A MESSAGE FROM THE DIRECTOR

This 1965 Annual Report is prepared especially for livestock owners, cattle dealers, farm business leaders, rural bankers, veterinarians, extension workers, and agricultural cooperatives. As an expression of our appreciation of their aid and interest, the names are listed in this report of those helping to support the research program of the Institute.

The Veterinary Virus Research Institute began work in September, 1950, as a center for correlated studies of microbiology, pathology, and immunology of diseases of different species of animals. In 1955, the microbiology laboratory was built; in 1958, with funds from National Institutes of Health and Cornell, a control laboratory was constructed; in 1960, the first endowed professorship of nutrition was established; and, in 1963, an additional endowed professorship was added. Now, funds for much-needed expansion of the Institute have been requested from the National Institutes of Health to allow more workers and additional modern equipment.

From the beginning, work was planned and facilities constructed so that, for the infectious diseases of animals, research could be done by the use of the same methods, equipment, and scientific techniques used for studies of the diseases of human beings. Different diseases of one species, such as cattle, could be studied, and the same disease, such as leptospirosis could be compared in cattle, swine, and dogs. Buildings suitable for such work were constructed. Individual units were built in order to prevent cross-infections with viruses that might be airborne or otherwise transferred accidentally.

During the past year, several additional investigators lent their assistance to the research program. Those taking part have been:

Dr. James A. Baker
Dr. Ben E. Sheffy
Dr. Leland E. Carmichael
Dr. Robert F. Kahrs
Dr. Max Appel
Dr. Daouda Sylla
Dr. Douglas S. Robson
Dr. Hadley C. Stephenson
Prof. Clarence G. Bradt

Director
Assistant Director
Associate Professor
Research Assistant
Visiting Investigator
Visiting Investigator
Statistical Consultant
Consultant
Consultant

Twenty-six additional people, including laboratory and animal technicians, office secretaries, and maintenance employees complete the Institute's working staff.

As results of the Institute's work have developed, veterinarians and livestock owners have been kept informed. Numerous
articles relating to the work have appeared in veterinary journals and the farm press. Meetings have been held at the Institute and elsewhere, and from time to time, special reports relating to the Institute's findings have been prepared and mailed to cooperators.

Funds have been contributed mainly by livestock people themselves, and affiliated business enterprises for the conduct of the Institute's laboratory and field programs on cattle and other diseases. The table below shows the primary sources of these funds collected to aid the research during the past three years.

<table>
<thead>
<tr>
<th>Dairy and Livestock Contributions</th>
<th>July 1, to June 30</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Contributors</strong></td>
<td><strong>1962-63</strong></td>
</tr>
<tr>
<td>Farm Cooperatives</td>
<td>Number</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Farm Cooperatives</td>
<td>72</td>
</tr>
<tr>
<td>Agricultural Business</td>
<td>18</td>
</tr>
<tr>
<td>Cattle Dealers and Markets</td>
<td>13</td>
</tr>
<tr>
<td>Banks, N. Y. State</td>
<td>8</td>
</tr>
<tr>
<td>Individuals</td>
<td>22</td>
</tr>
<tr>
<td><strong>TOTALS</strong></td>
<td>133</td>
</tr>
</tbody>
</table>

In conclusion, this year has been very worthwhile, and one of great value to the dairy and livestock industries. Many cattle disease problems of the farm have been investigated, and some solutions found. The cooperation and financial assistance of livestock industry people have been exceedingly helpful and are much appreciated by our staff.

**CATTLE INVESTIGATIONS**

Cattle Diseases: As all cattle owners know, breeding troubles, abortions, mastitis, winter dysentery, decreased milk production during sickness, and the death of animals, especially young calves, are problems that lower incomes, and in some circumstances can ruin a business. The only insurance against such losses is the possibility of prevention. Each infectious disease has a cause, and when the cause can be found, prevention through
vaccination becomes a possibility. Vaccination, in order to prevent disease should be considered a profitable management practice when the total cost of vaccination is less than the probable loss from disease.

Find Cause, First Step: In the laboratory as the first problem, distinguishing the various diseases must be attempted, with isolation and identification of a particular virus or bacteria that causes the disease, as well as any that may accompany the original infection and cause additional complications, such as pneumonia. The single disease must be studied and its typical symptoms described. Its pure organisms must be kept alive, under suitable conditions, for further study, for making vaccines, and for sending to other scientists in order to estimate the occurrence of the disease in different parts of the country, and in some cases of the world. This allows prevalence of the disease to be assessed, and an estimate to be made of its probable economic importance. The owners or others who take care of the animals are always the first to discover when disease affects their herd. Sometimes these "natural" outbreaks of disease are caused by several types of organisms acting almost together or one will follow shortly after another, as resistance of the sick animals becomes lower.

In our work at the Veterinary Virus Research Institute, the following information has been developed based upon laboratory studies and field surveys.

<table>
<thead>
<tr>
<th>Disease</th>
<th>Cause</th>
<th>Average Within Herd Incidence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bovine Virus Diarrhea (BVD)</td>
<td>Virus</td>
<td>52%</td>
</tr>
<tr>
<td>Infectious Bovine Rhinotracheitis (IBR)</td>
<td>Virus</td>
<td>12%</td>
</tr>
<tr>
<td>Parainfluenza 3</td>
<td>Virus</td>
<td>45%</td>
</tr>
<tr>
<td>Leptospirosis</td>
<td>Bacteria</td>
<td>4%</td>
</tr>
<tr>
<td>Pneumoenteritis of Calves</td>
<td>Adenovirus ?</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

Prevention, Second Step: Knowing the cause and incidence of four of these commonly found conditions, a decision was made to attempt their prevention by vaccination as well as to evaluate whether such vaccination would be a worthwhile management practice in general. Obviously, if single vaccines for each separate disease could be combined into one combination vaccine for all four diseases and, therefore, could be given by one inoculation, this would lessen greatly the total cost of vaccination, and afford a great saving in labor.
The task set for the scientific staff was not an easy one. The causative organism of each separate disease had to be reduced in virulence in order to be safe when inoculated; then tests had to be made to judge its effectiveness, first singly, and then as a combined vaccine. Once this was done, a field study could be planned. A field study must include enough cattle to give significant results. The following points were investigated:

1. Safety
2. Efficacy
3. Best age for vaccination
4. Nature of serological response
5. Duration of serological response
6. Correlation of serological response with resistance to natural challenge
7. Spread of modified live virus components of vaccine
8. Inhibition of one agent by another

Three Year Field Study Plan Designed: A three year field study of nine New York dairy herds was designed in order to test the feasibility of a combination vaccine program for dairy cattle and to establish criteria for evaluation of combined vaccines. Three hundred ninety-one cattle were vaccinated with combination vaccines that contained: (1) modified live infectious bovine rhinotracheitis (IBR) virus; (2) bovine virus diarrhea (BVD) virus; (3) parainfluenza virus; (4) pneumoenteritis virus (B-155) (later shown to be a pleuropneumonia type organism); and (5) Leptospira pomona bacterin. Results were studied serologically and clinically and compared with 796 unvaccinated herdmate controls.

Incidence of Abortions Reduced: The incidence of abortion and retained placenta was significantly lower in the vaccinated group and the incidence of calf septicemia was lower in calves born of vaccinated dams. Clinically, apparent minor, untoward reactions appeared infrequently and the procedures used were judged to be safe.

Between the vaccinated and control groups there were no significant differences in the reported incidence of mastitis, diarrhea, winter dysentery, keratoconjunctivitis, undiagnosed illnesses, infertility, or numbers of animals sold.

Studies on IBR in New York Dairy Cattle: Investigation of naturally occurring outbreaks of infectious bovine rhinotracheitis (IBR) in unvaccinated dairy cattle have indicated that abortion can follow this infection, and that infected cattle are immune for at least 2 1/2 years following exposure.

Determination of Dosage Requirements for Cattle Vaccine: The dosage needed to immunize at least 95% of animals vaccinated with bovine virus diarrhea vaccine has been determined by vaccination.
of 105 susceptible cattle with varying doses of vaccine and then checking the vaccine's efficacy by blood tests one month after vaccination.

Studies on Winter Dysentery: Investigation of 7 winter dysentery epidemics thus far have not yet provided any new clue to the cause of this condition. Vaccines for IBR and bovine virus diarrhea did not prove of value in preventing winter dysentery. Presumably, some organism or condition not yet understood is the cause.

**SWINE STUDIES**

**Transmissible Gastroenteritis (TGE):** This highly infectious virus disease produces a high mortality in baby pigs under two weeks of age. A modified live virus vaccine for this disease has been developed and is being tested.

The SH strain of TGE virus, which produces cytopathic changes in tissue cultured pig kidney cells, was used to develop and standardize serological tests for TGE antibodies. This development enabled rapid progress to be made in the study of the nature of the virus as well as the response of the pigs to the virus. The SH strain has been shown to be similar to field strains of TGE that occurred in various parts of the United States.

The SH strain of TGE virus was serially passed in tissue culture until it no longer produced signs of illness in pigs less than 2 weeks of age, either when fed or when inoculated intramuscularly. Pigs inoculated with the virus, however, did produce serum neutralizing antibodies against it, and this protected pigs exposed to virulent TGE virus.

**NUTRITION RESEARCH**

**Factors Affecting Antibody Production:** The ability of animals to produce high levels of antibodies quickly is important for convalescence from a disease as well as for successful control of disease by vaccination. Investigations are in progress to determine if the ability to produce antibodies against viruses is affected by a deficiency or imbalance of feed nutrients, drugs, or the age of the animal at the time of vaccination.

Newborn pigs did not produce antibodies against hog cholera virus when vaccinated before the age of two weeks; instead, they died. When the age of vaccination was 2-4 weeks, antibodies were not produced until three weeks after vaccination. Older pigs produced antibodies against hog cholera virus 7-10 days after vaccination. Ingestion of non-immune, sow's colostrum did not help newborn pigs produce antibodies earlier.

Dogs that have deficiencies of vitamins, pantothenic acid,
Cornell's Virus Research Institute on Snyder Hill

Drawing Blood on Calf for Virus Disease Tests
The Virus Diseases of Pigs Receive Intensive Study at the Institute
folic acid, and pyridoxine have shown depressed antibody produc-
tion. Dietary requirements of the dog for pantothenic acid were
greater for antibody synthesis than for good growth. Studies with
folic acid deficiency have shown that it is necessary primarily for rapid
synthesis of antibody protein.

PLANS FOR THE FUTURE

Proof has been obtained that a combination vaccine will con-
fer economic benefits as routine management practice. The pre-
cise monetary benefit to livestock owners, however, could not be
obtained in such a short and limited study.

In the study, mothers vaccinated before breeding produced
healthier calves than unvaccinated mothers. This raised the
question of whether vaccination of mothers, with subsequent
transfer of immunity to calves by colostrum, would not be a pro-
fitable practice in itself. It would seem so, especially in a
situation such as in a veal calf operation in which large numbers
of calves are to be assembled. A program of disease prevention
in a veal calf operation is planned to begin later this year,
using vaccinated mothers in addition to controlled environmental
factors, nutrition, and feed additives to control bacterial
infection.

Adenovirus have been suggested as an important element in
producing the pneumoenteritis syndrome in calves. Viruses have
been isolated from sick calves, and will be studied intensively
in the laboratory.

Studies also will continue on nutrition of baby pigs. Work
will be continued with modern improved vaccines for swine dis-
eases.

With expanded facilities and additional personnel the fol-
lowing budget is necessary. It is hoped that these funds can be
obtained so that this vital work can continue without inter-
ruption.

FARM LIVESTOCK RESEARCH BUDGET
1965 - 66

Expenditures

Salaries

<table>
<thead>
<tr>
<th>Description</th>
<th>Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Research associate</td>
<td>$10,000</td>
</tr>
<tr>
<td>Two laboratory technicians</td>
<td>10,000</td>
</tr>
<tr>
<td>Stenographer (part-time)</td>
<td>2,000</td>
</tr>
<tr>
<td>Animal technician</td>
<td>5,000</td>
</tr>
<tr>
<td>Statistician and consultant</td>
<td>4,000</td>
</tr>
</tbody>
</table>
Laboratory Operations

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supplies and feeds for test animals</td>
<td>$1,500</td>
</tr>
<tr>
<td>Vaccines</td>
<td>500</td>
</tr>
<tr>
<td>Test animals purchased and raised</td>
<td>2,000</td>
</tr>
<tr>
<td>Tissue culture supplies</td>
<td>5,000</td>
</tr>
<tr>
<td>Postage, printing and supplies</td>
<td>500</td>
</tr>
</tbody>
</table>

Travel

<table>
<thead>
<tr>
<th>Item</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field service</td>
<td>500</td>
</tr>
<tr>
<td>Scientific meetings</td>
<td>500</td>
</tr>
</tbody>
</table>

TOTAL BUDGET 1965-1966 $41,500

Matching funds will be provided by Cornell University (from other sources) for buildings, laboratory equipment, maintenance and for other overhead costs of operation.

RECOGNITION OF CONTRIBUTORS

CORNELL'S VETERINARY VIRUS RESEARCH INSTITUTE

FARM ANIMAL RESEARCH FUND

1964 - 1965

FARM COOPERATIVES

Agway, Inc.
Boonville Farms Cooperative, Inc.
Dairymen's League Cooperative Association, Inc.
Eastern Milk Producers Cooperative Association, Inc.
and the following Locals:

<table>
<thead>
<tr>
<th>Location</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fort Plain</td>
<td>New Berlin</td>
</tr>
<tr>
<td>Frasers</td>
<td>New Haven (Vt.)</td>
</tr>
<tr>
<td>Grand Gorge</td>
<td>North Chatham</td>
</tr>
<tr>
<td>Little Falls</td>
<td></td>
</tr>
</tbody>
</table>

Genesee Valley Cooperatives, Inc.
New York Hereford Association
New York Holstein-Friesian Association
New York State Guernsey Breeders Cooperative, Inc.
Niagara Frontier Cooperative Milk Producers
Bargaining Agency, Inc. and member cooperatives as follows:

<table>
<thead>
<tr>
<th>Cooperative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arcade Farms Cooperative, Inc.</td>
</tr>
<tr>
<td>Aurora Independent Milk Producers Cooperative, Inc.</td>
</tr>
<tr>
<td>Collins Producers Cooperative, Inc.</td>
</tr>
<tr>
<td>Erie County Milk Producers Cooperative, Inc.</td>
</tr>
<tr>
<td>Frontier Federated Cooperatives, Inc.</td>
</tr>
<tr>
<td>Hollisville Milk Producers Cooperatives, Inc.</td>
</tr>
<tr>
<td>Niagara County Milk Producers Cooperative, Inc.</td>
</tr>
</tbody>
</table>
Metropolitan Cooperative Milk Producers Bargaining Agency, Inc. and member cooperatives as follows:

And-Well
Burke
Campbell
Canisteo
Canton
Cape Vincent
Central New York
Chautauqua-Maid
Fair Haven, (Vt.)
Finger Lakes
Fort Edward
Galeton, (Pa.)
Gouverneur
Gracie
Harford
Keuka
Konhokton
Leon

Sullivan County Cooperative Dairy Association, Inc.

CATTLE DEALERS and AUCTION MARKETS

M. Barmann and Sons
Walter M. Baron
Buckenmeyer Brothers, Inc.
Burton Livestock Exchange, Inc.
Morris Butensky
D. R. Chambers and Sons, Inc.
Benjamin E. Doan
Louis Guenzburger
Edward J. Hallock
Hess Livestock, Inc.
Krebs Brothers, Inc.

Herbert Langanke
Luther's Livestock Market
Ring and Stern, Inc.
Nelson R. Rogers
Schultz Potato Farms
Roy A. Tuttle
I. T. and C. A. Welch and Sons, Inc.
Welch Livestock Market, Inc.
C. Campbell White
Harris Wilcox, Inc.

AGRICULTURAL BUSINESSES

Arkport Dairies, Inc.
Beacon Feeds, Div. of Textron, Inc.
Beatrice Foods Company
Breyer Ice Cream Division
Cavalier Gage Company
Conti Packing Company
Cooperdale Dairy Company, Inc.
Davenport Center Dairy, Inc.
DeWitt Packing Company
Elmhurst Milk and Cream Company
Fitchett Brothers, Inc.
Foremost Research Foundation

Goodrich Milk Company, Inc.
Grandview Dairy, Inc.
Hegeman Farms Corporation
Hershey Chocolate Corporation
Karl Ehmer, Inc.
Moorman Manufacturing Company
North Blenheim Creamery Co.
Pine Grove Dairy, Inc.
Queens Farms Dairy Company
M. H. Renken Dairy Company
Sealtest Foods Div., Schenectady
Tobin Packing Company
NEW YORK STATE BANKS

Bank of Avoca
Bank of LeRoy
Chautauqua National Bank
Citizens Central Bank and branches
   at Delevan, Rushford & Silver Springs
Citizens National Bank
First National Bank
First National Bank
First National Bank
First National Bank
Homer National Bank
Lewis County Trust Company
Little Falls National Bank
Lyons National Bank
Montour National Bank
National Bank of Delaware County
   and branches at Andes & Franklin
National Bank of Florida
National Bank of Vernon
National Bank of Waterville
National Bank and Trust Company
   and branches at Afton, Bainbridge,
   Earlville, Grand Gorge, Margaretville,
   New Berlin, Sherburne & South Otselic
Ogdensburg Trust Company
State Bank of Albany
State Bank of Chittenango
United National Bank
Valley National Bank

INDIVIDUAL CONTRIBUTORS

(Livestock Owners, Veterinarians and Friends of Cornell)

Albany County:
   K. I. Gumaer, DVM
   Harry C. Lewis
   Robert E. Lynk, DVM

Allegany:
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   Robert H. McNinch
   John S. Potter & Son
   Arthur D. Williams

Broome:
   George J. Miller, MD
   Pydish Bros.

Cattaraugus:
   Howard A. Crosby
   John A. Read

Cayuga:
   Clarence Blumer
   Great Gully Farm
   L. S. Riford

Chautauqua:
   Edward Beckerink
   Alfred J. Deakin
   Harold Deakin & Son
   Donald Q. Eno, DVM
   Frank McCutcheon

Avoca
LeRoy
Cherry Creek
Arcade
Wellsville
Hamden
Interlaken
Jeffersonville
Moravia
Homer
Lowville
Little Falls
Lyons
Montour Falls
Walton
Florida
Vernon
Waterville
Norwich
Ogdensburg
Fort Plain
Chittenango
Callicoon
Wallkill
Chautauqua cont.:
Guy L. Stebbins

Chemung:
Neltson D. Chamberlain
Alfred Dalrymple
William T. Smith

Chenango:
Elliott & Smith, DVM's
John R. Gregory
Richard W. Ingalls, DVM
J. P. McLaughlin
Hans F. Weil

Clinton:
Ralph E. Lewis

Columbia:
Stanley N. Chittenden
C. Murray Jenkins, DVM
Paul C. Layer, DVM
John J. Mettler, Jr., DVM

Delaware:
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Fred E. Breth
Howard Cartwright
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Kuppens Bros.
Milton R. Ward

Dutchess:
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Black Watch Farms
Briarcliff Farms, Inc.
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Kenneth F. Chase, MD
Frederick Dreier
Karl Ehmer Farms Corp.
Myron M. Fuerst
Clinton M. Greenwood, DVM
Kent T. Kay, DVM
W. B. Lukens, DVM
Harold E. Martin
Seth T. Merwin
James C. Penney
Thomas Sanford, MD
Gordon D. Voorhis

Erie:
David Donald
William A. Evans
Egburt Farner
Wesley W. Handy
Ralph L. Higley
William F. Long
Leighton Snyder
C. C. Taylor & Son

Essex:
Johnson Orchards
Lee E. Mather
C. T. Newberry, Jr.

Franklin:
Warren B. Mount

Genesee:
Raymond J. Branton
Richard C. Call
Arthur F. Grayson
M. McPherson Harmon
Robert E. Jones, DVM
Gordon Lee Seward

Greene:
Ralph L. Allen

Herkimer:
Pearld Cool
F. David Davy, Jr.
Vincent P. Vangura, DVM
Van Horne Farms
Robert M. Wainwright, DVM

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R. E. Gillett, DVM

Lewis:
Edward Roes

Livingston:
Charles Z. Case
James F. Hammond, DVM
Clayton S. Young, DVM

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E. K. Elmer, DVM
Robert H. Fisher
Daniel F. Gates
Madison cont.:
William Larkin
David W. Yorton

Monroe:
Brockport Animal Hospital
Carey H. Brown
James A. Colby
Robert R. Crump
Max Forash
Luther W. Jennejahn
Philip Liebschutz
Moncony Farms, Inc.
John Proper and
Richard Smith, DVM’s
Paul Wolk

Nassau:
Manuel Weisbuch

Niagara:
Sherwood-Brown Farm

Oneida:
A. C. Anderegg
Charles A. Chopay, DVM
Leo Crane, Jr.
Ernest Eisenhut
Lester Mick, DVM
G. H. & G. A. Palmer
Edward R. Sattler
Summit Crest Farms
W. J. Van De Walker
Earle R. Williams

Onondaga:
Roy A. Bardwell
James Cleverley
A. W. Hudson and Sons
William C. Lipe
Louis A. Mulroy
Eleanore P. O’Neil

Orange:
William Bollenbach
Wisner Buckbee
L. B. Dexter
Brewster A. Felter
George Gibbs
Lester T. Lain
Douglas F. McBride, DVM
W. Lee Moore
Peter Sandfort
Benjamin D. Sears
Harold K. Stickel
Charles T. Wallace

Orleans:
Eugene P. Forrestel
Alan J. Wais

Otsego:
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G. H. Bostwick
Herman Dietrich
Hawver Bros.
Manor House Farms

Putnam:
Richard H. Merrick

Rensselaer:
O. A. Borden & Sons
Fred N. Dorn
Nassau Veterinary Hospital

Schenectady:
Clarence M. Gregg

Schoharie:
Roger Becker
Arne Nissen
S. M. Phillips, DVM

Seneca:
H. K. Fuller, DVM
Leroy J. Foorman

Steuben:
T. J. Beyer, DVM
Donald E. Chatfield
In establishing the Institute, Cornell's Board of Trustees authorized the Treasurer's Office to act as custodian of all funds given in support of the Institute. Donors, therefore, are assured of maximum benefits from their gifts by this supervision of Cornell University officials. Cornell welcomes any gifts or bequests that will help the work of the Institute in its effort to serve the dairy and livestock industries of this state and region. Many friends of Cornell are donors.