



Vaccine and Infectious Disease Organization

Protecting the World from Infectious Disease



*Creating a new paradigm for
Canadian vaccine development*

2007-2008

A research organization of the



UNIVERSITY OF
SASKATCHEWAN



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Image courtesy Sophie Collin, sxc.hu

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Our Vision

Protecting the world from infectious diseases.

Our Mission

To be a pre-eminent research institute investigating the pathogenesis of infectious diseases and the development of effective therapeutic and prophylactic methods to control infectious diseases of humans and animals.



Changing to meet future needs in the field of infectious disease

Dr. Andrew Potter, PhD
Director and CEO
Senior NSERC Industrial Research Chair in Food Safety



As change in our society and climate creates conditions for the emergence of new diseases, adhering to old paradigms carries the risk of missed opportunities.

The past year has been my first as the Director of VIDO and it has been highlighted by a number of positive changes for the organization that will define its future.

The most important of these was the start of construction of the Containment Level 3 International Vaccine Centre (InterVac) on November 1, 2007. This facility will be a cornerstone of our international involvement in efforts to reduce the threat of new and persistent infectious diseases.

The InterVac facility will ensure that we are well-positioned to meet the needs of Canada in the infectious disease field for the

This facility will be a cornerstone of our international involvement in efforts to reduce the threat of new and persistent infectious diseases.



foreseeable future. Over the past decade, there has been a very clear trend towards increased biosecurity in Canada, which has also been seen globally. InterVac will ensure that VIDO's existing research programs are not threatened by changes in federal biosafety regulations.

InterVac will not only enhance VIDO's research capacity, but also provide a unique training environment for our students and post-doctoral fellows.

New directions in vaccine research



We have been successful during the past year in establishing and participating in new research initiatives in the field of vaccinology. These include regional networks with over \$7.5 million in new funding as well as the successful Networks of Centres of Excellence initiative, the Pan-Provincial Vaccine Enterprise (PREVENT).

The establishment of PREVENT was a partnership between the University of British Columbia/BC Centre for Disease Control, the Canadian Center for Vaccinology (a partnership

among Dalhousie University, the IWK Health Centre and Capital Health), and VIDO. Its mission is to accelerate the commercialization of Canadian vaccine technologies for diseases of public health importance. PREVENT will not compete with industry, but rather reduce the risk

of product failure through the development pathway. While PREVENT is a separate not-for-profit corporation, it is headquartered at VIDO and there is a very clear synergy between the two organizations. All of these new ventures, including PREVENT, have taken advantage of VIDO's collaborative philosophy and culture that continues to serve us well.

Evolution of an enduring vision

VIDO's role and "home" within the University of Saskatchewan has been the subject of significant discussion over many years. The establishment of the organization 33 years ago was a visionary step forward, but one that has not often fit within the traditional university governance model. Issues such as intellectual property management are critical for VIDO's future, yet continue to be a source of debate within the University community. Over the past year, there has been significant progress made in redefining VIDO's role in the University and in defining a new governance model.

Last year's establishment of the University of Saskatchewan School of Public Health provided an opportunity to align VIDO's academic activities with a multi-disciplinary, collaborative body while maintaining complete control over its research personnel and activities. This is of paramount importance to our stakeholders, as we require the flexibility to respond to emerging opportunities.

I remain optimistic that a new governance model combining the strongest elements of VIDO's original constitution with an updated description of the relationship with the University of Saskatchewan will be achieved during the coming year.

Defining a new paradigm

VIDO's research programs have always been a source of pride to the organization. My job has been made much easier by the dedication of the organization's Senior Management Team, our Science Management Team, and all VIDO staff who continue to embrace our culture of co-operation and team-based approaches to solving research questions.

As the organization continues to grow, there are corresponding increases in the demands placed upon all members of staff. Indeed, VIDO has much the same structure and numbers of dedicated management personnel that existed when I joined the organization in 1985. Thus, with InterVac becoming a reality, one of my goals for the next year will be to work with our staff to redefine our roles within the organization and to ensure that additional personnel are added in both scientific and management areas.

The past year has been one of change for the organization and it has been a personal delight to observe the way our staff have embraced this change and continued to move forward. This is a testament to the tireless efforts of our former director, Dr. Lorne Babiuk, in establishing over 25 years a group of individuals with a collective vision and the skills necessary to move towards that vision. I look forward to working with our Board of Advisors and all of our staff during the coming year, continuing what Dr. Babiuk described as an "unprecedented journey."

The past year has been one of change for the organization and it has been a personal delight to observe the way our staff have embraced this change and continued to move forward.

Exhilaration, Challenges, Achievements

Mr. Brian Perkins, B.S.A., P. Ag., Chair, VIDO Board of Advisors



I have had the privilege to be involved with VIDO and now VIDO/InterVac for the last five years, and “exhilaration, challenges and achievements” is a good summary of that time.

As an organization in a constant mode of expansion and growth, VIDO’s focus and direction has remained remarkably stable.

The nucleus of this strength is the vision and focus of our Director and Senior Management Team.

The collaborative culture of the staff of our organization has also remained steadfast.

To me, VIDO could easily be classed as a hybrid in the academic and corporate worlds. It fulfills its commitment to society as a world-class training facility for the brilliant minds of our youth. It does this while interacting with the pharmaceutical community to assist in the development and delivery of vaccines having great impact on the economics of livestock production and on consumers with respect to food and water safety. In the years to come, VIDO will also have an increasing influence on the development and production of vaccines used worldwide in human health. All this is accomplished within the umbrella administration of the university environment.

The parameters and dynamics within which VIDO/InterVac functions are a challenge in

themselves. Over the last year, great strides have been made in defining VIDO/InterVac’s role within the University. With the creation of the School of Public Health and the School’s Graduate Program in Vaccinology and Immunotherapeutics, VIDO will continue its leading role in research and education, and VIDO scientists will be given the opportunity to be involved in the new interdisciplinary structure of the School of Public Health. Through the unwavering commitment of University of Saskatchewan President Peter MacKinnon and Vice-President (Research) Steven Franklin, potential new Canada Research Chairs in conjunction with tenured faculty positions will assist in developing a more stable environment for our key scientists.

All this, coupled with the progressing construction of the InterVac facility, our leading role in a new Centre of Excellence in Commercialization and Research - PREVENT, and the newly created \$2.4 million Research Alliance for the Prevention of Infectious Disease (RAPID), place VIDO/InterVac in an ideal position to fulfill its vision and commitment to society.

To Andrew Potter, my fellow board members and the entire staff of VIDO, I would like to thank you for allowing me the opportunity to be a small part of a great Canadian experience, an experience that will continue to offer exhilaration, challenges, and achievements.

To me, VIDO could easily be classed as a hybrid in the academic and corporate worlds

2008/09 VIDO Advisory Board



Front row, left to right:

Dr. Andrew Potter
Mr. Terry Manning (Chair, 08/09)
Mr. David Gordon
Dr. Beth Horsburgh (ex-officio)
Dr. Chuck Rhodes
Dr. Robert Kerr

Back row, left to right:

Dr. Gord Atkins (past member 07/08)
Dr. Marvin Fritzler
Mr. Brian Perkins (Chair, 07/08)
Dr. Luis Barreto
Dr. Don Wilson
Dr. Bill Ballantyne

Absent:

Dr. William Albritton (guest)
Dr. Steven Franklin
Dr. Walter Heuser



The International Vaccine Centre

The world is changing. So is disease.

Photo courtesy Liam Richards for On Campus News

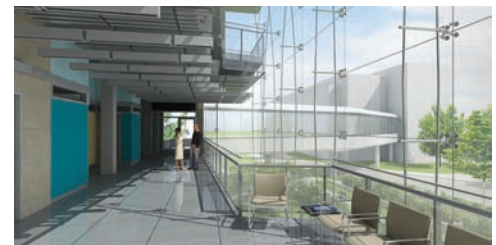
“Currently about thirty percent of the work VIDO does is focused on human vaccines, with the rest targeting livestock. Investment in InterVac will allow us to address more of the difficult human health challenges as well as anticipate new threats as they emerge.”

-VIDO Director Dr. Andrew Potter

Society is facing increasing numbers of deaths due to Containment Level 3 (CL3)-rated diseases such as tuberculosis. We also face the threat of pandemic outbreaks, yet VIDO finds itself limited in its current operations. VIDO can work with the proteins thought to be good vaccine components and can make prototype vaccines, but cannot test them to see whether they are effective. “It’s like only being able to fix half the problem,” says Dr. Andrew Potter, VIDO/InterVac Director.

There are few effective vaccines against pathogens rated at Containment Level 3 and today, there is a worldwide shortage of facilities in which to study these high-risk diseases. This has led to a bottleneck for this type of study that bars the discoveries that

could alleviate catastrophic effects of widespread disease by bringing effective vaccines to market quickly.



Led by VIDO, the University of Saskatchewan is building Canada’s largest vaccine research centre. To operate as one with VIDO, the International Vaccine Centre (InterVac) will open its doors to scientists from all nations in 2010.

InterVac will help VIDO bring its work – and the work of partners in government, industry and academia – full circle by enabling vaccine testing and eventual commercialization,

while helping researchers gain a deeper understanding of diseases caused by CL3 pathogens. VIDO/InterVac will be a “one-stop” shop – allowing vaccines to get to market much sooner than before: a new paradigm in Canadian vaccine development.

Supporters from all levels of government, funding agencies like the Canada Foundation for Innovation, and donors from Canada and the world believe InterVac will be among the country’s best weapons in the war on disease. There is no comparable CL3 vaccine development facility in Canada, and only a few in the world.

InterVac will be open to academic teams, commercial partners, researchers from Canadian and international universities, research institutes and governments. Opportunities for these types of collaboration are unavailable elsewhere in North America.

VIDO/InterVac forms the cornerstone of a critical mass in Canadian vaccine development. When complete, the \$140 million InterVac will offer enhanced training opportunities and be part of a unique University of Saskatchewan life sciences cluster that includes the full range of life sciences colleges; the Canadian Light Source, Canada's only synchrotron; and the Innovation Place research park. In 2008, Saskatoon ranked most competitive for business costs among western Canadian locations (KPMG).

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Follow InterVac construction progress at www.vido.org/netcam

What are containment levels?

Certain safety measures must be in place ensuring workers are safe when studying disease-causing organisms. Containment Level 1 applies to organisms that do not cause disease in healthy humans. Level 4 applies to exotic, lethal viruses transmitted by air (e.g., Ebola, smallpox). Canada has only one Level 4 lab, located in Winnipeg, Man.

A uniquely flexible weapon against disease

InterVac is being built to exceed current Containment Level 3 regulations. Rigorous safety practices, state-of-the art safety equipment and specially engineered building features prevent infectious agents from entering or leaving the building.

The facility’s large space and distinctive design incorporate an animal block and a laboratory block. The building can support experiments involving single or multiple pathogens and projects involving multiple investigators, making shared services a feature.

At 145,000 square feet, InterVac offers laboratory space for research at Containment Level 2 and 3 (Ag):

- Ⓢ 18 rooms for animal housing and six CL3 laboratories enable visiting scientists to capitalize on VIDO’s expertise in large-animal models
- Ⓢ Accommodates a range of experimental designs from preclinical testing for human medicines to licensing trials for animal vaccines

Every effort is being made to make the facility as energy-efficient as possible while maintaining the safety and integrity required by the regulatory bodies that oversee this and similar facilities.

A critical mass of vaccine development expertise in Saskatoon

Vaccine research that reaches beyond the laboratory



PREVENT

ACCELERATING CANADIAN
VACCINE DEVELOPMENT

The Pan-Provincial Vaccine Enterprise (PREVENT)

However novel and inspired, research targeting new vaccines inevitably reaches a critical juncture: Either a pharmaceutical company advances the technology through the clinical trials process to eventual commercialization, or the vaccine candidate stalls due to the high-risk nature of the early stages of the commercialization process.

VIDO is a partner in the Pan-Provincial Vaccine Enterprise (PREVENT), a new non-profit

PREVENT was formed in early 2008 as one of 11 new Centres of Excellence in Commercialization and Research through an award of \$15 million from the federal Networks of Centres of Excellence (NCE). VIDO and its collaborators – the Canadian Center for Vaccinology and the BC Centre for Disease Control – are providing an additional \$10.5 million to the corporation through in-kind support.

By fast-tracking the commercialization of vaccines crucial to public health, PREVENT will speed their passage to the Canadian marketplace. With potential targets including



Board of Directors of the Pan-Provincial Vaccine Enterprise (PREVENT).

Front left to right: Dr. George Khachatourians, Dr. Lorne Babiuk (Chair), Dr. Andrew Potter (CEO), Dr. Richard Florizone. Back row left to right: Dr. Gregory Hammond, Dr. Paul Hodgson (Secretary), Mr. Jean Saint-Vil (Deputy Director, Networks of Centres of Excellence), Dr. David Scheifele, Dr. Christian Blouin. Absent: Dr. Scott Halperin (PREVENT partner), Dr. Robert Brunham (PREVENT partner).

corporation aimed at accelerating the development of vaccines for both humans and animals. Headquartered at the University of Saskatchewan, PREVENT will conduct preclinical and clinical trials for promising vaccine candidates, absorbing the risk of early-stage vaccine development.

prion disease, chlamydia and influenza, PREVENT will intensify the industry's global competitiveness and Canada's leadership in tackling infectious disease.

The first vaccine candidate approved by the PREVENT board of directors is expected to enter Phase 1 clinical trials by 2010.

Research Alliance for the Prevention of Infectious Disease (RAPID)

A successfully commercialized vaccine must be delivered to its target population – a challenge from a social and public policy perspective.

In Saskatchewan, chronic diseases such as tuberculosis and hepatitis C are prevalent, particularly in high-risk populations. The province is also challenged by the highest human incidence of West Nile virus infection in Canada, as well as abnormally high rates of sexually transmitted infections.

The Research Alliance for the Prevention of Infectious Disease (RAPID) is a new multidisciplinary team of 17 researchers, based at the Saskatoon Health Region, the University of Calgary and VIDO.

The \$2.4 million project will take an interdisciplinary approach to improving vaccination coverage in Saskatchewan and elsewhere by developing vaccine formulations, determining their effectiveness in high-risk populations, and through simulation models for disease, gathering knowledge to guide policy decisions.

RAPID, to be led by VIDO director Dr. Andrew Potter, is funded by the Saskatchewan Health Research Foundation (SHRF).

The RAPID team

Left to right:

Dr. Jo-Anne Dillon
Dr. Nathaniel Osgood
Dr. Hyun Lim
Dr. Joyce Wilson
Dr. Philip Griebel
Dr. Sylvia van den Hurk
Dr. George Mutwiri
Dr. Andrew Potter (Team leader)
Dr. Volker Gerdts
Dr. John Gordon
Dr. Hugh Townsend

Absent:

Dr. Cory Neudorf
Dr. Johnmark Opondo
Dr. Alan Rosenberg
Dr. Allen Ross
Dr. Tony Schryvers
Dr. Suresh Tikoo



Ⓢ In Africa, infection rates with tuberculosis have tripled in the last decade, and worldwide infection rates are still on the rise. The disease kills 5,000 people a day – more than ever before (estimates in the World Health Organization's annual tuberculosis report for 2005).

A growing team crossing boundaries in vaccine research

Ms Joyce Sander, CIM, P. Mgr., Human Resources and Intellectual Property Manager



At VIDO, we are changing the ways vaccine development and application are conceptualized.

Disease will always be a part of the human existence. Here we believe in the role and importance of vaccines to individual and public health. With the impact vaccination has had on the health of humans and animals and on economies around the world, training new researchers to continue the work and respond to threats that may emerge is clearly a necessity.

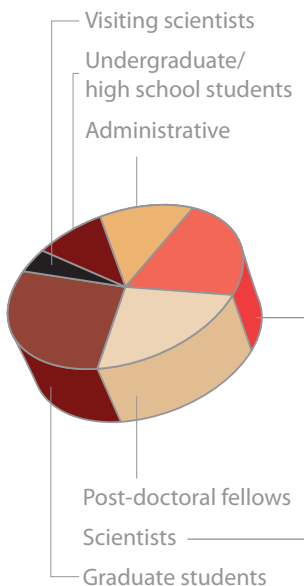
At VIDO, we are changing the ways vaccine development and application are conceptualized. VIDO/InterVac is a paradigm enabling scientists, post-doctoral fellows and graduate students to push the boundaries of vaccine research, challenging thinking and delving into benefits to public health.

development of real-world skills. Through their vaccinology training programs, students will also have opportunities to conduct research that will advance vaccine candidates through the PREVENT pipeline (see page 8). And in 2010, the U of S, led by VIDO, will complete the 145,000 square foot International Vaccine Centre (InterVac).

This is a time of great excitement about what the future holds for vaccine development in Canada. Our staff and students know that VIDO/InterVac will always be a dynamic workplace as we continue to evolve to meet society's needs. Our Senior and Science Management Teams have carefully mapped a strategy that will enable research programs to flourish during the next year.

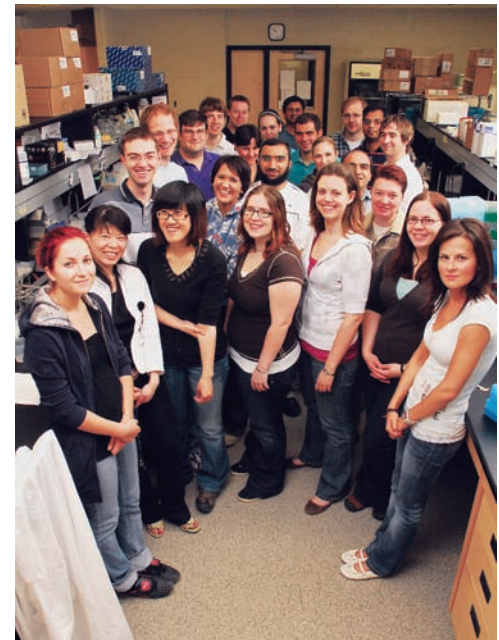
The disease challenges we face will only intensify the talent and energy that is contained within our walls.

Vido staff composition



VIDO/InterVac is a leader in the research and development of vaccine and immune-stimulating technologies for humans and animals, and offers students and staff a top-level graduate program, the most cutting-edge equipment and the ability to keep pace with advances in immunology and biotechnology.

In 2007, the University of Saskatchewan created a new, highly interdisciplinary School of Public Health offering unique opportunities for graduate training. VIDO is now accepting students in the new Interdisciplinary Graduate Program in Vaccinology and Immunotherapeutics. Trainees will be able to work in an organization with close links to industry, allowing networking and



Members of graduate programs at VIDO, 2008

Platform technologies: Exponential applications for vaccinology

Dr. Volker Gerdts, DVM, Associate Director, Research

Despite a year of change, VIDO's research programs have continued to evolve and to make significant progress.

In July 2007, Dr. Andrew Potter was appointed Director and CEO of VIDO/InterVac and I was appointed as Associate Director, Research. The dedication of our staff has ensured this change in leadership has had very little effect on the success of the organization.

VIDO's research activities continue to address both human and animal health. Our research is focused on "platform technologies" – technologies that can be applied across species and diseases – for formulating and delivering vaccines, and on the understanding of pathogenesis and the interaction between the host and the pathogen on the other hand.

With InterVac on the horizon, the development of human vaccines will become an area of

increasing strength at VIDO. While we operate several livestock-specific research programs, numerous projects are already targeting vaccines against important human diseases such as respiratory syncytial

virus infection, pertussis and hepatitis C.

Our research programs are currently aligned in seven theme areas:

- Ⓢ Viral Pathogenesis & Vaccine Development
- Ⓢ Bacterial Vaccine Development
- Ⓢ Emerging Infectious Diseases and Microbial Pathogenesis
- Ⓢ Neonatal Immunization
- Ⓢ Vectored Vaccines
- Ⓢ Immune Modulation and Vaccine Formulation and Delivery
- Ⓢ Pathogenomics

These seven programs are supported by our Clinical Research Group and the Chemistry, Glassware and Media Preparation (GMP) and Genomic Services Group. With the growth of the organization and the increase in staff and research activities, we are grateful to these groups for their continued efforts to ensure that the needs of our researchers are being met.

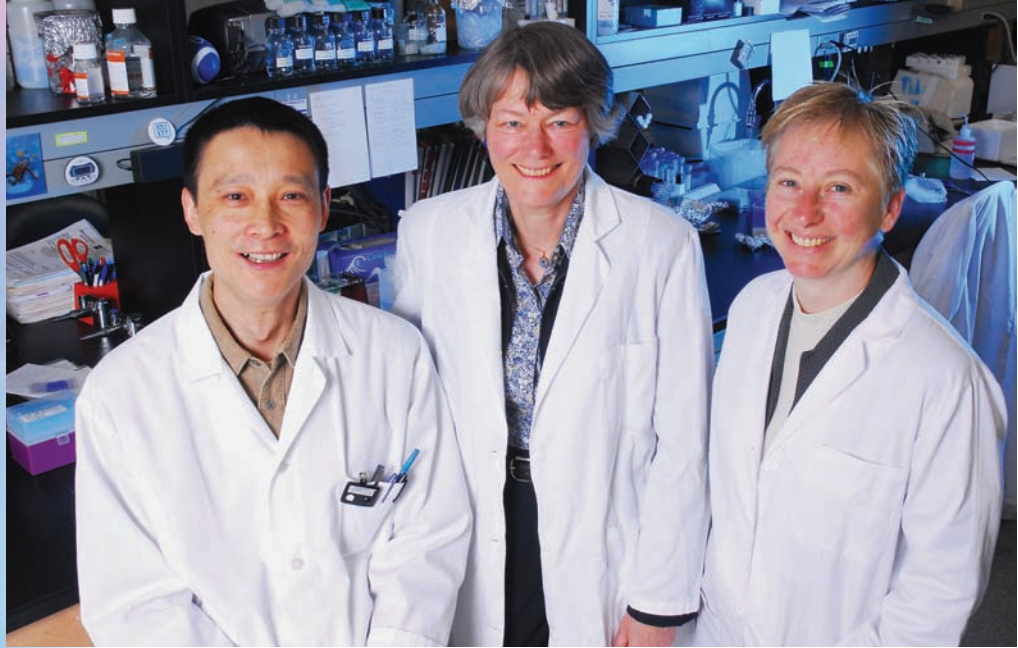
VIDO's research model has always been collaborative and team-oriented. The new University of Saskatchewan School of Public Health and the establishment of faculty cross-appointments between U of S colleges and schools will provide an excellent opportunity to expand these collaborations on a community level with researchers from across campus and the health regions, and also on a national and international level through the increase in collective expertise.

Our collaborations will also grow through the RAPID research initiative (see page 9) led by Dr. Potter. RAPID was recently created to bring together experts from within our province to address important diseases such as West Nile virus, tuberculosis and hepatitis C.

Though many of our scientists already contribute to undergraduate and graduate education, the new Graduate Program in Vaccinology & Immunotherapeutics through the School of Public Health will further enhance our contribution to teaching and the training of young researchers from across the globe in the growing discipline of vaccinology.



Immunization was responsible for one of the greatest accomplishments in public health: the eradication of smallpox in 1977.



VIDO scientists Dr. Qiang Liu (left), Dr. Sylvia van den Hurk, and Dr. Joyce Wilson are working to develop vaccines against hepatitis C.

Research Highlights

Infectious diseases remain the major cause of economic losses both in human and animal health and can have unprecedented social effects. It can be expected that Canadian health care costs will continue to increase dramatically over the next decade due to an ageing population, rising rates of chronic disease, and emerging diseases.

However, additional costs of dealing with potential outbreaks or pandemics highlight the need for a country-wide preparedness program that includes the infrastructure to deal with these diseases.

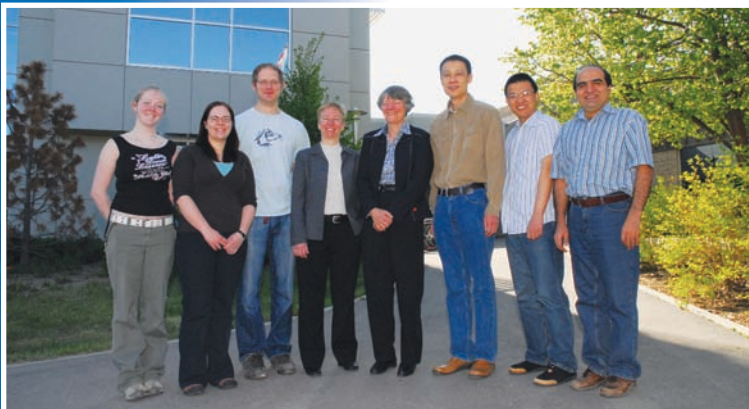
We are very pleased that the construction of InterVac has begun and we are anticipating its opening in 2010. InterVac will provide a unique opportunity for Canadian and international researchers to tackle some of the most important diseases and threats of today including pandemic influenza, tuberculosis, hepatitis C and West Nile virus. As one of the largest facilities of its kind in the world, InterVac will significantly enhance the existing research cluster at the University of Saskatchewan and Innovation Place and will help to recruit the very best to Saskatoon.

Chronic diseases

Hepatitis C

Three researchers at VIDO – Drs. Sylvia van den Hurk, Qiang Liu and Joyce Wilson – are studying hepatitis C from the point of view of novel vaccine development and disease pathogenesis.

The vaccine approach is based on the use of dendritic cells, a fairly new approach that has been shown in animal studies to control the virus. Alternately, Dr. Wilson is examining the use of microRNA, which regulates gene expression, as an alternative approach for treating this important disease.



The hepatitis C research group

Left to right: Ms Patricia McGee, Ms Candice Jackel-Cram, Mr. Adam Huys, Dr. Joyce Wilson, Dr. Sylvia van den Hurk, Dr. Qiang Liu, Dr. Zhonghua Xiang, and Dr. Amir Landi.

Dr. Liu's research is focused on the disease's pathogenesis and in particular, on understanding the molecular mechanisms behind liver steatosis, an abnormal build-up of fat in the liver that is a devastating clinical manifestation of this disease. Dr. Liu's group was able to demonstrate the contribution of viral proteins to the development of abnormal lipid metabolism.

West Nile virus

A disease that recently emerged in North America, West Nile virus has spread across the continent. Interestingly, the prevalence of West Nile infections within the province of Saskatchewan remains above the country's average and continues to represent a serious concern to the people of Saskatchewan.

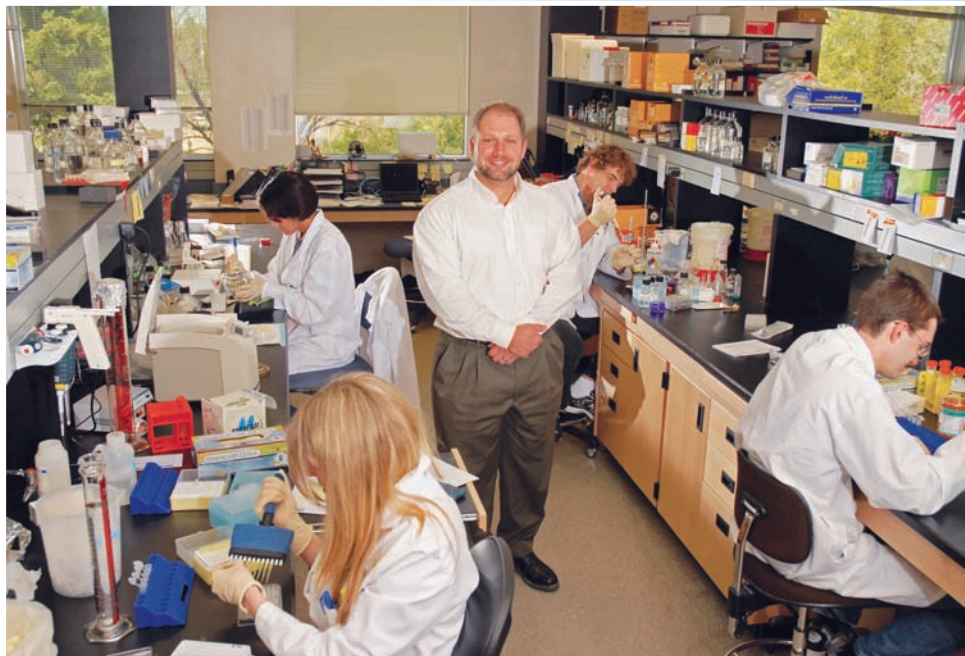
As part of the SHRF-funded team RAPID (see page 9), VIDO researchers and recognized experts from the Saskatchewan Health Region, the University of Saskatchewan departments of Community Health and Epidemiology and Computer Science will work to address the epidemiology of the disease and to investigate the impact of vaccination.

Chronic disease in agriculture

Chronic infectious diseases cause significant losses to the livestock industry. For example,



VIDO scientist Dr. Philip Griebel
(photo courtesy JLBPhotographs)



infections with *Mycobacterium paratuberculosis*, the causative agent of Johne's disease, are responsible for serious losses in the dairy and beef industries. A Canadian study in 2002 found that Johne's disease caused the highest average production loss among five production-limiting diseases (Chi et al. 2002. *Prev Vet Med* 55, 157-53).

VIDO scientist Dr. Scott Napper

VIDO researchers Drs. Potter, Griebel and Napper have established a project to investigate the interactions in the intestine between the *M. paratuberculosis* pathogen and the host. The research is focused on intestinal macrophages, important cells in the immune system that are target cells for the pathogen.

Using a novel "gut-loop" model developed at VIDO, the group is investigating the response of these cells in calves to infection and the ability of immune system modulators to affect this response. In the long term, the knowledge generated will lead to the development of novel intervention strategies to control this devastating disease.



Interestingly, infections with *M. paratuberculosis* have been associated with Crohn's disease in humans and although not definitively confirmed, *M. paratuberculosis* may prove to be an important zoonotic disease.

Zoonotic diseases

Food- and water-borne disease

Most of today's emerging diseases are zoonotic in nature, meaning that they can be transmitted from animals to humans. These diseases have great economic impact on both the livestock industry and human health and as a result the research fields of food safety and water safety are growing rapidly.

VIDO established a program in food safety more than a decade ago and partnered in the development of the first food safety vaccine of its kind against *E. coli* O157:H7. This vaccine is currently being commercialized by an industrial partner and is available for use in Canada.

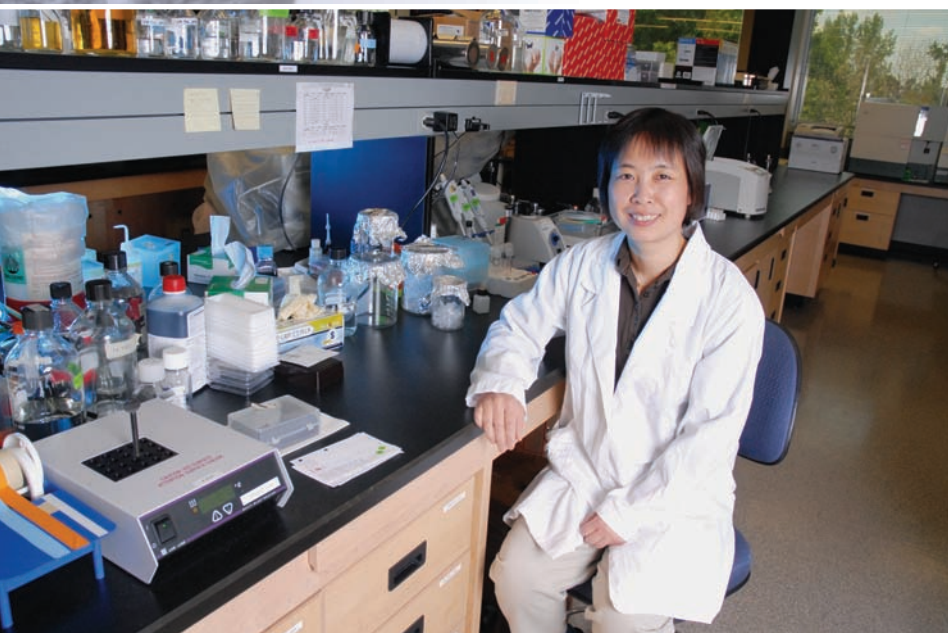
The food safety program has grown into a significant area of focus at VIDO with two NSERC Industrial Research Chair positions: Drs. Potter and Koester are heading projects focused on the development of vaccines against infections with *E. coli*, *Campylobacter* and *Salmonella* species.

Avian influenza

The threat of a potential avian influenza pandemic has inspired vigilance in both the public and the government and efforts to establish a countrywide pandemic preparedness program are currently underway. VIDO's research project on influenza viruses is led by Dr. Yan Zhou and focuses on vaccine development. Cellular events that are essential for efficient virus replication and propagation could be a target for anti-influenza interventions. By genetically changing influenza viruses via reverse genetics technology, Dr. Zhou studies how viral genes and gene products activate cellular signalling pathways and how the pathways regulate virus propagation and pathogenesis. Collaborations have been established with the National Microbiology Laboratory and Canadian Food Inspection Agency in Winnipeg, Man.

Prion diseases

Transmissible spongiform encephalopathies represent another important zoonotic disease. Drs. Napper, Griebel and Potter are currently testing potential vaccine candidates against this important group of pathogens in various animal models. This very novel approach is targeted towards the development of vaccines against BSE ("mad cow" disease), but could also significantly impact diseases such as Chronic Wasting Disease in elk or Alzheimer's in humans.



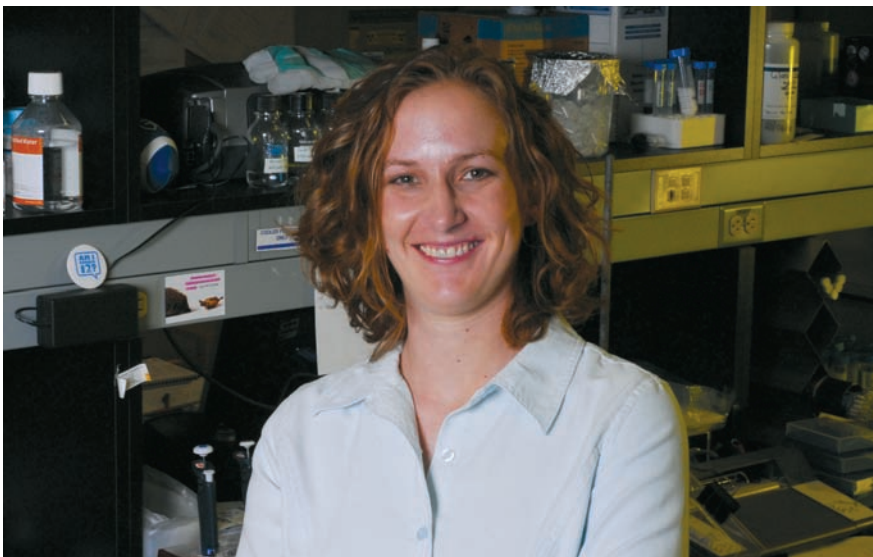
VIDO scientist Dr. Yan Zhou

Vaccine Formulation and Delivery

On the one hand, modern vaccine development requires research on vaccine formulation – the “recipe” for a vaccine to ensure the strongest immune response – and on novel delivery methods on the other, due to the drawbacks of relying on needles to vaccinate.

Such platform technologies are currently being developed in a number of projects at VIDO. Dr. Suresh Tikoo is developing viral “vectors” for vaccine delivery. Live viral

novel vaccine formulations for the neonate, targeting two of the most important diseases of newborns: pertussis (whooping cough), which kills 300,000 children a year in the developing world, and infections with respiratory syncytial virus, a virus that infects up to 65 million young children per year (Drs. Gerdts, van den Hurk respectively).



VIDO scientist Dr. Heather Wilson is a member of the Neonatal Immunization program.

vectored vaccines are created through the identification of areas of the viral genome that can be replaced with genes of interest (representing the disease or diseases to be targeted by the vaccine). Dr. Tikoo’s group uses adenovirus-based vectors that, it is hoped, will lead to vaccines for both human and animal diseases. Such vectors can be delivered through needle-free methods and induce a broad and long-lasting immune response.

Large grants from the Bill & Melinda Gates Foundation and the Krembil Foundation are supporting projects on the development of

Using large animal models, we are able to simulate much more closely the situation in humans and address important problems such as the immaturity of the neonatal immune system, interference with antibodies from the mother, as well as the problems that are associated with vaccinating a genetically diverse population. For both diseases, animal models in livestock species have been developed and novel vaccine candidates have shown great promise in these studies.

By the numbers

- ⦿ Vaccines preventing common childhood diseases cut associated health care costs by almost 300 per cent (BIOTECanada, 2007).
- ⦿ An estimated 4.1 million Americans have been infected with hepatitis C. The Centers for Disease Control and Prevention estimate the number of hepatitis C-related deaths in the U.S. could increase to 38,000 annually by the year 2010, surpassing annual HIV/AIDS deaths.
- ⦿ Whooping cough has been said to be one of the most poorly controlled of the vaccine-treatable diseases, and the majority of deaths occur in children too young for vaccination with existing vaccines (0-1 month). (Bettinger, J. et al (2006, May). Appropriately vaccinated children among hospitalized pertussis cases. Poster session presented at the Vaccine Research Conference, Baltimore, MD).

Adjuvants are compounds added to vaccines that can drastically improve the immune response to the vaccine. Dr. George Mutwiri's research program on immune modulation continues to investigate the use of CpG ODN – specific synthetic DNA sequences that can stimulate immune responses in mammals – as vaccine adjuvants and as stand-alone treatments for human and animal diseases.



VIDO scientist Dr. George Mutwiri



Dr. Jose Perez-Casal is using similar approaches for the development of vaccines against infections with *Mycoplasma bovis*, an extremely important disease of beef cattle. His group recently found that adding adjuvants such as CpG ODN to the vaccine candidate significantly improved immune protection resulting from vaccination. Using similar approaches, Dr. Perez-Casal is also developing vaccines against bovine mastitis.

With the emergence of novel diseases and the threat of pandemics, the development of platform technologies is becoming increasingly important. Next-generation vaccines against such diseases will rely on technologies that can be applied against a variety of pathogens and that lead to the rapid development of long-lasting immunity. VIDO will continue its research efforts to further establish and develop such platforms.

New alliances, sustaining relationships support disease-fighting efforts

Dr. Paul D. Hodgson, PhD, MBA
Associate Director, Business Development

Our most significant milestone this year was an award from the Networks of Centres of Excellence (NCE) to create a Centre of Excellence in Commercialization and Research headquartered at VIDO. The goal of the new centre, PREVENT (see page 8), with \$15 million from the NCE, is to accelerate the progress of vaccine commercialization by carrying vaccine candidates through pre-clinical and early clinical trials.

Although PREVENT is an independent corporation, it will provide VIDO/InterVac a potential avenue to further develop key technologies as well as additional opportunities to strengthen collaborations via contract research arising through PREVENT's partners.

Building a collaborative network

Collaborations in the life sciences industry speed research progress and add significantly to Canada's national capacity to defend humans and animals against infectious disease. As the construction of InterVac proceeds, we are working to develop new alliances with research institutes nationally and internationally. In the past year we have initiated more than 100 agreements with commercial and academic partners.

In a further effort to expand our network, we attended the BIO International Convention in San Diego. One of the world's largest biotechnology conferences, BIO gave us the opportunity to meet with key biotechnology and pharmaceutical companies. We also hosted dignitaries at the Saskatchewan

exhibit, most notably the federal Minister of Health, the Hon. Tony Clement. The convention allowed us to underline the importance of vaccine research to managing infectious disease, as well as the competitive advantage VIDO/InterVac can offer its partners and collaborators.



Producer relations

Producers are our best source of information on the needs and concerns of the livestock industry, and strong relationships with this industry are particularly important given the link between emerging human diseases and animals. As a non-profit organization, we must secure the majority of our funding and producer dollars are often leveraged two to three times. We also gratefully acknowledge the support we receive in the form of advocacy from the producer communities in recognition of VIDO's efforts.

The VIDO Swine Technical Group and the VIDO Beef Technical Group have developed several resources for the livestock community over the past year, including expanding the web-based information resources Beef InfoNet and Swine Disease Net, while new resources available for download include a report covering the advantages and disadvantages of large group housing in the swine industry and a Q&A on the impact of ethanol and bio-

fuel production on the beef industry. Several of our technical groups' presentations at industry conferences (e.g., the Banff Pork Seminar) are also available in full on our Web site.

The challenges being faced by both the beef and pork industries continue to be a priority our technical groups strive to address. We will continue to ensure that the groups play a role in enhancing producers' competitiveness by addressing specific challenges faced by these industries.

Keeping in touch

We continue our commitment to communicating our activities to our stakeholders and the public through press releases apprising of major funding successes, research advances, staff changes, producer resources,

organization news, and of the availability of our experts to contribute to national dialogues on infectious disease issues. Our Web site was redesigned in July 2004 and has gone from approximately 2,100 visits per month then to an average of 20,000 today.

We continue to build relationships through the development of new communications resources ranging from materials for distribution at conferences, to making use of strategic advertising opportunities, some of which have generated follow-up contacts from our audiences. VIDO also provides tours for groups including government delegations, media, academics and members of the agriculture industry.

We look forward to facing the challenges and developments of the coming year.



Valued partners support evolution to meet new challenges

Ms Carol Martel, CMA
Chief Financial Officer

As this year's report describes, the nature of the challenges we seek to address ensures that nothing at VIDO ever stands still.

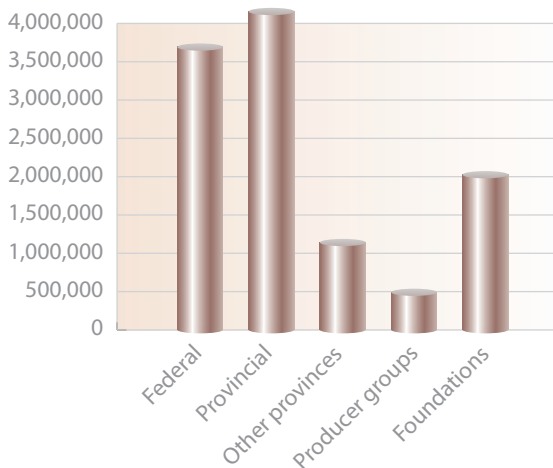
Operating as a non-profit organization owned by the University of Saskatchewan, VIDO continues to become more dynamic as it works to secure the means to build the infrastructure and relationships that will maintain and extend its activities into the future. Collaborations with research facilities at other Canadian universities, federal laboratories, pharmaceutical companies and research facilities in other countries have allowed us to expand scarce research dollars.

With the support of our partners and the University of Saskatchewan, which provides

infrastructure services, financial and administrative functions, our budget expenditure this year was \$12.8 million which allowed us to expand our projects, provide training spaces for students and post-doctoral fellows, and ensure that we operate our research programs at a level of excellence on par with R&D leaders around the world. Specifically, VIDO provided \$7.8 million to personnel this year and \$3.1 million on materials and equipment. This is a significant contribution to the research sector of our provincial economy.



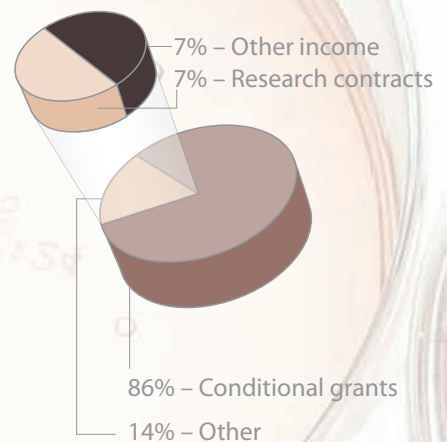
Conditional Grants



Federal	\$ 3,694,709
Provincial	4,268,123
Other provinces	1,140,885
Producer Groups	490,719
Foundations	2,026,530
Total	\$11,620,966

The diversity of our supporters (see back cover) – which include federal and provincial governments, livestock industry councils and agencies, foundations, and the pharmaceutical industry – is a testament to the broad conviction that VIDO/InterVac holds great promise in the developed world's contribution to helping manage infectious disease.

2008 Sources of Revenue



University Of Saskatchewan
Vaccine & Infectious Disease Organization (VIDO)

Statement Of Income

For The Year Ended April 30, 2008

(Comparative Figures For The Year Ended April 30, 2007)

	April 2008	April 2007
INCOME		
Donations and unconditional grants	\$ 286,955	\$ 282,609
Conditional grants	11,620,966	11,356,098
Contract research	983,693	377,681
Royalties and Licensing Fees	291,816	328,206
Investment income	330,488	247,664
Miscellaneous revenue	3,356	7,535
	13,517,274	12,599,793
EXPENDITURE		
Salaries and benefits	7,865,691	7,584,218
Materials and supplies	2,569,959	1,843,779
Equipment repair and service agreements	242,097	272,298
Sub-contract research	330,271	479,952
Travel and recruiting	276,267	264,119
Patents and legal fees	123,165	497,452
Amortization	1,431,335	1,464,676
Other expenditures	51,057	16,010
	12,889,842	12,422,504
EXCESS OF INCOME OVER EXPENDITURE	\$ 627,432	\$ 177,289

Unaudited

Visit us on the web

Follow VIDO and InterVac news by signing up to our RSS feed or joining our mailing list. Browse our research projects, watch InterVac construction progress on the web cam, find fact sheets, watch videos and listen to audio interviews.

All at www.vido.org.





Vaccine and Infectious Disease Organization

Contributors:

Agriculture and Agri-Food Canada
Agriculture Council of Saskatchewan Inc.
Agriculture and Food Council of Alberta
Alberta Agricultural Research Institute
Alberta Beef Producers
Alberta Chicken Producers
Alberta Egg Producers
Alberta Livestock Industry Development Fund
Alberta Milk
Apogee Technology, Inc.
Argos Therapeutics, Inc.
Avaxia Biologics Inc.
B.C. Cattlemen's Association
B.C. Pork Producers Association
Beef Cattle Industry Development Fund
Beef Cattle Research Council
Bill & Melinda Gates Foundation
Bioniche Life Sciences, Inc.
Boehringer Ingelheim Vetmedica Inc.
Canadian Bovine Mastitis Research Network
Canadian Institutes of Health Research
Canadian Liver Foundation
Canadian Poultry Research Council
Cattle Industry Development Council
CHU Sainte-Justine Research Center
Coley Pharmaceutical Group, Inc.
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Genome Prairie
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and Technology
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Government of Saskatchewan – Department of Advanced
Education, Employment and Labour
Government of Saskatchewan – Department of Agriculture and Food
The Heather Ryan and L. David Dubé Veterinary Health and Research Fund
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National Canadian Research Training Program in Hepatitis C
National Pork Board
Natural Sciences & Engineering Research Council of Canada
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Ontario Cattlemen's Association
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Poultry Industry Council
Prevtec Microbia Inc.
PrioNet Canada
Province of Manitoba
Saponin, Inc.
Saskatchewan Cattle Marketing Deductions Fund
Saskatchewan Chicken Industry Development Fund
Saskatchewan Health Research Foundation
Saskatchewan Horned Cattle Trust Fund
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University of Alberta
ViRexx Medical Corp.

Vaccine and Infectious Disease Organization

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