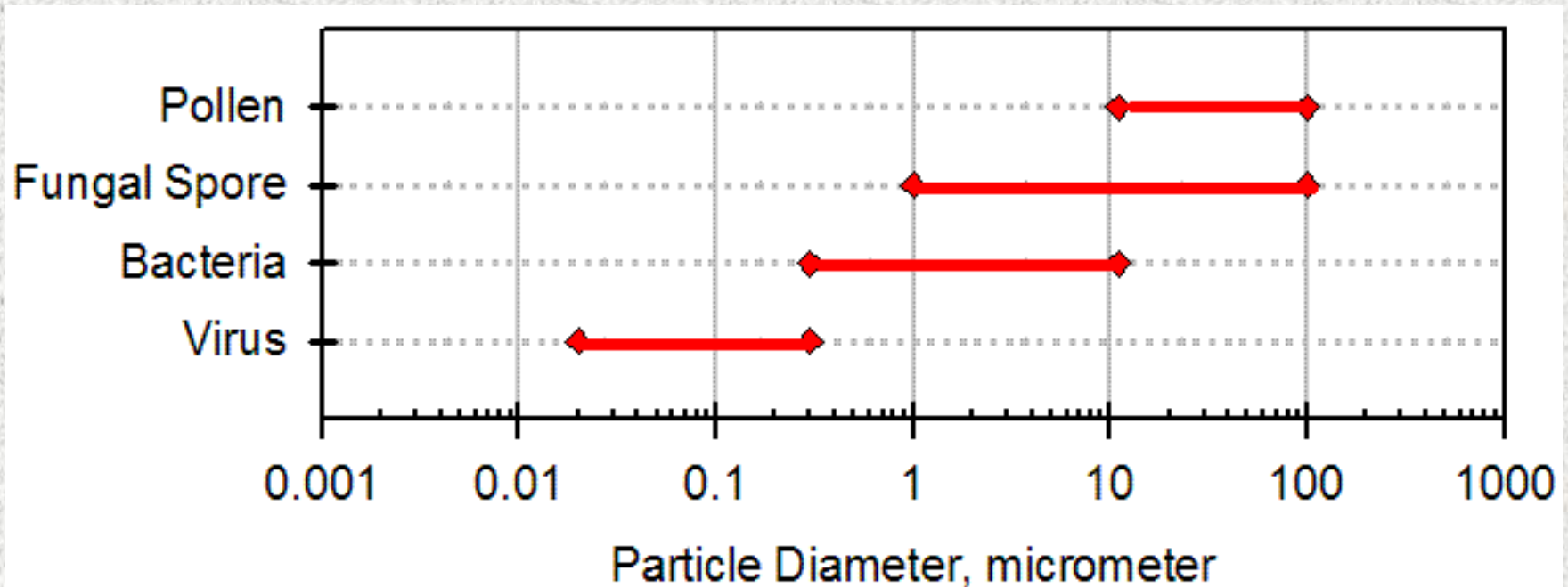


B.Sc. (H) Microbiology
SEC , Sem I

Respiratory infections

- During a sneeze, millions of tiny droplets of water and mucus are expelled at about 200 miles per hour (100 metres per second). The droplets initially are about 10-100 micrometres diameter, but they dry rapidly to **droplet nuclei** of 1-4 micrometres, containing virus particles or bacteria, a major means of transmission of several diseases of humans.

Individual particle sizes for some common bioaerosols



Some important diseases of humans transmitted from person to person by inhaled airborne particles

Virus diseases	Bacterial diseases
Chickenpox (Varicella)	Whooping cough (<i>Bordetella pertussis</i>)
Flu (Influenza)	Meningitis (<i>Neisseria</i> species)
Measles (Rubeola)	Diphtheria (<i>Corynebacterium diphtheriae</i>)
German measles (Rubella)	Pneumonia (<i>Mycoplasma pneumoniae</i> , <i>Streptococcus</i> species)
Mumps (Mumps)	Tuberculosis (<i>Mycobacterium tuberculosis</i>)
Smallpox (Variola)	<i>Haemophilus influenza</i>
Severe Acute Respiratory Syndrome (SARS)- identified as a new disease in ~2003	
Hantavirus pulmonary syndrome- respiratory disease from contact with infected rodents	

Diseases acquired by inhaling particles from environmental sources, not directly from an infected person

Disease	Source
Psittacosis (<i>Chlamydia psittaci</i>)	Dried, powdery droppings from infected birds (parrots, pigeons, etc.)
Legionnaire's disease (<i>Legionella pneumophila</i>)	Droplets from air-conditioning systems, water storage tanks, etc., where the bacterium grows.
Acute allergic alveolitis (various fungal and actinomycete spores)	Fungal or actinomycete spores from decomposing organic matter (composts, grain stores, hay, etc.)
Aspergillosis (<i>Aspergillus fumigatus</i> , <i>A. flavus</i> , <i>A. niger</i>)	Fungal spores inhaled from decomposing organic matter
Histoplasmosis (<i>Histoplasma capsulatum</i>)	Spores of the fungus, in old, weathered bat or bird droppings
Coccidioidomycosis (<i>Coccidioides immitis</i>)	Spores in air-blown dust in desert regions (Central, South and North America) where the fungus grows in the soil

Psittacosis

- **Psittacosis** is a serious disease acquired by handling birds or by inhaling dust from bird faeces.
- Caused by the bacterium ***Chlamydia psittaci***,
An obligate intracellular parasite. After entering the respiratory tract, the cells are transported to the liver and spleen, multiply there and then invade the lungs, causing inflammation, haemorrhage and pneumonia.

Legionnaire's disease

- **Legionnaire's disease** is a fairly common form of pneumonia in older or immuno-compromised people.
- It is seldom transmitted directly from person to person.
- The bacterium ***Legionella pneumophila*** is an aquatic rod-shaped species with a temperature optimum of about 36°C, and is a common inhabitant of warm-water systems in buildings.
- Infection occurs when people inhale aerosol droplets containing the bacteria.

Extrinsic allergic alveolitis

- **Extrinsic allergic alveolitis** is a serious hypersensitive response, usually associated with repeated exposure to airborne spores in the work environment.
- A classic example is the condition termed **farmer's lung**, caused by exposure to spores of thermophilic actinomycetes.

Aspergillosis, Histoplasmosis & Coccidioidomycosis

- **Aspergillosis, Histoplasmosis and Coccidioidomycosis** are examples of serious fungal infections of humans, initiated by spores deposited in the alveoli.
- They can be life-threatening diseases of immunocompromised people, when the fungi disseminate from the lungs to major organs of the body.
- However, in all cases the infection of humans is incidental to the fungus, playing no part in its normal biology.
- These are fungi that grow naturally as decomposer organisms in soil, bird faeces or other organic substrates.

Respiratory diseases	Agents	Environments
<i>Non-allergic</i>		
Non-allergic asthma, non-allergic rhinitis/mucous membrane irritations (MMI), chronic bronchitis, chronic airflow obstruction, organic dust toxic syndrome (ODTS)	Fungi, bacteria, actinomycetes, endotoxin, $\beta(1,3)$ -glucans, peptidoglycans, mycotoxins, and probably many other currently unidentified plant and amicrobial components	Agriculture and related industries, sewage/manure treatment/handling, food and animal feed industry, vegetable and animal fibre processing, wood industry, paper production, fermentation industry, slaughterhouses, metal machining industries (contaminated metal fluids), garbage collection and composting, buildings with contaminated ventilation/humidifying systems

Respiratory diseases	Agents	Environments
Allergic		
allergic asthma, allergic rhinitis, hypersensitivity pneumonitis (HP)/extrinsic allergic alveolitis (EEA)/farmer's lung	Fungi, microbial enzymes, plant proteins (soy, wheat, pollen, latex, etc.), mammalian proteins (rat, mouse, cow, etc.), invertebrate proteins (moths, locusts, spiders, etc.).	Compost facilities, agriculture and related industries, biotechnology industry and enzyme producers, food and animal feed industry, detergent industry, bakery industry, medical and public health sector (latex), veterinarians, pet shop keepers, laboratory animal facilities, biopesticide industry (invertebrates)

Allergens

- Comprise a large variety of macromolecular structures ranging from low molecular weight compounds that require conjugation to a protein (mainly chemicals such as diisocyanates, anhydrides, aldehydes, resins etc.) to high molecular weight sensitizers, which are most often proteins of biological origin.
- high molecular weight (HMW) allergens

- House Dust Mite and pet allergens
- Fungal allergens
- Occupational allergens

Occupational allergens

- Most potent occupational IgE binding allergens include enzymes derived from fungi and bacteria produced by biotechnological companies for use in, *for example*, washing powders and both the human and animal food industries
- Risk to workers in (eg: food processing) industries where enzyme preparations are used
- plant pollens, which may cause allergies in greenhouse workers
- Latex allergens have received extensive attention during the last decade with high numbers of health and hospital workers being sensitized due to the use of latex gloves produced from sap from the rubber tree *Hevea brasiliensis*
- Several animal proteins (dust mite, cat, mouse and rat allergens) are known to have strong allergenic properties, so laboratory animal workers are at risk of developing occupational type I (IgE-mediated) allergy to mice and rat allergens