

# GRADUATE CERTIFICATE IN VECTOR-BORNE DISEASES

Vector-borne and zoonotic diseases continue to emerge and re-emerge, threatening human and animal health. This comprehensive certificate program in Vector-Borne Diseases (VBD) aims to provide CSU graduate students with a solid foundation in vector-borne diseases, equipping them with the knowledge and skills in this disciplinary area for careers in fields such as public health, vector control, and epidemiology.

## Learning Objectives:

Upon successful completion, students will be able to:

1. Explain the role of arthropods in the spread of emerging vector-borne pathogens, including the description of transmission cycles of prominent vector-borne diseases, and how vector physiology and host-pathogen interaction contribute to pathogen transmission.
2. Apply vector control and epidemiologic principles in the context of managing emerging vector-borne diseases.

## Institutional Learning Objectives:

This purpose of this certificate program is to address the lack of trained professionals in the field of vector-borne diseases. The learning objective of this certificate is to equip students with foundational knowledge in arthropod biology and control, so that they can apply this knowledge in public health practice involving the role of arthropods in pathogen transmission. This certificate aligns with the land grant mission of our university by promoting educational access, excellence, and engagement around a multi-disciplinary area of public health significance. Moreover, it facilitates multi-disciplinary learning for students and builds collaborative communities across campus through the inclusion of course electives from multiple departments. Alignment of our program objective with the Institutional Learning Objectives are detailed below:

**Creativity** – The continual emergence of vector-borne and infectious diseases necessitates innovation and creativity through the design of novel approaches to combat complex problems. Courses in this certificate curriculum incorporate cutting edge molecular approaches to controlling pathogen transmission or vector populations, current virological techniques, inventive new vector traps and surveillance strategies, and integrated approaches to vector management and disease control. Students learn about how the field has matured in the face of ongoing and emerging disease threats, and how creative problem-solving skills from molecular to environmental scales are essential to tackle these issues.

**Reasoning** – Required and elective courses in this certificate program challenge students to apply course knowledge and logic to contemporary issues in vector-borne diseases. In their coursework, students will learn the fundamentals of vector biology, epidemiology, vector taxonomy, virology, and pesticides and pest management. Students are then challenged to apply this knowledge to real world situations including outbreak investigations and disease mitigation, case studies, management of insecticide resistance, risk communication, and environmental protection.

**Communication** – Being able to communicate effectively is essential in scientific disciplines, in both communication with peers and colleagues as well as to the public. Courses included in this certificate program foster the development of communication skills in this disciplinary

area through hands-on experiential and active learning activities, scientific journal article discussions, project presentations, and written assignments. Additionally, if students participate in independent study research, there are additional opportunities to present research at scientific meetings either at CSU or at professional conferences.

**Responsibility** – Globally, vector-borne diseases (i.e. malaria, leishmaniasis, dengue, fever) represent a significant public health burden. Impoverished communities in low-income countries are disproportionately affected by these diseases, and are vulnerable to emerging vector-borne disease events. While completing this certificate, students will learn the ecology, epidemiology, and control of vector-borne diseases of global significance, which promotes the responsibility of the scientific community to protect vulnerable populations. Furthermore, a complementary undergraduate certificate program will also be developed to expand the accessibility of this learning opportunity to students at both educational levels.

**Collaboration** – The curriculum design of this certificate promotes cross-college knowledge sharing, multidisciplinary learning, and collaboration through the incorporation of elective courses from multiple departments in the certificate curriculum. Flexibility is built into the proposed course electives to allow students to tailor their certificate more towards operational knowledge and vector control, or virology and disease epidemiology. Moreover, course content promotes an integrative One Health approach to disease investigation, and encourages students to engage in interdisciplinary collaborations to address vector-borne disease management in a professional context.

## Requirements Effective Spring 2025

Additional coursework may be required due to prerequisites.

Code	Title	Credits
<b>Core Courses</b>		
MIP 533/VS 533	Epidemiology of Infectious Diseases/ Zoonoses	3
Biology of Disease Vectors Module: <sup>2,3</sup>		
MIP 567	Introduction to Biology of Disease Vectors	1
MIP 568	Biology of Arbovirus Vectors/Genetics	1
MIP 569	Biology of Parasite/Bacteria Vectors	1
<b>Electives</b>		
Select a minimum of six credits from the following:		6
AB 523	Advanced Evolution/Classification of Insects	
AB 529	Pesticide Resistance Evolution and Management	
AB 551	Advanced Integrated Pest Management	
BSPM 794	Independent Study <sup>1</sup>	
JTC 630	Health Communication	
MIP 535	Vector Collection and Identification Methods	
MIP 537A	Advanced Virology: Fundamental Concepts and New Insights <sup>2</sup>	
MIP 537B	Advanced Virology: Mechanisms of Viral Disease <sup>2</sup>	
MIP 537C	Advanced Virology: Vector-Borne Viruses <sup>2</sup>	
MIP 540	Fundamentals of Biosafety and Biosecurity	

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MIP 573A	Bacterial Pathogenesis: Introduction to Mechanisms <sup>2</sup>
MIP 573B	Bacterial Pathogenesis: Mechanisms and Lifestyle <sup>2</sup>
MIP 573C	Bacterial Pathogenesis: Evading Host Defenses <sup>2</sup>
MIP 795	Independent Study <sup>1</sup>

**Program Total Credits: 12**

\*This certificate may have courses in common with other graduate certificates. A student may earn more than one certificate, but a given course may be counted only in one certificate program.

<sup>1</sup> Variable credit can be obtained towards the certificate by conducting research in a vector-biology lab. These independent study credits can only be taken after the 9 regular course credits have been completed.

<sup>2</sup> This course is offered in modular format, with three 1-credit modules.

<sup>3</sup> All three modules must be taken to receive core credit.