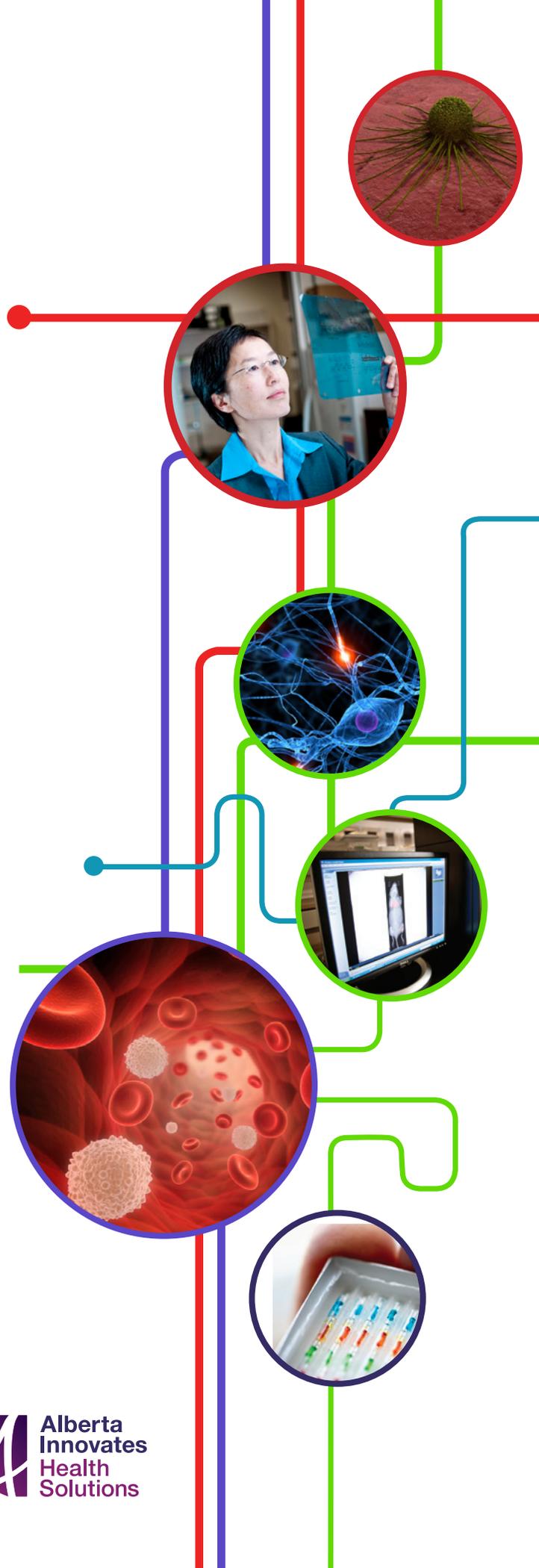


# SCIENCE BEHIND THE OUTCOMES

SUMMARY

a forum on  
basic discovery &  
translational science  
in Alberta

NOVEMBER 7 & 8, 2013  
SHAW CONFERENCE CENTER  
EDMONTON ALBERTA



## WE HEARD

### Basic science matters

*"Translational scientists like me rely on basic researchers and their findings so I can apply their work to disease."* **Michael Houghton**

*Without the type of discovery science that came up with embryonic stem cells, pluripotent stem cells, "you won't have the tools to solve your problems. You'll just be managing today's problems with today's skill set."* **Jonathan Lytton**

*"We're not here to debate whether the science behind the outcomes is important. It is important...Basic science is critical to our success and that is supported without exception by every one of our board members."*

**Rob Seidel, chair, Alberta Innovates Health Solutions**

*"It is discovery science that will define the future...I do understand the value of new knowledge for its own sake."*

**The Honourable Fred Horne, Minister of Alberta Health and Wellness**

*"I believe Alberta can be the best in discovery research."*

**Cy Frank, CEO, Alberta Innovates Health Solutions**

*"There's nothing to translate without a strong basic research enterprise."*

**Alain Beaudet, president, CIHR**

### But something has to change

*"We are creating knowledge that sits on a shelf and doesn't get applied very quickly. Some studies show an average of 17 years from discovery to application."* **Cy Frank**

*A wealth of excellent discovery research has existed in Alberta for many years. "It's staggering to think it has never been subject to a study of how to apply it to healthcare delivery or other areas of social policy."* **Minister Fred Horne**

*"If you get an adult human brain tumour, on average, you're dead in 15 months... you're asking, 'why isn't science doing something about it?'"* **Sam Weiss**

*In Canada, despite being among the top five in the world in basic research, "when you look to our healthcare system, we're doing abysmally."* **Alain Beaudet**

## Alberta is uniquely poised to drive that change

*"The stars are aligned." The health care system, the health ministry, AIHS, Campus Alberta and the Academic Health Networks are aligned in purpose and commitment. This positions Alberta to be the best-networked jurisdiction in Canada, working towards single-window access to data and harmonized processes and policies.*

*"The Strategic Clinical Networks and Operational Clinical Networks "allow for acceleration of the push of new knowledge into the delivery system, but they also allow for a more organized pull from the delivery system where the needs are identified to the research community." Minister Fred Horne*

*The country's first SPOR SUPPORT Unit is "a huge competitive advantage for this province...game changing." Cy Frank*

The SPOR SUPPORT unit will position Alberta as a leader in patient-oriented clinical research. The ability to plug into this strong network across areas of major health challenges will help our basic and translational science communities be more immediately relevant and more globally competitive.

## GROWING ALBERTA'S KNOWLEDGE GRID

### The conversation throughout the Science Behind the Outcomes Forum was animated and wide-ranging.

The clear theme that emerged was that we are in the era of "big science." We could learn from physicists, said one participant, and the international collaboration that built the particle accelerators and detectors at CERN (European Council for Nuclear Research). This shared platform is facilitating a rapid acceleration of knowledge in physics.

Alberta's own energy industry may provide other lessons in collaboration, suggested another. But there were also rich examples within existing basic and translational science, in Alberta and around the world. The question was not if we needed to become better at collaborating, but how. Shared platforms and harmonized processes seemed to be the answer.

What might it look like? Participants envisioned plugging into platforms operated by highly qualified personnel--professional scientists who were not distracted by grant writing or departmental reporting.

They envisioned provincial or interprovincial core facilities with exemplary customer service. And there was a shopping list of possibilities: Multi-modal imaging; multi-modal stimulation and ablation; transgenic, optogenetic and bio-photonic microscopy; Computation and bioinformatics centres; X-ray crystallography, to name a few.

Participants envisioned support for specialized areas and seamless integration of expertise that would include computational biologists, systems biologists, and scientists with experience in human induced pluripotent stem cell research. In addition, they called for consolidated and comprehensive resources in disease modeling, genomics, imaging, and clinical trials.

Participants envisioned streamlined, harmonized processes for ethics review and access to data; stable, sustainable, long-term funding; and a provincial talent strategy.

### Connecting patients to the knowledge grid

A second theme brought a new partner to the knowledge grid: patients. Can and should discovery research connect to patient needs? For some, it was a big step and there was discussion of the types of basic discovery, often in animal or cell models, that has transformed our understanding of human biology, but may not have been undertaken if scientists had been tied to research that only connected to patient need.

Is there a point at which discovery research can connect with patient need without compromising the generation of new knowledge?

Participants heard from a number of basic and translational researchers who believe it's possible, desirable, and as one said, a moral imperative.

*Participants envisioned streamlined, harmonized processes for ethics review and access to data; stable, sustainable, long-term funding; and a provincial talent strategy.*

## BUILDING KEY PLATFORMS TO SUPPORT ALBERTA'S KNOWLEDGE GRID

### WHAT ARE INNOVATIVE PLATFORMS?

#### Innovative Platforms

*Platforms are support structures or technologies equipped with highly qualified people that collectively support the health research system. Platforms are expansive in terms of their size, complexity, ability to serve the needs of broad programs, and their provincial scope. AIHS*

*"Platforms are not simply widgets, facilities, or specialized pieces of equipment; they represent 'ways' of discovering or facilitating new knowledge and applications. As such, they are active areas of research in themselves; they continuously evolve as new knowledge is created thereby opening new paths to inquiry, or changing the way we govern ourselves."*

**Edward McCauley (University of Calgary Strategic Research Plan 2012)**

*"Platforms facilitate, enable or enhance the natural assembly units to work at a higher level of efficiency or greater level of accomplishment."* **Douglas Miller**

## KEY PLATFORMS TO SUPPORT SUCCESS

Pre-event surveys and breakout group sessions at the forum identified similar priorities for development of key platforms to support basic discovery and translational science in Alberta. The following top five platforms emerged as priorities.

### Top 5 Platforms

Informatics & computation

Genomics & “omics”

Imaging

Pre-clinical models

Biobanking

### What is needed to strengthen Alberta's knowledge grid?

- Sustained, stable investment.
- Provincial and inter-provincial coordination of access to data, equipment and expertise.
- Provincial human resources strategies for recruitment and training of highly qualified personnel.
- Connecting basic, translational and clinical science in a way that strengthens each.

### What are our next steps?

The forum steering committee agreed on the following process for moving forward collaboratively over the next few months:

1. Involve stakeholder groups in validation of current asset maps for each priority.
2. Actively make the case for base operating dollars to secure existing assets.
3. Identify clear measures of success.
4. Develop a business case for each potential platform.
5. Assess where strategic direction, science and opportunity intersect, and which investments will bring Alberta to the level of global competitiveness.
6. Consult with stakeholders on final priorities.
7. Develop and initiate action plans for selected platforms.

## CONNECTING EXISTING PLATFORMS

The world is trying to build systems-based approaches and shared platforms to keep up with the era of “big science, rather than Lone Ranger science,” says Douglas Miller. It’s partly driven by “an impatient system,” frustrated with shorter lives and poorer health despite significant scientific advances.

The push to network is also driven by the need to keep pace with advanced technologies that bring massive datasets as well as opportunities for virtual drug design, target validation and more. The US national Network for Translational Medicine and Health Care Innovation is a systems-based network approach, while Nicolas Davies presented on the UK bio-banking experience, which is industrial scale science.

## CONNECTING SPOR SUPPORT PLATFORMS TO THE GRID

### TRANSLATIONAL RESEARCH?

**“Embrace it. It will do nothing but improve your career.”**

**David Dolphin**

A survey done of 10 top US universities 20 years ago compared academic output of those involved with entrepreneurial enterprise with those uninvolved. In every case, the academic output of those involved in entrepreneurial pursuits increased dramatically.

Academic partnership with the Centre for Drug Research and Development (CDRD) increased the success rate of grant applications to 50 per cent from the 18 per cent overall average.

Alberta is the first Canadian jurisdiction to have a Strategy for Patient Oriented Research (SPOR) Support for People and Patient-Oriented Research and Trials (SUPPORT) Unit. The partnership between CIHR and AIHS will bring a potential total investment of \$48M over five years.

Douglas Miller noted that the US has been working on the SPOR concept for 10 years. Moving forward requires “training the clinical scientist workforce, the connector workforce, the bridgers across the first and/or second ‘valley of death,’ this group is a very rare breed...they are believed to be the answer to a lot of our problems. If they can see the world in a clinical sense and they can also see it from the laboratory sense, maybe they can connect us.”

The initial SPOR SUPPORT platforms aim to strengthen connections between basic, translational and clinical science:

- Data platforms and services
- Health systems research implementation and KT Science
- Patient engagement research support
- High Quality Personnel career development in methods and health services
- Methods, measurement and evaluation supports
- Pragmatic trial supports
- Consultation and Research Services

## CONNECTING CURIOSITY TO CARE

Emerging theme: Not all basic science can or should be connected to clinical problems. But the evidence says that when it makes sense to connect it, researchers attract more funding and more partnership. As a result they strengthen their science and ultimately can demonstrate the impact of their work.

### Sam Weiss

Director, Hotchkiss Brain Institute, University of Calgary

*Curiosity-driven research needs to be prioritized and aimed at the intersection between scientific competitive advantage and areas of unmet health need.*

Dr. Sam Weiss began working with invertebrates but is now at the core of a living human laboratory focused on patients and clinical problems.

*"We are in an era when we have the tools and the wherewithal that allows us to explore and contemporaneously develop solutions for tractable challenges."*

We are at the end of the era "where discovery starts in the lab, meanders into the clinic, eventually maybe somebody pays attention and 17 years later it may, or may not have an impact on health," says Weiss.

Some powerful influencers brought him to this understanding, including the late Harley Hotchkiss, the businessman founder of the Hotchkiss Brain Institute. Hotchkiss was firm that patient care is what the public cares about and that research is the way to improve it. "He acts as a voice on my shoulder every day," says Weiss.

Then, in a weekly phone chat with his mother, she asked, "what are you doing that really matters?" She spoke of friends having strokes and developing Alzheimer's. "I didn't have an answer," says Weiss.

The third transformative encounter came when Weiss accompanied Dr. Alastair Buchan, now Head of the Medical Sciences Division at the University of Oxford, on clinical rounds during his time in Calgary. "He took me to see a patient who, when admitted with a stroke, couldn't speak or move. He was incapacitated." Thanks to a timely TPA intervention, the patient was alert, talking and grateful. He thanked Dr. Buchan, who replied that all the thanks belonged to research.

"We are in an era when we have the tools and the wherewithal that allows us to explore and contemporaneously develop solutions for tractable challenges," says Weiss. "We don't have the luxury of working in isolated laboratories any more. We have the moral imperative and the exciting opportunity to do more."

## FOUR-STEP PROCESS FOR INTEGRATED HUMAN HEALTH RESEARCH

When physician scientists, basic scientists and translational scientists join forces



## ADULT BRAIN TUMOUR

Sam Weiss

The prognosis for adult brain tumours is death within 15 months. But an era of accelerated research is here thanks to imaging and “omics” that allow for more precise signatures and diagnosis and the ability to phenocopy and genocopy the human brain tumour and share in worldwide research collaborations. In Dr. Weiss' lab, connections from basic science to animal trials, experimental therapeutics, clinical trial and back to patients accelerate progress.

## ADOLESCENT DEPRESSION

Sam Weiss

One in nine Alberta teens (13 to 17 years old) will suffer a major depressive episode. Left unchecked, the disease becomes chronic. It is now possible to safely and painlessly look inside a teenager's brain. One of the first things learned with advanced imaging was that depression causes shrinkage in the hippocampus.

## CHRONIC PAIN

**Gerald Zamponi**, Professor and Senior Associate Dean, Research, Department of Physiology and Pharmacology, University of Calgary

Gerald Zamponi was driven by curiosity about how calcium channels work. But through partnership with Centre for Drug Research and Development (CDCD) in Vancouver, his team is on the road to helping patients with unremitting chronic pain.

Zamponi found that inflammation and nerve injury activated an enzyme that acts on the T-type calcium channel, increasing its lifespan and increasing pain signals. He then identified a peptide that prevented the enzyme from activating.

CDRD tests came up with known molecules with the same effect as the peptide. These have been tested in animals and did reduce pain. “Just because you have a compound, doesn't mean you have a drug,” says Zamponi. But they are on their way.

## MULTIPLE SCLEROSIS – SPINAL CORD INJURY

**V. Wee Yong**, Professor, Departments of Clinical Neurosciences and Oncology, University of Calgary

A generic drug used to treat acne may be the key to delaying the full onset of Multiple Sclerosis. A phase II clinical trial pairing the drug with the existing treatment showed a significant reduction in new lesions on brain MRI. Now in Phase III trials, if successful, the drug could be taken orally for an annual cost of \$800 per patient compared to the current injectable therapy with annual per patient costs of \$30,000. Wee Yong notes it's taken 15 years to arrive at this point, with a year to go in the phase III trial. "We need to expedite this progress."

The understanding of the immunosuppressant effect of minocycline led Yong to also study its effect as an intervention for spinal cord injuries. There is currently no FDA approved medication for those with dramatic spinal cord injury. Phase II trials beginning administration of the drug within the first 12 hours of injury showed improved motor recovery. A phase III trial has just been launched. "If successful, it will be transformative," says Yong. It has taken 12 years to get to this point.

## PRESSURE ULCERS

**Vivian Mushahwar**, Associate Professor and AHFMR Senior Scholar, Division of Physical Medicine & Rehabilitation and Centre for Neuroscience, University of Alberta

"A pressure ulcer is a nasty, gaping wound that involves the skin, fat and muscle breakdown all the way to the bone," says Vivian Mushahwar. They are the number one complication of reduced mobility and sensation, are more prevalent than staph infections, require long hospitalizations, and roughly 30 per cent of people who get them die from complications. Pressure sores cost Canada's health system roughly \$3.9 billion annually.

A great deal of basic science went on before Mushahwar's team, which she calls an ecosystem, was developed to expedite the basic research discoveries to the lab.

Her interdisciplinary team developed a neural interface, known as Smart-e-Pants, which patients wear. The pants mimic the fidgeting the rest of us do every six to nine minutes with an electrical stimulus. This reduces the pressure that deforms the tissue and cuts off oxygen so pressure ulcers cannot form.

### Presenters

**Alain Beaudet**, President, CIHR

**Nicholas Davies**, Partner, Pharma Strategy, PwC

**David Dolphin**, Professor Emeritus, University of British Columbia,  
Member of the Board of Directors, Alberta Innovates – Health Solutions

**Cy Frank**, CEO Alberta Innovates – Health Solutions

**Marvin J. Fritzler**, Mitogen Advanced Diagnostics, University of Calgary

**The Honourable Fred Horne**, Minister of Health, Government of Alberta

**Michael Houghton**, Canada Excellence Research Chair in Virology, University of Alberta

**Chris Lumb**, (facilitator) CEO TEC Edmonton

**Chris McCabe**, Professor and Endowed Chair Emergency Medicine Research,  
Faculty of Medicine & Dentistry, University of Alberta

**Douglas Miller**, Dean, Faculty of Medicine and Dentistry, University of Alberta

**Vivian Mushahwar**, Associate Professor and AHFMR Senior Scholar Division of Physical  
Medicine & Rehabilitation and Centre for Neuroscience, University of Alberta

**David Naylor**, Director, Space Astronomy Division, Institute of Space Imaging Science,  
Department of Physics and Astronomy, University of Lethbridge

**Terry Snutch**, Professor and Canada Research Chair in the Michael Smith Laboratories,  
Departments of Psychiatry and Zoology, and the Brain Research Centre at the University of  
British Columbia

**Sam Weiss**, Professor, Faculty of Medicine, University of Calgary; Director,  
Hotchkiss Brain Institute

**V. Wee Yong**, Professor, Departments of Clinical Neurosciences and Oncology,  
University of Calgary

**Gerald Zamponi**, Professor and Senior Associate Dean, Research,  
Department of Physiology and Pharmacology, University of Calgary

### Steering Committee

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**Christopher P. Hosgood**, Dean, Health Sciences, University of Lethbridge

**Deborah E James**, Director, Innovation Partnerships, Faculty of Medicine & Dentistry,  
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**Paul Kubes**, Professor Faculty of Medicine, University of Calgary

**John Mackey**, Medical Oncologist, Cross Cancer Institute

**Evangelos Michelakis**, Director, Pulmonary Hypertension Program; Vice Chair (Research),  
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**D. Douglas Miller**, Committee Chair, Dean, Faculty of Medicine & Dentistry, University of Alberta

**Pamela Valentine**, Chief Operating Officer, Alberta Innovates Health Solutions

**V. Wee Yong**, Professor, Clinical Neurosciences, Faculty of Medicine, University of Calgary

**Gerald W. Zamponi**, Senior Associate Dean for Research, Physiology and Pharmacology,  
University of Calgary