

Communicable Diseases: A Primer



1

1

POLL QUESTION:

**What communicable diseases will
you be primarily working on?**

- ☐ Enteric/foodborne pathogens
- ☐ STIs
- ☐ Vaccine preventable diseases
- ☐ Respiratory diseases
- ☐ HAIs
- ☐ Will vary, depending on where I am needed
- ☐ Not sure yet
- ☐ ALL THE THINGS!



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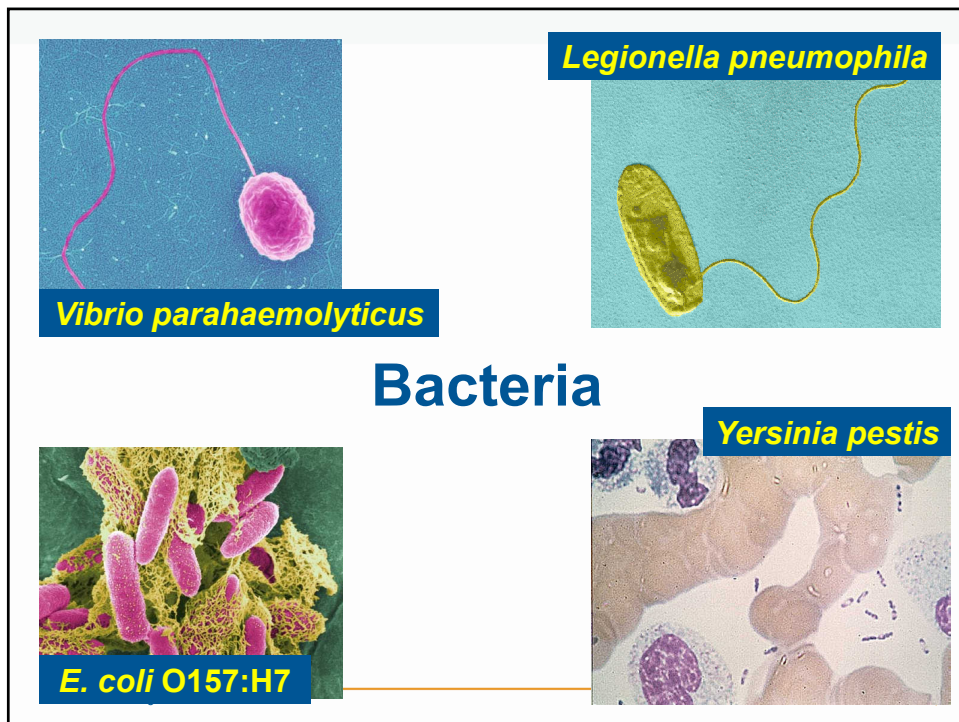
Objectives

- 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

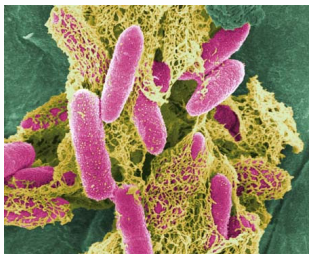




5

Characteristics of Bacteria

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



E. coli O157:H7



6

Examples of Bacteria of Public Health Significance:

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

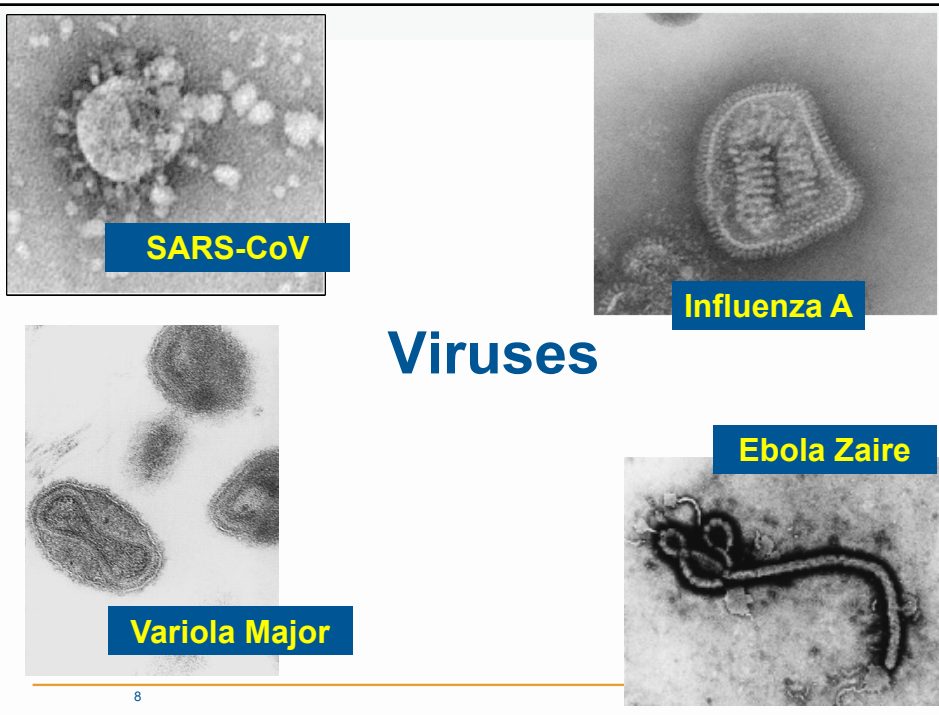


E. coli

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7

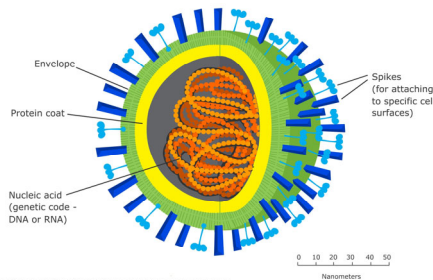


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Characteristics of Viruses

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



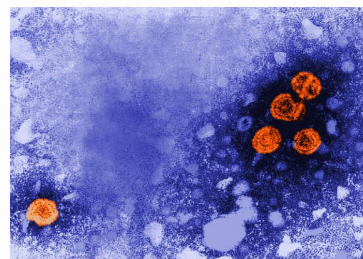
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Examples of Viruses of Public Health Significance:

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

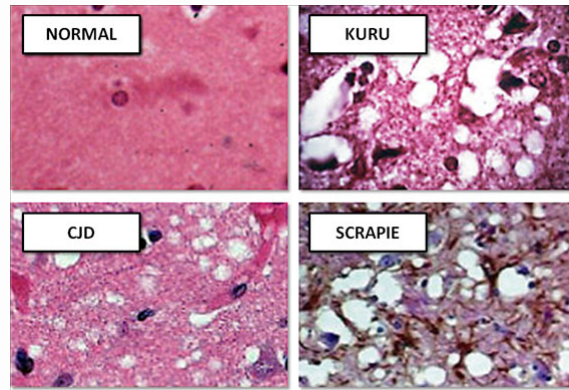


Hep B virions

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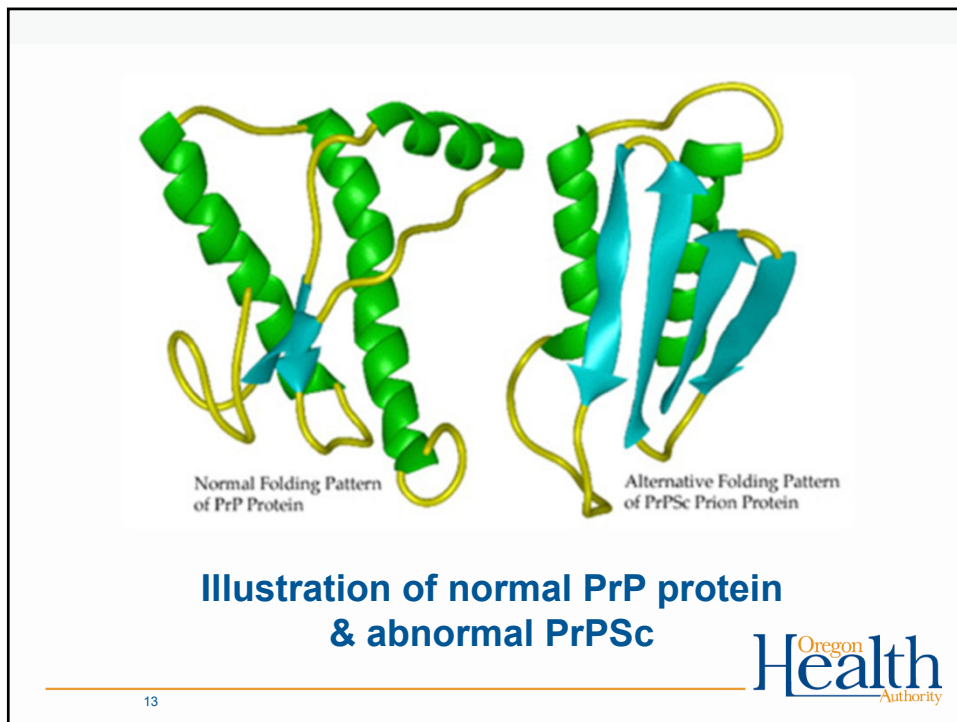
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Prions



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



13

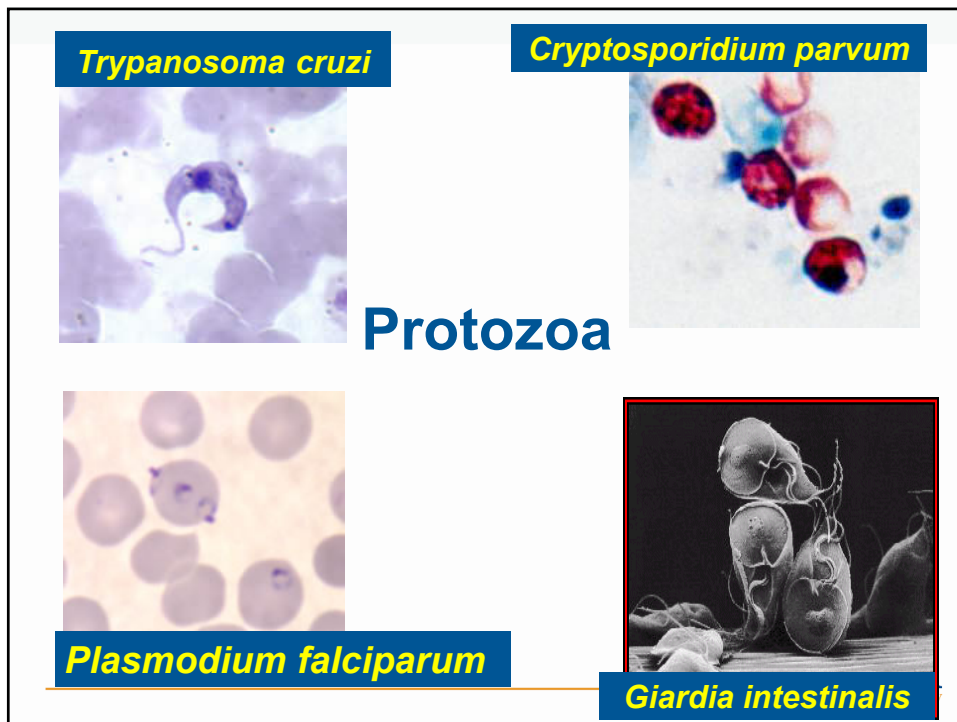
Examples of Transmissible Spongiform Encephalopathies (TSEs, AKA prion diseases):

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

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14

14



15

Characteristics of Protozoa

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

Classification of protozoa based on the mode of locomotion:



AMOEBOIDS
(pseudopodia)



CILIATES
(cilia)



SPOROZOA
(non-motile)



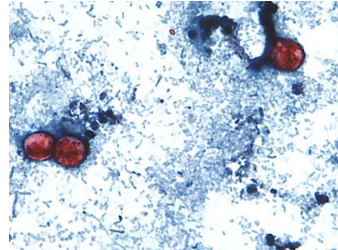
FLAGELLATES
(flagella)



16

Examples of Protozoa of Public Health Significance:

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

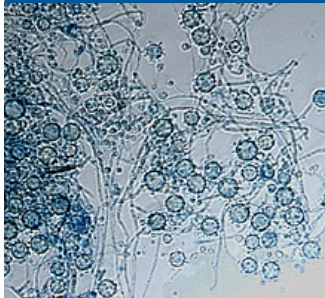


Cyclospora

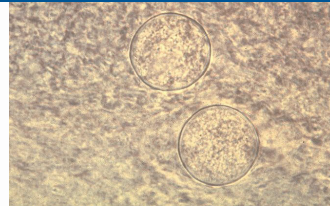
17

17

Histoplasma capsulatum



Coccidioides immitis



Fungi

Cryptococcus neoformans

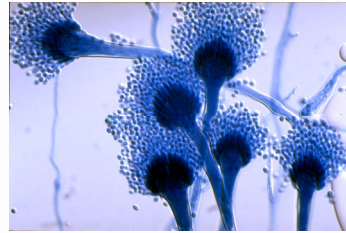


18

18

Characteristics of Fungi

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



Aspergilla

Examples of Fungi of Public Health Significance:

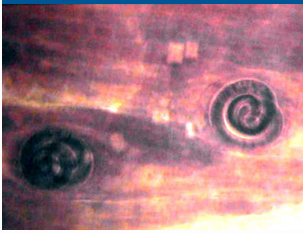


C. auris

- *Candidozyma auris* (FKA *Candida auris*)
- *Cryptococcus neoformans* and *C. gattii*
- *Coccidioides immitis*



***Taenia solium*
(pork tapeworm)**





Toxocara canis

Helminths




Ancylostoma



21

21

Characteristics of Helminths

- Multicellular parasites
- Vary greatly in size





22

22

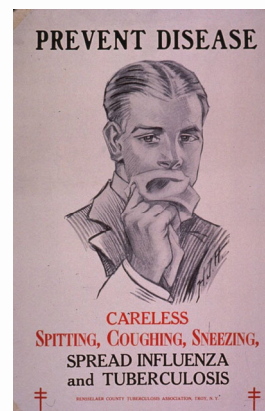
Examples of Helminths of Public Health Significance:

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

23

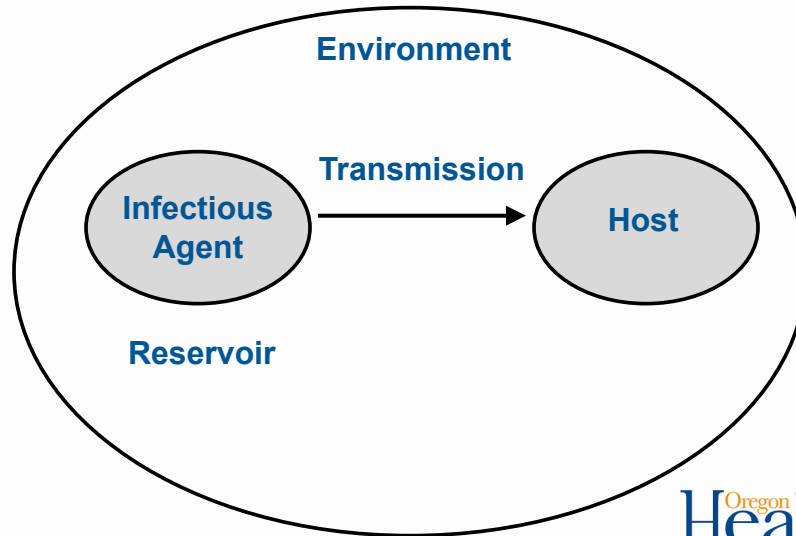
That's enough worms for today...

**DISEASE
TRANSMISSION**



24

Transmission of an Infectious Agent



25

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Reservoir of Infection

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



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Examples of Reservoirs of Infection:

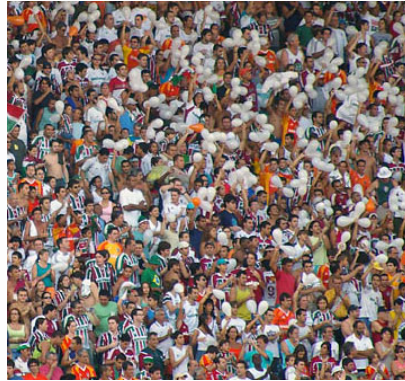
- Measles:
- *Vibrio parahaemolyticus*:
- Plague:
- *Legionella*:

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



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**

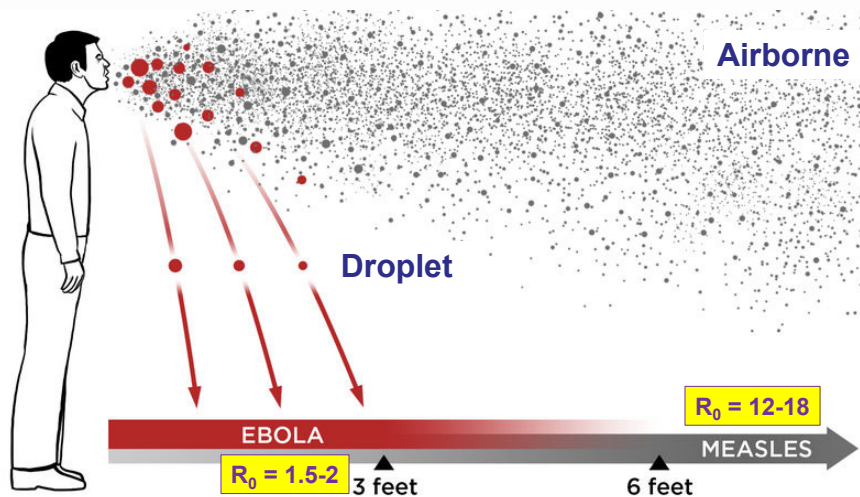
- Particles $<5\ \mu\text{m}$ in size evaporate, leaving “droplet nuclei”
- Act as gas, remain suspended in air for long periods
- Examples: measles, chickenpox, tuberculosis

33

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A little context...



34

<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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34

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

35

POLL QUESTION:

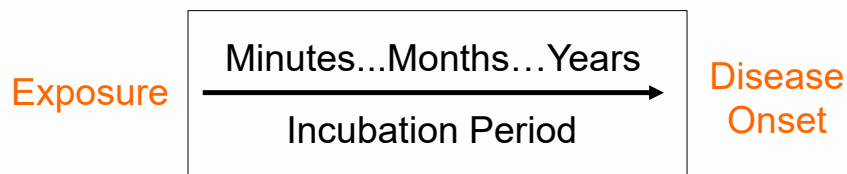
Which poses the greatest risk for disease transmission?

- ☐ Droplet transmission
- ☐ Airborne transmission
- ☐ Both pose equal risk

36

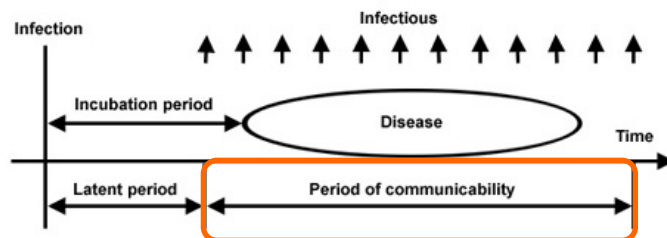
Incubation Period

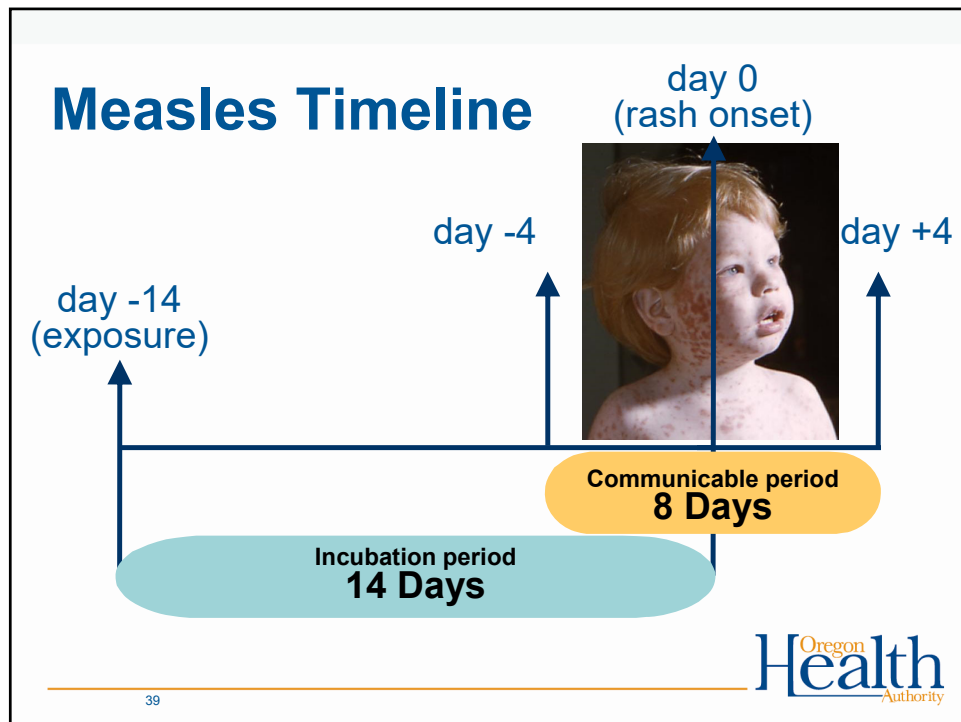
The time interval between exposure to an infectious agent and the appearance of clinical signs



Communicable Period

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





39



40

Review Question 1:

Explain the difference between
droplet transmission and
airborne transmission

41

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

42

Review Question 2:

- Name 3 diseases typically transmitted via the airborne route

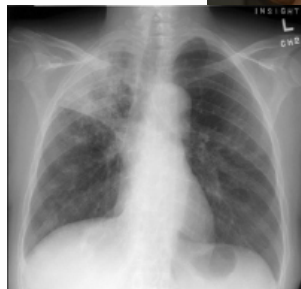
☐ ?

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Airborne Transmission

- Measles
- Chickenpox
- Tuberculosis

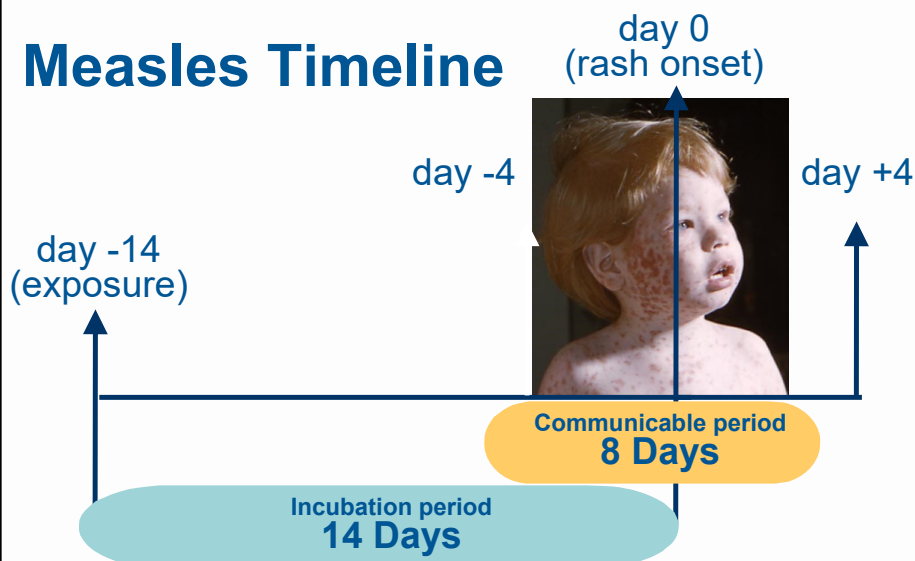


Review Question 3:

Describe the difference between
incubation period and
communicable period

45

Measles Timeline



46

Questions?



47