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Normal flora

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Normal flora

The term normal microbial flora (microbiota) means the population of microorganisms that inhabit the skin and mucous membranes of healthy normal persons. Shifts in the normal microbiota or stimulation of inflammation by these commensals may cause diseases such as bacterial periodontitis and inflammatory bowel disease.

The skin and mucous membranes always harbor a variety of microorganisms that can be arranged into two groups:

(1) The resident microbiota consists of relatively fixed types of microorganisms regularly found in a given area at a given age; if disturbed, it will reestablishes itself.

(2) The transient microbiota consists of nonpathogenic or potentially pathogenic microorganisms that inhabit the skin or mucous membranes for hours, days, or weeks. The transient microbiota is derived from the environment, does not produce disease, and does not establish itself permanently on the surface. However, if the resident microbiota is disturbed, transient microorganisms may colonize, proliferate, and produce disease.

NORMAL MICROBIOTA OF THE SKIN

The predominant resident microorganisms of the skin are aerobic and anaerobic diphtheroid *bacilli* (eg, *Corynebacterium*, *Propionibacterium*); nonhemolytic aerobic and anaerobic *staphylococci* (*Staphylococcus epidermidis* and other coagulase-negative *staphylococci*, occasionally *Staphylococcus aureus*, and *Peptostreptococcus* species); gram positive, aerobic, spore-forming bacilli that are ubiquitous in air, water, and soil; α-

hemolytic *Streptococci* (*viridans streptococci*) and enterococci (*Enterococcus* species); and gram-negative coliform bacilli and *Acinetobacter*. Fungi and yeasts are often present in skin folds; acid-fast, nonpathogenic mycobacteria occur in areas rich in sebaceous secretions (genitalia, external ear).

NORMAL MICROBIOTA OF THE MOUTH AND UPPER RESPIRATORY TRACT

The flora of the nose consists of prominent corynebacteria, *Staphylococci* (*S. epidermidis and S. aureus*), and *Streptococci*. In direct contrast to the highly differentiated communities of their mothers, neonates harbored bacterial communities that were undifferentiated across multiple body habitats, regardless of delivery mode. Thus, at its earliest stage of community development, the human microbiota is homogeneously distributed across the body. Vaginally delivered infants harbor bacterial communities (in all body habitats) that are most similar in composition to the vaginal communities of the mothers; C-section babies lack bacteria from the vaginal community (eg, Lactobacillus, Prevotella, Atopobium, and Sneathia spp.). Infants delivered via C-section harbor bacterial communities (across all body habitats) that are most similar to the skin communities of the mothers (eg, *Staphylococcus*, *Corynebacterium*, or *Propionibacterium* spp.). cterium spp.). Within 4–12 hours after birth, *viridans streptococci* become established as the most prominent members of the resident flora and remain so for life. These organisms probably originate in the respiratory tracts of the mother and attendants. Early in life, aerobic and anaerobic *staphylococci*, gram-negative *diplococci* (*neisseriae*, *Moraxella catarrhalis*), *diphtheroids*, and occasional *lactobacilli* are added. When teeth begin to erupt, the

anaerobic spirochetes, *Prevotella* species (especially *Prevotella melaninogenica*), *Fusobacterium* species, *Rothia* species, and *Capnocytophaga* species establish themselves along with some anaerobic vibrios and lactobacilli. Actinomyces species are normally present in tonsillar tissue and on the gingivae in adults, and various protozoa may also be present. Yeasts (Candida species) occur in the mouth.

Normal Microbiota of the Intestinal tract

At birth, the intestine is sterile, but organisms are soon introduced with food. The environment (eg, maternal vaginal, fecal, or skin microbiota) is a major factor in determining the early microbial profile. Many early studies reported that the intestinal microbiota of breastfed children is dominated by *Bifidobacteria*. *Bifidobacteria* did not appear until several months after birth and thereafter persisted as a minority population.

In normal adults, the esophagus contains microorganisms arriving with saliva and food. The stomach's acidity keeps the number of microorganisms at limited level. From the hundreds of detected microorganisms in the human stomach, only *Helicobacter pylori* persists in this environment. The normal acid pH of the stomach markedly protects against infection with some enteric pathogens (*Vibrio cholerae*).

NORMAL MICROBIOTA OF THE URETHRA

The anterior urethras of both sexes contain small numbers of the same types of organisms found on the skin and perineum.

NORMAL MICROBIOTA OF THE CONJUNCTIVA

The predominant organisms of the conjunctiva are *Diphtheroids*, *S. epidermidis*, and nonhemolytic *streptococci*. *Neisseriae* and gram-negative bacilli resembling *haemophili* (*Moraxella* species) are also frequently present. The conjunctival flora is normally controled by the flow of tears, which contain antibacterial lysozyme.