

MVP Core

CAMB 706

Spring 2020

Course Directors and Contact Info:

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Section Directors

Virology II : Matthew Weitzman/Jianxin You

Parasitology I & II: Sparky Lok/ Chris Hunter

Description

The MVP Core class provides CAMB-MVP students with key fundamental knowledge of Bacteriology, Virology, and Parasitology. The course runs through the Fall and Spring for first year CAMB-MVP students. The course starts with 3 overview lectures and is then organized into three sections that cover principles of Bacteriology, Virology, and Parasitology.

Prerequisites

None

Enrollment criteria

Required for all first year CAMB-MVP students. Non CAMB-MVP students by permission of course directors.

Schedule
MWF, 2:30-3:30

Location
209 Johnson

Format

- Lecture
- Discussion - Themed lecture sets with intermittent journal article discussion groups

Student assignments

Midterm/final exam for each subsection

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Journal article presentation within each subsection

Grading Criteria:

50% Exam based (in class or take home, varies by section leaders)

40% presentation based

10% participation based (participation in discussions, asking questions during lecture, etc.)

Course Goals

Students who complete this course successfully will have gained:

- A broad introduction to host-pathogen interactions
- A survey of bacteriology, virology and parasitology with emphasis on common and distinct themes
- Ability to analyze relevant primary articles in-depth

Guidelines/Expectations for Student Paper Presentations

Students not assigned to present:

=Read the paper well in advance of the presentation day.

1. Come prepared to participate actively in the discussion with at least **two** questions or observations about approaches or interpretations by the authors.

Student assigned to present:

1. Meet the faculty mentor for the paper well in advance of the presentation to go over expectations and discuss the background for the paper. It is your responsibility to establish contact with the faculty member.
2. Format will be a journal club style presentation via PowerPoint and should contain the following elements:
 - A. A brief presentation of the background of the research including rationale and key previous findings upon which it is based,
 - B. A presentation of key findings in the *most important* figures (ie. not necessarily all of them!),
 - C. A critical review of the major findings and interpretations and
 - D. A critique of the significance of the paper overall.
3. Meet with the faculty mentor for the paper soon after your presentation for feedback.

Faculty Mentor:

Faculty mentors are encouraged to give brief comments at the end of the presentation session about where the paper fits into the general thrust of research in their field.

Syllabus



Course Directors

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Parasitology Section

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Virology Section II
Course Directors: Jianxin You and Matthew Weitzman
CAMB 706 – Virology Section II

DATE	DAY	TITLE	LECTURER	EMAIL
1/15/20	W	Antiviral therapeutics	Dr. Bates	pbates@penmedicine.upenn.edu
1/17/20	F	Arboviruses	Dr. Ramage	hramage@penmedicine.upenn.edu
1/20/20	M	Martin Luther King Day - NO CLASS		
1/22/20	W	Innate Recognition	Dr. Cherry	cherrys@penmedicine.upenn.edu
1/24/20	F	<u>Student Paper Presentation</u>	Dr. Ramage	Cadena <i>et al.</i> Cell 2019;177, 1187–1200
1/27/20	M	Viral immune evasion	Dr. Cherry	cherrys@penmedicine.upenn.edu
1/29/20	W	<u>Student Paper Presentation</u>	Dr. White	Zhang <i>et al.</i> Cell 2018;175, 1465–1476
1/31/20	F	Viral Transformation and Cancer I	Dr. You	jianyou@penmedicine.upenn.edu
2/3/20	M	Viral Transformation and Cancer II	Dr. White	eawhite@penmedicine.upenn.edu
2/5/20	W	<u>Student Paper Presentation</u>	Dr. You	Feng <i>et al.</i> Science 2008;319,1096-1100
2/7/20	F	Viral DNA replication & repair	Dr. Weitzman	weitzmanm@email.chop.edu
2/10/20	M	Epigenetics and viral latency	Dr. Lieberman	lieberman@wistar.org
2/12/20	W	<u>Student Paper Presentation</u>	Dr. Lieberman	Roy <i>et al.</i> eLife 2019;8:e49500
2/17/20	M	Virology Final Due		

- 1/15/20 Antiviral Therapeutics (Bates)
- Overview of viral infections
 - Antiviral drug development
 - Therapeutic targets
 - Challenges for drug development
- 1/17/20 Arboviruses (Ramage)
- Introduction to arboviruses
 - Spread of Arboviruses
 - Vectors
 - Strategies for control
 - Togaviridae
 - Flavaviridae

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	<ul style="list-style-type: none">• Bunyaviridae
1/20/20	<u>Martin Luther King Day</u>
1/22/20	<u>Innate recognition (Cherry)</u> <ul style="list-style-type: none">• Introduction:• Pathways and mechanisms
1/24/20	<u>Student Paper Presentation and Discussion</u>
1/27/20	<u>Viral Immune Evasion (Cherry)</u> <ul style="list-style-type: none">• Introduction:• Pathways and mechanisms• Viral examples of evasion
1/29/20	<u>Student Paper Presentation and Discussion</u>
1/31/20	<u>Viral Transformation and Cancer I (You)</u> <ul style="list-style-type: none">• Introduction to human cancer viruses• Key features of tumor cells• Overview of viral oncogenic mechanisms• Tumor virus interactions with host immune system• New technologies for studying cancer viruses
2/3/20	<u>Viral Transformation and Cancer II (White)</u> <ul style="list-style-type: none">• Features of oncogenic human viruses• Human papillomaviruses• Human transforming herpesviruses• Systems approaches to virus-host interactions
2/5/20	<u>Student Paper Presentation and Discussion</u>
2/7/20	<u>Viral DNA Replication and Repair (Weitzman)</u> <ul style="list-style-type: none">• Viral DNA genomes and Virus DNA replication• Small linear ssDNA – Parvoviruses• Small circular dsDNA – Polyomaviruses• Linear dsDNA – Adenoviruses• Large circular dsDNA – Herpesviruses• Virus Replication Compartments• DNA repair and viruses
2/10/20	<u>Epigenetics and Viral Latency (Lieberman)</u> <ul style="list-style-type: none">• Introduction to viral latency• Introduction to arboviruses
2/12/20	<u>Student Paper Presentation and Discussion</u>
2/17/20	<u>Virology Final Due</u>

CAMB 706 – Parasitology Section
Course Directors: Sparky Lok & Chris Hunter
(Boris Striepen, Michael Povelones)

February 19-May 1: Parasitology (2:30-3:30 pm, MWF, 209 Johnson Pav.)

20 students – 7 paper presentations – they have been doing groups of 3.

Section I Protozoan infections

- **2/19 - Introduction to protozoa (Beiting).** A survey of the major protozoan infections of humans including a brief description of the parasite life cycles and a brief discussion of the clinical diseases seen during these infections
- **2/21 -- Disease manifestations in leishmaniasis (Scott).** This series will cover the complex biology of *Leishmania* species and the spectral nature of the disease.
- **2/24 – Immunity to *Leishmania* (Novais).** Studies on *Leishmania* have provided fundamental insights into how the immune system functions to control infection. This lecture will cover some of the contributions of this model system.
- **2/26 -- Pathobiology of *Cryptosporidium* sp. (Striepen)** Basics of *Cryptosporidium* biology and status as a leading cause of diarrheal disease (“Think intestinal malaria.”). Challenges to genetic study of *Cryptosporidium* and development of modern molecular tools.
- **2/28 –Cell Biology of Invasion (Striepen)** We will also discuss biochemical and cell biological similarities and differences with other apicomplexa (*Babesia*, *Cryptosporidium*, *Toxoplasma*, etc.), and implications for therapeutic development
- **3/2 – Biology and pathogenesis of *Toxoplasma* (Hunter).** The basic principles of the life cycle of this organism will be covered and the critical role that cell mediated immunity plays in the control of this infection and the evasion strategies utilized by *Toxoplasma*.
- **3/4 –Trypanosomes – (Povelones) : Immune evasion by *Trypanosoma brucei*.** Overview of life cycle and disease pathogenesis of *Trypanosoma brucei*, as well as techniques for genetic manipulation. Discuss parasite strategies for evasion of innate and adaptive immune responses.
- **3/6 – Student Paper Presentation 1 : Presenter(s) TBD – Boris**
- **3/9 – Biology and pathogenesis of *Plasmodium* (Audrey John).** This lecture will cover the life cycle *Plasmodium* parasites and pathology of human malaria.

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- **3/11** Malaria – Drug Development Audrey John

3/13 – Student Paper Presentation 2: : Presenter(s) TBD – Chris Hunter

Section II Helminth infections

- **3/16** -- Introduction to helminths (Lok). Overview of systematics, developmental and structural biologies of parasitic trematodes, cestodes and nematodes; brief notes on major disease systems involved and final comments on impact of parasitic helminths on global disease burden.
- **3/18** -- Helminth biology with a focus on soil-transmitted nematodes (Lok). This lecture will stress five aspects of parasitic nematode biology and pathogenicity: (1) pathogenicity of soil transmitted nematodes and global disease burden, (2) infective processes of passively ingested and skin penetrating worms, (3) chemo- and thermosensory neuronal mechanisms of host finding and acquisition, (4) genomes, molecular genetics and genome manipulation in soil transmitted nematodes with emphasis on new functional genomic tools for *Strongyloides* and *Brugia* and (5) developmental regulatory signal transduction pathways as novel chemotherapeutic targets.
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- **3/20**-- Student Paper Presentation 3: (Lok) Presenter(s) –
- **3/23** Innate immunity to helminth parasites (Herbert). Role and interaction of granulocytes leading to direct killing of parasites and regulation of the innate immune responses. The first part of this lecture will review the innate and adaptive immune mechanisms used by the mammalian host to resist infection with various parasitic helminth species. The second part will cover the parasite derived countermeasures that serve as immune evasion strategies for chronic parasitism.
- **3/25** – Th2 responses during helminth infection (Siracusa). This lecture will highlight balancing host protection, immunopathology and control of coincident infections.
- **3/27** – Student Paper Presentation 4: Presenter(s) –**Hunter?**
- **Parasitology Midterm Exam**: Take-home distributed; due April 3.
- **3/30** -- Swing date – weather related cancelations?

Section III Host Behavior/Parasite Ecology & Evolution / Arthropod associated parasite transmission / Genome-scale studies of parasites

- **4/1** – Introduction to Vector Biology (Lok). Overview of systematics, evolutionary and structural biology of arthropod vectors, with a breakdown of taxa involved in transmission of parasitic disease agents and an outline of general types of vector/parasite interaction.

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- **4/3** – Student Paper Presentation 5: Presenter(s) TBD – Povelones
- **4/6** - Student Paper Presentation 6: Presenter(s) Lok TBD
- **4/8** – Molecular Interactions between Plasmodium and mosquitoes (Povelones). Discussion of current papers on receptor/ligand interactions mediating parasite migration and proliferation in vectors. Consider vector defensive responses that limit parasite growth and genetic manipulation of vector/parasite interactions with an eye to novel control methods.
- **4/10** -- Molecular interactions between filariae and mosquito vectors (Povelones). Compare different human and animal filariae life cycles in their mosquito host. Discuss current and past papers on the genetic basis of vector susceptibility to filarial infection and molecular interactions between the mosquito and parasite.
- **4/13** – Parasite genomics workshop (Harb). This and the following session will focus on the use of the Eukaryotic Pathogens databases and will be conducted as a hands-on workshop with students designing and refining database searches to address specific research questions. The sessions will cover some parasite biology while at the same time considering how in silico experiments are done on these parasites, including high throughput methods and database incorporation
- **4/15** Parasite genomics workshop (Continued - Harb).
- **4/17** – Parasite genomics workshop (Continued - Harb).
- **4/20** -- Evolution of virulence in parasites (Brisson) General theory on parasites with regard to ecology and evolution with a discussion of life-history strategies (when is it better to be virulent or asymptomatic).
- **4/22** – Disease Ecology of Vector-borne Parasites (Levy). A hands-on class covering the fundamentals of mathematical models of vector-borne parasite transmission, including the Ross-MacDonald model. From these basics we then consider various intervention methods (bed nets, vaccines of various kinds, insecticides, etc). Some history of discovery of vector-borne parasites is covered, but the uses (and misuses) of models are the fulcrum of discussion.
- **4/24** - Student Paper Presentation 7 (Brisson)
Parasitology Final Exam Take home distributed at end of class; due May 3.
- **4/27** – Capstone = Groups of 5 students each get 30 minutes. Your job is to develop and present a 30 minute teaching presentation on a single theme related to the basic principles of Host-Pathogen interactions.
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