IDC Bootcamp Handbook

Microbiology 302qc
Introduction to Infectious Disease Research

Monday, January 11 to Friday, January 15, 2016
Countway Library Room 403

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Curriculum Fellow: Dr. Bradley Coleman, PhD
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Introduction
This is the course manual for the 2016 IDC Bootcamp. This is your resource for individual session topics, locations and readings, as well as contact information for the course organizers and instructors.

The Harvard Infectious Diseases Consortium
The Infectious Diseases Consortium (IDC) is an affiliation of Students, Fellows and Faculty from across the University who share an interest in understanding infectious diseases and their effects on people and societies. The work of the IDC currently revolves around programs, courses and events that bring together members of this community.

If you want to stay up to date on events and programs related to the IDC, please sign up for the listserv. You can use the following URL: http://goo.gl/forms/onVLGz4zLH or contact the IDC Curriculum Fellow, Brad Coleman.

Bootcamp Overview
The IDC Bootcamp is designed to be a fun, informative introduction to some of the organisms, concepts and techniques used to study infectious diseases at Harvard and beyond. This will be accomplished through a mix of lectures, discussions and reading as well as hands-on tutorials and data analyses. Active, enthusiastic participation of all students in all activities is essential for the success of the course.

Course Policies
Participation is an essential component of the bootcamp experience. **Student attendance at all sessions is required.** Grading will be based on the Sat/Unsat mechanism (Pass/Fail). A satisfactory grade will require attendance and participation in every session. If sessions require readings, it is expected that students will read them before class.

Due to the commitment required for the Bootcamp, it is not recommended that you pursue independent lab work during the course.

Evaluations
Evaluations will be provided at the end of each day to facilitate feedback about individual session and at the end of the course to allow for general feedback. You **must** fill out these evaluation forms. This is a critical resource for further course development. Daily evaluations will not be read until the entire course is complete.
# Course Schedule (in brief)

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Description</th>
<th>Instructor</th>
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<tbody>
<tr>
<td>1/11</td>
<td>9:00a-10:30a</td>
<td>Introduction to Infectious Diseases</td>
<td>Eric Rubin</td>
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<tr>
<td></td>
<td>10:30a-12:00p</td>
<td>Studying Disease Outbreaks</td>
<td>Roger Shapiro</td>
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<td></td>
<td>12:00p-1:00p</td>
<td>LUNCH</td>
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<tr>
<td></td>
<td>1:00p-2:30p</td>
<td>The Biotechnology of a <em>V. cholera</em> Vaccine Strain</td>
<td>Matt Waldor</td>
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<td></td>
<td>2:45p-5:00p</td>
<td>Clinical Microbiology Lab Tour and Discussion</td>
<td>Alex McAdam</td>
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<td></td>
<td>5:00p-6:00p</td>
<td><em>(optional)</em> Next-Gen Sequencing Demo*</td>
<td>Matt Gerding</td>
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<tr>
<td>1/12</td>
<td>9:00a-10:30a</td>
<td>Malaria and Other Parasites</td>
<td>Matt Marti</td>
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<td></td>
<td>10:30a-12:30p</td>
<td>Disease Transmission</td>
<td>Adam South Perrine Marcenac</td>
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<td>12:30p-1:30p</td>
<td>LUNCH</td>
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<td></td>
<td>1:30p-4:30p</td>
<td>Immunity and Pathogens</td>
<td>Kevin Bonham Brad Coleman</td>
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<td>1/13</td>
<td>10:00a-11:00a</td>
<td>Anti-infectives and Drug Discovery</td>
<td>Ralph Mazitschek</td>
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<td></td>
<td>11:00a-1:00p</td>
<td>Travel to Cambridge &amp; LUNCH*</td>
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<td>1:00p-5:00p</td>
<td>Fluorescence Microscopy*</td>
<td>Doug Richardson</td>
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<td>1/14</td>
<td>9:00a-10:30a</td>
<td>Image Processing</td>
<td>Hoong Lim</td>
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<td>10:30a-12:00p</td>
<td>Pandemic, the game</td>
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<td>12:00p-1:00p</td>
<td>LUNCH</td>
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<td></td>
<td>1:00p-4:00p</td>
<td>Bioinformatics Workshop</td>
<td>Radhika Khetani</td>
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<td>1/15</td>
<td>9:00a-12:30p</td>
<td>Electron Microscopy*</td>
<td>Maria Ericsson</td>
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<td>12:30p-1:30p</td>
<td>LUNCH</td>
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<td></td>
<td>1:30p-3:00p</td>
<td>Disease Evolution and Containment</td>
<td>Yonatan Grad</td>
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<td>3:00p-3:30</td>
<td>Conclusions</td>
<td>Eric Rubin</td>
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<td>3:30-?</td>
<td>Social Hour*</td>
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*Sessions are held in Countway 403 unless notes with an asterisk (*). See full Syllabus for alternate locations and session-specific reading assignments.*
Daily Schedule

Day 1

9:00a-10:30a
*Eric Rubin – A Brief Introduction to Infectious Diseases*

10:30a-12:00p
*Roger Shapiro – Studying Disease Outbreaks*

Dr. Shapiro will walk students through a case study developed by the CDC based on an outbreak investigation that he led in 1997.

Required Readings:
- Breuer et al, 2002: A Multistate Outbreak of E. coli O157:H7 Infection – CDC Case Study
  *The student version of the case study.*
  *The final, published report on the outbreak investigation.*

Supplemental Readings:
  *Background information on outbreak investigation.*
- For further exploration, there is also an interactive online version of the case (PC only): [http://www.cdc.gov/epicasestudies/download_computer.html#ecoli](http://www.cdc.gov/epicasestudies/download_computer.html#ecoli).

12:00p-1:00p
*Lunch and student introductions*

1:00p-2:30p
*Matt Waldor – Cholera: Disease, Outbreaks and Control*

An introduction to the disease caused by the bacterium *Vibrio cholerae*. Special attention will be paid to a recent history of cholera outbreaks and the need for a cholera vaccine. We will examine the development of a novel vaccine strain and focus on the biotechnology being leveraged in that development. We will re-visit several components of the *V. cholerae* vaccine strain in future hands-on sessions including microscopy and next generation sequencing analyses.
2:45p-5:00p
*Alex McAdam* – Discussion and lab tour of the clinical microbiology labs at Children’s Hospital

A discussion of the current state of diagnostic testing for infectious diseases, and where the field might be headed in the future. After an introductory lecture, students will tour the clinical microbiology lab at CHB.

Reading:

5:00p-6:00p
*Location: Waldor Lab, Channing 7th floor*
*Matt Gerding* – Whole Genome Sequencing Wet Lab

A short overview of the generation of bacterial whole genome sequence, data followed by the loading of our library into the Illumina MiSeq Desktop Sequencer. These *V. cholerae* sequence data will be used for the bioinformatics analyses in a later session.

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**Day 2**

9:00a-10:30a
*Mathias Marti* – Malaria and Other Parasites

An overview lecture and discussion of the special requirements of the parasitic lifestyle, with particular attention paid to the *Plasmodium* species that cause malaria.

10:30a-12:30p
*Adam South and Perrine Marcenac* – Disease Transmission

A lecture and paper discussion covering disease transmission, vector biology and the relationships between the two. The focus will be on *Anopheles* mosquitoes and the *Plasmodium* parasites that cause human malaria.

Reading: There will be a 1-hour lecture followed by a 1-hour paper discussion.

12:30p-1:30p
Lunch
1:30p-4:30p  
**Kevin Bonham and Brad Coleman – Your Immune System is Crazy (and I'll tell you why).**

We will explore, through lectures, demonstrations and discussions, some of the evolutionary oddities of your immune system and the connection to selective pressures exerted by pathogens.

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**Day 3**

10:00a–11:00a  
**Ralph Mazitschek – Anti-infectives and Drug Discovery**

A discussion of the ways in which we use small molecules to disrupt the progress of infectious diseases and the approaches used to identify them. A specific focus will be the identification of the biological target of the anti-malarial drug halofuginone.

11:00a-1:00p  
**Travel to Cambridge and Lunch**

1:00-5:00  
**Doug Richardson – Fluorescence Microscopy**  
*Location: Biolabs 2062*

We will use fluorescence microscopy to visualize labeled *V. cholerae*. We will focus on biological differences relevant for the generation of the previously discussed vaccine strain.

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**Day 4**

9:00a–10:30a  
**Hoong Lim – Image processing**

Images captured during the fluorescent microscopy session will be processed and analyzed. Topics covered will include image processing for publication and quantification of selected image characteristics across samples. Students should bring their own computers to this session. If you have not already done so, please install the free image processing software package FIJI ([http://fiji.sc/Downloads](http://fiji.sc/Downloads)) on your computer ahead of time.
10:30a-12:00p
Pandemic Game

Pandemic is a boardgame where players must work as a team to control infectious outbreaks as they spread across the globe. We will play and discuss.

12:00p-1:00p
Lunch

1:00-4:00
Radhika Khetani – Bioinformatics workshop

This hands-on session will familiarize students with some of the tools of genomic sequence analyses. Sequence data from the *V. cholerae* vaccine strain will be processed and analyzed in order to identify and discuss important features of this strain in comparison to laboratory and outbreak strains. We will primarily use the visual interface Galaxy to analyze and manipulate the data. Alternative methods of analysis will be discussed as time allows.

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Day 5

9:00a-12:30p Location: Goldenson 323
Maria Ericsson – Introduction to Electron Microscopy

A hands-on introduction to electron microscopy. Students will prepare samples of *V. cholerae* and operate the microscopes.

Reading:

12:30p-1:30p
Lunch

1:30p-3:00p
Yonatan Grad – Slowing the Spread of Disease

A discussion about the ways we can use genomics and other available resources to understand and slow the spread of disease. Discussion will focus on *Neisseria gonorrhoeae*, the causative agent of gonorrhea.
Reading:


3:00p-3:30p

*Eric Rubin – Concluding Remarks*

3:30p- Location: The Squealing Pig

Farewell/Social Hour
Faculty and Instructor Contact Information

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