



Department of Plant Pathology & Microbiology

Course title and number PLPA607 - Pathogen Strategies in Plant-Microbe Interactions.
Term Fall 2018
Meeting times and location M/W 10:20-11:35, 208 L.F. Peterson Bldg.

Course Description and Prerequisites

Key molecular mechanisms that pathogens employ to overcome resistance mechanisms of the host plant; events associated with the disease cycles of pathogens; consideration of pathogen-host co-evolution, pathogen virulence factors, and pathogen countermeasures to plant defense mechanisms.

Prerequisites: Graduate student classification.

Course Objectives

Key Course Learning Outcomes

1. Students will master an understanding of key concepts in plant pathology, and demonstrate this by defining and defending concepts used by plant pathologists.
2. Students will be able to explain the main evolutionary mechanisms of host-pathogen co-evolution and give specific examples to illustrate these concepts.
3. Students use examples of topics in the course to illustrate concepts of offensive and defensive pathogen strategies.

Instructor Information

Name Professor Daniel Ebbole
Telephone number 5-4831
Email address d-ebbole@tamu.edu
Office hours By appointment
Office location 321 Peterson

Textbook and/or Resource Material

Notes and reference materials provided by instructor.

Grading Policies

Grades will be based on a scale of <90% = A, 80-90 = B, 70-80 = C, 60-70 = D. >60 = F.

Classroom discussion and in-class or on-line quizzes will account for 40% of the grade. A class group project will account for 10% of the grade. An oral final exam (1 hour) will be schedule individually to account for 50% of the grade.

CLASS GROUP PROJECT: We will discuss a number of topics in the course, however, this will by no means exhaust the relevant topic material. During the course, the students as a group will choose a topic and, once approved by the instructor, will prepare a group presentation for that topic. Specific instructions for preparation of the presentation and the grading rubric will be presented during class.

Course Topics, Calendar of Activities

Topics

Week

1

Topic

-Terminology review, Disease cycle, disease control strategy
-Evolution of host-pathogen interactions

2

-Host selective toxins - evolution of ToxA in wheat tan spot
-ToxA function, TSN1 susceptibility gene of wheat.

3

-Detoxification and Tolerance of host defense anti-microbials
-Cell wall interface.
-Mid-term take home exam assigned.

4

-Manipulation of plant defense hormones by pathogens
-RNA as virulence and defense factors

5

-M. oryzae infection, host colonization, effectors and host adaptation.:
-Schedule individual Oral Final Exams (60 min)

References

Week 1

- Andrison D. 1993. Nomenclature for pathogenicity and virulence: the need for precision. *Phytopathol.* 83:889-90.
- Stukenbrock EH and BA McDonald. 2008. The origins of plant pathogens in agro-ecosystems. *Annu. Rev. Phytopathol.* 46:75-100.
- Inoue Y, Trinh TPV, Yoshida K, Asano H, Mitsuoka C, Asuke S, Anh VL, Cumagun CJR, Chuma I, Terauchi R, Kato K, Mitchell T, Valent B, Farman M, Tosa Y. 2017. Evolution of the wheat blast fungus through functional losses in a host specificity determinant. *Science* 357:80-83.

Week 2

- Friesen TL, EH Stukenbrock, Z Liu, S Meinhardt, H Ling, JD Faris, JB Rasmussen, PS Solomon, BA McDonald and RP Oliver. 2006. Emergence of a new disease as a result of interspecific virulence gene transfer. *Nature Genetics* 38:953-956.
- Faris JD, Z Zhang, H Lu, S Lu, L Reddy, S Cloutier, JP Fellers, SW Meinhardt, JB Rasmussen, SS Xu, RP Oliver, KJ Simons, and TL Friesen. 2010. A unique wheat disease resistance-like gene governs effector-triggered susceptibility to necrotrophic pathogens. *PNAS* 107:13544-13549
- Manning V, SM Hamilton, PA Karplus, and LM Ciuffetti. 2008. The Arg-Gly-Asp-containing, solvent-exposed loop of Ptr ToxA is required for internalization. *Mol Plant-Microbe Interact* 21:315-325.

Week 3

- P Bower BR Clarke, P Lunness, MJ Daniels, and AE Osbourn. 1995. Host range of a plant pathogenic fungus determined by a saponin detoxifying enzyme. *Science* 267:371-374.
- Patkar RN, PI Benke, Z Qu, YYC Chen, F Yang, S Swarup, and NI Naqvi. 2015. A fungal monooxygenase-derived jasmonate attenuates host innate immunity. *Nature Chemical Biology* DOI: 10.1038/NCHEMBIO.1885.

Week 4

- Wang M, Weiberg A, Dellota Jr. E, Yamane D, Jin H. 2017. Botrytis small RNA Bc-siR37 suppresses plant defense genes by cross-kingdom RNAi, *RNA Biology*, 14:4, 421-428
- Weiberg A, Wang M, Lin F-M, Zhao H, Zhang Z, Kaloshian I, Huang H-D, Jin H. 2013. *Science* 342:118-123.
- Koch et al. 2016. An RNAi based control of *Fusarium graminearum* infections through spraying

long dsRNAs involves a plant passage and is controlled by the fungal silencing machinery. PLOS Pathogens DOI:10.1371/journal.ppat.1005901

Week 5

-Khang CH, R Berruyer, MC Giraldo, P Kankanala, SY Park, K Czymmek, S Kang, and B Valent. 2010. Translocation of Magnaporthe oryzae effectors into rice cells and their subsequent cell-to-cell movement. Plant Cell 22:1388-1403.

Attendance and Participation: See: <http://student-rules.tamu.edu/rule07>. It is expected that students be prepared for class and participate in the group discussion.

Make-Up Policy If an absence is excused, the instructor will either provide the student an opportunity to make up work that contributes to the final grade or provide a satisfactory alternative by a date agreed upon by the student and instructor.

Academic Integrity Statement

Aggie Honor Code "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 Texas A&M University community from the requirements or the processes of the Honor System. For additional information, please visit: <https://aggiehonor.tamu.edu/>.

Plagiarism: <https://aggiehonor.tamu.edu/Rules-and-Procedures/Rules/Honor-System-Rules>

Plagiarism is defined as theft or inadequate citation of other work, including (but not limited to) primary and secondary literature and internet sources. Plagiarism will result in a grade of 'zero' for the assignment AND a deduction of the equivalent amount of points from your grade. For example, if plagiarism is discovered on an assignment worth 10 points, the assignment will be given -10 points as its score. Infractions will be reported to the Honor Code Office.

Disability Services

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>.