



**Biomedical Microbiology (VTPB 405)**  
at the Soltis Center, Costa Rica

**Sample Syllabus**  
4 course credit hours: 3 hr lecture / 1 hr lab

**Instructor Information**

Jeffrey Musser, DVM, PhD, DABVP (Dairy)  
Email: [Jmusser@cvm.tamu.edu](mailto:Jmusser@cvm.tamu.edu)

**Course Description and Prerequisites**

**Bienvenido y introducción**

By now you realize that a semester of learning at the Soltis Center is unlike any other learning environment that you have experienced. Our Course, Biomedical Microbiology, will not be like the course given at College Station: we will customize the course and our learning to take advantage of the unique environment, facilities at Soltis Center and Costa Rica, and your interests, along with added rigor to stimulate deeper and broader learning and understanding. Together, we will explore the fundamentals of bacteriology, virology, mycology, immunology, and selected infectious diseases. Being in the tropics, we will include sections on parasitology (a very relevant topic), milk microbiology in the tropics, zoonosis, and other microbiological topics and infectious disease of interest in the tropics.

This course will prepare you for specialized and advanced Bacteriology, Virology, and Mycology courses offered in the Biomedical Science program at TAMU, will fulfill the microbiology requirement for most professional schools, will help prepare you for professional entrance exams (such as the MCAT), and will, hopefully, instill an interest in furthering your knowledge on infectious diseases.

**Learning Outcomes or Course Objectives**

While it is impossible to cover all the aspects of microbiology in a single semester, during the course, we will cover, time allowing, the following topics:

- 1) Introduction to the fundamentals of prions, viruses, bacteria, & fungi
- 2) Biosecurity and disinfection personal and clinical
- 3) Immune responses to infectious Agents cell mediated, humoral, vaccinology
- 4) Introduction to laboratory diagnostics bacterial culturing, microscopy, staining, PCR, serology, cytology, histology
- 5) Basics of antibiotic therapy mechanisms of actions, basic principles, resistance
- 6) Bacteria selected gram positive and gram negative bacterial diseases

- 7) Fungi
  - major medical and agricultural organisms
  - fungal diseases
- 8) Virus
  - major medical and agricultural organisms
  - viral diseases
- 9) Prions
  - transmissible spongiform encephalopathies

Pathogens and situations of special interest in the tropics and recent outbreaks may be highlighted during the course. The agricultural industry and medicine in Costa Rica, as well as other tropical and developing countries, have some unique issues with regards to microbes and parasites. These will be addressed in lectures and in excursions to visit with experts and unique situations in the country.

Laboratory will complement the lecture portion of the course and help to improve your skills in microbiological fundamentals. During the laboratory time, we hope to cover the following topics:

- Laboratory biosafety and Disinfection
- Performance of basic microbiology skills
- Microbiological tests to identify bacteria
  - Identification of unknown bacterium
  - Performance of and interpretation of other diagnostic tests
  - Microbiological issues of agricultural industry in Costa Rica through site visits
  - Case scenarios and work-ups

The laboratory facilities at the Soltis Center and other visited institutions are not as extensive as those at TAMU, College Station. Thus the exercises will be different. We will take full advantage of the uniqueness of the facilities that we have.

## **Learning Outcomes**

### Lectures

At the completion of this course lectures the students will be able to:

1. Describe the science of Microbiology and summarize its historical roots and pathways of discovery;
2. Explain the microbial diversity based on metabolic diversity;
3. Differentiate between virus, bacteria, fungi, prions, and protozoa based on their structure, genetic content, and culture requirements;
4. Describe pathogens' structure and function and their methods of locomotion;
5. Enumerate the genetic elements in virus, prokaryotes and eukaryotes, and describe their function. In addition, you will be able to explain their replication and regulation of gene expression;
6. Describe the symbiosis between microorganisms and animals and their relevance to human and animal health;
7. Classify the physical and chemical antimicrobial procedures available to control microbial growth and outline those of use to treat infectious diseases in humans and animals;
8. Describe and interpret antibiotic resistance in bacteria and its impact on public health;
9. Explain the differences of adaptive and innate immune system as they relate to microbiology;
10. Discuss the ways in which we can stimulate the immune system to prevent infectious diseases;

11. Distinguish the different diagnostic systems in microbiology and immunology of routine use in current infectious disease medicine;
12. Summarize the principles of epidemiology and their relevance in Global Public Health;
13. Discuss the infectious process – transmission, virulence factors, replication, evasion of host defenses, spread in host, damage and pathology in host – and the prevention of the infectious process; and,
14. List the most relevant microbial species of importance in human and animal health in the following areas:
  - air-borne transmission,
  - direct contact transmission,
  - sexually transmitted,
  - arthropod borne infection,
  - food-borne pathogens.

### Laboratory

At the completion of this course the students will be able to:

1. Explain the concept of Biosafety and the importance of bio-containment and safety equipment used in the laboratory setting to prevent any accident;
2. Describe the types of laboratory equipment and culture media needed to develop and maintain pure culture;
3. Define aseptic techniques and those necessary to sub-culturing microorganisms;
4. Describe cultural and morphological characteristics of microorganisms in pure culture and under the microscope;
5. Explain the components and use of a light microscope;
6. Describe the chemical and theoretical basis of biological staining;
7. Describe, apply, and interpret different staining procedures such as Gram and acid-fast staining;
8. Describe and apply the differences between routine and special purpose media;
9. Compare and contrast the different methodologies to inhibit microbial growth and the modes of antimicrobial action;
10. Describe, apply, and interpret the different diagnostic testing:
  - a. immunologic based tests
    - i. enzyme linked immunosorbent assay (ELISA); western, northern and Southern blot assays; immunohistochemistry: immunohistofluorescence: agglutination assays; agar gel immunodiffusion (AGID) assay
  - b. molecular testing
    - i. PCR and RT-PCR
  - c. culture
11. Describe pasteurization and its usage to combat food-borne diseases.
12. Relate microorganisms and disease to animals through
  - a. physical exams of animals
  - b. evaluation of environment
  - c. assessment of husbandry

## Textbook and/or Resource Material

None required

### Optional to help in understanding

Electronic versions (can be accessed from Medical Sciences Library)

*Veterinary Microbiology and Microbial Disease*, 2<sup>nd</sup> Edition by Quinn, P.J. et al. 2011.

*Mims' Medical Microbiology and Immunology*, 6<sup>th</sup> Edition by Boering, R.V. et al. 2019.

*Big Picture Medical Microbiology*. Chamberlain N.R. 2009.

*Antimicrobial drug discovery*, Tegos G. and Mylonakis E. 2012.

*Bacteria from fish and other aquatic animals*, 2<sup>nd</sup> edition by Buller N.B. 2014.

### Assigned readings

Articles and chapters of text will be periodically assigned. Selected chapters of books and journal articles, as a PDF, will be provided by the instructor to complement the lectures and labs

## Grading Policies

### Lecture –

There will be 5 quizzes, 3 lecture/lab exams, and a **comprehensive** final exam.

### Laboratory –

lab quizzes (6) –

weekly (approximately) quizzes

previous week's lab work and on the Fun Facts of Pathogens

pathogen / case reports –

fill out the pathogen report form

### Grading breakdown

Lecture		Number given	Points
	Exam 1:	1	60
	Exam 2:	1	60
	Exam 3:	1	15
	each quiz 5 questions, each question worth 1 point	5	25
	the final exam	1	30
Lab			
	each quiz with 5 questions	6	30
	pathogen / case report	1	10
	Lab final	1	20
		<b>TOTAL POINTS</b>	<b>= 250</b>

## Grading Scale

*Points Grading Scale:*

- A – 225 to 250 points
- B – 200 to 224 points
- C – 175 to 199 points
- D – 163 to 174 points
- F – ≤ 162 points

Missed quizzes or examinations

**Make-ups MUST be arranged with the instructor within 1 days after the end of your excused absence.** If the above requirements are not met, the student will receive no credit for the exam or quiz. No make-up examination or quiz will be provided for a non-excused absence or if the above requirements have not been met. Only students with an excused absence will be permitted to make up examinations and quizzes.

### **Americans with Disabilities Act (ADA)**

The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please contact Disability Services, currently located in the Disability Services building at the Student Services at White Creek complex on west campus or call 979-845-1637. For additional information, visit <http://disability.tamu.edu>.

### **Academic Integrity**

*For additional information please visit: <http://aggiehonor.tamu.edu>*

*“An Aggie does not lie, cheat, or steal, or tolerate those who do.”*

Upon accepting admission to Texas A&M University, a student immediately assumes a commitment to uphold the Honor Code, to accept responsibility for learning, and to follow the philosophy and rules of the Honor System. Students will be required to state their commitment on examinations, research papers, and other academic work. Ignorance of the rules does not exclude any member of the TAMU community from the requirements or the processes of the Honor System. For additional information visit: [//aggiehonor.tamu.edu](http://aggiehonor.tamu.edu)

The Aggie Code of Honor is an effort to unify the aims of all Texas A&M men and women toward a high code of ethics and personal dignity. For most, living under this code will be no problem, as it asks nothing of a person that is beyond reason. It only calls for honesty and integrity, characteristics that Aggies have always exemplified. The Aggie Code of Honor functions as a symbol to all Aggies, promoting understanding and loyalty to truth and confidence in each other.

Scholastic dishonesty, in any form, will not be tolerated. There is no situation in which you could ever find yourself that would warrant cheating. I fully expect that none of you would ever consider cheating on an exam. All of you will be considered in this light unless you show otherwise. Definitions and examples of Academic Misconduct are found in the Aggie Honor

System (source: *The Aggie Honor System: Definitions of Academic Misconduct* see: [//aggiehonor.tamu.edu/Student%20Rules/definitions.html](http://aggiehonor.tamu.edu/Student%20Rules/definitions.html)).

Specifically for purposes of this course, the following actions constitute academic dishonesty:

**Cheating:** Intentionally using or attempting to use unauthorized materials, information, notes, study aids or other devices or materials in any academic exercise.

**Fabrication:** Making up laboratory data or results, and recording or reporting them; submitting fabricated documents.

**Plagiarism:** The appropriation of another person's ideas, processes, results, or words without giving appropriate credit.

**Complicity:** Intentionally or knowingly helping, or attempting to help, another to commit an act of academic dishonesty.

Scholastic dishonesty includes, but is not limited to, looking at the exam sheet of a classmate (with or without their permission), consulting notes or references during an exam, and providing information to (or seeking information from) classmates during an exam or between laboratory and written exam sessions. Additionally, removal of equipment from the laboratory is considered a form of scholastic dishonesty. The instructor reserves the right to dismiss from the course and administer a course grade of "F" to any student involved in incidents of scholastic dishonesty.

Any questions or concerns about professional ethics or academic honesty in this or any other course can be brought to the course leaders or the Associate Dean for Professional Programs.