CAMB 705 2019A Advanced Topics In Bacterial-Host Interactions

Jump to Today ✎ Edit

CAMB705: Advanced Topics in Bacterial-Host Interactions

Wednesday 3:30-5pm, starting January 23

Johnson 209

Course Co-Directors:

Igor Brodsky
Associate Professor of Pathobiology
ibrodsky@vet.upenn.edu (mailto:ibrodsky@vet.upenn.edu)
215-746-8426 (o)

Sunny Shin
Associate Professor of Microbiology
sunshin@mail.med.upenn.edu (mailto:sunshin@mail.med.upenn.edu)
215-746-8410 (o)

Course Description: This course will delve into specific topics in general area of bacterial pathogenes bacteria-host interactions. We will explore key historical and current papers on topics related to bacter invasion of and replication within host cells, bacterial interference with host cell signaling pathways, ba interactions with host mucosal tissues, and the role of bacterial colonization in shaping and instructing immune responses. Each week, a student will lead the class in the discussion of published papers on specific topic. The format of each class will be a 10-15-minute introduction of the key background and underlying questions to be presented by the student, followed by an in-depth analysis by all members class of one to two articles. Students will be graded based on their introductory presentation and activ participation in the paper discussions.

The class will meet once per week for 1.5 hours, and will discuss 1-2 key papers for each topic, as we relevant background.

General course background:

Falkow, S. (1988). Molecular Koch's postulates applied to microbial pathogenicity. *Reviews of Infectiou Diseases*, *10 Suppl 2*, S274–6.

Falkow, S. (2004). Molecular Koch's postulates applied to bacterial pathogenicity--a personal recollect years later. *Nature Reviews Microbiology*, *2*(1), 67–72.

Topics to be discussed:

(1) Bacterial invasion of host cells

Discussion Paper: Isberg and Falkow (1989). Identification of Invasin: a Protein that allows enteric bac to penetrate mammalian cells. *Cell*. 50:769-778.

Background:

Falkow (1991). Bacterial Entry into Eukaryotic Cells. *Cell.* 65:1099-1102.

Gaillard et al. (1991). Entry of L. monocytogenes into cells is mediated by internalin, a repeat protein reminiscent of surface antigens from gram-positive cocci. *Cell.* 65. 1127-1141.

(2) Bacterial secretion systems (I): intra-kingdom communication devices – Type III secretion

Discussion paper: Marlovitz et al. (2004). Structural Insights into the Assembly of the Type III Secretio Needle Complex. *Science*. 1040-1042.

Background: Galán, J. E., & Wolf-Watz, H. (2006). Protein delivery into eukaryotic cells by type III secr machines. *Nature*, *444*(7119), 567–573.

(3) Life within the cell Part I: bacterial manipulation of membrane trafficking

Discussion Paper:

Global Mapping of the Inc-Human Interactome Reveals that Retromer Restricts Chlamydia Infec (https://proxy.library.upenn.edu:2063/pubmed/26118995) Mirrashidi KM, Elwell CA, Verschueren E, Johnson JR, Frando A, Von Dollen J, Rosenberg O, Gulbahce N, Jang G, Johnson T, Jäger S, Gopalakrishnan AM, Sherry J, Dunn JD, Olive A, Penn B, Shales M, Cox JS, Starnbach MN, Derre I, Valdivia R, Krogan NJ, Engel J. Cell Host Microbe. 2015 Jul 8;18(1):109-21.

Background Papers:

Chlamydia cell biology and pathogenesis. (https://proxy.library.upenn.edu:2063/pubmed/27108705) Elwell C, Mirrashidi K, Engel J. Nat Rev Microbiol. 2016 Jun;14(6):385-400

(4) Bacterial secretion systems (II): intra-kingdom communication devices – Type IV secretion

Discussion Paper: Carey et al. (2011). The Coxiella burnetii Dot/Icm system delivers a unique repertoi type IV effectors into host cells and is required for intracellular replication. *PLOS Pathogens.* May;7(5):e1002056.

Background: Darbari and Waksman (2015). Structural Biology of Bacterial Type IV Secretion Systems. *Annual Review of Biochemistry,* 84:603-29.

(5) Life within the cell Part II: bacterial manipulation of membrane trafficking

Discussion Paper: Ruiz-Albert, J., et al. (2002). Complementary activities of SseJ and SifA regulate dynamics of the Salmonella typhimurium vacuolar membrane. *Molecular Microbiology*, *44*(3), 645–661

(6) Life outside the cell: bacterial adhesion and invasion.

Discussion Paper:

Pathogenic Neisseria meningitidis utilizes CD147 for vascular colonization. (https://proxy.library.upenn.edu:2063/pubmed/24880614) Bernard SC, Simpson N, Join-Lambert O, Fed C, Laran-Chich MP, Maïssa N, Bouzinba-Ségard H, Morand PC, Chretien F, Taouji S, Chevet E, Janel Lafont F, Coureuil M, Segura A, Niedergang F, Marullo S, Couraud PO, Nassif X, Bourdoulous S. Nat I 2014 Jul;20(7):725-31

Background Papers:

A journey into the brain: insight into how bacterial pathogens cross blood-brain barriers. (https://proxy.library.upenn.edu:2063/pubmed/28090076) Coureuil M, Lécuyer H, Bourdoulous S, Nassif X. Nat Rev Microbiol. 2017 Mar;15(3):149-159.

How Bacteria Use Type IV Pili Machinery on Surfaces. (https://proxy.library.upenn.edu:2063/pubm /26497940) Maier B, Wong GC. Trends Microbiol. 2015 Dec;23(12):775-88.

(7) Bacterial-Host Immune Response: Bacterial toxins and cell-surface receptors

Discussion Paper:

CCR5 is a receptor for Staphylococcus aureus leukotoxin ED. (http://www.ncbi.nlm.nih.gov/pubmed/23235831) Alonzo F 3rd, Kozhaya L, Rawlings SA, Reyes-Robles T, DuMont AL, Myszka DG, Landau Unutmaz D, **Torres** VJ. Nature. 2013 Jan 3;493(7430):51-5.

Background Papers:

The effects of Staphylococcus aureus leukotoxins on the host: cell lysis and beyond. (http://www.ncbi.nlm.nih.gov/pubmed/23466211) Yoong P, Torres VJ. Curr Opin Microbiol. 2013 Feb;16(1):63-9.

Bacterial survival amidst an immune onslaught: the contribution of the Staphylococcus aureus leukotoxins. (http://www.ncbi.nlm.nih.gov/pubmed/23436994) Alonzo F 3rd, Torres VJ. PLoS Pathog. 2013 Feb;9(2):e1003143

(8) Bacterial evasion of TLR signaling

Discussion Paper:

Virulence factors of Yersinia pestis are overcome by a strong lipopolysaccharide response. (https://www.ncbi.nlm.nih.gov/pubmed/16980981) Montminy SW, Khan N, McGrath S, Walkowicz MJ, S F, Conlon JE, Fukase K, Kusumoto S, Sweet C, Miyake K, Akira S, Cotter RJ, Goguen JD, Lien E. Nat Immunol. 2006 Oct;7(10):1066-73.

Background Paper:

Variation in lipid A structure in the pathogenic yersiniae. (https://www.ncbi.nlm.nih.gov/pubmed/15165239) Rebeil R, Ernst RK, Gowen BB, Miller SI, **Hinnebusch** BJ. Mol Microbiol. 2004 Jun;52(5):1363-73.

Structural Modifications of Bacterial Lipopolysaccharide that Facilitate Gram-Negative Bacteria Evasion of Host Innate Immunity. (https://www.ncbi.nlm.nih.gov/pubmed/23745121) **Matsuura** M. F Immunol. 2013 May 24;4:109.

(9) Bacterial-Host Immune Response part: Bacterial engagement/evasion of cytosolic receptors

Discussion Paper:

(10) Bacterial-Host interactions: Mucosal immunity and the microbiota

Discussion Paper:

Course Summary:

Date	Details