

# **Medical bacteriology: lecture 2**

## **The Normal Flora of Humans**

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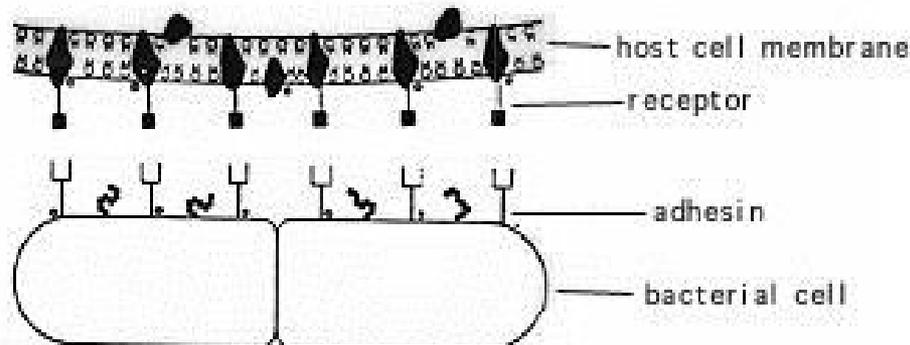
- **Definition:** organisms frequently found on or within body of healthy individuals
- **In healthy human, there are many of bacteria are consistently associated with the body:**
  - 1) Body surfaces 2) Mucus membranes  
(skin and mucous membranes, are always contact with environmental organisms and become colonized by various bacterial species).
  - 3) Intestinal linings of humans
- If a bacteria, whether or not a component of the normal flora, breaches one of these surfaces, an **infection** is occurred.
- Some bacteria rarely cause disease if they do infect; some bacteria will usually cause disease if they infect. But other factors play a role in determining the outcome of infection ,such as the **route of entry**, the **number of infectious bacteria**, and (most importantly) the **status of the host defenses**.
- The mixture of organisms or the bacteria and other microbes that are consistently associated with human and found at any site are called **the normal flora**, or **the "indigenous microbiota"**. These bacteria have a **symbiotic interactions** with their hosts.
- The normal flora of humans consists of a few fungi, but bacteria are the most numerous and obvious microbial components of the normal flora.
- The internal tissues, e.g. blood, brain, muscle, etc., are normally free of microorganisms.

# **Beneficial Effects of the Normal Flora?**

# Normal Flora

- Specific bacteria colonize specific tissues by one or another of mechanisms (**Tissue specificity**)
- Host provides essential nutrients and growth factors for the bacteria, in addition to suitable oxygen, pH, and temperature for growth (**Tissue Tropism**).
- Specific adherence involves biochemical interactions between bacterial surface components involves complementary chemical interactions between the two surfaces (**ligands or adhesins**) and host cell molecular (**receptors**)

**Normal flora may be influenced by various factors, including genetics, age, sex, stress, nutrition and diet of the individual.**



**.Specific adherence between host cell tissue and the bacterial surface.**

- **Normal Flora of the Skin** .(nonpathogenic : *S. epidermidis*, Corynebacteria ). Sometimes pathogenic *S. aureus* found on the hands. This because the face and hands are likely inoculated with the bacteria on the nasal membranes.
- **Normal Flora of the Conjunctiva** . number of organisms is usually small, *S. epidermidis* is predominant, *S. aureus*, *Haemophilus* sp. and *Neisseria* sp. are occasionally found, Newborn may especially prone to bacterial attachment. *Chlamydia* and *Neisseria* might be present on vagina of an infected mother, silver nitrate or an antibiotic may be put into the newborn's eyes to avoid infection after passage through the birth canal.
- **Normal Flora of the Respiratory Tract**. large number of bacterial species colonize the upper respiratory tract. predominantly with *S. epidermidis* and corynebacteria, and *S. aureus*. The healthy sinuses are sterile. The pharynx (throat) is normally colonized by streptococci and various Gram-negative cocci. Sometimes pathogens such as *Stre. pneumoniae*, *Strep. pyogenes*, *H. influenzae* - The lower respiratory tract (trachea, bronchi) is virtually free of bacteria, the pathogens such as *H. influenzae* or *S. pneumoniae*.
- **Normal Flora of the Urogenital Tract** . Urine is normally sterile .Some enteric bacteria (e.g. *E. coli*, *Proteus*) and corynebacteria, which are probably contaminants from the skin. The vagina becomes colonized after birth with corynebacteria, staphylococci, streptococci, *E. coli*, and the low pH of the vaginal epithelium prevents establishment by most 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.
- **Normal Flora of the Oral Cavity** . The mouth is a favorable habitat for a variety of bacteria. Oral bacteria include streptococci, lactobacilli, staphylococci and corynebacteria, with a great number of anaerobes, especially bacteroides, teeth colonized by *Strep. mutans*- oral flora contribute to host nutrition through the synthesis of vitamins, and they contribute to immunity by inducing low levels of antibodies that may cross react and antagonism with pathogens, oral flora can also cause diseases, including abscesses
- **Normal Flora of the Gastrointestinal Tract** . different in the composition by age, diet, and the use of antibiotics. high acidity of the gastric juice, very few bacteria (mainly acid-tolerant lactobacilli) can be cultured from the normal stomach. *Helicobacter pylori* is a pathogen, The flora of the large intestine (colon) is similar to that found in feces, The small intestine has a relatively sparse Gram-positive flora, mainly of lactobacilli and *Enterococcus faecalis*. intestinal tract is sterile at birth.

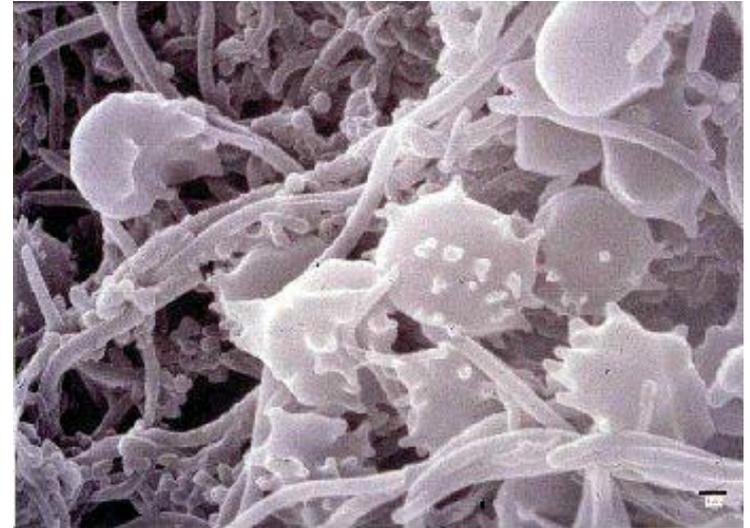
# Dental Caries, Gingivitis and Periodontal Disease

## only for further reading

The most frequent and economically-important condition in humans resulting from interactions with our normal flora is probably dental caries. Dental plaque, dental caries, gingivitis and periodontal disease result from actions initiated and carried out by the normal bacterial flora.

**Dental plaque**, which is material adhering to the teeth, consists of bacterial cells (60-70% the volume of the plaque), salivary polymers, and bacterial extracellular products. Plaque is a naturally-constructed biofilm, in which the consortia of bacteria may reach a thickness of 300-500 cells on the surfaces of the teeth. These accumulations subject the teeth and gingival tissues to high concentrations of bacterial metabolites, which result in dental disease.

- The dominant bacterial species in dental plaque are *Streptococcus sanguis* and *Streptococcus mutans*, both of which are considered responsible for plaque
- Plaque formation is initiated by a weak attachment of the streptococcal cells to salivary glycoproteins forming a pellicle on the surface of the teeth. This is followed by a stronger attachment by means of extracellular sticky polymers of glucose (glucans) which are synthesized by the bacteria from dietary sugars (principally sucrose). An enzyme on the cell surface of *Streptococcus mutans*, glycosyl transferase, is involved in initial attachment of the bacterial cells to the tooth surface and in the conversion of sucrose to dextran polymers (glucans) which form plaque.



**Dental plaque, scanning electron micrograph illustrating the diversity of microbes in plaque.**

## Review Questions

1. Some factors may play a role in determining the outcome of bacterial infection. Discuss?
2. What is the beneficial of normal flora? ( 5 points)
3. Give three examples of the body sites that associated with bacterial flora? Give two examples of the body sterile sites?
4. What are the Factors that effect on the human normal flora?
5. What do you know about normal flora of eyes (Conjunctiva)- Normal flora of Gastrointestinal Tract?
6. Give two examples of oral bacterial flora?