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September 19, 2005

Mike Marshall
Secretary of the Senate
State Capitol
Des Moines IA 50319

Margaret Thomson
Chief Clerk of the House
State Capitol
Des Moines IA 50319

Dear Mr. Marshall and Ms. Thomson:

In accordance with House File 816 as passed by the 2005 Iowa General Assembly, this report on the operation of the Veterinary Diagnostic Laboratory (VDL) is hereby submitted to the Governor and General Assembly. The report includes, but is not limited to, the current business structure of the VDL and a comparison to similar laboratories; recent trends in fees for services; the use of other funding sources for the VDL and similar laboratories; and recommendations for changes in the business structure and methods of funding for the VDL.

While Section (d), page 17 of the report contains funding options (Option 2, which recommends a specific appropriations increase to support the VDL), the Board of Regents is not requesting this appropriation. The Board continues to support its multi-year Partnership Plan for Transformation and Excellence.

Please contact me if you have any questions.

Sincerely,

Gary W. Steinke

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cc: Mary Shipman, LSA
Lee Hill, DOM
Legislative Liaisons
Legislative Log

Veterinary Diagnostic Laboratory
Study Group Report
Submitted September 6, 2005

Introduction

Background

A Veterinary Diagnostic Laboratory (VDL) Study Group conducted a study mandated by the 2005 Iowa General Assembly in House File 816. The legislative language requires the following:

The Iowa state university of science and technology shall prepare a report on the operation of the veterinary diagnostic laboratory which shall include, but shall not be limited to, the following information:

- (a) The current business structure of the veterinary diagnostic laboratory, along with a comparison to business structures of similar laboratories at other institutions of higher learning.*
- (b) Recent trends in fees for services charged by the veterinary diagnostic laboratory and by similar laboratories at other institutions of higher learning.*
- (c) The use of other funding sources, including state general fund appropriations for the veterinary diagnostic laboratory and a comparison to funding sources at similar laboratories at other institutions of higher learning.*
- (d) Recommendations for changes in the business structure and methods of funding for the veterinary diagnostic laboratory. The report shall be submitted to the governor and the general assembly not later than October 1, 2005.*

President Geoffroy appointed the VDL study group in June 2005. The members were:

Margaret Pickett, Associate VP for Business and Finance (Chair)
Ellen Rasmussen, Assistant Provost
Mark Chidister, Assistant to the President for Budget Planning and Analysis
Renee Knosby, College of Veterinary Medicine Fiscal Officer
Pat Halbur DVM, PhD, Professor and Interim Chair of Veterinary Diagnostic and Production Animal Medicine (VDPAM), Executive Director of the Iowa State University Veterinary Diagnostic Laboratory (ISU VDL). Halbur recently served as Interim Associate Dean of the ISU College of Veterinary Medicine (ISU-CVM) and as President of the Iowa Veterinary Medical Association (IVMA). Dr. Halbur is a diagnostic pathologist at the ISU VDL.

Dr. Bruce Janke DVM, PhD, Associate Professor in VDPAM and Interim Director of the ISU VDL, provided extensive assistance to the study group including a tour of the facilities, overview of the operational processes and insights into business planning issues and parameters. Dr. Janke is a diagnostic pathologist at the ISU VDL.

To assist in developing the report, the study group worked with a nationally recognized consultant. Dr. Mahlon Vorhies is the former VDL Director at South Dakota State University and former Chair of the Department of Diagnostic Medicine and Pathobiology (which includes the VDL) at Kansas State University. He has served as a consultant in reorganization efforts of the veterinary diagnostic systems in Wisconsin and Mississippi. He was a member of the American Association of Veterinary Laboratory Diagnosticians (AAVLD) Accreditation Team and has reviewed most of the accredited veterinary diagnostic laboratories in the United States. His role on the team was to formulate questions and collect comparative data from veterinary diagnostic laboratories as designated by the committee.

The study group also wishes to acknowledge the contribution of Karen Piconi, President, Persuade and Publish International who assisted with developing the committee report.

Methodology

The study group collected data from veterinary diagnostic laboratories in the following states: Illinois, Kansas, Minnesota, North Carolina, South Dakota, and Wisconsin. With the exception of North Carolina, these states were chosen because of their geographical location in the upper Midwest. North Carolina was chosen because it is similar to Iowa in its heavy concentration in swine and poultry production and competitive relationship with Iowa producers. Data sources included personal interviews, accreditation reports, annual reports, websites, brochures and other promotional materials, and journal articles.

Data published by professional associations and refereed journals

- The 2003 USDA Census was used to determine state animal agriculture values (receipts for livestock and products).
- The Association of American Veterinary Medical Colleges (AAVMC) website and comparative data report.
- The American Veterinary Medical Association (AVMA) website.
- Journal of the AVMA, Food Animal Economics, Vol. 227, No. 3 (August 1, 2005).
- The American Association of Veterinary Laboratory Diagnosticians (AAVLD) website.

Phone interviews with VDL administrators

The majority of comparative information was compiled through personal contact with directors of individual laboratories. The verbal communication provided opportunities to understand the scope and administrative structure of each laboratory. The following sources were used in compiling this report:

- Drs. D. Webb (VDL Director at Galesburg) and G. Niles (VDL Director at Centralia) and Ms. Michelle Sargent (Financial Officer at Urbana) of the State Department of Agriculture Laboratories in Illinois.
- Dr. J. Andrews, Director of the University of Illinois-Urbana Veterinary Diagnostic Laboratory.
- Dr. M. Chengappa, Head of the Department of Diagnostic Medicine and Pathobiology in the College of Veterinary Medicine at Kansas State University at Manhattan, Kansas.
- Dr. J. Collins, Director of the Minnesota Veterinary Diagnostic Laboratory at the University of Minnesota College of Veterinary Medicine.
- Dr. D. Marshall, State Veterinarian and Director of Diagnostic Laboratory Services, at the Commission of Agriculture and Consumer Services and the Office of the State Veterinarian/Diagnostic Laboratories in North Carolina. Also contacted Dr. G. Erickson, the Director of the Rollins Laboratory in Raleigh.
- Dr. D. Zeman, Director of South Dakota Research and Development and Diagnostic Laboratory (SDR&DL) and Head, Department of Veterinary Science, in the College of Agriculture and Biological Sciences.
- Dr. D. Shull, Director of Wisconsin's Department of Agriculture Laboratory at the University of Wisconsin at Madison.

Personal interviews and published data from Iowa State University

- Interviews with Dr. Patrick Halbur, Dr. Bruce Janke, Ms. Renee Knosby, Dr. Gary Osweiler (Professor and former Director of the ISU VDL), and Dr. John Thomson, Dean of the Iowa State University College of Veterinary Medicine.
- ISU VDL's Accreditation Report (FY 2001) and the response to the report (2003).
- ISU VDL's user manual.
- ISU VDL Financial Strategic Plan (Draft 4-1-05)

- *Sustaining High Quality Veterinary Diagnostic Services to Meet the Needs of Iowa's \$6.2 Billion Livestock and Poultry Industry* (Report generated by Dr. Patrick Halbur, June 2005)

Promotional/published materials from veterinary diagnostic laboratories and agencies

- Fiscal Year 2004 annual reports from several of the Veterinary Diagnostic Laboratories, Teaching Hospitals, federal agencies, and colleges were used to determine fiscal year activity as it related to user fee revenues.
- Laboratory and agency web sites.
- Marketing/promotional brochures.
- Published fee schedules.

Data limitations

Because of the dramatic differences among these organizations' administrative structures, scope of services, funding sources, regional and local markets, and budgets, this report can only reflect a comparison in the broadest sense of the word. In addition, during the course of interviews and research, what emerged was a variety of different political and philosophical approaches to VDL missions, the concept of service, the commitment to research, and the delivery of services.

Many laboratories were, as the ISU VDL is, in transition—working from models focusing on providing reactive services toward more sustainable models for growth and cost recovery. Summary reports and written documentation were limited or not available, especially given the fact that some of these laboratories are direct competitors of the ISU VDL. In addition, there is limited similarity among several of the laboratories in documentation and terminology to describe how funding is received, distributed, recorded, counted, directed, and redirected.

Overview of ISU VDL

In order to provide a context for the data presented in the remainder of the report, this section presents a brief description of the ISU VDL and its functions.

Unlike many states where VDLs have been mandated by state government, the original ISU VDL activity began as a service and research component of the ISU Department of Pathology in 1947 with Dr. Paul Bennet as the Director. Today the ISU VDL is a full-service laboratory that provides Iowa livestock owners with access to timely, accurate, and unbiased diagnostic services. It is the only public veterinary diagnostic laboratory in the state and is accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD).

The majority of the 40,000-50,000 annual case submissions to the ISU VDL comes from Iowa livestock producers. The diagnostic process begins when the livestock producer identifies a problem and then contacts a private practicing veterinarian who collects specimens or sends animals to the ISU VDL. Based on the history and knowledge of current disease patterns in the state, region and nation, appropriate tests are conducted on the case specimens. Results and conclusions are communicated back through the local practicing veterinarian to the livestock producer. During the diagnostic process, faculty members in Production Animal Medicine, ISU Extension specialists or veterinarians, or researchers within the CVM with the desired expertise are engaged in helping establish the best practices to address the current problem and prevent future losses for the livestock producer.

ISU VDL interacts with a number of other agencies involved in animal testing and animal health. Of particular interest is the relationship to USDA-run federal laboratories located in Ames. The USDA-run federal laboratories (e.g. NVSL) have much different missions than the ISU VDL and do not represent duplication of function. ISU VDL provides testing and diagnostic consultation for a comprehensive range of domestic animal diseases. If a foreign animal disease is suspected during the workup, appropriate samples are forwarded to NVSL. The VDL business plan which accompanies this report describes these relationships in more detail.

The ISU VDL conducts research that can identify new diseases and threats to animal health. New discoveries at ISU include the discovery of swine hepatitis E virus (affects both humans and pigs), discovery and development of models for porcine circovirus-associated diseases, discovery of a new strain of swine influenza, and investigation of the recent canine influenza outbreaks at Iowa dog tracks.

The ISU VDL provides many opportunities for exposure of professional veterinary students and graduate students to food animal cases and the food supply chain. This access is important for educating future veterinarians and creating leaders to serve the livestock and poultry industries of Iowa and the nation.

Section (a): Business Structure of VDLs

Iowa	<i>2003 Livestock and Products Receipts: \$6.1 Billion</i>
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Iowa State University Veterinary Diagnostic Laboratory (ISU VDL) is a section of the academic department of Veterinary Diagnostic and Production Animal Medicine (VDPAM) within the ISU College of Veterinary Medicine (ISU-CVM). The ISU VDL Director reports to the VDPAM Department Chair who also serves as the Executive Director of the VDL. The VDPAM Department Chair reports to the Dean of the CVM. Both the VDL Director and VDPAM Department Chair serve on the CVM Cabinet. The State Veterinarian reports to the Department of Agriculture. The ISU VDL works cooperatively with the State Veterinarian and the State Department of Agriculture, but there are no formal organizational ties. The Department of Agriculture provides no veterinary testing services.

Illinois	<i>2003 Livestock and Product Receipts: \$1.8 Billion</i>
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The Illinois diagnostic system includes three facilities. Two are operated by the State Department of Agriculture and the third is a university-operated diagnostic laboratory. The State Department of Agriculture operates laboratories at Galesburg and Centralia. Each agricultural laboratory occupies a single-purpose building. The Galesburg building is located on a state mental health campus, and the Centralia building is located on a local community college campus. The laboratory directors report to the State Veterinarian and the Division of Animal Health & Welfare. Separate from the state facilities, the University of Illinois-Urbana operates a veterinary diagnostic laboratory as part of the College of Veterinary Medicine. The VDL is an administrative unit within the Department of Pathobiology, and the VDL Director reports to the Dean of the CVM.

Kansas	<i>2003 Livestock and Product Receipts: \$6.2 Billion</i>
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The VDL is administered by the academic department of Diagnostic Medicine and Pathobiology in the College of Veterinary Medicine at Kansas State University (KSU) in Manhattan, Kansas. The director of the VDL reports to the department head. Separate accounts are maintained for the department and for the VDL for accountability.

Minnesota	<i>2003 Livestock and Product Receipts: \$4.1 Billion</i>
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The University of Minnesota Veterinary Diagnostic Laboratory (UMN-VDL) is a unit within the CVM. The Director reports to the Dean. Faculty academic appointments are in the Department of Population Medicine or Biomedical Sciences. The UMN-VDL has been by statute designated the Minnesota State Laboratory and reports quarterly to the Minnesota Board of Animal Health.

North Carolina	<i>2003 Livestock and Product Receipts: \$4.2 Billion</i>
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The diagnostic system is administered as part of the Commission of Agriculture and Consumer Services by the State Veterinarian who also serves as the Director of Diagnostic Laboratories. This system consists of the main laboratory (Rollins) at Raleigh and four regional branch laboratories.

South Dakota	<i>2003 Livestock and Product Receipts: \$2.1 billion</i>
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The South Dakota Animal Disease Research and Diagnostic Laboratory (SDR&DL) makes up the greater portion of the Department of Veterinary Science, which is in the College of Agriculture and Biological Sciences. The entire department/laboratory is housed in a standalone building. The Director of the SDR&DL is also the head of the Department of Veterinary Science. The budget is a separate appropriation within the South Dakota State University budget.

Wisconsin	<i>2003 Livestock and Product Receipts: \$4.1 billion</i>
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In 2000, the State of Wisconsin changed the administrative responsibilities for the Veterinary Diagnostic Laboratory from the Department of Agriculture and Consumer Services to the

University of Wisconsin-Madison. The laboratory is controlled by the Wisconsin Veterinary Diagnostic Laboratory (WVDL) Board of Directors. Membership includes the Chancellor's Office, Secretary of Agriculture, Dean of the College of Veterinary Medicine, three industry representatives and the VDL Director. Physical facilities include a new building which is being built on the Madison campus to replace the current Department of Agriculture Lab built in the 1960's. A branch laboratory is located at Barron, Wisconsin.

Discussion

There are three basic organizational structures identified from our comparative review. Below is a discussion of some of the issues the study group identified with each of the alternative organizational structures.

1. State Department of Agriculture operated facilities

North Carolina, Illinois and Wisconsin (prior to the reorganization in 2000) are examples of this organizational structure.

- In this organizational structure testing services are more heavily subsidized by state appropriations.
- In the case where State Department of Agriculture facilities are separate from a university-operated facility (i.e., Illinois), dollars spent per million dollars of animal agriculture were substantially higher (See Exhibits D and E). This appears to be the least cost-efficient arrangement.
- Attracting and retaining qualified staff is problematic because of state salary structure limitations.
- Inadequate facilities and geographic isolation from other animal health resources and expertise are problematic with some of the laboratories with this structure.
- Opportunities for clinical, research and educational synergies are limited.
- These laboratories are more tightly integrated with regulatory and surveillance functions which are the statutory responsibility of the state agencies in the respective states.

2. State University Operated Facilities

Iowa, Kansas and South Dakota are examples of this organizational structure.

- A VDL located within a College of Veterinary Medicine, as is the case in Iowa and Kansas, is considered by many as the ideal model where the circles of service, research, and teaching intersect. Efficiencies and impact are gained when the missions are integrated.
- This structure serves both the needs of the animal agriculture industry and fulfills the educational and research needs of the university.
- A VDL with a heavy food animal case load provides great opportunities for exposure of professional veterinary students and graduate students to food animal cases and the food supply chain. This access is important for educating future veterinarians and creating leaders to serve the livestock and poultry industries.
- Because of the greater access to resources and the ready interaction with students and other academics, highly qualified and motivated, and thus productive, faculty and staff are much easier to attract and retain at VDLs associated with universities.
- Applied research productivity is greater in VDLs associated with universities.
- Even without a direct supervisory relationship, interaction between state departments of agriculture and university-directed veterinary diagnostic laboratories can be efficient and successful, particularly if no other state testing laboratories exist. The ISU VDL and Iowa Department of Agriculture and Land Stewardship (IDALS) have such a cooperative and

collaborative relationship. The University of Minnesota and Minnesota Department of Agriculture have a very good relationship as well.

3. *Hybrid organizational structures*

This category involves some combination of State Department of Agriculture and university-related facilities and/or personnel. The Wisconsin structure, after the legislatively mandated reorganization in 2000, represents a case where the VDL is administered by the University, but it continues to have its own separate facility and a governing board and administrative structure that is independent of the School of Veterinary Medicine and closely linked through an advisory board to the Department of Agriculture and Consumer Affairs. The University of Minnesota VDL is officially designated as the testing laboratory of the State Department of Agriculture and works closely with both the CVM and the State Department of Agriculture.

- Promotes cooperation and collaboration between the VDL and the State Department of Agriculture.
- Although a portion of the funding for the University of Minnesota VDL apparently comes from the state legislature through the department of agriculture to which it provides a regular report of testing activity, this is not a supervisory relationship, and the relationship between the two entities functions very similarly to that in Iowa.

Section (b): Fee for Service Trends

Except for North Carolina, fees are an increasingly important source of revenue for all the VDLs in our study. Fees were never expected to be the sole source of support for VDLs. VDLs were established using state support, not only to serve livestock producers, but also for the greater good of the public. In early years, no fees or minimal fees were charged for services. Over time, as more testing capabilities were added, fees were added to help defray costs.

Exhibit A presents comparative fee schedules for a representative set of high-volume tests. ISU VDL fees are generally competitive or lower than surrounding states. North Carolina is a special case because testing is almost entirely subsidized by state appropriations so that most testing procedures are conducted without charge. This comparison of fees charged by neighboring state VDLs suggests that most laboratories have followed a similar philosophy as significant differences in fees are rare.

Typically, fees are established to cover costs of materials used in the tests, the salaries of the technicians that run the tests, and depreciation of necessary instrumentation. For some low-volume tests that require expensive instrumentation, it is not possible to charge the full cost of the test as the resulting charge would be too high for practical use. Thus, to allow the VDL to function as a full service laboratory, a premium may be added to the price of some high volume, relatively inexpensive tests to help defray the cost of the more expensive tests.

However, high user fees can have the effect of discouraging testing that benefits all producers and contributes to public safety. Cases that become a source of fee income are submitted by veterinarians and producers with disease problems that have reached a significant level. Diagnosis and control of these problems reduces the risk for neighboring producers. Surveillance programs for diseases considered serious enough to warrant such monitoring help protect all livestock producers. This principle was recognized in the case of the pseudorabies eradication program which received state and federal funding to partially offset the cost of a testing program that helped protect an important industry and maintain a valuable food supply.

ISU VDL Fee Revenue

Exhibit B summarizes a three-year history of ISU VDL finances and a projection for the current fiscal year.

In FY03, the VDL generated over \$5.6 million in fee revenue. Fee revenues dropped to \$4 million in FY04. The primary reason for the drop was the successful eradication of pseudorabies virus (PRV) from Iowa and the U.S. The eradication of PRV resulted in the loss of subsidized funding for PRV testing, and revenues from this testing in the ISU VDL dropped from a peak of \$1,326,503 in FY01 to \$158,184 in FY04. A substantial amount of serologic testing for other swine infectious diseases (PRRSV, *M. hyo.*, SIV) was commonly requested on blood samples submitted for PRV testing. Testing has subsequently decreased since veterinarians are not on farms as often doing surveillance testing for PRV and consequently this has compounded the loss in revenues associated with PRV testing. Between FY02 and FY05, VDL fee receipts dropped by over \$2 million. Approximately half of the fee income is used to pay for the salaries of the technicians and clerical staff that run and report the tests; the other half is used to pay for equipment and materials used in the tests.

The University allocates General University resources to the VDL as part of the College of Veterinary Medicine budget allocation. This \$2.2 million allocation is used primarily to cover faculty and a few of the staff salaries and benefits. Most of the faculty have well over an 80%

commitment to service. The General University also pays for the operation and maintenance of the space occupied by the VDL. The balance of the projected shortfall, almost \$500,000, will be funded from reserve balances that the VDL accumulated when the pseudorabies program was in full-swing. If current trends continue, those reserves will be exhausted before the end of FY06.

ISU VDL is not a cost recovery operation. The net loss from VDL operations for FY06 is projected at \$420,000. On a full-cost basis, the deficit is projected at approximately \$3 million. The VDL Business Plan which accompanies this report proposes a number of adjustments to respond to the revenue decline. It includes measures to reduce expenses and generate additional revenue. Some of the proposed strategies in the plan are intended to increase fee income. These strategies are a prudent and proactive response to the revenue decline but will not result in full cost recovery.

To avoid a potential conflict of interests between economic drivers and public health, the American Association of Veterinary Laboratory Diagnosticians (AAVLD) recommends that no more than 35 percent of an accredited VDL budget should come from fee income. ISU's VDL exceeds this recommendation because approximately 64% of its revenue comes from fees. The current VDL budget does not adequately allow for development of new and improved, less costly and more sensitive testing equipment and methods. Nor does it allow scientists to develop teams for rapid response to disease outbreaks or to rapidly conduct in-depth laboratory studies to characterize emerging or re-emerging disease threats.

Exhibit A: ISU VDL Laboratory Test Fees Compared to Other VDLs*
June 2005

Test	Iowa	# in 04	Illinois	Kansas	Minnesota	South Dakota	Wisconsin
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Porcine

PRV g1 ELISA	\$2.00	325,590		\$1.75	\$2.25	\$2.50	\$3.00
PRRSV ELISA	\$4.00	88,116	\$4.00	\$4.50	\$4.50	\$4.00	\$7.00
SIV H3N2 HI	\$4.00	48,470	\$3.00		\$4.75	\$4.00	\$13.00
SIV H1N1 HI	\$4.00	28,082	\$3.00		\$4.75	\$4.00	\$13.00
Mhyo ELISA	\$4.00	22,946	\$3.00	\$3.00	\$4.75	\$4.00	
PRRSV PCR (fluid)	\$25.00	11,007			\$21.00	\$25.00	

Bovine

BVD PI IHC	1-3 \$11.00 4+ \$3.00	37,084	1-6 \$15.00 >6 \$3.00	1 \$12.00 2+ \$4.00 100+ \$3.00	\$5.00	1-5 \$17.50 6+ \$3.50	
Johne's ELISA	1-10 \$4.00 >10 \$3.00	14,797	\$10.00	\$5.00	\$6.00 4 sample min	\$3.50	\$5.00
BLV AGID	\$4.00	3,509		\$5.00	\$4.75	\$3.50	\$4.50
Anaplasma ELISA	1-10 \$6.00 >10 \$2.75	3,837				\$2.75	\$6.50
Lepto MAT	\$4.00 for 5 Serovars	2,295	\$16.00 for 7 Serovars	\$7.50 for 5 Serovars	\$8.50 for 6 Serovars	\$4.00 for 6 Serovars	\$8.50 for 6 Serovars

Equine

EIA AGID	\$5.00	5,971	\$5.00	\$5.00	\$7.25	\$7.50	
VS Ind VN	\$4.00	830		\$10.00	\$5.00	\$4.00	\$8.50
VS NJ VN	\$4.00	822		\$10.00	\$5.00	\$4.00	\$8.50

Poultry

AIV AGID	\$2.50	8,605			\$1.00		
Salm Envir Cult	positive \$29.00 suspect \$16.00 negative \$9.00	865 1,257 651			\$26.00	\$30.00	
AIV ELISA	\$1.00	2,110					\$1.00
Pneumovir. Serol.	\$1.00	1,899			\$1.25		

Small Ruminant

CAE serology	\$3.00	92	\$3.00 - \$3.50	\$6.00		\$3.00	\$4.00
OPP serology	\$3.00	66	\$3.00 - \$3.50		\$3.75	\$3.00	\$4.50

Canine

Brucella canis RSAT	\$10.00	952			\$11.50	\$10.00	\$17.00
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*North Carolina does not charge fees

**Exhibit B: Operating Statement for ISU College of Veterinary Medicine
Veterinary Diagnostic Laboratory**

	FY03	FY04	FY05	FY06
	Actual	Actual	Actual	Projected
VDL Revenues:				
Fee for Service Income				
Administration	\$353,131	\$311,306	\$315,210	\$320,000
Pathology/Histology	458,521	464,114	450,156	450,000
Serology	2,966,177	1,993,238	1,798,901	2,000,000
Chem Toxicology	69,823	70,011	73,261	70,000
Virology	80,330	81,735	83,646	80,000
Molecular Micro Diagnostics	357,766	399,550	636,945	800,000
Bacteriology	436,055	436,870	479,332	500,000
Bio-Analytical Service	0	0	3,845	70,000
Pseudorabies (PRV)	704,976	158,184	40,000	40,000
Special Projects	154,637	52,776	24,129	30,000
Subtotal Fee for Service Income	\$5,581,416	\$3,967,784	\$4,270,112	\$4,360,000
External Grant funding	164,132	439,549	442,915	300,000
Total Revenues	\$5,745,548	\$4,407,333	\$4,348,340	\$4,660,000
VDL Expenses:				
Staff Salaries & Benefits	\$2,579,944	\$2,559,245	\$2,401,144	\$2,473,178
Travel	51,440	66,292	45,632	60,000
Res/Vet/Lab/Ag Supplies & Services	2,673,101	1,691,947	1,812,229	1,900,000
Office Supplies & Expenses	210,058	140,102	156,360	150,000
Maintenance & Repair/FP&M Requests	107,095	67,480	91,494	85,000
Administrative Fees	22,428	64,612	86,412	100,000
Equipment	153,001	28,549	89,886	150,000
One-Time Renovation & Capital Projects	519,628	422,323	87,518	100,000
Hazardous Materials Charge	0	0	58,499	61000
Subtotal	\$6,316,695	\$5,040,550	\$4,829,174	\$5,079,178
Net Income (Loss) From Testing Operations:	(\$571,147)	(\$633,217)	(\$480,834)	(\$419,178)
Less expenses funded by Gen. U.				
CVM Salaries & Benefits	(\$1,833,561)	(\$1,957,739)	(\$1,813,970)	(\$1,988,334)
CVM Equipment Funds	(76,137)	(76,137)	(71,440)	(71,440)
CVM Innovation & Development	0	0	(102,353)	(125,000)
Gen. U Space & Maintenance	(359,202)	(366,386)	(373,714)	(384,925)
Revenue Shortfall:	(\$2,840,047)	(\$3,033,479)	(\$2,842,311)	(\$2,988,877)

Section (c): Use of other Funding Sources

Exhibit C presents total comparative financing sources for the states in our survey. Based on this data, the distinguishing characteristics of the funding sources are discussed below.

Iowa

The ISU VDL relies heavily on user fees (65%). Only the Minnesota VDL brings in more total user fee dollars. The ISU VDL user fees are almost entirely derived from food animal testing. Companion animal and teaching hospital cases constitute less than \$100,000 of the annual revenue stream. Psuedorabies (PRV) and serology testing revenues have declined significantly in recent years. Growth in molecular diagnostics and grant funding has not offset the overall decline in VDL revenue.

Illinois

The state of Illinois supports its two Department of Agriculture labs for a combined \$3.23 million and provides another \$1 million as a line item within the CVM budget for the VDL that is an administrative unit within the Department of Pathobiology. In addition to routine predominantly food animal casework testing (which generates approximately \$0.5 million per year), the Department of Agriculture laboratories conduct cooperative USDA testing programs (e.g., federal revenue for FY05 was \$656,000). Diagnostic activity in the CVM-VDL that generates fee income includes approximately forty percent (\$1 million) from the Teaching Hospital and Clinical Pathology Laboratory, predominantly from companion animal specimens (cases). Less than \$250,000 income is generated from livestock specimens in the CVM-VDL. A contract with the Brookfield Chicago Zoo amounts annually to \$300,000.

Kansas

The state of Kansas, which has livestock receipts similar to that of Iowa, provides \$3.4 million support for its VDL. The user fee revenue has three accounts: (1) routine diagnostic laboratory (FY05 \$1,148,000) (2) clinical pathology (mainly small animal teaching hospital, FY05 \$324,000) and (3) a unique niche opportunity developed to test for anti-rabies antibody – RFFIT (Human Serum Antibody), FY05 \$1,444,000.

Minnesota

The University of Minnesota VDL budget consists of \$1 million from the College of Veterinary Medicine, \$1 million direct appropriation from the Minnesota Legislature, and approximately \$7.8 million in user fees. Approximately \$600,000 of the user fees comes from Minnesota Board of Animal Health for *Mycobacterium paratuberculosis* (Johnes Disease) surveillance testing. Substantial portions of the user fees come from the UMN Veterinary Teaching Hospital (\$400,000), companion animal biopsy services and equine pathology services to the public (approximately \$2.5 million in revenues generated by 3 surgical pathologists, 3 clinical pathologists, and 4 equine pathologists), services to the Minnesota zoos, an endocrinology diagnostic service, and a regional poultry diagnostic laboratory (\$350,000). Estimated user fees generated by food animal cases are similar to those generated by the ISU VDL (approximately \$4 million).

**Exhibit C: Summary of Comparative Expenditure Data for
Veterinary Diagnostic Laboratories**

	Year 2003 (\$millions)	Year 2004 (\$millions)	Year 2005 (\$millions)	Animal Ag. (\$billions)
Iowa Total	7.642	6.176	6.468	6.07
State Appropriation	2.061	2.208	2.198	
User Fees	5.581	3.968	4.270	
Illinois Total	7.032	7.326	7.446	1.80
Univ. of Illinois Total	2.880	2.940	3.060	
State Appropriation	1.380	1.340	1.360	
User Fees	1.500	1.600	1.700	
Dept. of Agriculture Total	4.153	4.386	4.386	
State Appropriation	3.003	3.230	3.230	
User Fees	0.487 + 0.662 ^A	0.500 + 0.656 ^A	0.500 + 0.656 ^A	
Kansas Total	5.024	5.351	6.316	6.18
State Appropriation	3.000	2.900	3.400	
User Fees	2.024	2.451	2.916	
Minnesota Total	8.622	8.998	9.792	4.07
State Appropriation	2.287	2.006	2.001	
User Fees	6.335	6.992	7.791	
North Carolina Total	na	5.774	5.908	4.16
State Appropriation	na	5.774	5.908	
User Fees	na	(0.753) ^B	(0.757) ^B	
South Dakota Total	4.780	4.587	4.879	2.12
State Appropriation	1.308	1.340	1.377	
User Fees	3.471	3.247	3.502	
Wisconsin Total	5.682	5.598	5.923	4.09
State Appropriation	3.000	3.010	3.023	
User Fees	2.682	2.588	2.900	

^A Fee income reverts back to the general fund and is not available for lab expenditures

^B North Carolina user fees revert back to the Department of Agriculture General Funds and are not available for lab use

North Carolina

The authorized budget of \$5,908,722 is state appropriated. Revenue is not available for use by the laboratory but reverts to the general fund. FY04 Professional Service Revenue total was \$756,904, primarily from National Poultry Improvement Plan (serology testing \$501,904.) The laboratory activities include USDA cooperative agreements.

South Dakota

User fees include \$250,000 from a parasiticide use tax. The user fees also reflect the fact that thirty percent of the accessions are from out of state. These out-of-state fees have a significant surcharge, approximately two times the in-state fees. The SDR&DL Annual Report for detailed FY04 activity is on file at the ISU VDL.

Wisconsin

Currently all salaries are paid from state appropriations and user fees are budgeted for other expenses. Current carryover user fees have ranged from \$902,000 in FY03, \$109,000 in FY04 and \$750,000 in FY05. During FY04, \$2 million was transferred to the building fund. A request will be made in FY07 to pay technical salaries from fees to support increased laboratory activities. The State of Wisconsin has several bull studs and embryo transfer programs that rely on the VDL for testing to establish preventive health programs necessary to maintain regulatory movement. This provides significant revenue for the VDL.

Discussion

Exhibits D summarizes state funding for VDLs relative to the size and importance of the livestock industry within the state.

Exhibit D: 2003 USDA Census Livestock & Products Receipts

	2003 Livestock & Products Receipts (\$Billions)	2003 Total Commodity Receipts (\$Billions)	U.S. Total Agriculture Commodity Rank	VDL Appropriation (\$Millions)	Dollars Spent Per \$Million of Animal Agriculture
Wisconsin	4.09	5.87	15	3.02	738 per million
South Dakota	2.12	4.02	18	1.38	651 per million
North Carolina	4.16	6.92	12	5.91	1,421 per million
Kansas	6.18	9.05	6	3.40	550 per million
Illinois	1.80	8.29	3	4.59	2,550 per million
Iowa	6.07	12.63	2	2.19	361 per million
Minnesota	4.07	8.59	7	2.00	491 per million

Exhibit E

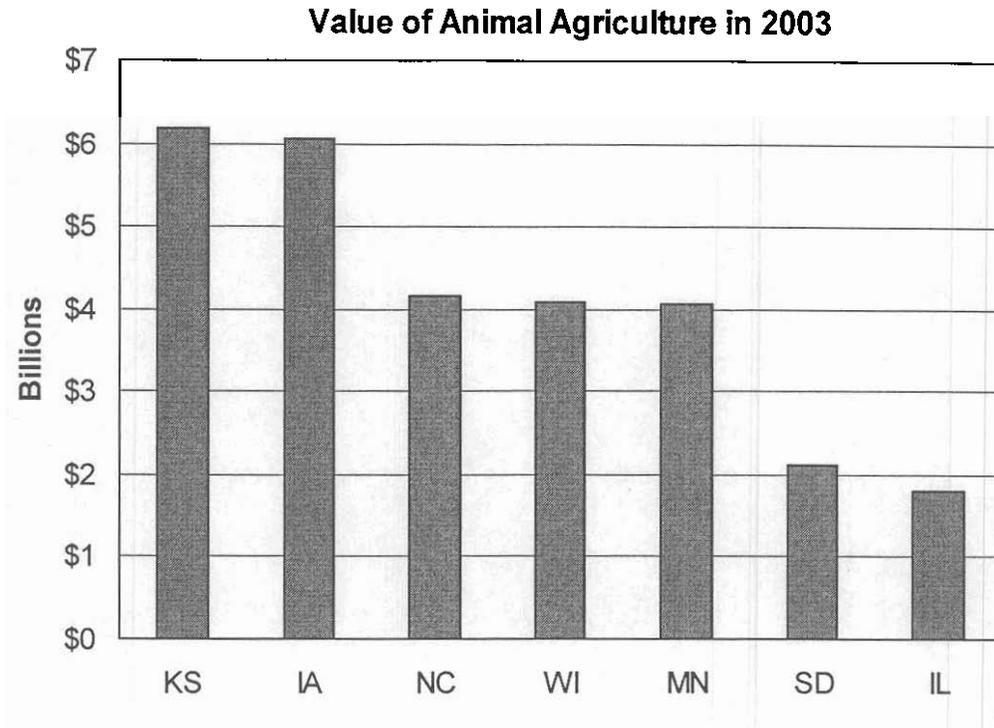
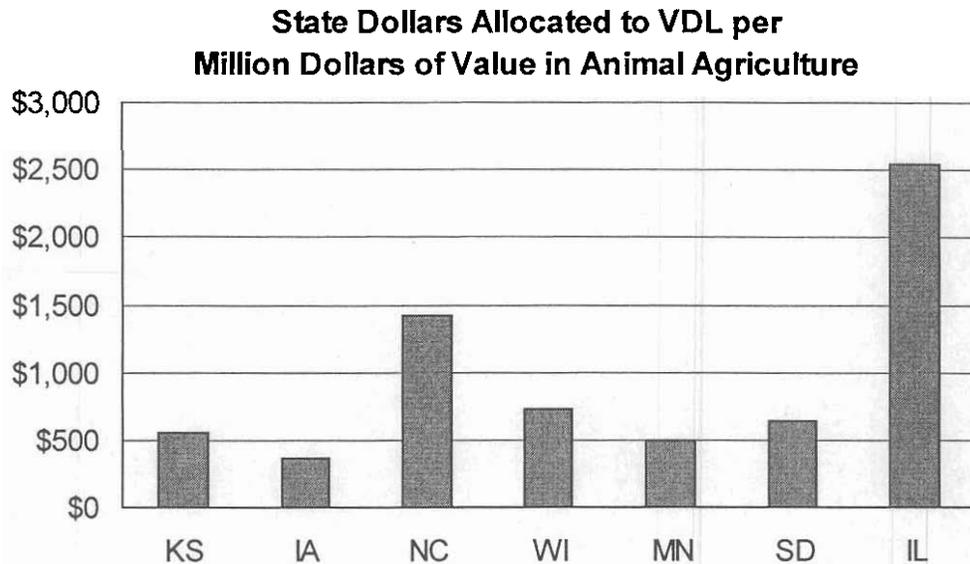


Exhibit F



Exhibits E and F illustrate the inverse relationship exhibited by some of the states in this study between the economic importance of the animal agriculture industry and overall spending on veterinary diagnostic services to ensure the overall health of that industry. Iowa and Kansas are similar in the size and economic importance of animal agriculture, but VDL spending relative to the size of the industry is the lowest in these states.

Illinois and North Carolina, states with smaller animal industries than Iowa, provide substantially more state support for veterinary diagnostic testing. These are the two states in our study where diagnostic testing is a service of a state department of agriculture. North Carolina is unique in the negligible amount of user fees collected, suggesting a public policy decision to subsidize, not just teaching and research, but most or all of the testing services as well.

Like ISU, Minnesota is heavily dependent on fee revenue. However, some of the revenue indirectly derives from Department of Agriculture-related programs. By concentrating on low-cost, high-volume tests, the Minnesota VDL generates a substantial amount of revenue. The Minnesota VDL has also been very aggressive in expanding cutting-edge testing services, especially molecular diagnostics, and developing a national clientele in certain sub-specialties. Insights gained from the Minnesota business model are being incorporated into the ISU VDL business plan. However, like ISU VDL, the Minnesota VDL also reports financial pressures that may affect service and research activities in the future.

Section (d): Recommendations for business structure and funding

After reviewing other state operating structures and funding arrangements, four options have been identified for consideration. Exhibit G summarizes in table format the funding implications and some of the advantages and disadvantages of each option.

Option 1: Maintain current structure as a VDL within a state university

Option 1 is the university operated model which currently exists in Iowa. This model has been successful in Iowa for many years. The ISU VDL can continue to provide diagnostic services to veterinarians and animal owners and monitor the threat to zoonotic diseases; however, these services will diminish significantly due to increases in operating expenses, the cost of salaries and benefits, and declining revenues from user fees. If the \$2.2 million state allocation from the College of Veterinary Medicine (CVM) continues to be directed to the service component of the VDL it may compromise the ability of the CVM to move forward as the CVM missions for education, research and service are in direct competition for limited resources.

Option 2: Secure additional direct appropriation from the state of Iowa

Option 2 has elements of the hybrid model which was noted in Minnesota. The VDL would continue to be a component of the College of Veterinary Medicine but there is a direct state appropriation to the VDL and there is a more formal management relationship between the VDL, the state department of agriculture and other stakeholders. The VDL would continue to provide testing on a fee-for-service basis to recover most direct testing costs. Additional state funding would allow the VDL to provide diagnostic services at an increased level including: anticipating market trends and state and global needs for new instrumentation and tests; increased focus on ELISA serology and molecular diagnostics; research leading to innovation and development of the next generation of diagnostic tests; a Rapid Response Team for investigation of disease outbreaks and other high value services. Accompanying this report is a Business Plan prepared by the management of the ISU VDL to describe how the VDL would operate with an annual direct appropriation of \$4 million from the State of Iowa. The Business Plan represents a detailed look at the benefits of this option.

Option 3: Function solely as a regulatory testing laboratory

This option is similar to the state Department of Agriculture operated facilities and would be analogous to the Illinois situation. The VDL will only provide surveillance and regulatory support as mandated by federal programs. The VDL will not provide comprehensive diagnosis, disease tracking, or consulting services. There would be neither teaching nor research components. As this option only requires technician-level expertise (rather than faculty expertise in analysis, research and development) The VDL would not need to be associated with ISU CVM. The VDL could not be AAVLD accredited.

Option 4: Eliminate the VDL and allow private labs to test

There is no counterpart to this example in other states in this study as all had some type of public VDL facility. ISU would not provide diagnostic services and would be dismantled. Faculty and technicians would be released. ISU loses an avenue for public service and building relationships with producers, commodity groups and practitioners. These groups would have to find private or out-of-state agencies to provide comprehensive diagnostic services.

Exhibit G
Summary of Options for Restructuring and Funding the Veterinary Diagnostic Laboratory
For the State of Iowa

Option 1. Maintain current structure as a VDL within a state university

Description	Funding Implication	Advantages	Disadvantages
<ul style="list-style-type: none"> ➤ No change in current mission, which is to provide diagnostic services to veterinarians and animal owners and monitor and report the threat of animal and zoonotic diseases. Retain current structure as a section in the Department of VDPAM within the ISU CVM. Specialists on the VDL faculty would continue to oversee operations of the 7 sections within the VDL. ➤ Primary focus would remain on service. Teaching and research would continue through access to the VDL case load. 	<ul style="list-style-type: none"> ➤ \$2.2 M state appropriation would continue as an allocation from the College of Veterinary Medicine. ➤ Would require more than the current \$4.2 M (which is 65% of the operating budget) in revenue generated from fees to balance budget. AAVLD recommends no more than 35%. ➤ Because of the thin margin on most tests and the fact that the market will not bear full cost recovery for some tests, increased testing volume will not provide sufficient revenue over cost to offset budget deficit. ➤ Because of competition from other state and private labs, fees cannot be raised significantly. Increased fees will result in variable decreases in test requests; some will drop precipitously. ➤ Increasing fees will likely cause a decrease in case submissions. 	<ul style="list-style-type: none"> ➤ Faculty are continuously in contact with the livestock industry through the 40,000 cases handled by the VDL each year ➤ Case materials used extensively for teaching and exposure of students for food supply veterinary medicine. ➤ Case materials feed research programs. ➤ New discoveries result in patents for the university. 	<ul style="list-style-type: none"> ➤ Funding levels in this option are insufficient to maintain fiscal self-sufficiency. Adjustment and shrinkage in current scope of service would be needed. The VDL could no longer provide a full range of services eroding the support for the livestock industry and potentially impacting accreditation. ➤ Non-cost recovery services (e.g., toxicology, chemistry, virology) may need to be eliminated/downsized due to decreasing funding and inability to provide adequate staff. ➤ Certain diseases may go undetected because of a failure to do comprehensive diagnostic profiles. ➤ Case turnaround time would increase. ➤ Inability to maintain and update facilities, equipment and testing activity to meet accreditation standards. ➤ Fewer case submissions provide fewer teaching and research opportunities. ➤ Proposal development, marketing, needs assessment and other activities that enhance and improve operations and build reputation would not be possible. ➤ No flexible funds are available for significant research, which decreases ISU opportunities to lead in diagnostic medicine. ➤ Further revenue losses or budget cuts with the CVM could magnify the negative effects of fee revenue losses and further erode the services VDL provides to the livestock industry.

Option 2. Secure additional direct appropriation from the State of Iowa

Description	Funding Implication	Advantages	Disadvantages
<ul style="list-style-type: none"> ➤ No change in current mission, which is to provide diagnostic services to veterinarians and animal owners and monitor and report the threat of animal and zoonotic diseases. Retain current structure as a section in the Department of VDPAM within the ISU CVM. Specialists on the VDL faculty would continue to oversee operations of the 7 sections within the VDL. ➤ Establish an advisory board that includes industry stakeholders, CVM Dean, VDPAM Chair, VDL Director, Secretary of Agriculture and others. ➤ Explore longer term vision to leverage shared strengths and collaboration with DNR, Iowa Department of Agriculture, and IDPH. 	<ul style="list-style-type: none"> ➤ Direct state appropriation of \$4M annually to support service mission of the VDL. ➤ Maintain \$4.2M generated from fees. ➤ College of Veterinary Medicine will allocate \$400K in funding to reflect the benefits gained for the teaching and research done in the VDL. ➤ Solicitation efforts. 	<ul style="list-style-type: none"> ➤ Funding levels in this option will provide a balanced budget and the disadvantages described in option 1 are averted. ➤ A full range of services is maintained and proposal development, marketing, and needs assessment will lead to improved service to livestock producers, thereby enhancing Iowa's economy. ➤ Enhances the VDL's alignment with ISU's mission in economic development and improving Iowa life for agricultural community and public health. ➤ New business-based model of assessment, accountability, and efficiency will decrease training time, staff turnover, and improve operations. ➤ \$1.8M from CVM budget previously allocated to the VDL for diagnostic services will be reallocated for programs to establish and teach best practices for food supply veterinary medicine. ➤ Brings the VDL budget more in line with peer institutions. ➤ Fee-based funding can be competitive without compromising public health and the mission of land-grant institutions 	<ul style="list-style-type: none"> ➤ More market-industry driven than current structure. ➤ Requires more business and marketing expertise, training and planning.

Option 3. : Function solely as a regulatory testing laboratory

Description	Funding Implication	Advantages	Disadvantages
<ul style="list-style-type: none"> ➤ Changes mission of the VDL to surveillance and regulatory initiatives. Service needs are defined and driven by Iowa Department of Agriculture and Land Stewardship (IDALS). ➤ VDL becomes similar to private labs. No research or teaching components. ➤ May no longer need to be associated with ISU CVM. ➤ Advisory Board includes representatives from DNR, IDALS and IDPH and serves to ensure cost recovery and establish direction of VDL activities. 	<ul style="list-style-type: none"> ➤ Tax based. Legislature provides funds only for specified services. ➤ No research funding. ➤ Fees structure determined by industry standard. 	<ul style="list-style-type: none"> ➤ Much reduced cost to run because of reduction in staff (supervisory and technical). ➤ Focused areas of testing. 	<ul style="list-style-type: none"> ➤ VDL becomes a testing rather than a diagnostic lab and thus would not provide comprehensive diagnosis, trace disease history, or determine risks to animal and human populations. ➤ Lack of comprehensive diagnostic services limits capacity to detect other diseases posing potential animal and public health threats. ➤ VDL would likely lose accreditation. AAVLD accredited labs must be full service. ➤ Inhibits long-term strategic planning—focuses primarily on industry trends and surveillance-oriented services. ➤ Does not support non-industry-driven research. ➤ May require significant financial investment in salaries to lure high-quality supervisory scientists needed to maintain high-quality performance standards and best practices—these types of scientists are rarely interested in delivering services without a mission for increasing knowledge, advancing science and developing new technologies.

Option 4. Eliminate the VDL and allow private labs to test

Description	Funding Implication	Advantages	Disadvantages
<ul style="list-style-type: none"> ➤ ISU will not provide diagnostic services. ➤ VDL services provided by private labs and competing laboratories at institutions of higher education. ➤ ISU VDL space is used for CVM functions. 	<ul style="list-style-type: none"> ➤ No funding cost to state, CVM, or ISU for diagnostic services. 	<ul style="list-style-type: none"> ➤ Allows current College funding to be redirected for other initiatives and projects ➤ Decreases management and administrative load. ➤ Frees up space for other CVM teaching and research activities. 	<ul style="list-style-type: none"> ➤ Loss of relationships with producers, commodity groups, and practitioners ➤ Loss of much-needed exposure to food animal cases for professional and graduate student teaching. ➤ Loss of research productivity provided by VDL faculty (approximately 25% of CVM productivity). ➤ Impact on reputation and potential to influence global community in matters of emerging infectious diseases of livestock. ➤ Livestock industry loses a valuable resource and connection to the university along with the impact on the Iowa economy.

Business Plan prepared by Iowa State University Veterinary Diagnostic Laboratory (ISU VDL)

1600 South 16th Street, College of Veterinary Medicine, Iowa State University, Ames, Iowa 50011

I. Executive Summary

In Iowa, veterinary diagnostic services are conducted by a variety of laboratories. Private, for-profit laboratories focus on conducting high-volume, standardized tests for targeted profiles as requested by their clients. Federal laboratories are driven by global concerns regarding disease research, detection and surveillance. The VDL at Iowa State University has a unique mission to provide comprehensive, current and long-term diagnostic services to veterinarians and animal owners and conduct surveillance against the threat of animal and zoonotic diseases.

The primary customers served by the ISU VDL are private veterinary practitioners who serve independent livestock producers. Many times, it does not benefit the producer very much to get an accurate diagnosis, because he/she has already sustained the losses from a disease outbreak or exposure to toxin. However, it is very important to the veterinarian and the other producers in the region to have an accurate diagnosis so they can take steps to avoid losses on their farms from exposure to the same infectious agent or toxin. If the lab is not subsidized by the state, the producers may be unwilling to pay high lab fees for something that they view as being too late to help them and the problem will go undiagnosed and spread to other premises. The benefit of an accurate diagnosis may not be for the affected producer, but for other producers in the region. Preventing diseases in the state has a big impact on profits and state tax revenue. If we lose the full service lab to protect the \$6 billion animal agriculture industry in Iowa, it is likely to cost the state more in lost tax revenue than they would spend to maintain the lab.

The ISU VDL is the only public veterinary diagnostic laboratory in the state and is accredited by the American Association of Veterinary Laboratory Diagnosticians (AAVLD). It is one of the major “windows” of our university—an opportunity for the public to witness and understand the value of service that Iowa State University provides on a daily basis. As a public window, this service must be well-supported and well represented within the state.

The ISU VDL provides a consistent and reliable foundation to sustain and improve the health of Iowa’s animal agricultural economy. Though we are initially focused on soliciting additional funds to meet existing demands for services, we are also driven to be pro-active in order to preserve, sustain, and protect the future of Iowa’s animal agricultural industry; the ISU VDL must have additional resources that will allow it to anticipate industry needs and develop responsive services and methods to

- provide Iowa livestock producers affordable access to cutting edge diagnostic tests for detection of domestic and foreign animal diseases
- develop rapid response teams of VDL specialists including diagnostic pathologists, toxicologists, microbiologists, and species-specific production medicine specialists to lead investigations for independent and corporate producers and veterinary practitioners
- provide retrospective diagnostic services including database management and serum banking for epidemiological investigations for independent producers and the Iowa Department of Agriculture and Land Stewardship
- serve as a centralized information/training resource for federal and state agencies, universities, and corporations
- develop a pathogen depository for infectious disease organisms which would be a great resource for university researchers, biological companies, and diagnosticians across the world
- develop graduate training programs that will utilize the information and pathogens acquired through diagnostic investigations in research programs that will advance our knowledge base in diagnostic medicine and educate the next generation of diagnosticians which are in very short supply

Current funding will not only be insufficient to maintain existing services but will hinder progressive development of this critical resource. In 2005, ISU VDL revenues totaled to \$6,818,751. To avoid a potential conflict of interests between economic drivers and public health, the American Association of

Veterinary Laboratory Diagnosticians (AAVLD) recommends that no more than 35 percent of an accredited VDL budget should come from fee income; yet, ISU's VDL derives approximately 64% of its revenue from fees, far exceeding AAVLD recommendation. Currently, the \$2.2 million in state appropriations accounts for less than 30% of the ISU VDL funding. The remaining 6% of receipts come from federal grants for surveillance activities.

The ISU VDL cannot continue operating under current funding conditions and still continue to provide the breadth and excellence of services it has provided in the past. Without additional funding, there will be inevitable reduction in services offered and expected; ultimately, it will be difficult to maintain the desired quality of services that are rendered. The current VDL budget does not adequately allow for development of new and improved, less costly and more sensitive and specific testing equipment and methods. Nor does it allow scientists to develop teams for rapid response to disease outbreaks or to rapidly conduct in-depth laboratory studies to characterize emerging or re-emerging disease threats. The current budget limits ISU VDL from sufficiently developing targeted services that would have immediate economic value, both for the ISU VDL and for Iowa's agricultural industry. Examples of such services include: diagnostic tests to assess animal welfare, rapid and highly sensitive molecular diagnostic tests (PCR), global information systems (GIS) monitoring disease spread across the state and the U.S., ante-mortem testing, and pathogen and serum banking.

Current funding includes \$2.2 million in state appropriations allocated to VDL by the College of Veterinary Medicine. Essentially, all of the \$2.2 million is allocated for faculty and staff salaries and benefits; however, that funding is now critically needed by the College of Veterinary Medicine as the College attempts to regain accreditation and sustain and build increasingly competitive programs. The College's current drive is to attract outstanding faculty, build nationally recognized programs, and increase collaboration with the federal laboratories in Ames. The College has intensified its focus, funneling its resources into practicing outcomes/evidence-based medicine, acquisition of leading edge teaching/information technologies, development of multi-institutional/disciplinary research projects and attaining funding for graduate student and faculty development.

Benefits to consumers/industry rely on securing funds for expert staff as well as support for innovation and development efforts. Though funding will primarily ensure that we can attract, retain, and promote high-quality, renowned faculty and staff to serve the Iowa livestock industry, we are also requesting funding for innovation and development. These funds are critical for development and implementation of the next generation of diagnostic tests and having the resources to advance our knowledge about the specific diseases that currently affect Iowa's \$6.2 billion livestock industry. Iowa's agriculture industry generates \$6.1 billion dollars a year in livestock sales. Disease outbreak, even if it impacts only 1% of that industry, will result in a \$61 million loss in livestock receipts. The costs of these losses are passed on to consumers, processors, transporters, and packaging plants. Iowa needs to increase rather than decrease the critical support for diagnostic services accessible to Iowa livestock owners through the ISU VDL.

To sustain the ISU VDL and support Iowa's agricultural industry, we must focus on evidence-based medicine and outcomes assessment that will effectively and efficiently enhance the knowledge and dissemination of best practices for use on Iowa farms. This will "close the loop" between the farm and the university. In the process it will spin off learning opportunities for students and research opportunities for faculty interested in impacting the local industry and economy.

VDL solicits a \$4 million annual investment from its most significant client—the state of Iowa. Often overlooked is the significant contribution that the ISU VDL's testing, education, and support services make to the protection of public health and to Iowa's economic welfare. It would seem that the clients who receive the most value from ISU VDL's services would most benefit by investing in the increased quality and volume of those services. In this case, the ISU VDL's most significant clients are the public and the livestock industry. The Iowa Legislature represents the interests of those clients. To adequately fund the ISU VDL for the level of service it delivers would require the Iowa Legislature to invest, by direct appropriation, four million dollars.

ISU VDL projected annual budget. Though we will pursue other sources of revenue (see proposal for scientific focus and business development strategy), the thrust of our efforts at this point is to gain the investment of our greatest stakeholder—the Iowa Legislature. Projected ISU VDL revenues and expenses are summarized below.

Fiscal Year 2006 VDL projected operating budget

Revenue Summary

Direct appropriation	\$4,000,000
Fee income	\$4,360,000
External grants	\$ 300,000
HLI Equipment Fund	<u>\$ 71,440</u>
TOTAL	\$8,731,440

Expense Summary

Faculty salaries and benefits	\$1,988,334
Technical and operating Staff	\$2,473,178
Operating expenses	\$2,606,000
Space and maintenance	\$ 384,925
Innovation and development	\$ 1,000,000
Equipment	<u>\$ 150,000</u>
TOTAL	\$8,602,437

As a result of their recurring investment in ISU VDL, Iowans will experience direct benefits. One of the major advantages of increasing funding for VDL will be the results gained from those dollars invested in “innovation and development.” It’s these dollars that allow scientists to anticipate the needs for safety measures and develop instrumentation, partnerships, and resources critical for disease prevention and for securing Iowa’s agricultural resources. Without these funds, we can only react to crisis and attempt “damage control.” Specifically, Iowans can expect the following benefits from their investment in VDL:

- Protection (through surveillance and monitoring) of Iowa’s primary economic resource—agriculture
- Protection of the public through advancements in food safety (e.g. greater protection from *E. coli*, *Salmonella*, and *Campylobacter* contamination)
- Protection against bio-terrorism agents that could be economically devastating for the state’s economy—foot and mouth disease, hog cholera (classical swine fever), influenza viruses, and others
- Protection of Iowa’s ecosystem through continuing education on best practices for disease diagnosis and control for veterinarians and producers
- Rapid response teams that investigate infectious disease outbreaks as well as provide ongoing, long-term monitoring of the spread and impact of diseases in individual and corporate producer operations
- Evidenced-based medicine—the ability to establish and disseminate best practices for management and control of diseases
- Protection for producer communities and maintenance of Iowa’s ecosystems as standards and practices are monitored to understand and prevent the spread of infectious disease from farm to farm.

II. What is Iowa State University’s Veterinary Diagnostic Laboratory and how does it serve the public—locally, nationally, and globally?

In Iowa, veterinary diagnostic services are conducted by a variety of laboratories. Among the most high-volume, prominent laboratories are Iowa State University’s Veterinary Diagnostic Laboratory (ISU VDL), the United States Department of Agriculture’s Animal and Plant Health Inspection Service laboratories (National Animal Disease Center, National Veterinary Services Laboratories, Center for Veterinary Biologics), and a handful of private laboratories. Though ISU’s VDL has established a relationship with most of these diagnostic agencies (see *ISU VDL Relationships with Other Agencies* diagram, page 7), the ISU VDL is unique in both its function and scope. Private, for-profit laboratories focus on conducting high-volume, standardized tests for targeted profiles as requested by their clients. Federal laboratories are driven by national diagnostic, surveillance and research concerns.

Iowa State University’s VDL is much broader and more comprehensive in the services it provides to producers and, more importantly, in the critical service it provides to its most prominent clients—Iowa’s food consumers and the livestock industry that is the backbone of Iowa’s economy. The ISU VDL provides complete diagnostic workups for its clients, which means that it not only tests for a broad variety of diseases but the lab also serves as a state-wide and national sentinel, surveilling for events that may threaten Iowa’s agricultural industry and public health. Private laboratories and federal facilities do not have the infrastructure, resources, academic and professional expertise, or the charge to deliver the type of comprehensive, broad spectrum preventative, surveillance, and diagnostic testing services that protect against the specific types of economic and health crises that affect Iowa livestock. That makes every Iowan a stakeholder in the investment made to fund the unique type of services the Iowa State University’s VDL provides.

The ISU VDL diagnostician, local veterinarian, and local producer exchanges that occur on a daily basis are a highly effective way to disseminate information from the university to the end user and vice versa. This makes the ISU VDL one of ISU's most prominent public "delivery" agencies. Although the ISU VDL is primarily a professional practice unit, professionals within the unit are faculty with academic responsibilities; education, research and development are intimately intertwined with the service components. Thus the development of more effective, efficient, and innovative testing methods and instrumentation as well as ongoing education about the nature and prevention of disease are natural outcomes and expected benefits of VDL's services.

VDL and its place in Iowa State University--building upon a legacy of success

The Iowa State University Veterinary Diagnostic Laboratory is a section of the academic department of Veterinary Diagnostic and Production Animal Medicine in the College of Veterinary Medicine. In 1947 VDL activity was initiated in the Department of Pathology under the VDL Director, Dr. Paul Bennet. There was no legislative action regarding the establishment of the laboratory nor was there a budget. Faculty and staff salaries were allocated out of Department of Pathology and any fees were returned to the general university fund. The department generally performed necropsies for farmers. In 1964, Dr. Vaughn Seaton became the first full time ISU VDL Director. Since that time Dr. Gary Osweiler (1996-2004) and Dr. Bruce Janke (2004-present) have served as Director. The ISU VDL is now one of 3 sections (ISU VDL, Production Animal Medicine, and Extension) in the Department of Veterinary Diagnostic and Production Animal Medicine for which Dr. Pat Halbur serves as Interim Chair and as the Executive Director of the VDL. The Laboratory has a long history of success including the milestones on the next page.

Historical, current and future ISU VDL milestones

Pathology

Historically

- Early leader in use of immunohistochemistry as a diagnostic tool in the detection of infectious agents in livestock
- Pathologists have been involved in the discovery and characterization of newly identified and emerging diseases such as those induced by BVDV, PRV, SIV, PRRSV
- Trained food animal diagnostic pathologists placed in diagnostic labs across the U.S.
- Rotation through VDL a "must do" for those students in the U.S. interested in practicing food animal medicine
- Diagnosticians are information resources on best practices for control of diseases diagnosed in the VDL

Current

- Discovery of new diseases in the U.S. swine industry (hepatitis E virus, circovirus-associated diseases, swine influenza variants, swine neurologic and reproductive syndrome)
- Detection of the first case of rabbit hemorrhagic disease virus in North America
- Development of experimental models to understand etiology, pathogenesis, transmission and control of major livestock diseases (PRRSV, PCV2, SIV, M. bovis, C. perfringens, Erysipelas)
- Portal to the network of university resources to help producers and veterinarians establish best practices

Future

- Leader in food animal disease surveillance of major economic importance to U.S. livestock producers through use of Global Information Systems (GIS)
- Leader in use of diagnostic pathology techniques to detect food animal infectious diseases

Bacteriology

Historically

- ISU CVM graduates know how to culture bacteria based on VDL and Clinical Microbiology rotation
- Thorough, low cost examination of tissues for bacterial

- Collaboration with researchers at ISU, other universities, and industry

Current

- Advances in antimicrobial susceptibility testing including automated reading and data linkage to computer systems
- Significant contributions to the Veterinary Antimicrobial Decision System (VADS)
- Surveillance programs and models

Future

- Transfer of bacterial molecular diagnostic technologies from research to diagnostic use
- Development of a food animal bacterial pathogen bank
- Development of PCR-based testing for routine diagnosis of infection with such pathogens as *Haemophilus parasuis*, *Leptospira* spp, *Erysipelothrix* spp.
- Development of PFGE methodologies for characterization of *Erysipelothrix* spp., *Haemophilus parasuis*, *Streptococcus suis* and other organisms

Virology/Molecular Diagnostics

Historically

- Broad services for detection of viruses by culture and fluorescent antibody detection techniques

Current

- Focus on developing molecular diagnostic technologies (PCR) for a major pathogens of food animals
- Developed real time PCR technologies and genetic sequencing for PRRSV, SIV, and PCV2
- Development of experimental models for validation of tests
- Focus on QA/QC for all virology tests
- Assisted with development and ongoing assessment of Bioanalytical Services unit for same day or overnight PRRSV PCR testing in semen/serum for boar stud monitoring
- Development of epidemiologic databases for herds/operations through gene sequence analysis of PRRSV and SIV isolates
- Contribution to monitoring and eradication programs for PRRSV
- Ongoing participation in NAHLN efforts in preparedness against FAD introduction/bioterrorism incidences.

Future

- Viral pathogen bank
- THE place for detection of new viral diseases
- Phylogenetic monitoring of pathogen changes
- Risk assessment through GIS mapping

Serology

Historically

- PRV surveillance and eradication
- Broad panel of tests for viral diseases for all species

Current

- Important resource for export testing
- Focus on QA/QC
- Adaptation of ELISAs for use in food animals

Future

- Development of data manipulation into graphic presentation format capabilities and database storage for maintenance of ongoing herd profiles
- Lyophilized serum storage for retrospective serologic analysis to aid in the diagnosis of acute disease problems or retrospective studies on disease incidence
- Development and implementation of new SIV serologic tests that differentiate infection vs. vaccination titers and will detect anti-SIV antibody unaffected by antigenic variation.
- Development and implementation of new serologic tests for emerging diseases (e.g. PCV2, *Neospora* sp.)

Chemistry/Toxicology

Historically

- One of the first and most complete menu of test offerings of any VDL in the U.S.
- Charter researchers in establishment of analytical standards for cholinesterase activity in tissues
- Mycotoxin center of excellence
- Carson and Osweiler veterinary toxicology textbook

Current

- Custom chemistries
- Development and growth of Racing Chemistry

Future

- Environmental testing
- Participation in Food Emergency Response Network and function as surge testing laboratory for certain compounds

Current VDL staff profiles/expertise. Both individually (through publications and research grants) and as teams, VDL faculty and staff have demonstrated **their** capacity for building programs and developing state-of-the-art tests and instrumentation. The qualifications and capabilities of faculty and staff are listed in *Appendix 1*.

Current client profiles. Cases submitted to the ISU VDL must be submitted through a veterinarian. The primary customers served by the ISU VDL are private veterinary practitioners who serve independent livestock producers and have a veterinary-client-patient relationship on those farms. The VDL also does contract surveillance work such as the VDPAM-Meat-Juice Project. The Meat Juice Project is a Pseudorabies virus surveillance project using novel technology developed by Dr. McKean in the CVM. For that project, muscle tissue is collected at slaughter plants across the Midwest U.S. and juices from that are tested by an ELISA serology test to determine if the farm of origin has been infected with this recently eradicated virus. This surveillance model is novel and has positioned the ISU VDL to be the leader in serological surveillance to work towards eradication of other major food animal diseases in the future.

Immediate, deliverable value to VDL's most significant client and stakeholder—the public¹

Iowa's agriculture industry generates \$6.1 billion dollars a year in livestock. Disease outbreak, even if it impacts only 1% of that industry, will result in a \$61 million loss in livestock receipts. The costs of these losses are passed on to consumers, processors, transporters, and packaging plants. Iowa needs to increase rather than decrease the critical support for diagnostic services accessible to Iowa livestock owners through the ISU VDL.

Industry, practitioners, and the state of Iowa have charged the ISU VDL with the critical and essential mission to safeguard Iowa's agricultural industry. Consider that the pork production is valued at \$3.1 billion, beef at \$2.1 billion, dairy at \$422 million, and poultry and egg production at \$512 million based on the 2003 USDA census.

Impact on Iowa Pork Production: \$3.1 Billion Industry. The diagnostic lab conducts its highest volume of testing for porcine reproductive and respiratory syndrome (PRRS) virus. PRRS virus costs \$6.61/pig produced. PRRSV-induced disease is estimated to cost the U.S. \$560 million and the Iowa industry \$140 million annually.² Diagnostic tests to stop the introduction and spread of PRRS virus are a primary focus of the ISU VDL. High quality diagnostic services result in decreased mortality and increased sales of pork. *A one percent increase in pork sales translates to \$31 million in revenue for Iowa.*

Impact on Iowa's \$2.1 Billion Beef and \$422 Million Dairy Industries. ISU VDL conducts fertility testing to diagnose the cause of infertility in cattle. High quality diagnostic services result in increased fertility in beef and dairy herds. Improving reproductive efficiency in beef cows by 10 percent means \$1,100 savings in a 100-cow herd which translates to \$9 million per year to the Iowa beef industry. Reduction of bovine respiratory disease morbidity/mortality by 10 percent results in \$1.7 million/year increased receipts. Reduction of dairy mastitis by 10 percent equals \$2.45 million/year. The reduction of Johne's disease by 10 percent translates to \$2.75 million/year. *A one percent increase in beef and dairy sales equals \$25 million per year in revenue for Iowa.*

Impact on Iowa Poultry and Egg Production—\$512 Million Industry. ISU VDL performs surveillance for avian influenza for the state of Iowa. The introduction and spread of a highly pathogenic strain of avian influenza to Iowa would conservatively result in losses of 30 percent of poultry sales. At 30 percent of \$512 million we estimate that this would cost the poultry industry \$154 million. Introduction and spread of fowl cholera in a 20,000 bird turkey operation can result in major losses. The loss of one-third of the birds translates to a \$173,250 loss for a single producer. High quality diagnostic services result in decreased mortality and increased sales of poultry and eggs. *One percent in poultry sales translates to \$5.12 million in potential revenue.*

Iowa Grain Industry. When Iowa's livestock industry is impacted by the spread of infectious disease and increased health problems, the Iowa grain industry is also impacted. Iowa livestock consumed approximately 520 million bushels of Iowa's corn crop. Of that, 54 percent went to hogs, 29 percent to beef cattle, 12 percent to poultry, and 5 percent to dairy cattle.

¹ <http://www.ers.usda.gov/StateFacts/IA.htm>, and <http://www.ers.usda.gov/StateFacts/TopAgCommodities/TOP25IA.txt>

² Figures and data derived from JAVMA, volume 227 number 3, August 1, 2005: "Assessment of the economic impact of porcine reproductive and respiratory syndrome on swine production in the U.S.

Private laboratories and federal facilities do not have the infrastructure, resources, academic and professional expertise, or the charge to deliver the type of comprehensive, broad spectrum preventative, surveillance, and diagnostic testing services that protect against these types of economic and health crises. That makes every Iowan a stakeholder in the investment made to fund the unique type of services the Iowa State University' VDL provides. I think this paragraph is very important. I don't recall seeing it in the exec summary.

With necessary funding, the ISU VDL provides the foundation for sustaining the health of Iowa's agricultural economy.

ISU VDL is continually in the process of upgrading its facilities and equipment and, most significantly, recruiting and training the professional experts necessary to manage the increasing demand for services. Though we must certainly solicit additional funding to meet existing demands for services, we must also be more pro-active if we are to sustain, and protect the future of Iowa's agricultural industry; ISU VDL must have funds to anticipate and develop services and methods to

- provide Iowa livestock producers affordable access to cutting edge diagnostic tests for detection of domestic and foreign animal diseases
- provide Iowa livestock producers immediate access to unbiased expertise on current health challenges
- develop rapid response teams of VDL specialists including diagnostic pathologists, toxicologists, microbiologists, and species-specific production medicine specialists to lead investigations for independent and corporate producers and veterinary practitioners
- provide retrospective diagnostic services including database management and serum banking for epidemiological investigations for independent producers and the Iowa Department of Agriculture and Land Stewardship
- serve as a centralized information and training resource for federal and state agencies, universities, and corporations
- develop a pathogen depository for infectious disease organisms which would be a great resource for university researchers, biological companies, and diagnosticians across the world
- develop graduate training programs that will utilize the information and pathogens acquired through diagnostic investigations in research programs that will advance our knowledge base in diagnostic medicine and educate the next generation of diagnosticians which are in very short supply

ISU's VDL provides a significant resource for federal agencies, universities, producers, practitioners.

The VDL's unique variety of services makes it an ideal resource for clients, federal agencies, and universities. The table on the following page (*VDL's Relationships with Other Agencies*) indicates the breadth of information the ISU VDL is capable of distributing and tracking through its relationship with other agencies. With appropriate funding, VDL scientists can leverage these relationships to attract further funding, increase collaborative partnerships, and advance scientific knowledge.

ISU-Veterinary Diagnostic Laboratory's Relationships w/Other Agencies

National Animal Disease Center

- The focus of NADC is research into diseases of current concern to the livestock industries of the U.S. Some diseases have been studied for many years and others are added as they become more significant.
- A number of faculty in the College of Veterinary Medicine (including the ISU VDL) collaborate on research projects with scientists at NADC and serve on graduate committees for graduate students who conduct their research at NADC while enrolled at ISU.
- NADC experts are frequently notified of interesting cases or disease outbreaks in their area of research by ISU VDL diagnosticians. In some cases this may result in joint field trips to the farms with ISU faculty and students.

IA Dept. of Ag. and Land Stewardship

- ISU VDL does the surveillance and regulatory testing for diseases designated by IDALS including brucellosis, avian influenza, equine infectious anemia, pseudorabies virus, and others.
- ISU VDL does additional testing on Iowa packing plant carcass samples with unknown diseases or suspected regulatory diseases.
- ISU VDL does testing for certification programs designed by the IDALS. Examples include avian salmonella, avian influenza, and Johnes disease in cattle.

Internally—ISU Colleges

College of Agriculture

- VDPAM and Animal Science faculty are co-investigators on several grants. Many of these involve disease surveillance. Testing for those diseases is done at the ISU VDL.
- Faculty working on animal welfare and environmental management often do research that involves assessing physiological parameters of animals. Tests to assess this are done at the ISU VDL.
- Health monitoring of ISU Farms (Dairy, Beef, Swine, Small Ruminant) is done through the ISU VDL.

College of Liberal Arts and Sciences

- Research projects often have a microbiological or histopathological assessment component. That assessment is often done through testing at the ISU VDL.

Family and Consumer Sciences

- Food safety research projects often have a substantial microbiological component. That assessment is often done through testing at the ISU VDL.

ISU Veterinary Diagnostic Lab

- Works primarily through local veterinary practitioners on current livestock disease outbreaks.
- The menu of tests offered is broad in that all types of infectious diseases (viruses, bacteria, parasites) and production problems (toxicological, environmental, nutritional) are considered and screened for in the diagnostic investigation.
- Case turnaround time is expected to be days rather than weeks.
- ISU VDL diagnosticians often collaborate with experts in production animal medicine section of VDPAM and work with the referring veterinarian to go beyond the diagnosis and assist with developing treatment and control programs and assessing outcomes of those intervention strategies.
- Case material is used extensively for teaching professional students during this process and developing best practices to be used in professional courses.
- Case material is an important and frequently used resource for research ideas, projects and grants.

Other Universities

- ISU VDL has recognized expertise in swine pathology and immunohistochemistry. Samples from other University VDLs are commonly forwarded to ISU VDL for testing and expert opinions in these areas.
- ISU VDL offers certain tests that other VDLs do not and samples are received for testing in those areas. ISU VDL also sends some samples out for testing in areas where ISU VDL lacks expertise or equipment because the low volume does not justify having the test in house.

National Veterinary Services Laboratory

- NVSL serves the entire U.S. and is administered by Veterinary Services, Animal and Plant Health Inspection Services (APHIS) of the USDA.
- Portions of NVSL in Ames include the Diagnostic Pathology, Bacteriology and Virology Labs.
- These labs function as the U.S. diagnostic reference center for exotic and major enzootic diseases and supply diagnostic reagents to state and private labs.
- NVSL also has testing capabilities for many of the rarely observed diseases that are of relatively minor importance and occur so infrequently that reagents are not readily accessible and thus university and state laboratories cannot justify running those tests on a regular basis.
- ISU VDL uses NVSL in the same manner as all other states. This includes submission of case samples suspected of being foreign

Center for Veterinary Biologics

- CVB is responsible for the regulation of the production, testing and distribution of veterinary biologic (immunological) and diagnostic products in the U.S.
- A program of licensing, testing and inspection is administered by the CVB to assure that products distributed in the U.S. for the diagnosis, prevention, and treatment of animal diseases are not worthless, dangerous, or harmful.
- CVB interacts with diagnosticians at ISU VDL to get feedback on the safety and efficacy of biological products based information from VDL cases
- CVB often access ISU VDL expertise on experimental models for testing and assessing vaccine efficacy

III. How is the ISU VDL funded and what are the funding needs?

Fees for VDL services were not charged until 1970, when client demand increased to the point where fees were required to cover a portion of testing materials and processing. Over time, the portion of the operating budget derived from fees gradually increased to peak at about 75% in fiscal years 2001-2002, during the height of Pseudorabies virus testing. In 1996 the ISU VDL received a portion of the state appropriation for the Healthy Livestock Initiative which provided funding for the advancement of production animal medicine and the improvement of livestock health.

In 2005, ISU VDL's revenues totaled to \$6,818,751. The VDL received funding primarily from three sources:

% of Total Revenue Stream	Revenue Source	Primarily Allocated for
64%	fees for services	cost recovery for testing
30%	state appropriations	salaries, benefits
6%	federal and state grants	targeted research and surveillance projects

Fees: Approximately 64% of VDL's annual budget is derived from fees charged for services. The American Association of Veterinary Laboratory Diagnosticians recommends that no more than 35% of the budget of a veterinary diagnostic laboratory come from fee income to avoid conflicts in its mission to serve producers and consumers for the benefit of public and animal health.

State Appropriations: In FY 2006, the CVM was block funded \$20.7 million of state appropriations from ISU. Of that, \$4.7 million is distributed to VDPAM and from that \$2.2 million (30% of the total VDL operating budget and nearly 10% of the CVM budget) is allocated to the VDL. Essentially, all of the \$2.2 million allocated to the VDL is for faculty and staff salaries and benefits; however, that funding is now critically needed by the College of Veterinary Medicine to regain accreditation and sustain and build increasingly competitive programs by attracting outstanding faculty, building nationally recognized programs, and increasing collaboration with federal laboratories in Ames. The College has intensified its focus and is funneling its resources into practicing outcomes/evidence-based medicine, acquisition of leading edge teaching/information technologies, development of multi-institutional/disciplinary research projects and attaining funding for graduate student and faculty development.

Grant funding: The majority of the research funds received were for research trials—original research for developing new technology/instrumentation and tests, experimental models, testing intervention strategies, and for understanding the epidemiology of certain diseases. Research conducted by ISU VDL has proven to be an extremely effective and efficient investment when based on numbers of peer reviewed publications and direct service provided to the agriculture industry.

Need for increased funding due to decreasing budgets and elimination of funded programs. As recommended by the AAVLD criteria for accreditation, and in response to the State's land grant charge, Iowa State's VDL does not recover the costs of its operation through fee generation and has relied a great deal upon state appropriations to support salaries and benefits of its staff. Specifically, funding deficits have evolved for the following reasons:

- Eradication of Pseudorabies Virus (PRV) meant the elimination of nearly \$1 million in subsidized funding. In addition, income dropped more than \$1 million as a result of reduction in serologic testing that was routinely added to samples taken for PRV testing.
- Over the past 12 years, the number of staff positions has remained fairly constant but the amount paid for salaries and benefits has increased dramatically. VDL has not proportionately passed on these increased costs by raising fees. The goal has been to keep fees at reasonable rates to encourage testing by clients.
- Central ISU administration surcharges on receipts and Environmental Health and Safety surcharge on purchases now costs the ISU VDL \$130,000 annually.

The ISU VDL cannot continue operating under current funding conditions and still continue to provide the breadth and excellence of services it has provided in the past. Without additional funding, there will be inevitable reduction in

services offered and it will be difficult to maintain the desired quality of services that are rendered. In addition, there are no funds allocated for those prevention and sustainability programs that will allow us to sustain, and protect the future of Iowa's agricultural industry.

Rationale for directing and developing alternative funding sources

"Keep in mind that revenue is a fairly good measure of activity but not of profit . . . More revenue generating [while continuing] money losing activity is not a formula for success." *Dr. James Collins, VDL Director, University of Minnesota*

The University of Minnesota VDL is structured similarly to the ISU VDL. Like ISU VDL, the Minnesota VDL is dangerously close to operating at a loss because of its heavy reliance on revenues from fees and its goal to maintain a broad menu of diagnostic testing. Yet some of the "money-losing" tests from the menu (such as portions of chemistry, virology and toxicology), may prove to be critical in the event of detecting disease outbreaks and preventing the spread of disease. An unbiased, comprehensive approach to testing is the unique role and responsibility of university veterinary diagnostic laboratories. Therefore, it is essential that we not focus on the elimination of those activities that fail to recover costs but on expanding those services and developing those markets that provide the best opportunities for generating revenue (as defined in "Rapidly Developing Areas of Interest").

Our plan to increase funding is driven, not by profit but by a mission of providing valuable services to, and meeting diagnostic demands locally, nationally and globally to ensure the safety of human and animal populations and to protect our food source.

These demands come in many forms

- Need for new and improved tests that are more effective, efficient, and less costly
- Need for new and improved instrumentation
- Rapidly increasing demand for services as they relate to molecular diagnostics, serology, semen quality assurance, and ante-mortem testing
- Articulated and defined international need to standardize the training of food supply veterinarians in support of safe trade practices
- Opportunities to promote economic development by providing training and support for other universities, federal laboratories, individual producers, veterinarians, and private businesses
- Opportunities to capitalize upon alternative funding programs such as participation in federal and state funded surveillance, prevention, and bio-terrorism programs.
- Economic value gained by developing and managing databases that track the source of infectious disease and serve as a historical reference for animal production systems
- Need for rapid response teams and services that will provide diagnosis, surveillance, and education for producers and veterinary practitioners
- Potential savings gained by providing tracking services, such as serum banking storage and turnover, as an "insurance policy" for producers in case of an infectious disease outbreak
- Internationally recognized need to improve communications and collaborations with federal and other state agencies
- Opportunities to generate new vaccines by providing and maintaining an international pathogen depository for organisms, an invaluable resource for biological and bio-pharmaceutical companies

In order to meet the demands as identified above, ISU's VDL must pursue alternative funding sources and access growing markets to support the operating infrastructure for client development as well as funds for improving and developing high-quality instrumentation and testing services. A critical component of our plan is to build upon and aggressively educate clients and federal and state agencies by promoting VDL's reputation for excellence, its history of local, national and international service.

Funding through direct state appropriation. There are a variety of options for revenue generation, some of which are explored in the following pages. Though these options have been identified and will be pursued, as part of a marketing and business plan, we must first consider the most obvious option for revenue generation, which is to request support from the client that benefits most significantly from VDL's services—the public.

Less than of 30% of the VDL's support derives from state appropriations, though the state investment represents Iowa's most significant stakeholders and clients—consumers and industry

To avoid a potential conflict of interests between economic drivers and public health, the American Association of Veterinary Laboratory Diagnosticians (AAVLD) recommends that no more than 35 percent of an accredited VDL budget should come from fee income; yet, ISU's VDL derives approximately 64% of its revenue from fees, exceeding AAVLD recommendation. In 2005 ISU VDL revenues totaled \$6,818,751. State appropriations account for less than 30% of that budget. The remaining 6% of revenues come from funding for research and surveillance.

It would seem that the clients who receive the most value from VDL's services would most benefit by investing in the increased quality and volume of those services. In this case, those clients are the public and industry, and the state legislature represents the interests of those clients. To adequately fund VDL at the level of service it delivers would require the legislature to invest \$4 million.

Deliverable benefits to consumers and industry from the \$4M investment include:

- Protection (through surveillance and monitoring) of Iowa's primary economic resource—agriculture
- Advancements in food safety (e.g. greater protection from *E coli*, *Salmonella*, and *Campylobacter* contamination)
- Protection against bio-terrorism agents that could be economically devastating for the state's economy—foot and mouth disease, hog cholera (classical swine fever), influenza viruses, and others
- Continuing education on best practices for disease diagnosis and control for veterinarians and producers
- Rapid response teams that investigate infectious disease outbreaks
- Diagnosis of current disease problems and long-term monitoring of the spread and impact of diseases in individual and corporate producer operations
- Outcomes-based medicine—the ability to establish and disseminate best practices for management and control of diseases
- Predictive modeling to understand and prevent the spread of potential animal disease outbreaks in Iowa livestock
- Reduced risks for consumers

To sustain the ISU VDL and support Iowa's agricultural industry, we must invest in evidence-based medicine that enhances knowledge of best practices. With added investment that would allow us to add people to work in these areas as well as in the laboratories to better characterize the pathogens we do discover, we can make tremendous strides toward better diagnostic medicine and enhance the practice of veterinary medicine and the profitability of animal agriculture.

ISU VDL solicits \$4 million investment from its most significant client—the state of Iowa. Often overlooked is the significant contribution that the ISU VDL's testing, education, and support services make to the protection of public health and to Iowa's economic welfare. The clients who receive the most value from ISU VDL's services are the public and the agriculture industry. To adequately fund the ISU VDL for the level of service it delivers would require the Iowa legislature to invest, in direct appropriations, approximately \$4 million.

ISU VDL Projected Budget. Though other sources of revenue generation will be pursued (see business plan for scientific focus and business development strategy), the thrust of our efforts at this point is to gain the investment of our greatest stakeholder—the Iowa legislature. Projected revenues and expenses are summarized below.

FY 2006 VDL projected operating budget

Revenue Summary

Direct appropriation	\$4,000,000
Fee income	\$4,360,000
External grants	\$ 300,000
HLI Equipment Fund	\$ <u>71,440</u>
TOTAL	\$8,731,440

Expense Summary

Faculty salaries and benefits	\$1,988,334
Technical and operating Staff	\$2,473,178
Operating expenses	\$2,606,000
Space and maintenance	\$ 384,925
Innovation and development	\$ 1,000,000
Equipment	\$ <u>150,000</u>
TOTAL	\$8,602,437

Potential solutions: decreasing costs—eliminating “money-losing” services, increasing value-added services

One of the characteristics of being an AAVLD accredited laboratory is that those laboratories are funded such that they avoid conflict of interests when considering costs as opposed to value or benefit of the public good. For this reason, the ISU VDL does not operate on a cost-recovery basis. The table below (*FY 2005 Expenses and Income by Section*) summarizes income and expenses by VDL section and demonstrates areas (serology and molecular diagnostics) the VDL should focus on for enhancement of revenues.

FY 2005 Expenses and Income by Section

	Expenses	% of Total	Income	% of Total
Informatics	\$59,464.52	1%	\$17,738.00	0%
Bacteriology	\$540,089.44	12%	\$585,009.75	14%
Chemistry/Toxicology	\$266,453.08	6%	\$108,589.40	3%
Bio-Analytical Service	\$31,351.99	1%	\$15,145.00	0%
Histopathology	\$365,313.98	8%	\$468,931.10	11%
Pathology	\$168,263.59	4%	\$29,926.99	1%
Serology	\$1,350,937.70	31%	\$1,888,393.81	44%
Virology	\$271,734.79	6%	\$185,510.55	4%
Molecular Diagnostics	\$530,189.68	12%	\$653,046.25	15%
Administration	\$802,459.78	18%	\$337,561.20	8%
TOTAL	\$4,386,258.20		\$4,289,852.05	

Eliminating sections and services: Expenses could be reduced by elimination of entire sections for which volume is low or costs relatively high. However, relatively few cases (except serology cases) involve only testing from one section, and a comprehensive workup requires testing in multiple sections. Clients expect comprehensive workups (one of the strengths of the ISU VDL) and decreasing comprehensive testing capacity will short-change and disappoint our clients, potentially endanger their livestock, and seriously damage the ISU VDL reputation. This also will eventually (and perhaps rather

quickly) result in loss of clientele and caseload. Finally, the decision to eliminate specialized areas of scientific investigation limits ISU's capacity for retaining and recruiting faculty interested in cutting edge research and impact on the livestock industry.

It is possible to reduce the number of tests we offer. Although the VDL offers many tests of various kinds, in each section a handful of tests constitute the bulk of the caseload. Technicians in the VDL must be able to multitask, and the less frequently requested tests are fit into the regular work schedule in addition to the large volume tests. To eliminate the low volume tests might simplify technicians' work but would have minimal effect on the financial picture. To eliminate high volume tests will result in loss of clients who expect such tests to be available.

Reducing Personnel: One approach to bringing a negative budget into balance is to reduce spending, which in the case of a diagnostic laboratory could mean elimination of personnel. Over the last couple years, non-essential positions have been eliminated through attrition and non-replacement or by transfer of staff from under-utilized areas to areas of greater need. In the serology section (which suffered the greatest loss of income due to the end of the PRV eradication program), the number of technicians has dropped from approximately 26 full- and part-time employees at the peak of testing to 10 at the present time. Technical staff is currently at less than optimum level in all sections, and absences due to illness, vacation, etc... cause considerable stress to maintain services. To cut additional staff would mean reducing the quality and timeliness of services or loss of specific services.

Raising fees: The ability to raise fees is limited. Clients closely monitor costs. Clients with large volume testing needs will shift submissions between laboratories to save pennies per test. *The ISU VDL, according to its charge and mandate, must be less concerned with generating and competing for more clients than it is with generating more value-added services that will protect the public and Iowa's agricultural industries.*

Refocusing on essential areas of service. While we may eliminate and/or reduce services in certain non-cost recovery areas (all or portions of chemistry, toxicology, virology sections), we will maintain and re-focus on conducting those 6-8 higher volume tests which are critical to Iowa livestock producers and generate 80% of the income (lead, mycotoxins, vitamin E, selenium, copper, organophosphates) in those sections. We will work cooperatively with other VDL's in the region to outsource tests in areas where other VDLs have higher testing volume and local expertise for specific toxicological tests and chemical analyses.

We will re-assign resources previously allocated for chemistry and toxicology and invest that in serology and molecular diagnostics (see next section, IV Scientific Areas for Developing Focus). We will also be developing custom diagnostic result databases, custom serum banking services, offer diagnostic training and education programs for a fee, and provide rapid response teams to generate more visibility and revenue.

IV. Scientific Areas of Focus for Developing Services

"The AVMA is advocating for increased efforts to identify and meet work force needs in population medicine, food supply veterinary medicine, and rural practice. Research and training in the areas of food supply veterinary medicine is now a critical priority for colleges." *JAVMA, Vol 227, No.3; News: AVMA Executive Board Coverage*

Strategic Investment in Rapidly Developing Areas of Interest

ISU VDL activities will be targeted to focus on traditionally successful (serology) or new (molecular diagnostics) profit centers and areas of rapidly developing interest and impact (semen testing) as identified through

- Market assessment as a result of VDL's work with industry specialists, commodity, and producer groups
- VDPAM faculty understanding of and experience in the future trends of Production Animal Medicine in Iowa and the U.S.
- Needs articulated in publications and presentations generated by federal and state agencies
- Faculty and staff assessment of and experience with global issues related to bio-security, bio-terrorism, and the spread of infectious disease among animal and human populations

Specific areas of developing interest include, but are not limited to the following areas:

Molecular diagnostics

Technology now allows us to detect pathogens directly from a blood or tissue sample (as opposed to growing the organism in cultures). The technology is more sensitive and specific and provides more comprehensive and critical information about organisms. This allows us to compare historical and current data for individual farms and regions and to determine whether organisms have changed over time or new ones have been introduced. These tools allow us to help producers distinguish between management and bio-security breakdowns. Based on previous experiences and projections, we anticipate significant revenue growth in this area each year. In FY04, \$400,000 was generated, in FY05, \$640,000, and, on the conservative side, fee revenue of \$800,000 is projected for FY06. To be competitive with laboratories such as the Minnesota VDL, we must apply technology earlier, continue to improve on it, and develop and access broader markets.

PCR on boar (and eventually bull) semen from artificial insemination centers.

Currently, there are approximately 20 boar studs in Iowa. Over 90% of the swine producers use artificial insemination and purchase semen from insemination centers (boar studs). The boars in these studs are collected daily and semen is shipped to farms across the state or region. At the same time, aliquots are sent to VDLs to test for infectious pathogens such as porcine reproductive and respiratory syndrome virus (PRRSV). The semen is held at the producers' farms until the VDL confirms the samples are negative for PRRSV and other pathogens. Once confirmed to be negative the semen is used to breed females in the herds. We anticipate this testing could generate \$500,000-\$1 million per year. PRRSV costs the U.S. industry \$560 million and the Iowa swine industry \$140 million annually.

New serology tests

The ISU VDL is continually working to improve current and develop new serological assays to assess exposure to viral and bacterial pathogens. Producers have become accustomed to using these assays to confirm that incoming seed stock is free of costly diseases. These have become critical insurance policies for producers. The tests are also used to understand the pattern of infection in production systems with current disease problems. The development and improvement of these tests require targeted funding for high-level bench-top R&D technicians who can assess client needs and appropriately direct test development.

Bovine ante-mortem testing

This type of testing is particularly important for the beef and dairy industries since individual animals are so valuable that it is often not cost effective to wait until animals die or to sacrifice animals to collect tissues from them to submit to the diagnostic lab. A good example is the growth in the demand for (and the impact of) testing for BVD virus by examination of a piece of skin from the ear of cattle. For \$3 the producer can assess if a newly purchased or sick animal is carrying and shedding BVD which plays a major role in reproductive and respiratory diseases.

Participation in federal and state-funded bioterrorism and surveillance programs

Our goal is to expand participation in the areas of surveillance, particularly meat juice surveillance systems for Foreign Animal Disease, and in preparedness for bioterrorism through participation in the National Animal Health Laboratory Network System.

ISU VDL will become a regional center for excellence for 3-5 swine and bovine diseases

We are well on our way to becoming the center for excellence in diagnosis and epidemiological assessment of PRRSV, SIV, PCV2, and Erysipelas for pig producers. Likewise we need to and will establish that reputation for BVD, Johnes, and Lepto in cattle.

Develop a center of excellence for testing the quality, consistency and safety of by products from ethanol production plants in Iowa. In the last few years, Iowa has invested billions of dollars into further processing of corn including production of ethanol in the last few years. Sustaining a market for the co-products or by-products of these processes is dependent on quality assurance of the product used in animal feeds. ISU can play a major role in providing unbiased confirmatory testing of these products for the plants and users.

V. Plan for Developing and Accessing Alternative Funding Sources

Our plan is to develop and implement a broad-based approach to generating funding for the ISU VDL's operations. This includes a multi-faceted approach for accessing and establishing potential funding sources such as:

- Solicitation of likely donors
- Accessing state economic development funds
- Applying to federal research agencies
- Developing fee-based corporate and international diagnostic training programs
- Increasing services in targeted areas as defined above
- Establishing collaborations/partnerships with state and federal agencies to build ISU's VDL into a regional Center for Excellence in Food Animal Veterinary Diagnostic Medicine
- Targeting and establishing research, service, and training relationships with other universities and laboratories

Ensure federal and state investment in economic development

- Secure increased legislative funding through direct appropriation for the ISU VDL
- Pursue and leverage state funding for economic development by defining and promoting ISU VDL's role in supporting the sustainability of Iowa's most significant industries—agriculture
- Increase ISU VDL's participation in nationally and internationally, federally-funded programs for surveillance and bio-security

Generate funds for innovation and research excellence

- Secure grant funds from end users for projects and programs researching new testing and instrumentation that will be used directly for service
- Share internal resources among the four ISU colleges served by the ISU VDL

Deliver local, national and global training programs

- Develop and implement plans/programs for fee-based targeted training for corporate partners, veterinarians and producers
- Develop and implement plans/programs for federal-funded international training programs (globalization)
- Develop specialized learning opportunities to address the national shortage of food supply veterinarians—ISU is unique in the access to food animal cases in the ISU VDL

Establish international center for delivery of VDL services

- Establish new and build upon existing partnerships with other educational institutions—we can provide unique training and education to these institutions that do not have financial and educational expertise in production animal medicine
- Establish new and build upon existing corporate partnerships—provide a “full-service” approach by not only delivering diagnostic services but also training technicians, veterinarians, and production specialists
- Develop and establish donor base to endow facilities, programs, and projects—target particularly those veterinarians, corporations, and producers who have successful partnerships and fond relationships with ISU VDPAM
- Work with State and Federal Agencies to develop an Iowa Food Animal Disease and Diagnostic and Research Center—this has been modeled in Michigan where the DNR, Michigan Department of Agriculture, and the MSU Veterinary Diagnostic Laboratory share a facility and cooperate on delivery of programs and grants.

VI. Leveraging Alternative Sources of Funding: Phase I Preparation

The ISU VDL is in the process of shifting gears to better assess, develop, and implement plans for meeting demands, improving services, educating clients, promoting services and, ultimately, generating significant revenue for these activities. Our first step in approaching this course of action is to formally conduct an assessment of VDL's capacity to provide services given industry trends and client demands. The target areas for "growing" the ISU VDL to better serve the state and generate revenue are: technology development, knowledge development, operations and management, training and staffing, planning, and market development.

1. Conduct market assessment

- Identify clients (10-20% revenue)—particularly new and emerging clients with potential for growth and industry leadership. A list of current clients and high-end potential prospects will be established and a comprehensive service plan and timeline developed.
- Establish and utilize an advisory board of leaders reflective of the client base.
- Identify/assess needs—
 - internal (ISU) need for diagnostic services and expertise as it relates to research and service projects within the CVM and other ISU colleges
 - external needs for services and expertise as it relates to development of the next generation of diagnostic tests to better serve current and attract new clients and improve the quality and impact of tests for disease diagnosis and prevention in commercial, seed stock, and alternative production operations
 - current and anticipated needs for services in private biopharmaceutical companies
 - current and anticipated needs for services and partnerships with other universities
 - current and anticipated needs for services and opportunities for partnerships with state and federal government agencies
- evaluate ISU in relation to competition in pricing, scope and quality of services provided
- regularly and systematically review fees based on the market, competition, and impact
- regularly calculate return on investment for all tests offered to determine VDL's areas of focus and growth
- maximize the use of case materials for teaching and research opportunities internally and externally

2. Determine ISU VDL's capacity for meeting market demands/client needs

- Develop client profiles and needs by category—producer groups, private veterinary practitioners, corporate, federal, state, etc...
- Determine level of staff expertise and reputation in targeted areas of industry needs and associated growth in diagnostic services
- Regularly conduct an evaluation of the process and ability of ISU VDL personnel to deliver services
- Regularly and proactively conduct evaluations to determine the need for development of new tests and acquisition of instrumentation to keep the ISU VDL efficient and competitive

3. Establish and implement marketing plans

- Educate clients about need for/quality of services offered by the ISU VDL
- Promote services by developing/implementing an ongoing cultivation/education campaign
- Promote ISU VDL reputation by developing communication/marketing materials/plans
- Demonstrate quality and reliability
- Demonstrate benefits of interrelationship of science/research/education expertise
- Demonstrate our edge over competition
- Recruit clients
- Develop and build upon informal and formal relationships with industry leaders
- Develop and leverage internal and external partnerships to generate broader and more diverse client base

A component of marketing will rely on documenting and communicating ISU VDL's reliability, quality, innovation, success, capacity for service and ability to deliver that service effectively and efficiently.

4. Meet market demands through

- Service contracts with commercial companies—particularly biological and pharmaceutical companies
- Contracts with private food animal research companies like Veterinary Resources, Inc.
- Contracts with genetic suppliers who have a large stake in dissemination of animal diseases and are heavily invested in surveillance for those diseases in their seed stock
- Subcontracts with ISU and ISU CVM researchers
- Partnerships with federal and state agencies
- Partnerships with other universities and colleges to maximize and leverage resources and expertise

Appendix 1

Staff Profiles

ISU VDL Management

Pat Halbur DVM, MS, PhD – Diagnostic pathologist. Active in leadership of the Iowa Veterinary Medical Association (IVMA) and the American Association of Swine Veterinarians (AASV) and currently serving as Interim Chair of the Department of Veterinary Diagnostic and Production Animal Medicine and **Executive Director of the ISU VDL**. World-renowned for his diagnostic efforts and research accomplishments in swine infectious diseases (PRRSV, PCV2, and Hepatitis E viruses). Highly sought after by VDL clients because of his ability to analyze current field problems and link them to the latest research and develop action plans to control current and prevent future problems based on his knowledge of best practices in these areas.

Bruce Janke DVM, PhD – Diagnostic pathologist. Currently serving as **Interim Director of the ISU VDL**. Over 25 years experience in diagnostic medicine in Iowa, South Dakota and Missouri. Active in the American Association of Veterinary Laboratory Diagnosticians. Nationally recognized for expertise in the area of Swine Influenza.

Faculty and Selected Professional and Scientific Staff

Vickie Cooper DVM, MS, PhD – Diagnostic pathologist. Strong interest and expertise in cattle, both dairy and beef. Very knowledgeable in practical bovine medicine and application of diagnostic results to action plans for beef and dairy herds. Expertise in bovine virus diarrhea virus (BVDV); oversees ISU VDL services in herd screening efforts through use of ear notch testing for identifying animals persistently infected with and shedding BVDV. Experience in diagnostic medicine in Nebraska, Kansas, Oklahoma and Wisconsin before coming to ISU.

Karen Harmon PhD – Molecular diagnostician. Has led the development, implementation, maintenance and continued improvement of the ISU VDL molecular diagnostic section (PCR tests, gene sequencing) which is the fastest growing section and one of the profit centers of the VDL. Extensive efforts in characterization of PRRSV and SIV.

Lorraine Hoffman PhD – Diagnostic bacteriologist and Section Leader of Bacteriology. Nationally recognized for her expertise in diagnostic bacteriology. Many years service in the AAVLD on committees that address these areas. Highly sought after by VDL clients and by microbiologists from other federal, state and private diagnostic laboratories because of her extensive knowledge base in diagnostic bacteriology. Extensive record of collaboration with commercial companies in developing and implementing “beyond the normal” diagnostic bacteriology efforts to derive information of value to the livestock industries.

Walt Hyde PhD – Chemist. Section Leader of Chemistry and Racing Chemistry. International reputation in the dog and horse racing communities for development and implementation of quality assurance programs for regulatory testing in these industries. Produces and administers proficiency tests for laboratory certification for several international governing bodies in the racing industry. Most recently serving as supervisor in charge of set up and running of Bioanalytical Services unit within the VDL which provides timely and dependable testing for PRRSV in semen from boar stud operations in Iowa and surrounding states.

Paula Imerman MS, PhD – Chemist. Oversees daily chemistry/toxicology testing. Proficient in custom chemistry offerings in which special requests for analysis for new compounds or old compounds in a new substrate require compilation of information in the literature combined with knowledge of basic chemistry principles to develop new analytical tests. Point person for ISU VDL participation in the Food Emergency Response Network.

John Johnson DVM– Assistant Scientists in diagnostic pathology. Recently joined the ISU VDL after 24 years in a progressive private food animal practice in Iowa. Now is focused on coordinating major case investigations and delivery of value-added diagnostic services to current major and prospective clients that are industry leaders.

Dianna Jordan DVM, MS, PhD– Diagnostic pathologist. Recent addition to the ISU VDL. Strong interest and expertise in development and use of molecular techniques for diagnostic medicine, particularly bacterial diseases of food animals. Research efforts in *E. coli*, *Actinobacillus suis*, erysipelas and *Haemophilus parasuis* in swine.

JoAnn Kinyon MS– Bacteriologist. Renowned for her years of experience and effectiveness in teaching diagnostic bacteriology to fourth year veterinary students. World renowned for her expertise in the discovery and diagnosis of swine dysentery and other porcine spirochetes. A leader in establishing service contracts for bacteriology projects with private and corporate companies.

Christy Loiacono DVM, PhD– Diagnostic pathologist that recently joined the ISU VDL. Board-certified by the American College of Veterinary Pathologists. Strong interests in equine and bovine diagnostic medicine.

Gary Osweiler DVM, PhD– Diagnostic toxicologist. Board certified by the American College of Veterinary Toxicology. Extensive experience and international reputation in the field of toxicology. Co-author of a veterinary diagnostic toxicology textbook that is widely used in veterinary curriculums across the world. Served as ISU VDL Director for 10 years. Currently serving as the President of the American Association of Veterinary Laboratory Diagnosticians.

Kent Schwartz DVM, MS– Diagnostic pathologist. Livestock producer. Section Leader of Pathology. Internationally recognized as an expert in swine and bovine infectious diseases and production problems. Recognized for his expertise in conducting field trials to establish best practices for control of swine enteric and respiratory diseases. Highly sought after internationally for his current and historical knowledge of the swine industry.

Mike Yaeger DVM, PhD– Diagnostic pathologist. Many years experience in diagnostic medicine in South Dakota and Iowa. Board-certified by the American College of Veterinary Pathologists. Broad knowledge in pathology for all species and recognized for his expertise in reproductive and gastrointestinal diseases of pigs and cattle. Outstanding teacher.

Kyoung-Jin Yoon DVM, PhD– Diagnostic virologist. Section Leader of Virology and Molecular Diagnostics. Board-certified in Veterinary Microbiology. Internationally recognized for research efforts in PRRS virus and swine influenza viruses. Major role in development and expansion of VDL molecular diagnostic services. Provides VDL clients with ongoing PRRSV and SIV epidemiology data on their herds/operations through sequencing studies and phylogenetic tree preparation.

Eric Zhou PhD– Diagnostic Immunologist. Section Leader of Serology. Expertise in the development of new serologic tests, especially ELISA-based tests, most recently for PRRS virus and the recently emerged porcine circovirus-associated diseases. Very knowledgeable on development and implementation of tests necessary for exporting food animals.