January 11, 2010/Bvk

Syllabus

Name of Course: BIO 355 (Seminar in Medical and Environmental Microbiology)
Time of Course: TU/TH - 10.00 to 11.15 am
Room: HS G39

Contact info
The best way to reach me is to email in advance to set up an appointment. Otherwise find me in my office or the labs (G32 Micro teaching lab, G71 Kjellerup Research Lab), so we can schedule an appointment.

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Materials
Peer-reviewed papers either available on-line or on BlackBoard

Course Description
This course introduces the world of biofilms (bacteria or other microorganisms attached to surfaces) and applies critical examination of current research problems and findings as well as the synthesis of primary literature in microbiology. Emphasis is on the different ways that communities of microorganisms influence human health and human activities in a broader perspective. This includes environmental biofilms and beneficial biofilms such as those involved in bioremediation and waste water treatment. Also included are molecular techniques to study and survey biofilms, biofilm structural analyses, industrial applications, host-pathogen interactions in biofilm infections, extreme environmental biofilms and biofilm growth and elimination strategies.

Students will present articles from primary literature and/or text books and/or reviews of a chosen topic, which will be the basis of a lively and entertaining class discussion.

Course Content
Presentations, Part I:
For the first part of the course, each week, 3-4 students will give presentations. When possible 1-2 students will give an overview of scientific papers from the earliest part of the biofilm period and the other students will each present a paper from the current primary literature that is relevant to the topic of the week. There will be 25 minutes for each presentation (15 min presentation and 10 min discussion). Time-limits will be strictly enforced so we stay on schedule. Presentations may utilize powerpoint, chalk board, video, audio and show & tell kind of style. Basically, you are free to use most any means possible to present your topic, as long as you get your point across effectively. Students presenting papers that are different from the ones listed must provide a pdf to all members of the class by 10am the Monday before the presentation. If a pdf is not available, a hard copy of the article must be given to me by 10am the Monday before the presentation and I will copy it and make it available to everyone. Change of papers must be discussed with me in advance (at least the week before).

Presentations, Part II:
The last part of the course will be devoted to presentations on a topic of your choosing, concerning a specific biofilm related problem and/or solution, a phenomenon, chemical or microbiological relationships in biofilms etc. You will choose a topic to review for the class in a 45 minute talk. Your talk may include other aspects such as the physical, chemical, geological, human, physiological etc. components of the system, but you must focus on the biofilm aspects. Include, for example, what the current areas of research focused on, what are the unanswered questions, why your topic is important/exciting/interesting. While you will likely use multiple papers from the primary literature to reference for you talk; try not to give specific examples from all of them. It is usually better to focus on one or two exciting papers. You must use primary literature, not only review papers.

You may either come up with a topic on your own (this requires my approval) or choose a topic from the list I provide. We will discuss topics in class on March 11, 2010 to ensure that more than one person does not choose the same topic. On the day of your presentation, you must provide the class with an abstract of your talk and the list of the literature you consulted.

Presentation Grading:
80%: I will assess all presentations (text, primary literature, and chosen topic) for clarity, organization, ability to answer questions, and knowledge and understanding of the topics.
20%: The students in the class will be assessing all presentations based on the above listed criteria and hand their written evaluations and grades in at the end of each class.

Class Participation: All class members are required to read the assigned articles before the seminar and actively participate in the class discussion and student evaluation. Participation in discussion is an important component of your final grade.

Attendance: Regular attendance is expected and is to your advantage, as participation in class discussions and student presentations is required.

Overall grading:

- Student presentation 1: 60% (3 x 20% each)
- Student presentation 2: 25%
- Class participation: 10% (0% for virtually silent, 10% for regular and reasonable contributions)
- Attendance: 5%

Lecture schedule

Date	Lecture #	Topic	Presenter	Literature
Jan.26	1	Intro to biofilms and the course in general	Kjellerup	
Part I				
Biofilm characteristics				
Jan. 28	2	Related to bacteria	Students 1-3 (I)	1: Microscopic examination of natural sessile bacterial populations from an alpine stream. 2: Biofilm Formation as a Developmental Process 3: Is there a role for quorum sensing signals in bacterial biofilms
Feb. 2	3	Related to EPS, surfaces etc.	Students 4-6 (I)	1: Relevance of microbial extracellular polymeric substances (EPSs)--Part I: Structural and ecological aspects 2: The EPS matrix: the "house of biofilm cells" 3: Bacterial adhesion: seen any good biofilms lately
Methods to study biofilms				
Feb. 4	4	In situ devices	Students 7-9 (I)	1: On-line monitoring of biofilm formation in a brewery water pipeline system with a fibre optical device 2: A photoacoustic technique for depth-resolved in situ monitoring of biofilms 3: On-line biofilm monitoring by "BIOX" electrochemical probe
Feb. 9	5	In the lab/research	Students 10-13 (I)	1: Assessment of metabolic potential of biofilm-associated bacteria 2: In situ identification of bacteria in drinking water and adjoining biofilms by hybridization with 16S and 23S rRNA-directed fluorescent oligonucleotide probes 3: Distribution of sulfate-reducing bacteria, O2, and H2S in photosynthetic biofilms determined by oligonucleotide probes and microelectrodes 13: Identification of *Staphylococcus aureus* proteins recognized by the antibody-mediated immune response to a biofilm infection

Effects of biofilms				
Feb. 11	6	Biofouling	Students 1-3 (II)	1: Relevance of microbial extracellular polymeric substances (EPSs)--Part II: Technical aspects 2: The role of microbial biofilms in deterioration of space station candidate materials 3: An alternative approach to antifouling based on analogues of natural processes
Feb. 16	7	Biocorrosion or microbial fuel cells	Students 4-6 (II)	4: Evaluation of analytical methods for determining the distribution of biofilm and active bacteria in a commercial heating system 5: Biocorrosive thermophilic microbial communities in Alaskan North Slope oil facilities 6: Sampling natural biofilms: a new route to build efficient microbial anodes
Feb. 18	8	Infections in humans	Students 7-10 (II)	7: Production of mucoid microcolonies by *Pseudomonas aeruginosa* within infected lungs in cystic fibrosis 8: Characteristics of Biofilms from Urinary Tract Catheters and Presence of Biofilm-Related Components in *Escherichia coli* 9: Osteomyelitis and the role of biofilms in chronic infection 10: Inhibition of *Streptococcus pyogenes* Biofilm Formation by Coral-Associated Actinomycetes
Feb. 23	9	Infections in humans	Students 11-13 (II)	1: The application of biofilm science to the study and control of chronic bacterial infections 2: Chemical communication among bacteria 3: Quorum-sensing blockade as a strategy for enhancing host defences against bacterial pathogens
Feb. 25	10	Drinking water	Students 1-3 (III)	1: Examination and characterization of distribution system biofilms 2: Biofilms: the environmental playground of *Legionella pneumophila* 3: Biofilm growth in response to

				various concentrations of biodegradable material in drinking water
Mar. 2	11	Food contamination	Students 4-7 (III)	1: Significance of microbial biofilms in food industry: a review 2: Campylobacter biofilm phenotype exhibits reduced colonization potential in young chickens and altered in vitro virulence 3: Microbial contamination of fruit and vegetables and the behaviour of enteropathogens in the phyllosphere: a review 4: Vancomycin heteroresistance and biofilm formation in *Staphylococcus epidermidis* from food
Mar. 4	12	Waste water	Students 8-10 (III)	1: Microbial biofilms: a concept for industrial catalysis 2: Treatment of H2S using a horizontal biotrickling filter based on biological activated carbon: reactor setup and performance evaluation 3: Microbial Population and Activity in Wetland Microcosms Constructed for Improving Treated Municipal Wastewater
Mar. 9	13	Bioremediation	Students 11-13 (III)	1: Construction of a rhizosphere pseudomonad with potential to degrade polychlorinated biphenyls and detection of bph gene expression in the rhizosphere 2: Widespread capacity to metabolize polychlorinated biphenyls by diverse microbial communities in soils with no significant exposure to PCB contamination 3: The application of a mulch biofilm barrier for surfactant enhanced polycyclic aromatic hydrocarbon bioremediation
Mar. 11	14		Topics for Part II	
Part II				
Mar. 23	15		Student #1	
Mar. 25	16		Student #2	

Mar. 30	17		Student #3	
Apr. 1	18		Student #4	
Apr. 6	19		Student #5	
Apr. 8	20		Student #6	
Apr. 13	21		Student #7	
Apr. 15	22		Student #8	
Apr. 20	23		Student #9	
Apr. 22	24		Student #10	
Apr. 27	25		Student #11	
Apr. 29	26		Student #12	
May 4	27		Student #13	
May 6	28		Evaluation etc.	

Course Policies

Attendance

Since your effort (attendance and participation, incl. assessing other students) counts as a part of your grade you are highly encouraged to attend all lectures. Attendance will be taken and repeated absences are taken into consideration for border line grades and professionalism points.

If you are sick, please contact me via email as soon as possible, latest before class starts. Otherwise you will be counted as “absent without reason”.

Electronic devices

All electronic devices must be turned off during lectures and put away. They are not to be placed on the desk.

Academic Honor Code

Reminder: All students are bound by the standards of the Academic Honor Code, found at www.goucher.edu/documents/General/AcademicHonorCode.pdf