

Course Syllabus

Department of Food Science and Technology (FST)
College of Food, Agricultural and Environmental Sciences
Division of Environmental Health Sciences
College of Public Health (CPH)
The Ohio State University

Advanced Food Microbiology II

FST 7546, PUBHEHS 7546
Autumn semester, 2 credit hours
(will be offered every other year)

Instructor

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Office Hours: Monday 10:00-11:30AM, or by appointment, Parker Bld Rm 233.

Class Time and Location: Time and location will be announced.

Pre-requisites: None

Portal description:

Principles of food virology and immunology; biology, pathogenesis, immunity, and prevention of foodborne viruses; food as immuno-regulator in cancer immunology and immunodeficiency diseases; food allergy; and vaccines against foodborne pathogens.

Course description:

This is an advanced food microbiology course that will cover various cutting-edge topics in food virology and immunology. The course will have four major components: 1) food virology including basic concepts in virology, biological characteristics of foodborne viruses, mechanisms of viral replication, gene expression and pathogenesis, and prevention and control of foodborne viruses; 2) food immunology including function and components of the host immune system, host responses to foodborne viral

pathogens, foods as a regulator in tumor immunity and immunodeficiency diseases; 3) food related immunopathology including allergies, tolerances, and hypersensitivities; and 4) vaccines against foodborne pathogens. The course will also discuss the experimental methods and technologies in food virology and immunology.

Course objectives: Upon completion of this course, students should be able to:

1. Summarize the basic concepts in food virology and immunology.
2. Explain the pathogenesis and immunopathology of foodborne viral pathogens.
3. Describe the host responses to foodborne viral infection.
4. Explain the function and mechanism of the immune system in the clearance of infectious pathogens.
5. Explain the immunobiology of food related allergies, tolerances, and hypersensitivities.
6. Identify the role of foods in regulating host immune response, cancer immunology, and immunodeficiency diseases.
7. List steps to develop vaccines to combat foodborne pathogens.

Applicable Core Competencies for Environmental Health Sciences

1. Explain the significance of the community and workplace environment to public health.
2. Outline the health threat that natural and anthropogenic contaminants in the environment can pose to population health.
3. Compare the fate, transport, and human uptake of chemical and biological agents.
4. Explain the physiological factors that influence human exposure and the uptake of chemical and biological environmental agents.
5. Critique and conduct human risk assessments.
6. Identify and explain individual (e.g., genetic, physiologic and psychosocial) and community (social, built, economic, race) susceptibility factors that heighten the risk for populations for adverse health outcomes from environmental hazards.
7. Define, recognize, and explain environmental justice and its significance as a public health issue.
8. Use various risk management and risk communication approaches for environmental hazards.
9. Summarize the underlying mechanisms of toxicity and pathogenicity resulting from exposure to environmental agents.
10. Describe federal and state regulatory programs, guidelines and authorities relevant to environmental and occupational health.

11. Compare the principle components and influencing factors in the exposure continuum from source to disease.
12. Determine the role of exposure assessment in environmental and occupational health.

Reading Materials:

Reading materials covering lecture topics will be given in the classroom.

Required Texts:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England.

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA.

Additional References:

Sagar Goyal. 2006. Viruses in Foods. Springer. New York, NY, USA.

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA.

Examination and Grading Criteria:

Attendance	10%
Group discussion and presentation	30%
Mid-term exam	30%
Final exam:	30%

Total:	100%

Note: The class will have one group discussion and two paper presentations. The dates will be announced as the course progresses. For group discussion, the lecturer will propose a topic (for example: should FDA approve food irradiation to eliminate virus contaminants?) related to the course, and the students will participate in discussion and debate on this topic. For paper presentations, the lecturer will select a most recent research paper on food virology and immunology. The students will be divided into three groups, and each group will have a representative to present the paper in journal club format. The student will present the background, research design, results, and future direction. The presentation should include the opinions of their team members. Each presentation will be 20 min, followed by 5 min discussion.

There will be one midterm and one final exam. Both exams will be in-class and closed book. The final exam will be comprehensive. The exams will be based on material covered in class and in any assigned readings. The exam format may include multiple choice, short answer, short essay, and experimental design. No makeup exams will be given, except under extraordinary circumstances such as medical emergency. Well-documented justification will be needed for any potential make-up exams.

Grades will be assigned by the percentage of the total points earned:

94% - 100%	A
90% - 93%	A-
87% - 89%	B+
84% - 86%	B
80% - 83%	B-
77% - 79%	C+
74% - 76%	C
70% - 73%	C-
60% - 69%	D
Below 60%	E

Course outline:

Week 1:

1: Overview of food virology and immunology

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp, 1-7.

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA. pp, 1-7.

2: Virus structure, classification, and evolution

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.31-58.

Week 2:

3: Virus life cycle I: virus entry and uncoating

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.59-102.

4: Virus life cycle II: viral replication, gene expression, assembly, and release

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.59-102.

Week 3:

5: Major food- and water-borne viruses and their impacts on food safety and environment.

Assigned Readings:

Sagar Goyal. 2006. Viruses in Foods. Springer. New York, NY, USA. pp.121-151.

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.157-172.

6. Human caliciviruses: the viruses and their replication

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 28.

Week 4:

7. Viruses that causes hepatitis: hepatitis A and E viruses

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 27.

8. Viruses that cause neurological disease: polio virus and enterovirus 71

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 24.

Week 5:

9. Rotavirus: the virus and its replication

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 53.

10: Influenza virus: the virus and its replication

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 47.

Week 6:

11: Control of food- and water-borne viruses in high risk foods

Assigned Readings:

Sagar Goyal. 2006. Viruses in Foods. Springer. New York, NY, USA. pp.121-151.

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.297-203.

L Baert, J Debevere, and M Uyttendaele. The efficacy of preservation methods to inactivate foodborne viruses. Int J Food Microbiol. 2009, 131: 83-94.

12. Animal models for food- and water-borne viruses

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.297-203.

Week 7:

13: Detection of food- and water-borne viruses

Assigned Readings:

Sagar Goyal. 2006. Viruses in Foods. Springer. New York, NY, USA. pp.121-151.

14: Virological techniques in food virology research

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 17.

Week 8:

15: Viral pathogenesis

Assigned Readings:

Neal Nathanson, Rafi Ahmed, and Christine Biron. 2007. Viral Pathogenesis and Immunity. 2nd Edition. Elsevier Science. pp.3-82.

Cheetham S, Souza M, Meulia T, Grimes S, Han MG, and Saif LJ. Pathogenesis of a genogroup II human norovirus in gnotobiotic pigs. J Virol. 2006, 80(21):10372-10381.

16: Viral clearance

Assigned Readings:

Neal Nathanson, Rafi Ahmed, and Christine Biron. 2007. Viral Pathogenesis and Immunity. 2nd Edition. Elsevier Science. pp.3-82.

Week 9:

17: Unconventional agents: viroids and prions

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 22.

18: Basic concepts in immunology

Assigned Readings:

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA. pp, 66-87.

Week 10:

19: Host immune system

Assigned Readings:

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA. pp, 152-202.

20: Cytokine

Assigned Readings:

Angus Thomson and Michael Lotze. 2003. The Cytokine Handbook, Two-Volume Set, Volume 1-2, 4th Edition. pp, 3-85.

Week 11:

21: Innate and adaptive immune responses

Assigned Readings:

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA. pp, 9-45.

22: Food and tumor immunology

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.285-296.

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA. pp, 326-341.

Week 12:

23: Food and immunodeficiency diseases

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.197-211.

24: Food allergy, tolerance, and hypersensitivity

Assigned Readings:

Sulabha Pathak and Urmi Palan. 2005. Immunology: essential and fundamental. Science Publishers Inc. USA. pp, 307-326.

Norman G. Marriott and Robert B. Gravani. 2006. Principles of Food Sanitation. Springer; 5th edition. Chapter 4. pp70-75.

Week 13:

25: Antiviral drugs

Assigned Readings:

David Knipe and Peter Howley (ed.). Fields Virology. Lippincott Williams & Wilkins Co., 5th edition, New York, NY, USA. Chapter 14.

26: Principle of vaccine and vaccination

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.305-325.

Week 14:

27: Vaccine development against major food- and water-borne pathogens

Assigned Readings:

John Carter and Venetia Saunders. 2007. Virology: principles and applications. John Wiley and Sons Ltd. England. pp.305-325.

Souza M, Costantini V, Azevedo MS, and Saif LJ. A human norovirus-like particle vaccine adjuvanted with ISCOM or mLT induces cytokine and antibody responses and protection to the homologous GII.4 human norovirus in a gnotobiotic pig disease model. *Vaccine*. 2007, 25(50):8448-8459.

Final exam

ACADEMIC INTEGRITY

Academic integrity is essential to maintaining an environment that fosters excellence in teaching, research, and other educational and scholarly activities. Thus, The Ohio State University, the School of Public Health, and the Committee on Academic Misconduct (COAM) expect that all students have read and understood the University's *Code of Student Conduct* and the School's *Student Handbook*, and that all students will complete all academic and scholarly assignments with fairness and honesty. The *Code of Student*

Conduct and other information on academic integrity and academic misconduct can be found at the COAM web pages (<http://oaa.osu.edu/coam/home.html>). Students must recognize that failure to follow the rules and guidelines established in the University's *Code of Student Conduct*, the *Student Handbook*, and in the syllabi for their courses may constitute "Academic Misconduct."

The Ohio State University's *Code of Student Conduct* (Section 3335-23-04) defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination. Please note that the use of material from the Internet without appropriate acknowledgement and complete citation is plagiarism just as it would be if the source were printed material. Further examples are found in the *Student Handbook*. Ignorance of the *Code of Student Conduct* and the *Student Handbook* is never considered an "excuse" for academic misconduct.

If I suspect a student of academic misconduct in a course, I am obligated by University Rules to report these suspicions to the University's Committee on Academic Misconduct. If COAM determines that the student has violated the University's *Code of Student Conduct* (i.e., committed academic misconduct), the sanctions for the misconduct could include a failing grade in the course and suspension or dismissal from the University. If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me.

SPECIAL ACCOMMODATIONS

If you need an accommodation based on the impact of a disability, you should contact me to arrange an appointment as soon as possible. At the appointment we can discuss the course format, anticipate your needs and explore potential accommodations. I rely on the Office for Disability Services for assistance in verifying the need for accommodations and developing accommodation strategies. If you believe you need accommodation and have not previously contacted the Office for Disability Services, I encourage you to do so (more information available at <http://www.ods.ohio-state.edu/>).

Advanced food & beverage production. discovery of microorganisms. Modern infectious disease medicine is built upon a solid understanding of microbiology. In this unit, we shall examine the meaning of microbiology, the role of micro organisms and characteristics of microbes. 2.0 OBJECTIVES. At the end of this unit, you should be able to: • define microbiology • classify microbes into five groups • state the roles of microorganisms • practise at least five ways of identifying microorganisms.Â i. The lag phase ii. Exponential or logarithmic phase iii. Stationary phase iv. Death or decline phase. 3.3.1.1 The Lag Phase. Immediately after inoculating the bacterial cells into a medium, it undergoes a period of adaptation where it becomes adapted to its environment.