

FROM MICROSCOPE TO MARKETPLACE:

SPIN-OFF COMPANIES FROM ACAHO MEMBER INSTITUTIONS



MAY 2008



ASSOCIATION OF CANADIAN ACADEMIC HEALTHCARE ORGANIZATIONS

WHO WE ARE...

The Association of Canadian Academic Healthcare Organizations (ACAHO) is the national voice of Teaching Hospitals, Academic Regional Health Authorities (RHAs) and their Research Institutes. The Association represents over 45 organizations, with members ranging from single hospitals to multi-site, multi-dimensional regional facilities (also known as "Research Hospitals").

Members of ACAHO are leaders of innovative and transformational organizations who have overall responsibility for the following integrated activities:

- Provision of and timely access to a range of specialized and some primary health care services.
- Provision of all of the principal clinical teaching sites for Canada's health care professionals including partnerships with all 17 Faculties of Medicine and Faculties of Health Sciences.
- Infrastructure to support and conduct health research in its dimensions — medical discovery, knowledge creation, knowledge translation, and innovation and commercialization.

There are no other organizations in the health system that provide the unique combination of health services that our members do. We consider our institutions to be vital "hubs" in the health system — in addition to being a national resource.

OUR MISSION...

The mission of ACAHO is to advance and promote excellence in the delivery of quality health services, the teaching and educational experience, and the health research and innovation enterprise.

OUR MANDATE...

The mandate of ACAHO is to provide effective national leadership, advocacy, and policy representation in the following three related areas of the:

- Funding, organization, management and delivery of highly specialized tertiary and quaternary, as well as primary health care services.
- Education and training of the next generation of Canada's health care professionals.
- Infrastructure to support and conduct basic and applied health research, medical discovery, innovation and commercialization.

For more information on the activities of the Association, please visit our website at www.acao.org.





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For additional copies, please send your written request to:

ACAHO
780 Echo Drive
Ottawa, ON
K1S 5R7
(613) 730-5818

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A MESSAGE FROM THE PRESIDENT

When we generally consider the role and impact of health research, we think about the tremendous strides we, as a country, have taken in identifying and treating disease (and in some cases its eradication) and the gains we have made in the way in which we deliver quality health care to Canadians. Without question, our societal investments in health research continue to improve our overall health status, quality of life and standard of living.

As much as we understand the intrinsic value of health research, the emergence of the knowledge-based economy has also meant that we must consider how to harness the full health, social and economic benefits that come with the creation of new knowledge – while ensuring that Canadians and the rest of the world have access to health innovations.

In an increasingly interdependent global economy, the creation, dissemination and ownership of knowledge matters. More particularly, where a growing number of countries are competing – and winning – on the basis of new discoveries, speed wins. Understanding these forces suggests that it is to our individual and collective advantage to nurture and support sectors that discover and produce leading-edge innovative products and services that not only benefit Canadians, but the international community.

Building on the release of “Moving at the Speed of Discovery...From Bench to Bedside to Business” – a comprehensive report examining the linkages between the inputs of health research and the outputs that come from such investments – in November 2007, it is understood that the life sciences and biotechnology sectors represent a substantial opportunity for Canada.

That said, the pressing policy question is how can we maximize the health and wealth of Canadians by building on the publicly-funded platform of Medicare? While the former demands that we look for more effective ways in which to translate new knowledge to the public, media, providers, administrators, policy makers and governments, the latter requires that we take a fresh look at how we identify and capture economic opportunity and its derivative benefits (i.e., skilled jobs, rising incomes, increased capital formation, wealth creation and a growing public revenue stream) that flow from health research.

In this context, “From Microscope to Marketplace...Spin-Off Companies from ACAHO Member Institutions” identifies over 85 spin-off companies that are largely the product of publicly-funded research. Implicitly, the report underscores the important relationships between early-stage research (which is largely publicly-funded by governments) and later stage research and development and the role of the private sector in terms of bringing innovative products and services to the marketplace. The report also identifies some of the other important metrics that are related to the notion of “return-on-investment”.

In closing, if Canada is to strengthen its social and economic fabric as well as its international standing – now and well into the future – it must continue to invest in the elements that support and nurture innovation; that is, people, structures, processes and outcomes. Managed within an integrated strategic framework, it is vital that we find ways in which to fully reap the health, social and economic dividends that come from a supportive and dynamic environment that encourages and embraces innovative behavior.

At the end of the day, if we as a country do not embrace innovation as a high priority public policy goal, Canada will not be able to attract the great minds and talent needed to discover the ideas that will transform our society from good to great.



Dr. Denis-Richard Roy

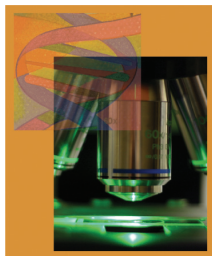
President, ACAHO

Directeur général

Centre hospitalier de L'Université de Montréal

Montréal, Québec





INTRODUCTION

Understanding that over the past decade the emergence of the knowledge-based economy has been largely characterized by increased global competition, it is both timely and important to reflect on how Canada can continue to build in areas where it has a comparative advantage internationally – in this case, as a driver of health innovation, a leader in commercialization and more largely, a strong supporter of the health research enterprise. While in the past, the notion of “industrial competitiveness” has largely been framed outside of the health sector (e.g., manufacturing, natural resources, financial or hi-tech sectors), increasingly we must look to nurture a “Canadian advantage” that is focused on a nimble and well-educated workforce that can take full advantage of the creation, dissemination and ownership of new knowledge, in addition to the factors of production (i.e., capital, entrepreneurship, land and labour).

As the world enters a third wave of innovation – a biotechnology revolution – Canada must look to develop a sharpened strategic focus, while accelerating the level of investments in health research which contribute to improved health, social and economic benefits for all Canadians. Any move away from such commitments would result in Canada falling out of step with those countries that place tremendous value on the linkages between creating knowledge and its spin-off effects; that is, our quality of life and standard of living.

The purpose of From Microscope to Marketplace – the third in a trilogy of reports – is to illustrate how public investments in health research, specifically targeted towards members of ACAHO, produce spin-off companies which create highly-skilled employment opportunities for Canadians, generate income, investment, wealth, public and private revenue streams, and stimulate further impetus for innovation.

ACAHO’s recent publication – Moving at the Speed of Discovery – identified several metrics to define a “return on innovation” or a value quotient. Disclosures, provisional and full patents, licenses executed, license, royalty and technology transfer revenue all quantitatively reflect the value that accrues from public investments in health research. However, from an economic standpoint, perhaps the most impactful or visible output is the creation of a new organization – a unique business enterprise that employs Canadians and eventually begins to generate revenue through the diffusion of innovative products and services.

Spin-off companies play a revolutionary role generating innovative products and services, creating dynamic employment opportunities and in some cases, develop significant economic returns in the form of revenues, earnings, capital formation and new public revenue streams. As a result, viable and successful spin-off companies provide a very tangible and measurable metric when it comes to demonstrating the economic and social value of health research.

From Microscope to Marketplace identifies over 85 Canadian spin-off companies that continue to support a prosperous and productive economy. With continued strategic, sustainable and predictable investments into basic discovery research, Canada is well positioned to continue to occupy a significant global role in health research, innovation and commercialization.

“As the world enters a third wave of innovation – a biotechnology revolution – Canada must look to develop a sharpened strategic focus, while accelerating the level of investments in health research which contribute to improved health, social and economic benefits for all Canadians.”

CONTEXT

From the perspective of members of the Association of Canadian Academic Healthcare Organizations (ACAHO), health research has produced some of the most significant discoveries of the 19th, 20th and 21st century.¹ These discoveries have manifested themselves in many ways: from improving the health status of individuals and communities; introducing more effective ways in which to deliver a range of health services to Canadians in need; and impacting on the way in which we organize and manage our health delivery system; to producing economic benefits by having a healthy, adaptable and well-trained workforce; and developing innovative goods and services that create employment, capital formation, income streams and wealth generation.

With these linkages in play, the Association is of the view that it is to our collective advantage to create a strategic framework that fully leverages the inter-relationships between our health status, Canada's health system, economic competitiveness, and our future as a nation.

The process of care delivery requires many different inputs that can impact on our ability maintain and enhance our health status. From an economic perspective, is this country prepared to import the products and services we need to improve the health of Canadians – with scarce capital flowing out of the country? Or, can we take full advantage of the opportunities to invest in the people, infrastructure and mechanisms that are required to own the factors of production (i.e., capital, entrepreneurship, land and labour), and capture the economic spin-offs that flow from world-class, leading-edge innovations – while improving our quality of life and standard of living?

This last point carries added weight when one considers the economic opportunities that are before us in terms of the size of the global marketplace for innovative health products and services, which stood at roughly \$1.0 trillion in 2003 and continues to grow. If Canada could increase its market share from its current level of 2% to 3% or 4%, it would attract an additional \$10 to \$20 billion in new revenue. Perhaps more importantly, it would also be a magnet for highly skilled jobs, robust income streams, long-term capital investment, and a significant public revenue stream, while making important inroads on its current trade deficit in the health sector.²

The following quote summarizes the challenges: *"Among the many promising industrial subsectors subsumed within health care are information technology; biotechnology; health care diagnostic, treatment and delivery services; health care management; knowledge/information management systems (including data collection and software development); and imaging systems. These are also leading-edge sectors for employing our high-level human capital and talent, an essential requisite if we wish to become a knowledge-based economy and society. However, there is much more at stake here than merely missing out on a major export platform in the information era: Failure to be in the forefront of these remarkable diagnostic, treatment and service-delivery innovations will mean that we will assuredly fail in our objective to ensure that Canadians will have access to state-of-the-art health care."*³

The point that there is much at stake and much potential to be captured is underscored in the recent assessment of the state of science and technology in Canada. Stakeholders indicated that the health and related life sciences sector "have the potential to emerge as areas of prominent strength for Canada and generate significant economic and social benefits."⁴ Internationally, Singapore, Stockholm, Austin, Raleigh-Durham, Boston and San Diego are stellar examples of entire economies being built around the health research enterprise. They demonstrate that advanced knowledge-based industries are essential to securing global, long-term economic prosperity.⁵

While many of the country's macro-economic fundamentals appear to be sound, there is no guarantee that they will remain so over the medium and longer term in a world that is increasingly driven by innovation. It is particularly important to keep this in mind as other rising economies, such as Brazil, Russia, India, and particularly China are already competitive in some of our well established knowledge areas and are placing increasing pressure on our manufacturing sector with cheaper labour and other input costs.⁶

In a world characterized by increasing market competition, if we are to continue to grow our economy and improve our quality of life, we must look to those sectors in which Canada has a comparative advantage – which is based less and less on low-skilled input costs and increasingly reliant on the development of a



"With these linkages in play, the Association is of the view that it is to our collective advantage to create a strategic framework that fully leverages the inter-relationships between our health status, Canada's health system, economic competitiveness, and our future as a nation."



"In a world characterized by increasing market competition, if we are to continue to grow our economy and improve our quality of life, we must look to those sectors in which Canada has a comparative advantage – which is based less and less on low-skilled input costs and increasingly reliant on the development of a nimble, well-educated workforce that can take full advantage of the creation and ownership of knowledge and the factors of production."

nimble, well-educated workforce that can take full advantage of the creation and ownership of knowledge and the factors of production.⁷

This report will focus on one specific outcome of commercialization: the creation of new business enterprises – or "spin-off" companies.⁸ Spin-off companies, perhaps made most popular by the information technology boom of the 1990s, are an increasingly important player on the burgeoning biotechnology and biopharmaceutical frontiers.

Spin-off companies play a revolutionary role generating and commercializing new products and services. Concurrently, spin-off companies create dynamic employment opportunities, and in some cases, develop significant economic returns to Canada in the form of sales, earnings, capital formation and new public revenue streams.⁹ Moreover, spin-off companies provide an important metric when it comes to assessing how investments in (health) research generate returns to Canada.

DID YOU KNOW?

In 2006, ACAHO member institutions and their Research Institutes received over \$3.0 billion in total research funding – supporting more than 20,000 scientists, clinical investigators, other researchers and staff.

In 2005, ACAHO member institutions and their Research Institutes recorded 1,429 disclosures, filed 139 full patents, and executed 277 licenses.

Between 2003 and 2006, ACAHO member institutions and their Research Institutes recorded \$5.5 million in license and royalty income, and \$27 million in technology transfer revenue.

Between 1999 and 2006, research hospital spin-off companies generated over \$1.5 billion in investment capital, and in 2006 alone employed over 2,000 individuals and recorded sales well above \$160 million.

Source: From "Moving at the Speed of Discovery...From Bench to Bedside to Business", ACAHO November 2007

THE COMMERCIALIZATION PROCESS...FROM MICROSCOPE TO MARKETPLACE

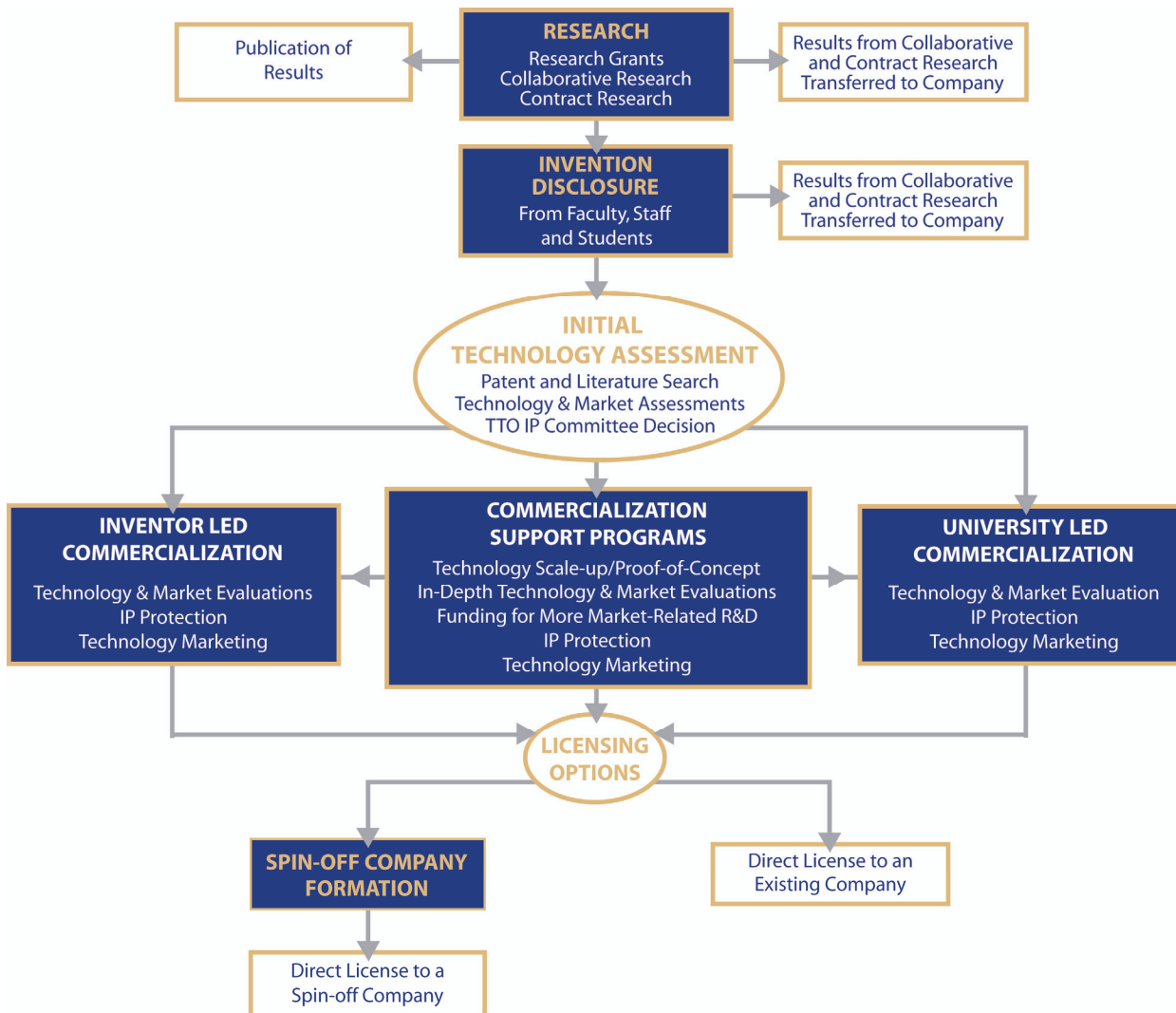
Determining the right commercialization path is a challenge for even the most experienced entrepreneurs. From formulating a business plan and securing capital, to employing skilled workers and managing a board of directors, to negotiating licensing terms and joint venture agreements, turning raw ideas into practicable companies that can compete against the world's best is never easy.¹⁰ Exhibit 1 illustrates a generalized commercialization process that outlines the key steps from research to the transfer of technology to a new or existing company.

Creating a spin-off company to enable results of research to reach the marketplace is an exciting opportunity for not only for researchers, but their respective institutions (Research Hospitals, Universities) and those who are involved on the business development side of the equation. While there are many significant reasons to consider licensing discoveries to existing firms, many researchers will consider a spin-off company for the following reasons:

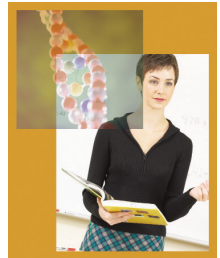
- The market potential for the opportunity is worth the added risk
- The researcher(s) wish to participate in maximizing the health and economic value of their discovery
- The researcher(s) would like the opportunity to work with an experienced business development organization who can develop the company
- A "culture of commercialization" is embedded within the organization
- The researcher(s) have contacts to create a successful business team and access other support resources, and/or
- Earlier attempts to license the discovery have proven unsuccessful.¹¹

EXHIBIT 1

THE COMMERCIALIZATION PROCESS¹²



"Creating a spin-off company to enable results of research to reach the marketplace is an exciting opportunity for not only for researchers, but their respective institutions (Research Hospitals, Universities) and those who are involved on the business development side of the equation."



For the purposes of this report, we will focus on the commercialized outcomes that result in a spin-off company.¹³ Specifically, spin-off companies that have emerged as the result of research conducted in an ACAHO member institutions.

METHODOLOGY

The information contained in this report was collected in 2006, in collaboration with the National Research Council, as part of a larger survey of ACAHO member organizations. Members of the Association were asked to identify any supplementary spin-off companies which emerged as the result of research conducted within their institution or health research institute. Specifically, members were asked to identify the spin-off company, the number of personnel employed by the organization, whether the spin-offs were privately or publicly held, investment capital generated as well as sales revenue. The results of the full survey are published in ACAHO's 2007 report entitled *Moving at the Speed of Discovery: From Bench to Bedside to Business*.

In this report, we focus specifically on showcasing some of the spin-off companies, their success, breadth and contribution to healthcare and the economy.



RESEARCH & INNOVATION RISING...ACAHO SUCCESS STORIES

ACAHO members support more than 20,000 scientists, clinical investigators, other researchers and staff who are involved in health research. These 20,000 researchers and their institutions received over \$3.0 billion in total research funding in 2006; or close to 80% of all public funding for health research in Canada. Importantly, Canada's expanding biotechnology industry has been as a result of the research conducted in ACAHO member Teaching Hospitals, Research Institutes as well as within Universities.¹⁴

As of 2006 and over a ten year period, Exhibit 2 provides a list of more than eighty-five other Canadian spin-off companies founded on innovative and ground breaking research. Importantly, these spin-off companies show leadership in bio-pharmaceuticals designed for the treatment of cancer and neurodegenerative diseases; infections; brain and spinal cord injuries; cardiac and other conditions. They also produce diagnostic and medical imaging products; information technologies; and provide services that support the process of research and commercialization. Their mission statements are broad; their products, discoveries or technologies diverse; however the tie that binds reflects their origins – all of the spin-off companies emerged as the result of research conducted within an ACAHO member institution.

These spin-off companies, largely based in the biotechnology or biopharmaceutical industries, commercialize intellectual property specifically owned by an ACAHO member (either in part or entirely) and/or a researcher employed by an ACAHO member institution, and/or an affiliated University partner.

Available data suggests that in 2006, over 2,000 Canadians are employed by ACAHO member spin-off companies.¹⁵ Importantly, these spin-offs have generated close to \$1.5 billion in investment capital between 1999 and 2006, and have recorded sales well above \$160 million in 2006 alone.¹⁶

"As of 2006 and over a ten year period, Exhibit 2 provides a list of more than eighty-five other Canadian spin-off companies founded on innovative and ground breaking research. Importantly, these spin-off companies show leadership in bio-pharmaceuticals designed for the treatment of cancer and neurodegenerative diseases; infections; brain and spinal cord injuries; cardiac and other conditions."

Exhibit 2

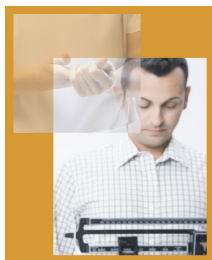
SELECTION OF SPIN-OFFS COMPANIES FROM ACAHO MEMBERS

- 1. AB Biopharma (Calgary Health Region – Calgary, Alberta):** Founded in 2001, AB BioPharma is a nutraceutical company that develops products to help sufferers of gastrointestinal problems. The term "nutraceutical" refers to foods believed to have a medicinal effect on human health.
- 2. AdapCS Canada Corporation (Kingston General Hospital – Kingston, Ontario):** Founded in 2003, AdapCS develops information technologies and services for the Canadian health care market that focus on current areas of concern, including clinical and financial outcomes, accountability and access. (www.adapcscanada.com)
- 3. Adherex Technologies Inc. (McGill University Health Centre Research Institute – Montreal, Quebec):** Founded in 1998, Adherex Technologies Inc. is a biopharmaceutical company dedicated to the discovery and development of novel cancer therapeutics. Adherex has multiple oncology products in the clinical stage of development. (www.adherex.com)
- 4. Advanced Molecular Imagine (AMI) Inc. (Centre Hospitalier de Sherbrooke – Sherbrooke, Québec):** AMI was founded in 2004 to design, develop and manufacture next-generation imaging systems for both clinical and preclinical applications. The company invented MicroSPECT® and its X-SPECT® system is the market leader in the small animal SPECT category. (www.advanced-mi.com)
- 5. Advitech (Les Produits Lactotech) (Hôpital Laval – Sainte-Foy, Québec):** Founded in 1995, Advitech is a nutraceutical company specializing in the development of new therapies for health conditions and diseases of the immune system. The term "nutraceutical" refers to foods believed to have a medicinal effect on human health. (<http://advitech.com/>)
- 6. Aegera Therapeutics (Children's Hospital of Eastern Ontario – Ottawa, Ontario):** Aegera Therapeutics, founded in 1995, is a clinical stage biotechnology company focused on developing drugs that control apoptosis (programmed cell death) to address major unmet medical needs. Lead programs are in development to induce apoptosis to kill cancer cells and to prevent apoptosis to save injured neuronal cells. (www.aegera.com)
- 7. Affinity Biologicals Inc. (Hamilton Health Sciences/McMaster University – Hamilton, Ontario):** Founded in 1987, the company's initial focus was the production of reagents for research into disorders of thrombosis and hemostasis (blood clotting disorders). Products include affinity-purified antibodies, matched-pair antibody sets for ELISA, as well as a line of artificially prepared coagulation factor-deficient plasmas. (www.affinitybiologicals.com)

8. **Affinium Pharmaceuticals (University Health Network — Toronto, Ontario):** Founded in 2002, Affinium is a pharmaceutical company focused on the clinical development of antibacterials (used to kill or prevent the growth of bacteria). Affinium's lead development program encompasses a potent, orally available, novel antibiotic class for the treatment of antibiotic resistant infections. (www.afnm.com)
9. **Amorfix (Sunnybrook Health Sciences Centre — Toronto, Ontario):** Founded in 2004, Amorfix is focused on the diagnosis and treatment of neurodegenerative diseases, where aggregated misfolded proteins (AMP) are prevalent. These include degenerative diseases such as Alzheimer's, Amyotrophic Lateral Sclerosis (ALS) and Parkinson's). (www.amorfix.com)
10. **ARIUS Research (University Health Network — Toronto, Ontario):** Since its inception in 1999, ARIUS has been engaged in the research and development of novel anti-cancer monoclonal antibodies (antibodies that are identical because they were produced by one type of immune cell). ARIUS' proprietary FunctionFIRST™ technology platform uniquely creates functional anti-cancer monoclonal antibodies that belong to a class of revolutionary cancer drugs. (www.ariusresearch.com)
11. **Aspreva Pharmaceuticals (Provincial Health Services Authority/Centre for Molecular Medicine and Therapeutics — Victoria, British Columbia):** Founded in 2003, Aspreva specializes in the search for innovative treatments for less common diseases through the identification, development, and commercialization of late-stage and approved medicines that show potential for high therapeutic impact. (www.aspreva.com)
12. **Atamai Interactive Visualization (Robarts Research Institute — London, Ontario):** Founded in 2000, Atamai is specialized in real time three-dimensional medical image visualization. Atamai operates a growing repository of software components that can be modified and assembled quickly into functioning applications by those who prefer to focus on their problem domain rather than software engineering. The vast majority of this code base is available under a non-restrictive licence, making it attractive for academic environments to use and contribute code. (www.atamai.com)
13. **Atherochem Inc. (Kingston General Hospital — Kingston, Ontario):** AtheroChem Inc. is developing novel compounds for the treatment of coronary heart disease caused by atherosclerosis, an accumulation of fatty deposits within the artery walls. (www.atherochem.com)
14. **BioAxone Therapeutic Inc. (Centre Hospitalier de l'Université de Montréal — Montréal, Québec):** BioAxone's strategy is to target the Rho factor protein in RNA transcription and Rho-related pathways with the purpose of developing drugs that meet large unmet medical needs. Rho is a signaling pathway which plays a key role in many disease indications. BioAxone was founded in 2000. (www.bioaxone.com)
15. **Biomark Imaging Inc. (Robarts Research Institute — London, Ontario):** Founded in 2004, Biomark Imaging Inc. specializes in imaging technology. Imaging technologies, which are varied in their application, can assist in diagnosing and treating conditions such as cardiovascular disease, asthma and mental illness. Imaging technologies are helping to better define clinical trials, and are even changing the way surgery is performed. More recently, imaging technologies are being used to bridge vast geographical expanses.
16. **Biomira Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** Biomira is a biotechnology company founded in 1985, specializing in the development of innovative therapeutic products for the treatment of cancer. Biomira's goal is to develop and commercialize novel synthetic vaccines and targeted small molecules that have the potential to improve the lives and outcomes of cancer patients. (www.biomira.com)
17. **BioMS Medical (Capital Health / University of Alberta — Edmonton, Alberta):** BioMS Medical is a biotechnology company engaged in the development and commercialization of novel therapeutic technologies with emphasis on the treatment of multiple sclerosis. BioMS was founded in 2000. (www.biomsmedical.com)
18. **Biorthex Inc. (Hôpital Sainte-Justine — Montréal, Québec):** In 1994, Biorthex Inc. was established as a biotechnology company that designs, develops, manufactures and markets innovative and proprietary surgical products for the treatment of spinal disorders. The company is dedicated to providing the surgical community with safe, technologically proven and innovative spinal implants for use in the treatment of spinal disorders, diseases and injuries. (www.biorthex.com)
19. **Cardiovascular Solutions Inc. (Winnipeg Regional Health Authority — Winnipeg, Manitoba)** CSI is developing and commercializing new treatments for restenosis – the blockage of arteries as a result of atherosclerosis. CSI has developed a proprietary product to coat stents which are used to prevent re-blockage of arteries. Successful pre-clinical trials in animal models are being used to prepare an application to be used in clinical trials.



"Available data suggests that in 2006, over 2,000 Canadians are employed by ACAHO member spin-off companies. Importantly, these spin-offs have generated close to \$1.5 billion in investment capital between 1999 and 2006, and have recorded sales well above \$160 million in 2006 alone."



20. **Cevena Bioproducts Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** Cevena is a science-based manufacturer and supplier of technologically superior oat and barley-based ingredients for the dietary supplement and functional food markets. Cevena was founded in 2002. (www.cevena.com)
21. **Chenomx Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** Chenomx offers a platform for generating, classifying and interpreting metabolic information obtained from biological fluids. Metabolic profiling allows researchers to link biochemicals to corresponding genes or proteins with relative ease. From these linkages, the detection and validation of potential drug targets can be accelerated. (www.chenomx.com)
22. **Critical Outcome Technologies Inc. (Robarts Research Institute — London, Ontario):** Founded in 1996, Critical Outcome Technologies' mission is to apply computer technologies to profile, identify and optimize commercially viable drug candidates at the early stage of preclinical drug development and thereby dramatically reduce the time line and cost of getting new drugs to market. (www.criticaloutcome.com)
23. **CV Technologies (Capital Health / University of Alberta — Edmonton, Alberta):** Founded in 1992, CV Technologies develops and manufactures evidence-based natural health products for disease prevention and health maintenance. CV Technologies' most successful product is Cold-fX, a leading cold and flu product in Canada. CVT trades on the Toronto Stock Exchange. (www.cvtechnologies.com)
24. **Dementia Guide Inc. (Capital District Health Authority — Halifax, Nova Scotia):** Founded in 2000, Dementia Guide Inc. conducts research and development to create SymptomGuide, a tool to provide simple and comprehensive management of the symptoms of dementia. (www.dementiaguide.ca)
25. **Diabetogen Biosciences Inc. (Robarts Research Institute — London, Ontario):** Diabetogen is a biotechnology company that discovers and develops new drugs for autoimmune diseases (such as diabetes or lupus). Diabetogen's initial programs focus on the development of novel therapeutics for the treatment, prevention and cure of Type 1 (insulin-dependent) diabetes. (www.diabetogen.com)
26. **DNA Genotek (The Ottawa Hospital):** Founded in 2003, the DNA Genotek technology "Oragene•DNA" is the easiest, most reliable and cost-effective way to collect, transport, store and process large amounts of human DNA. Oragene•DNA is non-invasive, dependable, and easy-to-use. DNA Genotek markets its products worldwide and has established a global customer base, with more than 1,500 labs in 58 countries currently testing and using its products. (www.dnagenotek.com)
27. **DriveABLE Assessment Centres Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** DriveABLE provides a scientifically based driving evaluation procedure to identify persons who have become unsafe to drive due to cognitive impairment. Its technology is internationally recognized and can be delivered on a worldwide basis. (www.driveable.com)
28. **Dynastream Innovations Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** Dynastream's patented SpeedMax technology is the platform on which several personal monitoring devices currently on the market are based. Dynastream is a developer and manufacturer of motion-sensing and communication technologies to large companies worldwide. (www.dynastream.com)
29. **Emerillon Therapeutics (McGill University Health Centre Research Institute — Montreal, Quebec):** Emerillon Therapeutics is a genomics-based drug discovery company founded in 2003, dedicated to the discovery of novel drug targets in complex human diseases. Emerillon is a spin-off of its parent company Xenon Pharmaceuticals. (www.emerillon.ca)
30. **GEMMA Biotechnology Ltd. (University Health Network — Toronto, Ontario):** GEMMA BioTechnology, founded in 1996, has developed an immune-boosting nutraceutical ingredient which could find a place in meal-replacement products and food supplements. The company's lead technology is Lactation-Associated ImmunoTrophic Protein (LAIT).
31. **GlycoDesign Inc. (Mount Sinai Hospital — Toronto, Ontario):** GLYCODEsign is a world leader in the field of glycobiology (carbohydrate containing molecules and their role in the body). The company focuses on the discovery and early stage clinical development of novel glycotherapeutics for the treatment of cancer, cardiovascular diseases, inflammation and infectious diseases.
32. **Iaculor Injection Inc (Centre Hospitalier Universitaire de Sherbrooke — Sherbrooke, Québec):** Iaculor is focusing on the development and commercialization of new generation needle-free medical devices for the delivery of liquid or powder form drugs or vaccines. The company's short-term goal is to complete the development of its medical devices and establish strategic partnerships for their production and commercialization.

- 33. Innovotech (University of Calgary — Calgary, Alberta):** Founded in 1995, MBEC Biofilm Technologies was taken over by Innovotech, a product development company with three core businesses: contract research, commercial sale and product development. (www.innovotech.ca)
- 34. Inception Biosciences (Mount Sinai Hospital — Toronto, Ontario):** Founded in 1996, Inception is the largest cord blood program in Canada, with more than 21,000 samples banked. The Inception Cord Blood Program is able to provide every family with the ability to collect and store their baby's cord blood, while the company's biosciences division focuses on developing new and improved applications for stem cells. (www.biomsmedical.com)
- 35. ISM Biopolymer Inc. (Centre Hospitalier Universitaire de Sherbrooke — Sherbrooke, Québec):** ISM BioPolymer Inc. was founded in 1997. Its mission is to discover, develop and transform natural biopolymers (such as proteins and peptides, DNA, RNA, etc.) into unique, scientifically supported, high commercial-quality active ingredients that will improve human, animal and plant health in targeted indications. (www.ismbiopolymer.com)
- 36. Isotechnika Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** Isotechnika Inc. is an international biopharmaceutical company dedicated to the discovery, development and commercialization of novel immunosuppressive therapeutics (to reduce the activation or efficacy of the immune system) for the treatment of autoimmune diseases (e.g., Type 1 diabetes, lupus, rheumatoid arthritis) and for use in the prevention of organ rejection in transplantation. (www.isotechnika.com)
- 37. Jennerex Biotherapeutics Inc. (The Ottawa Hospital — Ottawa, Ontario):** Founded in 2006, Jennerex Biotherapeutics Inc. is a development stage company working to discover, develop and commercialize novel oncolytic virotherapy products. Virotherapy is an experimental form of cancer treatment using biotechnology to convert viruses into cancer-fighting agents by reprogramming viruses to attack only cancerous cells, leaving healthy cells undamaged. The lead product candidate has completed one Phase I/II clinical trial and is currently in expanded Phase I/II clinical testing. The pipeline product candidates are completing preclinical evaluation and are expected to enter Phase I clinical trials in early 2007. (www.jennerex.com)
- 38. Kinexus (Vancouver Coastal Health Authority — Vancouver, British Columbia):** Founded in 1999, Kinexus is harnessing the powerful synergies of genomics, proteomics (the study of protein) and bioinformatics to understand cell signaling for the advancement of drug discovery, disease diagnosis, and global biomedical research. (www.kinexus.ca)
- 39. KMT Hepatech Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** Founded in 2001, KMT Hepatech, Inc. provides collaborative research services to companies that are in preclinical development of hepatitis C therapeutics and vaccines, utilizing proprietary platform technology. (www.kmthepatech.com)
- 40. Life Imaging Systems Inc. (London Health Sciences Centre — London, Ontario):** The company began operations in 1995 to commercialize medical imaging technologies pioneered at the London Health Sciences Centre. Life Imaging Systems' primary focus is in developing three-dimensional ultrasound imaging technologies to overcome the limitations of conventional two-dimensional ultrasound imaging and increase ultrasound's overall clinical efficacy. (<http://www.imaging.robarts.ca/irlspin.htm>)
- 41. Liponex Inc. (Ottawa Heart Institute — Ottawa, Ontario):** Founded in 2000, Liponex is a biopharmaceutical company moving into Phase II trials with CRD5, its lead candidate. CRD5 raises High Density Lipoprotein (HDL), often called "good cholesterol." Novel HDL therapies, such as CRD5, are an area of significant interest for pharmaceutical companies worldwide. Liponex also has a broad pipeline of products with drug candidates in areas such as atherosclerosis, cancer and infectious disease. (www.liponex.ca)
- 42. LMS Medical Systems (McGill University Health Centre Research Institute — Montreal, Quebec):** LMS is a health care technology company founded in 1993 that develops innovative tools for obstetrical decision support, risk management and clinical information systems. LMS is a leader in the application of advanced mathematical modeling and neural networks for medical use. (<http://www.lmsmedical.com>)
- 43. Lymphosign Inc. (The Hospital for Sick Children — Toronto, Ontario):** LymphoSign Inc. is a private biopharmaceutical company developing drugs acting on signaling pathways involved in the progression of acute leukemias, lymphomas and solid tumours. LymphoSign is developing a number of novel compounds to inhibit abnormal cellular signaling specific to the growth of cancer cells. LymphoSign's lead drug candidate is nearing completion of preclinical testing and has shown great promise as a potential treatment of acute leukemias as well as other cancers. (www.lymphosign.com)





44. **MDS OCATA (Mount Sinai Hospital — Toronto, Ontario):** MDS Ocata Inc. is a new company using mass spectrometry to identify interacting proteins (www.mdsinc.com).
45. **Medicure Inc. (Winnipeg Regional Health Authority — Winnipeg, Manitoba):** Founded in 1997, Medicure Inc. is a publicly traded biotechnology company focused on becoming an internationally recognized leader in the development of therapies for unmet cardiovascular needs. (<http://www.dfait-maeci.gc.ca/canada-europa/france/espace/pdf/Medicure-ENG.pdf>)
46. **MedPharmGene Inc. (Centre Hospitalier de l'Université de Montréal) :** Founded in 2001, MedPharmGene Inc is focused on clinical research in the fields of diabetes and hypertension. Current research aims to verify if more intensive management of blood pressure and glucose levels in diabetic patients is reducing the risk of major complications such as heart attack, stroke, blindness and kidney failure.
47. **Micralyne Inc (Capital Health / University of Alberta — Edmonton, Alberta):** With core competencies in micromachining, thin film deposition, and micro-electromechanical systems assembly and test capabilities, Micralyne develops and manufactures devices for the communications, energy, life sciences, and transportation markets. Micralyne was founded in 1982. (<http://www.micralyne.com/>)
48. **MIGENIX (Vancouver Coastal Health Authority — Vancouver, British Columbia):** MIGENIX is focused on the development of drugs to treat or prevent infectious, degenerative and metabolic diseases or disorders. MIGENIX was founded in 1988. (www.migenix.com)
49. **MJ Laboratory Services Limited (Hamilton Health Sciences/McMaster University – Hamilton, Ontario):** Established in 1990, the company offers a complete range of testing for clinical trials, research projects and product evaluation to pharmaceutical companies, diagnostic manufacturers and researchers. Areas of expertise include the measurement of routine and esoteric hemostasis testing, cytokine testing and DNA analysis. (www.hemostasislabs.com)
50. **Molecular Templates Inc. (University Health Network — Toronto, Ontario):** Founded in 2000, Molecular Templates Inc. aims to advance the preclinical and clinical development of novel treatments for melanoma, prostate and other cancers and move rapidly into clinical trials. (<http://www.moleculartemplates.com/home.htm>)
51. **MOXXI Medical Inc. (McGill University Health Centre Research Institute — Montreal, Quebec):** Founded in 2003, MOXXI Medical is an integrated delivery system for prescription drug management for physicians, pharmacists, payers and their respective patients. MOXXI Medical will commercialize an electronic prescription and drug-tracking transaction-based solution that directly links physicians prescribing medications, pharmacists fulfilling the prescriptions, and payers (public and private). (www.moxximedical.com)
52. **NAEJA Pharmaceuticals Inc. (Capital Health / University of Alberta — Edmonton, Alberta):** NAEJA specializes in preclinical drug discovery and contract research in multiple therapeutic areas. NAEJA employs scientific researchers with expertise in all aspects of drug development, including lead optimization, biopharmaceutical profiling, microbiology and custom synthesis. (www.naeja.com)
53. **Neptune Technologies and Bioresources Inc. (Centre Hospitalier Universitaire de Sherbrooke — Sherbrooke, Québec):** Neptune Technologies and Bioresources Inc. extracts, scientifically validates, and markets natural health products from marine biomasses and currently provides the world's only FDA-approved oil from krill. (www.neptunebiotech.com)
54. **Neurochem Inc. (Kingston General Hospital — Kingston, Ontario):** Neurochem is a publicly traded pharmaceutical company with product candidates in clinical development for amyloid-related diseases and disorders of the central nervous system (such as Huntington's disease, Parkinson's disease, etc). Neurochem was founded in 1994. (www.neurochem.com)
55. **Neuromed Pharmaceuticals (Vancouver Coastal Health — Vancouver, British Columbia):** Formed in 1998, Neuromed Pharmaceuticals develops drugs to target chronic pain, including neuropathic pain and inflammatory conditions such as arthritis. In March 2006, Neuromed and Merck & Co. signed a research collaboration and licence agreement to research, develop and commercialize novel compounds for the treatment of pain and other neurological disorders, including Neuromed's lead compound NMED-160 for the treatment of pain, which is currently in Phase 2 development. (www.neuromed.com)
56. **NovaNeuron (Capital District Health Authority — Halifax, Nova Scotia):** By studying Huntington's disease (HD) mouse models and post-mortem brains of HD patients, NovaNeuron scientists discovered a drug target for HD. Research is ongoing to demonstrate the link between this target and the pathogenesis of HD.

- 57. OncoGeneX (Vancouver Coastal Health — Vancouver, British Columbia):** Founded in 2000, OncoGeneX is a biopharmaceutical company committed to the development and commercialization of new cancer therapies that address treatment resistance in cancer patients. OncoGeneX currently has three product candidates in development. These product candidates are designed to selectively inhibit the production of proteins that are associated with treatment resistance and that are over-produced in response to a variety of cancer treatments. (www.oncogenex.ca)
- 58. Oncolytics Biotech Inc. (Calgary Health Region — Calgary, Alberta):** Founded in 1998, Oncolytics is a Calgary-based biotechnology company focused on the development of oncolytic viruses as potential cancer therapeutics. Oncolytics' clinical program includes a variety of Phase I and Phase I/II human trials. (www.oncolyticsbiotech.com)
- 59. Osteokine Inc. (Hamilton Health Sciences/McMaster University — Hamilton, Ontario):** Osteokine Inc. is a small biotechnology company that has as its main focus the development of novel therapeutics for the treatment and prevention of postmenopausal bone loss. Osteokine investigators have made exciting observations in animal models, enabling the identification of the molecular mechanisms responsible for bone loss leading to the development of specific agents to reverse these mechanisms.
- 60. Plantigen Inc. (London Health Sciences Centre — London, Ontario):** Plantigen Inc. is a novel therapeutics discovery company focused on the identification and development of biopharmaceuticals in genetically enhanced plants to prevent and treat disease. (www.lhsc.on.ca/plantigen)
- 61. Prognomix Inc. (Centre Hospitalier de l'Université de Montréal) :** Founded in 2006, Prognomix aims to develop new prognostic genomic biomarkers for the early identification of subset of type 2 diabetes patients at risk of developing renal, cardiovascular, nervous or ocular complications.
- 62. Quillsoft Ltd (Bloorview Kids Rehab — Toronto, Ontario):** Founded in 2000, Quillsoft manufactures and distributes specialized writing software (WordQ and SpeakQ software) for individuals with learning disabilities. Distribution includes Canada, USA, UK, Germany, Australia and New Zealand. WordQ is available in English, French, German, and Spanish. There are currently more than 100,000 WordQ users, with gross revenues in excess of \$1.5 million. (www.wordq.com)
- 63. Resonant Medical (McGill University Health Centre Research Institute — Montreal, Quebec):** A privately-held company founded in 2000 by industry experts, Resonant Medical develops, manufactures and commercializes 3-D ultrasound image-guided adaptive radiotherapy products. Radiotherapy is the use of radiation as part of cancer treatment to control malignant cells. The goal is to help cancer centres make significant improvements in radiation therapy planning, verification and delivery in order to advance patient care. (www.resonantmedical.com)
- 64. Resverlogix Corp. (Calgary Health Region — Calgary, Alberta):** Resverlogix Corp. is a publicly traded biotechnology company focused on groundbreaking research in the areas of cardiovascular disease, cancer, and fibrotic diseases. Resverlogix was founded in 2003. (www.resverlogix.com)
- 65. Saga Tech Electronics Inc. (Calgary Health Region — Calgary, Alberta):** SagaTech focuses on creating innovative medical devices for the diagnosis and management of sleep apnea. SagaTech develops and manufactures convenient, scientifically valid devices that provide cost-effective solutions to diagnostic and therapeutic challenges in the field of sleep-disordered breathing. (www.sagatech.ca)
- 66. Sembiosys (Calgary Health Region — Calgary, Alberta):** Sembiosys develops products using its proprietary oilbody-oleosin technology to treat cardiovascular and metabolic diseases, while harvesting the investments that have been made in non-pharmaceutical products. Sembiosys employs nearly 50 researchers in its Calgary headquarters. (www.sembiosys.com)
- 67. Sentinelle Medical (Sunnybrook Health Sciences Centre — Toronto, Ontario):** Sentinelle Medical, which has grown out of leading-edge research at Sunnybrook and Women's Health Sciences Centre, is dedicated to furthering breast MRI and interventional technology. (www.sentinellemedical.com)
- 68. Sirius Genomics (Vancouver Coastal Health — Vancouver, British Columbia):** Sirius Genomics is a life sciences company that uses pharmacogenomics in the research, development and commercialization of genetic-based diagnostic products for the treatment of critical illnesses and severe infections. The company identifies important genetic variations in the biological pathways that are important in critical illness and severe infection and then uses this information to select the appropriate treatment for each patient. These discoveries will make possible dramatic improvements in the design and results of the efficacy of clinical trials and clinical care through the selection of appropriate patients. (www.siriusgenomics.com)





69. **Solution YD3 (Centre Hospitalier de l'Université de Montréal)** : Founded in 1999, YD3 is commercializing a 3D evaluation tool of knee kinematics comprised of a harness and data analysis software. The method provides quantitative data for the 3 main knee movements. Real-time data is obtained by harnessing sensors to the knee thus producing the personalized signature of the patient's knee (BIOKNEE™).
70. **Spectral Diagnostics (University Health Network — Toronto, Ontario)**: Spectral is a developer of innovative technologies for comprehensive disease management. It provides accurate and timely information to clinicians enabling the early initiation of appropriate and targeted therapy. (<http://www.spectraldx.com/>)
71. **Stem Cell Therapeutics (Calgary Health Region — Calgary, Alberta)**: Stem Cell Therapies is developing a pipeline of CNS-regenerative drugs to treat traumatic brain injury. (www.stemcellthera.com)
72. **Stempath Inc. (The Ottawa Hospital — Ottawa, Ontario)**: Founded in 2002, Stempath Inc. aims to become the first pharmaceutical company specializing in therapeutic solutions that modulate the body's natural regenerative capacity. Currently at the discovery stage, StemPath is engaged in *in vivo* proof-of-concept experiments and anticipates entering into preclinical testing by early 2007. (www.stempath.com)
73. **Strida Pharma Inc. (McGill University Health Centre Research Institute — Montreal, Quebec)**: Strida Pharma Inc. is a biopharmaceutical company dedicated to improving the survival and quality of life of cancer patients by developing targeted therapeutics focused on a proprietary strategic anti-cancer target. Strida Pharma Inc was founded in 2002. (www.stridapharma.com)
74. **Topigen Pharmaceuticals Inc (Centre Hospitalier de l'Université de Montréal)** : Founded in 2005, Topigen is developing several new classes of drugs and is actively progressing two drug candidates in Phase II trials for Chronic Obstructive Pulmonary Disease and asthma. These drugs are uniquely focused on inhibiting multiple inflammation targets underlying chronic pulmonary diseases. (www.topigen.com)
75. **Transition Therapeutics Inc (Mount Sinai Hospital — Toronto, Ontario)**: Founded in 1998, Transition Therapeutics is a fully integrated biopharmaceutical company with a proprietary state-of-the art drug discovery engine and extensive drug development program exploring novel therapeutics in multiple disease indications. (www.transitiontherapeutics.com)
76. **TrialStat (Children's Hospital of Eastern Ontario — Ottawa, Ontario)**: TriatStat is an Ottawa based technology and services company, founded in 2002, providing powerful, cost-effective turn-key data capture and management tools for researchers and investigators in health care. TrialStat provides proven, industrial-strength data management software solutions to the clinical research community. Focused specifically on clinical trials, systematic reviews and patient registries, TrialStat's comprehensive, intuitive products are helping hundreds of clinicians to manage their data and their entire studies efficiently, securely and cost effectively. (www.trialstat.com)
77. **Trillium Technologies (Robarts Research Institute — London, Ontario)**: Founded in 1996, Trillium Technologies is a research-driven biopharmaceutical company with a strong immunology focus, specializing in the discovery and development of innovative therapies for the treatment of immune-mediated disorders. The company's therapeutic approaches are aimed at restoring balance to the immune system in conditions associated with aberrant and harmful immune responses, such as autoimmune and inflammatory disorders, graft rejection, cancer and chronic viral diseases. (<http://www.trilliumtherapeutics.com/>)
78. **Unleashed Informatics Ltd. (Mount Sinai Hospital — Toronto, Ontario)**: Founded in 2004, Unleashed Informatics is targeted to the general life sciences market, including biotechnology and pharmaceutical firms, with a focus on bioinformatics, genomics, proteomics, and cheminformatics applications. (www.unleashedinformatics.com)
79. **Variation Biotechnologies Inc. (Children's Hospital of Eastern Ontario — Ottawa, Ontario)**: Variation Biotechnologies Inc. was founded in 2001 to commercialize pioneering research in the bioinformatic design of vaccines. Variosite technology addresses the issue of "antigenic variation," which allows viral pathogens to escape detection by the human immune system; the technology can be applied to viruses such as HIV, hepatitis C, influenza, SARS and dengue. In 2006, Variation was named one of the top 10 life science companies in Canada. (www.variationbiotech.com)
80. **Vascular Therapeutics Incorporated (Hamilton Health Sciences/McMaster University — Hamilton, Ontario)**: Since acquired by Glycocode in 1999, Vascular Therapeutics Incorporated (VTI) was funded to the level of one million USD per year, in return for 10 years of first rights of refusal of discoveries in the treatment of thrombosis. (www.hemostasislab.com)

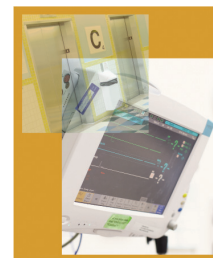
- 81. ViRexx (Capital Health / University of Alberta — Edmonton, Alberta):** ViRexx is an Edmonton, Alberta-based biotechnology company focused on the development of novel therapeutic products for the treatment of cancer and chronic viral infections. ViRexx's most advanced clinical programs include drug candidates for the treatment of ovarian cancer, chronic hepatitis B&C and solid tumours. (www.virexx.com)
- 82. Viron Therapeutics Inc. (Robarts Research Institute — London, Ontario):** Founded in 1997, Viron Therapeutics Inc. is a biopharmaceutical company dedicated to becoming a market leader in the treatment of inflammatory disorders. By harnessing the evolutionary power of viruses that have evolved over millennia, the company is developing powerful protein therapeutics that will block the human body's inflammatory attack. (www.vironinc.com)
- 83. VisualSonics Inc. (Sunnybrook Health Sciences Centre — Toronto, Ontario):** VisualSonics is the leading developer of high-resolution, *in-vivo* micro-imaging systems devised specifically for non-invasive, small animal research. High-resolution imaging allows the small animal researcher to derive results in ways that were previously possible to imagine, but extremely difficult to achieve. (www.visualsonics.com)
- 84. World Heart Corporation (The Ottawa Hospital — Ottawa, Ontario):** Founded in 1996, World Heart is a global technology leader in mechanical circulatory support systems. World Heart provides long-term mechanical circulatory support to the population of heart failure patients. World Heart is developing both pulsatile ventricular assist devices (VADs), which mimic the action of the natural heart, as well as the continuous flow rotary VAD, which is smaller and more easily implanted. (www.worldheart.com)
- 85. Xenon Pharmaceuticals (Vancouver Coastal Health Authority/Provincial Health Services Authority — Vancouver, British Columbia):** Xenon is a privately held company located in Vancouver with just over 70 employees. Xenon is a leader in clinical genetic-based drug discovery and development and has built a worldwide network of over 40 clinical collaborators to find and access the rare families with diseases of relevance to drug discovery. (www.xenon-pharma.com)
- 86. Xillix Technologies (Provincial Health Services Authority — Vancouver, British Columbia):** Founded in 1988, Xillix focuses on the research, development and commercialization of medical imaging technologies which aid in the early detection and localization of cancer. (www.xillix.com)
- 87. XLR Imaging (Robarts Research Institute — London, Ontario):** Founded in 2003, XLR develops and manufactures MRI imaging products and solutions. (www.xlrimaging.com)

Relative to their university counterparts, hospital spin-off companies are generally smaller in size. The smaller size of hospital spin-offs is most likely attributable to the fact that a higher proportion (71%) of hospital spin-offs were formed in the last 10 years (i.e., 1996 and onwards), whereas 65% of university spin-offs are over 10 years old and have therefore had the chance to more fully develop and mature.¹⁷

Significantly, it is estimated that 20% of Canadian hospital spin-offs listed are considered public companies; that is, they trade on a public stock exchange such as the Toronto Stock Exchange, the American Stock Exchange and Options Exchange or the NASDAQ. The remaining 80% of Canadian hospital spin-off companies listed are privately held.¹⁸ Statistics reveal that hospital spin-off companies are more likely to establish public entities compared to other sectors, including universities; this is especially remarkable given hospital spin-offs are relatively "young" companies, and as a result they tend to have fewer employees.¹⁹

That said, a number of hospital spin-off companies are experiencing rapid growth in their early years. Spin-off companies that achieve a doubling of employment in five years or less are considered "gazelles". Gazelles exemplify responsible growth and economic viability. A healthy 10% of hospital spin-offs companies have doubled employment within five years to a minimum of 20 employees.²⁰ Comparatively, only 1% to 4% of all spin-off companies in Canada achieve "gazelle" status, according to Statistics Canada and the Industrial Research Assistance Program (IRAP) study of over two million firms.²¹

While these are still considered "early days" for research hospital spin-off companies across the country, there is no disputing the impact these companies are having in the biotechnology and biopharmaceutical sectors, to say nothing of their global impact improving the health of millions and the wealth of Canadians. To that end, Amorfix Life Sciences – a CIHR funded research hospital spin-off based in Toronto, was named one of 47 companies globally (and the only spin-off from Canada) to receive the 2007 Technology Pioneer Award from the World Economic Forum. To be selected as a Technology Pioneer, a company must be involved in the development of life-changing technology innovation and have potential for long-term impact



"A healthy 10% of hospital spin-off companies have doubled employment within five years to a minimum of 20 employees. Comparatively, only 1% to 4% of all spin-off companies in Canada achieve "gazelle" status, according to Statistics Canada and the Industrial Research Assistance Program (IRAP) study of over two million firms."



"As ACAHO members continue to produce cutting edge research discoveries – and subsequently establish spin-off companies to commercialize discoveries – it becomes incumbent upon us to pose penetrating public policy questions regarding how to move the yardsticks forward in an integrated fashion, in order to position Canada as a global leader that can take full advantage of the benefits of innovation – and share them with the rest of the world."

on business and society. In addition, Amorfix needed to demonstrate visionary leadership and show the signs of being a long-standing market leader – and its technology must be proven.²² Amorfix, which focuses on the diagnosis and treatment of brain-wasting diseases (such as Alzheimer's or Parkinson's), was founded with a grant from the CIHR Proof of Principle program to commercialize the discoveries of research conducted at Sunnybrook Health Sciences Centre.

In March 2008, ACAHO published a comprehensive list of major medical discoveries – or world's firsts – which transpired in research hospitals across the country.²³ Many of these discoveries provided the genesis or foundation for the creation of spin-off companies to license a technology or idea and ultimately bring new and innovative products to market. As ACAHO members continue to produce cutting edge research discoveries – and subsequently establish spin-off companies to commercialize discoveries – it becomes incumbent upon us to pose penetrating public policy questions regarding how to move the yardsticks forward in an integrated fashion, in order to position Canada as a global leader that can take full advantage of the benefits of innovation – and share them with the rest of the world.

CONCLUSION

In many ways, the significant advances of medicine in the last century are the product of our ability to extract and apply the knowledge that comes from science and technology. At the same time, an important driver of economic prosperity and productivity for Canada moving forward will be the advent of highly specialized biotechnology and biopharmaceutical companies who will produce novel and globally significant tools or intelligence to begin to unravel life's greatest mysteries related to health promotion, disease prevention and life expectancy.

As we embrace the beginnings of a biotechnology revolution, Canada – as a nation – must consider how to create additional capacity (with respect to appropriate infrastructure, supply of highly skilled labor, intellectual property models, creative tax policy initiatives, and pre-commercialization gap funding mechanisms) to assist in – and incentivize the commercialization of health research.

Innovation and investment are key growth drivers of Canada's future productivity. In the Association's view, it will be important to consider how embracing these higher order public policy objectives can be translated into a series of specific science and technology strategies and cohesive policies that will not only continue to improve the quality of life of all Canadians, but contribute to the country's sustained economic prosperity, quality of life and overall standard of living.

APPENDIX A

MEMBERS OF ACAHO - 2007

While members of the Association are the institutions or regional health authorities, they are represented by the President and CEO of that organization.

Newfoundland and Labrador

Ms. Louise Jones
Eastern Regional Integrated
Health Authority
www.easternhealth.ca

Nova Scotia

Ms. Anne McGuire
IWK Health Centre
www.iwk.nshealth.ca

Ms. Christine Power
Capital District Health Authority
www.cdha.nshealth.ca

New Brunswick

Ms. Dora Nicinski
Atlantic Health Sciences Corporation
www.reg2.health.nb.ca

Mr. Donn Peters
South-East Regional Health Authority
www.serha.ca

Québec

Monsieur Robert Busilacchi
Institut de cardiologie de Montréal
www.icm-mhi.org

Monsieur Khiem Dao
Hôpital Sainte-Justine
www.chu-sainte-justine.org

Monsieur Michel Delamarre
Hôpital Laval, Institut universitaire
de cardiologie et de pneumologie
www.ulaval.ca/crhl

Madame Lise Denis
Association québécoise
d'établissements de santé et
de services sociaux
www.aqesss.qc.ca

Madame Carole Deschambault
Hôpital Maisonneuve-Rosemont
www.maisonneuve-rosemont.org

Mr. Henri Elbaz
SMBD-Jewish General Hospital
www.@adm.jgh.mcgill.ca

Madame Patricia Gauthier
Centre hospitalier universitaire
de Sherbrooke
www.crc.chus.qc.ca

Monsieur Denis Lalumière
Institut universitaire de gériatrie
de Sherbrooke
www.iugm.qc.ca

Monsieur Michel Larrivière
Hôpital du Sacré-Cœur de Montréal
www.crhsc.umontreal.ca

Dr. Arthur Porter
McGill University Health Centre
www.muhc.mcgill.ca

Monsieur René Rouleau
Centre hospitalier universitaire
de Québec
www.chuq.qc.ca

Dr. Denis-Richard Roy
Centre hospitalier de L'Université
de Montréal
www.chumontreal.qc.ca

Madame Marie-France Simard
Institut universitaire de gériatrie
de Montréal
www.iugm.qc.ca

Ontario

Monsieur Jean Bartkowiak
SCO Health Services
www.scohs.on.ca

Dr. Robert Bell
University Health Network
www.uhn.on.ca

Monsieur Michel Bilodeau
Children's Hospital of Eastern Ontario
www.cheo.on.ca

Mr. Joe de Mora
Kingston General Hospital
www.kgh.kari.net

Dr. Paul Garfinkel
Centre for Addiction and Mental Health
www.camh.net

Mr. Hugh Graham
Hotel Dieu Hospital
www.hdh.kari.net

Ms. Mary Jo Haddad
The Hospital for Sick Children
www.sickkids.ca

Ms. Sheila Jarvis
Bloorview MacMillan
www.bloorview.ca

Dr. Jack Kitts
The Ottawa Hospital
www.ottawahospital.on.ca

Mr. Jeffrey Lozon
St. Michael's Hospital
www.smh.toronto.on.ca

Mr. Joseph Mapa
Mount Sinai Hospital
www.mtsinai.on.ca

Mr. Murray Martin
Hamilton Health Sciences
www.hhsc.ca

Dr. David McLellan
Sunnybrook Health Sciences Corp.
www.sw.ca

Mr. Cliff Nordal
London Health Sciences Centre
www.lhsc.on.ca

Mr. Cliff Nordal
St. Joseph's Health Care
www.sjhc.london.on.ca

Dr. William Reichman
Baycrest Centre for Geriatric Care
www.baycrest.org

Mr. Mark Rochon
Toronto Rehabilitation Institute
www.torontorehab.on.ca

Dr. Kevin Smith
St. Joseph's Healthcare
www.stjosham.on.ca

Mr. George Weber
Royal Ottawa Hospital Group
www.rohcg.on.ca

Manitoba

Dr. Brian Postl
Winnipeg Regional Health Authority
www.wrha.mb.ca

Dr. Michel Tétreault
St. Boniface General Hospital
www.gwmail.sbggh.mb.ca

Dr. Brock Wright
Health Sciences Centre
www.hsc.mb.ca

Saskatchewan

Ms. Maura Davies
Saskatoon Health Region
www.sdh.sk.ca

Mr. Dwight Nelson
Regina Qu'Appelle Health Region
www.rghealth.ca

Alberta

Mr. Jack Davis
Calgary Health Authority
www.crha-health.ab.ca

Mr. Patrick Dumelie
The Caritas Health Group
www.cha.ab.ca

Dr. Jean-Michel Turc
Alberta Cancer Board
www.cancerboard.ab.ca

Ms. Sheila Weatherill, C.M.
Capital Health
www.cha.ab.ca

British Columbia

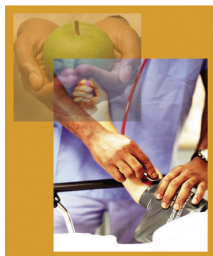
Ms. Lynda Cranston
Provincial Health Services Authority
www.phsa.ca

Ms. Dianne Doyle
St. Paul's Hospital
www.providencehealth.bc.ca

Ms. Ida Goudreau
Vancouver Coastal Health Authority
www.vrhc.bc.ca

Mr. Howard Waldner
Vancouver Island Health Authority
www.viha.ca





APPENDIX B

ACAHO VICE-PRESIDENTS OF HEALTH RESEARCH - 2007

Dr. Arthur Slutsky (Co-Chair)

Vice-President, Research
St. Michael's Hospital
Toronto, Ontario

Dr. Tom Feasby (Past Co-Chair)

Past Vice-President, Academic Affairs
Capital Health
Edmonton, Alberta

Newfoundland and Labrador

Mr. Wayne Miller

Senior Director, Corporate Strategy & Research
Eastern Health
St. John's, Newfoundland

Nova Scotia

Dr. Raymond P. LeBlanc

Vice-President, Research and Academic Affairs
Capital District Health Authority
Halifax Nova Scotia

Dr. Patrick McGrath

Vice-President, Research
IWK Health Centre
Halifax, Nova Scotia

New Brunswick

Ms. Jacquelyn Légère

Interim Vice-President,
Research Liaison
Department of Research Services
Atlantic Health Sciences Corporation
Saint John, New Brunswick

Ms. Nancy Roberts

Vice-President
Planning and Professional Services
South-East Regional Health Authority
Moncton, New Brunswick

Québec

Dr. Luc Bélanger

Professeur de Biologie Médicale,
Directeur scientifique,
Centre de recherche en cancerologie de
L'Université de Laval
L'Hotel-Dieu de Québec (CHUQ)

Dr. René Cardinal

Directeur de la recherche
Hôpital du Sacré-Cœur de Montréal
Montréal, Québec

Mr. Mario Deslongchamps

Directeur administratif, centre de recherche
Centre hospitalier de L'Université de Montréal (CHUM),
Hôtel Dieu
Montréal, Québec

Dr. Jean-Claude Forest

Directeur de la recherche
Centre hospitalier universitaire de Québec (CHUQ)
Sainte-Foy, Québec

Dr. Victor Frak

Directeur scientifique
Site de recherche CRIR
Institut de réadaptation de Montréal
Montréal, Québec

Dr. Pavel Hamet

Directeur de la recherche génétique
Centre hospitalier de L'Université de Montréal (CHUM),
Hotel-Dieu
Montréal, Québec

Dr. Fernand Labrie

Directeur de la recherche
Centre de recherche CHUL
Québec, Québec

Ms. Ginette Leblanc

Directrice de l'Organisation des
services, des affaires médicales et de la qualité
Association québécoise d'établissements
de santé et de services sociaux (AQESSS)
Montréal, Québec

Dr. Michel Maziade

Directeur de la recherche
Centre de recherche
L'Université Laval Robert-Giffard (CRULRG)
Beauport, Québec

Dr. Jean-Marie Moutquin

Directeur de la recherche
Centre de recherche clinique Etienne-Le Bel
Centre hospitalier universitaire de Sherbrooke (CHUS)
Fleurimont, Québec

Dr. Vassilios Papadopoulos

Director, McGill University Health Center
Research Institute
Montreal, Québec

Dr. Guy Rouleau

Directeur de la recherche
Centre de recherche
Hôpital Sainte Justine CHU
Montréal, Québec

Dr. Denis-Claude Roy

Directeur de la recherche
Centre de recherche
Hôpital Maisonneuve-Rosemont
Montréal, Québec

Dr. Marc-André Roy

Directeur de recherche
Centre de recherche
L'Université de Laval Robert-Giffard
Beauport, Québec

Dr. Jean-Claude Tardiff

Directeur de la recherche
Institut de cardiologie de Montréal
Montréal., Québec

Dr. Jacques Turgeon

Directeur du Centre de recherche
Centre Hospitalier de L'Université de Montréal
Montréal, Québec

Dr. Mark Wainberg

Director of Research
SMBD-Jewish General Hospital
Montréal, Québec

Ontario

Dr. Larry Chambers

President & Chief Scientist,
& Vice-President, Research
Elisabeth Bruyere Research Institute
SCO Health Services
Ottawa, Ontario

Dr. Anne-Marie Christian

Vice-President, Research Operations
The Hospital for Sick Children
Toronto, Ontario

Dr. Roger G. Deeley

Vice-President, Research Development
Kingston General Hospital
Kingston, Ontario

Dr. Geoff Fernie

Vice President, Research
Toronto Rehabilitation Institute
Toronto, Ontario

Dr. David Hill

Scientific Director
Lawson Research Institute
Integrated Vice-President Research
London Health Sciences Centre and
St. Joseph's Health Care
London, Ontario

Dr. Michael Julius

Vice-President, Research
Sunnybrook Health Sciences Centre
Toronto, Ontario

Dr. Shitij Kapur

Chief of Research
Centre for Addiction & Mental Health
Toronto, Ontario

Dr. Andreas Laupacis,

Director, Li Ka Shing Knowledge Institute
St. Michael's Hospital
Toronto, Ontario

Ms. Jean Lazarus

Director, Research Operations
Research Centre for Aging and the Brain
Baycrest
Toronto, Ontario

Dr. Stephen Lye

Vice President, Research, Mount Sinai Hospital
Associate Director
Samuel Lunenfeld Research Institute
Toronto, Ontario

Dr. Colin MacArthur

Vice-President of Research &
Director of the Bloorview Research Institute
Toronto, Ontario

Dr. Alex MacKenzie

Director of Research Institute
Children's Hospital of Eastern Ontario
Ottawa, Ontario

Dr. Zul Merali

President & CEO
Ottawa Institute of Mental Health Research
Royal Ottawa Hospital Group
Ottawa, Ontario

Dr. Chris Paige

Vice-President, Research
University Health Network
Toronto, Ontario

Dr. Ian Rodger

Vice President, Research & Academic Affairs
Father Sean O'Sullivan Research Centre
St. Joseph's Healthcare
Hamilton, Ontario

Dr. Janet Rossant

Chief of Research, Senior Scientist
The Hospital for Sick Children Research Institute
Toronto, Ontario

Dr. Duncan Stewart

CEO & Scientific Director
Ottawa Health Research Institute
The Ottawa Hospital
Ottawa, Ontario

Dr. David Streiner

Assistant Vice-President, Research
Baycrest
Toronto, Ontario

Dr. Donald T. Stuss

Vice-President, Research
Director, Rotman Research Institute
Baycrest
North York, Ontario

Dr. Jeffrey I. Weitz

Director
The Henderson Research Centre
Hamilton, Ontario

Dr. Gordon Winocur

Vice-President, Research
Baycrest
North York, Ontario

Dr. Jim Woodgett

Director
Simon Lunenfeld Research Institute
Mount Sinai Hospital
Toronto, Ontario

Dr. John Woods

Director, Strategic Planning & Research Administration
Father Sean O'Sullivan Research Centre
St. Joseph's Healthcare
Hamilton, Ontario

Dr. Salim Yusuf

Vice-President, Research
Chief Scientific Officer
Director of Population Health and Research Institute
Hamilton Health Sciences
Hamilton, Ontario

Manitoba

Dr. Blake McClarty

Director of Research
Community Health Sciences
University Manitoba
Health Sciences Centre
Winnipeg, Manitoba

Dr. Grant N. Pierce

Executive Director of Research
St. Boniface Hospital Research Centre
Winnipeg, Manitoba

Saskatchewan

Ms. Laurel Duczek

Director, Strategic Health Information and Planning Services
Saskatoon Health Region
Saskatoon, Saskatchewan

Dr. Beth Horsburgh

Vice President, Research and Innovation
Chief Medical Health Officer
Saskatoon Health Region
Saskatoon, Saskatchewan

Mr. Derrick Larsen

Executive Director, Research and Performance Support
Regina Qu'Appelle Health Region
Regina, Saskatchewan

Alberta

Ms. Barbara Hiscock

Director, Research Administration
Alberta Cancer Board
Standard Life Centre
Edmonton, Alberta

Dr. Cyril Kay

Vice President, Research
Alberta Cancer Board
Edmonton, Alberta

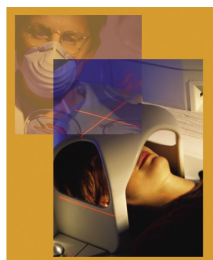
Ms. Sheli Murphy

Senior Executive Team Lead,
Research & Academics
Caritas Health Group Research Centre
Misericordia Hospital
Edmonton, Alberta

Ms. Jo-Ann Nettleton

Director of Education & Research
Caritas Health Group Research Centre
Misericordia Hospital
Edmonton, Alberta





Dr. Robert Sheldon
Vice President, Research
Calgary Health Region
Calgary, Alberta

Dr. Lloyd Sutherland
Director, Care for the Advancement of Health
Calgary Health Region
Calgary, Alberta

British Columbia

Dr. Bernie Bressler
Vice-President, Research
Vancouver Coastal Health Authority
Research Pavilion
Vancouver, British Columbia

Dr. Peter Kirk
Medical Director of Research
& Academic Development
Vancouver Island Health Authority
Victoria, British Columbia

Dr. Yvonne Lefebvre
Vice-President, Research & Academic Affairs
Providence Health Care
Vancouver, British Columbia

Dr. Stuart MacLeod
Vice-President
Academic Liaison & Research Coordination
Provincial Health Services Authority
Vancouver, British Columbia

END NOTES

1. A more in-depth review of world firsts is contained in section 10 of the ACAHO report "*Moving at the Speed of Discovery: From Bench to Bedside to Business*" (November 2007), and "*Eureka! World Firsts and Major Medical Breakthroughs in ACAHO Member Institutions*" (March 2008).
2. Health Innovation Canada Factsheet, December 2003.
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4. The Committee on the State of Science & Technology in Canada, Council of Canadian Academies, *The State of Science & Technology in Canada*, September 2006.
5. A cross-city comparison was recently conducted and released by the Toronto Regional Research Alliance in November 2006: *At a Crossroads — Strengthening the Toronto Region's Research and Innovation Economy*.
6. The Conference Board of Canada, *Mission Possible: Stellar Canadian Performance in the Global Economy*. (Ottawa: The Conference Board of Canada, 2007).
7. In 2003, Secor presented a ten point strategy to improve Canada's performance in health innovation. Source: Health Care and the Innovation Agenda: *Assuring Canada's Growth in the Life Sciences Century – report from the Conference on Health Innovation, Wealth Creation and System Renewal*, November 2003 – as part of the "Directions for Canadian Health Care" published by Merck Frosst.
8. The alternative to commercializing via the formation of a new company is to license the discovery to an existing company.
9. *The Health of Canadians – The Federal Role*. Final Report on the State of the Health Care System in Canada. Standing Senate Committee on Social Affairs, Science and Technology. Volume Six: Recommendations for Reform, October 2002, p 218.
10. MaRS Discovery District. www.marsdd.com
11. Commercialization Handbook: An Introductory Guide for Researchers. The Intellectual Property Management Offices of Ontario's Post-Secondary Research Institutions and the Ontario Centres of Excellence. 2005
12. *Commercialization Handbook: An Introductory Guide for Researchers*. The Intellectual Property Management Offices of Ontario's Post-Secondary Research Institutions and the Ontario Centres of Excellence. 2005
13. In October 2007, the Association of Canadian Academic Healthcare Organizations (ACAHO) published a report entitled *Moving at the Speed of Discovery: From Bench to Bedside to Business*. This report details many of the specific stages of commercialization referred to in Figure 1.
14. *Follow the Funding, ACAHO Research Funding Flow Survey*, 2006.
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22. World Economic Forum. www.weforum.org
23. *Eureka! World's First Discoveries and other Major Medical Breakthroughs in ACAHO Member Institutions*. ACAHO. March 2008.



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