

Communicable Diseases: A Primer



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POLL QUESTION

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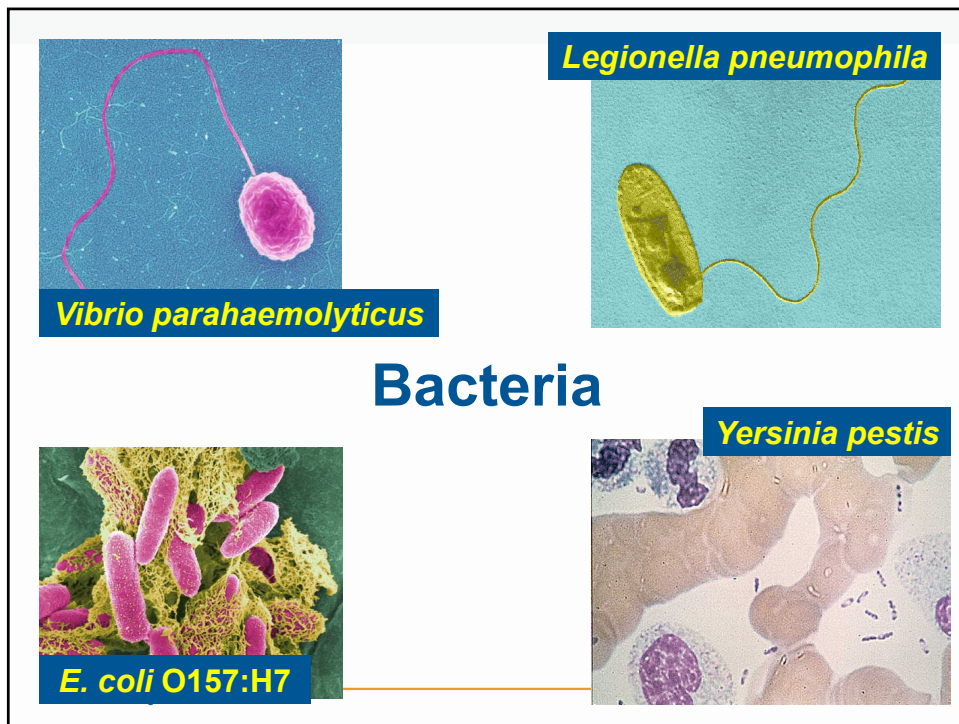
Objectives

- Name 6 types of communicable pathogens
- Describe difference between “droplet” transmission and “airborne” transmission
- Name 3 diseases typically transmitted via the airborne route
- Understand difference between incubation period and communicable period

Communicable Pathogens

- Bacteria
- Viruses
- Prions
- Protozoa
- Fungi
- Helminths

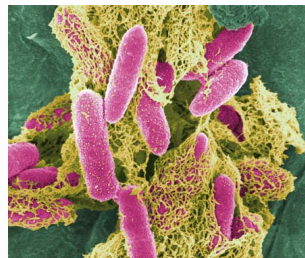




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Characteristics of Bacteria

- Extremely abundant
- Microscopic
- No nucleus
- Serve many positive roles
- Some pathogenic



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Examples of Bacteria of Public Health Significance

- *E. coli* O157:H7 (STEC)
- *Vibrio parahaemolyticus*
- *Legionella pneumophila*
- *Yersinia* spp.

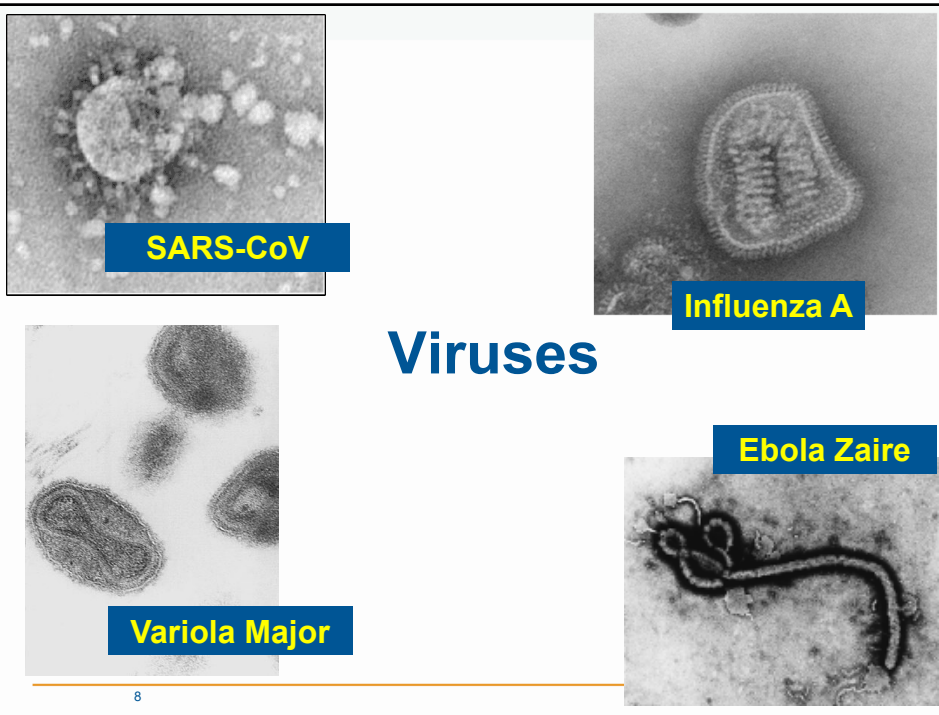


E. coli

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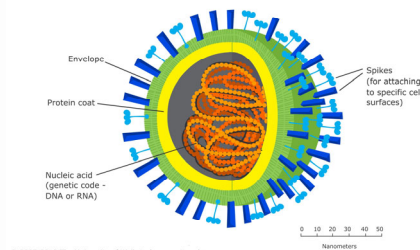


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Characteristics of Viruses

- Ultra microscopic
- Nucleic acid core (DNA or RNA) with outer protein coating (capsid)
- Replicate by hijacking host cell



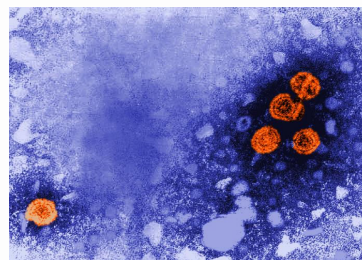
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Examples of Viruses of Public Health Significance

- Hepatitis A, B, C
- Measles (Rubeola)
- Variola major (smallpox)
- Influenza A

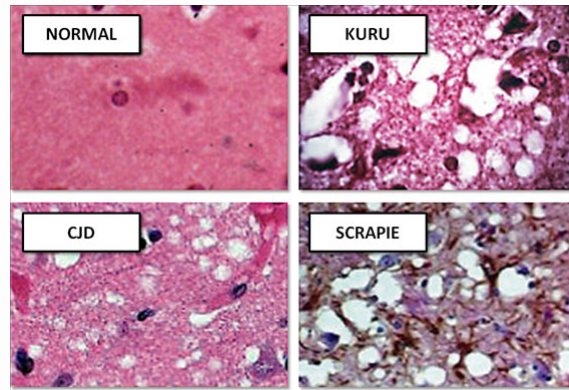


Hep B virions

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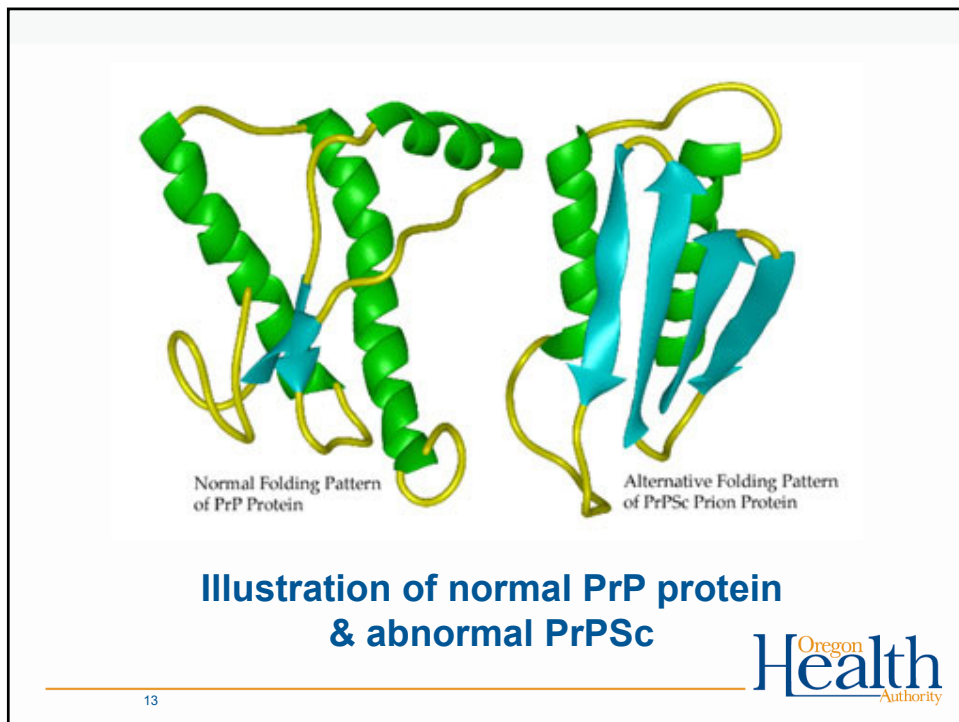
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Prions



Characteristics of Prions

- Variation of normal protein found in most mammalian cells
- Abnormally folded protein induces abnormal folding in adjacent proteins
- Resistant to heat, radiation, chemical treatment
- Non-living



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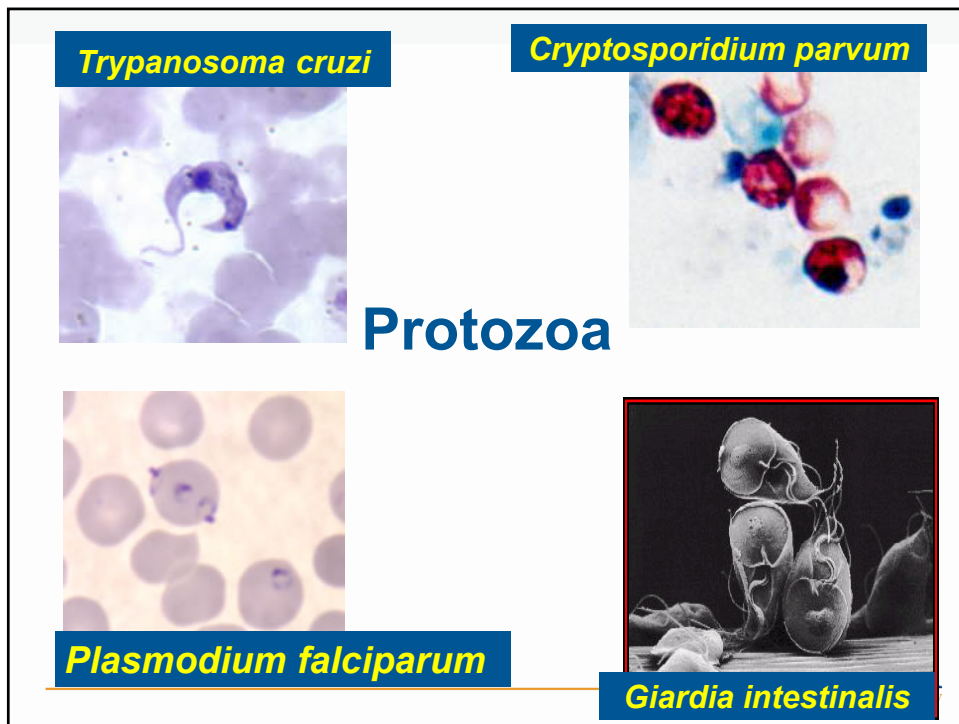
Examples of Transmissible Spongiform Encephalopathies

- Creutzfeldt–Jakob disease (CJD)
- Bovine Spongiform Encephalopathy
- Scrapie

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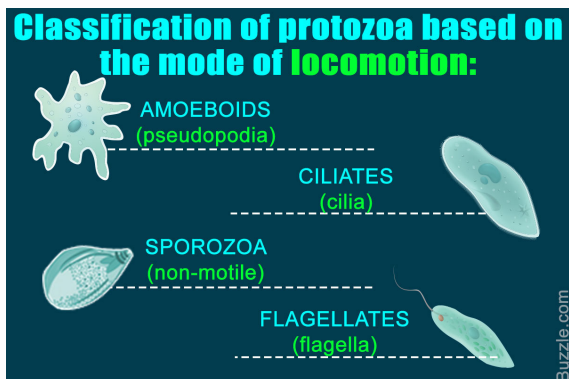
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Characteristics of Protozoa

- Greek: “first animals”
- Single cell
- Microscopic, but large
- Classified by type of motion

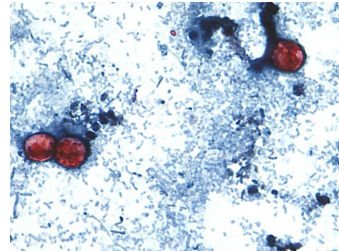


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Examples of Protozoa of Public Health Significance

- *Cyclospora cayetanensis*
- *Cryptosporidium* spp.
- *Giardia intestinalis*
- *Plasmodium falciparum*

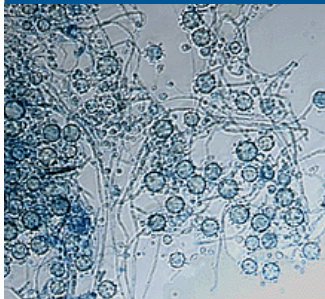


Cyclospora

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Histoplasma capsulatum



Coccidioides immitis



Fungi

Cryptococcus neoformans

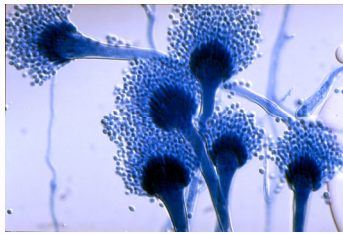


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Characteristics of Fungi

- Unicellular fungi typically called yeasts
- Most fungi are multicellular
 - Form threadlike hyphae
- More related to animals than plants
- Thick cell wall



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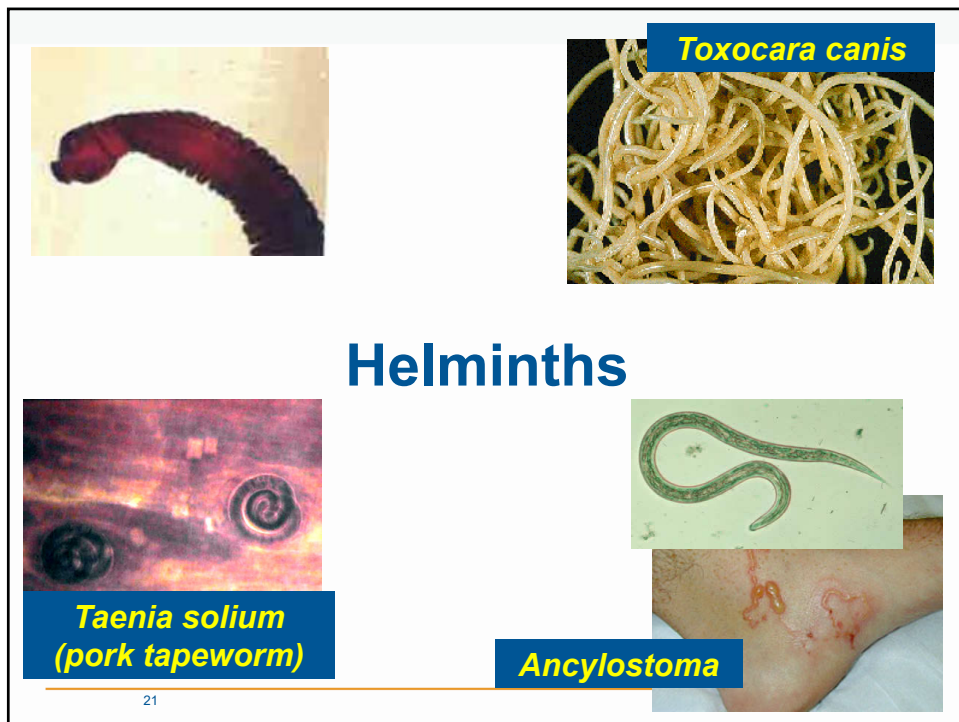
Examples of Fungi of Public Health Significance

- *Candida auris*
- *Cryptococcus neoformans* and *C. gattii*
- *Coccidioides immitis*

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Characteristics of Helminths

- Multicellular parasites
- Vary greatly in size



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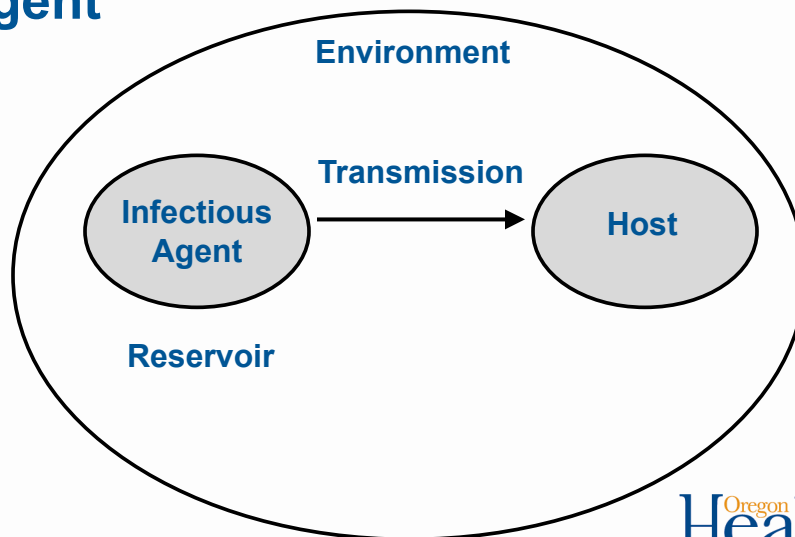
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Examples of Helminths of Public Health Significance

- *Ancylostoma* spp. (hookworm)
- *Toxocara* spp. (cat or dog roundworm)
- *Taenia solium* (pork tapeworm)

Transmission of an Infectious Agent



Reservoir of Infection

- Anywhere an infectious agent normally lives and multiplies
 - People
 - Animals
 - Environment



Examples of Reservoirs of Infection

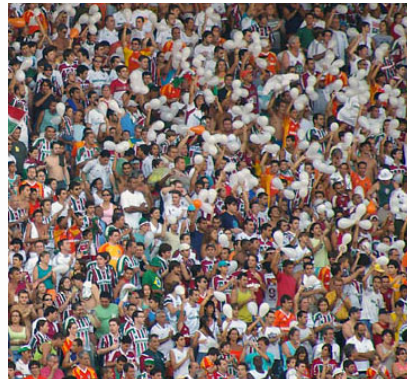
- Measles:
- *Vibrio parahaemolyticus*:
- Plague:
- *Legionella*:

Examples of Reservoirs of Infection

- Measles: humans
- *Vibrio parahaemolyticus*: water
- Plague: wild rodents
- *Legionella*: water

Examples of Host Characteristics

- Age
- Sex
- Immune status
- Chronic conditions
- Many others



Examples of Environmental Factors

- Temperature
- Humidity
- Sanitation
- Crowding
- Air pollution

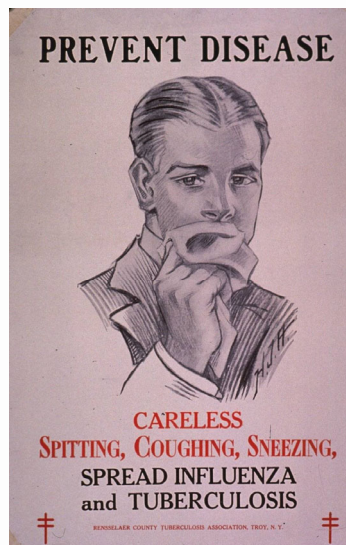


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Infectious Disease Transmission



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Direct Disease Transmission

- **Person-to-Person Contact**

- Passed directly from hands or mucous membranes
- Examples: shigellosis, hepatitis A, STDs

- **Bloodborne**

- Transfusion, transplant, needles
- Examples: hepatitis B, hepatitis C, HIV

- **Vertical**

- Mother to baby *in utero* or at birth
- Examples: rubella, hepatitis B, HIV

Direct Disease Transmission

- **Droplet**

- Water-heavy particles in nose and throat
- Fall to ground within ~6 feet
- Most “respiratory” diseases: influenza, rubella, pertussis, meningococcal disease, *Haemophilus influenzae* infection, others

Indirect Disease Transmission

- **Airborne**

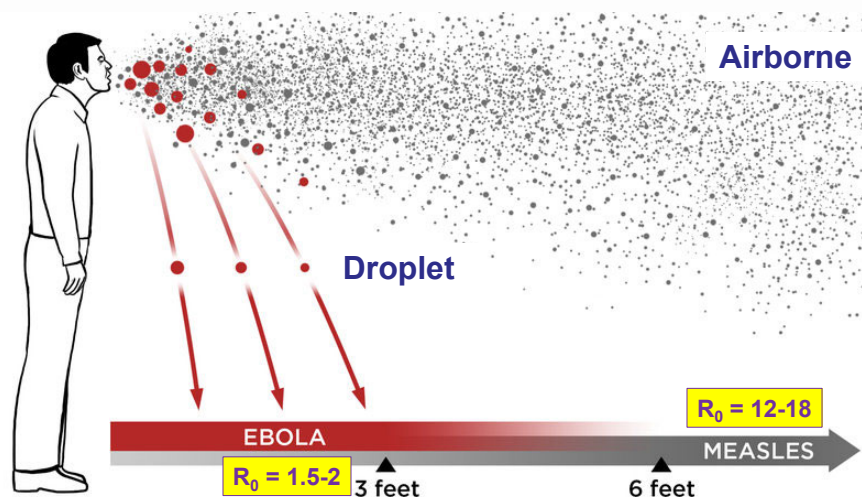
- Particles $<5\text{ }\mu\text{m}$ in size evaporate, leaving “droplet nuclei”
- Act as gas, remain suspended in air for long periods
- Examples: measles, chickenpox, tuberculosis

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A little context...



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<https://www.npr.org/sections/goatsandsoda/2014/12/01/364749313/ebola-in-the-air-what-science-says-about-how-the-virus-spreads>

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Indirect Disease Transmission

- **Vehicle-borne**
 - Usually foodborne or waterborne
- **Vector-borne**
 - Arthropod vector, via bite, feces, or direct contact
 - Examples: West Nile virus (mosquitoes), plague (flea), shigellosis (flies)
- **Fomites (singular, *fomes*)**
 - Contact with contaminated inanimate object
 - Examples: doorknobs, soiled sheets

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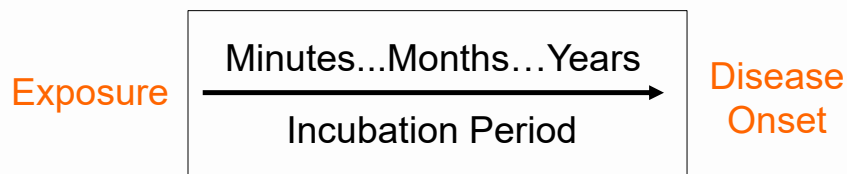
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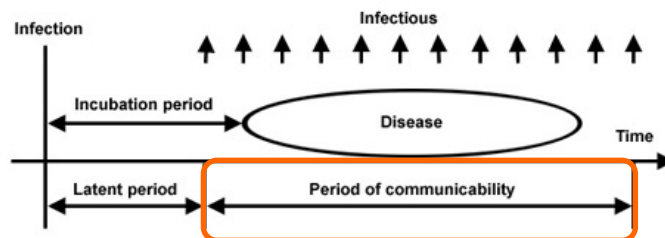
Incubation Period

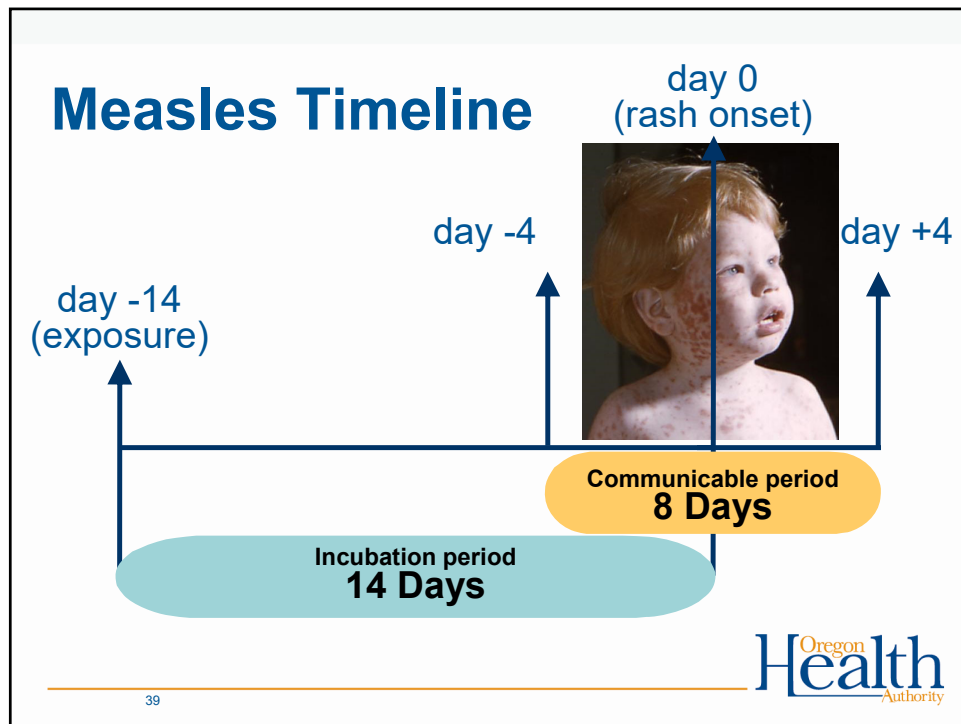
The time interval between exposure to an infectious agent and the appearance of clinical signs



Communicable Period

The time during which an infectious agent can be transferred directly or indirectly from an infected individual to another individual





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Review Question 1

- Explain the difference between droplet transmission and airborne transmission

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Droplet vs. Airborne Transmission

- Droplet Transmission
 - Water-heavy particles from nose & throat
 - Fall to ground within 6 feet
- Airborne Transmission
 - Particles $<5\ \mu\text{m}$ in size evaporate, leaving “droplet nuclei”
 - Droplet nuclei act as gas; remain suspended in air for long periods

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Review Question 2

- Name 3 diseases typically transmitted via the airborne route

Airborne Transmission

- Measles
- Chickenpox
- Tuberculosis

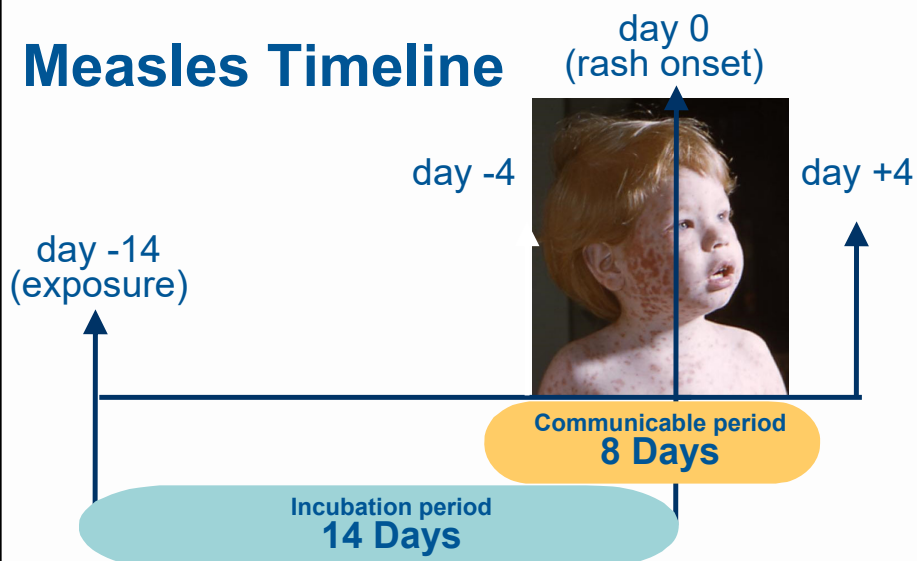


Review Question 3

- Describe difference between incubation period and communicable period

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Measles Timeline



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Questions?



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