

**Lecture 1****32. Concepts in microbial ecology**

- What are microbial ecosystems ?
  - Characteristics of habitats, hosts, living conditions and composition of organismic populations.
  - Ecologic resolution and dimensions: space, reactions in time, interactions between organisms.
  - Microbially mediated reactions in global physiology: modern and ancient biogeochemical cycles.
  - Kinds of interactions between microbial populations.
  - Principles of life derived from microbial ecology.
  - Basic biological concepts emerging from studying prokaryote ecology.
  - Limits for microbial existence are the limits of life.
- 

**Lecture 2****5. Microbially dominated ecosystems****5.1 Defining microbial ecosystems**

- Ecosystems consist of habitats, conditions and organisms. Habitats separated by physically defined boundaries. Conditions are defined by chemical and physical determinants changing in time and space. Organisms, present as communities (= multitude of populations) can change conditions and migrate across boundaries. Cross-boundary transmitting agents: Arthropods, Chordates, Annelids, Protozoa; transport vehicles: water, aerosols, food; transport mechanisms: ingestion, inhalation, surface contact.
- Niches: physiologically defined ecosystem functions changing through the presence and the evolution of organisms.
- Barriers are limitations for microbial migration and functioning. Physical barriers: temperature, radiation, pressure, pore size, adhesion attraction; chemical barriers: pH, salinity, oxidant, denaturant, surfactant, toxicity; biological barriers: immune response, trophic competition, predator-prey, viral attack, resistance, surface protection.
- The role of microbes in ecosystem functioning.
- Linking structures with functions in microbial ecosystems.

**5.2 Biodiversity in functionally stabilized ecosystems (an overview)**

- Diversity of aquatic ecosystems in altitudinal gradients and transients: nival zone, alpine, subalpine, highland, lowland, riverine, estuarine, littoral, shelf, continental slope, abyssal.
  - Freshwater vs. marine habitats.
  - Lakes and reservoirs in temperate and tropic climatic zones.
  - Oxic and anoxic sediments of lakes and oceans.
  - Subsurface aquifers: oligotrophy and bioremediation.
  - Microbial mats and biofilms.
  - Hot spring cyanobacterial mats.
  - Hydrothermal vent environments.
  - Cryoenvironments in snow and ice.
  - Endolithic and rock surface environments (e.g. lichens).
  - Syntrophy in animal digestive systems: gastro-intestinal tracts, microniches in gut habitats.
  - Host-microbe interactions: plant, animal and human hosts for pathogens.
  - Skin - a dry hostile environment.
- 

**Exercise II: To topics from  
Basic Concepts in microbial Ecology and Evolution**