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# Communicable Diseases: A Primer



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**POLL QUESTION**



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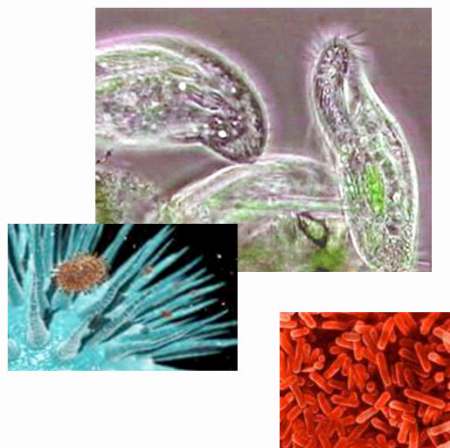
## Objectives

- 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

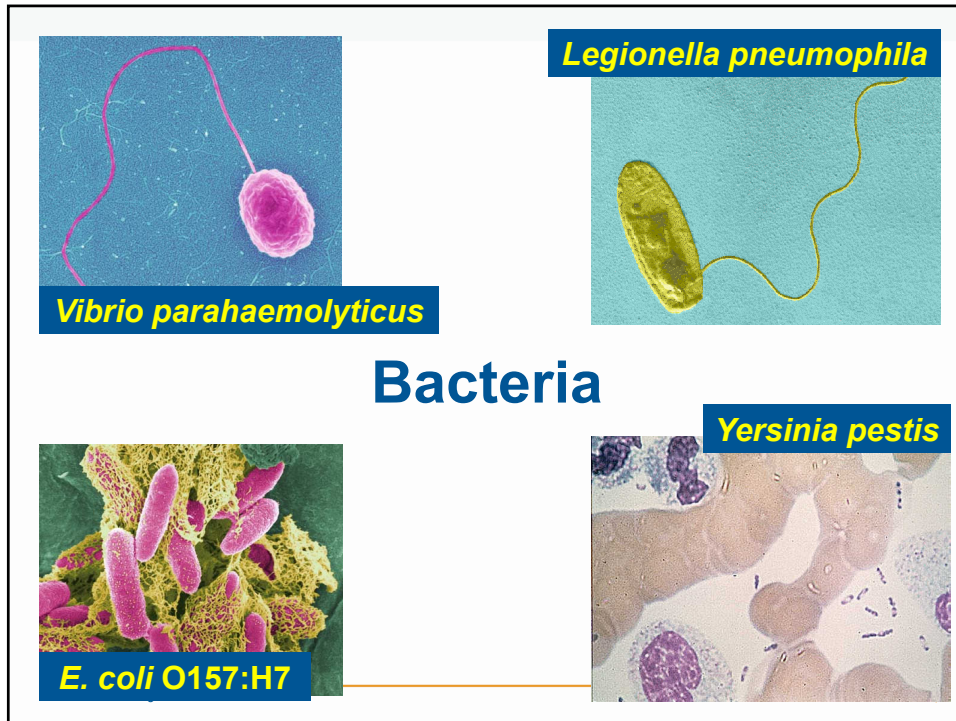
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## Communicable Pathogens

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



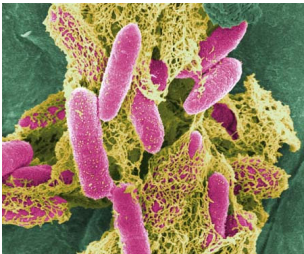
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## Characteristics of Bacteria

- 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.

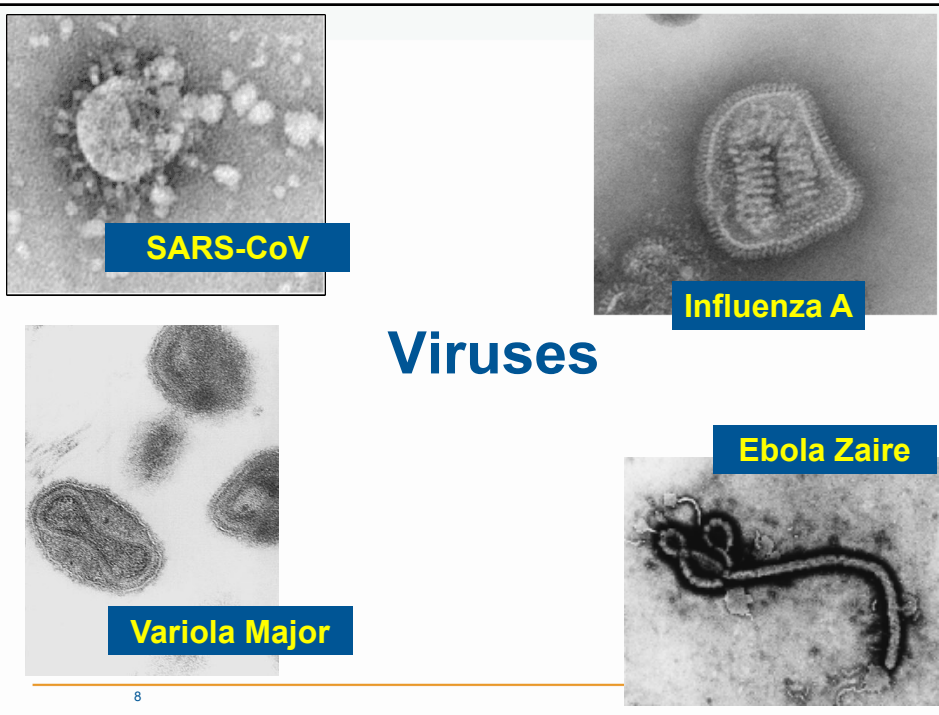


*E. coli*

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**SARS-CoV**

**Influenza A**

**Viruses**

**Variola Major**

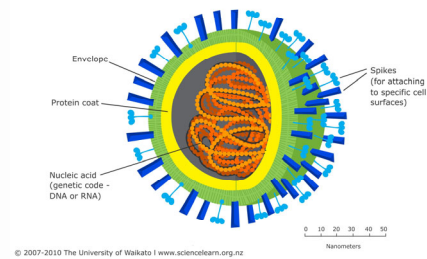
**Ebola Zaire**

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## Characteristics of Viruses

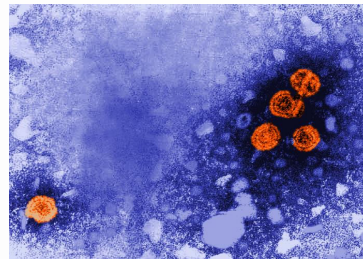
- Ultra microscopic
- Nucleic acid core (DNA or RNA) with outer protein coating (capsid)
- Replicate by hijacking host cell



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## Examples of Viruses of Public Health Significance

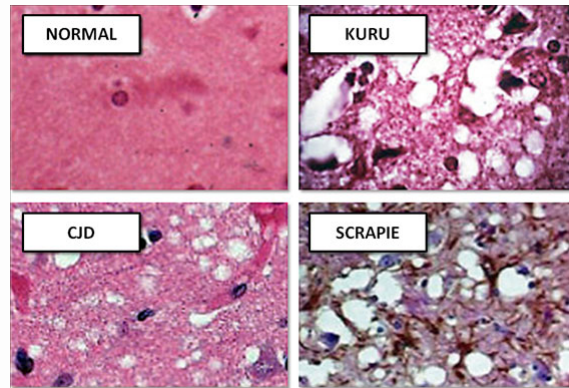
- Hepatitis A, B, C
- Measles (Rubeola)
- Variola major (smallpox)
- Influenza A



Hep B virions

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# Prions



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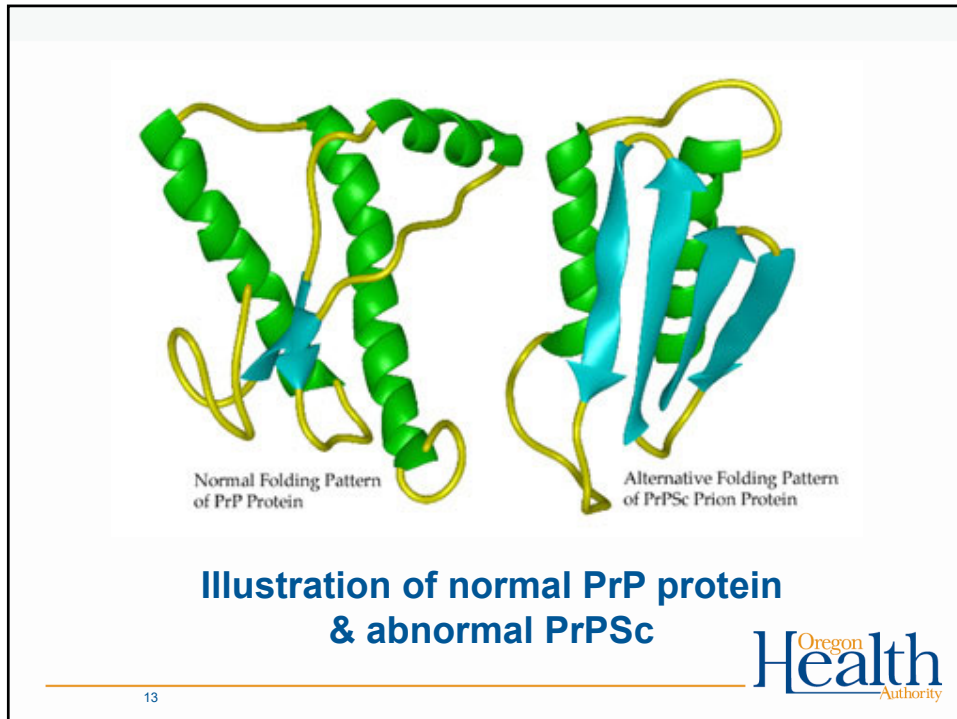
## Characteristics of Prions

- 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

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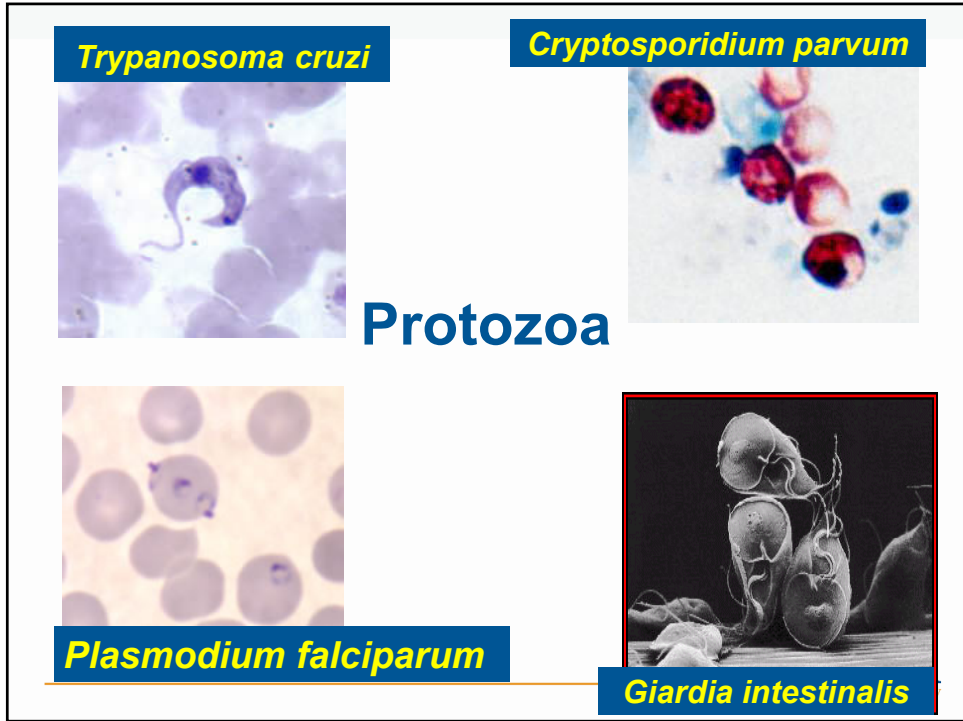
## Examples of Transmissible Spongiform Encephalopathies

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

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## 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:**

 <p style="color: cyan; font-size: small;">AMOEBIDS (pseudopodia)</p>	<p>-----</p> <p style="color: cyan; font-size: small;">CILIATES (cilia)</p> <p>-----</p>	
 <p style="color: cyan; font-size: small;">SPOROZOA (non-motile)</p>	<p>-----</p> <p style="color: cyan; font-size: small;">FLAGELLATES (flagella)</p> <p>-----</p>	

Buzzle.com

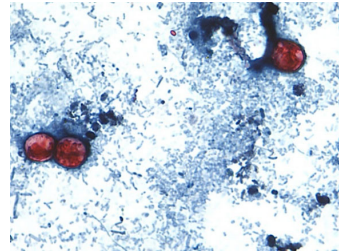


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# Examples of Protozoa of Public Health Significance

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

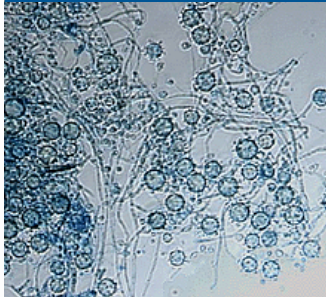


Cyclospora

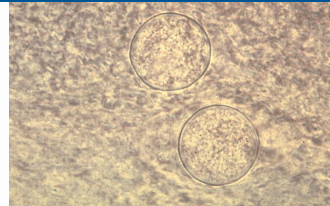
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*Histoplasma capsulatum*



*Coccidioides immitis*



## Fungi

*Cryptococcus neoformans*

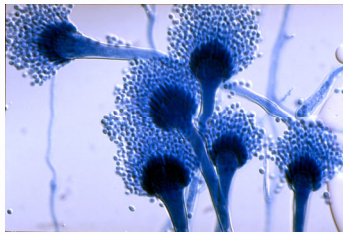


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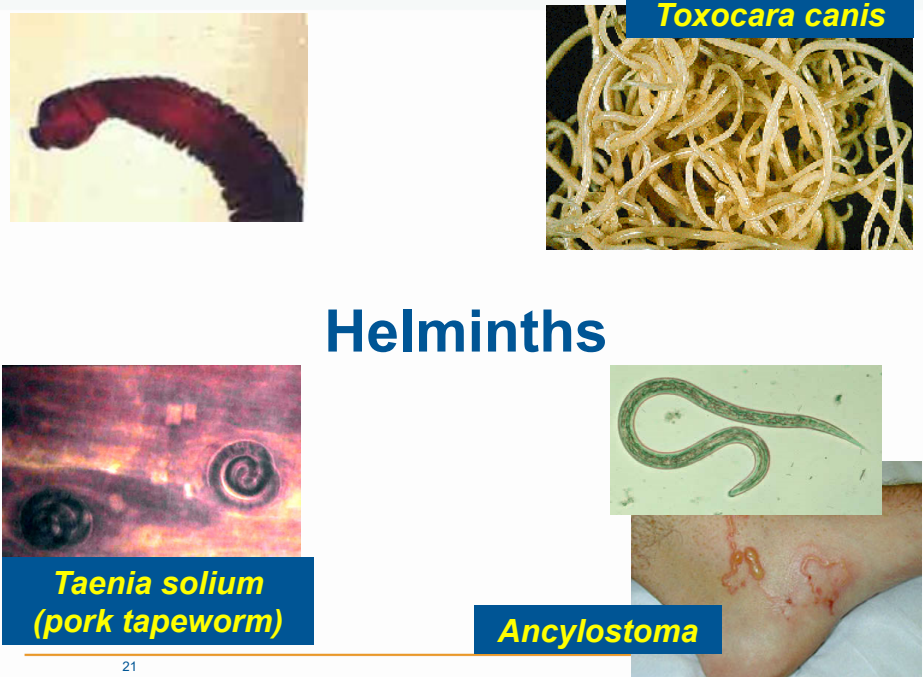
## Characteristics of Fungi

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



## Examples of Fungi of Public Health Significance

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



**Helminths**

*Toxocara canis*

*Taenia solium*  
(pork tapeworm)


*Ancylostoma*

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## Characteristics of Helminths

- Multicellular parasites
- Vary greatly in size



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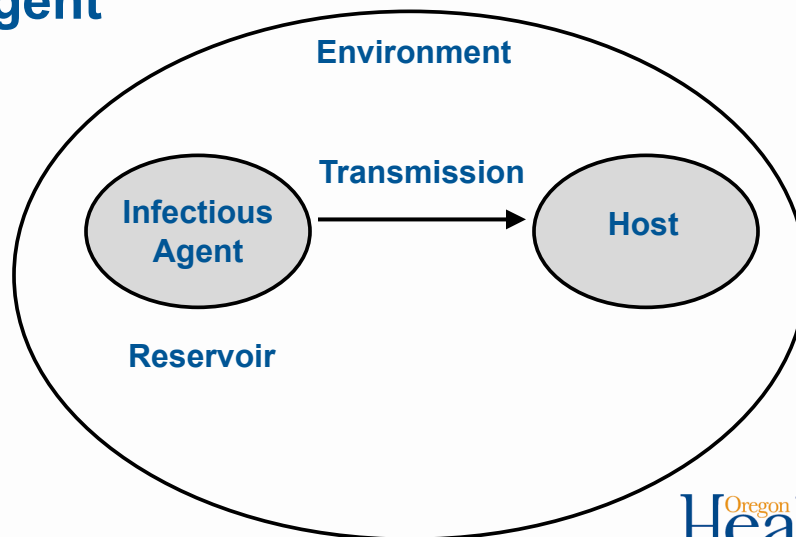
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## Examples of Helminths of Public Health Significance

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

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## Transmission of an Infectious Agent



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## Reservoir of Infection

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



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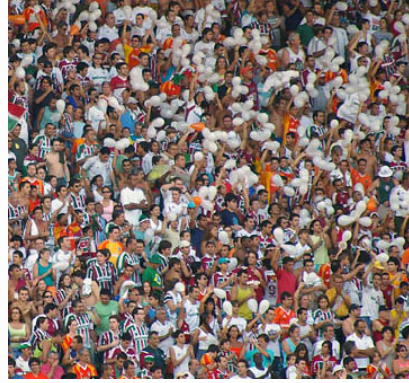
## Examples of Reservoirs of Infection

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

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## Examples of Host Characteristics

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



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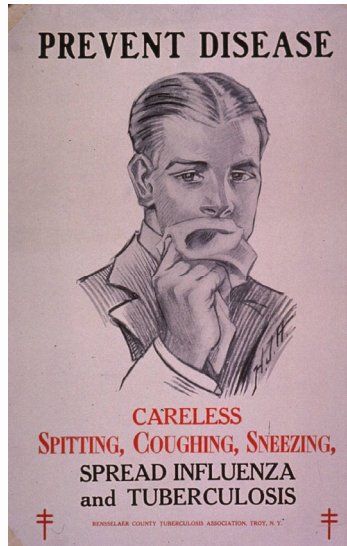
## Examples of Environmental Factors

- 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

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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

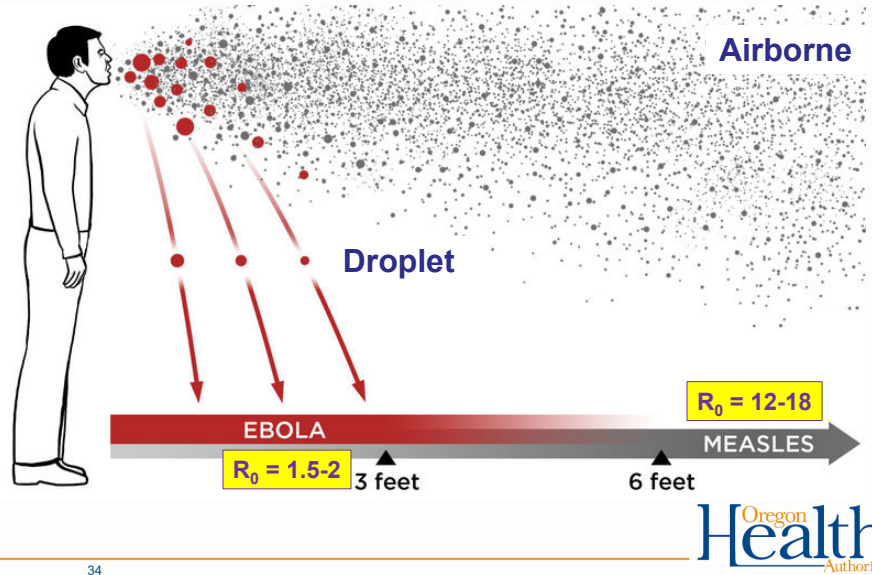
## Indirect Disease Transmission

- **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...



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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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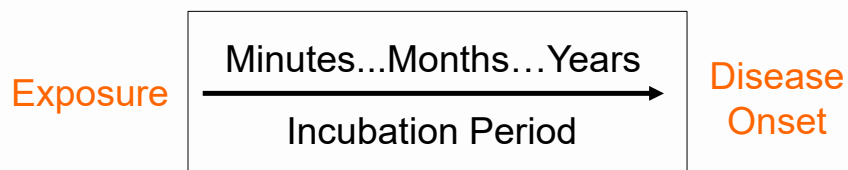
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## POLL QUESTION

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## Incubation Period

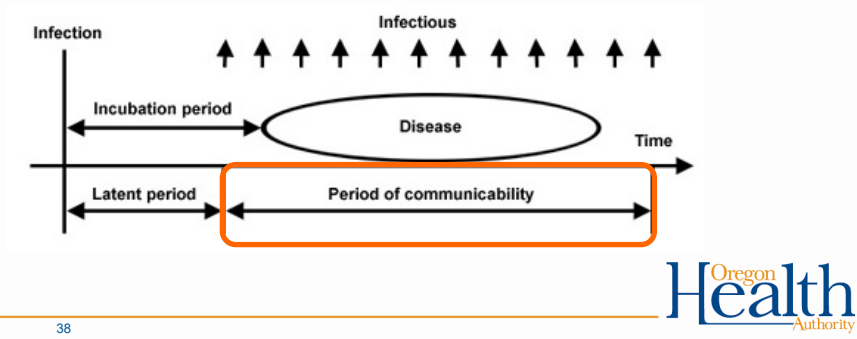
The time interval between exposure to an infectious agent and the appearance of clinical signs



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# Communicable Period

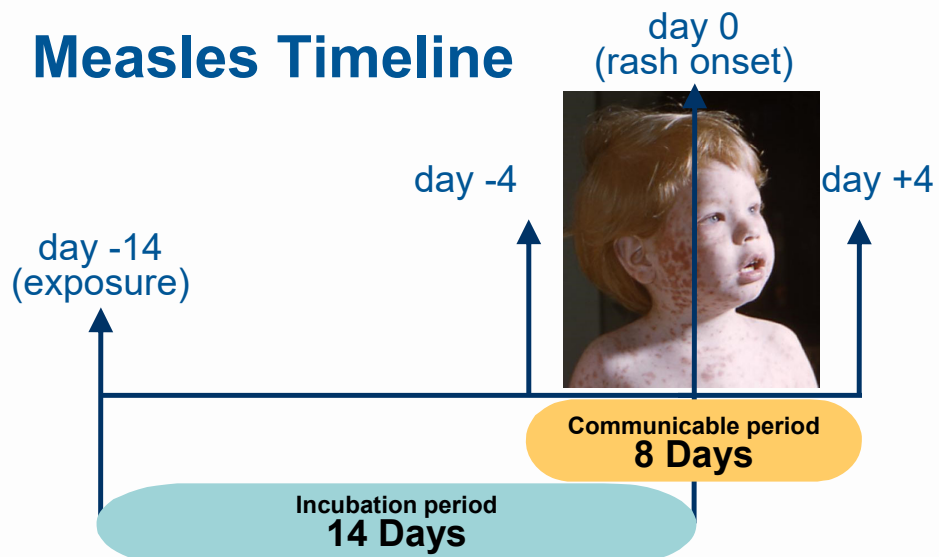
The time during which an infectious agent can be transferred directly or indirectly from an infected individual to another individual



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# Measles Timeline



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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

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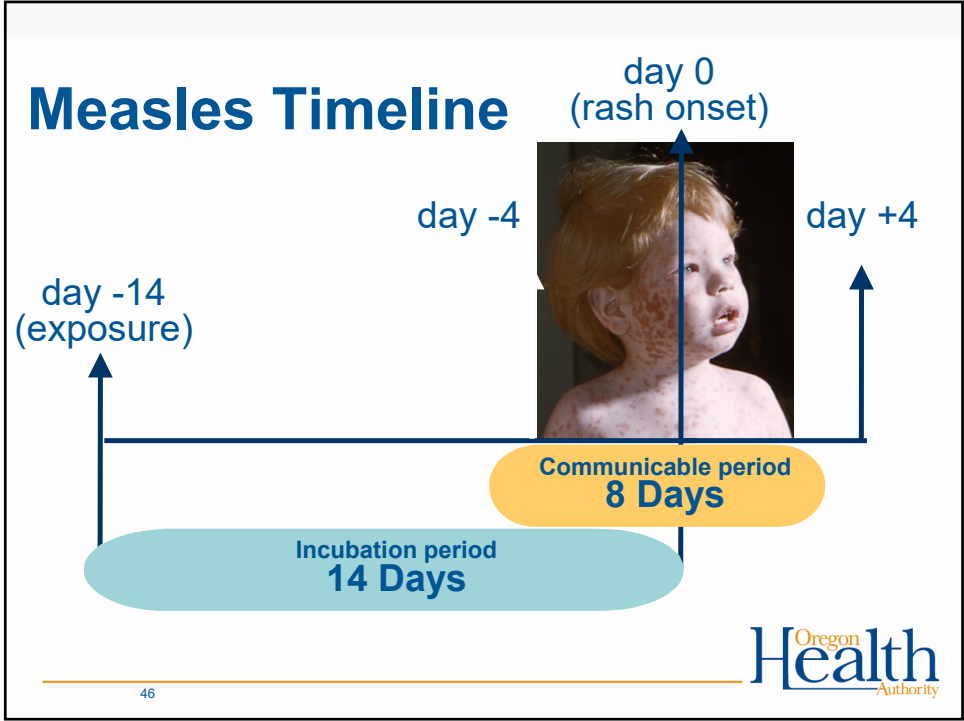
## Airborne Transmission

- Measles
- Chickenpox
- Tuberculosis

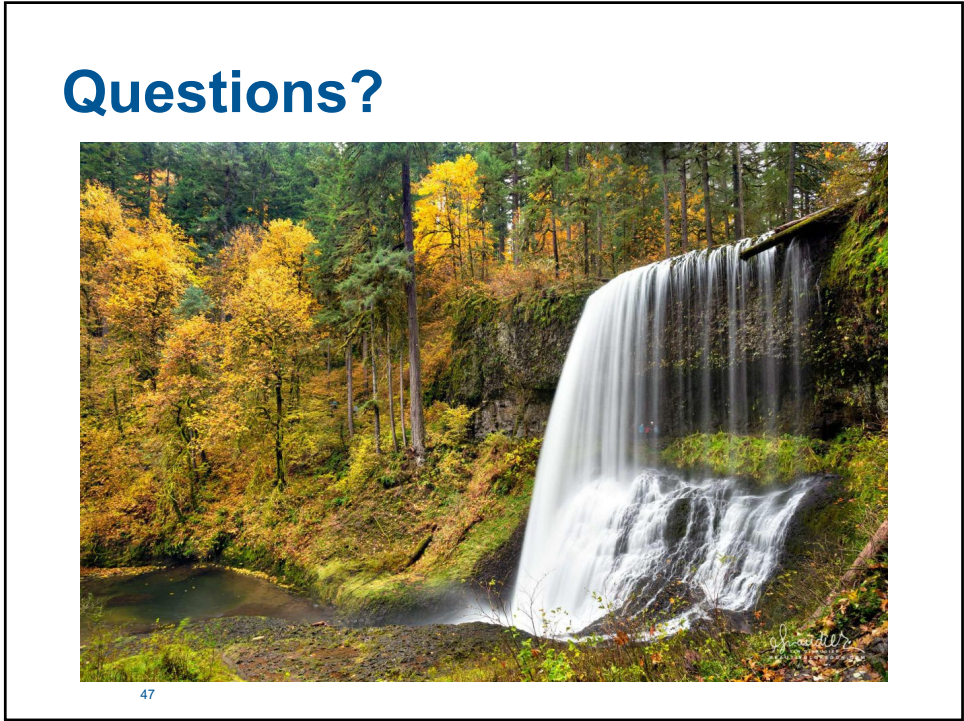


## Review Question 3

- Describe difference between incubation period and communicable period



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