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Airborne diseases

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Outline

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- Common pathogens
- Characteristics of droplet residuals
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- Airborne particles generated by medical equipment
- Symptoms and treatment
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Introduction

- Airborne diseases pass from one person to another when microorganisms — such as bacteria, fungi, or viruses — **travel through the air in aerosolized particles.**
- These organisms may be spread through sneezing, coughing, spraying of liquids, the spread of dust, or any activity that results in the generation of aerosolized particles.
- According to the WHO, "**Airborne transmission** of infectious agents refers to the transmission of disease caused by the dissemination of droplet nuclei that remain infectious when suspended in air over long distance and time."

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Forms of transmission

– Direct transmission

Exposure to microorganisms **in droplets** (e.g., through aerosolized oral and nasal secretions from infected patients). Pathogens spread in this manner are influenza virus, rhinoviruses, adenoviruses, and respiratory syncytial virus (RSV).

– Indirect transmission

The spread of airborne infectious diseases **via droplet nuclei**.The microorganisms in droplet nuclei persist **in favorable conditions** (e.g., a dry, cool atmosphere with little or no direct exposure to sunlight or other sources of radiation). Pathogenic microorganisms that can be spread via droplet nuclei include *Mycobacterium tuberculosis*, VZV, measles virus (i.e., rubeola), and smallpox virus (i.e., variola major).

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Common pathogens that may spread via airborne transmission are:

Bacterial:

- Anthrax
- Neisseria meningitidis
- Streptococcus pneumoniae
- Legionellosis
- Tuberculosis
- Bordetella pertussis
- **Fungal:**
- Aspergillosis
- Blastomycosis
- Cryptococcosis

Viral:

- Chickenpox
- Adenovirus
- Chickenpox
- Adenovirus
- Influenza
- Rhinovirus
- Measles
- Mumps
- Severe acute respiratory syndrome (SARS)
- Middle East Respiratory Syndrome (MERS)
- Coronavirus Disease 2019

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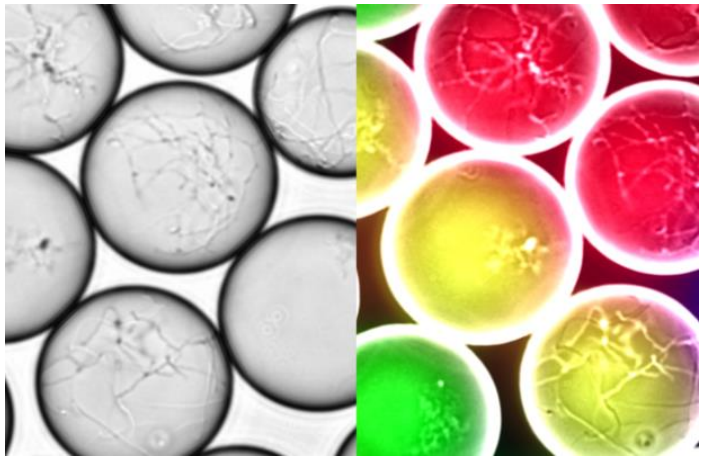
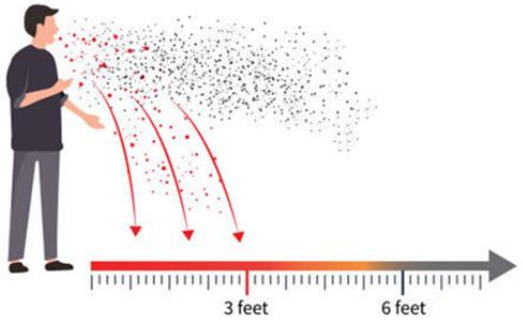
Characteristics of droplet residuals:

- **contain microorganisms** that could be active
- may have a **protective coat of dry secretions**, such as mucus or saliva
- may **stay in the air indefinitely**
- may **carry over long distances**.

The further the droplets travel from the source, the lower the risk of infection, due to environmental factors.



pL-droplets as microcultivation vessels for various streptomycetes



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Factors that influence airborne transmission:

- air temperature
- humidity
- exposure to sunlight or other forms of radiation
- wind and tropical storms
- the weight of the particles, which can affect how long they take to settle
- the structure and stability of the pathogen
- socioeconomic and living conditions
- rural vs urban areas
- inadequate sewage and drainage systems

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Airborne Particles Generated from Medical Equipment

Besides patients, several medical and surgical procedures may also generate aerosolized infectious particles.

- Sputum induction
- Chest physiotherapy
- Lung surgery
- Nebulizer therapy and steam inhalation
- Non-invasive positive pressure ventilation (BIPAP, CPAP)
- An autopsy of the lungs
- Manual ventilation with a bag and mask
- Intubation
- Open endotracheal suctioning
- Bronchoscopy
- Cardiopulmonary resuscitation

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Symptoms and treatment

- The symptoms of an airborne disease will widely, depending on the type of disease.
- The outlook will vary widely depending on a person's diagnosis. Some airborne diseases, such as the common cold, produce minor symptoms in most people and usually resolve within a few days. Others, such as COVID-19, can be life-threatening or involve long-term complications.
- Antibiotics can help manage a bacterial infection, and antifungal medications may help resolve infections due to fungi. Antivirals can help slow the activity of a virus in some cases.
- **Vaccines** can prevent many pathogenes from causing severe illness.

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Prevention

Measures taken by hospitals and individuals can help prevent the spread of airborne infectious diseases.

Measures to be taken by **individuals**:

- staying away from other people when symptoms are present or after receiving a diagnosis of an infectious disease
- wearing a face mask in public places
- keeping rooms properly ventilated
- regularly cleaning and servicing ventilation systems
- covering the mouth and nose when coughing or sneezing
- proper hand washing
- the practice of antiseptic techniques

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Prevention at health care facilities

- Healthcare workers need to maintain a **high degree of suspicion** in patients who present with signs and symptoms compatible with such an infection. The earlier the airborne prevention methods are adopted, the lower the risk of transmission to other patients and healthcare staff.
- Hospitals should follow guidelines to ensure **adequate ventilation**.
- **Airborne isolation rooms (in some specialized hospitals).**
- All healthcare workers who enter the negative pressure room should wear an appropriately fit-tested **N95 respirator**.
- **Maintaining careful hygiene and sanitation protocols** and getting vaccinated against the organisms associated with airborne infections.

Thank you for your attention!

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