



Misdirected, hijacked and used as
camouflage:

Membrane traffic in human disease.

BIOL 842 CELL BIOLOGY & BIOCHEMISTRY SEMINAR

Meeting time: TBD

Syllabus

Instructor:

Dr. Mara Duncan
304 Coker Hall
843-8435

Course Description:

The course content is selected to give students a full overview of membrane traffic pathways and how these pathways or defects in these pathways contribute to a variety of diseases including: viral infection, cancer and bacterial pathogenesis. Each week selected student(s) will lead a discussion about papers selected for that meeting. One of the goals of this course is to teach students how to lead a discussion and design graded problems. One week prior to the presentation, the student will provide attendees with 2-4 focus questions which must be handed in at the beginning of class. After a short formal presentation detailing the background for the paper, a student will lead a round-table discussion similar to the sorts of round table discussion a professor might lead in an undergraduate seminar. In the round table discussion, the leader may pose questions to other class participants about experimental design and interpretation of results (see Appendix 1 for details).

Grades:

One half of the grade will be determined by the student's presentation, one quarter will be determined by weekly homework assignments and one quarter will be determined by a final exam. Students presenting papers will design and grade 2-4 focus questions to be handed in at the beginning of the class period. Students will also design one question for the final exam based on their presentation. See Appendix 1 for grade criteria.

Feedback, resources and help:

There are textbook and presentation resources available on blackboard. I will be available to discuss papers, focus questions and final exam questions by appointment. Within the week after a presentation, the presenter must meet with me to get feedback on presentation.

January 13, 2009-Meeting 1: Organizational meeting.

Topics: Course organization issues

Meeting time

Group responsibilities (what should the policy be on)

Late focus questions

Missed classes as an attendee

Missed classes as a presenter

What will the final look like?

Can we change the assigned papers?

Getting to know the class

What do you know about membrane traffic?

How do you read a paper?

How to organize a background and significance

How to design focus questions

How to lead a discussion

Preparation

Canned questions (describe fig 1, what is the control in this experiment)

Open ended questions (What is missing? What would you do next?)

Does this help the paper?)

How to involve all students in a discussion

How to deal with a quiet class

How to manage over talkers

Developing a teaching portfolio

January 20: No meeting.

January 27 Meeting 2: How do viruses invade our cells #1-clathrin mediated endocytosis

Paper: **Assembly of endocytic machinery around individual influenza viruses during viral entry.** *Rust et al.*

Nature Structural and Molecular 2004. 11:567-573

Review: **Penetration of Nonenveloped Viruses into the Cytoplasm**

B. Tsai Annu. Rev. Cell Dev. Biol. 2007. 23:23-43

Presenter:

February 3 -Meeting 3: How do viruses invade our cells #2-caveolae

Paper: **Caveolar endocytosis of simian virus 40 reveals a new two-step vesicular transport pathway to the ER**

L. Pelkmans et al. NCB 2001. 3:473-483

Review: **Virus Entry: Open Sesame**

M. Marsh and A. Helenius. Cell 2006. 124:729-740

Presenter:

February 10-Meeting 4: How do viruses invade our cells #3-non-non

Paper: **Clathrin- and Caveolin-Independent Entry of Human Papillomavirus Type 16- Involvement of Tetraspanin-Enriched Microdomains (TEMs)**

G. Spoden et al. PLOS ONE 2008. 3:e3313

Review: **Tetraspanins as Regulators of Protein Trafficking** *F. Berditchevski and E.*

Odintsova Traffic 2006.8:89-96

Presenter:

February 17-Meeting 5: How do viruses like HIV prevent their host cells from being destroyed by the immune system

Paper: **HIV-1 Nef disrupts MHC-I trafficking by recruiting AP-1 to the MHC-I cytoplasmic tail.** *J.F. Roeth et al. J Cell Biol. 2004. Dec: 167(5):903-13*

Review: **Pathogen evasion strategies for the major histocompatibility complex class I assembly pathway** *A. N. Antoniou and S.J. Powis. Immunology 2008. 124:1-12*

Presenter:

February 24-Meeting 6: How do viruses mask themselves in our own cellular components?

Paper: **Tsg101 and the Vacuolar Protein Sorting Pathway**

Are Essential for HIV-1 Budding. *Garrus et al. Cell 2001. 107:55-65*

Review: **Beyond Tsg101: the role of Alix in 'ESCRTing' HIV-1.** *Fujii et al. Nat. Rev. Micro. 2007. 5:912-916*

Presenter:

March 3-Meeting 7: Intracellular bacteria 1.

Paper: **Mycobacterium's Arrest of Phagosome Maturation in Macrophages Requires Rab5 Activity and Accessibility to Iron.** *V. A. Kelley, and J. S. Schorey. MCB. 2003. 14: 3366-3377*

Review: **Manipulation of Rab GTPase Function by Intracellular Bacterial Pathogens** *J.H. Brumell and M.A. Scidmore. MICROBIOLOGY AND MOLECULAR BIOLOGY REVIEWS. 2007. 71: 636-652*

Presenter:

March 10-Spring Break

March 16-Meeting 8: Intracellular bacteria 2

Papers: **Legionella pneumophila Replication Vacuole Formation Involves Rapid Recruitment of Proteins of the Early Secretory System.** *I. Derré and R. R. Isberg Infect. Immun. 2004. 72:2048-3053*

LidA, a Translocated Substrate of the Legionella pneumophila Type IV Secretion System, Interferes with the Early Secretory Pathway *I. Derré and R. R. Isberg Infect. Immun. 2005. 73: 4370-438*

Review: **The Legionella pneumophila replication vacuole: making a cosy niche inside host cells** *R.R. Isberg et al Nature Reviews Microbiology 2009. 7:13-24*

Presenter:

March 23-Meeting 9: Bacterial toxins and membrane traffic-Shiga toxin

Paper: **Direct Pathway from Early/Recycling Endosomes to the Golgi Apparatus Revealed through the Study of Shiga Toxin B-fragment Transport** *F. Mallard et al. J. Cell Biol. 1998 143: 973-990.*

Review: **ALTERNATE ROUTES FOR DRUG DELIVERY TO THE CELL INTERIOR PATHWAYS TO THE GOLGI APPARATUS AND ENDOPLASMIC RETICULUM.** *M.T. Tarragó-Trani and B. Storrie. Adv Drug Deliv Rev. 2007 59: 782-797.*

Presenter:

March 31-Meeting 10: Bacterial toxins and membrane traffic-Cholera toxin

Paper: **Retrograde transport of cholera toxin from the plasma membrane to the endoplasmic reticulum requires the trans-Golgi network but not the Golgi apparatus in Exo2-treated cells.** *Y. Feng et al. EMBO reports. 2004 5:596-601.*

Review: **Rafting with cholera toxin: endocytosis and trafficking from plasma membrane to ER.** *D.J. Chinnapen et al. FEMS Microbiology letters. 2007 2:129-137*

Presenter:

April 7-Meeting 11: Membrane traffic in cell overgrowth-ESCRTs

Paper: **Chmp1A functions as a novel tumor suppressor gene in human embryonic kidney and ductal pancreatic tumor cells.** *J.Li et al Cell Cycle. 2008. 7:2886-2893*

Review: **ESCRT proteins in physiology and disease** *S. Stuffers et al. Experimental Cell Research 2009. (in press)*

Presenter:

April 14-Meeting 12: Membrane traffic in cell overgrowth-HPV and lipid rafts

Paper: **HPV-16 E5 oncoprotein upregulates lipid raft components caveolin-1 and ganglioside GM1 at the plasma membrane of cervical cells**
F.A .Suprynowicz et. al. Oncogene 2008. 27:1071-1078

Review: **Role of tumor-associated gangliosides in cancer progression** *S. Birklé et. al. Biochimie 2003. 85:455-463*

Presenter:

April 21- Meeting 13: Traffic proteins in schizophrenia

Paper: **Evidence That the BLOC-1 Protein Dysbindin Modulates Dopamine D2 Receptor Internalization and Signaling But Not D1 Internalization.** *Y Iizuka Journal of Neuroscience 2007. 27:12390-12395*

Review: **Schizophrenia Susceptibility Genes Directly Implicated in the Life Cycles of Pathogens: Cytomegalovirus, Influenza, Herpes simplex, Rubella, and Toxoplasma gondii.** *C.J. Carter Schizophrenia Bulletin (in press)*

Presenter:

April 27: Final exam due

May 4: Student grading of final exam due.

Unpresented paper

(The contribution of normal secretion to the cancer micro environment

Paper: **Macrophages Regulate the Angiogenic Switch in a Mouse Model of Breast Cancer.** *E.Y. Lin et al Cancer Research 2006. 66:11238-11246*

Review: **Macrophages define the invasive microenvironment in breast cancer.** *J.W. Pollard Journal of Leukocyte Biology 2008. 84:623-630)*

Appendix 1: Grading criteria

Homework (25% of course grade):

High pass-Student answered all questions correctly or if no correct answer possible made a good attempt at a correct answer or pointed out the lack of a correct answer.

Pass-Student answered all questions some are incorrect.

Low Pass-Student answered some questions which may or may not be correct

Final (25% of course grade): Take home exam due April 27.

High pass- Student answered all questions correctly or if no correct answer possible made a good attempt at a correct answer or pointed out the lack of a correct answer.

Pass-Student answered most or all questions some may be incorrect.

Low Pass-Student answered only some questions which may or may not be correct

Weekly presentation (50% of course grade):

Focus questions (25% of presentation grade)

High pass-Directs attendee to most important aspects of paper, reveals attendee understanding of techniques used, reveals attendee understanding of paper conclusions, reveals attendee understanding of whether experiments support conclusions.

Pass- lacks a few of the above criteria, unclear, no answer possible

Low Pass-e.g. not based on the paper, random facts

Background and significance (25% of presentation grade)

High Pass-Engaging presentation, contains an appropriate level of detail, introduces as much background information as required to understand paper, all items are factually correct, identifies important previous research and explains importance of current study

Pass- lacks a few of the above criteria and/or a few factual errors

Low Pass-e.g. unclear, missing essential information, not based on the paper, clear lack of understanding of assigned paper, many factual errors

Group discussion (35% of presentation grade)

High Pass-Involves many attendees in the discussion, allows attendees to demonstrate understanding of techniques used, leads attendees to the correct answer for fact based questions, draws attendees to point out flaws and strengths of the conclusions and/or experiments, stimulates an engaging discussion and allows appropriate time for open ended discussion.

Pass- lacks a few of the above criteria

Low Pass-e.g. unclear, does not involve attendees, no prepared questions, does not understand paper

Final exam question (15% of presentation grade)

High Pass-Focuses on most important aspects of paper, reveals attendee understanding of techniques used and/or paper conclusions and/or whether experiments support conclusions, and exhibits a clear correct answer with an easy grading rubric.

Pass- lacks a few of the above criteria, unclear, no answer possible

Low Pass-e.g. not based on the paper, random facts