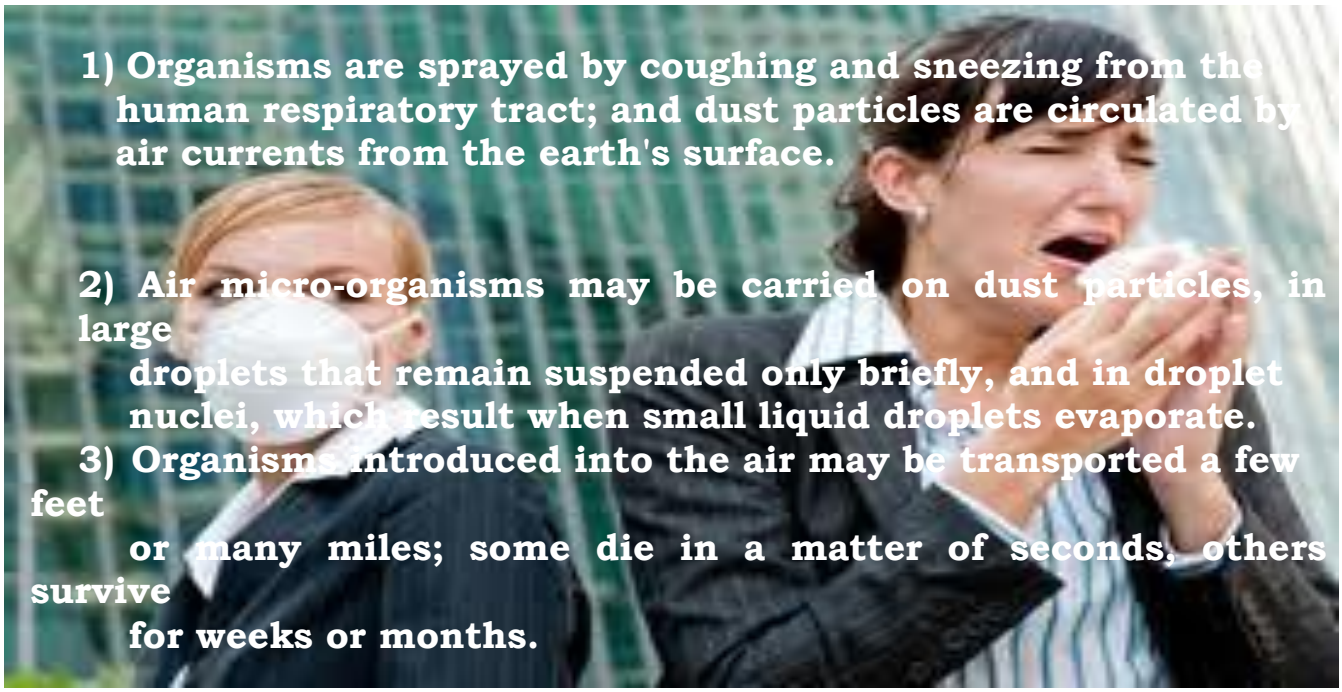
MICROBIOLOGY OF AIR

- The microbial flora of air is transient and variable.
- Air is not a medium in which micro-organisms can grow but a carrier of particulate matter, dust, and droplets, which may be laden with microbes.

Transmission of Air borne Micro-organisms.



Fate of Airborne Micro-organisms

The ultimate fate of airborne micro-organisms is governed by a complex set of circumstances including the atmospheric conditions, e.g.

a) Humidity
b) Sunlight
c) Temperature
d) Size of the particles bearing the microorganisms

e) Nature of the micro-organisms
i.e. the degree of susceptibility or resistance of a particular species to the new physical environment.

The Microbial Content of Air

Although no micro-organisms are indigenous to air, the air in our immediate environment as well as that several miles above the earth's surface, over land as well as over water, contains various species of micro-organisms in large or small numbers.

Indoor Air

The degree of microbial contamination of indoor is influenced by factors such as

1. Ventilation rates
2. Crowding
3. Nature and degree of activity of the individuals occupying quarters.

Sources of Transmission

The airborne micro-organisms are carried on dust particles or in droplets expelled from the nose and mouth during sneezing, coughing or even talking.

Size

- Particles of dust raised from surfaces and droplets expelled from the respiratory tract vary in their dimensions from micrometers to millimeters.
- Those in the low-micrometer range can remain airborne for long periods time, while the larger droplets and dust particles settle rapidly as dust on various surfaces. This dust becomes airborne intermittently during periods activity in the room.

Typical Examples

a) Tubercle Bacilli

Tubercle bacilli have been isolated from the dust of Sanitoria.

b) Diphtheria Bacilli and Hemolytic Streptococci

Diphtheria bacilli and hemolytic streptococci have been isolated from floor dust near patients or carriers harboring these organisms.

Out door: The Atmosphere

1- Algae, protozoa, yeasts, molds and bacteria have been isolated from the air near the surface of earth.
2- Mold spores constituted the largest portion of the airborne micro flora.
3- The predominant mold spores were of the species Cladosporium
4- Among the bacterial types were spore forming and non-spore forming gram positive bacilli, gram positive cocci, and gram negative bacilli,

Occurrence

Bacteria and mold spores have been found high above the earth's surface. The viable bacteria and fungi occur at an altitude of 3,000 m in air masses all the way across the North Atlantic.

Bacterial Species

Bacteria are characterized as:

a. Micrococcus
b. Sarcina
c. Gram-negative rods
d. Gram positive pleomorphic rods

e. Aerobic spore formers

Fungal species:

1. Cladosporium
2. Alternaria
3. Pullularia
4. Penicillium
5. Batrytis
6. Stemphylium

Cladosporium is the most abundant over land as well as sea.

Devices for Microbiological Analysis of Air

The sampling of air to determine its microbial content requires special instruments. Several devices, either

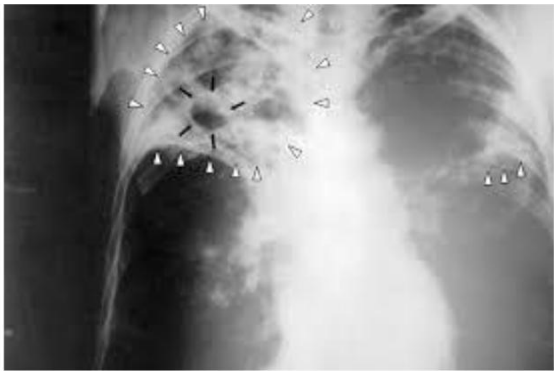
1. Solid impingement devices.
2. Liquid impingement devices have been designed for this purpose.
3. Liquid Impingement Devices:

Techniques Used

Some of the techniques and devices used for microbiological analysis of air are described as below

1) Setting-plate Technique:
2) Sieve and slit-type Samplers:
3) Membrane filter

Air Borne Diseases

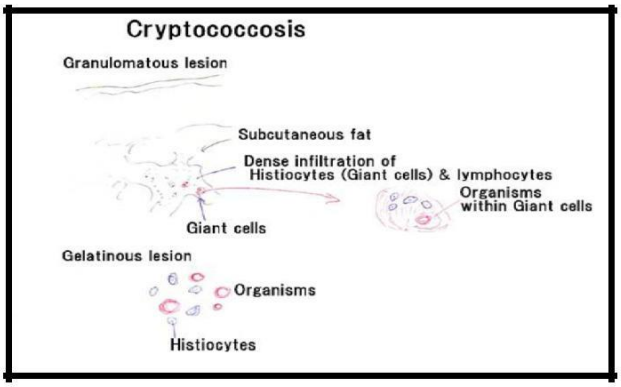


1. Bacterial

- Diphtheria
- Tuberculosis
- Pneumonia
- Meningitis

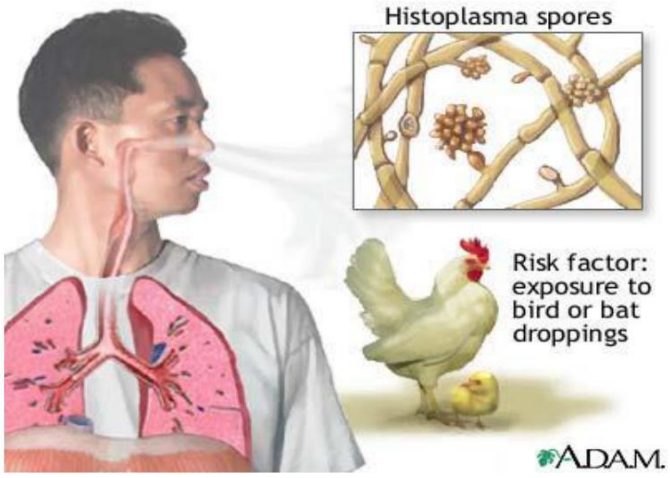
2. Viral

- Small pox
- Measles
- Influenza
- Common cold



3. Fungal

- Systemic Mycosis
- Histoplasmosis
- Cryptococcosis



CONTROL OF MICRO-ORGANISMS IN AIR

Since certain infectious agents may be airborne, air hygiene measures to reduce the microbial population of air is of great importance.
The level of air contamination can be reduced, or the air can be sterilized, as the situation demands, by the application of some of the physical and chemical agents.

There are several effective methods of controlling the level air contamination; which are discussed as below:

1) Ultraviolet Radiation

Ultraviolet radiation has great potential value for reducing the microbial flora of air. Practical application of ultraviolet air sanitation can be made in following ways.

a) Direct Irradiation:

b) Indirect Irradiation:

2) Chemical agents

Certain chemical substances vaporized or sprayed into the air of a room are effective in reducing the microbial flora.
Infect the chemical is dispersed as an aerosol and represents its antimicrobial action trough contacts with suspended particles carrying organisms.

Example:

- Triethylene glycol
- Formaldehyde
- Lactic Acid