**Lec – 2 –**

**Oral Microbial Ecology**

**Ecology** (from Greek) is the scientific study of interactions among organisms and their environment, such as the interactions organisms have with each other and with their abiotic environment;

The ecosystem is composed of microbial communities living on specific sites surrounded by a different physical and chemical elements.

 Ecosystems are composed of dynamically interacting parts including organisms, the communities they make up, and the non-living components of their environment;

Ecosystem processes, such as primary production, nutrient cycling, and various niche construction activities, regulate the flux of energy and matter through an environment.

**Econiche**

Definitions of  Hutchinson:

“The set of biotic and abiotic conditions in which a species is able to persist and maintain stable population sizes."

**Microflora**

Living microorganisms that are so small that they can be seen only with a microscope and that maintain a more or less constant presence in a particular area;

Includes bacteria, viruses, protozoa, fungi.

**Oral microflora**

Oral microflora refers to the community of microorganisms coexisting in the oral cavity as its primary habitat;

These strains of bacteria colonize the various different surfaces present in the oral cavity, and communicate between each other through complex cell signaling processes;

The body’s own defenses also play a role in maintaining a balance and ensuring a healthy oral environment.

**Normal - resident flora**

In a healthy body, the internal tissues - blood, brain, muscle, etc., are normally free of microorganisms;

However, the surface tissues - skin and mucous membranes, are constantly in contact with environmental organisms and become readily colonized by various microbial species;

The mixture of organisms regularly found at any anatomical site is referred to as the normal flora or resident flora, some researchers prefer the term "indigenous microbiota".

**Resident microflora**

Typical microflora of a econiche;

Microorganisms are separated and grouped according to the different conditions of life;

Resident microflora has an important function in host:

Digestive and nutritional;

Competition with pathogenic microflora.

**Transient Microbiota**

Transient microbes are just passing through;

Although they may attempt to colonize the same areas of the body as do resident microbiota, transients are unable to remain in the body for extended periods of time due to:

Competition from resident microbes;

Elimination by the body’s immune system;

Physical or chemical changes within the body that discourage the growth of transient microbes.

**Opportunistic microbes**

Under normal conditions, resident and transient microbes cause the host no harm;

However, if the opportunity arises, some of these microbes are able to cause disease and become opportunistic pathogens.

**This can happen due to a number of different conditions:**

When the immune system isn’t working properly, normal flora can overpopulate or move into areas of the body where they do not normally occur;

When the balance of normal microbes is disrupted, for example when a person takes broad spectrum antibiotics, microbes that are normally crowded out by resident microbes have an opportunity to take over;

Disease can result when normal flora are traumatically introduced to an area of the body that they do not normally occur in.

**Endogenous microflora**

 That is microflora already present in the body, but has previously been inapparent or dormant.

 Bacterial flora is endogenous bacteria, which is defined as bacteria that naturally reside in a closed system.

**Exogenous microflora**

Exogenous bacteria are microorganisms introduced to closed biological systems from the external world;

 They exist in aquatic and terrestrial environments, as well as the atmosphere;

Microorganisms in the external environment have existed on Earth for 3.5 billion years;

 Exogenous bacteria can be either benign or pathogenic.

**The source of microorganisms**

The source of these microorganisms mainly comes from saliva, although it also includes the food and water consumed by the individual;

This process takes place within the first few hours of life;

Majority of children obtain their resident microflora from their mothers, as they often possess identical strains of bacteria;

This is known as vertical transmission;

Horizontal transmission also takes place as children interact with their peers, and later in life between spouses and partners.

**Formation of the ecosystem**

The development of microbial community comprises an alternation of populations;

The process starts with the colonization of the environment of the first microbial population;

It fills the new space, modify it and makes it convenient for resettlement of new microbial population.

**Climax community**

The settlement of all econiches occurs relative stability of the system by the microorganisms – called climax community;

The stability of the community is based on the homeostasis, including compensatory mechanisms against the effects of various factors.

**Bacteria during the life cycle**

Oral colonization begins in the birth canal:

Populations on the tongue and mucosa;

Established during infancy - include anaerobes;

Tooth eruption provides non-shedding surfaces:

The “window of infectivity” concept;

Colonization from source sites and caregiver saliva;

Hormonal shifts - puberty and pregnancy

Can alter proportions of Gm- anerobes;

Complete loss of teeth shifts flora towards infant state:

Dentures restore supragingival non-shedding sites;

Implants restore supra- and subgingival sites.