BSPM 502B – Phytobacteriology
Fall 2019
Mon/Wed 2-3:20 PM

Instructors and Office Hours

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pronouns: she, her, hers
Office Hours: arrange by email

Course Structure: Lectures and paper discussions on Monday and Wednesday (2-3:30 pm), starting on Oct 30th. Questions will be provided to help guide discussion and written answers (short answer) to these questions are required. 1 credit

Required Text: None

Texts: Assigned readings are indicated in the syllabus and are freely available online. Background texts are available, on loan from the instructor, for students who wish to complete additional study.

Course Overview: Students will learn about molecular mechanisms required for bacterial symbiosis with plants, including pathogenic and mutualistic symbiosis mechanisms. This course builds upon basic concepts learned in an introductory plant pathology and microbiology courses. Students must have a basic understanding of bacterial and bacterial genetics.

Canvas Online System (http://info.canvas.colostate.edu/login.aspx)

The course homepage can be found on the University Canvas online system and contains all of the information for this course. When the course site is updated with new information, students will be notified by email. Students are responsible for making sure they are able to access to Canvas and understand where material is located within the homepage. If you have problems contact me or check http://info.canvas.colostate.edu/student-resources.aspx

Learning Outcomes

Breadth and Depth of Knowledge in Phytobacteriology

Explain the functions of molecular and cellular factors that affect bacterial symbiosis with plants and with the insect vectors of bacterial pathogens.

Describe the evolutionary importance of genetic variation in bacterial symbiosis with plants. Evaluate experimental designs and methodologies in peer-reviewed scientific publications that report new findings in phytobacteriology.

Agricultural Literacy

Demonstrate an understanding of the social, economic, biological, and physical aspects of the management of bacterial pathogens in managed ecosystems.

Explain how research in phytobacteriology has impacted agriculture and other scientific fields.

Critical Thinking

Demonstrate how scientists develop solutions for bacterial plant diseases and take advantage of bacterial-plant mutualism in managed ecosystems.

Be able to identify knowledge gaps in phytobacteriology and design hypotheses to test these gaps

Leadership and Professionalism

Work effectively within diverse teams to solve complex problems and achieve desired outcomes in managed ecosystems.

Manage one's time effectively, work independently, take initiative, and collaborate with colleagues on group research projects.
Apply professional standards of science and responsible conduct of scientists essential for the pursuit of knowledge.
Communication
Develop materials to engage the public, including fellow scientists, industry and government personnel, the general public, in the study of phytobacteriology.

Attendance: Because a portion of the grade is based on participation, class attendance is expected. Absences must be well justified and explained to the instructor. If students are absent, make-up work will be required.

Exams:
Final written exam consisting of short answer analysis of recent discoveries in phytobacteriology. Questions will be similar to those graduate students are asked in a prelim examination.

Grades: Grades will be assigned according to a scale (for example, A = 90-100; B = 75-89; C = 60-74; F = 60 or below)
Final exam = 20 points
Class participation = 20 points
Class project = 10 points
Written work on assigned readings = 50 points

Academic integrity is expected of all CSU students
The CSU General Catalog (http://www.catalog.colostate.edu/FrontPDF/1.6POLICIES1112f.pdf) outlines expectations for all students. Additional information on academic integrity is available at http://learning.colostate.edu/integrity/index.cfm

Accommodations for Students with a Disability: If you may need an accommodation based on the impact of a disability, please contact Dr. Charkowski privately to discuss your specific needs. Written documentation from the Office of Resources for Disabled Students may be requested.

Service Animals
BSPM502B will follow all of the policies regarding service animal access to the classroom. The full university policy may be found here: http://policylibrary.colostate.edu/policy.aspx?id=747 .

Date	**Topic**	**Reading**
Nov 4	**Introduction** History and importance of phytobacteriology General management strategies for bacterial diseases Bacterial and plant structures Taxonomy Terminology Life cycles and disease triangle	
Nov 6	**Necrotrophic bacterial pathogens** *Dickeya* and *Pectobacterium* Type 2 Secretion System (T2SS) Quorum-sensing systems and inhibitors Plant cell wall degrading enzymes Reporter genes	Moleleki et al. 2017. Molecular Plant Pathology 18:32-44. https://onlinelibrary.wiley.com/doi/epdf/10.1111/mpp.12372

	Contributions of phytobacteriology to biochemistry	
Nov 11	**Hemi-biotrophic bacterial pathogens** *Pseudomonas* – Type III secretion system (T3SS), harpins, and effectors *Xanthomonas* – T3SS and TALs Bioinformatics and virulence gene discovery Contributions of phytobacteriology to biotechnology	Schandry et al. 2018. Molecular Plant Pathology 19:1297-1301
Nov 13	**Gall-forming plant pathogens / Biocontrol** *Agrobacterium* T4SS and plant transformation Bacterial production of plant hormones Biocontrol Contributions of phytobacteriology to biotechnology	Lacroix and Citovsky. 2018. Pathways of DNA Transfer to Plants from Agrobacterium tumefaciens and Related Bacterial Species. Ann. Rev. Phytopathol. 57:11.1-11.21
Nov 18	**Biotrophic bacterial pathogens / Insect transmission** *Xylella* *Liberibacter* *Phytoplasmas* *Spiroplasma* Evolution of biotrophic pathogens and reduced genomes	Tomkins et al. 2018. A multi-layered mechanistic modelling approach to understand how effector genes extend beyond phytoplasma to modulate plant hosts, insect vector sand the environment. Current Opinion in Plant Biology. 44:39-48
Nov 20	**Human pathogens on plants** *Salmonella* and *Escherichia coli* adherence to plants, interactions with plant pathogens, survival in soil and water Are these bacteria plant pathogens?	Erickson et al. 2019. Survival of *Salmonella enterica* and *Escherichia coli* O157:H7 Sprayed onto the Foliage of Field-Grown Cabbage Plants. Journal of Food Protection 82:479-485 https://jfoodprotection.org/doi/pdf/10.4315/0362-028X.JFP-18-326 Cox et al. 2018. Production of the Plant Hormone by *Salmonella* and Its Role Interactions with Plants and Animals. Frontiers in Microbiology 10.3389 https://www.frontiersin.org/articles/10.3389/fmicb.2017.02668/full
Nov 25, 27	**Fall Recess**	
Dec 2	**Case study** *Should there be a threshold for potato blackleg in seed potato certification*?	
Dec 4	**Small molecules** *Streptomyces* – toxins *Rhizobium* – nod factors	Bown et al. 2016. Production of the *Streptomyces scabies* coronafacoyl phytotoxins involves a novel biosynthetic pathway with an F420-dependent oxidoreductase and a short-chain dehydrogenase/ reductase. Mol. Microbiol. 101:122-135 https://www.ncbi.nlm.nih.gov/pubmed/26991928
Dec 9	**Diagnostics and detection** Biochemical phenotypes	Badial et al. 2018. Nanopore Sequencing as a Surveillance Tool for Plant Pathogens in Plant and Insect Tissues. Plant Disease 12:1648-1652

	Molecular detection methods - PCR, ELISA, RPA, LAMP In-field DNA sequencing	https://apsjournals.apsnet.org/doi/pdf/10.1094/PDIS-04-17-0488-RE
Dec 11	**Management of bacterial plant pathogens** Management of endemic bacteria - sanitation, exclusion, biocontrol How responses to epidemics are coordinated Quarantine pathogens	For in-class discussion: Murray et al. 2017. *Rathayibacter toxicus*, other *Rathayibacter* species inducing bacterial head blight of grasses, and the potential for livestock poisonings. Phytopathology 107:804-815
Final	**Take-home exam**	