

SWINE HEALTH INFORMATION CENTER

FINAL RESEARCH GRANT REPORT

Project Title: ISU technological transfer and implementation at OH ADDL of confirmed tissue disease diagnosis codes and prospective reporting to the SDRS.

Project Identification Number: PR-25-068

Principal Investigator: Giovani Trevisan, DVM, MBA, PhD & Daniel Linhares, DVM, MBA, PhD.

Co-Investigators: Melanie Prarat, Eric Burrough, Guilherme Cezar, Rodger Main, Ryan Farmer, & Ryan Yanez

Institution: Veterinary Diagnostic and Production Animal Medicine. Iowa State University, College of Veterinary Medicine.

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Industry Summary: Endemic diseases remain one of the most important challenges affecting swine health and production in the U.S. The Swine Disease Reporting System (SDRS, <https://fieldepi.org/sdrs/>) provides industry stakeholders with disease-surveillance information generated from veterinary diagnostic laboratory data. One important source of information is the Disease Diagnosis (Dx) code system developed at the Iowa State University Veterinary Diagnostic Laboratory (ISU-VDL), which captures pathologist-confirmed tissue disease diagnoses using a standardized coding framework. These diagnoses provide a valuable surveillance tool, allowing the capture of trends of confirmed disease occurrence since they rely on the final interpretation of clinical history, pathology findings, and laboratory testing results by a diagnostician. The Swine Health Information Center (SHIC) funded a project to transfer and implement the ISU-VDL Dx code system at the Ohio Animal Disease Diagnostic Laboratory (OH-ADDL) and establish prospective reporting of confirmed tissue disease diagnoses into the SDRS. The project included transferring the Dx code matrix, implementing Dx code capture within OH-ADDL laboratory information management system (LIMS), developing automated application programming interface (API) Dx code collection reporting to SDRS, collation with ISU VDL data, and reporting on SDRS monthly PDF reporting. All project objectives were successfully achieved. OH-VDL became the first veterinary diagnostic laboratory outside ISU-VDL to adopt the Dx code framework, and report confirmed tissue

diagnoses in SDRS, with the first OH-ADDL Dx code data being reported into SDRS report #94 in December 2025. The project established the first multi-laboratory database of standardized confirmed tissue diagnoses and demonstrated that diagnostician-assigned disease diagnoses can be successfully shared and aggregated across institutions. These developments expand geographic coverage, improve the representativeness of surveillance data, and provide a scalable model of future participation of additional veterinary diagnostic laboratories.

Contact information: Giovani Trevisan, Principal Investigator

trevisan@iastate.edu +1515-294-3556

Daniel Linhares, Principal Investigator

linhares@iastate.edu +1515-294-9358

Please indicate if you plan to submit this full report for peer-reviewed publication: Yes ☒ No ☐

If you plan to submit this full report for publication, SHIC will only post the industry summary on its website and will delay posting of the full final report according to the terms of the contract (Publication Section 5a).

This work has been submitted for peer-reviewed publication and is already available at:

Cezar GA, Burrough ER, Main RG, Koscielny MP, Farmer R, Yanez R, Nicolino RR, Linhares DCL, Trevisan G. Macroepidemiologic assessment of swine disease co-occurrences in the United States of America. Porcine Health Manag. 2026 Feb 5;12(1):21. doi: 10.1186/s40813-026-00487-4. Available at <https://link.springer.com/article/10.1186/s40813-026-00487-4>

Key Producer Outcomes:

- Transfer the current ISU-VDL disease diagnosis Dx code matrix to OH-ADDL
- Implement the disease diagnosis system at OH-ADDL
- Prospective report confirmed tissue disease diagnosis from OH-ADDL to SDRS
- Findings will be reported on monthly SDRS reports.
- Created a structured framework capable of being expanded and reporting confirmed tissue disease diagnosis for over 40 pathogens affecting the US Swine Industry

Keywords: Dx code, OH-ADDL, prospective report, SDRS

Scientific Abstract: The Dx code system developed at ISU-VDL provides a standardized approach for capturing confirmed tissue diagnoses and supporting disease surveillance. Although successfully used within ISU-VDL and the SDRS, implementation at other veterinary diagnostic laboratories had not previously occurred. The objective of this project was to transfer workflow and framework to the OH-ADDL, implement the system within its diagnostic workflow, and establish prospective reporting to SDRS. The complete Dx code matrix was transferred and incorporated into OH-ADDL LIMS. Automated data exchange was established through a secure API, allowing routine retrieval and integration of confirmed tissue diagnoses into SDRS. All objectives were achieved. OH-ADDL became the first laboratory outside ISU-VDL to adopt the coding framework, and prospective reporting began in 2025, with data incorporated into SDRS monthly reports starting with Report #94 in December 2025. This project established the first multi-laboratory infrastructure for standardized reporting of confirmed tissue diagnoses and provides a scalable foundation for expanding tissue-disease surveillance in the U.S. swine industry.

Introduction:

While foreign animal diseases remain an important concern, endemic diseases continue to represent a major burden affecting swine population in the U.S. Understanding disease occurrence by region, production type, and age category provides valuable information to support animal health decision-making and disease control efforts. Veterinary diagnostic laboratories generate substantial amounts of diagnostic information; however, traditional diagnostic reports are generally produced as individual case documents and are not practical for large-scale disease surveillance.

To address this limitation, the ISU-VDL developed a Dx code system to standardize the recording of confirmed tissue diagnoses. The coding framework captures the affected system, insult type, lesion, and disease process or etiology, allowing diagnostician conclusions to be stored as structured data and facilitating case retrieval, disease monitoring, and epidemiological analyses (Derscheid et al., 2021). Aggregated Dx code data have subsequently been used to support disease surveillance dashboards and reporting through SDRS (Trevisan et al., 2021).

Despite its successful application, the Dx code framework had only been implemented at ISU-VDL, limiting confirmed tissue disease surveillance to a single institution. Stakeholders have requested

expansion of confirmed tissue diagnoses reporting beyond ISU-VDL. In addition, the 2025 SHIC Plan of Work specifically requested SDRS to “*Report the prevalence and trends of co-infections over time and expand the VDLs that contribute to the confirmed disease diagnoses through histopathology and tissue evaluation by pathologists, such as diagnostic codes*”. Therefore, *the overall objective* of this proposal was to transfer technology and expand the veterinary diagnostic laboratory network using Dx codes and reporting confirmed tissue disease diagnosis to the SDRS. The specific aims were to:

- a) Transfer the current ISU VDL disease diagnosis Dx code matrix to OH-ADDL;
- b) Implement the disease diagnosis system at OH-ADDL;
- c) Prospectively report confirmed tissue disease diagnosis from OH-ADDL to SDRS.

Materials & Methods:

Data source and management:

Following the methodology described by Cezar et al, the diagnostic code methodology developed by ISU-VDL was transferred to the OH-ADDL and implemented in their laboratory information management system (LIMS) to ensure consistency in diagnostic terminology. Usage of a standardized coding system enhances the accuracy of data aggregation across laboratories by harmonizing case results. In alignment with previously established methodologies, anonymized confirmed diagnosis submission records, including the four levels of the code (system, insult type, lesion type, and etiology), were collected, cleaned, and standardized at the submission level. All identifying information related to laboratory clients, including farm owners, veterinarians, and submitters, was anonymized before being integrated into the database. Initially, data collation was performed using a SAS script (SAS Version 9.4, SAS Institute Inc., Cary, NC). It was later transitioned to a web-based application developed in C# 10 using the NET 6 framework. The processed data were securely stored in a Microsoft SQL Server database hosted by the Department of Veterinary Diagnostic and Production Animal Medicine (VDPAM) at Iowa State University. OH-ADDL supplied a unique application programming interface (API) key, which enabled secure and automated daily retrieval of diagnostic data through “GET” calls. The system ensures that the central database remains consistently updated with the most recent submissions, supporting prospective reporting of confirmed tissue disease diagnoses to SDRS.

Following implementation of the Dx code system at OH-ADDL, prospectively assigned disease diagnosis records from porcine tissue cases were organized at the submission level, with each accession ID representing a unique case. Associated metadata included received date, site state, and Dx codes and have been included in the SDRS reports since the end of 2025.

Disease diagnosis collation

Diagnostic records were organized at the submission level using the accession ID assigned by OH-ADDL as the unique case identifier. Associated information included received date, site state, and diagnostician-assigned Dx codes. Records associated with non-swine species, research cases, or submissions originating outside the U.S. were excluded from reporting. Since December 2025 confirmed tissue disease diagnosis records were prospectively integrated with existing ISU-VDL Dx-code data to support multi-laboratory disease surveillance through SDRS. The developed framework has been functional for eight months and has demonstrated operation in a stable, sustainable format.

Results:

The project has successfully completed the foundational steps needed to establish a multi-laboratory, standardized tissue-diagnosis surveillance system. The ISU-VDL diagnostic coding system was transferred and implemented in a compatible format at the OH-ADDL, marking the first adoption of the Dx code framework outside ISU-VDL. The Dx codes were integrated into the OH-ADDL LIMS, ensuring the capacity for data collection and transfer. Prospective reporting of Dx codes, tissue diagnoses from OH-ADDL to SDRS began with SDRS Report #94 from December 2025. Using the existing API-based data-transfer tool, OH-ADDL now allows the SDRS team to make calls and retrieve Dx codes for cases daily, enabling automated, secure retrieval of new records. These data are routinely aggregated with ISU-VDL submissions into a single multi-laboratory database.

Early implementation demonstrated the feasibility of sharing standardized disease diagnosis data across institutions with confirmed tissue cases from OH-ADDL successfully integrated into the database during the initial implementation phase. OH-ADDL cases originated mostly from Ohio but also from other states like West Virginia, expanding the geographic coverage of tissue-disease surveillance.

In addition, project outcomes contributed to the peer-reviewed publication “*Macroepidemiologic assessment of swine disease co-occurrences in the United States of America*” (Cezar et al., 2026), which

described the successful transfer of the Dx code methodology and demonstrated the feasibility of integrating confirmed tissue diagnoses across institutions.

Table 1: Summary of proposed objectives and achievements for this project.

<u>Proposed goal</u>	<u>Achievements</u>
Transfer the current ISU VDL disease diagnosis Dx code matrix to OH ADDL	Completed the full transfer and implementation of the ISU VDL Dx code matrix at OH-ADDL, establishing the first standardized, cross-laboratory diagnostic-coding system between the two institutions. This achievement includes making ISU Dx code permutations available in a transferable format to OH-ADDL to enhance the ability to capture disease-diagnosis reporting.
Implement the disease diagnosis system at OH ADDL	The disease-diagnosis coding system was fully implemented at OH-ADDL, including the development of a LIMS application capable of capturing and storing diagnostician-assigned Dx codes and enabling data sharing with SDRS.
Prospectively report confirmed tissue disease diagnosis from OH ADDL to SDRS.	The system now prospectively reports confirmed tissue-diagnosis Dx codes from OH-ADDL into SDRS. Dx codes are transferred through the existing application program interface (API), routinely retrieved, collated, and aggregated with ISU VDL data, and integrated into a single multi-laboratory database. These combined datasets have fed the SDRS monthly reports since December 2025 (SDRS report #94).

Discussion:

The project successfully demonstrated that the Dx code developed at ISU-VDL can be implemented at other veterinary diagnostic laboratories and used to integrate diagnostic data in a seamless process. The successful adoption of the system at OH-ADDL established the first cross-laboratory framework for reporting pathologist-confirmed tissue diagnoses through SDRS.

Automated API-based reporting enabled routine sharing of confirmed-diagnosis data and expanded the geographic coverage of tissue-disease surveillance. Although differences in the format of data shared by OH-ADDL required additional information technology development and code-mapping efforts beyond those originally anticipated, these challenges were successfully addressed and did not delay achievement of project objectives. The resulting infrastructure provides a scalable foundation for participation of additional laboratories and supports broader monitoring of endemic swine diseases using standardized, pathologist-confirmed diagnoses.

References:

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