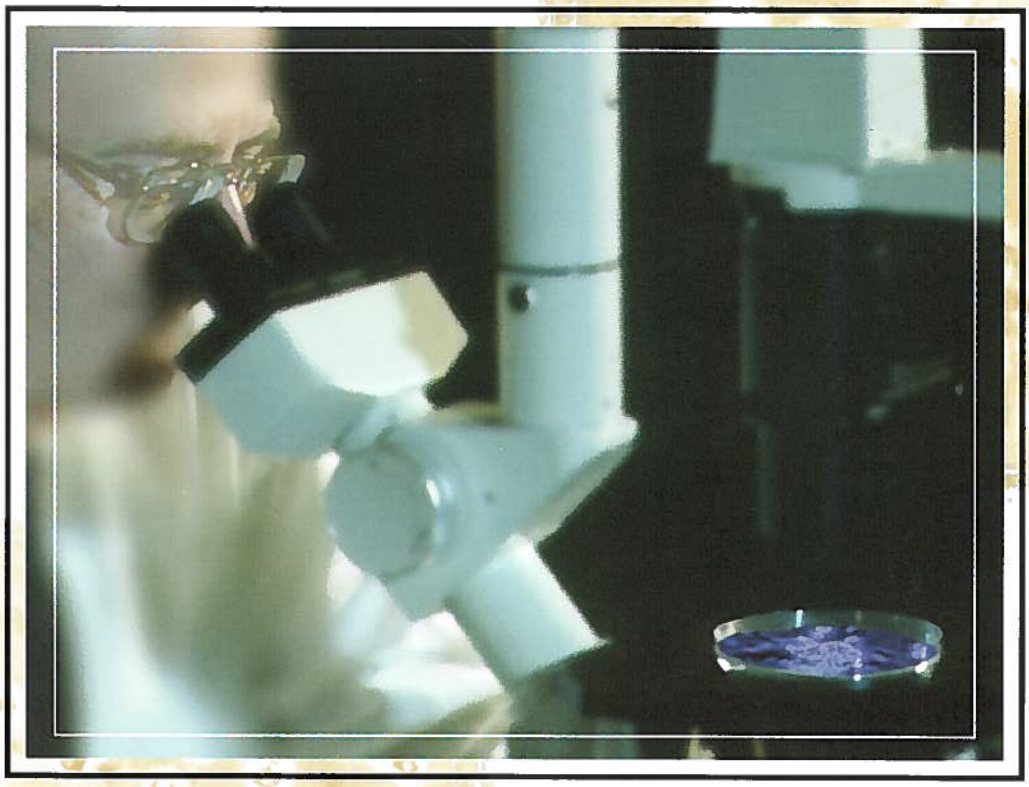

VIDO

1995/96 ANNUAL REPORT

VIDO'S MANDATE

TO SERVE THE CANADIAN LIVESTOCK AND POULTRY INDUSTRY BY:

Conducting animal health related research

Communicating livestock management techniques and information

Facilitating the transfer of technology for international commercial development

GOALS OF VIDO

- To serve and assist the economic competitiveness of the livestock industry through research on the common infectious diseases of animals and poultry.

- To provide information leading to safe and effective animal health preventive medicine programs which enhance animal care through improved management and performance of livestock.

- To identify opportunities to utilize VIDO's livestock research to improve human and companion animal health.

- To maximize funding by enhanced visibility and development of innovative communication programs with all organizations that provide support to VIDO.

- To transfer technology to the biological industry to enhance its commercial application for the benefit of the Canadian livestock producers and to provide financial stability to VIDO.

- To manage its financial, educational, and human resource efforts to ensure long-term benefits to the organization's stakeholders.

BOARD OF DIRECTORS

Left to Right
Back Row: Dennis Billo, Dale Armstrong, Peter Rempel, Lorne Hepworth, Alex Livingston and Fred Van Ingen
Front Row: Dennis Johnson, Lorne Babiuk, Bob Hunsberger, Deborah Whale and Ian Thompson

VIDO

1995/96 ANNUAL REPORT

CHAIR'S REPORT

Ed Moss
Chair

Deborah Whale
Vice-Chair

If 1995 was a year of transition for VIDO, 1996 would have to be classified as a year of stability, growth and optimism. As early as January I could sense a growing confidence amongst the staff that VIDO had turned the corner and the future looked promising. As the year progressed this confidence was realized in every area of the organization.

Stability in staffing was achieved early in the year when it became apparent that the success rate in the grant applications was very high and there were a number of new inquiries for contract research. In fact, as the year progressed there were indications that staffing would need to be increased in some areas to meet the demand. This has generated optimism and a productive environment that has helped move many of the current projects close to completion.

Stability was also achieved in the financial side with the restoration of the balance in the trust fund plus enough left over to direct a small but encouraging amount to the capital account to replace aging equipment. State of the art equipment is essential for VIDO to achieve its goals.

VIDO's reputation for world class science and the understanding in the research community that VIDO is open for business has led to a considerable increase in requests to do contract and collaborative research. The growth in this area has been very encouraging and has led to a number of alliances that will ensure stability and growth for some time. The concept of collaborative research that brings together a number of sources of expertise to complete a complex project allows for increases in efficiencies and the utilization of so called platform technology. Because VIDO has developed a broad base of technical ability in infectious diseases it is well positioned to apply this platform technology to many projects.

As the pharmaceutical giants merge and restructure, the need for new vaccines can not be overstated. We in the cattle feeding industry have been reminded of this in dramatic fashion this winter by *Haemophilus somnus*. The available vaccines for this leading cause of feedlot disease losses have become almost useless. Research organizations that can produce results in these areas will be in increasing demand and VIDO is currently being offered the opportunity to prove itself with a number of these industrial partners.

It is difficult not be to optimistic about VIDO's future given its past performance, its solid core of scientists and technicians, its respected management personnel and its world class facility. So as I terminate my tenure with VIDO's Board of Directors I do so with confidence that the organization has the people and the strategy for success.

DIRECTOR'S REPORT

Lorne Babiuk
Director

The past year has seen continued progress at VIDO in solidifying its vision and strategic plan. VIDO views its strategic plan as a dynamic document, which helps guide the organization, but does not shackle it in such a way as to prevent the organization from responding to new opportunities. This strategy has helped VIDO to maintain an international reputation in animal health and has allowed us to initiate collaborations with the major multi-nationals in the animal health industry. This approach has positioned us for significant progress in growth as we approach the third millennium. The collaborations with multi-national companies will not only provide VIDO with funds to help maintain its global leadership in animal health research; such partnerships also help identify the industry's greatest need and provide a rapid outlet for products developed at VIDO. The expense of developing a novel vaccine, exceeding $10M and taking approximately 10 years to develop and market, makes it mandatory for organizations like VIDO to establish strong links with all stakeholders to ensure the most efficient use of resources.

VIDO continues to work primarily on the development of safer and more effective vaccines for the livestock and poultry industry. We are firm believers that preventing infections will dramatically increase livestock and poultry productivity and therefore provide a significant return to the primary producers. Furthermore by preventing disease, the quality of the products produced will be improved. Some of the highlights of the research being conducted at VIDO are described in the following report. Preventing disease, rather than treating it once it occurs is much more acceptable from a number of respects. This has been clearly demonstrated daily as we listen to the news about new and emerging infections and increasing resistance to antibiotics. In the last decade alone we have witnessed global scares about Ebola virus, Hantavirus, re-emergence of tuberculosis, and HIV the agent responsible for AIDS in humans, and drug resistant bacteria for which no antibiotics are available. These are just a few examples of the potential threats that infectious agents provide to society. Over the last decade over 30 new or emerging diseases have become of concern. These statistics clearly indicate that infectious diseases continue to be major impediments to economic development, health and animal suffering in both the developed and developing world. It is for these reasons that organizations like VIDO must continue to develop novel approaches to counteract infections before they start. Furthermore, we must not only develop better vaccines, we must encourage society to use these vaccines to prevent infection so that therapy would only be used in very restricted situations.

Canada prides itself with its quality and safety of the food supply. Unfortunately, quality, safety and quantity of food produce by the Canadian livestock industry can be dramatically influenced by infectious diseases. For example *E. coli* infections, which can cause Hamburger Disease, not only risk human lives, but can have a dramatic impact on the acceptability of the products and influence our export markets. Therefore it is critical that research into preventing and diagnosing infections be supported and increased, if we expect global demand for the products to increase, and our producer's ability to meet this increased demand.

This year, as in all previous years out success could not have been achieved without the combined support of many individuals and organizations. These individuals include the staff of VIDO, who have devoted much more time to the organization that would be normally expected. This is a reflection of them identifying with VIDO and its mission and in recognizing it as "their" Organization. Ownership, team work and pride in an organization is a type of culture that can make what appears impossible very easy to achieve. However, the staff could not achieve this without the support of "other teams" outside VIDO. These include the producers which provide funds for research through various check-off programs, provide animals and facilities for our research, moral support with granting agencies and government organizations that support VIDO. We also value the ideas many of you have provided the Organization during this past year. We welcome these constructive criticisms, since they make VIDO more responsive to our constituency, and indicate that you care. Your financial contributions are especially critical as many granting agencies and governments are under extreme financial pressures to balance budgets. As an organization we firmly believe in the philosophy that "knowledge is the currency of our future". Without funds to support the research and expansion of knowledge at organizations, such as VIDO, Canada faces the risk that when a major epidemic occurs there will not be the infrastructure in place to be able to address it effectively. This in the long run will be much more expensive than investing in research today.

I would also like to acknowledge the VIDO Board of Directors, a group of dedicated individuals representing various livestock and poultry groups, the agribusiness community, governments and the University of Saskatchewan who have provided continued insight and guidance through this year. Their expertise has been instrumental in helping VIDO solidify both its financial and management activities. Their insight has been extremely valuable in helping VIDO respond to the rapidly changing environment in animal health we experience today.

RESEARCH REPORT

Dr. Andrew Potter
Associate Director of Science

Introduction

Tools for the control of infectious diseases, including vaccines and therapeutic agents, have been used for over a century and were made possible by pioneering studies in the field of vaccinology as well as the discovery of antibiotics. This has led to a reduction in losses due to infectious diseases and has had several social benefits. The success of vaccination as a control measure is highlighted by the eradication of smallpox, a task which would not have been possible without effective vaccines. However, the use of these agents has also led to a sense of complacency and a belief that a *"magic bullet"* is available for the control of most infections. As we have seen in both human and animal medicine, there are new emerging diseases (e.g. HIV, equine morbillivirus), the re-emergence of diseases which we thought were controlled (tuberculosis, streptococcal infection) and changes in the type of disease caused by known pathogens (*Haemophilus somnus*). In part, our reliance of antibiotics and anti-parasitic compounds has led to the emergence of bacteria and parasites which are no longer susceptible to treatment. Indeed, our arsenal of useful antibiotics is decreasing with time at a rate faster than new compounds can be developed to take their place. This highlights the need to design effective management practices and control measures which will be effective in the future to ensure that producers remain competitive and that animal suffering is reduced.

VIDO is addressing these issues in several different ways, including the development of new vaccines for the prevention of diseases, diagnostics for the detection of infected animals and new technologies for vaccination. Vaccines for *Streptococcus suis* infection in swine, bovine mastitis, *E. coli* infection in poultry and bovine respiratory disease agents are under development and improved vaccines for *Haemophilus somnus* and *Pasteurella haemolytica* are nearing completion. We are also actively studying new emerging diseases affecting the Canadian livestock producers.

Traditional vaccines have been injectable products which can cause decreases in carcass quality through reactions at injection sites. Also, vaccines delivered this way do not stimulate immunity at the site of infection, where it is needed the most. Thus, a major part of our research program involves the development of new vaccination technologies which will ultimately lead to safer more effective products which will be easier for the producer to administer. Examples of this work include projects on mucosal immunity, vaccine formulations which can be delivered intranasally and transdermally, live vectored vaccines and nucleic acid immunization. We believe that this research will ultimately lead to greater economic gains for the producer as well as the production of safe, high quality food.

The following pages highlight four of VIDO's twelve ongoing research projects dealing with the above issues.

Liposome Delivery of Vaccines

Vaccines are an effective way to use natural defense mechanisms to prevent disease. VIDO is developing vaccines that can induce protective immunity at vulnerable body surfaces and that can be delivered without affecting meat quality. By stimulating the immune system with protein(s) from a disease-causing agent, vaccines protect the animal from subsequent exposure to a disease. It is important that these vaccine proteins induce the type of immune response that can either prevent infection or assist animals in destroying disease-causing agents after infection occurs.

The majority of disease-causing agents invade the body through either the respiratory or digestive systems (mucosal surfaces) of animals. The best immune protection of these body surfaces is induced by vaccines that are delivered directly to the mucosal surface. However, most commercial vaccines are injected into the muscle or under the skin. These vaccines are poor inducers of immune protection at mucosal surfaces and injection site reactions have adverse effects on meat quality. VIDO is developing new vaccine delivery systems which will induce strong immunological protection of mucosal surfaces and which will not affect meat quality.

Liposome incorporation of vaccine antigens is one delivery system being investigated. Liposomes are microscopic spheres made of lipids that are very similar to the components of normal cell membranes. Vaccine proteins have been incorporated into liposomes and these liposomes were sprayed up the nose or injected into the muscle of mice and cattle. Strong immune responses in the lungs were observed only when animals were immunized in the nose. This confirmed the importance of vaccine delivery to the mucosal surface. Cytokines, molecules which regulate the immune response, have also been incorporated into liposomes. The cytokines enhanced immune responses to a vaccine protein. Thus, liposome incorporation of vaccine proteins and cytokines is a safe and effective delivery system for inducing protective immunity in the respiratory system. We have also demonstrated the utility of this technology by reformulating an ineffective vaccine with liposomes, which resulted in an effective product.

(Left to Right) Back Row: Philip Griebel, Jane Fitzpatrick, Gillian Merrifield, Sani Suradhat
Second Row: Sylvia van den Hurk, Marlene Snider
Front Row: Jeff Lewis, Maria Baca-Estrada

Mastitis Research

Infectious diseases – particularly mastitis, enzootic pneumonia and calf scours – are important to dairy producers. Mastitis remains the most costly disease affecting dairy producers' economic health. Accurate estimates are difficult to determine; however in the United States decreased milk production, discarded milk, early culling, drug costs, veterinary fees and increased labor cost about $200 per cow.

Dairy producers are aware of the need to produce, and to be seen to produce, a quality product since consumers are demanding foods of the highest quality. There are many choices available to North American consumers which results in strong competition at the food market. Disease control can have more impact than disease treatment for maintenance of product quality and market share.

The disease control issue is particularly important because the Canadian industry is in the enviable position of having a population of high-producing dairy cows. These animals are profitable when they are in top health, but production is susceptible to significant economic loss when health declines.

(Left to Right) Back Row: Steve Korol, Andy Potter, Philip Willson, Alex Bolton
Second Row: Sam Attah-Poku, Nina Petchpud, Ron MacLachlan
Front Row: Trent Watts

In order to remain competitive, however; dairy producers strive to reduce the inefficiency of production loss from sub-clinical mastitis. Treatment is expensive and vaccination would be a desirable way to control profit-robbing, sub-clinical mastitis.

One of the major targets of the VIDO mastitis research program is to develop a vaccine which will control *Streptococcus uberis*. Although the pathogenesis of *S. uberis* mastitis is not completely understood, we believe that hemolytic factors and signal molecules are important. Vaccine trials with these experimental vaccines containing these components have shown some reduction in mastitis. We are currently developing reagents which are necessary in order to produce another protective component of *S. uberis* to augment the protective capacity of the vaccine.

Control of *Streptococcus dysgalactiae* infection is a second focus of the research.

The mechanism by which *S. dysgalactiae* causes mastitis is also not completely known. Our targets for control of this organism are the molecules used for attachment and iron acquisition. We have developed reagents and test systems to identify the responsible *S. dysgalactiae* genes and to proceed with vaccine development and are currently isolating the genes in order to produce the large quantities of material needed for vaccine testing.

In summary, we have developed an experimental vaccine for *S. uberis* which has been shown in one trial to lead to significantly reduced udder inflammation. We have also developed test systems that will lead to identification of additional vaccine components that may lead to an improved vaccine to control streptococcal mastitis.

(Left to Right) Back Row: Barry Carroll, Wayne Connor
Front Row: Philip Willson, Sam Attah-Poku, Sandra Klashinsky

Swine Research

The primary objective of the swine research program at VIDO is to understand pathogenesis and develop a vaccine to control *Streptococcus suis* disease losses. *Streptococcus suis* infection can lie dormant and cause problems when immunity is reduced. Our studies have shown that 84 to 93% of swine herds in western Canada have *S. suis* present in some of their pigs. Pathogenesis and epidemiology studies have shown that infection is common and that there is considerable variability in virulence among strains of the bacteria.

Vaccine development progress has demonstrated the potential of vaccination of sows with an experimental extract vaccine which reduced piglet mortality from 17% in litters from control sows to 9% in litters from vaccinated sows. Although this proves the concept of vaccination, this experimental vaccine was expensive to make and did not provide protection against other strains of *S. suis* bacteria, a major limitation of a vaccine for general use. Therefore, we have produced recombinant vaccine components which should offer broader protection. Preliminary trials with these antigens from *S. suis* shows potential to protect vaccinated piglets from experimental *S. suis* challenge.

We have also begun to investigate a newly described swine disease (Post-weaning Multisystemic Wasting Syndrome), possibly associated with a virus infection. This work on pathogenesis and molecular biology is being done in collaboration with the WCVM (primarily Dr. Ted Clark) and researchers at Stormont, Northern Ireland. Veterinary practitioners (Drs. Harding and Strokappe) brought this disease problem to our attention because some herds have lost 10% or more of their weaned piglets to this disease syndrome. Our major thrust at this time is to confirm that this is caused by some infectious disease and develop a model of this disease in pigs.

The VIDO Swine Technical Group has continued with transfer of technology. VIDO's success depends on ultimate transfer and use of innovative technology as well as recognition of VIDO's accomplishments among swine producers. This year the Swine Technical Group published the fifth in a series of bulletins, "Dry Sow Barn Design and Management". The set of 5 bulletins has been distributed on a cost recovery basis throughout Canada. This new bulletin, which contains information generated through research mini-projects, was launched by presentations this year at producer meetings in Ontario, Manitoba, Saskatchewan and British Columbia. Several corporate sponsors assisted in cost recovery for this activity. The group has also published and distributed the second annual "Biosecurity" calendar, with sponsorship by Elanco Animal Health. This is designed as a management and educational tool to help maintain health in swine herds.

In summary, the swine research effort at VIDO this year has been varied and rewarding. *Streptococcus suis* vaccine development is progressing smoothly, PMWS investigation is beginning on the ground floor, and producer response to the Tech Group activities was enthusiastic.

Prevention of Diseases of Poultry Caused by *E. Coli*

(Left to Right) Back Row: Neil Rawlyk, Tracy Prysliak, Stacy Stocki, Brenda Allen
Front Row: Norleen Caddy, Chengru Zhu

Escherichia coli is a significant bacterial pathogen in the poultry industry in Canada and elsewhere in the world. Infections caused by *E. coli* are the leading cause of economic loss from disease in the poultry industry. Condemnation figures published by Agriculture and Agri-Food Canada in 1995 indicate that *E. coli*-related condemnations of poultry constitute 35% to 40% of the total disease-related condemnations. Additional losses occur due to mortality prior to the time of slaughter and due to failure of the birds to thrive subsequent to an *E. coli* infection.

E. coli infection of poultry may take several forms including respiratory colibacillosis and cellulitis. It is not a primary pathogen and usually the host must be compromised by prior infection with another infectious agent or by environmental stress before infection occurs. Control and prevention of diseases caused by *E. coli* require good management practices and vaccination will provide another tool for the producers to use in their control strategies.

We have shown that oral vaccination using live *E. coli* is an effective method of preventing respiratory colibacillosis in turkeys. For a live vaccine to be acceptable to the poultry producers and to comply with government regulations, the bacteria must be genetically altered (mutated) to reduce the ability of the organism to cause disease. We are in the process of developing candidate vaccine strains of *E. coli* containing two independent mutations that contribute to the loss of virulence. Our immediate objective is to develop an effective oral vaccine for the prevention of *E. coli* infection in poultry. In the longer term, this vaccine will be adapted to express antigens from other poultry pathogens in order to produce multivalent vaccines.

Cellulitis, in particular, has been increasing in importance as a cause of loss to the broiler industry over the last ten years. We have determined that the *E. coli* responsible for this disease share many characteristics with those that cause respiratory colibacillosis. We have initiated experiments to assess the effectiveness of vaccination in the prevention of cellulitis.

In conjunction with modified management strategies, we believe that vaccination using a live attenuated vaccine will be effective in reducing economic losses due to diseases caused by *E. coli* in the poultry industry.

MARKETING REPORT

Dr. Ron Clarke
Associate Director of
Marketing and
Administration

Joyce Sander
Manager
Human Resources

Someone once said: "In a successful world the work is never done," and in one short sentence described vaccine research.

Each step in VIDO's successful pursuit of innovative ways to prevent disease through vaccination leads to new and unexplored frontiers of biological research. The battle against common infectious diseases and the negative impact they have on food animal production is relentless.

Infectious disease research began, albeit in a very rudimentary fashion, very soon after humans domesticated their first animal. Although research into treatment and prevention of infectious disease and the tools it provides have grown in sophistication, disease remains the single biggest barrier to further development of the food animal industry. Future progress will depend on our ability to effectively prevent disease within modern management systems while satisfying needed standards of animal care, environmental stewardship and food safety. Success will rest with this industry's ability to put science to work on real problems in search of better solutions that will ultimately be adopted and applied. In effect, success relies on organizations like VIDO maintaining its place on the frontier of vaccine development while ensuring commercialization of the technology it generates.

Crucial to this effort is agriculture's financial support of research.

The fuel that drives the research engine is money. The job of securing funds on a year to year basis is a relentless process, one dependent on many people working in teams applying for grants, working with governments and universities at many levels, frequent communication with dozens of commodity groups across Canada and contacts with the biopharmaceutical industry. It is a world replete with special communication needs and one characterized by an increasing level of competition for shrinking pools of research funds. The work required in seeking funding with many agencies on an annual basis and keeping all stakeholders informed of research progress consumes significant resources - perhaps 15-20% of VIDO's resources are committed to this cause.

VIDO's future under the mandate it has been issued - finding solutions to predominant and evolving disease problems facing the food animal industry - remains promising. Basic research is a long-term undertaking and one VIDO approaches with commitment and dedication, not only within VIDO, but across an extensive network of people and organizations involved in research.

If an uncertainty exists about VIDO's future, it is coupled with the growing notion amongst commodity groups that infectious disease research may be a fad beyond its time. The truth remains, the impact of infectious disease is growing, not shrinking in importance. The industry must take stock in what infectious disease costs, not only in terms of direct loss which may exceed 20%, but also in the indirect costs associated with food quality and safety concerns attributable to disease and its treatment.

The food animal industry has stated on many occasions their number one challenge is reassuring consumers the product they buy is safe. Those reassurances are inexplicably linked to the potential of disease transmission through food products, real or perceived, and the effect disturbances in health can have on product quality. Quality and safety have a real significant impact on trade.

Disease prevention must become the norm.

Research into better vaccines and alternate ways of administering them, combined with new diagnostics and improved management systems reach deep into the economics and sustainability of animal agriculture. Through industry partners on all levels, VIDO will remain at the forefront of vaccine research and help secure agriculture's future.

AUDITORS' REPORT

Carol Martel
Manager
Financial Operations

AUDITORS' REPORT

To the Board of Directors of the
Veterinary Infectious Disease Organization (VIDO),
University of Saskatchewan

We have audited the combined balance sheet of the University of Saskatchewan - Veterinary Infectious Disease Organization as at September 30, 1996 and the statements of income, expenditure and fund balance (Research Trust, Capital Trust, and Technology Development Trust) and combined statement of changes in financial position for the year then ended. These financial statements are the responsibility of the Organization's management. Our responsibility is to express an opinion on these financial statements based on our audit.

We conducted our audit in accordance with generally accepted auditing standards. Those standards require that we plan and perform an audit to obtain reasonable assurance whether the financial statements are free of material misstatement. An audit includes examining, on a test basis, evidence supporting the amounts and disclosures in the financial statements. An audit also includes assessing the accounting principles used and significant estimates made by management, as well as evaluating the overall financial statement presentation.

In common with many non-profit organizations, the Organization derives part of its income in the form of donations and certain grants the completeness of which is not susceptible to satisfactory audit verification. Accordingly, our verification of revenues from these sources was limited to the amounts recorded in the records of the Organization and we were not able to determine whether any adjustments might be necessary to donations and grant revenue, excess of income over expenditure, assets and fund balance.

In our opinion, except for the effect of adjustments, if any, which we might have determined to be necessary had we been able to satisfy ourselves concerning the completeness of donations and certain grants referred to in the preceding paragraph, these financial statements present fairly, in all material respects, the financial position of the Organization as at September 30, 1996 and the results of its operations and the changes in its financial position for the year then ended in accordance with generally accepted accounting principles.

Deloitte : Touche

Chartered Accountants

December 13,1996

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Research Trust - Statement of Income, Expenditure and Fund Balance

Year ending September 30, 1996

	1996	1995
INCOME		
Donations and unconditional grants (Schedule 1)		
Livestock industry - beef	**$ 115,350**	$ 80,700
- dairy	**40,000**	50,000
- swine	**129,262**	86,560
- turkey	**-**	25,000
Provincial governments	**18,350**	73,700
Other foundations, companies and individuals	**25**	120,000
	302,987	435,960
Conditional grants (Schedule 2)	**1,790,721**	1,736,302
Contract research		
Department of Western Economic Diversification	**519,197**	393,391
Commercial	**93,177**	(6,019)
Associated Company	**214,012**	183,530
Government of the Province of Saskatchewan	**325,000**	300,000
Department of National Defence	**191,349**	2,500
Contract services	**149,214**	306,305
Royalties 212,368	**73,858**	
Interest	**47,265**	39,815
Animal sales	**23,524**	33,150
University of Saskatchewan	**137,112**	66,113
Miscellaneous Income	**1,220**	-
	4,007,146	3,564,905
EXPENDITURE		
Salaries and fringe benefits	**2,308,929**	2,416,346
Materials and supplies	**541,738**	505,766
Animal services	**103,966**	92,611
Equipment and service agreements	**186,673**	82,756
Travel and recruiting	**127,498**	145,197
Patents and legal fees	**90,832**	11,514
Other expenditures (Note 7)	**187,630**	188,489
	3,547,266	3,442,679
EXCESS OF INCOME OVER EXPENDITURE	**459,880**	122,226
FUND BALANCE, BEGINNING OF YEAR	**951,286**	829,060
	1,411,166	951,286
Transfer to Capital Trust	**112,000**	-
FUND BALANCE, END OF YEAR	**$ 1,299,166**	$ 951,286

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Capital Trust - Statement of Income, Expenditure and Fund Balance

Year ending September 30, 1996

	1996	1995
FUND BALANCE, BEGINNING OF YEAR	**$ 30,000**	$ 30,000
Transfer from Research Trust	**112,000**	-
FUND BALANCE, END OF YEAR	**$ 142,000**	$ 30,000

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Technology Development Trust - Statement of Income, Expenditure and Fund Balance

Year ending September 30, 1996

	1996	1995
FUND BALANCE, BEGINNING OF YEAR	**$ 4,699,876**	$ 4,699,876
Provision for Revaluation of Note Receivable	**(3,054,057)**	-
FUND BALANCE, END OF YEAR	**$ 1,645,819**	$ 4,699,876

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Combined Balance Sheet

September 30, 1996

	1996	1995
ASSETS		
Current Assets		
Cash on hand	**$ 76,746**	$ 201,610
Funds held (claim on cash) - University of Saskatchewan	**619,975**	270,385
Due from University of Saskatchewan - operating fund	**894,959**	941,629
Accounts receivable (Note 3)	**655,218**	469,139
Inventories (Note 4)	**101,200**	67,685
	2,348,098	1,950,448
Note Receivable (Note 5)	**1,645,819**	4,699,876
Capital Assets		
Site and improvements	**146,503**	146,503
Furnishings, fixtures and equipment	**459,752**	459,752
Buildings and facilities	**5,036,996**	5,036,996
	5,643,251	5,643,251
	$ 9,637,168	$ 12,293,575
LIABILITIES		
Current Liabilities		
Accounts payable	**$ 11,100**	$ 10,200
Unearned revenue (Note 6)	**895,832**	958,962
	906,932	969,162
EQUITY		
Capital Assets	**5,643,251**	5,643,251
Research Trust	**1,299,166**	951,286
Capital Trust	**142,000**	30,000
Technology Development Trust	**1,645,819**	4,699,876
	8,730,236	11,324,413
	$ 9,637,168	$ 12,293,575

APPROVED BY THE BOARD: Deborah Whale Director Laura M. Kennedy Trustee

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Combined Statement of Changes in Financial Position

Year ended September 30, 1996

	1996	1995
OPERATING ACTIVITIES		
Working capital from operations		
Research Trust - Excess of income over expenditure	**$ 459,880**	$ 122,226
Technology Development Trust - Provision for revaluation of note receivable	**(3,054,057)**	-
	(2,594,177)	122,226
Changes in non-cash operating working capital		
Due from University of Saskatchewan	**46,670**	62,205
Accounts receivable	**(186,079)**	239,412
Inventories	**(33,515)**	(3,052)
Accounts payable	**900**	1,897
Unearned revenue	**(63,130)**	168,496
Cash used by operating activities	**(2,829,331)**	591,184
INVESTING ACTIVITIES		
Decrease in note receivable	**3,054,057**	-
	3,054,057	-
INCREASE IN CASH	**224,726**	591,184
CASH, BEGINNING OF YEAR	**471,995**	(119,189)
CASH, END OF YEAR	**$ 696,721**	$ 471,995
Cash consists of:		
Cash on hand	**$ 76,746**	$ 201,610
Funds held (claim on cash) - University of Saskatchewan	**619,975**	270,385
	$ 696,721	$ 471,995

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Notes to the Financial Statements

September 30, 1996

1. ESTABLISHING AGREEMENT

The Organization was established by an Agreement dated August 11, 1975 between the Devonian Foundation of Calgary, Alberta, the Province of Alberta, the Province of Saskatchewan and the University of Saskatchewan to conduct research on indigenous infectious diseases of food producing animals.

Effective April 1, 1980 the above Agreement was replaced by a Constitution which provides for a Board of Directors to assume the responsibilities formerly performed by the Board of Advisors and the Governing Committee.

2. SIGNIFICANT ACCOUNTING POLICIES

These financial statements have been prepared in accordance with the following policies:

Fund accounting

Transactions of the Organization are accounted for by fund accounting principles which require classification of resources into funds to reflect the various designated uses. The Research Trust fund consists of those revenues and expenses used in the general operations of the Organization. The Capital Trust fund consists of grants, interest and authorized transfers from the Research Trust for the purpose of acquiring capital assets. Funds are transferred from the Research Trust to operations and to the Capital Trust as approved by the Board of Directors. The Technology Development Trust fund consists of net income generated from Technology Access Agreements and the proceeds will be used for the future development of technology under patent or license. The balance sheet and statement of changes in financial position have been presented on a combined basis reflecting the activities of all funds.

Capital assets

Capital assets are recorded as Capital Trust expenditures when purchased. The same assets are included in the balance sheet as Capital assets offset by the Capital Assets equity account. No depreciation is recorded on the capital assets.

Equipment purchased with Research Trust monies is expensed as purchased, and is not included in the balance sheet as assets.

The Constitution referred to in Note 1 states that all buildings and facilities constructed for the Organization shall be used by it in accordance with the Constitution and upon termination of the Organization, the buildings, facilities and equipment therein shall remain the absolute property of the University of Saskatchewan.

Inventories

Inventories of materials and supplies are valued at the lower of cost and net realizable value. Animal inventory is valued at cost.

Grants and donations

Grants and donations are recognized in these financial statements in the period defined in the terms or conditions of the respective grants or donations.

Grants and donations received without terms or conditions as to the period in which the grant or donation is to be used are recognized in the financial statements when received.

Unearned revenue consists of unexpended funds relating to specific grants and donations and is determined on the percentage of completion basis.

Royalties

Royalties are recognized as they are received or earned.

3. ACCOUNTS RECEIVABLE

	1996	1995
Donations and unconditional grants	$ 86,380	$ 53,200
Conditional grants (Schedule 2)	142,181	47,858
Contract research	358,319	266,029
Contract services	7,463	86,802
Royalties	60,875	15,250
	$ 655,218	$ 469,139

4. INVENTORIES

	1996	1995
Animals	$ **46,833**	$ 3,640
Materials and supplies	**54,367**	64,045
	$ **101,200**	$ 67,685

5. NOTE RECEIVABLE

As of December 15, 1993, the University of Saskatchewan, as represented by VIDO, signed a Debenture/Debt Transfer Agreement with 598707 Saskatchewan Ltd., the trustee of the BIOSTAR Trust. This agreement transfers the debt obligation including related interest as evidenced by the Debenture made between BIOSTAR Inc. and the University of Saskatchewan, effective December 11, 1991, to 598707 Saskatchewan Ltd. Consideration for the transfer was a Promissory Note of $4,699,876 bearing no interest and due on demand. The only asset of the BIOSTAR Trust is shares in BIOSTAR Inc. The book value of those shares at March 31, 1996, based on the audited financial statement of BIOSTAR Inc., is $1,645,819.

Note Receivable consists of the following:

	1996	1995
Note Receivable	$ **4,699,876**	$ 4,699,876
less: Allowance for Revaluation of Note Receivable	**3,054,057**	-
	$ **1,645,819**	$ 4,699,876

6. UNEARNED REVENUE

	1996	1995
Donations and unconditional grants	$ **14,633**	$ 15,085
Conditional grants (Schedule 2)	**756,199**	797,243
University of Saskatchewan	**-**	56,634
Contract research	**125,000**	90,000
	$ **895,832**	$ 958,962

7. OTHER EXPENDITURES

Other expenditures consist of VIDO operating accounts which include repairs and maintenance, equipment rental, annual report and technical bulletins, professional fees and Board expenses.

8. INCOME TAXES

The Organization is not subject to either federal or provincial income taxes.

9. RELATED PARTY TRANSACTIONS

a) VIDO is a research affiliate of the University of Saskatchewan. The University of Saskatchewan maintains, as part of its normal operations, various financial and administrative functions relating to VIDO. The financial statements do not include expenditures for administrative and ancillary services, or in-kind support provided by the University of Saskatchewan.

b) The University of Saskatchewan is the beneficiary of a Trust which owns 36.93% of BIOSTAR Inc. as at March 31, 1996. BIOSTAR Inc. is a research and development company which assists VIDO in the development of its products and technologies. During the year VIDO had the following transactions with BIOSTAR Inc.:

	1996	1995
Income from BIOSTAR Inc. to VIDO		
Contract research	$ **214,012**	$ 177,511
Contract services and leases	**103,776**	247,513
Royalties	**212,368**	73,858
Sponsorship of an industrial research chair at VIDO in conjunction with NSERC	-	72,096
Expenditures made by VIDO on BIOSTAR Inc.'s behalf	**12,002**	37,190

At September 30, 1996 the Organization has a receivable from BIOSTAR Inc. of $96,911 (1995 -$138,618).

c) In 1993, VIDO entered into technology access agreements relating to specific products with BIOSTAR Inc. Income of $4,699,876 generated from these agreements is in the Technology Development Trust fund. Consideration for this transaction was a Note Receivable (Note 5). During the current year an allowance was established to recognize a potential decline in value of this receivable. An allowance of $3,054,057 was established.

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Schedule 1

Schedule of Donations and Unconditional Grants

Year ending September 30, 1996

		1996	1995
LIVESTOCK INDUSTRY			
Beef	Ontario Cattlemen's Association	$ 5,000	$ 5,000
	Saskatchewan Horned Cattle Trust Fund	35,000	-
	Kamloops Stockmen's Association	350	700
	Saskatchewan Cattle Marketing Deductions Fund	75,000	75,000
		115,350	80,700
Dairy	Alberta Milk Producers	25,000	25,000
	Manitoba Milk Producers' Marketing Board	-	25,000
	Dairy Farmers of Ontario	15,000	-
		40,000	50,000
Swine	Ontario Pork Producer's Marketing Board	35,000	-
	Alberta Pork Producers Development Corporation	46,823	38,825
	BC Hog Marketing Commission	2,500	3,153
	Manitoba Pork est.	20,000	20,000
	SPI Marketing Group	24,659	24,308
	Swine Improvement Services Cooperative Ltd.	280	274
		129,262	86,560
Turkey	Canadian Turkey Marketing Agency	-	25,000
PROVINCIAL GOVERNMENTS			
	Alberta	-	55,000
	British Columbia	2,850	3,200
	Manitoba	15,500	15,500
		18,350	73,700
OTHER FOUNDATIONS, COMPANIES AND INDIVIDUALS			
	Individuals	25	-
	Max Bell Foundation	-	120,000
		25	120,000
		$ 302,987	$ 435,960

University of Saskatchewan
Veterinary Infectious Disease Organization (VIDO)

Schedule 2

Schedule of Unconditional Grants and Contracts

Year ending September 30, 1996

	September 30, 1995		1996	September 30, 1996			
	Accounts Receivable	Unearned Revenue	Funds Received	Accounts Receivable	Unearned Revenue	1996 Income	1995 Income
Natural Sciences & Engineering Research Council of Canada (NSERC)							
- Industrial Research Chairs	$ -	$ -	$ -	$ -	$ -	$ -	$ 2,696
- Operating, Strategic and Equipment	-	97,375	358,513	-	88,458	367,430	462,416
- Industry Matching	-	23,600	48,400	-	24,200	47,800	47,200
- President's Award	-	-	-	-	-	-	1,146
BIOSTAR Inc. - NSERC Industrial Research	-	23,600	48,400	-	24,200	47,800	72,097
Canadian Bacterial Diseases Network (CBDN)	-	97,630	243,895	-	114,195	227,330	187,386
Agriculture Canada/NSERC Research Partnership Grants	-	35,418	95,750	-	53,354	77,814	190,782
Medical Research Council	-	110,936	145,415	-	110,936	145,415	210,100
World Health Organization	-	-	56,218	-	-	56,218	56,505
Alberta Agriculture Research Institute (AARI)							
- Matching Grants Program	47,858	116,040	244,218	43,381	54,661	301,120	180,371
- Farming for the Future Program	-	35,214	25,335	-	-	60,549	40,582
Alberta Cattle Commission	-	107,420	124,220	-	71,726	159,913	75,846
Saskatchewan Agriculture Development Fund	-	57,700	97,200	73,800	71,250	157,450	101,300
Saskatchewan Beef Development Board	-	27,008	102,100	-	63,725	65,383	19,292
Beef Industry Development Fund	-	-	25,000	25,000	33,642	16,358	-
Health Services and Research Commission	-	50,962	16,82	-	25,737	42,055	67,538
Saskatchewan Health Research Board Fellowship	-	14,340	23,861	-	20,115	18,086	21,045
	$ 47,858	$ 797,243	$1,655,354	$ 142,181	$ 756,199	$1,790,721	$1,736,302

PATENTS, PUBLICATIONS, PRESENTATIONS, AND RESEARCH COLLABORATORS

Patents Issued on Which VIDO Staff are Inventors

United States Patent No 5,521,072
Title - *Actinobacillus pleuropneumoniae* Transferrin Binding Proteins and Uses Thereof
Date - May 28, 1996
Inventors - Andrew A. Potter, Gerald F. Gerlach, Philip J. Willson, and Amalia Rossi-Compos

United States Patent No 5, 476, 657
Title - *Pasteurella haemolytica* leukotoxin Compositions and Uses Thereof.
Date - December 19, 1995
Inventors - Andrew A. Potter, Steve Acres, Lorne A. Babiuk, and J.P. Lawman

Research Publications in Scientific Journals

Martin, W.T., Zhang, Y., Willson, P.J., Archer, T.P., Kinahan, C., and Barber, E.M. 1966. Bacterial and fungal flora of dust deports in a pig building. Occupational and Environ. Med. 53:484-487.

Gomis, S.M., Godson, D.L., Beskorwayne, T., Wobeser, G.A., and Potter A.A. 1996. Modulation of phagocytic function of bovine mononuclear phagocytes of *Haemophilus somnus*. Microb. Pathog. in press.

Gomis, M.S., Watts, T., Riddell, C., Potter, A.A., and Allan, B.J. 1996. Experimental reproduction of *E. coli* cellulitis and septicemia in broiler chickens. Avian. Dis. in press.

Gomis, M.S., Goodhope, R., Kumor, L. Caddy, N., Riddell, C., Potter, A.A., and Allan, B.J. 1996. Isolation of *Escherichia coli* from cellulitis and other lesions of the same bird in broilers at slaughter. Can. Vet. J. in press.

Sorden, S.D. and Watts, T.C. 1996. Spontaneous Cardiomyopathy and exophthalmos in Cotton Rats (sigmodon hispidus). Vet. Pathol. 33:375-382.

Jiang, M., Babiuk, L.A., and Potter, A.A. 1966. Cloning, Sequencing, and Expression of the CAMP factor gene of *Streptococcus uberis*. Microbial Pathogenesis. 20:297-307

Morsey, M.A., Popowych, Y., Kowalski, J., Gerlach, G., Godson, D., Campos, M., and Babiuk, L.A. 1996. Molecular cloning and expression of bovine interleukin-8. Microbial Pathogenesis. 20:203-212.

Godson, D., Campos, M., Attah-Poku, S., Redmond, M.J., Cordeiro, D.M., Sethi, M.S., Harland, R.J., and Babiuk, L.A. 1996. Serum haptoglobin as an indicator of the acute phase response in bovine respiratory disease. Vet Immunol. Immunopathol. 51:277-292.

Li, Y., van Drunen Littel-van den Hurk, S., Liang, X., and Babiuk, L.A. 1996. Functional analysis of the transmembrane anchor region of bovine herpesvirus 1 glycoprotein gB. Virology. In press

Li, Y., van Drunen Littel-van den Hurk, S., Liang, X., and Babiuk, L.A. 1996. Production and characterization of bovine herpesvirus-1 glycoprotein B ectodomain derivatives in an hsp70A gene promoter-based expression system. Arch. Virol. In press

Li, Y., van Drunen Littel-van den Hurk, S., Liang, X., and Babiuk, L.A. 1996. The cytoplasmic domain of bovine herpesvirus-1 glycoprotein B is important for maintaining conformation and the high-affinity binding site of gB. Virology. 222: 262-268.

Li, Y., van Drunen Littel-van den Hurk, S., Liang, X., and Babiuk, L.A. 1996. Glycoprotein Bb, the N-terminal subunit of bovine herpesvirus-1 gB, can bind to heparin sulfate on the surface of Madin-Darby bovine kidney cells. J. Virol. 70: 2032-2037.

Mittal, S.K., Papp, Z., Tikoo, S.K., Baca-Estada, M., Benko, M., Yoo, D., and Babiuk, L.A. 1996. Induction of systemic and mucosal immune responses in cotton rats immunized with human adenovirus type 5 recombinants expressing the full and truncated forms of bovine herpesvirus type 1 glycoprotein gD. Virol. 222: 299-309.

Ngeleka, M., Kwaga, J.K., White, D.G., Whittam, T.S., Riddell, C., Goodhope, R., Potter, A.A., and Allan, B. *Escherichia coli* cellulitis in broiler chickens: Clonal relationship among strains and analysis of virulence-associated factors of isolates from diseased birds. Infect. Immun. 64: 3118-3126.

Mittal, S.K., Papp, Z., Tikoo, S.K., Baca-Estrada, M., Yoo, D., Benko, M., and Babiuk, L.A. 1996. Induction of systemic and mucosal immune responses in cotton rats immunized with human adenovirus type 5 recombinants expressing the full length and secretory forms of bovine herpes virus type 1 glycoprotein gD. Virology 222: 299-309

van Drunen Littel-van den Hurk, S., Khattar, S.K., Tikoo, S.K., Babiuk, L.A., Baranowski, E., Plainchamp, D., and Thiry, E. 1996. Bovine herpesvirus-1 gH (gII\gp108) and gL form a functional complex which plays a role in penetration, but not in attachment of BHV-1. J. Gen. Virol. 77: 1515-1520.

Khattar, S., van Drunen Littel-van den Hurk, S., Attah-Poku, S., Babiuk, L.A., and Tikoo, S.K. 1996. Identification and characterization of a novel bovine herpesvirus-1 glycoprotein gL which is required for the antigenicity, processing, and transport of bovine herpesvirus glycoprotein gH. Virology 219: 66-76.

Mittal, S.K., Middleton, D., Tikoo, S.K., Prevec, L., Graham, F.L., and Babiuk, L.A. 1966. Pathology and immunogenicity in cotton rats (Sigmodon Hispidus) model following infection with a bovine adenovirus type 3 recombinant virus expressing the firefly luciferase gene. J. Gen. Virol. 77: 1-9.

Khadr, A., Tikoo, S.K., Babiuk, L.A., and van Drunen Littel-van den Hurk, S. 1966. Sequence and expression of a bovine herpesvirus-1 (BHV-1) gene homologous to the glycoprotein K-encoding gene of herpes simplex virus-1 (HSV-1). Gene 168: 189.193.

Baca-Estrada, M., Snider, M., Tikoo, S.K., Harland, R., Babiuk, L.A., and van Drunen Littel-van den Hurk, S. 1996. Immunogenicity of bovine herpesvirus-1 glycoprotein gD in mice. Effect of antigen form on the induction of cellular and humoral immune responses. Viral Immunology 9: 11-22.

Van Donkersgoed, J., McCartney, D., and van Drunen Littel-van den Hurk, S. 1996. Efficacy of an experimental subunit gIV vaccine in beef calves following BHV-1 challenge. Can. J. Vet. Res. 60: 55-58.

Griebel, P.J. and Hein, W.R. 1996. Expanding the role of Peyer's patches in B-cell ontogeny. Immunol. Today 17: 30-38

Griebel, P.J. Kugelberg, B., and Ferrari, G. 1996. Two distinct pathways of B-cell development in Peyer's patches. Develop. Immunol. 4: 263-277.

Griebel, P.J., Ghia, P., Grawander, U., and Ferrari, G. 1996. A novel molecular complex expressed on immature B-cells: a role in T-cell independent B-cell development. Develop. Immunol. 5: 67-78.

Raggo, C., Fitzpatrick, D.R., Babiuk, L.A., and Liang, X. 1996. Expression of bovine interleukin-1(in a bovine herpesvirus-1 vector: *In vitro* analysis. Virol. 221: 78-86.

Brekker-Klassen, M., Yoo., D., and Babiuk, L.A. 1996. Comparisons of the F and HN gene sequences of different strains of bovine parainfluenza virus type-3: Relationship to phenotype and pathogenicity. Canadian Journal of Veterinary Research. 60: 228-236.

McCutcheon, A.R., Roberts, T.E., Ellis, S.M., Hancock, R.E.W, Babiuk, L.A., and Towers, G.H.N. 1996. Antiviral screening of medicinal plants of the British Columbian native peoples. Journal of Ethnopharmacology. 49: 101-110.

Liang, X., Chow, B., Raggo, C., and Babiuk, L.A. 1996. Bovine herpesvirus-1 UL49.5 homolog gene encodes a novel viral envelope protein that forms a disulfide-linked complex with a second virion structural protein. J. Virol. 70: 1448-1454.

Research Presentations, Posters, and Abstracts Presented at Meetings

Gomis, S., Goodhope, B., Kumor, L., Caddy, N., Riddell, C., Potter, A.A., and Allan, B.J. Characteristics of *Escherichia coli* isolated from multiple tissues in broilers condemned for cellulitis. American Association of Avian Pathologists, American Veterinary Medical Association, Louisville, KY. USA. July 20-24, 1996.

Li, Y., van Drunen Littel-van den Hurk, S., Liang, X., and Babiuk, L.A. 1996. Fusogenic domain and membrane anchor of bovine herpesvirus-1 glycoprotein gB. The 21st International Herpesvirus Workshop, July, 1996. DeKalb, IL. (Travel award from National Institutes of Health).

Gomis, S.M., Watts, T., Riddell, C., Potter, A.A., and Allan, B. Experimental reproduction of *E. coli* cellulitis and septicemia in broiler chickens. 7th Biennial UA-UC International Conference on Infectious Diseases 1996.

Onderka, D.K., Hanson, J.A., McMillan, K.R., and Allan, B. Pathological and bacteriological characterization of cellulitis in broilers and its correlation with systemic disease. AAAP/AVMA Annual Meeting 1996.

Gomis, S.M., Goodhope, B., Kumor, L., Caddy, N., Riddell, C., Potter, A.A., and Allan, B. Characterization of *E. coli* isolated from multiple tissues in broilers condemned for cellulitis. AAAP/AVMA Annual Meeting 1996.

Gomis, S.M. and Allan, B. Isolation of *E. coli* from multiple sites in broilers condemned for cellulitis. Sixth Western Meeting of Poultry Clinicians and Pathologists 1995.

Potter, A.A., Schryvers, A.B., Lo, R.Y.C., and Watts, T. 1996. Protective capacity of *Pasteurella haemolytica* transferrin-binding proteins. CBDN Annual Meeting, Kananaskis, AB, May, 1996.

van Drunen Littel-van den Hurk, S., Lewis, P.J., Tikoo, S.K., Baca-Estrada, M.E., Braun, R., and Babiuk, L.A. 1996. Efficacy of polynucleotide immunization against bovine herpesvirus-1 in cattle. Keystone Symposium on Cell Biology of Virus Entry, Replication and Pathogenesis. St. Fe, NW.

Khattar, S., van Drunen Littel-van den Hurk, S., Attah-Poku, S., Babiuk, L.A., and Tikoo, S.K. 1995. Identification and characterization of a novel bovine herpesvirus-1 (BHV-1) glycoprotein gL. 76th Conference of Research Workers in Animal Diseases, Chicago, IL.

Yarosh, O.K., Hughes, H.P.A., and Babiuk, L.A. Effect of Alum and VSA on the humoral and cellular immune response to BHV-1 gD. Canadian Society for Immunology, Lake Louise, AB, March 24-27, 1995.

Lewis, P.J., Babiuk, L.A., Cox, G., van Drunen Littel-van den Hurk, S. 1996. Polynucleotide vaccines in animals: Enhancing and modulating responses. International Meeting on Nucleic Acid Approaches for the Prevention of Infectious Disease. WHO/EC/NIH - US/FDA - US. Bethesda, MD.

Reports and Presentations to the Livestock Industry, External Groups, and Organizations

Willson, P.J. 1996. Expression of *Streptococcus suis* genes in *E. coli*. Department of Microbiology seminar. Saskatoon, SK.

Willson, P.J., 1996. *Streptococcus suis*: Immunity and Vaccine Development. Alberta Pork Producers Development Corporation. Edmonton, AB. April 3, 1996.

Willson, P.J., 1996. *Streptococcus suis*: Immunity and Vaccine Development. SPI Marketing Group. Saskatoon, SK. July 9, 1996.

Potter, A.A. Iron Acquisition by Veterinary Bacterial Pathogens. Dept. of Pathobiology, University of Minnesota Seminar Series. October, 1995.

Clarke, R. Dairy Farmers of Ontario Annual Meeting. Toronto, ON. January, 1996.

Clarke, R. Canadian Pork Council Meeting on "Research Activities and Future Priorities". January, 1996.

Clarke, R. Ontario Veterinary Medical Association Meeting. Ottawa, ON. January, 1996

Clarke, R. Saskatchewan Cattle Feeders Meeting. Saskatoon, SK. January, 1996.

Clarke, R. Saskatchewan Poultry Producers Annual Meeting. Saskatoon, SK. March, 1996.

Clarke, R. Saskatchewan Beef Forum Meeting. Saskatoon, SK. March, 1996.

Clarke, R. Saskatchewan Pork Producers Seminar. Saskatoon, SK. March, 1996.

Clarke, R. Manitoba Pork Producers Annual Meeting. March, 1996.

Clarke, R. Alberta Agriculture Research Institute Research Review on Swine and Equine. Edmonton, AB. March, 1996.

Clarke, R. National Dairy Expo. Saskatoon, SK March, 1996.

Clarke, R. International NSERC Review Panel presentation re: Synchotron Light Source. May, 1996.

Clarke, R. Holy Cross High School Science Fair presentation "What in the World is Biotechnology?" Saskatoon, SK. May, 1996.

Clarke, R. Marketing Swine Biosecurity Calendar through Elanco partnership. May, 1996.

Clarke, R. Alberta Milk Producers Annual Meeting. Edmonton, AB. May, 1996.

Clarke, R. Saskatchewan Stock Grower's Annual Meeting. Swift Current, SK. June, 1996.

Clarke, R. Feedlot Health Management seminar. Calgary, AB. June, 1996.

Clarke, R. Chair of Agriculture Biotechnology International Conference session on animal agriculture. June, 1996.

Clarke, R. Presentation to the Animal Science Beef Symposium for producers on advances on vaccine research. June, 1996.

Clarke, R. Canadian Veterinary Medical Association Annual meeting in Charlottetown, PEI. July, 1996.

Clarke, R. Participate with extension program on "Agriculture in the Classroom" for high school teachers across Saskatchewan dealing with issues on food safety and biotechnology. June, 1996.

Clarke, R. Saskatchewan Stock Growers article "Immunology as a Production Tool". July, 1996.

Clarke, R. Presentations to 12 trade delegations visiting VIDO. July, 1996.

Clarke, R. Canadian Cattlemen's Association Annual Meeting. Dauphin, MB. August, 1996.

Clarke, R. VIDO involvement in FACS billboard display.

Clarke, R. Seminar on Intellectual Property. September, 1996.

Clarke, R. VIDO staff teamwork seminar. September, 1996.

Clarke, R. University of Saskatchewan Animal Research Committee meetings. September, 1996.

Clarke, R. Life Sciences Council "Commercialization of Biotechnology". Ottawa, ON. October, 1996.

Clarke, R. Canadian Western Agribition presentation "Biotechnology". Regina, SK. November, 1996.

Clarke, R. Canadian Cattlemen's Association Industry Workshop on Issues on Opportunities facing the Beef Industry. November, 1996.

Clarke, R. Agriculture Outlook Conference "Issues on the Future of Canadian Agriculture". Saskatoon, SK. December, 1996.

Chapters in Books, Expository, and Review Articles

Hein, W.R. and Griebel, P.J. 1996. Sheep Immunology Methods. Immunology Methods Manual. Ed. Ivan Lefkovits. Academic Press.

Babiuk, L.A. and Rouse, B.T. 1996. Herpesvirus vaccines. Advanced Drug Delivery Reviews. 21: 63-76.

Babiuk, L.A., Lewis, P.J., Suradhat, S., van Drunen Littel-van den Hurk, S., Baca-Estrada, M., Tikoo, S., and Yoo, D. 1996. Polynucleotide Immunization: A novel approach to vaccination. Molecular Approaches to Control of Infectious Diseases: Vaccines 96, Cold Spring Harbor Laboratory Press. Editor: Brown, F., Norrby, E., Burton, D., and Mekalanos, J. pp. 33-38.

Research Collaborators

Dr. O. Abdelmagid - Tuskegee University, Tuskegee, AL
Dr. E. Baranowski - University of Liege, Belgium
Dr. M. Campos - Pfizer Animal Health, Groten, CT
Dr. B. Crosby - Plant Biotechnology Institute, Saskatoon, SK
Dr. D. Deregt - ADRI, Lethbridge, AB
Dr. J. Dillon - University of Ottawa, Ottawa, ON
Dr. B. Duncan - Biologics Evaluation Lab, Agriculture & AgriFood Canada, Nepean, ON
Dr. S. Garzon - University of Montreal, Montreal, QC
Dr. D. Hannant - Animal Health Trust, Newmarket, England
Dr. J. Hanson - Alberta Agriculture, Edmonton, AB
Dr. W.W. Kay - University of Victoria, Victoria, BC
Dr. L. Kumor - Agriculture & Agri-Food Canada, Food Protection & Inspection Branch, Saskatoon, SK
Dr. R. Lo - University of Guelph, Guelph, ON
Dr. C. Lutze-Wallace - Biologics Evaluation Lab, Agriculture & AgriFood Canada, Nepean, ON
Dr. K. McMillan - Lilydale Poultry Co., Edmonton, AB
Dr. D. Onderka - Alberta Agriculture, Edmonton, AB
Dr. J. Richards - National Research Council of Canada, Ottawa, ON
Dr. T. Schryvers - University of Calgary, Calgary, AB
Dr. E. Thiry - University of Liege, Belgium
Dr. P. Tijssen - Institut Armand Frappier, Montreal, QC
Dr. A. van den Broeke - University of Brussels, Belgium
Dr. J.C. Weill - Institut Necker, Paris, France
Dr. D. White - North Dakota State University, Fargo, ND
Dr. L. Willems - Faculty of Agronomy, Gembloux, Belgium
Dr. O. Yarosh - Agriculture & AgriFood Canada, Nepean, ON
Dr. C. Yason - AVC, Charlottetown, PEI

University of Saskatchewan

Dr. M. Chirino-Trejo - University of Saskatchewan, Saskatoon, SK
Dr. C. Riddell - WCVM, Saskatoon, SK
Dr. E.G. Clark - Vet Path, WCVM, Saskatoon, SK
Dr. Dorothy Middleton - Vet Path, WCVM, Saskatoon, SK

Canadian Bacterial Diseases Network Personnel - At Various Centres Throughout Canada

A network of over 50 investigators from seven Canadian universities, a number of industrial companies, and government laboratories interested in bacterial diseases of humans, animals, and fish.

VIDO FINANCIAL SUPPORTERS

The following groups and agencies contributed funds to VIDO over the course of the past fiscal year through donations, grants, or contracts. Their support is acknowledged and greatly appreciated.

Agriculture Canada
Alberta Agriculture Research Institute
Alberta Cattle Commission
Alberta Milk Producers
Alberta Pork Producers Development Corporation
Bayer Corporation
B.C. Hog Marketing Commission
Beef Industry Development Fund
BIOSTAR Inc.
Boehringer Ingelheim (Canada) Ltd.
Canadian Bacterial Diseases Network
Canadian Turkey Marketing Agency
Dairy Farmers of Ontario
Egyptian Cultural & Educational Bureau
Employment & Immigration Canada
Government of Canada - Department of Western Economic Diversification
Government of Canada - Department of National Defense
Health Services Utilization & Research Commission
Kamloops Stockmen's Association
Mallinckrodt Veterinary Inc.
Manitoba Pork est.
Medical Research Council
Miles Inc.
Natural Sciences & Engineering Research Council of Canada
Ontario Cattlemen's Association
Ontario Pork Producer's Marketing Board
Pfizer Animal Health Inc.
Province of Alberta - Alberta Agriculture
Province of British Columbia - Ministry of Agriculture, Fisheries, & Food
Province of Manitoba - Manitoba Agriculture
Saskatchewan Agriculture Development Fund
Saskatchewan Beef Development Board
Saskatchewan Cattle Marketing Deductions Fund
Saskatchewan Health Research Board
Saskatchewan Horned Cattle Trust Fund
Saskatchewan Research Council
SPI Marketing Group
Swine Improvement Services Co-operative Ltd.
World Health Organization