1: Introduction to Infectious Diseases

*Examples of reading assignment:*

Introduction to infectious diseases vocabulary

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Disease

any abnormal bodily condition that impairs functioning and can usually be recognized by signs (what can be seen/felt e.g., redness, swelling) and symptoms (what patients “feels” e.g. nausea, malaise, pain).

Figure 1.1: Child infected with smallpox/variola virus. http://www.emergency.cdc.gov/agent/s.../smallpox3.htm

Infectious disease

disease caused by colonization of host organism by pathogenic microbes

- *pathos* = suffering
- *genic* = to make

- *pathogenic microbes* e.g. prions, viruses, bacteria, protozoa

EID=Emerging Infectious Diseases:

\described as infectious diseases appearing "emerging" within the last 20-30 years. e.g. zoonotic avian influenza, Ebola
• Included as EID’s are “re-emerging infectious diseases”, diseases which had decreased in prevalence at one time in history and now are once more spreading through human populations.

• The Institute of Medicine (IOM) also includes the recently evolved antibiotic-resistant pathogens as causes of EID’s. -e.g. MRSA/ Methicillin Resistant *Staphylococcus aureus*, MDR-TB/Multi-Drug Resistant Tuberculosis.

Parasite

An organism/agent (e.g. virus, bacterium, helminth) which lives at the expense of another (the host). The terms parasite and pathogen are sometimes used interchangeably.

Pathogen

from Greek *patho* =suffering, An agent/organism which causes disease/harm to another organism (the host). *pathogenic*: capable of causing disease e.g. pathogenic microbe compared to non-pathogenic microbe

Ecology

Greek *oikos* =house -*logy* = study of : the study of interactions between organisms and their environment

Infectious Disease Medical ecology

the study of the interactions between *host*, pathogens and environment leading to *infectious disease*.

Symbiosis

The living together of two (or more) dissimilar organisms. 3 types of symbiotic relationships:

1. **mutualism**: both symbiotic partners benefit (e.g. non-pathogenic E. coli living in your intestinal tract)

2. **commensalism**: one partner benefits, the other neither benefits nor is harmed, e.g. *Staphylococcus aureus* living harmlessly in your nose)
3. **parasitism**: one partner (the parasite/pathogen) benefits at the cost of the other partner (the host is harmed). e.g. Staphylococcus aureus causing an infection of a cut on your hand; E. coli causing a bladder infection

- Note: as indicated with *Staphylococcus aureus* and *E. coli*, **symbiotic relationships can change**!

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### Opportunistic pathogen

A microbe which normally does not cause disease but given special circumstances, may cause disease. e.g. *E.coli* causing bladder infection / cystitis or *Pneumocystis jirovecii* causing pneumonia in someone with HIV/AIDS

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### Microbial pathogens

Pathogens/parasites too small to be seen with the “naked eye” / not using magnifying instrument, e.g. prions, viruses, bacteria, protozoa.

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### Macroscopic parasites

Parasites which can be seen with the “naked eye”/ without magnification. The general categories:

- **ectoparasites**: parasites which live/feed on the outside (“ecto-“) of the body. Many are blood-feeders, e.g. insects including fleas, mosquitoes, lice; arachnids including ticks.
- **endoparasites**: parasites which live within (“endo-“) the host. e.g. “worms” or helminths such as *Ascaris lumbricoides*

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### Arthropod vectors

Many of the blood-feeding ectoparasites act as arthropod vectors, organisms which transfer microbial pathogens between hosts.

- -eg. Mosquitoes are vectors of West Nile virus and *Plasmodium*/malaria.
- *arthropod* = "jointed foot"; invertebrates (lack backbones) with segmented bodies and jointed limbs; have "exoskeletons:" -e.g. insects, arachnids

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*Figure 1.3: A mosquito as a vector.* [http://www.cdc.gov/features/stopmosq...toes_456px.jpg](http://www.cdc.gov/features/stopmosq...toes_456px.jpg)
### Agents of Infectious Diseases

<table>
<thead>
<tr>
<th>Prions</th>
<th>Eukaryotes</th>
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<tbody>
<tr>
<td>spongiform encephalopathies</td>
<td>HIV</td>
</tr>
<tr>
<td>&quot;Mad Cow Disease&quot;</td>
<td>Ebola</td>
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<tr>
<td>Kuru</td>
<td>Hanta</td>
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<tr>
<td>Creutzfeldt-Jakobs Disease</td>
<td>Polio</td>
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<tr>
<td>Chronic Wasting Disease</td>
<td>Rabies</td>
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<td>Hepatitis</td>
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<td></td>
<td>Smallpox</td>
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<td></td>
<td>Salmonella</td>
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<td></td>
<td>Chlamydia/STD</td>
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<tr>
<td></td>
<td>Treponema pallidum</td>
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</tbody>
</table>

### Determinants of Infectious Disease

To cause an infectious disease, a pathogen must be able to:
1. Initially be transported to host: food, water, sex, arthropod vectors, aerosols, animal bites, blood, congenital
2. Adhere to, colonize or invade the host
3. Multiply (grow) or complete its life cycle on or in the host
4. Initially evade host defense mechanisms
5. Possess the mechanical, chemical or molecular ability to damage the host.
6. Leave host, invade new host

HOMEWORK

Discussion questions and study guide questions for quizzes and exams.

Prepare for lecture 2, TURN-IN your answers at the start of lecture 2, make sure your name is on your homework sheet. + 5 points

People will be asked to answer these questions during our class discussion in lecture 2.

1. What are “infectious diseases”? Provide 1 example
2. What are EID’s, Emerging Infectious Diseases? Provide 2 examples
3. Medical ecology explores how interactions between pathogens, hosts and the environment lead to infectious diseases. Draw and label a medical ecology Venn Diagram indicating pathogen, host, environment and infectious disease.
4. Describe pathogen, host and environment factors which could influence prevalence of infectious diseases by filling in the table below:

<table>
<thead>
<tr>
<th>Host factors</th>
<th>Pathogen factors</th>
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</table>

5. Define/describe the following terms and provide a specific example of each.
   a. symbiosis
6. Do an online computer search for “the political ecology of infectious disease”.

What is your definition of the political ecology of infectious diseases? Provide a specific example.

Contributors

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