

7. Aerosols in the Internal Environment

Aerosols microclimate

- **Aerosol microclimate** is a component of an internal environment formed by aerosol flows that co-create the overall state of the internal environment.
- **Aerosol** is a special type of dispersion system consisting of a gaseous phase and solid or liquid particles dispersed therein.
- Aerosols are made up of solid particles (dust) or liquid particles (fog). Solid aerosol are electrically charged positive or negative, with a size of 0.1 to 100 micrometers. In the outdoor air of the city, dust falls within the range of 1100 t/km² per year at a standard concentration of 1 to 3 mg/m³.

Distribution of Aerosols

- Aerosols can be divided into **solid aerosols** and **liquid aerosols**.
- Solid aerosols or dust can be classified according to their origin by **organic** (animal or plant origin), **inorganic** (metallic or non-metallic) and **mixed**.
- The process of sedimentation of dust particles is influenced by the earth's attraction, air resistance and the electrical polarity of individual material surfaces. Aerosol particles are microbial transporters.

Distribution of Aerosols

- According to the shape of the dispersed particles can be divided aerosols **corpuscular, laminar, and fibrillar disperse systems**:
 - **Corpuscular dispersion systems** consist of isometric dispersion particles whose dimensions are approximately the same in all three spatial directions.
 - **Laminar dispersion systems** (mineral particles of bentonite and kaolin) and **fibrillary dispersion systems** (natural and synthetic fibers of inorganic or organic nature) have anisometric particles. One or two of these dimensions predominate in such particles and belong to di-form systems.

Biological Effects of Aerosols

- The effect of an aerosol microclimate depends primarily on the flow of aerosol particles, the exposure time, the concentration, the chemical composition and the physical properties.
- Physical characteristics include **particle size, shape and strength, electrical charge, solubility in biological fluids, and others.**
- Aerosols act mechanically on the skin, in the conjunctival sac, on the mucosa, block the lymphatic pathways in the lungs and the like. Longer exposure is irritating and results in nonspecific inflammatory changes of the skin, conjunctiva and mucous membranes depending on the chemical composition of the particles, their amount, size, shape, depth of action and individual response.

Optimization of Aerosol Microclimate

- **Intervention to the source** of aerosols can be done in three basic ways:
 - Change of technology already in preparation for operation
 - Mixing bulk material with other suitable substances, such as water
 - Closing the source with a solid cover or liquid screen

Optimization of Aerosol Microclimate

- **Interference with the aerosol transfer field** can be accomplished:
 - Limiting aerosol dispersion in the building (vertical or horizontal distribution)
 - Ventilation
 - Air filtration through filters in air handling units
 - Coagulation of aerosol particles (by spraying a liquid aerosol with high wettability, small particles are merged into larger ones that settle down due to gravity)