

**PHYTOBACTERIOLOGY**  
**PLHL 7011 - 2015**

COURSE DESCRIPTION

Taxonomy, biology and pathogenic mechanisms of plant pathogenic bacteria, and control of bacterial plant diseases.

CREDIT- 4 credit hours

PREREQUISITE - PLHL 4000, MBIO 2051, or consent of the instructor.

INSTRUCTOR

Dr. Jong Hyun Ham, 460 Life Sciences Building, 8-6798. ([jham@agcenter.lsu.edu](mailto:jham@agcenter.lsu.edu))

OFFICE HOURS

Preferred times to visit my office (460 LSB) are 10 am to noon & 1 to 3 pm on Monday, Wednesday, or Friday.

COURSE OBJECTIVES

1. To become familiar with current taxonomy of plant pathogenic prokaryotes and important bacterial diseases.
2. To become familiar with techniques for manipulating bacteria such as isolation, identification and inoculation of pathogens.
3. To gain the knowledge of different pathogenic mechanisms used by different groups of major bacterial pathogens.
4. To understand the ecology of various plant pathogenic bacteria and current disease management strategies for bacterial diseases.
5. To develop the academic ability to critically review research articles about biological/agricultural sciences.

SCHEDULE

**Lectures:** Tuesday and Thursday at 9:00-10:20 AM in room A465 Life Sciences Annex Building.

**Laboratories:** Tuesday at 1:30 – 4:30 PM in room 308 Life Sciences Building. For many lab exercises, some extra follow-up experiments/works should be conducted as needed.

TEXT BOOK

There is no designated text book for this course, but the following books are strongly recommended to read:

Janse, J. D. 2005. *Phytopathology: Principles and Practice*. CABI Publishing.

Kado, C. I. 2010. *Plant Bacteriology*. APS Press.

Agrios, G. N. 2005. *Plant Pathology* (5<sup>th</sup> Edition). Academic Press.

### LABORATORY GUIDE BOOKS TO BE FREQUENTLY USED

Schaad, N. W. et al, eds. 2000. *Laboratory Guide for Identification of Plant Pathogenic Bacteria*, Third Edition. APS Press, St. Paul, MN.

Klement, Z., Rudolph, K., and Sands, D. C. 1990. *Methods in Phytopathology*. Akadémia Kiadó, Budapest, Hungary.

Lelliott, R. A., and Stead, D. E. 1987. *Methods for the Diagnosis of Bacterial Diseases of Plants*. British Society for Plant Pathology/Blackwell Scientific Publications, Oxford.

### LABORATORY

Students must attend all the lab sessions and be present from the beginning of each session for hearing introductory remarks and instructions. Each student is expected to keep a laboratory notebook. There is no required format for the lab notebook but it should contain the protocols and results of each experiment and brief discussions addressing “Discussion Points” and other points thought to be important to discuss.

### ASSIGNMENTS:

- 1. Laboratory notebook**
- 2. Report** on the identification of unknown bacteria
- 3. Pre-proposal** on a research topic of phytopathology and plant-bacterial interactions. Pre-proposal should be succinct (maximum 5 pages with Times Roman 12 font size) in the following format: 1) Background, 2) Rationale, 3) Goals and Specific Objectives, and 4) Experimental Plan. References should be cited appropriately (Reference list will not be counted for page limitation). **DUE DATE for 1, 2 and 3: April 14, 2015 (T) 1:00 PM**
4. At the end of the semester, each student should write up review comments on three pre-proposals of other students as the primary, secondary or tertiary reviewer for each of them, and give a brief (~ 5 to 10 minutes) oral summary on the pre-proposal assigned for the primary review.

5. Selected research articles on current topics of phytobacteriology will be discussed during the course. Each student will take turns to present a selected article and lead discussion on it. Every student should write up a brief review/critique on each article to be discussed before the discussion session.

## GRADING

A. Four in-class exams (Quiz 1 (5%) / Midterm (20%) / Quiz 3 (5%) / Final (30%))	60%
B. Lab report for identification	10%
C. Lab notebook	5%
D. Pre-proposal	10%
E. Oral presentation on the assigned journal article	5%
F. Review comments and questions on journal articles	5%
G. Evaluation of pre-proposal	5%
H. <u>Positive influence on laboratory and discussion sessions</u>	5%
<b>Total</b>	<b>105%</b>

There will be no makeup exams without an official University excuse (i.e. documented serious illness, University-approved travel, special curricular requirements, court-imposed legal obligations, military obligations, University athletic participation and University musical event participation). Absence of class without the official University excuse will cause one-point (%) deduction for each lecture and two-point deduction for each lab session. Final grades will be given as follows: 105 - 90 = A, 89 - 75 = B, 74 - 60 = C, 59 - 45 = D.

## FOR STUDENTS WITH DISABILITIES

If you have a hidden or visible disability that may require classroom or test accommodations, please see me as soon as possible during the scheduled office hours. If you have not already done so, please register with the Office of Disability Services, 112 Johnston Hall, (225)578-5919, which is the department responsible for coordinating accommodations and services for students with disabilities.

## ACADEMIC INTEGRITY

Any academic misconduct (e.g. copying and plagiarism) will be reported to the Office of the Dean of Students. It is strongly recommended to visit the Student Advocacy Accountability website (<http://saa.lsu.edu/code-student-conduct>) and read '8.0. Misconduct' as well as '7.0. Accountability Procedures' and '9.0. Disciplinary Sanctions' in 'the Code of Student Conduct' for more information about academic misconducts and the corresponding actions for them.

## PLHL 7011 Phytobacteriology Course Schedule (2015 Spring Semester)

Lecture	Date	Topic	Lab	Date	Topic
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1	01/15/15 (Th)	Introduction to the course			
2	01/20/15 (T)	General features of bacteria I	1	01/20/15 (T)	Aseptic techniques Enumeration
3	01/22/15 (Th)	General features of bacteria II			
4	01/27/15 (T)	General features of bacteria III	2	01/27/15 (T)	Isolation of bacteria from plant samples
5	01/29/15 (Th)	History of Phytobacteriology			
6	02/03/15 (T)	Taxonomy I	3	02/03/15 (T)	Identification I: Grow isolated bacteria on KBA and NA plates
7	02/05/15 (Th)	Taxonomy II <b>Quiz 1</b>			
8	02/10/15 (T)	Taxonomy III	4	02/10/15 (T)	Identification II: Gram staining, KOH, etc. <b>JA 1 and 2</b>
9	02/12/15 (Th)	Taxonomy IV			
	02/17/15 (T)	<b>Mardi Gras</b>		02/17/15 (T)	<b>Mardi Gras</b>
10	02/19/15 (Th)	Diagnosis I			
11	02/24/15(T)	Diagnosis II	5	02/24/15 (T)	Identification III: Catalase, oxidase and ice nucleation <b>JA 3 and 4</b>
12	02/26/15 (Th)	Diagnosis III			
13	03/03/15 (T)	Diagnosis IV (Raj Singh)	6	03/03/15 (T)	Diagnosis: Citrus canker with real time PCR and <i>Xylella fastidiosa</i> with ELISA (Singh)
14	03/05/15 (Th)	<b>Midterm Exam</b>			
15	03/10/15 (T)	Major pathogens I	7	03/10/15 (T)	Identification V: DNA extraction, PCR and DNA sequence analysis (BLAST search) <b>JA 5 and 6</b>
16	03/12/15 (Th)	Major Pathogens II			
17	03/17/15 (T)	Major Pathogens III	8	03/17/15 (T)	Assays for

18	03/19/15 (Th)	Major Pathogens IV			bacterial virulence factors <b>JA 7 and 8</b>
19	03/24/15 (T)	Major Pathogens V	9	03/24/15 (T)	Presentation about bacterial identification
20	03/26/15 (Th)	Bacterial Pathogenesis I			
21	03/31/15 (T)	Bacterial Pathogenesis II	10	03/31/15 (T)	Virulence and HR tests I  <b>JA 9 and 10</b>
22	04/02/15 (Th)	Bacterial Pathogenesis III <b>Quiz 2</b>			
	04/07/15 (T)	<b>Spring break</b>		04/07/15 (T)	<b>Spring break</b>
	04/09/15 (Th)	<b>Spring break</b>			
23	04/14/15 (T)	Bacterial pathogenesis IV	11	04/14/15 (T)	Virulence and HR tests II  <b>JA 11 and 12</b>
24	04/16/15 (Th)	Bacterial pathogenesis V			
25	04/21/15 (T)	Plant defense system	12	04/21/15 (T)	Panel review for pre-proposals (Group I)
26	04/23/15 (Th)	Epidemiology and disease control			
27	04/28/15 (T)	Important bacterial diseases	13	04/28/15 (T)	Panel review for pre-proposals (Group II)
28	04/30/15 (Th)	Review session			
	<b>05/05/15 (T)</b>	<b>Final Exam</b>			

**Journal Articles To Be Discussed**

1. Ramos *et al.*, 2014. Mutation of the *Erwinia amylovora argD* gene causes arginine auxotrophy, nonpathogenicity in apples, and reduced virulence in pears. *Appl Env Microbiol* 80 (21): 6739-6749
2. Kim *et al.*, 2015. A mutation in the *aroE* gene affects pigment production, virulence, and chemotaxis in *Xanthomonas oryzae* pv. *oryzae*. *Microbiol Res* 170: 124-130
3. Hamza, *et al.*, 2012. MultiLocus Sequence Analysis- and Amplified Fragment Length Polymorphism-based characterization of xanthomonads associated with bacterial spot of tomato and pepper and their relatedness to *Xanthomonas* species. *Sys Appl Microbiol* 35: 183-190
4. Shams *et al.*, 2013. Rapid and accurate species and genomic species identification and exhaustive population diversity assessment of *Agrobacterium* spp. using *recA*-based PCR. *Sys Appl Microbiol* 36: 351-358
5. Rigano *et al.*, 2014. Rapid and sensitive detection of *Candidatus Liberibacter asiaticus* by loop mediated isothermal amplification combined with a lateral flow dipstick. *BMC Microbiol* 14:86
6. Ouyang *et al.*, 2013. Enhanced reliability and accuracy for field deployable bioforensic detection and discrimination of *Xylella fastidiosa* subsp. *paucis*, causal agent of citrus variegated chlorosis using Razor Ex technology and TaqMan quantitative PCR. *PLoS ONE* 8(11): e81647
7. Hockett *et al.*, 2014. *Pseudomonas syringae* CC1557: A highly virulent strain with an unusually small type III effector repertoire that includes a novel effector. *Mol Plant-Microbe Interact* 27 (9): 923-932
8. Bowden *et al.*, 2013. Virulence in *Pectobacterium atrosepticum* is regulated by a coincidence circuit involving quorum sensing and the stress alarmone, (p)ppGpp. *Mol Microbiol* 90 (3): 457-471\*
9. Savido *et al.*, 2014. *Clavibacter michiganensis* subsp. *michiganensis* Vatr1 and Vatr2 transcriptional regulators are required for virulence in tomato. *Mol Plant-Microbe Interact* 27 (10): 1035-1047
10. Yaryura *et al.*, 2014. XbmR, a new transcription factor involved in the regulation of chemotaxis, biofilm formation and virulence in *Xanthomonas citri* subsp. *citri*. *Environ Microbiol* doi: 10.1111/1462-2920.12684. [Epub ahead of print]\*
11. Ashfield *et al.*, 2014. Evolutionary relationship of disease resistance genes in soybean and Arabidopsis specific for the *Pseudomonas syringae* effectors AvrB and AvrRpm1. *Plant Physiol* 166: 235-251\*
12. Lim *et al.*, 2013. Biocontrol of *Pectobacterium carotovorum* subsp. *carotovorum* using bacteriophage PP1. *J Microbiol Biotechnol* 23(8): 1147-1153