements for each study subject. The bone mineral content, lean mass, and fat mass values will be added to a database and further analyzed using descriptive statistics, as well as compared to the findings of other research studies. It has been proposed that this kind of research will aid in the development of feeding guidelines for premature infants in order to reduce the frequency of re-hospitalization, and prevent adverse health issues later in life.

I am extremely grateful for the opportunity that the award has provided me to gain valuable experience in the area of musculoskeletal health research. This kind of exposure will allow me to enhance my understanding of the health-related issues that strain our economy today, as well as the initiatives that can be taken to alleviate these financial burdens. I am very fortunate to have an excellent mentor, who has provided me with other opportunities to improve my research skills and broaden my academic training.

STUDENT: BRYAN TENNANT
Institution: University of British Columbia
Mentor: Dr. Christopher Overall

Tissue degradation by Matrixmetalloproteinases (MMPs) is pivotal to inflammation

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Bone and Joint Decade 2005 World Network Conference

Ottawa, Canada - October 26-28, 2005

Over 400 million people around the world are living with the crippling, chronic pain of joint diseases, osteoporosis, spine disorders and musculoskeletal trauma. In 2000, the World Health Organization, with the endorsement of the United Nations, took steps to address this serious matter by officially designating 2000-2010 as the Bone and Joint Decade (BJD). Canada is one of 60 countries working together to raise awareness of bone and joint diseases and injury.

The goal of the Bone and Joint Decade is to improve the quality of life for people with musculoskeletal health disorders that are notorious and common causes of severe, long-term pain and physical disability. The organizers of the Decade aim to raise awareness and promote action to combat suffering and the cost to society associated with musculoskeletal disorders, such as joint diseases, osteoporosis, spinal disorders, severe trauma to extremities and crippling diseases and deformities in children. The Institute of Musculoskeletal Health and Arthritis (IMHA) actively supports the goals of the Bone and Joint Decade and is working to sustain health and enhance quality of life by eradicating the pain, suffering and disability caused by arthritis, musculoskeletal, oral and skin conditions.



From October 26-28, 2005, Canada will be hosting the Bone and Joint Decade 2005 World Network Conference in Ottawa. This major event will bring together the BJD International Steering Committee, delegates, patient advocates and other officials from many countries. The Conference will initiate the process of developing:

- international standards for risk factors and strategies for prevention and care of proximal femoral fractures and chronic musculoskeletal pain management;
- musculoskeletal education guidelines for health professionals; and
- strategies for prevention of injuries associated with road traffic accidents.

Dr. Alan Bernstein, President of CIHR, will be providing opening remarks at the evening reception to be held on October 26, 2005. Dr. David Butler-Jones, Canada's Chief Public Health Officer, has also been invited to share his views on this important issue.

To find out more information about this conference and the Bone and Joint Decade in Canada, visit:
<http://www.bjdcanda.org>.

The international website for the Bone and Joint Decade is:
<http://www.boneandjointdecade.org>. ■

RECRUITING RESEARCHERS OF THE FUTURE *continued from page 8*

and metastases and cleavage products of MMP-Substrate complexes are present in rheumatoid synovial fluids. This provides direct evidence of the involvement of MMPs in modulating complexes present in rheumatoid synovial fluids. This provides direct evidence of the involvement of MMPs in modulating inflammation. As such we proposed to manufacture a high throughput screening chip containing the C-terminal hemopexin domains present in all collagenolytic MMPs. My plans for this summer studentship is to isolate, sequence and express the hemopexin domains of MMP-10, 11 and 16. Following the expression I will run a series of purification protocols to obtain a pure sample that can then be added to the growing list of purified hemopexin domains in our lab for attachment to the chip.

The Summer Studentship in MSK Research was pivotal to my role in this research project as there are few positions available without funding and provided me the opportunity to work on this project. Ventures such as the Summer Studentship in MSK Research make it possible for young researchers to get the opportunity to work in a research environment before leaving university giving them the required work experience prior to entering the work force. This is invaluable to students and IMHA, Pfizer and CIHR should be thanked for their role in establishing this program.

STUDENT: JACQUI SOLOWJEW
Institution: Ottawa Health Research Institute
Mentor: Dr. Kursad Turksen

For twelve weeks, I have the privilege of working in the lab of Dr. Kursad Turksen in the Department of Hormones, Growth and Development at the Ottawa Health Research Institute. My research focuses on epidermal permeability barrier formation and development. The Summer Studentship goes far beyond financial support; it has granted me the opportunity to explore and experience health research in a real-life setting, reinforcing my interest in this field. Everyday I am learning new skills and acquiring new knowledge. I am very appreciative of the individuals I work with for their patience, guidance and inspiration. I am truly grateful to have this fantastic opportunity. ■

Understanding the Barriers to Effective Pain Management

Dr. James Henry, a neurophysiologist and Inaugural Scientific Director of the Michael G. DeGroot Institute for Pain Research and Care at McMaster University, and Dr. Alex Jadad, Director of the Centre for Global e-Health Innovation, Canada Research Chair in eHealth Innovation and the Rose Family Chair in Supportive Care in Toronto, presented results of their work in pain and fatigue at a meeting of IMHA's Knowledge Exchange Task Force (KETF) on April 18 and 19, 2005.

Dr. Henry has discovered that pain is actually a disease itself. "Our research demonstrates, that chronic pain - pain that lasts more than six months - can lead to physiological changes such that pain becomes a disease in and of itself," said Dr. Henry. "What this means is that we not only need early detection and treatment, we need to remove the numerous barriers that currently impede our ability to effectively manage chronic pain."

"The lack of physician knowledge and training in chronic pain, the commonly held belief that pain is accepted and normal, the fact that patients have a fear of analgesics and their side effects, and the absence of health policy in pain management are only a few of the barriers we face in effectively addressing this important issue," added Henry.

Dr. Jadad, pointed out another barrier to effective pain management - the increasing knowledge explosion and the competing interests of pharmaceutical companies, governments, health professionals and researchers.

"By the year 2000, more than 24,000 studies had been conducted in the area of pain relief," said Jadad. "And yet we still don't have answers to the majority of questions we have in the area of musculoskeletal pain. This trend represents an evidence-based crisis driven by the fact that most studies are biased or are irrelevant, many are never published and those who pay tend to win." To address this issue, Dr.



"Our research demonstrates, that chronic pain - pain that lasts more than six months - can lead to physiological changes such that pain becomes a disease in and of itself,"

Jadad recommended that the following be considered:

- Implementation of an arms length approach to education and research.
- A reassessment of the emphasis on efficacy trials as the centrepiece of the drug approval process.
- Independent gatekeepers (e.g. ethics boards, trial registries and regulatory bodies).
- Have pharmaceutical companies provide the majority of financial support with no strings attached.
- Institute a strong post-marketing surveillance process.

The KETF was spearheaded by the Institute of Musculoskeletal Health and Arthritis, of the Canadian Institutes of Health Research, in the fall of 2004. One of the KETF's priority areas is chronic pain in that it is a common experience for those suffering from musculoskeletal (MSK) diseases and conditions.

"In forming the KETF, our goal was to empower a group of patient consumers to become 'research ambassadors' whose efforts would serve to increase research and education around the wide array of MSK, oral and skin diseases, and conditions that currently cost taxpayers over \$22 billion per year," said IMHA's scientific director, Dr. Cy Frank. "Ultimately, we hope this accelerated translation and exchange of new research knowledge between clinicians and consumers will lead to the improved health of all Canadians. ■"

IMHA Board Member Recognized

The Advisory Board of the Institute of Musculoskeletal Health and Arthritis would like to take this opportunity to congratulate one of its members, Dr. Jan Dutz, for his most recent accomplishments:

- Excellence in Clinical Teaching Award, Canadian Dermatology Association - Resident and Fellows Society.
- Research Recognition Award - Canadian Dermatology Foundation Lecturer for 2005.

Thinking Outside the "Adult" Box leads to new Cutting Edge Medical Technology

IMHA announces its 2005 "Quality of Life Student Research Award" Winner

Sometimes, it seems that all you need to achieve a breakthrough is to ignore the trappings of so-called "adult" thinking, and have the opportunity to test your theories in your parent's laboratory. Just ask Chet Gervais, IMHA's 2005 "Quality of Life Student Research Award" winner.

It was almost two years ago now, that Chet was working in his parents imaging facility in Windsor Ontario - Chet's Dad just happens to be Diagnostic Radiologist, Dr. Charles Gervais and his Mom, Lena Scott, owns and operates their advanced digital imaging clinic-when he was confronted with the shortcomings of current North American (and world wide) breast imaging protocols. These protocols make it impossible to accurately relate a lesion seen on the two most common breast cancer screening modalities, mammography and breast ultrasound in 3D space. So, thinking outside the "adult" box, and ignoring the limits of existing medical technology, Chet thought, "why not just do the breast ultrasound like a CT scan (in parallel full width slices) at the same time as mammography, then the data sets would be linked in 3D space."

Despite the naysayers, Chet made it his mission to prove his Dad and current medical technology wrong by creating The Matrix Probe - Evolution, a system which actually allows CO-REGISTRATION of digital mammography and breast ultrasound data sets in 3D space. For the first time, Chet's invention actually enables radiologists to accurately relate the two imaging modalities. In a sense, Chet had found the "holy grail" of breast

cancer diagnosis and screening. And, as they say, the rest is history.

In 2005, Chet's "cutting edge" digital mammography/3D breast ultrasound "FUSION" imaging system positioned him as the winner of IMHA's "Quality of Life Student Researcher Award", at the Canada Wide Science Fair (CWSF) held at the University of British Columbia from May 15 - 21. Chet's invention is like a CAT scan for soft tissues because it uses ultrasound imaging to create a 3D "data block" image of the tissues. There is no associated radiation and it can be used to image any area where the tissue is not covered by overlying bone. From IMHA's perspective, Chet's Matrix Probe could have some interesting implications for bone research. For example, it could be combined with a regular x-



ray of the leg or arm, which doesn't "see" the soft tissues to evaluate the overlying muscles and blood vessels. Often if an abnormality is present on an x-ray, the doctors want to correlate it with imaging the surrounding tissue. This device provides a complimentary soft tissue imaging system to regular bone x-rays. In addition to the presentation of IMHA's award, Chet also received the prestigious Manning Foundation Young Canadian Innovator Award, a Health Science Bronze medal, and a University of Western Ontario scholarship. Chet was equally successful the week prior to the CWSF as a participant in what could be considered the Olympics of pre-college science - the International Science and

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Paediatric Rheumatologist wins Prestigious International Award for Rheumatology Research

In early 2005, Dr. Brian Feldman received the Henry Kunkel Young Investigator Award for his research in childhood rheumatic disease. Given yearly to scientists under the age of 45 by the American College of Rheumatology, Dr. Feldman is the first paediatric rheumatologist to win this award. Dr. Feldman holds a Canada Research Chair in childhood arthritis and is an Associate Professor in the Department of Paediatrics, Health Policy Management and Evaluation and Public Health Sciences at the University of Toronto. He is also a rheumatologist at the Hospital for Sick Children and the Clinical Chief of the Arthritis Program at the Bloorview MacMillan Children's Centre, both in Toronto. Dr. Feldman has developed new clinical trial designs and methods to study therapies in rare diseases, and spearheaded efforts to develop cost-effective preventative treatment of arthropathy in severe haemophilia. His work has been instrumental in helping to predict the course and outcome of systemic-onset juvenile idiopathic arthritis and juvenile lupus. ■



THINKING OUTSIDE THE ADULT BOX *continued from page 11*

Engineering Fair (ISEF) held in Phoenix, Arizona. Attracting some 1,450 gold medalists from 45 countries, the Medicine and Health Divisions is perhaps one of the most competitive sectors. And our Chet rose to the challenge receiving one of three "First Awards" presented in the Medicine and Health category, making him the only Canadian to win in that competitive division. Between both Fairs, Chet was awarded over \$14,000 in prizes and scholarships and two upcoming trips to Jasper and Winnipeg.

Putting things in perspective, however, it's important to note that Chet's success did not come without considerable dedication and hard work. In 2002, Chet was selected as the "Best Jr. Science Project" in Canada for his "P-n-IPA Artificial Muscles" Project, and in 2004 he was the CWSF Intermediate Gold Medalist in Engineering. This was also Chet's 5th trip to the CWSF as part of Team Ontario Science and his second time as part of Team Canada to the ISEF.

So what's next for this young wunderkind? Well, the next step is to construct a "pre-commercial all electronic prototype" Matrix Probe and to do a formal human trial (he presently works only with turkey breast phantom tissue). Chet is currently looking for (ideally a Canadian) medical manufacturer to build the solid state electronic version of his patent pending Matrix Probe System. Another option would be to work with the Canadian Space Agency (his Matrix device has a "space shuttle" virtual surgery in space/4D ultrasound application) to help him manufacture it. He has also submitted both a USA/World PCT patent on his Matrix Probe design and has prepared a formal scientific Research Paper for publication/presentation at the RSNA World

Radiology Conference in Chicago in November 2005. If selected, he will be the only non-medical graduate to ever do so at the RSNA World Radiology Congress.

Other than that, Chet is just a normal 17 year-old, grade 11 student who likes playing drums and playing squash, soccer and football. Career wise, Chet is considering entering the University of Western Ontario to study medicine in the fall of 2006. We at IMHA would like to take this opportunity to congratulate Chet once again for his contribution to Canadian health research and to wish him every success in the future. ■

BUILDING A BETTER TEAM

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"The CFI provides you with the material needed to conduct research," says Wilson, "lab space, a building - a really world-class array of new equipment and facilities. The Centre for Hip Health will be a major new research facility that will be the first centre in Canada, and likely the first in the world, focused on the hip."

Wilson is quick to stress that there is no easy formula for achieving this kind of funding track record: "You have to put your most innovative stuff on the table. A common vision comes from hard work, developing as a team, just getting comfortable with each other. That process started long before the CFI application with our brainstorming about how we would build capacity during the ICE competition." ■

SPREAD THE WORD

Have you received an award, enjoyed a major research success, or simply have some news you'd like to share? If so, we'd like to hear from you.

Just send a quick email to:

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