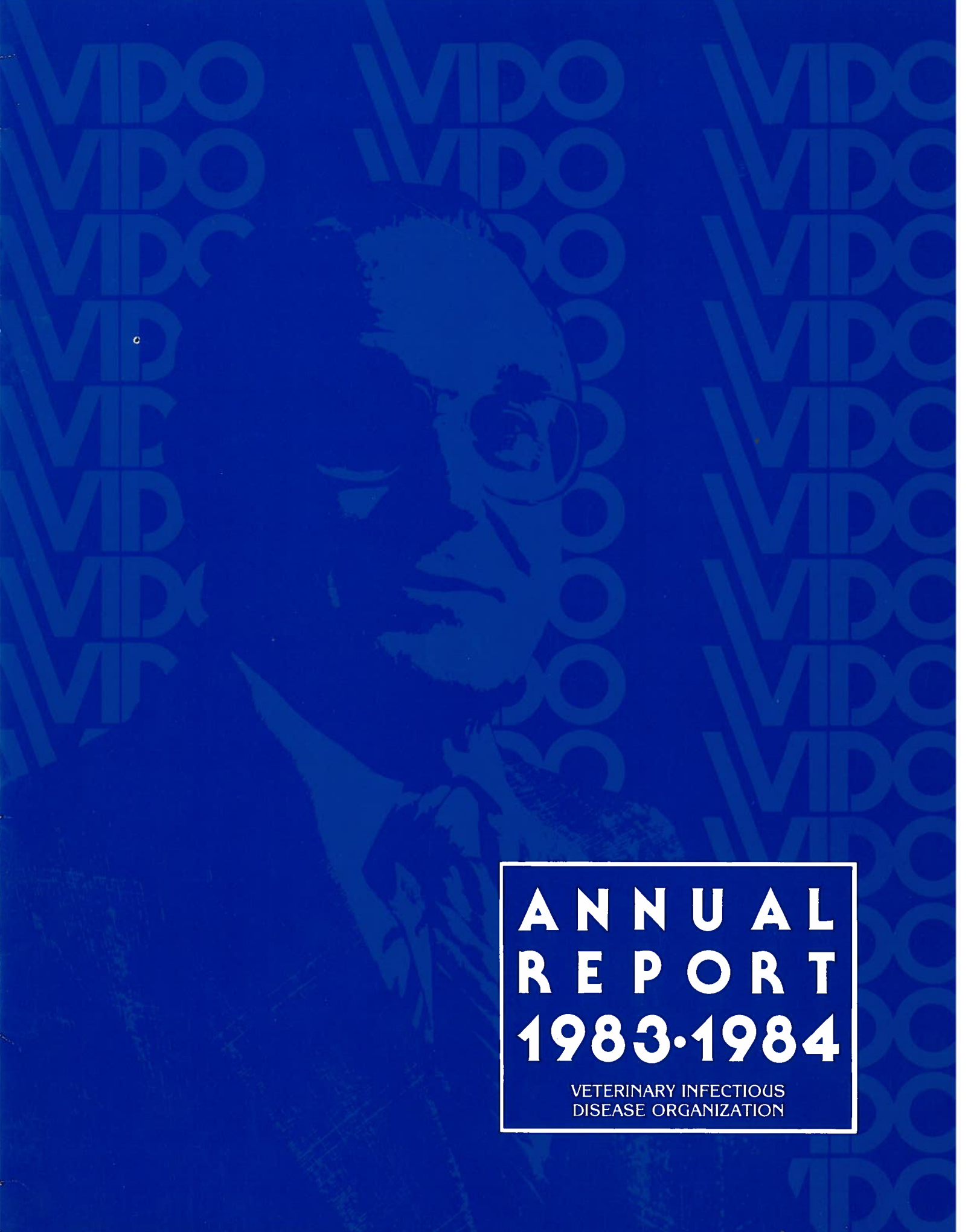

ANNUAL REPORT 1983-1984

VETERINARY INFECTIOUS DISEASE ORGANIZATION

DR. CHRISTOPHER HEDLEY B

"His vision became both a reality and a success."

C.H. Bigland
DVM, DVPH, MSc

Next year the Veterinary Infectious Disease Organization (VIDO) will be celebrating its tenth anniversary.

In the nine years since its inception, VIDO has known th **success** of making major scientific breakthroughs, and the **challenge** of raising funds to support ongoing research.

Throughout the past nine years, the responsibility of dealing with VIDO's challenge has rested with DR. CHRISTOPHER HEDLEY BIGLAND. On June 30, 1984 Dr. Bigland retired as the Director of VIDO. However, the many contributions that he has made, both in creating the Organization and in leading it through its growth and development, will continue to provide benefits in the years to come.

This year, VIDO's Board of Directors and Management would like to formally acknowledge Dr. Bigland's many valuable contributions to VIDO, the veterinary profession, the scientific community and the livestock industry in general. To this end, VIDO's 1983-84 Annual Report is dedicated to the many noteworthy achievements of the Organization's founder and retiring Director.

Dr. Bigland first distinguished himself in 1941 when, at the age of 21, he became the youngest graduate of the Ontario Veterinary College. Following graduation, he returned to his native city of Calgary to enter private veterinary practice with Dr J. Gordon Anderson. Together they operated the first animal clinic built between Winnipeg and Vancouver.

Early in his career, Dr. Bigland saw the need to provide better diagnostic services to the livestock industry of Alberta. He achieved this goal by committing fourteen years of his career to helping establish the Veterinary Diagnostic Laboratory of the Alberta Veterinary Services Branch in Edmonton. During this time, he helped to build that Laboratory into one of the strongest in Canada and to establish it as a model for other provinces.

The veterinary profession in Alberta formally acknowledged its high esteem for Dr. Bigland in 1962, by electing him as an Honorary Life Member of the Alberta Veterinary Medical Association.

Dr. Bigland was also one of the first to recognize the need for a veterinary college in Western Canada. With the support of the Alberta veterinary profession, he led a powerful campaign that culminated in the decision, in 1963, to establish the Western College of Veterinary Medicine in Saskatoon, Saskatchewan. In 1964, he was invited to join the new College as Head of the Department of Veterinary Microbiology, which he proceeded to build into a first-class teaching and research

LAND

department. Dr. Bigland held this position until 1974, when he began to concentrate his efforts on gaining political and financial support for the establishment of VIDO.

VIDO grew out of Dr. Bigland's dream to establish a research laboratory to study the common infectious diseases of food-producing animals and poultry. As early as 1957, he initiated this effort at the Alberta Veterinary Medical Association by sponsoring a resolution calling for the establishment of such a laboratory. His dream became a reality in 1975 when the Devonian Group of Charitable Foundations of Calgary, Alberta, together with the Provinces of Saskatchewan and Alberta, accepted his request for core funds to establish VIDO. Subsequently, the University of Saskatchewan agreed to donate five acres of land and contribute, on a long-term basis, the salary of the Director, building maintenance, payment of utilities and other ancillary services.

In the nine years since its inception, VIDO has grown from a staff of five employees temporarily housed in two trailers situated on the University campus, to a vigorous organization with over 35 employees in a unique 36,000 sq. ft. modern laboratory building and an annual operating budget in excess of $1.6 million. To date, the Organization has received over $11 million in support of its research programs.

Dr. Bigland's dedication and determination have been the driving force behind the successful growth and development of VIDO. Its establishment has significantly increased Canada's research and development base for animal health.

In 1981, Dr. Bigland's extraordinary services to the veterinary profession were formally recognized for a **second** time when the Ontario Veterinary Association presented him with an Award of Merit for his achievements at VIDO.

More recently, notice has been received that Dr. Bigland will be awarded the MacMillan Laureate in Agriculture by the University of Guelph early in 1985. The award is made every five years and recognizes the most significant contribution to Canadian agriculture over the preceding five years. Dr. Bigland's award will cover the period of 1979 to 1984.

Another honor was bestowed upon Dr. Bigland when VIDO's Board of Directors, together with the University of Saskatchewan, founded the C.H. BIGLAND FELLOWSHIP FUND IN VETERINARY MICROBIOLOGY AND EPIDEMIOLOGY. The purpose of the Fund is to help resolve the chronic shortage of Canadian veterinarians pursuing advanced training in veterinary microbiology and epidemiology. Moreover, the Fund has been established to acknowledge Chris Bigland's long-standing commitment to teaching and research, and his more than 40 years of service to veterinary medicine, the veterinary profession, the livestock and poultry industries, and public health.

Through donations, VIDO hopes to raise $150,000 for the Fund. The principle plus the accumulated interest will be used to support Canadian veterinarians wishing to enter a program of graduate studies leading to a PhD degree. It is hoped that the Fund will be operational by the summer of 1987.

For more information on the Fund, please contact VIDO.

THE OBJECTIVES OF VIDO

1) To serve the livestock industry through research on the common infectious diseases of farm animals and poultry.
2) To fill the gap between scientific discoveries in the laboratory and their application on the farm.
3) To increase the world's supply of animal protein by reducing loss and wastage from livestock disease.
4) To have higher quality food available to consumers through research on biological (non-residue forming) vaccines and improved production and management techniques.
5) To improve the public health by reducing diseases that are directly transmissible to man and through spin-off of the research of VIDO to provide better human health products.
6) To reduce the suffering of animals caused by disease.
7) To study the economics of livestock disease.

VIDO

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REPORT FROM THE CHAIRMAN OF THE BOARD OF DIRECTORS
— P.M. MONCRIEFF


P.M. Moncrieff,
Chairman, 1983-1984

The ninth successful year at the Veterinary Infectious Disease Organization concluded on September 30, 1984.

It was a year of major change marking the transition from the "Founder", Dr. Chris Bigland, to a new Director. The Board is very pleased that Dr. Stephen Acres, formerly Deputy Director (Research), agreed to assume the Directorship. This transition was managed by the Board to allow for a full and complete review of purpose and an evaluation of management structure. VIDO had a successful management transition.

The reassessment of VIDO's purpose led to the recommitment and rededication of the Organization to "serving the livestock industry through research". This purpose is much broader than "science for the sake of science", or a focus solely on products or technologies that will earn the institution monetary returns. VIDO's purpose has been successfully assessed and rededicated.

The ninth fiscal year also saw VIDO in a position of being able to return a net financial contribution to the Research Trust, after three years of drawing upon the Trust to maintain research program operations. As indicated in the financial section of this report, the Research Trust now stands at $1,569,336. It is the Trust which provides VIDO the where-with-all to take the large long-term research risks and hire experienced staff to address the major infectious disease projects. VIDO had a successful financial year.

The last year also saw several research successes. The **E. coli** subunit vaccine "ECOLAN" was licensed and is now on the market. Progress was achieved in all the research programs and several research projects were completed according to their projected timelines. This progress is outlined in detail in the reports of the Director and Associate Director (Research). Clearly, while other major hurdles still exist, and in some projects we now know better what does not work, progress continues to be made in our major priority research areas of neonatal diarrhea, respiratory diseases in cattle, respiratory diseases in pigs, and adenovirus-related diseases in poultry. Research success at VIDO has been satisfactory. Closely managed and focused programs continue. Results are what counts.

VIDO, through its structure, is unique. As an organization, it is a national voluntary association, under the legal auspices of the University of Saskatchewan. VIDO has its own Board of Directors, hires and manages its own scientific and management personnel, is responsible for its own funding, and sets its research priorities in consultation with the livestock and poultry industries. The Board of Directors is a unique blend of individuals who are leaders in their own fields. They bring a competent but diversified collective expertise to guide the affairs of VIDO.

On behalf of the Board, I would like to thank Dr. Conrad L'Ecuyer, Director General, Food Production and Inspection Branch, Agriculture Canada, for his contributions over the past four years. I would like to welcome Mr. Rod Bailey, Assistant Deputy Minister, Agriculture Canada, as his replacement. My thanks to all the Board Members and particularly Mr. Garnet Altwasser, Vice-Chairman, for their help and guidance.

While self-reliant, VIDO also depends heavily on the University of Saskatchewan for many things on an on-going basis. The most important of these is the nurturing process. The University, through its senior management and the Western College of Veterinary Medicine provides support so that VIDO can successfully, through dedicated research and external activities, address the needs of the livestock industry and Canadian society. VIDO appreciates this broad-minded viewpoint from which we all benefit.

Through the necessity of achieving on-going funding from Governments (largely Provincial to date), and livestock and poultry groups, VIDO has to be truly market sensitive and has to produce tangible and visible results. That it has been successful for nine years is a testimony to its design, its people and the industry it serves.

As we look into the tenth year, we see further growth in scientific capability, research results that should prove interesting and beneficial to the industry, plus the need to have the Canadian Government recognize VIDO's complementary research role in Canada. The success of VIDO will continue.


G. Altwasser, Vice-Chairman, 1983-1984

REPORT FROM THE DIRECTOR
— S.D. Acres

S.D. Acres,
DVM, MPVM, PhD

Transition

The past year has been one of major transition at VIDO. As highlighted elsewhere in this report, Dr. Chris Bigland retired as Director on June 30, 1984. Chris' many achievements exemplify his talents as a visionary, builder, and innovator. These qualities have enabled Chris to make major contributions to Canada's veterinary profession and to the nation's agricultural industry. He has "passed the torch". Now, the challenge for us is to continue to "hold it high" by striving to achieve the objectives and standards which he established.

A new management team is in place to guide the Organization's daily operations. On July 1st, I assumed the responsibility of Director, and continued to serve as Deputy Director (Research) on an interim basis. Mr. Paul G. Hodgman continued as Executive Officer with responsibility for the non-scientific activities of the Organization. Dr. Lorne A. Babiuk became Associate Director (Research) on October 1, 1984. In addition to being responsible for the scientific operations of VIDO, he also retains his appointment as Professor in the Department of Veterinary Microbiology in the Western College of Veterinary Medicine. We look forward to his increased participation in the scientific and management aspects of VIDO.

This new Executive Committee is looking forward to facing the many challenges of managing the operations of VIDO. We appreciate the support, advice, and patience we have received from the Board of Directors and the VIDO staff during this period of change.

Research Achievements

A detailed report of progress in each of the four research programs is provided in the Report of the Associate Director (Research). The highlights include the following:

- **A New Calf Scours Vaccine** — Development and testing of a subunit vaccine against **E. coli** calf scours has been completed. This vaccine is a refinement of VICOGEN, which was the world's first **E. coli** calf scours vaccine developed by VIDO in 1978. The commercial rights to the new vaccine were sold to BIOSTAR Inc., who subsequently licensed the rights to Langford Laboratories Ltd., of Guelph, Ontario. Langford Laboratories produces the vaccine under the tradename ECOLAN, and markets it through Armitage-Carroll Ltd. of London, Ontario. The developmental work on a vaccine containing rota and coronavirus antigens is almost complete. Eventually this will be combined with ECOLAN to provide a three-way vaccine against the most common causes of scours.

- **Hemorrhagic Enteritis Vaccines** — Field testing of a purified spleen extract vaccine has been completed. Significant improvement in feed conversion and weight gain of turkeys was seen in vaccinated flocks. Approximately 200,000 doses of this vaccine have now been provided to turkey producers on an interim basis. However, VIDO has not proceeded with further development of this vaccine because significant progress was made in developing a tissue culture-produced vaccine. The new vaccine, which is produced in turkey cell cultures, will offer several advantages over the spleen vaccine. It is currently being tested at VIDO, and field trials will begin within the next year.

- **Biotechnology** — Progress is being made toward the development of recombinant DNA and synthetic peptide vaccines for rota, corona, and IBR viruses. While these products are still three to five years from completion, several key virus proteins were identified which provide the basis for future progress.

- **Monoclonal Antibodies** — These reagents have been produced against a variety of animal pathogens including **Pasteurella haemolytica, Haemophilus pleuropneumoniae,** enterotoxigenic **Escherichia coli,** rota, corona, IBR, and hemorrhagic enteritis viruses. These antibodies are integral to the research on each infectious agent, and they have also allowed the development of a range of enzyme-linked immunoadsorbent assay (ELISA) diagnostic procedures. In the future, the use of some of the monoclonal antibodies for preventing and treating diseases will also be explored.

- **Management Information** — A major portion of VIDO's research is focused on the development of improved management techniques and programs for livestock. In the past year, data collection in the study of shipping fever in feedlots was completed. Analysis of the information has started in an attempt to identify risk factors affecting the occurrence of the disease. In the area of swine diseases, the Swine Technical Group has started preparing a detailed bulletin on the construction of farrowing barns. In all programs, the ELISA's mentioned above are being used to study the epidemiology of the various pathogenic organisms. They allow us to "trace the footprints" of the infectious organisms in herds and flocks so that we can better understand how they are transmitted and spread. This information will ultimately lead to the development of better management practices.

In summary, progress has, and is still, being made in all of the four research programs. The details of this progress has been reported in the many publications and presentations listed later in this Annual Report. Major achievements, which provide practical solutions to costly

REPORT FROM THE DIRECTOR
— S.D. Acres

diseases, occur as a series of small successes. We are confident that some of the achievements of the past year will provide the basis for future progress.

Financial-Historical Perspectives

Yearly revenue has increased from approximately $1,369,323 in 1981-82, to $1,687,154 in the current year. When adjusted for inflation, this amounts to an average increase of approximately 5.2% per year. These funds indicate and confirm the commitment of the livestock and poultry industries, provincial governments and granting agencies, private foundations, and individuals to VIDO's objectives. However, in spite of this increase in funding, VIDO has never operated at 100% capacity. The potential to do more exists; much more needs to be done.

When VIDO started research in 1975, the Board spent considerable time identifying potential sources of funding. A formula was developed to establish the proportion of VIDO's operating costs which should be contributed by various sources. This formula was based on several factors including: a) the relative importance of animal agriculture to various areas of Canada and, b) the recognition that economic and production losses caused by animal diseases affect both producers and consumers of livestock and poultry products. Hence, it was anticipated that contributions would be received from livestock and poultry producers, as represented by various farm groups across the country, as well as from consumers, as represented by the federal and provincial governments. The formula specified that approximately 33% of VIDO's operating budget should come from the following groups.

A. The livestock and poultry industries, charitable foundations, individuals, commercial contracts, invention revenue and interest on the balance in the VIDO Research Trust Fund.

B. Provincial governments and their granting agencies.

C. Federal Government departments and agencies in the form of grants, contracts, and core support.

As of September 30, 1984 VIDO has raised a total of $14.49 million: $4.42 million for capital construction and $10.07 million for operating funds. Of the operating funds, 54.0% ($5,432,031) came from sources in Group A, 42.2% ($4,249,332) from sources in Group B, but only 3.8% ($385,946) from sources in Group C. All of the $385,946 from federal sources came in the form of grants and contracts with federal government departments and agencies. Hence, its use was restricted to specific projects and could not be used to support the core operating costs of the Organization.

In spite of repeated attempts, VIDO was unable to obtain any "core funding" from the previous Federal Government. In the coming year, VIDO will be asking the new Government to rectify this deficiency by joining with other major contributors in supporting VIDO's success story.

Biotechnology for Animal Health

VIDO made a commitment to biotechnology in 1980. Since that time, several projects have been started towards developing recombinant DNA and synthetic peptide vaccines. Also, monoclonal antibodies are being produced and used: 1) to develop improved diagnostic techniques, 2) as therapeutic agents, and 3) as research tools. During the current year the Organization has devoted 10 person-years to these areas. As far as we are aware, this is the largest biotechnology group in Canada working on common infectious disease problems. This puts VIDO at the forefront of biotechnology and animal health in Canada, and much effort will be required to maintain and enlarge this activity.

Biotechnology is a collaborative technology which requires input from scientists in a variety of different disciplines. As mentioned by Dr. Bigland in last year's Annual Report, the existing group must be enlarged to provide the necessary expertise to effectively apply biotechnology to solving animal disease problems. Assembling and maintaining the critical mass of scientists requires additional funds. Hence, VIDO is exploring ways of: a) expanding the biotechnology group to make it viable and, b) collaborating with other groups which could provide complementary expertise.

Renewed approaches to several groups are being made in an attempt to obtain additional funding. These include the National Research Council (NRC), the Natural Sciences and Engineering Research Council (NSERC), Agriculture Canada, the Saskatchewan Department of Science and Technology and other agencies. In addition, discussions are underway with groups such as the NRC and commercial companies, which possess the expertise in biotechnology needed to complement VIDO's strengths.

In short, VIDO is exploring every avenue of maintaining and expanding its biotechnology group, so that work can continue on infectious diseases of food-producing animals and poultry. We will be looking to Government councils, agencies, and departments to provide the funds necessary to develop and maintain a critical mass of scientific talent which must be in place in order to make contributions to animal agriculture in Canada.

Personnel

Introduction of the Associate Director (Research): It is a pleasure to introduce Dr. Lorne A. Babiuk, the new Associate Director (Research) at VIDO. Dr. Babiuk is a native of Canora, Saskatchewan, and obtained both a BSA in Agriculture (1967) and a MSc in Soil Science (1969) from the University of Saskatchewan. Following this, he earned a PhD in Microbiology, with specialization in virology and immunology, from the University of British Columbia. He then undertook post-doctoral studies in Medical Microbiology at the University of Toronto. In 1973 he joined

the staff of the Department of Veterinary Microbiology in the Western College of Veterinary Medicine at the University of Saskatchewan. Since then, he has made major contributions to the research and teaching programs within the College. In recognition of his teaching excellence, he was awarded the Norden Teacher of the Year Award in 1978 and the WCVM Students Award in 1980. He also received the Saskatchewan Veterinary Medical Association Award in 1978 for major contributions to the veterinary profession by a non-veterinarian.

Dr. Babiuk's association with VIDO extends back to 1976 when he helped to initiate research on rotaviral diarrhea of newborn calves. Since then, viral diarrheas have become one of his major research interests, and he has played a leading role in VIDO's Neonatal Diarrhea Program. His second major research interest is in respiratory diseases, particularly infectious bovine rhinotracheitis (IBR) and the role of this virus in the shipping fever complex. He became the Co-ordinator of VIDO's Bovine Respiratory Disease Program in 1980.

Dr. Babiuk has established an international research reputation in enteric and respiratory diseases. Through his rural background he has firsthand experience with the economic and production losses caused by these common problems. He is dedicated to helping develop practical methods of reducing these losses through scientific excellence. I look forward to working closely with him to focus VIDO's research resources on costly disease problems.

Scientific Staff: During the past year, three members of the scientific staff left to assume other positions. Dr. Colin Crouch completed his two-year fellowship and returned to the United Kingdom. Drs. James Raybould and Geoff Hudson resigned to take positions with industry. While here, each one contributed to the success of VIDO by completing various phases of the research programs. New scientists are now being recruited who will assist with the next steps in the R&D cycle.

Graduate Students: Canada has a shortage of well trained scientists working on infectious diseases of animals. VIDO recognizes the need to help train highly qualified manpower who will serve future generations. This year, for the first time, VIDO welcomed two graduate students to the Organization. Dr. Dirk Deregt (DVM) and Mr. Arnold Verbeek are working on the viruses which cause scours in newborn animals. They are supported by grants from the Natural Sciences and Engineering Research Council and the Medical Research Council.

Research Collaborators: The staff of VIDO was again privileged to interact with a dynamic group of scientists at the University of Saskatchewan and other institutions. They are listed on the inside back cover of this report. One individual who deserves special mention is Dr. Dudley Osborne, Chairman of the Department of Veterinary Microbiology at the Western College of Veterinary Medicine. Dr. Osborne previously served as Co-ordinator of the Porcine Respiratory Disease Program, but relinquished this position in 1983 when he became Chairman of the Department. Since then, he has continued to play a major role in the research on Haemophilus pleuropneumonia. He has also fostered a close and mutually beneficial working relationship between VIDO and the Department of Veterinary Microbiology.

Strategic Plan — Future Challenges

In preparation for the transition surrounding Dr. Bigland's retirement, the Board of Directors established a Task Force to carry out a strategic planning exercise for VIDO. The Task Force identified and examined many issues which will affect the operations of VIDO during the next 10 years, including the aims and objectives of the Organization and some constraints and critical issues which must be addressed.

During this discussion, VIDO's mandate of "serving the livestock industry through research" was reconfirmed. The needs of the livestock and poultry industries were identified as the "driving force" of the Organization. It was also recognized that in order to make research advancements which will benefit agriculture, a strong technology base of modern scientific talent is necessary.

A long-range research plan is being developed through dialogue with the livestock and poultry industries, veterinarians, and other groups involved in animal agriculture. The plan is focused on production diseases and will ensure that VIDO's research resources continue to be concentrated on priorities identified by the industry. The objective is to develop practical methods of preventing and controlling these diseases as a means of lowering unit production costs.

Some of the constraints and critical issues which VIDO must address include the following:

1) The need for increased core funding to provide financial stability and growth potential.
2) Mechanisms of providing security for key research staff must be found and put into effect.
3) A plan to obtain and develop a farm facility for infectious disease research must be implemented.
4) Collaborative relationships both within and outside of the University should be strengthened.
5) A plan to replace aging and worn-out equipment must be developed.

As new Director, my major challenge is to obtain the funds necessary to resolve these issues and to operate VIDO at capacity. When fully staffed, the existing facility could accommodate at least 15 research scientists plus support staff. Funding commitments are now in place to operate at

REPORT FROM THE DIRECTOR
— S.D. Acres

75% of the maximum staffing level. The challenge for the future is to increase revenues by another 25% so that existing facilities are being used to their maximum potential.

VIDO's management team has carefully mapped a strategy which will enable the Organization to meet its fund-raising and research objectives. Several new funding initiatives have been started and should allow the Organization to meet some of its growth potential during the next year.

Ultimately, VIDO's success depends upon one very important group of people: our professional, technical and support staff. It is to this group that I would like to extend my sincere personal appreciation. With their help, I look forward to guiding VIDO into the next decade of its history with the same determination and enthusiasm as my predecessor, Chris Bigland.

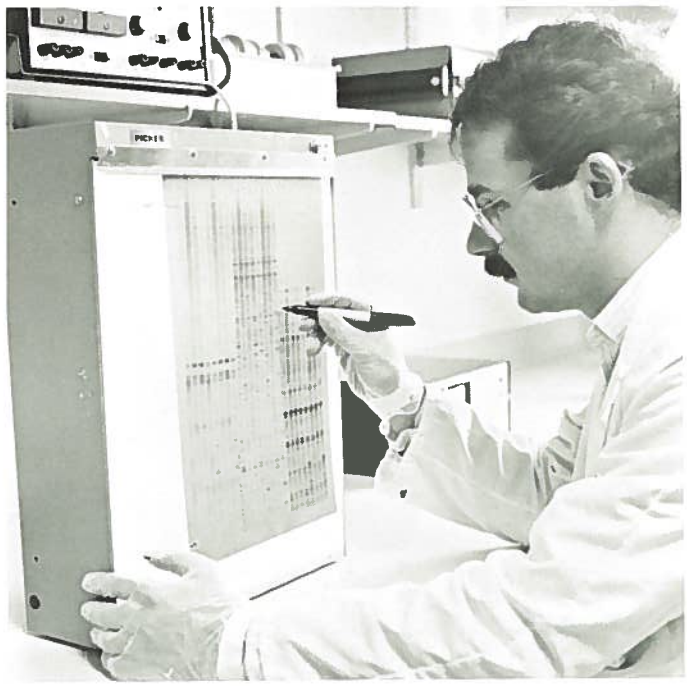
VIDO Hosts Fourth International Symposium on Neonatal Diarrhea

The fourth in a series of International Symposia on Neonatal Diarrhea of Animals was hosted by VIDO on October 3-5, 1983 at Place Riel Theatre on the University of Saskatchewan Campus. Over 100 researchers and veterinary scientists from 14 different countries participated. A variety of topics were discussed including viral, bacterial, and protozoan causes of neonatal diarrhea, transfer of immunity from the dam to the newborn, and prevention and control of diarrhea through vaccination. The Proceedings of the three-day meeting have been published in a 700 page volume and are available for $40 (Canadian) from VIDO.

These international meetings were first started in 1976 when VIDO established its research program on neonatal diarrhea of calves and pigs. Other symposia in this series were held in 1978 and 1980. This series of meetings has become internationally recognized as one of the best in the world on neonatal diarrhea of animals.

VIDO has received many requests to sponsor similar meetings in the future. Consideration is being given to initiating a series on respiratory diseases of cattle and swine, and perhaps hosting the Fifth International Symposium on Neonatal Diarrhea in 1986 or 1987. The possibility of hosting these meetings will be evaluated in light of other research pressures and availability of funding.

Financial support for the Fourth International Symposium on Neonatal Diarrhea was provided by Agriculture Canada, eight veterinary biological companies, the City of Saskatoon and the Province of Saskatchewan. We owe them a deep debt of appreciation for helping VIDO to focus attention on one of the most common and costly disease complexes of food-producing animals.



Analysis of a viral gene sequence for development of vaccines by biotechnological methods.

REPORT FROM THE EXECUTIVE OFFICER
— P.G. Hodgman


P.G. Hodgman
BSc. (Agr)

"The secret of success is constancy to purpose."
Benjamin Disraeli

Risk and success... the evolving story of VIDO.

Dr. Chris Bigland, founder of VIDO, built the Organization on several simple but solid principles.

— "Serve the livestock industry through research, but research only those diseases that are of significant economic importance."
— "Seek input from, and be accountable to your supporters."
— "Develop management techniques and animal health products only if excellence of science is not jeopardized."
— "Develop research teams of bright leading scientists and provide them with the necessary support to do their work."
— "Build a unique research facility and utilize it to capacity."

These principles have ensured that VIDO's Board of Directors, Management and scientists never lose track of their mission: "to serve the livestock industry through research". In spite of VIDO's dedication to purpose, the Organization continues to search for long-term financial commitments to match the terms of major research projects and to compete for scarce scientific talent. Despite this, over the past few years VIDO has increased its support from many sources.

Financial and "In-Kind" Support

The economic situation in Canada has not been conducive to development or expansion over the past two or three years. However, VIDO has been able to maintain its broad base of support from livestock organizations, charitable foundations, provincial governments, granting agencies, and others. Revenue has not declined; in fact, revenue has **increased** during these difficult economic times.

Livestock Industry

The livestock industry continues to support us in meaningful ways. Of particular note is the Canadian Turkey Marketing Agency, which has continued in a major way to fund research on avian adenoviruses with particular emphasis on hemorrhagic enteritis. The Alberta Cattle Commission also continues to contribute to our bovine research. Much to our delight, the cattle producers of Saskatchewan, through their checkoff, have contributed significantly to VIDO's research during the past year.

Support from the livestock industry is perhaps the most important to VIDO, as it shows other potential donors that the primary benefactors of the research are solidly behind the Organization.

Charitable Foundations

Just as the Devonian Group of Charitable Foundations (Calgary, Alberta) provided money and leadership for the birth and development of VIDO, other charitable foundations continue to be a very important part of our funding base.

This year, the Max Bell Foundation (Toronto, Ontario) concluded its three-year contribution toward research on shipping fever. This work is now being supported by the Kahanoff Foundation (Calgary, Alberta). The McLean Foundation (Toronto, Ontario) continues to support research in our gnotobiotic (germ-free) area, which is essential to our research, particularly in the Neonatal Diarrhea Program.

Government

The four western provinces continue to be a vital source of "core" or "unencumbered" funds. Led by the Provinces of Saskatchewan and Alberta, these monies are used in all targeted research areas to pay costs that cannot be covered from other "directed" sources of funds.

British Columbia and Manitoba continue to contribute to VIDO's core funding. In the past year, we have made several contacts with the Government of Ontario through the Ministry of Agriculture and Food, and hopefully, they will soon support VIDO's research.

The new Federal Government has stated its interest and desire to increase R&D and to stimulate development of products and technologies that are practical and mission oriented. These have been VIDO's objectives since its inception. Discussions are under way with politicians and senior civil servants to seek core financial support. If this is achieved, the major missing partner will help to maintain and accelerate VIDO's continuing success story.

University of Saskatchewan

One of the most important contributors to VIDO's success is the University of Saskatchewan. After initially providing the five acreas of land for the VIDO building, the Director's salary and some of the initial start-up costs, the University continues to contribute in a major way by providing: (a) utilities, (b) the security and maintenance of the building, and (c) ancillary services, such as accounting, investment support, payroll and personnel administration.

REPORT FROM THE EXECUTIVE OFFICER
— P.G. Hodgman

BIOSTAR

BIOSTAR Inc., the corporate marketing arm of VIDO, is beginning to fulfill the role that was envisioned for it. BIOSTAR has successfully marketed two of VIDO's products to a biological manufacturer. The Company is now negotiating with other interested parties for the rights to manufacture other VIDO technologies and products throughout the world. BIOSTAR has also obtained contracts for research and testing from other foreign biological production companies, major portions of which have been subcontracted to VIDO.

C.L. Nicholls
B.Comm., MBA,
Executive Assistant

BIOSTAR has also hired its first employee, Ms. Charlene Nicholls. Ms. Nicholls performs many financial and other support services.

The Board of Directors of BIOSTAR have indicated that the Company will be issuing its own Annual Report in the coming year.

Extension and Communications

VIDO continues to be accountable to and receive input from livestock producer groups. Various presentations to the livestock and poultry industry are made on a continuing basis. This enables VIDO to report on its research activities and inform supporters how their investments have been utilized. In the past year several scientific papers, along with less technical information for producers have been presented. These publications are listed elsewhere in this Annual Report and can be obtained from VIDO.

The VIDO Swine Technical Group represents a diverse group of individuals with interests in the swine industry. The group is composed of veterinarians, producers, government specialists, and feed industry representatives. An example of the type of information the Swine Technical Group continues to prepare for hog producers is the soon to be released technical bulletin on farrowing.

Computers

During the past year VIDO has introduced microcomputers into our operations. Computers are being used extensively by the research staff for the preparation and analysis of specific scientific data. New computer programs will also be integrated into our financial and management systems.

Summary

The risks and challenges facing VIDO continue to be met. Success on the scientific and financial fronts is being achieved — the future is bright!

"If you remove the risk of failure, you remove the possibility of success beyond mediocrity."

BOARD OF DIRECTORS — 1983-84

Front Row - left to right:
Dr. Chris Bigland - Director (to June, 1984);
Mr. Pat Moncrieff, Chairman, Senior Manager, Agriculture Department, Bank of Montreal;
Mrs. Carol Teichrob, Livestock Producer, Saskatchewan;
Dr. Boyd Anderson, Livestock Producer, Saskatchewan;
Mr. Paul Hodgman, Executive Officer.

Back Row - left to right:
Mr. Stuart Kramer, Assistant Deputy Minister, Saskatchewan Department of Agriculture;
Mr. Richard Klassen, Livestock Producer, Manitoba;
Dr. Gavin Hamilton, Dean, Western College of Veterinary Medicine;
Dr. Doug Maplesden, Past Dean, Ontario Veterinary College;
Mr. Barrie Peterson, Livestock Producer, British Columbia;
Dr. S.D. Acres, Director (from July, 1984);
Mr. Garnet Altwasser, Vice-Chairman, Livestock Producer, Alberta;
Dr. Brian Tinker, Vice-President, University of Saskatchewan;
Dr. Ralph Christian, Director, Animal Health Division, Alberta Agriculture;
Dr. Conrad L'Ecuyer, Director General, Food Production and Inspection Branch, Agriculture Canada.

FINANCIAL STATEMENTS
— Year Ended September 30, 1984

AUDITOR'S REPORT

To the Board of Directors of the
Veterinary Infectious Disease Organization:

I have examined the balance sheets of the Research Trust Account and the Capital Trust Account for The University of Saskatchewan —Veterinary Infectious Disease Organization as at September 30, 1984 and the statements of income, expenditure and unexpended funds for the year then ended. Except as explained in the following paragraph my examination was made in accordance with generally accepted auditing standards and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In common with many non-profit organizations, the Veterinary Infectious Disease Organization derives part of its income in the form of grants and donations which are not susceptible to complete audit verification. Accordingly, my verification of income from these sources was limited to the amounts recorded in the records of the Organization.

In my opinion, except for the effect of adjustments, if any, had grants and donations been susceptible to complete audit verification, these financial statements present fairly the financial position of the University of Saskatchewan —Veterinary Infectious Disease Organization as at September 30, 1984 and the results of its operations for the year then ended in accordance with the stated accounting principles applied on a basis consistent with that of the preceding year.

Regina, Saskatchewan
November 23, 1984

W.G. Lutz, F.C.A.
Provincial Auditor

RESEARCH TRUST BALANCE SHEET

As at September 30

	1984	1983
ASSETS		
Funds held by The University of Saskatchewan (Note 1(d))	$1,578,491	$1,464,143
Accrued interest	34,988	12,794
Accounts receivable		
- Royalties	360	-
- Donors	75,298	58,850
- Contracts — Research	60,541	-
— Services	29,898	-
Prepaid expenses		
- Marketing Services	25,000	-
Inventory (Note 1(c))	33,965	37,085
Investments	47,000	-
	1,885,541	1,572,872
LIABILITIES		
Due to University of Saskatchewan		
- Operating fund	284,740	113,337
Unearned grant revenue	31,465	7,477
	316,205	120,814
EQUITY		
Unexpended funds (Statement 2)	1,569,336	1,452,058
	$1,885, 541	$1,572,872

(See accompanying notes to the financial statements)

STATEMENT OF INCOME, EXPENDITURE AND UNEXPENDED FUNDS

For the Year Ended September 30

	1984	1983
INCOME		
Provincial Governments:		
- Saskatchewan	$ 267,700	227,700
- Alberta	100,000	200,000
- Manitoba	15,000	20,000
- British Columbia	6,155	6,700
Agricultural Research Council of Alberta "Farming for the Future"	361,652	354,300
Kahanoff Foundation	150,000	150,000
Natural Sciences and Engineering Research Council of Canada (NSERC)	107,146	82,245
Max Bell Foundation	75,000	130,000
McLean Foundation	15,000	30,000
Agriculture Canada - Symposium	9,861	-
Alberta Agricultural Research Trust	7,554	-
Canadian Veterinary Research Trust	10,000	-
Saskatchewan Horned Cattle Trust	-	19,500
Livestock industry	161,671	118,393
Other individuals, companies and foundations	1,311	21,403
	1,288,050	1,360,241
Interest income	154,657	145,773
Contracts - research	153,315	33,381
- services	47,066	-
Royalties	14,250	9,710
Animal services	29,786	32,557
Miscellaneous revenue	30	-
	1,687,154	1,581,662
EXPENDITURE		
University of Saskatchewan		
Salaries and fringe benefits	957,975	939,959
Material and supplies	206,344	219,576
Animal services	135,748	100,040
Travel	75,414	94,523
Equipment (Note 1(b))	58,779	47,643
Other	135,616	93,924
	1,569,876	1,495,665
Increase in unexpended Trust balance	117,278	85,997
Add: Unexpended Trust balance - beginning of year	1,452,058	1,366,061
Unexpended Trust balance - end of year	$1,569,336	$1,452,058

(See accompanying notes to the financial statements)

FINANCIAL STATEMENTS
— Year Ended September 30, 1984

CAPITAL TRUST BALANCE SHEET
As at September 30

	1984	1983
ASSETS		
Current:		
Funds held by University of Saskatchewan (Note 1(d))	$ 44,537	$ 94,571
Accrued interest	930	653
Total current assets	45,467	95,224
Capital Assets (Note 1(b))		
Site and improvements	133,765	133,765
Furnishings, fixtures and equipment	384,112	382,130
Buildings	3,946,728	3,916,728
Total capital assets	4,464,605	4,432,623
	$4,510,072	$4,527,847
LIABILITIES		
Due to University of Saskatchewan - Operating Fund	$ -	$ 25,000
EQUITY		
Equity in capital assets	4,464,605	4,432,623
Unexpended funds (Statement 4)	45,467	70,224
	4,510,072	4,502,847
	4,510,072	4,527,847

(See accompanying notes to the financial statements)

CAPITAL TRUST
STATEMENT OF INCOME, EXPENDITURE AND UNEXPENDED FUNDS
For the Year Ended September 30

	1984	1983
INCOME		
Interest	$ 7,225	$ 9,976
EXPENDITURES		
Furnishings and fixtures	1,982	35,778
Buildings	30,000	-
	31,982	35,778
Excess of expenditure over income	(24,757)	(25,802)
Unexpended funds, beginning of year	70,224	96,026
Unexpended funds, end of year (Statement 3)	$ 45,467	$ 70,224

(See accompanying notes to the financial statements)

Notes to Financial Statements
September 30, 1984

1. Summary of Significant Accounting Policies

(a) Fund Accounting

The accounts of the Organization are kept in accordance with fund accounting principles. This enables presentation of restrictions placed upon resources by contributors. Those principles require classification of resources into 'funds' to reflect the various designated uses. Two funds are presented: the Research Trust and the Capital Trust. Funds are transferred from the Research Trust as approved by the Board of Directors and from the Capital Trust as expenditures are incurred.

(b) Capital Assets

Capital assets are expensed as Capital Fund expenditures when purchased. The same assets are included in the Capital Fund balance sheet as assets offset by the 'equity in capital assets' account.

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

The constitution referred to in note 2 states that all buildings and facilities constructed for the Organization shall be used by it in accordance with the Agreement and upon termination of the Organization, the buildings, facilities and equipment therein shall remain the absolute property of the University of Saskatchewan.

(c) Inventories

Inventories of animals, materials and supplies are maintained by the Organization for research purposes. These inventories are valued at cost.

(d) Pooled Investments

The University of Saskatchewan pools for investment purposes, all cash balances of the various trusts, of which the V.I.D.O. Research Trust and the V.I.D.O. Capital Trust are two, maintained by it. They are allocated short term interest earnings in proportion to the average monthly balance of cash on deposit for that account.

(e) Grants and Donations

Grants and donations are recognized in these accounts in the period as 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 accounts when received.

2. Establishing Agreement

The Organization was established by an agreement dated August 11, 1975, between the Devonian Foundation, 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.

3. Related Party Transactions

(a) V.I.D.O. is a research affiliate of the University of Saskatchewan. The University of Saskatchewan maintains, as part of its normal operations, the various financial and administrative functions relating to V.I.D.O.

(b) The University of Saskatchewan owns approximately 82% of a company called BIOSTAR Inc. During the year the company contracted research to V.I.D.O. totalling $37,658 and paid rent, office services and management services fees totalling $47,066. In addition V.I.D.O. paid to the company management services fees of $5,843 and provided $25,000 in payment of marketing services to be provided.

At September 30, 1984 the organization has a receivable from BIOSTAR of $38,608.

BIOSTAR's primary purpose is to assist V.I.D.O. in both research and development of its products and the ultimate sale of its products/technologies to commercial biological production.

4. Ancillary Services and In-Kind Support

The accompanying financial statements do not include expenditures for administrative and ancillary services, or in-kind support provided by the University of Saskatchewan.

5. Commitments

As at September 30, 1984 the Organization had commitments of $43,975 in the Research Trust (1983 — $39,822).

6. Comparative Figures

Certain of the 1983 comparative figures have been changed to conform with the current year's presentation.

REPORT FROM THE ASSOCIATE DIRECTOR (RESEARCH)

— Dr. L. A. Babiuk

L.A. Babiuk,
BSA, MSc, PhD

During the past year I was honoured by being appointed the Associate Director (Research). I am looking forward to working as a member of the management team in conjunction with the Board to continue VIDO's tradition of conducting goal-oriented research for the livestock industry.

My philosophy is that research can resolve complex problems and that research should be directed at practical problems. Thus VIDO's philosophy and mine are in unison. Furthermore, I feel that the only way that practical solutions to many complex problems can be found is by attacking them from a number of different directions. To achieve this requires top quality investigators with varied but complementary expertise. VIDO is in the process of recruiting several new staff members to strengthen our existing personnel and I am confident that the next years will be ones of growth and major accomplishments. As a result of this growth, co-ordination of the research programs will be much more challenging than ever before in the history of VIDO. I look forward to this challenge and am confident that VIDO scientists can make major contributions to the health and welfare of the livestock industry in Canada and the world.

T.C. Watts,
DVM, Co-ordinator
Animal Support Services

VIDO's research endeavors continue to be focused on four major common diseases of livestock and poultry. These areas are: 1) neonatal diarrhea, 2) bovine respiratory disease, 3) pneumonia in pigs and, 4) avian adenoviruses. The latter viruses cause a group of diseases in poultry, including hemorrhagic enteritis of turkeys and splenomegaly in chickens. Continued emphasis in these four diseases is consistent with VIDO's research principles, namely to concentrate on a few important research targets at any one time.

All of these diseases occur as a result of the interaction between various factors including specific pathogens, the host animal and the environment. Therefore, a multi-faceted approach is being used to solve these particular problems. To achieve this, VIDO has developed a long-term strategic plan and a research team in each of the four targeted areas. In each program, individuals possess different types of expertise complementary to each other, and therefore, provide the overall skills required to achieve the objective of the specific program. Furthermore, individuals often participate in more than one research program.

One example of such a team is in the area of biotechnology (monoclonal antibodies and genetic engineering). Biotechnology is a cornerstone of modern disease diagnosis and control including vaccine production. Hence these techniques are being used in each of the four research programs to help develop applied methods of prevention and control.

Poultry Adenovirus Program

The objectives of this program are to develop and test improved vaccines against type-2 avian adenoviruses. This program was initiated in 1980 with a grant from the Canadian Turkey Marketing Agency. It has continued with additional support from Farming for the Future and the Alberta Agriculture Research Trust and a subsequent grant from the Canadian Turkey Marketing Agency.

J.V.J.M van den Hurk,
BSc, MSc, Virology

Purified Spleen Vaccine — The first prototype vaccine was prepared by Dr. van den Hurk (Co-ordinator of the Adenovirus Program) by purifying virus from infected turkeys' spleens. This vaccine proved to be effective under both experimental and field conditions. Approximately 200,000 doses of this vaccine were provided to turkey producers during the past year on an interim basis. However, the need to use live turkeys as a source of virus made this vaccine less than satisfactory for large-scale production due to the risk that other infectious agents could be present in turkey spleens used to produce the vaccine. It did, however, confirm that a vaccine would provide economic benefit to the turkey industry.

Tissue Culture Spleen Vaccine — Because of the restrictions and limitations of the spleen vaccine, Dr. van den Hurk proceeded to develop a tissue culture system in which to grow the virus. He has now clearly demonstrated that the virus replicates **in vitro** in a subpopulation of turkey leukocytes and that it is possible to use cultured leukocytes as a method for growing the virus. Furthermore, experimental trials showed that virus grown in this system was very effective as a vaccine. Methods of producing high yields of virus in the leukocyte system are now being explored.

To date all potency tests of the vaccine have been done by infecting turkeys and measuring both their antibody responses to vaccination and their resistance to subsequent challenge with virulent virus. In order to reduce the expense of using large numbers of turkeys for potency testing of each vaccine lot, an **in vitro** test is being developed. If these tests are successful, it may be possible to start field trials of

REPORT FROM THE ASSOCIATE DIRECTOR (RESEARCH)

— Dr. L. A. Babiuk

the new vaccine within the next year.

Methods of improving the yield of virus in tissue culture and the development of continuous cell lines for the growing of the virus are continuing. If this is achieved it will dramatically reduce the amount of safety testing required for each batch of vaccine. Furthermore, the importance of this virus in chickens and the potential benefits of vaccinating chickens is being investigated.

Porcine Respiratory Disease Program

Haemophilus pleuropneumoniae is one of the most important causes of respiratory disease in young feeder pigs in North America. Studies indicate that the incidence of this disease is rapidly increasing in Canada. It has been shown that **Haemophilus pleuropneumoniae** can occur in a number of clinical forms. First, acute pneumonia causes sudden death of 0.5% to 10% of the pigs, often before significant clinical signs can be observed. Sudden stress or environmental changes can precipitate this form of the disease. Second, chronic disease causes pigs to develop fever, lung abscesses and pleuritis which results in less appetite and a lower feed conversion and average daily gain. Third, subclinically infected pigs shed the bacteria without showing any signs of disease. These carrier pigs serve as sources of infection for other pigs.

P.J. Willson,
BA, MS, DVM. Clinical Medicine - Epidemiology

VIDO's team of investigators, coordinated by Dr. P. Willson, have been investigating methods of controlling this disease by: (a) developing sensitive techniques to diagnose infection, especially in carrier animals, so that infected pigs can be culled; (b) evaluating immunization to prevent both acute and chronic forms of the disease; (c) monitoring environmental stressors responsible for precipitating acute outbreaks.

Diagnostic Tests — Progress has occurred in all three areas of investigation. A sensitive ELISA assay was developed and used to test sera from hundreds of pigs in dozens of herds. This test is being evaluated as a means of identifying infected herds, and perhaps individual pigs within herds. This will help prevent introduction of infected animals into clean herds. The results indicate that this test is much more sensitive than the previously used methods. However, some false positive and false negative results have been observed. Hence, additional animal screening in herds known to be free of, or infected with **Haemophilus pleuropneumoniae** is under way.

Vaccine Development — Although some of the commercially available vaccines reduced some losses due to acute disease, none of those tested significantly reduced the carrier state. Hence, one of VIDO's goals is to produce and test more effective vaccines against **Haemophilus pleuropneumoniae.** A number of experimental vaccines have been developed and tested in combination with various adjuvants. At present, four different vaccines have been developed which can prevent acute disease and at least one reduces the number of chronic carriers which develop following challenge exposure to an aerosol of **Haemophilus pleuropneumoniae**. Studies are continuing in an attempt to develop the antigen-adjuvant combination which provides optimum immunity.

A.D. Osborne,
MRCVS, DVSM, FRCPath, Microbiology W.C.V.M.

Stress — Stressors, such as transportation and temperature extremes are thought to play a role in precipitating acute clinical disease. Experiments are in progress to identify how various stress factors such as transportation, mixing and temperature fluctuations affect the pig's susceptibility to infection.

VIDO Swine Technical Group — The members of the VIDO Swine Technical Group have experience and expertise in many areas of swine production. They include producers, engineers, veterinarians, nutritionists, government specialists and others who volunteer their time and pool their talents in order to produce information which will help Canadian swine producers. During the past year the Group has published several articles in the Western Hog Journal under the heading "Helpful Hog Hints" and has advised several groups including Canada Plan Services and the Federated Humane Societies of Canada.

The major work, however, has been to start designing a "Farrowing Bulletin" which will guide producers through the decisions necessary for planning and building an efficient swine farrowing facility. This booklet will not only provide detailed construction plans for farrowing barns, but will also outline the rationale for various construction recommendations. Additional emphasis will be placed on obtaining adequate ventilation and on proper operating principles for farrowing units. This booklet will be available next year.

Neonatal Diarrhea Program

The objective of this program is to develop methods of preventing and controlling viral and bacterial diarrhea (scours) in young calves. Although a large number of potential pathogens are capable of inducing the disease, two viruses (rotavirus and coronavirus), and one bacterium **(E. coli)** are among the major causes of neonatal diarrhea in

REPORT FROM THE ASSOCIATE DIRECTOR (RESEARCH)

— Dr. L. A. Babiuk

Canada. **E. coli** appears to be the major pathogen in calves during the first five days of life, whereas the viruses can cause problems in animals up to three weeks of age and older. There are also many instances where a calf or a herd may be infected with any combination of these enteric agents. When these mixed infections occur the disease is generally more severe.

Calf Scour Vaccine — Since these three pathogens are some of the major ones causing the disease, control of them would dramatically reduce the direct economic losses which occur annually. VIDO has developed two **E. coli** vaccines. VICOGEN was the world's first vaccine for **E. coli** diarrhea in calves. It has been available to cattle producers since 1978. This year, VIDO licensed the rights to a second **E. coli** vaccine to BIOSTAR Inc. BIOSTAR subsequently licensed the commercial rights to this vaccine to Langford Laboratories of Guelph, Ontario. It is now marketed under the Langford Laboratories trade name of ECOLAN. ECOLAN is a subunit vaccine which contains several protective antigens to **E. coli**.

C.F. Crouch,
BSc, PhD, Virology

Work is proceeding to develop a vaccine containing rotavirus and coronavirus, the two most common viral causes of calf scours. A challenge model has been established whereby diarrhea can be induced in specific pathogen-free calves by oral infection (the natural route of infection) with these viruses. Using this model, the level of specific antibody required in the milk to prevent diarrhea and virus shedding following challenge was established. Having established the protective levels of antibody required in the milk, cattle are being immunized with a combined experimental vaccine containing the two viruses to see whether protective milk antibody levels can be achieved. If successful, this viral vaccine will be combined with ECOLAN to provide a trivalent vaccine against the three most common forms of calf scours.

M.I.J. Sabara,
BSc, MSc, PhD Molecular Biology

Biotechnology Vaccine Development — Although a conventional rotavirus-coronavirus vaccine is presently being tested, attempts to improve and develop a second generation of rotavirus and coronavirus vaccines are already in progress. This is being done by modern biotechnological methods.

In order to use biotechnology for vaccine production, it is important to characterize the virus at the molecular level. This has been done by developing monoclonal antibodies to the proteins of rotavirus and coronavirus. The first step involved producing monoclonal antibodies that bind to the virus and prevent attachment of the virus to animal cells (neutralize the virus). Secondly, by identifying the specific virus proteins which react with these neutralizing monoclonal antibodies, it was possible to select those proteins that should be used in a vaccine. This has been achieved for both rotavirus and coronavirus.

G.R. Hudson,
BSc, PhD, Molecular Biology

A. Verbeek,
BSc, MSc
Graduate Student

D. Deregt
BSc, DVM
Graduate Student

In a further step, monoclonal antibodies were used to identify the specific amino acid sequence or epitope of the rotavirus protein that stimulates protective responses. This epitope was found to be common to two different serotypes of bovine rotavirus. This is an important discovery because it indicates that different rotaviruses possess common neutralizing proteins. Further studies are in progress to determine whether other bovine rotavirus serotypes contain this specific series of amino acids. The immunogenicity of the specific protective region is also being tested, and preliminary results indicate that animals can develop immunity to this small protein. Hence, one synthetic peptide vaccine containing this region may induce protection against a number of rotavirus serotypes in different animal species.

In addition to identifying the protective proteins, the genes coding for these proteins have also been identified and cloned. Attempts are now in progress to express these genes in various systems for use as potential recombinant DNA produced vaccines. Similar studies are in progress with the coronavirus. Thus advances are being made in developing viral vaccines by a variety of approaches.

Monoclonal antibodies directed against the neutralizing regions are also being tested in the **in vivo** calf challenge model to determine whether they could be used as a means of passive immunization against viral diarrhea.

Epidemiology of Scour Causing Viruses — In an attempt to better understand the epidemiology of rotaviruses and coronaviruses and perhaps to develop better management techniques, VIDO has used a sensitive ELISA

assay to follow virus shedding from infected animals. Infection of young animals results in a rapid increase in virus shedding in the manure which is correlated with the occurrence of diarrhea. If these animals are reinfected after six months of age, some of them become chronically infected and shed coronavirus in their manure for extended periods of time, possibly for life. Since the presence of the virus in the intestine induces an immune response, antibody is produced and attaches to the virus. This antibody generally interferes with virus detection using conventional methods. To detect this virus-antibody complexes an ELISA assay was developed and this assay was used to follow shedding of virus in the manure of six different cows. All cows continuously shed virus-antibody complexes over a period of 12 weeks. In each animal, virus-antibody complexes were shed continuously, and free virus was also shed occasionally. This suggests that these carrier cows act as a reservoir for infectious virus and transmit it to newborn calves. Studies are in progress to determine what percentage of normal cattle are chronic shedders of these viruses. Attempts have also been made at modulating the animals immune response to see if shedding patterns can be altered. Unfortunately, methods used so far have interrupted shedding only temporarily.

Thus it appears that adult cows are the major source of infection for neonates, and it may not be possible to prevent the shedding. However, using ELISA assays it may be possible to detect carrier cows and cull or isolate them from the herd before calving. This could help reduce the viral load in the environment and presumably reduce the rate of infection of neonates. Hence, in the future it may be possible to screen cows before the onset of calving to determine which ones are "clean" and which are "carriers" and thus reduce the number of scour outbreaks which occur each year.

Bovine Respiratory Disease Program

Bovine respiratory disease is one of the major disease problems in beef and dairy cattle. It is most important in calves entering feedlots. This disease is caused by the stress of various factors including management, viruses and bacteria. The hypothesis of how this disease develops is that the stress of transportation, vaccination, diet alterations and mixing of cattle in feedlots results in a depression of the immune response. Furthermore, the confinement provides an excellent opportunity for viruses, present in a few animals, to spread rapidly and infect other susceptible animals. Virus infection leads to further immunosuppression thus allowing bacteria (predominantly **Pasteurella haemolytica**) to colonize the lung and cause pneumonia (shipping fever). Due to the multifactorial nature of this disease complex, investigations into the factors that predispose animals to infection as well as the infectious agents involved in inducing the disease are being conducted.

Epidemiology of Shipping Fever

S.H. Wilson,
PVM, DVM, MPVM,
Epidemiology

Dr. Susan Wilson is continuing her study on identifying the "risk factors" that affect the occurrence of shipping fever in feedlots. This study is being done in Alberta feedlots in collaboration with Alberta Agriculture.

Data collection started in 1981 and was completed this year. In total, 2,010 lots of cattle which entered seven feedlots were studied. The lots were classified as containing calves only, yearlings only, or a mixture of calves and yearlings. A summary of the average morbidity and mortality rates of cattle in the different categories is shown in Table 1. As can be seen from the Table, the morbidity and mortality rates were more than twice as high in unmixed calf lots (22.5% and 1.6%) than in unmixed yearling lots (10.4% and 0.6%). The rates were intermediate (14.7% and 1.0%) in the mixed lots.

While these rates describe the magnitude of the problem in each of the different categories, they do not help identify the factors responsible for causing disease. Further analysis showed that almost all of the disease occurred in only 44% of the calf lots, 15% of the yearling lots and 20% of the mixed lots. The emphasis in the next year of the project will be to determine how and why these "high risk" lots differed from those in which the level of disease was very low.

Table 1.
Average Morbidity and Mortality Rates for Cattle in Alberta Feedlot Study 1981 - 1984

	Unmixed Calves		Unmixed Yearlings		Mixed Lots		Total	
Total Number	53,340		139,230		44,650		237,200	
Number Treated or Found Dead	13,807	22.5%[a]	14,571	10.4%[a]	6,554	14.7%[a]	34,932	14.5%[a]
Number Which Died	865	1.6%[b]	860	0.6%[b]	452	1.0%[b]	2,177	0.9%[b]

[a] Morbidity Rate = The percentage of animals which became sick calculated as the percentage of the total number of animals in this category which received a first treatment or which were found dead before treatment.

[b] Mortality (or death) Rate = Calculated as the percentage of the total number of animals in this category which died.

REPORT FROM THE ASSOCIATE DIRECTOR (RESEARCH)

— Dr. L. A. Babiuk

T.J.G. Raybould, BSc, PhD, Microbiol Immunochemistry

Pasteurella Vaccine Development — Studies are in progress with **Pasteurella haemolytica** in attempts to identify the antigens involved in protecting against bacterial infection of the lungs. In this instance, monoclonal antibodies to a variety of surface proteins of the bacterium as well as to the cytotoxin (a component of the bacterium which kills bovine white blood cells) have been prepared. These monoclonal antibodies have been used to help purify various proteins from bacterial extracts. These are presently being investigated as potential subunit vaccines. This is being done first in a mouse model, and if some of these extracts or polypeptides are protective in mice, they will be tested for efficacy in cattle.

One of the major reasons for infection (colonization) of the lung by **Pasteurella haemolytica** is that immunosuppression occurs as a result of stress and viral infection. This immunosuppression prevents the clearance of **Pasteurella haemolytica**. The influence of stress and viral infection on the host's immune response has been identified and methods are now being explored into ways it may be possible to enhance the immune response in infected animals. It is hoped that immune enhancement combined with better vaccines will prevent colonization of the lung, and thus reduce morbidity and mortality caused by shipping fever.

Infectious Bovine Rhinotracheitis (IBR) — One of the major viruses involved in the bovine respiratory disease complex is bovine herpes virus-1 or infectious bovine rhinotracheitis (IBR). Although there are vaccines licensed to protect against IBR, these vaccines haven't proven to be successful in eliminating viral infections under feedlot conditions. In an attempt to develop a better vaccine, monoclonal antibodies have been developed to the virus proteins and the specific proteins involved in neutralizing the virus have been identified. Of the 33 proteins produced by IBR only three are important in stimulating protection. The specific genes coding for these antigens are presently being identified in the hopes of producing recombinant DNA vaccines. These three protective antigens have been purified using monoclonal antibodies and tested for their ability to induce immunity in animals. The proteins did induce protective antibody which is additional evidence that they are the ones to use in a vaccine.

In addition, individual proteins were used to develop an ELISA assay to detect animals previously infected with IBR. Animals that have antibody to IBR may not be exported to countries that do not have the disease, since once infected, even with vaccine virus, animals remain infected for life. Since it is not possible to differentiate vaccinated animals from carriers of latent virulent virus, exportation of all antibody positive animals is restricted. Vaccination with the recombinant DNA subunit vaccine being developed, combined with the ELISA assay would be able to differentiate between animals exposed to field strains of virus and subunit vaccines. Thus animals could be protected from infection by vaccination with the subunit vaccine and still be exported if the need should arise.

As is the case with rotavirus and coronavirus (Neonatal Disease Program), attempts are being made, using monoclonal antibody, to identify the specific regions of the proteins involved in inducing a protective immune response so that synthetic peptide vaccines can also be produced.

RESEARCH COLLABORATORS

It is again a privilege to acknowledge scientists at other universities and institutions which have collaborated with the VIDO research staff. These include the following:

E. Barber - Department of Agricultural Engineering, University of Saskatchewan, Saskatoon.
J.E.C. Bellamy - Department of Veterinary Pathology, Western College of Veterinary Medicine, Saskatoon.
G. Bohac - Agriculture Canada's Animal Disease Research Institute, Lethbridge.
J. Cho - Agriculture Canada's Animal Disease Research Institute, Lethbridge.
T.L. Church - Head, Preventive Medicine Branch, Animal Health Division, Alberta Department of Agriculture, Edmonton.
J.W. Costerton - Department of Biology, University of Calgary.
G.H. Green - Department of Agricultural Engineering, University of Saskatchewan, Saskatoon.
E. Janzen - Department of Veterinary Clinical Studies, Western College of Veterinary Medicine, Saskatoon.
K. Jericho - Agriculture Canada's Animal Disease Research Institute, Lethbridge.
B. Kingscote - Agriculture Canada's Animal Disease Research Institute, Lethbridge.
M. Makarechian - Department of Animal Science, University of Alberta, Edmonton.
S.W. Martin - Ontario Veterinary College, Guelph.
D. McCartney - Agriculture Canada's Animal Disease Research Institute, Melfort, Saskatchewan.
J.M. Naylor - Department of Veterinary Internal Medicine, Western College of Veterinary Medicine, Saskatoon.
A.D. Osborne - Department of Veterinary Microbiology, Western College of Veterinary Medicine, Saskatoon.
M. Perry - National Research Council of Canada, Ottawa.
O.M. Radostits - Chairman, Department of Veterinary Internal Medicine, Western College of Veterinary Medicine, Saskatoon.
C. Riddell - Department of Veterinary Pathology, Western College of Veterinary Medicine, Saskatoon.
J.R. Saunders - Department of Veterinary Microbiology, Western College of Veterinary Medicine, Saskatoon.
J.L. Spencer - Agriculture Canada's Animal Disease Research Institute, Nepean.
D. Spurr - Agriculture Canada, Saskatoon.
R.G. Thomson - Department of Veterinary Pathology, Western College of Veterinary Medicine, Saskatoon.
M.R. Wilson - Ontario Veterinary College, Guelph.
G. Woode - Department of Veterinary Microbiology, Western College of Veterinary Medicine, Saskatoon.
W.D.G. Yates - Agriculture Canada's Animal Disease Research Institute, Lethbridge.

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LIST OF PUBLICATIONS AND PRESENTATIONS BY VIDO STAFF

Research Publications in Scientific Journals

L.A. Babiuk, Sabara, M.I. and Hudson, G.R. 1984. Rotavirus and coronavirus infections in animals. Progress in Vet. Med. 1:1-32.

H. Bielefeldt-Ohmann, Filion, L.G. and Babiuk, L.A. 1984. Cellular interactions in the generation of bovine Con-A suppressor cells, and in the mitogen proliferation response. Vet. Immunol. Immunopath. 6:307-320.

H. Bielefeldt-Ohmann and Babiuk, L.A. 1984. Effect of bovine recombinant alpha interferon on inflammatory responses to bovine phagocytes. J. Interferon Res. 4:29-263.

H. Bielefeldt-Ohmann and Babiuk, L.A. 1984 **In vitro** generation of hydrogen peroxide and superoxide anion by bovine polymorphonuclear neutrophilic granulocytes, blood monocytes and alveolar macrophages. Inflammation 8:251-275.

H. Bielefeldt-Ohmann, Filion, L.G. and Babiuk, L.A. 1984. Bovine monocytes and macrophages: An accessory role in suppressor cell generation by Con A and in lectin induced proliferation. Immunol. 50:189-197.

R. Chan, Acres, S.D. and Costerton, J.W. 1984. Morphological examination of cell surface structures of enterotoxigenic strains of **Escherichia coli.** Can. J. Microbiol. 40:451-460.

C.F. Crouch, Raybould, T.J.G., Acres, S.D. 1984. A monoclonal antibody capture enzyme-linked immunosorbent assay for the detection of bovine enteric coronavirus. J. Clin. Microbiol. 19:388-383.

C.F. Crouch and Acres, S.D. 1984. Prevalence of rotavirus and coronavirus antigens in the faeces of normal cows. Can. J. comp. Med. 48:340-342.

L.G. Filion, Willson, P.G., Bielefeldt-Ohmann, H. Babiuk, L.A. and Thomson, R.G. 1984. The possible role of stress in the induction of pneumonic pasteurellosis. Can. J. comp. Med. 48:268-274.

L. Filion, McGuire, R. and Babiuk, L.A. 1983. The nonspecific immunosuppressive effect of BHV-1 infection in cattle on bovine leukocyte functions. Infect. Immun. 42:106-112.

E.D. Janzen, Stockdale, P.H.G., Acres, S.D. and Babiuk, L.A. 1984. Therapeutic and prophylactic effects of some antibiotics on experimental shipping fever. Can. Vet. J. 25:78-81.

W.O. Martin, Acres, S.D., Janzen, E.D., Willson, P.J. and Allen, B. 1984. A field trial of preshipment vaccinations of calves. Can. Vet. J. 25:145-147.

R.L. McGuire and Babiuk, L.A. 1984. Evidence for defective neutrophil functions in calves exposed to Infectious Bovine Rhinotracheitis. Vet. Immunol. Immunopath. 5:259-271.

M.B. Perry and Babiuk, L.A. 1984. Structure of the polysaccharide chains of **Pasteurella haemolytica** (Serotype 4) lipopolysaccharide. Can. J. Biochem. 62:108-114.

L. Petrie, Acres, S.D. and McCartney, D.H. 1984. The yield of colostrum and colostral gammaglobulins in range cows and the absorption of colostral immunoglobulins by range beef calves. Can. Vet. J. 25:273-279.

M.I. Sabara and Babiuk, L.A. 1984. Identification of bovine rotavirus gene and gene products influencing cell attachment. J. Virol. 51:499-509.

G.N. Woode, Kelson, N.E. Simpson, T.F., Gaul, S., Evans, L.E. and Babiuk, L.A. 1983. Antigenic relationships among some bovine rotaviruses, serum neutralization and cross-protection in gnotobiotic calves. J. Clin, Microbiol. 18:358-364.

W.D.G. Yates, Stockdale, P.H.G., Babiuk, L.A. and Smith, R.S. 1983. Prevention of experimental bovine pneumonic pasteurellosis with an antigen of **Pasteurella haemolytica.** Can. J. Comp. Med. 47:250-256.

Contributed Papers in Published Proceedings and Abstracts

D. Deregt, Crouch, C.F., Sabara, M., Gilchrist, J.E. Babiuk, L.A. and Hudson, G.R. 1983. Preliminary studies of a bovine coronavirus (BCV) antigen responsible for neutralization. Proc. 4th Int. Symposium on Neonatal Diarrhea. Veterinary Infectious Disease Organization, Saskatoon, Saskatchewan, pp. 117-133.

D. Deregt, D., Crouch, C.F. Sabara, M., Gilchrist, J.E., Babiuk, L.A. and Hudson, G.R. 1984. Characterization of bovine coronavirus (BCV) glycoproteins using monoclonal antibodies. VIth Int. Cong. Virol., Sendai, Japan. Abst. No. W22-3.

A.D. Osborne, Saunders, J.R. and Willson, P.J. Some observations on **Haemophilus pleuropneumoniae** infection in pigs with particular reference to the effects of stress. 1984. 8th IPVS Congress, Ghent, Belgium.

M. Sabara, Gilchrist, J.E. Babiuk, L.A. and Hudson, G.R. 1984. Characterization of the major bovine rotavirus glycoprotein. VIth International Congress of Virology, Sendai, Japan. Abst. No. P9-12.

M. Sabara, Gilchrist, J., Babiuk, L.A. and Hudson, G.R. 1983. A study of the bovine rotavirus type specific antigen. Proc. 4th Int. Symposium on Neontal Diarrhea. Veterinary Infectious Disease Organization. Saskatoon, Saskatchewan. pp. 28-47.

S. van Drunen Littel-van den Hurk, van den Hurk, J.V. and Babiuk, L.A. 1984. Antigenic and immunogenic characteristics of bovine herpesvirus type-1 (BHV-1) glycoproteins. International Herpesvirus Workshop. Seattle, WA. p. 270.

S. van Drunen Littel-van den Hurk, van den Hurk, J.V., Misra, V. and Babiuk, L.A. 1983. Monoclonal antibodies, specific for bovine herpesvirus type 1 glycoproteins. International Herpesvirus Workshop, Oxford, England. p. 274.

Chapters in Books, Expository and Review Articles

L.A. Babiuk, and Bielefeldt-Ohmann, H. 1984. Effect of levamisole and bovine interferon alpha on bovine immune responses and susceptibility to bovine herpesvirus-1. In Chemcial Regulation of Immunity in Veterinary Medicine. Ed. M. Kende, J. Gainer and M. Chirigos. Alan. R. Liss Inc. N.Y. pp. 433-422.

L.A. Babiuk and Acres, S.D. 1984. Experimental models for bovine respiratory diseases. In Bovine Respiratory Disease: A Symposium. Texas A&M University Press. Ed. R.W. Loan. pp. 287-325.

T.H. Flewett and Babiuk, L.A. 1984. Prospects for rotavirus vaccines in man and animals. In Control of virus diseases. Ed. Kurstak, E. and Marusyk, R. Marcel Dekker Inc., New York. pp. 57-65.

M. Sabara and Babiuk, L.A. 1983. The significance of rotavirus electrophoretypic heterogeneity within individual bovine rotavirus isolates. In Double-Standard RNA viruses. Ed. R. Compans and D.H.L. Bishop. Elseviers Science Publ. Co. Amsterdam. pp. 95-106.

Research Presentations or Posters at Meetings

Acres, S.D. Resistance to Infectious Diseases in Farm Animals. First J.G. O'Donoghue Memorial Lecture. Sponsored by the Alberta Department of Agriculture and the Department of Animal and Poultry Science, University of Alberta. Sept. 1983. Edmonton, Alberta.

Acres, S.D. Controlling Neonatal Pathogens to Increase Calf Livability; Judicious Use of Vaccines and Biologics in Preventive Medicine Calf Programs. 16th Annual Conference of the American Association of Bovine Practitioners. Nov. 1983. Oklahoma City, Oklahoma.

Babiuk, L.A. and Acres, S.D. Experimental models for bovine respiratory disease. North American Symposium on Bovine Respiratory Disease. Sept. 1983. Amarillo, Texas.

Babiuk, L.A. Effect of levamisole and bovine interferon alpha on bovine immune responses and susceptibility to bovine herpesvirus-1. Chemical Modulators in Immunity. Sept. 1983. Washington, D.C.

Babiuk, L.A. Viral-Bacterial Synergistic Interaction in Respiratory Disease. June 1984. Canadian Federation Biological Societies Annual Meeting - Saskatoon, Sask.

Babiuk, L.A. Viral induced immunosuppression by BHV-1 virus. June 1984. Workshop on viral induced Immunosuppression. Sponsored by Medical Research Council of Canada. Montreal, Quebec.

Babiuk, L.A. Bovine herpesvirus. July 1984. Canadian Veterinary Medical Association Convention, Guelph, Ontario.

Willson, P.J. Haemophilus pneumonia. March 1984. Western Hog Growers Association Annual Meeting. Wainwright, Alberta.

Willson, P.J. VIDO Swine Research Program. March 1984. SISCO 8th Annual Meeting, Saskatoon, Sask.

Willson, P.J. The use of ELISA tests in the diagnosis of **H. pleuropneumoniae** infection. 1984. Canadian Veterinary Medical Association 37th Annual Convention. Guelph, Ontario.

Publications in Livestock Journals, Newsletters and Technical Bulletins

Acres, S.D. Resistance to Infectious Diseases in Farm Animals. First J.G. O'Donoghue Memorial Lecture — Agriculture and Forestry Bulletin, University of Alberta, Vol. 7, No. 1, March, 1984.

VIDO Swine Technical Group (Don Lidster), Management of Front Creeps. West. Hog J. (Winter) 1984.

VIDO Swine Technical Group (Peter Hill), Saving Pigs by Cross-Fostering. West. Hog J. (Spring) 1984.

VIDO Swine Technical Group (Paul Vielfaure and Dennis Hodgkinson), Increased Profit with Anti-Crush Bars. West. Hog J. (Fall) 1984.

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