

MVP Core

CAMB 706
Spring 2019

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	Location
MWF, 2:30-3:30	209 Johnson

Format

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

Student assignments

Midterm/final exam for each subsection

Journal article presentation within each subsection

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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.

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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
1/16/19	W	Antiviral therapeutics	Dr. Bates	pbates@penmedicine.upenn.edu
1/18/19	F	Innate recognition	Dr. Cherry	cherrys@penmedicine.upenn.edu
1/20/19	M	Martin Luther King Day - NO CLASS		
1/23/19	W	Student Paper Presentation		
1/25/19	F	Viral immune evasion	Dr. Cherry	cherrys@penmedicine.upenn.edu
1/28/19	M	Arboviruses	Dr. Ramage	hramage@penmedicine.upenn.edu
1/30/19	W	Viral DNA replication & repair	Dr. Weitzman	weitzmanm@email.chop.edu
2/1/19	F	Student Paper Presentation		
2/4/19	M	Viral Transformation and Cancer I	Dr. You	jianyou@penmedicine.upenn.edu
2/6/19	W	Viral Transformation and Cancer II	Dr. White	eawhite@penmedicine.upenn.edu
2/8/19	F	Student Paper Presentation		
2/11/19	M	Epigenetics and viral latency	Dr. Lieberman	lieberman@wistar.org
2/13/19	W	Student Paper Presentation		
2/18/18	M	Virology Final Due		

Virology II

- 1/16/19 Antiviral Therapeutics (Bates)
- Overview of viral infections
 - Antiviral drug development
 - Therapeutic targets
 - Challenges for drug development
- 1/18/19 Innate recognition (Cherry)
- Introduction:
 - Pathways and mechanisms

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- 1/20/19 Martin Luther King Day
- 1/23/19 Student Paper Presentation and Discussion
- 1/25/19 Viral Immune Evasion (Cherry)
- Introduction:
 - Pathways and mechanisms
 - Viral examples of evasion
- 1/28/19 Arboviruses (Ramage)
- Introduction to arboviruses
 - Spread of Arboviruses
 - Vectors
 - Strategies for control
 - Togaviridae
 - Flavaviridae
 - Bunyaviridae
- 1/30/19 Viral DNA Replication and Repair (Weitzman)
- 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
- 2/1/19 Student Paper Presentation and Discussion
- 2/4/19 Viral Transformation and Cancer I (You)
- 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
- 2/6/19 Viral Transformation and Cancer II (White)
- Features of oncogenic human viruses
 - Human papillomaviruses
 - Human transforming herpesviruses
 - Systems approaches to virus-host interactions
- 2/8/19 Student Paper Presentation and Discussion
- 2/11/19 Epigenetics and Viral Latency (Lieberman)
- Introduction to viral latency

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- Introduction to arboviruses

2/13/19 Student Paper Presentation and Discussion

2/18/19 Virology Final Due

CAMB 706 – Parasitology I & II Section
Course Directors: Sparkly Lok & Chris Hunter

February 18-May 1: Parasitology (2:30-3:30 pm, MWF, 209 Johnson Pav.)

Section I Protozoan infections

- **2/18 - 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
- **2/20 -- Biology and pathogenesis of *Plasmodium* (Striepen)**. This lecture will cover the life cycle *Plasmodium* parasites and pathology of human malaria. We will also discuss biochemical and cell biological similarities and differences with other apicomplexa (*Babesia*, *Cryptosporidium*, *Toxoplasma*, etc.), and implications for therapeutic development
- **2/22 – 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*.
- **2/25 -- Disease manifestations in leishmaniasis (Novais)**. This series will cover the complex biology of *Leishmania* species and the spectral nature of the disease.
- **2/27 – Student Paper Presentation 1**: Presenter(s) TBD - Dr. Hunter
- **3/1 -- Student Paper Presentation 2**: : Presenter(s) TBD - Dr. Novais
- **3/4 – Immunity to *Leishmania* (Scott)**. 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.
- **2/27 -- Pathogenesis of African Trypanosomiasis (Hunter)**. An overview of the pathogenesis of African trypanosomiasis will be presented, focusing on several mechanisms used by the parasite to evade host defenses in the bloodstream.
- **3/6 – Pathobiology of *Cryptosporidium* sp. (Striepen)** Basics of *Cryptosporidium* biology and

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status as a leading cause of diarrheal disease (“Think intestinal malaria.”). Challenges to genetic study of *Cryptosporidium* and development of modern molecular tools.

- **3/8** -- Immunity to *Plasmodium* (Burns). This lecture will cover general and unique features of immunity to infection with malaria parasites. Immune evasion mechanisms, including the role of sequestration in parasite survival will be discussed as will the challenges of malaria vaccine development and the different strategies for achieving this goal.
- **3/11** – Student Paper Presentation 3: : Presenter(s) TBD – Dr. Hunter.

Section II Helminth infections

- **3/13** -- 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.
- **3/15** -- Th2 responses during helminth infection: balancing host protection, immunopathology and control of coincident infections. (Herbert).
- **3/18** -- Innate immunity to helminth parasites: Role and interaction of granulocytes leading to direct killing of parasites and regulation of the innate immune responses. (Herbert).
- **3/20** -- Helminth biology with a focus on *Schistosoma* (Beiting). This lecture will stress four aspects of schistosome biology and pathogenicity: (1) the life cycle, (2) molecular composition, structure and development of the tegument with notes on role of tegumental molecules in host-parasite interactions, (3) molecular genetics and the genome with emphasis on new functional genomic tools for schistosomes, and (4) the pathogenesis of schistosomiasis with emphasis on granuloma formation.
- **3/22** – Student Paper Presentation 4: Presenter(s) TBD - Dr. Harb
- **3/25** – Student Paper Presentation 5: Presenter(s) TBD – Dr. Striepen
Parasitology Midterm Exam: Take-home distributed; due April 1.
- **3/27** -- Student Paper Presentation 6: Presenter(s) TBD – Dr. Herbert

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

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- **4/1** – Quantitative ecology of parasites growing within hosts and transmitting between hosts (Graham)
- **4/3** – 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).
- **4/5** – Student Paper Presentation 7: Presenter(s) TBD – Dr. Beiting
- **4/8** – Student Paper Presentation 8: Presenter(s) TBD – Dr. Lok
- **4/10** -- 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.
- **4/12** – Parasite genomics workshop (Continued - Harb).
- **4/15** -- Student Paper Presentation 9: Presenter(s) TBD - Montoya
- **4/17** – 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.
- **4/19** -- Molecular Interactions of Parasites and Vectors (Povelones). Discussion of current papers on receptor/ligand interactions mediating parasite migration and proliferation in vectors and vector defensive responses limiting parasite growth; genetic manipulation of vector/parasite interactions with an eye to novel control methods.
- **4/22** -- Plasmodium infections of wild-living primates and their zoonotic potential (Hahn). Ecology, population genetics and evolutionary biology of *Plasmodium* spp. in primates, with discussion of their relative importance in the origins of human malaria and in present-day zoonotic infection.
- **4/26** -- Student Paper Presentation 10: Presenter(s) TBD – Dr. Povelones
- **Parasitology Final Exam** Take home distributed at end of class; due May 3.
- **4/29** – Student Paper Presentation 11: Presenter(s) TBD – Dr. Lok

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- **5/1** – Recap, bringing it all together, and farewell (Hunter and Lok)