NORMAL MICROBIAL FLORA

The mixture of organisms regularly found at any anatomical site is referred to as the normal flora. Normal flora of humans consists of a few eucaryotic fungi and protists, but bacteria are the most numerous and obvious microbial components of the normal flora. They inhabit mainly the skin and inner surfaces of the body such as the mucous membranes of the oral cavity, upper respiratory tract, intestinal tract and genitourinary tract.

In fact, not much is known about the nature of the associations between humans and their normal flora, but they are thought to be dynamic interactions rather than associations of mutual indifference. Both host and bacteria are thought to derive benefit from each other, and the associations are, for the most part, mutualistic. The normal flora derive from their host a steady supply of nutrients, a stable environment, and protection and transport. The host obtains from the normal flora certain nutritional and digestive benefits, stimulation of the development and activity of immune system, and protection against colonization and infection by pathogenic microbes. So, these microorganisms are harmless, mostly they do not cause disease and are even beneficial.

Microbial committees in the host systems stay on in a critical balance. The lost normal microbial flora can cause serious diseases. For example lactobacilli in vagina decrease the pH, so pathogen microorganisms cannot exist. In the case of using inappropriate antibiotics or hormone changes during pregnancy, lactobacilli in the vagina will disappear and the pH will increase, hence vaginal candidiasis and bacterial vaginosis can be seen.

In gastrointestinal tract there are a lot of facultative and strict anaerobe bacteria in normal flora, these bacteria helps the host by vitamin K synthesis. After using antibiotics, normal flora of the gastrointestinal system will be damaged so vitamin K deficiency occurs or pathogen microorganisms like toxin positive C. difficile will dominate the tract and cause antibiotic related diarhoea.

On the other hand same normal flora members might be opportunistic pathogens meaning that the the organism is somehow given a special opportunity of weakness or let-down in the host defenses in order to infect. An example of an opportunistic infection is chronic bronchitis in smokers wherein normal flora bacteria are able to invade the weakened lung.

The normal flora of humans are exceedingly complex and consist of more than 200 species of bacteria. The makeup of the normal flora may be influenced by various factors, including genetics, age, sex, stress, nutrition and diet of the individual. Most members of the normal bacterial flora prefer to colonize certain tissues and not others. This “tissue specificity” is usually due to properties of both the host and the bacterium.

A human first becomes colonized by a normal flora at the moment of birth and passage through the birth canal. In utero, the fetus is sterile, but when the mother's
water breaks and the birth process begins, so does colonization of the body surfaces. Handling and feeding of the infant after birth leads to establishment of a stable normal flora on the skin, oral cavity and intestinal tract in about 48 hours.

**Resident flora:** Consist of relatively fixed types of microorganisms regularly found in a given area at a given age. Resident flora promptly reestablishes itself if disturbed.

**Transient flora:** Consist of non-pathogenic or potentially pathogenic microorganisms that inhabit the mucous membranes for hours, days, weeks. Members of the transient flora are derived from the environment and they are not establish themselves permanently on the surfaces. They can not cause infectious diseases if resident flora remains intact.

**Normal flora of the skin:**

Several factors such as dryness, low pH, inhibitory substances (lysozyme from sweat glands and toxic fatty acids from sebaceous glands) are responsible for discouraging skin colonization. *Staphylococcus* species do compose 90% of aerobic members of normal skin flora. Anaerobic diphteroids inhabit deeper layers of skin.

**Normal flora of respiratory tract:**

**Mouth:** Continuous flow of saliva exerts a mechanical flushing action that removes many microorganisms. Until eruption of teeth, most microorganisms in oral cavity are aerobes and facultative anaerobes. As the first tooth appears, obligate anaerobes become more evident as the tissue surrounding the teeth provides an anaerobic environment. *Streptococcus mutans* is a member of normal oral flora and appears to be the major ethiological agent of dental caries.

**Upper respiratory tract:** Through inhalation, air containing microorganisms pass through nasal passages and nasopharynx, microorganisms stick to the thin moisty layer of highly viscous mucus that overlies these surfaces. Mucus also contains bactericidal enzyme, lysozyme. In addition, rhythmic beating of ciliar epithelial cells of upper respiratory tract drives microorganisms through pharynx. Nose and nasopharynx are inhabited by many microorganisms despite those mechanisms.

A large number of bacterial species colonize upper respiratory tract (nasopharynx). Nostrils are always heavily colonized, predominantly with *Staphylococcus epidermidis* and Corynebacteria, and often (in about 20% of the general population) with *Staphylococcus aureus*, this being the main carrier site of this important pathogen.

Staphyloccoci are the main habitants of the nose. Other normal flora members of nasopharynx are to be *Streptococcus, Neisseria and Haemophilus species*.

**Lower respiratory tract:** Trachea and bronchi do not have a normal flora due to cilia-driven mucus flow. The lower respiratory tract (trachea, bronchi and pulmonary tissues) is virtually free of microorganisms, mainly because of the efficient cleansing action of the ciliated epithelium which lines the tract. Any bacteria reaching the lower
respiratory tract are swept upward by the action of the mucociliary blanket that lines the bronchi, to be removed subsequently by coughing, sneezing, swallowing, etc

**Normal flora of gastrointestinal tract:**

In the upper gastrointestinal tract of adult humans, the esophagus contains only the bacteria swallowed with saliva and food. Because of the high acidity of the gastric juice, very few bacteria (mainly acid-tolerant lactobacilli) can be cultured from the normal stomach.

Duodenum has less than 1000 bacteria/ml which are mostly *Gram (+) cocci and bacilli*. In jejunum, few enterococci, lactobacilli and diphteroids may be present. In ileum the flora resembles that of the large intestine. The flora of the large intestine (colon) is qualitatively similar to that found in feces. Anaerobic bacteria and members of the family *Enterobactericeae* appear in large numbers. 95-99 % of normal flora in colon are anaerobes.

The other members are *Gram (+) bacilli*, enteric bacteria and the yeast *Candida*. Normal flora of intestine can be influenced by various factors such as stress, starvation, antibiotic therapy and diet.

**Normal flora of genitourinary tract:**

In a healthy person kidneys, urinary bladder and ureters are free of microorganisms. However, bacteria are commonly found in the lower portion of both male and female urethra. Usually, streptococci and diphteroids may be found in urethra. In females vagina has a very complex normal flora. Its composition would change according to the age. Before puberty the predominant organisms are stapylococci, streptococci, diphteroids and *E. coli*. In adult vagina main inhabitants are acid-tolerant lactobacillus, which breakdown glycogen, forming acid. As a result the pH of vagina is 4.4-4.6 and this prevents overgrowth of other microorganisms. The resulting low pH of the vaginal epithelium prevents establishment by most other bacteria as well as the potentially-pathogenic yeast, *Candida albicans*. This is a striking example of the protective effect of the normal bacterial flora for their human host.