BIOL 8801

Special Topics: Bacterial Quorum Sensing: microbial chemical ecology

Course Objectives:

- Appreciate the ubiquity of cell-cell signaling (quorum sensing) in bacteria.
- Compare/contrast quorum sensing mechanisms in diverse bacteria.
- Analyze the methods used by researchers to identify and validate components of these systems.
- Discover processes under quorum sensing control.
- Learn how quorum sensing systems can be integrated into networks for responding to additional signals.
- Assess the potential of engineering quorum sensing for manipulating bacterial behavior.
- Develop effective methods for conducting an oral presentation on a research paper

Prerequisites:
For graduate level courses, Graduate Standing or Permission of Instructor is assumed

For undergraduates interested in enrolling, a grade of at least a C in Genetics (BIOL 2344/2354), Eukaryotic Molecular Genetics (BIOL 4668), or Prokaryotic Molecular Genetics (BIOL4608/6608) is required.

Reading Material:
Selected research articles

Supplemental Reading:
There are numerous review articles on quorum sensing in bacteria. Several are listed below:

R Kolter. 2010. Reflections on the History of Microbial Chemical Ecology. *Microbe*. 201-5.

WL Ng & BL Bassler. 2009. Bacterial quorum-sensing network architectures. *Annu Rev Genet*. 43:197-222.

A & TK Wood. 2008. Bacterial Quorum Sensing: Signals, Circuits, and Implications for Biofilms and Disease. *Annu. Rev. Biomed*. 10:145-167.

JC March & WE Bentley. 2004. Quorum sensing and bacterial cross-talk in biotechnology. *Curr Opin Biotech* 15:495-502.

Course format:
This 1-credit course meets once a week, on Mondays from 1 to 2 pm. This course will be primarily based on student presentations and ensuing discussions of primary research articles that are present in the syllabus. Students will be assigned as presenters and as reviewers during the first week of class. Natural quorum sensing systems will be emphasized with a focus on Vibrios as well as other bacterial systems. Integrated into the journal articles will be

several focus on engineered systems and application of quorum sensing-based control to hinder pathogenicity in disease-causing bacteria or promote beneficial behavior in benign bacteria.

Attendance Policy:
Each student will be allowed one excused absence from class. Written verification will be required for additional absences. Students are expected to adhere to the Student Honor Code (http:www.honor.gatech.edu).

Grading:
Each student will be required to read the research article assigned for each week. All students in the class are expected to participate in discussions. In addition, several students will be specifically assigned to review each presentation and be required to lead the in-class discussion by asking questions of each presenter. Throughout the semester each student will prepare and present 1 article as an in-class Powerpoint presentation. The course instructor will evaluate and grade your student presentations using the rubric below. Both the material in the article and appropriate background material should be included in the presentation. Each presentation will be video-taped and each presenter will write view their own recording and write a self-evaluation of their presentation.

Student presentations	60%
Self-evaluations	10%
Review	30%

Grading will be assigned according to the following scale:
A = 90-100; B = 80-89; C = 70-79; D = 65-69; F = 64 or below.

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Below is the schedule and list of papers used in 2012. The papers for the 2014 course will be selected primarily from papers published between 2012-14.

	Date	Topic	Papers	Student presenter	Student reviewer
1	Jan 9	QS in *Strep pyogenes*	Change et al 2011 *PLOS Pathogens*	*Hammer*	
*	Jan 16	HOLIDAY			
2	Jan 23	Synthetic QS	Prindle et al 2011 *Nature*	student	student1 student2
3	Jan 30	PQS QSing in *Pseudomonas*	Sonnleitner et al 2011 *Mol Microbiol*	student	student1 student2
4	Feb 6	QS in *Bacillis* biofilms	Lopez et al 2009 *Genes & Devel*	student	student1 student2
5	Feb 13	Agr QS system in *Staph*	Queck et al 2008 *Mol Cell*	student	student1 student2
6	Feb 20	*V. cholerae* QS	Shao & Bassler 2012 *Mol Microbiol*	student	student1 student2
7	Feb 27	Engineered QS vs *Pseudomonas*	Saeidi et al 2011 *Mol Systems Biol*	student	student1 student2
8	Mar 5	EHEC therapeutics vs QS	Rasko et al 2008 *Science*	student	student1 student2
9	Mar 12	*Pseudomonas* prevent QS cheaters	Xavier et al 2011 *Mol Microbiol*	student	student1 student2
	Mar 19	BREAK			
10	Mar 26	*Yersinia* QS biofilms in worms	Atkinson et al 2011 *PLOS Pathogens*	student	student1 student2
11	Mar 5	Abs vs *Strep pneumo* enhances QS	Yano et al 2011 *mBio*	student	student1 student2
12	Mar 12	QS-dep OM vesicle formation	Schertzer et al 2012 *mBio*	student	student1 student2
13	Mar 19	QS versus efficiency sensing	Hense et al 2007 *Nat Rev Micro*	student	student1 student2
14	Mar 26	QS receptor ratio in *Vibrio harveyi*	Teng et al 2011 *Mol Systems Bio*	student	student1 student2

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BIOL 4402/8802
Prokaryotic Molecular Genetics
SPEAKER EVALUATION FORM

Presentation Date: _____ Presentation # _____

Presentation Title: _____

Presenters' names: _____

	excellent 5	very good 4	good 3	fair 2	poor 1		total
Mechanics of Communication (10)							
Were the speakers familiar with the A/V equipment?						→	
Were the slides easy to read and not overcrowded?						→	
Presentation (25)							
Was the talk well presented? (typos, slide order, time management?)						→	
Did presenters speak loud enough and avoid unnecessary audible "caesura" (uh, errs, um)						→	
Did speakers strive to keep the audience's attention? (eye contact, voice/expression, inflection?)						→	
Were speakers attentive to needs of a general audience? (ex: this may sound like "X" but…, can you see in back?)						→	
Did speakers avoid jargon when simple phrases suffice? (ex: explain technical acronyms, avoid confusing phrases?)						→	
Content (55)							
Did the talk have a distinct introductory, middle and concluding section?						→	
Was the introduction and background material adequate and make audience curious?						x 3 =	
Were the results explained clearly and simply?						x 3 =	
Were the results explained accurately and in sufficient detail?						x 3 =	
Did the conclusion summarize the main point, and make clear what should be taken away from the talk?						→	
Questions (5)							
Did the talk stimulate interesting questions and were they answered adequately?						→	
Group dynamics (5)							
Did each group member contribute sufficiently to the presentation?						→	

Strengths: _____

Suggestions for improvement: _____

Overall Evaluation _____

TOTAL

*** this assessment form will be given to presenters after TOTALs are recorded**