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The Institute of Musculoskeletal Health and Arthritis (IMHA) of the Canadian Institutes of Health Research (CIHR)

THE 2009 BONE HEALTH RESEARCH CONSENSUS CONFERENCE (BHRCC)

Final Report

Bone Health is about more than just Bones

November 9 - 10, 2009
Toronto, Ontario - Canada

Sheraton Centre Toronto Hotel,
123 Queen Street West, Toronto, ON M5H 2M9

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Institute of Musculoskeletal Health and Arthritis | Institut de l'appareil locomoteur et de l'arthrite

Executive Summary

Bone health research has made a significant contribution to the health of Canadians by improving the prevention, diagnosis and treatment of chronic conditions such as osteoporosis, rheumatic diseases, and periodontal disease. Today, bone health researchers are making greater advances by understanding the bi-directional relationship between bone health diseases, and other related chronic conditions such as cardiovascular disease and diabetes. This has been accomplished by interdisciplinary and inter-sectoral research that has provided stimulating research environments to address complex health issues in bone health.

To support continued innovation in bone health research, CIHR's Institute for Musculoskeletal Health and Arthritis (IMHA) organized the first Bone Health Research Consensus Conference (BHRCC) in Canada. Held on November 9-10, 2009 in Toronto, the BHRCC provided a forum for Canadian bone researchers and partners, including government, NGOs, private sector, and consumer representatives to help set the bone health research agenda for Canada for the foreseeable future.

The key objectives of the BHRCC were to:

- Engage researchers and partners in a process of prioritizing bone health research areas and questions that will make a difference to the health of Canadians, and helping to establish the tools and mechanisms for addressing these research questions;
- Identify research gaps and opportunities, and funding mechanisms in bone health research;
- Promote opportunities for building multi-disciplinary and multi-sectoral teams to engage in research and knowledge translation in bone health.

To achieve these objectives, the Bone Health Research Consensus Conference Planning Committee identified 13 expert speakers to present on topics within three plenary sessions to help facilitate research ideas for breakout group discussions. The three plenary sessions were: Prevention and Management of Bone Loss and Fractures in People and Populations; Prevention and Treatment across the Lifespan; and Barriers to Achieving Optimal Bone Health.

The meeting began with welcoming comments from CIHR President Alain Beaudet, Joan McGowan, Director of the Musculoskeletal Diseases Branch at the National Institute of Arthritis and Musculoskeletal and Skin Diseases, and IMHA's Scientific Director Dr. Jane Aubin, followed by presentations that covered a wide range of issues in each of the four pillars of CIHR (biomedical, clinical, health systems, and population health), including novel ideas for guidelines on improved methods for fracture prediction; the efficacy and safety of pharmacological and non-pharmacological therapies; structural engineering initiatives investigating loads during growth; sex variables, genetic contributions, and biomechanical influences on bone health; effective interventional programs; population/cohort studies to identify those at high risk of fracture; optimized models of care; and knowledge translation research involving patients, researchers, and policy makers leading to better communication about bone health and related diseases.

One hundred and seventy-eight participants then worked in nine separate break-out groups to identify and prioritize five central priorities for future research in Canada and the enablers that could make the research possible. Nine breakout-session power points were used to report back to all participants during each of the three plenary sessions. These slides were then synthesized by IMHA's Scientific Director and Oversight Committee Co-chairs during lunch on Day 2 and presented by the Scientific Director to the participants during Session 4 "Research and Policy Recommendations." The five research priorities identified were:

- Optimized prevention of "bone attacks" (fractures)
- Optimized fracture risk prediction tools
- Optimized fracture management – sequelae – intervention – treatment
- Bone and other diseases – commonalities and bidirectional relationship
- New optimized models of care

A "cross pillar, cross institute, cross stakeholder" approach was identified to include an examination of populations and individuals across all five priorities. Participants also identified enablers to make the research possible. These included:

- Holistic system approach to bone health, including patients
- Common message for all health professional and patients to improve bone health
- Collaboration across disciplines
- Piggyback on existing longitudinal epidemiological studies
- National fracture registry linking to other outcome databases and large study cohorts
- Capacity and training development
- Partnerships and funding

The overarching theme of the BHRCC was "bone health is about more than just bones." Conference participants affirmed that bone loss is not simply implicated in osteoporosis, but in other MSK disorders, as well as high risk preclinical conditions related to other chronic diseases, genetics, and quality of life factors across the lifespan.

In the winter 2010 IMHA will launch a Catalyst Grant for Bone Health Research as determined by the outcomes of the November 2009 BHRCC. This "Catalyst Grant – Bone Health" is being offered to encourage and stimulate new and established investigators to undertake new, high priority research challenges in the field of bone health. It is expected that this targeted investment will enable researchers to generate preliminary data, validate methodology or tools, and/or explore novel (high risk) research ideas towards enhancing the success of subsequent applications to the CIHR open and strategic competitions focused on priority areas in bone health.

On behalf of the Institute of Musculoskeletal Health and Arthritis (IMHA) of the Canadian Institutes of Health Research (CIHR) and the conference planning committee, we sincerely thank all of our participants and sponsors. We were pleased that they were able to participate in an initiative that will further enhance Canada's leading reputation in this field.

Jane Aubin, Ph.D.
Scientific Director

Earl Bogoch, M.D., M.Sc.
Co-Chair, BHRCC
Oversight Committee

Angela Cheung, M.D., Ph.D.
Co-Chair, BHRCC
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Co-Chair, BHRCC
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Bone Health Research: Challenges and Opportunities

On November 9-10, 2009 at the Sheraton Centre in Toronto one hundred and seventy-eight participants with differing experiences and expertise gathered to identify and prioritize five central questions for future research priorities in Canada, and to identify the enablers that could make the research possible. Thirteen expert speakers gave presentations in three plenary sessions to help facilitate ideas for the break-out group discussions on future priorities for bone health research.

Research opportunities posed by the speakers in Session 1 (**Prevention and Management of Bone Loss and Fractures in People and Populations)** included:

- What is the most important determinant assessment of bone strength (BMD, bone size and shape, matrix properties, bone remodeling, exercise and diet)? What are the relative contributions of each of these determinants?

- Who should receive pharmacological therapy to prevent fractures?
  There is real potential for expanding the current guidelines on risk criteria by including other common risk conditions in patients.

- How can physicians effectively communicate risks of fractures and benefits of treatment? What are the information needs of patients?

- Will the correction of remodeling disequilibrium restore bone quality? Targeting resorption may have "unexpected" consequences with respect to formation and bone quality.

- There is a need in clinical trials of drugs for better predictors of fractures (markers of bone quality and strength); other clinically relevant endpoints beyond fracture (musculoskeletal functions, CNS functions and quality of life); optimal combination and sequential regimens by drug, by dose and duration of treatment; and prospective head-to-head comparisons (clinical endpoints and someone to pay for them).

- How can we promote the distribution of bone healing and remake bone beyond pharmaceutical treatment?

Research opportunities posed by the speakers in Session 2 (**Prevention and Treatment across the Lifespan)** included:

- To improve the identification of people at risk for fracture, we need better (more accurate) predictive tools that can be applied in younger men and women; BMD test that is a safe, accurate measure of bone quality and quantity; methods to

accurately evaluate expected RATE of bone loss (plan next test, treatment) and clinical practice guidelines to guide treatment based on absolute fracture risk.

- Opportunities for future research in optimizing bone health include: re-emphasizing prevention – both primary & secondary; implementing/evaluating effective interventional programs (nutrition and exercise); investigating which exercises/loads are uniquely effective during growth, maturity vs aging; and integrative research (diet/exercise) among bone/muscle/neuromotor control.

- Behavioural change models are not taken into consideration in most studies on post fracture osteoporosis care. There is a real need to look for ways to enable behaviour change in patients, providers and the health care system to get patients on care.

- There is potential for studies connecting menopause, genetics, and bed rest given our aging population with restricted mobility, co-morbidities, and potential for prolonged "bed rest"/disuse. There is also a need for more "personalized medicine" (genomic analysis) approaches with regard to regulation of bone health and effectiveness of interventions/countermeasures, as well as mechanistic studies to better understand the individual elements contributing to risk for loss of bone integrity, but also how they intersect (+ or -).

Research opportunities posed by speakers in Session 3 **(Barriers to Optimal Bone Health)** included:

- More research is needed on the barriers to optimal bone health in Canada. Need to (re)engineer systems that facilitate:
  - identification of high risk populations
  - post-fracture care
  - identification of non-persistence/non-adherence
  - "physician-proof" decision making

- There is a need for a clear clinical definition of fragility fracture. While BMD is unquestionably a major contributor to bone strength there are numerous other factors that may contribute as much, if not more, variability to the overall mechanical integrity of bone.

- How do we share knowledge creation with patients? What are the barriers and facilitators to medication adherence?

After each plenary session, working group leads and co-leads engaged participants in a process of prioritizing bone health research areas and the tools and mechanisms for addressing their research questions. These priorities were synthesized by IMHA's Scientific Director and Oversight Committee Co-chairs and presented by the Scientific

Director to the participants during Session 4 (Research and Policy Recommendations) of the conference proceedings. These priorities are listed in the Executive Summary.

Detailed Analysis of Cross-Pillar Research Priorities in Bone Health

Post-conference activities included a detailed analysis of the priority research questions identified by each of the nine break-groups (A-I). IMHA staff, led by Scientific Director, Jane Aubin, and the Oversight Committee Chairs: Drs. Earl Bogoch, Angela Cheung, and Cy Frank, categorized the research questions to best suit the five emerging themes which were identified at the conference. While carefully reviewing all break-out group priorities, the IMHA team also identified two additional and equally important emerging themes. These were: **novel and high-risk research on bone, and KT research for bone health**. These have been included in the top cross-pillar research priorities detailed below.

1. **Optimized prevention of "bone attacks" (fractures)**

Research: Mechanisms and pathophysiology of bone diseases and fractures/new medications/therapies

- what is normal and what is not in bone development and aging
- what can be learned from rare bone diseases
- what is the basis of regional skeletal differences and effects in disease onset, progression and therapeutic response
- understanding biological response to acute and chronic stimuli (e.g., mechanical; inflammation; hormonal changes)
- new animal models for pathophysiological and preclinical studies
- systemic & local factors that initiate or maintain uncoupling between osteoclast & osteoblast activity (i.e. chronic inflammation); identification of new therapeutic targets
- determinants of bone physiology, strength, health (genetics, epigenetics, environmental)
- bone as one component of a healthy MSK system

Social/Pop health

- psychosocial and environmental determinants of bone health, disease process, interventions and clinical outcomes: at population and individual levels

- better understanding of the population - e.g., longitudinal (cohort studies)
- a lot has been done in mechanistic science, but not at the level of care (individual and populations)
- not only change behavior at the individual level but at the population based level

Bone health across lifespan

- importance of bone health across lifespan and bone health continuum (from healthy to frail)
- the association of bone health and general health, prevention (including falls prevention) and treatment protocols (starts at childhood) prospective and longitudinal studies
- what is the normal development and maturation of bone and disease course in specific populations (e.g. aboriginal populations, survivors of chronic disease in childhood)

2. Optimized fracture risk prediction tools

- understand the determinants of bone quality and improve the tools to evaluate bone quality, changes over time and fracture risk; better surrogate for bone strength based on bone quality measures
- improve sensitivity and specificity of diagnostic markers (biomarkers/QCT and novel imaging, lifestyle questionnaires, muscle function)
- understand the trajectory of disease and appropriate times for interventions
- improve the assessment indicators of bone health (a lot more work done on how we assess bone health)

3. Optimized fracture management – sequelae -intervention - treatment

Research: Mechanisms and pathophysiology of bone diseases and fractures/new medication/therapies

- need to develop/analyze surrogate disease/animal models that represent certain aspects of bone disease, reflect certain subgroups, and allow assessment of treatment efficacy
- post fracture care: what is the most effective program, what influences healing and how to optimize fracture repair in osteoporosis?

- personalized medicine – gene fingerprints for identifying appropriate clinical care

Interventions

- interventions – identify populations at risk and optimize therapies; concern for patients with co-morbidities; population-level interventions
- how can we tell if interventions (e.g. post fracture, physical activity, pharmaceutical, etc.) are successful?

Outcome measurement

- what are the appropriate outcomes (QOL, function, behaviour, including use of preclinical models) to measure success and over what time period? Broaden the definition of "outcome" to include modifiable determinants of disability – more than just fx (QoL, mobility, pain, depression, weakness, slow vs. catastrophic disability)
- need to connect studying relevant mechanisms and studying outcomes
- robust quantitative standardized measures/diagnostic tools/outcomes (including pt vs. health care professional reported outcomes – pain/psychosocial) to be applied clinically and in research over time
- understand the mechanisms of pain & healing in management of Fx; the clinical and psychological sequelae of Fx; pain management - working towards pain-free Fx – no disability after fracture

Health Systems OP/bone disease management

- how can we manage future "line-ups"?
- health services research for bone diseases other than osteoporosis (periodontal bone loss etc.)?

Multidisciplinary / patient involvement

- patient perception: how to integrate patients into decision making
- how can we involve all health professionals (RN, OT, PT, Dietitians, Naturopaths, Chiropractors, Dentists, MDs) in order to improve bone health?
- develop a holistic approach to fracture prevention (bone health, falling, environment

Adherence

- compliance (acceptance and adherence) – lack of information/better communication/barriers to adoption

4. Bone and other diseases – co-morbidities, commonalities and bidirectional relationship

Research: Mechanisms and pathophysiology of bone diseases and fractures/new medication/therapies

- what research is ongoing re: other bone diseases – pediatric, periodontal, etc?
- widen the scope to include medications and diseases that increase fracture risk?

Interactions and links with other chronic diseases

- links and interactions with other chronic diseases, illness, treatments and pain across the lifecycle; learn from management of other chronic diseases
- how can we incorporate bone health into broader chronic disease management programs - cooperate to identify overlapping goals, alternatives for conflicting treatment
- what are the disease processes that lead to fracture? (obesity, muscle, CVD, stroke, renal failure, dementia, falling, etc)
- role of bone in other systemic diseases
- develop unique potential and limitations of controllable animal/preclinical models (in conjunction with other disease states)
- understand the influences of other systems i.e. vessels, neurology, muscles, fat, hormones – and the etiology of OP as a "systemic" disease
- what is the burden of illness due to fractures in terms of other chronic diseases (i.e., depression, anxiety, CVD)? behavioral research; identification of risk factors for fracture, acceptance of risk, compliance to avoid risk
- try to understand bone health by linking in with a systemic approach (other systems and chronic diseases - inflammation in fact may be the key)

5. New optimized models of care

Social/Pop health

- a lot has been done in mechanistic science, but not at the level of care (individual and populations)

Interventions

- interventions – ID populations at risk, optimize therapies; concern for patients with co-morbidities
- how can we develop novel outcome measures (tools as surrogates or markers, i.e. personalized medicine, muscle, fat
- how can we tell if interventions (i.e., post fracture, physical activity, pharmaceutical, etc) are successful?
- can you show that early intervention is effective to prevent fracture?

Adherence

- compliance (acceptance and adherence) – lack of information/better communication/barriers to adoption
- improving adherence strategies - reminder technology
- addressing/solving the care gap; responsibilities of the care
- test the hypothesis that alternative ways of care delivery might be better than the classical medical model

  Issues:
  - Compassion
  - Health literacy
  - Initiation and compliance
  - Subpopulations
  - Understand basic aspects and knowledge of bone health
- I've just been diagnosed… what do I do? (patient outreach/education) What information do GPs give (newly-diagnosed) patients? How equipped are patients to interpret and understand that information? What are their information needs?

6. Novel and high risk research on bone

- the systems biology approach to bone and its interacting systems: bone and immune cells, bone and marrow, bone and blood cells, bone as an endocrine organ, bone and cancer metastases, bone and novel drug delivery mechanisms
- new computational models for bone and integrated physiology
- new-novel technologies for diagnosis and treatment

- novel regenerative medicine approaches for systemic and local bone disease

7. KT research for bone health

General KT (a common message for all)

- messaging – what key messages should be developed and conveyed; how to guarantee consistent messaging
- increase visibility of consequences of poor bone health (QoL, work, lifestyle)
- what is the most effective way to communicate to policy makers utilizing existing and new epidemiologic and quality of life data at the local, national and international level, and cost to the individual and society?
- how can we increase the level and quality of communication between the patient, medical and research communities?
- what are the most effective methods for communicating health information applied to bone to:
  - Public/Patients/Families
  - Government
  - Health care providers
- health literacy – educating people to understand bone health and relationship to overall health
- engagement and education of public and health care providers at all stages of training (going all the way into the school systems to have people understand the benefits of physical education & nutrition)
- engage younger population and men to increase awareness of bone health
- think outside the box: work with novelty groups (marketing organizations and stores to really develop tools that will allow us to have preventative bone health messaging at every stage - not just when someone develops OP)

KT for researchers

- researchers improve the clarity of bone test results for patients; increase visibility of consequences of poor bone health (QoL, work, lifestyle)

- how do we increase the effectiveness of other disciplines and promote cross-disciplinary communication – kinesiology, engineering, within medicine (diabetes, CV work)
- build capacity by encouraging trainees into the bone health field by making bone sexy...

KT for clinicians

- how to get primary care providers to present the information to the consumer?
- develop a common message for all health professionals (RN, OT, PT, Dietitians, Naturopaths, Pharmacists, Chiropractors, Dentists, MDs) in order to improve bone health
- what is the most effective method of information transfer in the retention/treatment of hip fracture patients (involve RNs, case managers, preprinted order sets) work ongoing?
- translating the best evidence around basic science into clinical care (ex. communicating fracture risk)

KT for patients

- what message (other than pharmacotherapy) is being relayed to patients and to other healthcare providers?

Data tracking and sharing

- how can we share data nationally (and internationally) within the research community?
- use health care system data to track outcomes
- an international registry of biomarker/diagnostic data to provide baseline information across the life-span to “individualize” the patient treatment.

Enablers: "Bone Health is about more than just Bones"

Each of the nine break-out groups was asked to identify enablers to help make their research priorities possible. The Scientific Director and Chairs synthesized the enablers into seven themes during lunch on Day 2 and reported these back to the conference participants in the final plenary session. As so many innovative ideas were produced during the group discussions, the IMHA team felt it would be useful to categorize and list the cross pillar, cross institute, & cross stakeholder approach for making bone health research possible under the following seven thematic headings:

1. Holistic system approach to bone health, including patients

Patient involvement

- Need for involvement of patients in decision-making
- Promotion of patient stories
- Team work amongst researchers with inclusion of "clients" in decision process to define research priorities
- Involving patients and front line physicians in research and designing research questions

Cohort

- Capitalize on existing Canadian and international cohorts: CaMos, CLSA
- Multiple modalities: Add mechanistic studies to assembled cohorts
- Community-based cohort studies
- Support for long term cohort studies
- Sustainability of funding for long-term cohort studies
- Systemic, holistic approach to bone health – e.g., for persuasion and adherence

Research

- Support the integration of new technologies with ongoing clinical research
- Transfer of new knowledge in innovative but clear, individualized messages (use decision making models and listen to the consumer)

Peer review

- Interdisciplinary bone health review committee; appropriate review panels at the funding agencies
- Provide a second, abbreviated stream for new researchers with constructive feedback (Mentors)
- Need appropriate reviewers

2. Common message for all health professionals and patients to improve bone health

- To create a mechanism leading to a single voice (commonality of purpose) in bone health

3. Collaboration across disciplines

Multidisciplinary

- Multidisciplinary alignment – managing teams to identify common focuses and priority secondary focuses
- Teams for cross-fertilization fora
- Bring people together across disciplines and pillars
- Team approaches to bridge between mechanisms in vitro in animal and human models
- Improved diagnostics
- Standardized measures accepted by consensus (research and clinical)
- Human resources – collaboration with experts outside of the bone field and developing highly qualified personnel through fellowships
- Collaboration across disciplines / multiple institutes / targeted RFAs
- Engage broad spectrum of disciplines to help with the education piece

4. Piggyback on existing longitudinal epidemiological studies

- Piggy-backing to longitudinal studies for collecting samples (bone, blood, genome) at the national level
- Leveraging resources from large epidemiological longitudinal studies to develop new outcomes and measures of determinants of disability after fracture
- Existing cohort efforts receive sustained funding

5. National fracture registry linking to other outcome databases and large study cohorts

Data access

- Better access, collection and integration of health care administrative information
- To finance the use of administrative and other data sources to study health economics, epidemiology, care gaps and pharmaco-economics of bone diseases

Databases and registries

- Capitalize on existing databases (pharmaceutical, clinical registries, etc.)
- More research dollars
- More information about relevant genetic biomarkers and the relationship/variations among the various assessment tools
- Detailed clinical registries with tissue and blood banks
- Provide the infrastructure for an image repository – setting up a network for collaboration that would bring together groups (i.e. biomedical engineers, similar to OAI in that Canada will be the coordinating unit)

- Clinical data
- Connect with existing databases to address bone health issues
- Data quality and validation of electronic data bases (i.e., UKGPRD)
- Take advantage of unique patient genotypes and phenotypes
- National fx registry – and having wide access across all researchers & physicians

6. Capacity and trainee development

Research Capacity

- Capacity building in research

7. Partnerships and funding

Partnerships

- Link stakeholder communities (consumers, NGOs, researchers) through partnerships. Look for collaborative opportunities (government, businesses, NGOs, etc).
- Partner with nonprofit organizations
- NSERC-joint grants – involvement of engineers and use of models
- Forming and maintaining key partnerships - consumers, educators, trainees, government, health charities, media
- Collation of ongoing research to facilitate collaboration and reduce duplication
- Partner with industry
- Links with stakeholders – sci/consumer/govt/NGOs + venture capitalists, industry

Multidisciplinary

- Closer relationships between CIHR, Health Canada, and government to promote bone health
- Collaborate with HCP and researchers in other disease areas

Funding

- Increase research funding
- Research funding supporting KT
- More funding and research about cellular and molecular mechanisms of bone diseases and in conjunction with other disease states
- Funding for prospective population/health services studies and linking of multiple data sources
- Funding resources from industry partners for the development of outcomes
- $$$$$
- Money for TRAINING
- More research dollars

Workshop Evaluation

Forty-seven of the one hundred and seventy-eight conference participants completed and returned a workshop evaluation form. The evaluation was overwhelmingly positive with participants indicating that the conference was a very useful experience, providing stimulating discussion, new networks, and future collaborative opportunities in bone health research. Participants remarked that the breakout groups were well facilitated with excellent discussions and appreciated the differing perspectives within their group and of the panel speakers. Many participants also commented that they would like to see a continuation of the conference to further discussions on cross-Canadian collaborations (i.e. a bone health stakeholder coalition, a national bone health strategy, and the creation of a centre of excellence in bone care). They remarked that they would like the conference report widely disseminated to health professionals, patient groups, NGOs and industry, and suggested connecting with individuals who lead the CIHR KT Strategy as an enabler for dissemination nationally.

Conference participants also identified activities that IMHA and its partners need to think about. These included:

- initiatives to educate health professionals and patients about bone health
- more research opportunities beyond "the box"
- IMHA to fund and showcase partnerships
- a national strategy on bone health
- team oriented training programs
- a mentorship matching service where new investigators are matched to mentors
- a focus on regenerative and personalized medicine
- continue biomedical / basic research including sufficient funding for new ideas
- guidelines so that all health professionals in Canada can implement them
- interdisciplinary initiatives actively inviting collaborations with different disciplines
- new partnerships with NIH and local Canadian partners
- investigate other diseases related to bone health across the lifespan
- enhanced funding for existing cohort studies
- review progress in achieving identified goals

Appendices

Conference Planning

In March 2009, the Institute Advisory Board appointed Dr. Earl Bogoch to oversee an Oversight Committee and a larger Planning Committee to determine the scope, logistics and agenda for the Bone Health Research Consensus Conference, which was planned for fall 2009. The Oversight Committee consisted of 3 Co-Chairs: Drs. Earl Bogoch, Angela Cheung, Cy Frank and IMHA's Scientific Director, Dr. Jane Aubin. The Planning Committee consisted of NGOs, health consumers, researchers, clinicians and staff.

Planning Committee Members:		
Earl Bogoch	Monique Gignac	Liz Stirling
Angela Cheung	Ina Ilse	Tanya Gallant
Cy Frank	Robert Josse	Marc Milot
Jane Aubin	Marc McKee	Julie de Courval
Blair Boudreau	Gillian Hawker	Elizabeth Robson
Jeff Dixon	Famida Jiwa	Sally Clelford

In the summer 2009, the Planning Committee provided the IMHA IAB briefing notes on a provisional program, which included conference objectives, a partnerships strategy, and a format for plenary sessions and breakout groups. Potential speakers were identified for three plenary sessions:

- Prevention and Management of Bone Loss and Fractures in People and Populations
- Prevention and Treatment across the Lifespan
- Barriers to Achieving Optimal Bone Health

The Planning Committee also identified the categories of stakeholders who should be invited. Partners approached included research ambassadors (patient-citizens), principal investigators, research trainees, representatives from CIHR, the private sector, NGOs, and the public sector.

In the fall 2009, the Planning Committee decided that there should be 9 break-out groups for each of the three sessions, based upon the number of participants (178) who had registered on-line. PIs were evenly distributed amongst the nine break-out groups factoring in their pillar of research and their geographic location. The remaining participants (partners, trainees, lay consumers, industry representatives, and speakers) were also evenly distributed to ensure diverse perspectives for developing outcomes. Leads, co-leads and rapporteurs were identified for their ability to facilitate discussion and ensure that all members were given the opportunity to participate and voice their opinions. A speakers' dinner, a reception, and breakfasts were planned to provide participants with an opportunity to meet others, and to have an open dialogue on how to work together to implement the conference outcomes.

Conference Proceedings

During registration on Day 1, participants were given a conference package, which included a welcome letter from Leona Aglukkaq, the Minister of Health, an agenda, a evaluation form to be submitted at the end of the conference, a name badge identifying their specific breakout group (A-I), and a question for each of the three break-out sessions. The questions were:

Session 1: "How can bone health research get the attention it deserves?"
Session 2: "How can we (better understand the relationship between disease process and outcome?"
Session 3: How can we (more effectively treat common bone health disorders?

The conference began at 7am on Day 1 with a breakfast designed for the larger group of participants, a breakfast for IMHA's partners, and an orientation breakfast for the volunteer leads/co-leads and rapporteurs. During the partnership breakfast, IMHA's Scientific Director Jane Aubin welcomed 20 organization representatives including: Osteoporosis Canada, Elli Lilly, Amgen, Alliance for Better Bone Health, several CIHR institutes, Canadian Arthritis Network, the Canadian Memorial Chiropractic College, About Face, Bone and Joint Decade, The Arthritis Society, Canadian Dental Association, and the Canadian Orthopedics Foundation. A representative of the CIHR Partnerships and Citizen Engagement Branch also spoke briefly. All agreed the event was a nice way to start the BHRCC. All attendees and supporters were thanked and there was signage outside the room to highlight their support. A brief survey was provided for partners to fill out during the breakfast. Angela Cheung chaired a young investigator breakfast sponsored by Osteoporosis Canada on Day 2.

During the orientation breakfast for the leads/co-leads and rapporteurs Gillian Hawker briefed the attendees on their roles and responsibilities for the break-out sessions. The leads were asked to convey discussions with their respective groups around specific questions included in the conference package, and to generate 3-5 research questions. These questions should:

- Be suitable to be used subsequently in a call for research proposals from the organizing funding body (CIHR/IMHA) and its partner organizations
- Require interdisciplinary / cross-pillar collaborations to be successful; and
- If answered, have the potential to substantially reduce the burden of illness due to bone health disorders in Canada, in the short-term (1-5 years) or longer term.

The leads were also briefed to ask their respective groups to consider what barriers needed to be overcome, and what enablers were needed, to make the research possible. The co-leads were asked to keep time, and to keep the conversation on topic and goal-directed. The rapporteurs were asked to make notes of key points that were made during the session, and to assist in summarizing the "deliverables" for the group during, and subsequent to, the breakout session. A PowerPoint template was provided for each of the nine groups entitled "Top Five Bone Research Priorities." Each participant had approximately five minutes to identify one issue she/he felt was a priority, 25 minutes to engage in the group discussion, 5 minutes to vote on the research questions generated, and approximately 30 minutes to obtain consensus on the top 5 research questions and enablers to make the research possible.

Nine breakout-session power points were used to report back to all participants during each of the three plenary sessions. These slides were synthesized by IMHA's Scientific Director and Oversight Committee Co-chairs during lunch on Day 2 and presented by the Scientific Director to the participants during Session 4 "Research and Policy Recommendations."

CONFERENCE AGENDA

SUNDAY, NOVEMBER 8, 2009

4-7 pm	Registration
7:00 pm	Speakers' Dinner

DAY 1 **MONDAY, NOVEMBER 9, 2009**

7:00 am	Continental Breakfast
8:00 am	Welcome Greetings from NIH and Conference Overview Alain Beaudet / Joan McGowan / Jane E. Aubin
8:15 am	Bone Health - A Patient's Perspective Sheila Brien
8:30 am	Keynote Address: Who Should Receive Pharmacologic Therapy to Prevent Fractures? Steven R. Cummings

SESSION 1 **Prevention and Management of Bone Loss and Fractures in People and Populations**
Chair: Earl R. Bogoch

9:00 am	1A: Determinants of Bone Strength and Fracture Risk Mary L. Bouxsein
9:15 am	1B: Clinical Disorders Associated with Bone Loss: "Mechanisms and Therapeutic Targets" Steven R. Goldring
9:30 am	1C: Therapeutics to Reduce Bone Loss and Fracture Ed Nemeth
9:45 am	1D: Future of Bone Replacement/Repair: Drugs, Grafts, Factors Joseph Lane
10:00 am	Speaker Panel / Q & A

10:15 am	Setting the Bone Health Research Agenda Introduction to Working Groups Jane E. Aubin
10:20 am	Health Break
10:35 am	Facilitated Working Groups
11:45 am	Weighing In: Working Group Reports / Working Group Chairs
12:30 pm	Lunch - "The US Bone Health Strategy: A Public Private Partnership" Joan McGowan and Ann L. Elderkin

SESSION 2 **Prevention and Treatment across the Lifespan**
Chair: Angela Cheung

1:30 pm	2A: Identifying People at Risk for Fracture – Case Finding Strategies Gillian Hawker
1:45 pm	2B: Optimizing Bone Health: Diet and Exercise Ron Zernicke
2:00 pm	2C: Bringing Guidelines to Reality: The Role of Models of Health Behaviour Change in OP Care Dorcas Beaton
2:15 pm	2D: Intersection of Sex, Genes and Biomechanical Influences on Bone Health David Hart
2:30 pm	Speaker Panel / Q & A
2:45 pm	Health Break
3:00 pm	Facilitated Working Groups
4:05 pm	Weighing-In: Working Group Reports / Working Group
4:50 pm	Wrap Up and Adjournment
5-7 pm	Reception

DAY 2 **TUESDAY, NOVEMBER 10, 2009**

7:00 am	Continental Breakfast
8:10 am	Overview Day 2 Jane E. Aubin

SESSION 3 **Barriers to Achieving Optimal Bone Health**
Chair: Cy Frank

8:15 am	3A: Barriers to Optimal Bone Health: A System that Depends on Reliability is Unreliable William Leslie
8:30 am	3B: Who Should Get Drugs to Prevent Fractures? Jacques Brown
8:45 am	3C: The Impact of Osteoporosis: The Patient Perspective Alexandra Papaioannou
9:00 am	Speaker Panel / Q & A
9:15 am	Health Break
9:30 am	Facilitated Working Groups
10:40 am	Weighing-In: Working Group Reports / Working Group Chairs
11:30 am	Lunch

SESSION 4 **Research and Policy Recommendations**

1:00 pm	Synthesis and Recommendations for the Conference Participants Chairs
1:15 pm	Participant Feedback
1:25 pm	Concluding Remarks and Closure Jane E. Aubin

Keynote & Conference Speakers

Dorcas Beaton, B.Sc.OT, M.Sc., Ph.D.

Associate Professor, University of Toronto; Director, Mobility Program Clinical Research Unit, St Michael's Hospital

Dorcas Beaton is an occupational therapist by background and worked in orthopaedics for many years before returning to school to complete a Ph.D. in clinical epidemiology. Her main interests are in measurement of patient outcomes and perceptions, as well as bringing these measures into frontline clinical care. She is working with the Ontario Osteoporosis Strategy's Fracture Clinic Screening Coordinator program and leads the analysis of their growing dataset of over 20,000 persons who have had a fracture. It is there that she has noted gaps that models of behaviour change might help us to fill. She will bring that knowledge to the Bone Health Research Consensus Conference. Dr. Beaton is based in the Mobility Program Clinical Research Unit in the Keenan Research Centre, Li Ka Shing Knowledge Institute of St Michael's Hospital. She also works at the Institute for Work and Health and teaches at the University of Toronto.

Mary L. Bouxsein, Ph.D.

Assistant Professor, Orthopedic Surgery, Harvard Medical School; Adjunct Assistant Professor of Mechanical Engineering, Boston University; Faculty member, MIT-based Bioastronautics Program

Dr. Bouxsein received her doctorate in Mechanical Engineering from Stanford University and completed a post-doctoral fellowship at the Orthopedic Biomechanics Laboratory at Harvard Medical School. She currently holds joint appointments as an Assistant Professor of Orthopedic Surgery at Harvard Medical School, adjunct Assistant Professor of Mechanical Engineering at Boston University, and is also a faculty member in the MIT-based Bioastronautics Program. Her research focuses on understanding skeletal fragility from a biomechanics viewpoint, and includes studies using animal models and human cadaveric tissue, as well as clinical investigations. She also has a strong interest in the use of novel non-invasive imaging techniques to predict fracture risk and monitor response to osteoporosis therapies. Dr. Bouxsein is a board member of the International Bone and Mineral Society, and serves on the committee of scientific advisors for the International Osteoporosis Foundation and on the Advocacy Committee of the American Society for Bone and Mineral Research. Dr. Bouxsein has published over 120 peer-reviewed articles and 30 book chapters and invited reviews.

Sheila Brien

Canadian Osteoporosis Patient Network

"Don't let complacency set in!"

While helping to carry a table up a flight of stairs, Sheila felt something "give" in her back and suddenly found herself barely able to walk and in a great deal of pain. Following an x-ray and a bone mineral density test, Sheila was diagnosed with two fractured vertebrae. This was in 1987 and there were few medications available. Fortunately this soon changed for the better and Sheila was eventually able to go on a medication regime that kept her fracture-free for 19 years. Last year she again fractured a vertebra. The message was brought home to her: "Don't let complacency set in." Sheila has volunteered over the years with Women and Osteoporosis, Osteoporosis Canada, and is currently volunteering with the Canadian Osteoporosis Patient Network (COPN).

Jacques P. Brown, M.D.

Head, Division of Rheumatology, Le Centre hospitalier universitaire de Québec

Dr. Jacques P. Brown is a rheumatologist and a well-known Canadian authority in metabolic bone diseases. He is a clinical professor, Department of Medicine, at Laval University and Head of the Division of Rheumatology at Le Centre hospitalier universitaire de Québec. His major research interests include Paget's disease of bone and osteoporosis. He is Centre Director (Québec) for the Canadian Multicentre Osteoporosis Study (CaMos), an epidemiologic study looking to the prevalence of osteoporosis and the incidence of osteoporotic fractures. He is the Principal Investigator of the Recognizing Osteoporosis and its Consequences (ROCQ) study, a patient health-management program aimed at evaluating the diagnostic and treatment care gaps for osteoporosis following a fragility fracture in women 50 years of age and over. In 2003, Dr. Brown has received the John B Johnson Award from The Paget Foundation in recognition of his outstanding contribution to research by identifying the first gene associated with Paget's disease of bone. In 2004, the Lindy Fraser Memorial Award was given to Dr. Brown for his leadership and dedication to the "2002 Clinical practice guidelines for the diagnosis and management of osteoporosis in Canada." Last June, Dr Brown was decorated a Knight of the Ordre national du Québec, the highest distinction awarded by the government of Quebec.

Steven R. Cummings, M.D.

Founding Director, San Francisco Coordinating Center (SFCC)

Dr. Cummings is the founding Director of the San Francisco Coordinating Center (SFCC), which leads and coordinates several large studies in women's health and osteoporosis. He is an emeritus Professor of Medicine and Epidemiology at the University of California San Francisco and Senior Scientist at the California Pacific Medical Center Research Institute. He has published over 300 original articles about osteoporosis and women's health, including the results of pivotal trials of alendronate, raloxifene, tibolone, and zoledronate and denosumab. He has served on the ASMBR Council, NOF Board of Trustees, Board of Directors of IOF and IBMS. He has been elected to the Institute of Medicine (IOM) of the U.S. National Academy of Sciences for his work in clinical research and women's health. He has been awarded the ASBMR's Frederick C. Bartter Award for excellence in clinical research in osteoporosis, the John G. Haddad Award and the NAMS SERM Research Award.

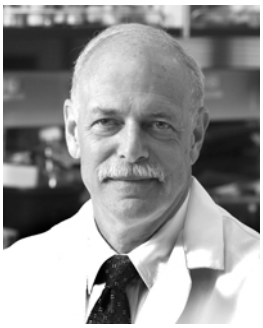
Ann L. Elderkin, P.A.

Executive Director, American Society for Bone and Mineral Research (ASBMR)

Ms. Elderkin is Executive Director of the American Society for Bone and Mineral Research (ASBMR), the world's largest professional, scientific and medical society established to bring together clinical and experimental scientists involved in the study of bone and mineral metabolism. With almost half its members from outside the US, ASBMR is proactive in shaping research and facilitating the translation of that science to health care and clinical practice worldwide. A driving force in the development of the National Action Plan for Bone Health, the ASBMR works closely with the National Coalition for Osteoporosis and Related Bone Diseases (the Bone Coalition), comprised of ASBMR, the National Osteoporosis Foundation, the Osteogenesis Imperfecta Foundation, The Paget Foundation and the American Academy of Orthopaedic Surgeons. The Plan outlines recommended actions, responsibilities, and short- and long-term timelines for priorities and programs for health professionals, health systems and population-based approaches to promote bone health. A leader with a reputation for making a difference in the health care industry, Elderkin has more than 25 years of experience in health care leadership positions, directing health care policy development, managing public health administrations and providing medical services as a physician assistant. Prior to joining ASBMR, Elderkin served as project director and managing editor of Bone Health and Osteoporosis: A Report of the Surgeon General, released in October 2004. She also directed projects on women's mental health and health care services. Elderkin served in the Office of the

Surgeon General of the US as a Senior Health Policy Fellow and Consultant from 2000 to 2002. From 1990 to 2000, she was director of the City of Somerville (Massachusetts) Health Department and also served as director of the City of Portland (Maine) Public Health Division. Elderkin has received many awards for her work, including: the Surgeon General Exemplary Service Award in 2002; the American Medical Association Dr. Nathan Davis Award for Outstanding Career Public Servant at the Local Level in 1995; the American Cancer Society Making a Difference Award for Outstanding Community Service in1995; the Massachusetts Department of Public Health Partners in Prevention Award in 1995; and the American Cancer Society Award for Extraordinary Effort and Results, recognizing leadership in tobacco-control regulations in 1992. Elderkin has a bachelor's degree in human services from the University of Massachusetts and a Physician Associate Certificate from Yale University School of Medicine.

Steven R. Goldring, M.D.

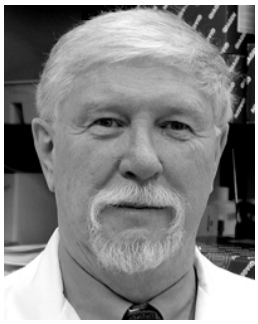


Chief Scientific Officer and St. Giles Chair, Hospital for Special Surgery; Professor of Medicine, Weill Cornell Medical College

Steven R. Goldring, M.D. is the St. Giles Chair and Chief Scientific Officer at Hospital for Special Surgery and Professor of Medicine at Weill Cornell Medical College in New York City. He previously was a Professor of Medicine at Harvard Medical School and Chief of Rheumatology at New England Baptist Hospital and Beth Israel Deaconess Medical Center, Boston, Massachusetts. After receiving his MD from Washington University School of Medicine, St. Louis, Missouri, he completed his medical residency training at Peter Bent Brigham Hospital and his rheumatology training at the Massachusetts General Hospital in Boston. His research interests focus on the cellular and molecular mechanisms involved in the regulation of physiological and pathological bone remodeling. He is the past President and Secretary-Treasurer of the American Society of Bone and Mineral Research. He previously served as the Chairman of the Orthopaedics and Musculoskeletal Study Section at the National Institutes of Health and has been the Chairman of the Gordon Research Conference on the Molecular Biology of Bones and Teeth, Co-Chairman of the Keystone Conference on the Pathogenesis of Rheumatoid Arthritis and Vice-Chairman of the National Institutes of Health, Consensus Development Panel on Osteoporosis. Dr. Goldring is a co-recipient of the Klemperer Award, Carol Nachman Prize in Rheumatology and has received the Arthritis Foundation's James H. Fairclough, Jr. and Marian Ropes Awards and the Paget's Disease Foundation Research Award.

David A. Hart

Professor, Departments of Surgery, Medicine, and Microbiology and ID



Dr. Hart received his B.A. degree from Northern Michigan University and received his PhD in Biochemistry from Michigan State University. In 1983, Dr. Hart moved to the University of Calgary as a Professor of Microbiology and ID and Medicine, as well as more recently the Department of Surgery (2002). He is currently Chair of the Life Sciences Advisory Committee for the Canadian Space Agency, the Director of the Alberta Bone and Joint Training Program, and a Member of the ISIS MSK Network of the Society for Women's Health (USA). In 2006, Dr. Hart was awarded an Honorary Doctorate in Biochemistry from Northern Michigan University and has been the Calgary Foundation-Grace Glaum Professor at the University of Calgary since 1994. He was elected a Fellow of the Canadian Academy of Health Sciences in 2008. For the past several years, Dr. Hart's research has focused on the molecular and cell biology of wound healing, with particular emphasis on ligament and tendon maturation and healing, normal and abnormal skin wound healing, and sequelae of conditions involving fibrotic processes such as joint contractures and tendinopathies. Dr. Hart has published over 350 original articles, book chapters, and reviews, as well as over 1100 abstracts. Dr. Hart has an active laboratory with many trainees, as well as an international and national network of collaborators (including Sweden, Germany, Australia, USA, and South Africa).

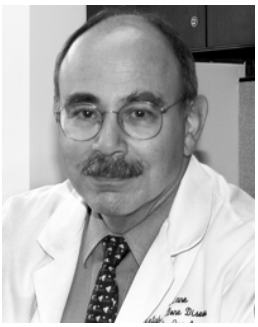
Gillian A. Hawker
M.D., M.Sc., FRCP (C)

Professor of Medicine and Rheumatology, University of Toronto; Chief of Medicine, Women's College Hospital

Dr Hawker is Professor of Medicine and Rheumatology at the University of Toronto, and Chief of Medicine at Women's College Hospital, where she co-founded the Multidisciplinary Osteoporosis Clinical and Research Programs. She is a recipient of The Arthritis Society's Senior Distinguished Rheumatologist Investigator Award and holds the F. M. Hill Chair in Academic Women's Medicine. Her research is focused on two common musculoskeletal conditions in women, osteoporosis and osteoarthritis. Her osteoporosis research has been focused in two areas: identifying the determinants of low bone mass, and its optimal management, in young and middle aged women; and health services research to assess, and develop strategies to address, gaps and needs for osteoporosis care in the population.

Joseph M. Lane, M.D.

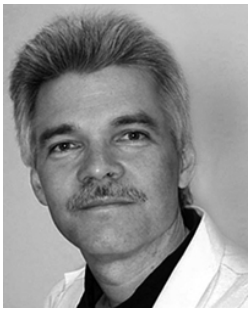
Professor of Orthopaedic Surgery and Assistant Dean of Medical Students, Weill Medical College of Cornell University



Dr. Lane's research interests include metabolic bone disease, cartilage preservation and transplantation, bone regeneration and connective tissue injury and repair. His most recent research has been directed at bone quality. Formal training included a chemistry undergraduate degree, graduating Magna Cum Laude from Columbia University and M.D. from Harvard University. In addition to clinical professorship posts, Dr. Lane has held numerous positions for on-going research in orthopaedics with the National Institute of Health (serving on several study sections), the American Academy of Orthopaedic Surgeons, and past President of the Orthopaedic Research Society. He is presently Professor of Orthopaedic Surgery and Assistant Dean of Medical Students at Weill Medical College of Cornell University, New York. He is an Orthopaedic Attending and Clinical Research Scientist at the Hospital for Special Surgery, New York. He has served as Chief of Bone Tumors at Memorial Sloan-Kettering Cancer Center, New York and Chairman of Orthopaedics at UCLA. Dr. Lane has served as Chairman to many professional society functions and committees. His influence in orthopaedic research is evidenced by hundreds of publications, book chapters and scientific articles. In addition, he has contributed to orthopaedic knowledge as a frequent visiting professor.

William Leslie, M.D. M.Sc. FRCP (C)

Professor of Medicine and Radiology, University of Manitoba



Dr. Leslie is Professor of Medicine and Radiology at the University of Manitoba. He obtained his specialty training from the University of Manitoba and McGill University, qualifying in Internal Medicine in 1989 and in Nuclear Medicine in 1990. He is clinically active in nuclear medicine and thyroid cancer, and has research interests in osteoporosis testing and other nuclear diagnostic techniques including PET scanning. Dr. Leslie joined the Scientific Advisory Council of Osteoporosis Canada in 1997. He contributed to the 2002 Guidelines document and to the recent publications "Recognizing and Reporting Vertebral Fractures: Reducing the Risk of Future Osteoporotic Fractures" and "Recommendations for Bone Mineral Density Reporting in Canada." More recently he has been involved in MOHLTC projects addressing bone density testing in men, bone density testing in women age 40-59 years, and updated vitamin D recommendations. He is currently Chair of the Scientific Advisory Council and Past Chair of the Guidelines Committee for Osteoporosis Canada, on the Board of the International Society for Clinical Densitometry, Director of the Manitoba Bone Density Program, and Co-Director of the Winnipeg PET Imaging Centre.

Joan A. McGowan, Ph.D.

Director, Musculoskeletal Diseases Branch, National Institute of Arthritis and Musculoskeletal and Skin Diseases

Dr. McGowan is the Director of the Musculoskeletal Diseases Branch at the National Institute of Arthritis and Musculoskeletal and Skin Diseases, leading a program of research on orthopaedics, osteoarthritis, bioengineering, basic skeletal biology, osteoporosis and related bone diseases. Before joining NIH, Dr. McGowan was a faculty member at the Harvard Medical School and Massachusetts General Hospital. She received training at Cornell University (Master in Nutritional Science) and Brown University (Ph.D. in Biomedical Science). Dr. McGowan has been very active in osteoporosis and women's health activities at NIH including serving as a Project Officer in the Women's Health Initiative, a clinical trial and observational study that has recruited over 160,000 postmenopausal women. The study is designed to test promising interventions in cardiovascular disease, breast and colon cancer and osteoporosis. The study involves 40 clinical centers all over the country including the three centers focusing on osteoporosis. Dr. McGowan served as a member of the Advisory Board of the Canadian Institute of Musculoskeletal Health and Arthritis (2001 –2004) and serves on the Editorial Board of the journal Aging: Clinical and Experimental Research. Dr. McGowan chairs the Federal Working Group on Bone Diseases whose members represent all of the U.S. federal agencies with activities in osteoporosis and related bone diseases. This group serves to develop and foster collaborative activities among the government agencies in bone diseases. She was the NIH organizer of a Consensus Development Conference on Optimal Calcium Intake in 1994 and one on Osteoporosis held in March, 2000. She served as the Senior Scientific Editor of Bone Health and Osteoporosis: A Report of the Surgeon General published in October 2004.

Edward F. Nemeth, Ph.D.

Visiting Scientist, Department of Pharmaceutical Sciences; and Co-Director, Drug Discovery Course, University of Toronto

Edward F. Nemeth received a B.A. in chemistry and psychology from Lawrence University, a M.A. in psychology from Princeton University, and a Ph.D. in pharmacology from Yale University. He was a faculty member in the Department of Physiology and Biophysics at Case Western Reserve University School of Medicine and the Chief Scientific Officer at NPS Pharmaceuticals. Dr. Nemeth is a Visiting Scientist in the Department of Pharmaceutical Sciences at the University of Toronto where he co-directs the drug discovery course. Dr. Nemeth's research interests are the pharmacology of G protein-coupled receptors and the physiology of bone and mineral metabolism. He established and led the team that discovered the first molecules that act on the calcium receptor and coined the terms "calcimimetic" and "calcilytic" to describe activators and inhibitors of this receptor, respectively. The first drug resulting from these efforts is cinacalcet (Sensipar®), a calcimimetic that is used to treat patients with hyperparathyroidism. Dr. Nemeth participated in the development of parathyroid hormone (Preotact®) as a therapy to build new bone in patients with established osteoporosis (anabolic therapy). Calcilytic compounds, which stimulate the secretion of parathyroid hormone, are being developed by several pharmaceutical companies as anabolic therapy for osteoporosis.

Alexandra Papaioannou, B.Sc.N., M.Sc., M.D., FRCP (C)

Professor, Department of Medicine and Director, Division of Geriatric Medicine, McMaster University

Dr. Alexandra Papaioannou is a Professor in the Department of Medicine and a Geriatrician at Hamilton Health Sciences. She is the past Director of the Division of Geriatric Medicine, McMaster University with joint appointment in the Division of Rheumatology. Dr Papaioannou has received a CIHR Research Chair – Eli Lilly Osteoporosis and Fracture Prevention and was a prior Ontario Career Scientist. She is an Associate Member in the Department of Clinical Epidemiology and Biostatistics and has completed Masters of Science (MSc), Health Research Methods at McMaster University. Dr. Papaioannou is Chair of the Scientific Advisory Council of Osteoporosis Canada (OC) and past Chair of the Board. She is the project lead for the Ontario Osteoporosis Strategy for Fracture Prevention in Long-term Care, Co-Director of the Hamilton Canadian Multi-Centre Osteoporosis Study (CaMos) and is leading the Fracture Think Osteoporosis project, a chronic disease management program in Hamilton, Ontario. Dr. Papaioannou is a member of the Scientific Advisors of the International Osteoporosis Foundation. She has published 139 peer reviewed journal articles and 14 book chapters.

Ronald Zernicke, Ph.D., D.Sc.

Professor, Department of Orthopaedic Surgery - Department of Biomedical Engineering and School of Kinesiology, University of Michigan; Director, Bone and Joint Injury Prevention and Rehabilitation Center, University of Michigan; Adjunct Professor, Kinesiology-Medicine-Engineering, University of Calgary

Dr. Zernicke began (2007) at the University of Michigan as a Professor in the Department of Orthopaedic Surgery, Department of Biomedical Engineering, and School of Kinesiology, where he is Director of the Bone and Joint Injury Prevention and Rehabilitation Center. He continues to hold an Adjunct Professor position at the University of Calgary, in the Faculties of Medicine, Engineering, and Kinesiology. Immediately prior, he was the Executive Director of the Alberta Bone and Joint Health Institute, and at the University of Calgary, he was Wood Professor in Joint Injury Research in the Faculty of Medicine, Professor and former Dean of the Faculty of Kinesiology, and Professor in the Schulich School of Engineering. He was Director of the Alberta Provincial CIHR Training Program in Bone and Joint Health, a combined graduate program of the University of Calgary and University of Alberta. His baccalaureate was from Concordia University Chicago (1970), and his MSc (1972) and PhD (1974) were from the University of Wisconsin–Madison. He joined UCLA in 1974 and was Chair of the Department of Kinesiology when he was recruited to Calgary in 1991. He received the UCLA Award for Distinguished Teaching, City of Calgary Community Achievement Award (Education), the University of Calgary Award for Outstanding Achievement in Graduate Supervision, and he was Alumnus of the Year for Concordia University Chicago. He was president of the Canadian, American, and International Societies of Biomechanics. He received research awards from NASA, the Society for Physical Regulation in Biology and Medicine, the American and International Societies of Biomechanics, Career Award from the Canadian Society for Biomechanics, the Founder's Award for Best Research from the Canadian Orthopaedic Research Society, and the Partnership Award from the Canadian Institutes for Health Research. He is a Fellow of the Canadian Society of Biomechanics, the American College of Sports Medicine, and American Academy for Kinesiology and Physical Education. His research has been supported by the Arthritis Society of Canada, Alberta Heritage Foundation for Medical Research, Alberta Ingenuity Fund, Canadian Space Agency, Natural Sciences and Engineering Research Council of Canada, Canada Foundation for Innovation, Alberta Innovation and Science, Canadian Institutes for Health Research, Lew Reed Spinal Cord Injury Foundation, the Fraternal Order of Eagles (Alberta and Saskatchewan), National Aeronautics and Space Administration, National Science Foundation, and National Institutes of Health (US). His research focuses on: (1) the adaptation of bone to exercise, disuse, diet, and disease and (2) joint injury and post-traumatic osteoarthritis.

Acknowledgements

Thank you to the following institutions & organizations for their generous support

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CIHR Institute of Partnerships and Citizen Engagement Branch

Special Thanks from IMHA

IMHA would like to thank all conference participants for sharing their ideas to help shape a national bone health research agenda. We were delighted that you were able to contribute to this initiative and look forward to future collaborative opportunities that will further enhance Canada's leading reputation in this field.

IMHA would also like to extend thanks and appreciation to the Minister of Health, Leona Aglukkaq for her welcoming message and commending the Institute for its leadership in bringing together researchers, clinicians, patients and health policy makers to help shape a national bone health research agenda that has a realistic prospect of bettering the health of Canadians and others.

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