

# Communicable Diseases: A Primer



1

1

**POLL QUESTION**



2

2

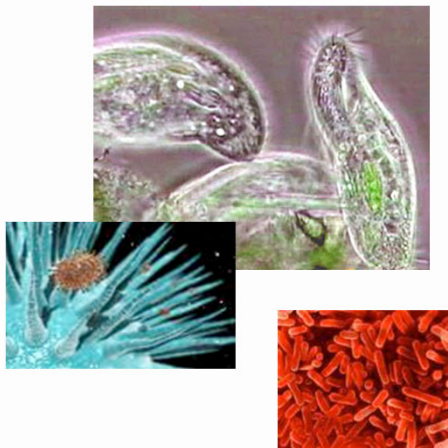
## Objectives

- 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

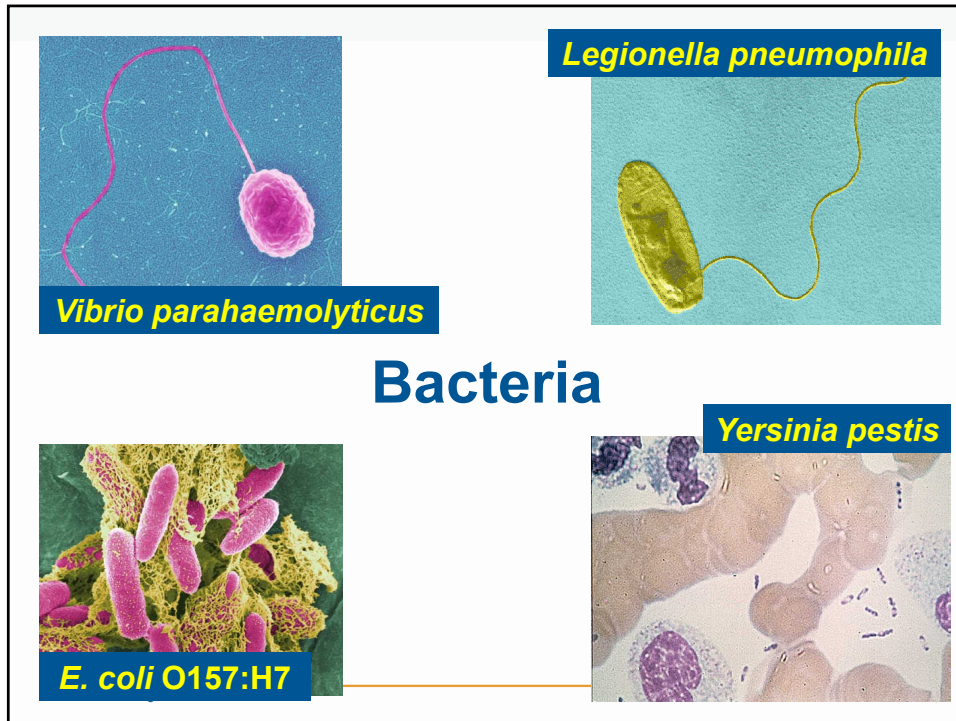
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## Communicable Pathogens

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



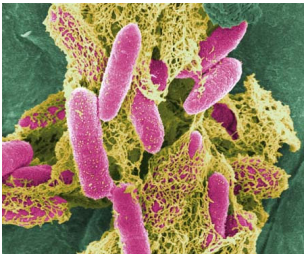
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5

## Characteristics of Bacteria

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



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6

## Examples of Bacteria of Public Health Significance

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

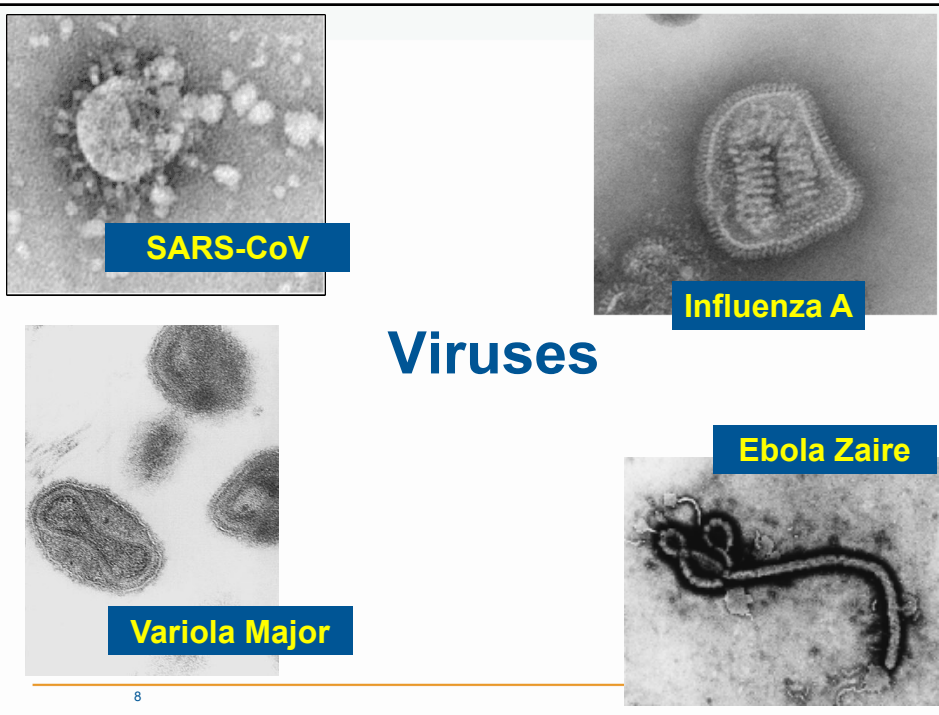


*E. coli*

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**SARS-CoV**

**Influenza A**

**Viruses**

**Variola Major**

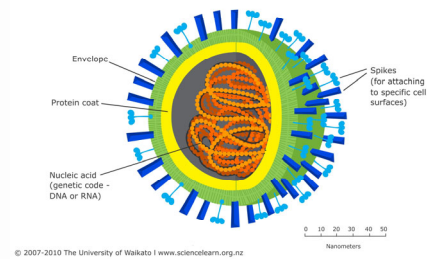
**Ebola Zaire**

8

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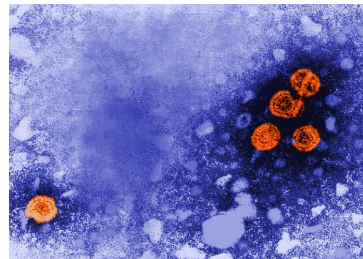
## Characteristics of Viruses

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



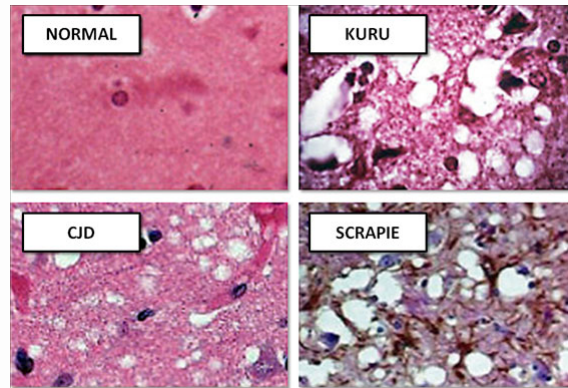
## Examples of Viruses of Public Health Significance

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



Hep B virions

# Prions



11

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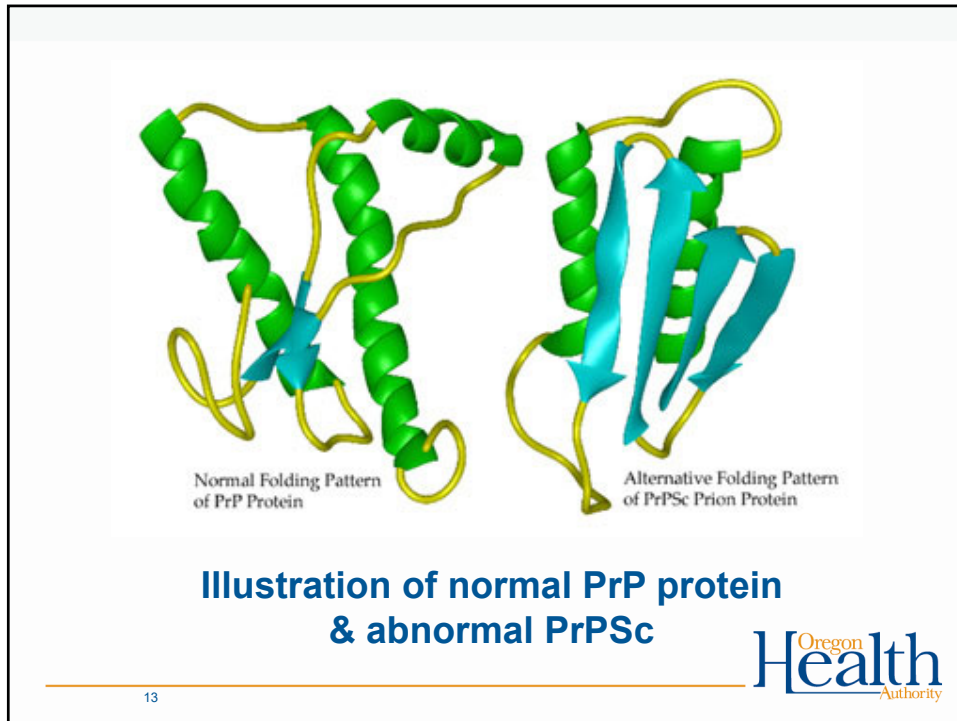
## Characteristics of Prions

- 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

12

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13

## Examples of Transmissible Spongiform Encephalopathies

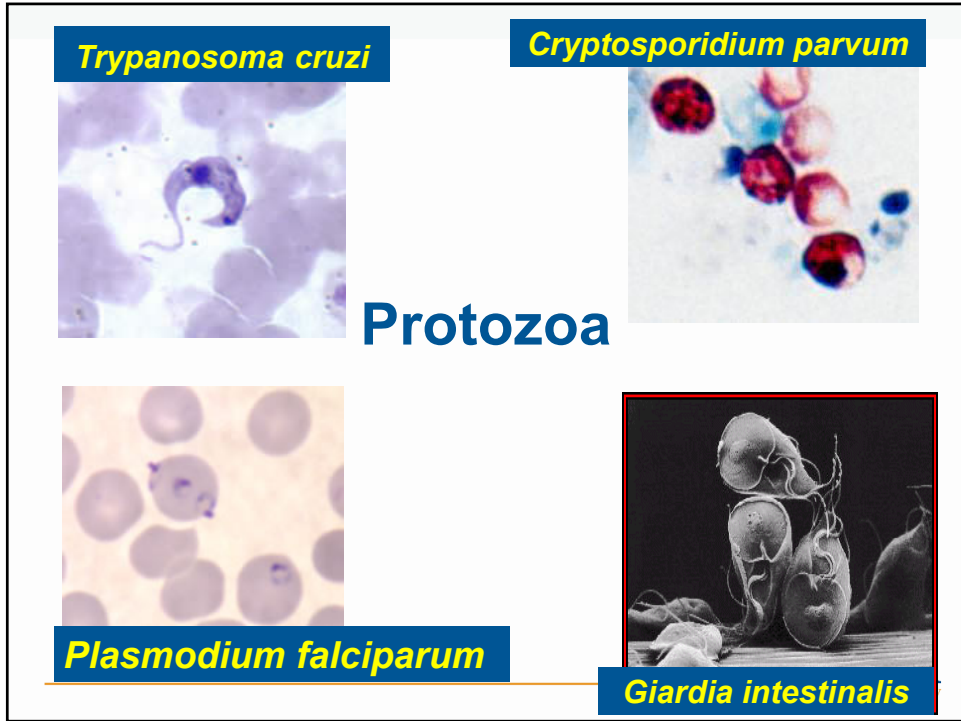
- Creutzfeldt–Jakob disease (CJD)
- Bovine Spongiform Encephalopathy
- Scrapie

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14

Detailed description: This slide features a title 'Examples of Transmissible Spongiform Encephalopathies' in bold blue text. Below the title is a bulleted list containing three items: 'Creutzfeldt–Jakob disease (CJD)', 'Bovine Spongiform Encephalopathy', and 'Scrapie'. The Oregon Health Authority logo is located in the bottom right corner, and the number 14 is in the bottom left corner.

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)

Buzzle.com

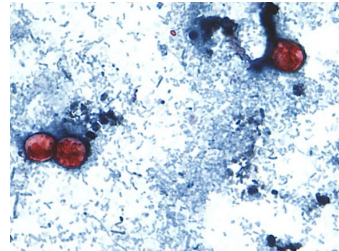
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16



# Examples of Protozoa of Public Health Significance

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

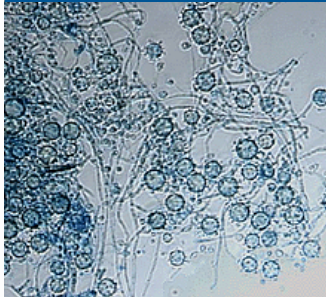


Cyclospora

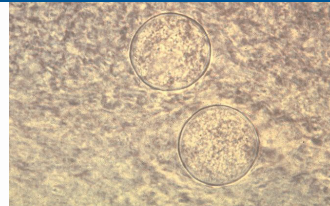
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*Histoplasma capsulatum*



*Coccidioides immitis*



## Fungi

*Cryptococcus neoformans*

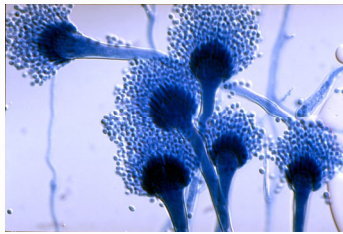


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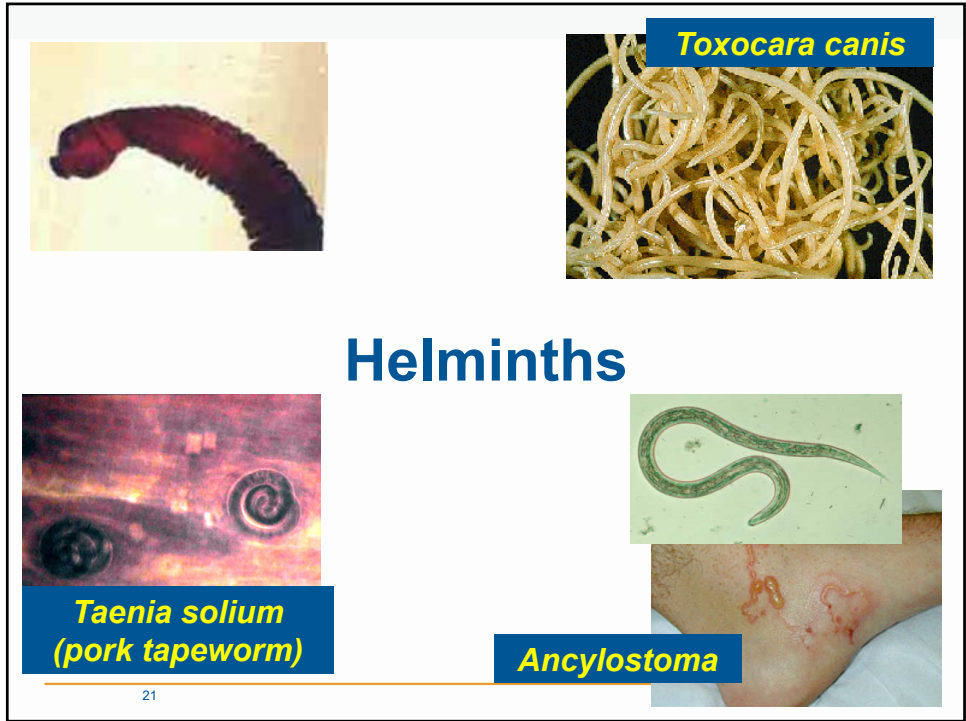
## Characteristics of Fungi

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



## Examples of Fungi of Public Health Significance

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



21

## Characteristics of Helminths

- Multicellular parasites
- Vary greatly in size

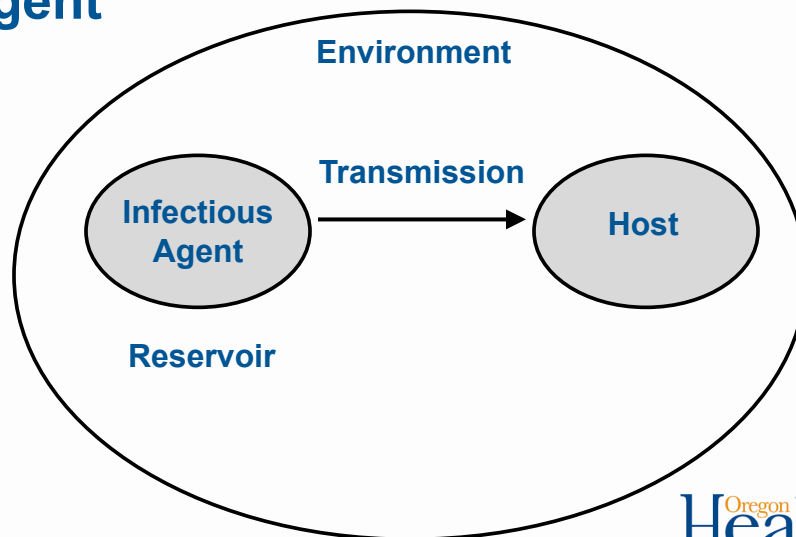
22

## Examples of Helminths of Public Health Significance

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

23

## Transmission of an Infectious Agent



24

## Reservoir of Infection

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



25

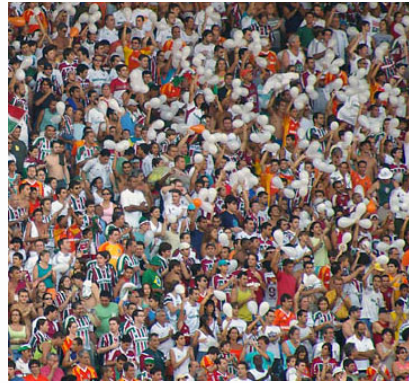
## Examples of Reservoirs of Infection

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

26

## Examples of Host Characteristics

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

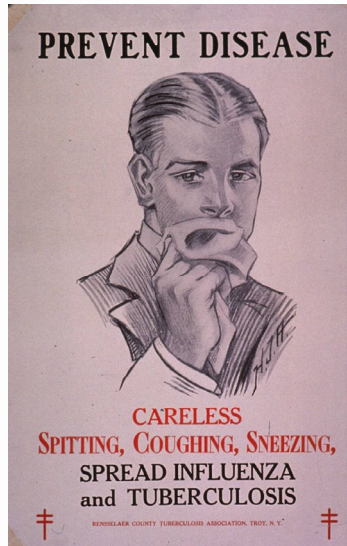


## Examples of Environmental Factors

- Temperature
- Humidity
- Sanitation
- Crowding
- Air pollution



# Infectious Disease Transmission



30

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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

31

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## 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

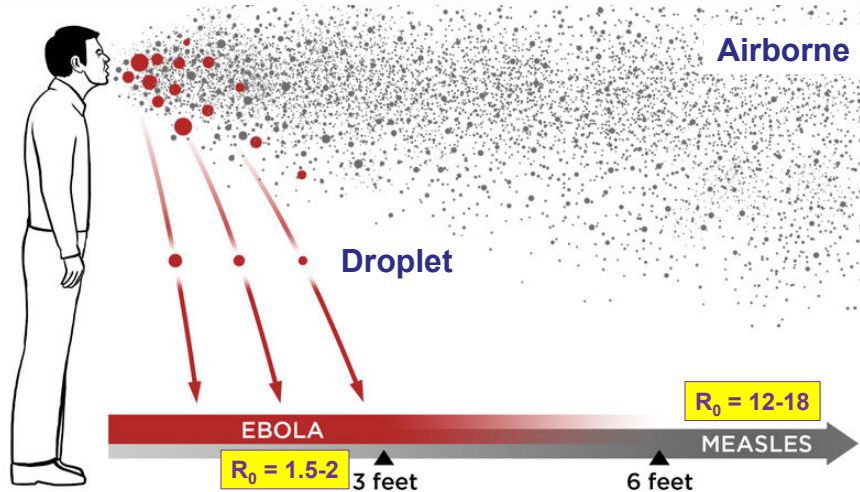
## Indirect Disease Transmission

- **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



## 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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## 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

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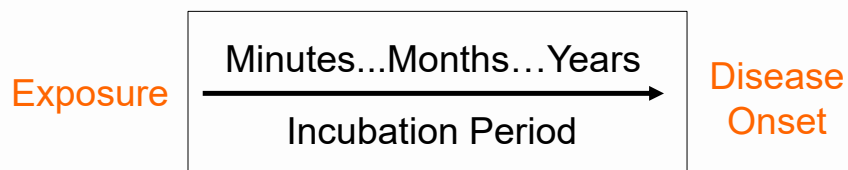
35

## POLL QUESTION

36

## Incubation Period

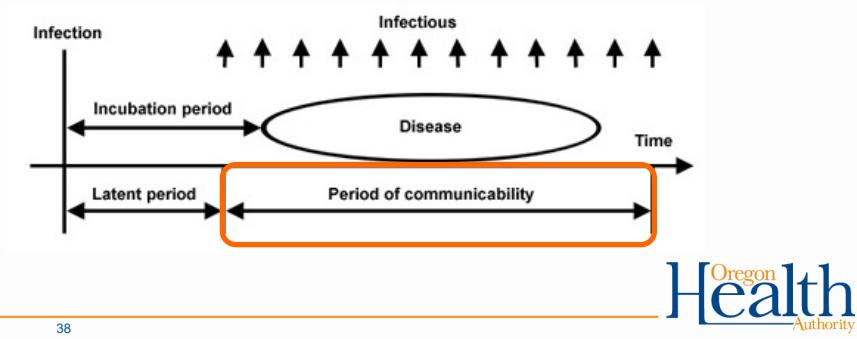
The time interval between exposure to an infectious agent and the appearance of clinical signs



37

# Communicable Period

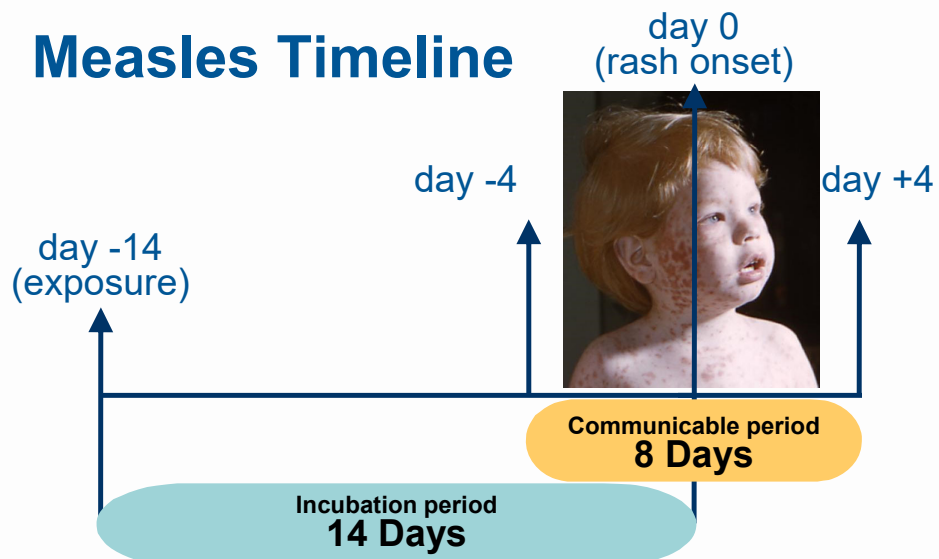
The time during which an infectious agent can be transferred directly or indirectly from an infected individual to another individual



38

38

# Measles Timeline



39

39



40

## Review Question 1

- Explain the difference between droplet transmission and airborne transmission

41

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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

## Review Question 2

- Name 3 diseases typically transmitted via the airborne route

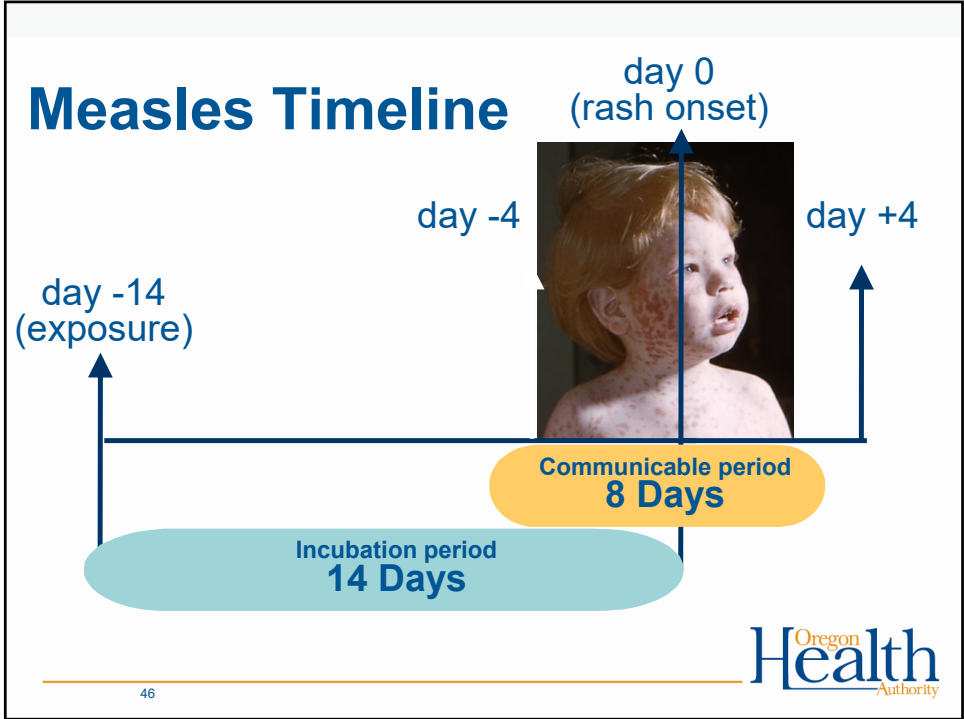
## Airborne Transmission

- Measles
- Chickenpox
- Tuberculosis



## Review Question 3

- Describe difference between incubation period and communicable period



46



47