

Microbial Flora of Normal Human Body

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Normal Microbial Flora

- Skin
- Conjunctivae
- Oral Cavity
- Upper respiratory tract
- Intestinal tract
- Genitourinary tract
 - External genitalia and anterior urethra
 - vagina
- Blood and tissues

Normal Microbial Flora

- Normal flora is beneficial to the body
- Some normal flora members can be opportunistic pathogens

Normal Microbial Flora

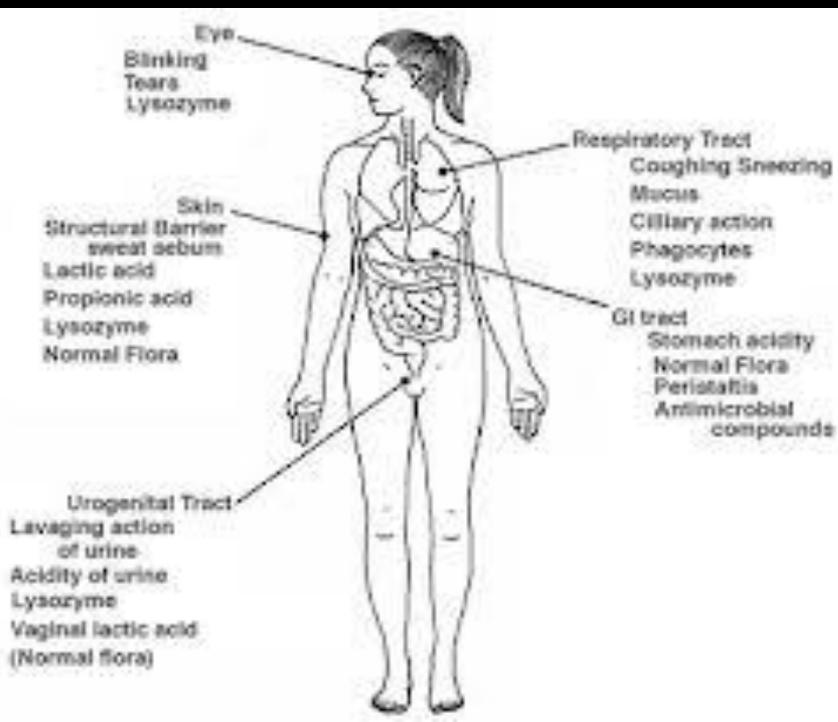
- Sterile sites of human body
 - Internal organs
 - CNS
 - Blood
 - Lower bronchi and alveoli
 - Liver
 - Spleen
 - Kidney
 - Bladder

Normal Microbial Flora

- Resident flora:
 - Microorganisms which are regularly found in specific sites
- Transient flora:
 - Microorganisms that inhabit the mucous membranes for a short time of period
 - Derived from environment
 - Non-pathogenic or potentially pathogenic

Normal Microbial Flora

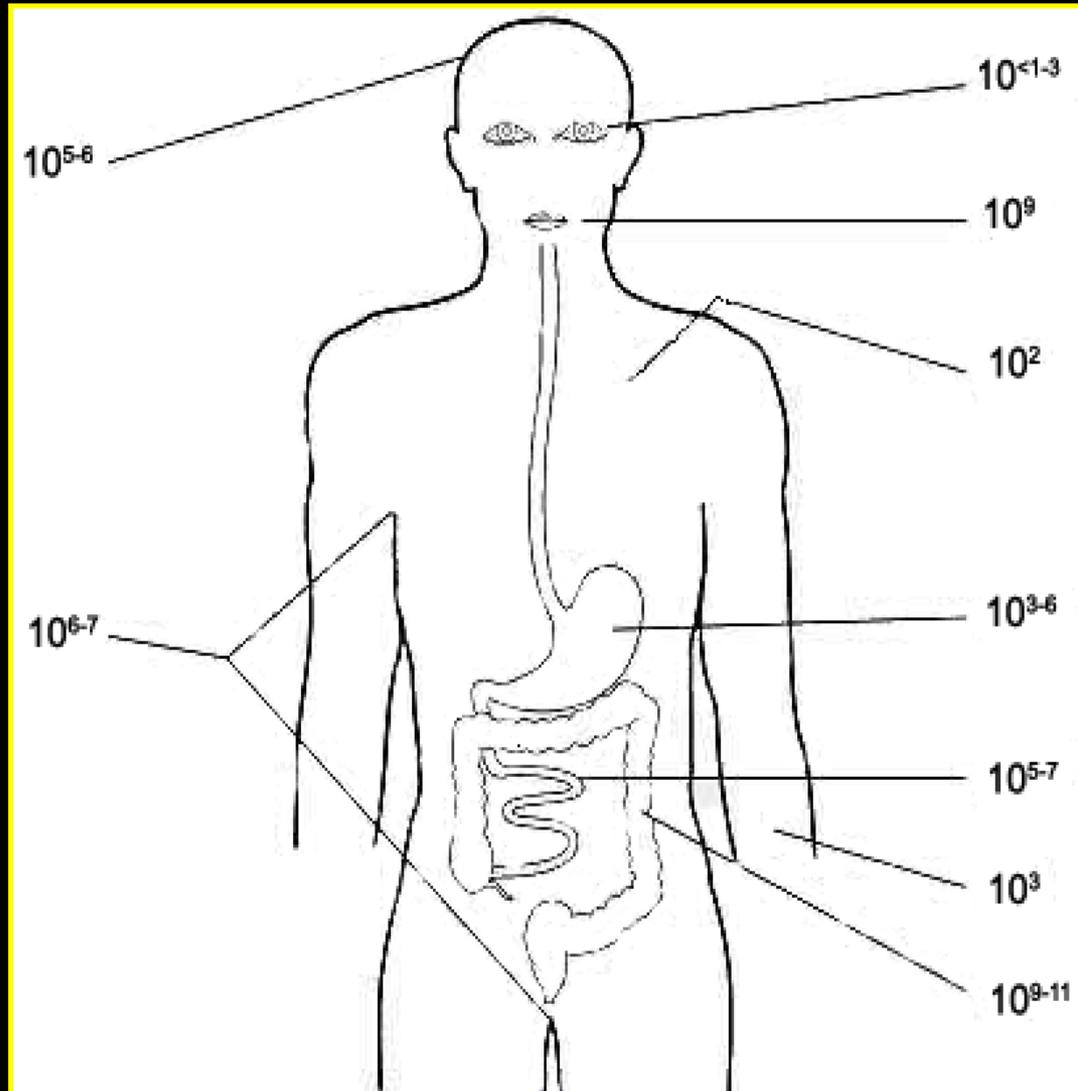
- Origin of normal flora
 - Acquired during birth
 - Acquired from environment



Normal Microbial Flora

- The normal flora are bacteria which are found in on our bodies without causing disease.
- There are more bacteria living in our bodies.
- A human body contains around 10^{13} cells. The human body is home to around 10^{14} bacteria.
- One fourth of fecal weight is made of bacteria!

Normal Microbial Flora



Normal Microbial Flora

- The normal flora protect us from disease by
 1. Competing with invaders for space and nutrients
 2. Producing compounds (bacteriocins, fatty acids, peroxides) which kill other bacteria
 3. Lowering the pH so that other bacteria can't grow

Normal Microbial Flora

- **The Good Side**

- Produce vitamins we are unable to produce such as vitamin B12
- Boost our immune system
- Help digest food

- **The Bad Side**

- If the normal flora escape from their normal location, they can cause disease. For example, *Escherichia coli*, commonly found in the intestine, can cause urinary tract infections if introduced into the bladder
- Immunosuppression can allow otherwise harmless bacteria to cause disease. AIDS, some cancer treatments and transplant rejection drugs all suppress the immune system and allow the normal flora to cause occasionally serious disease.

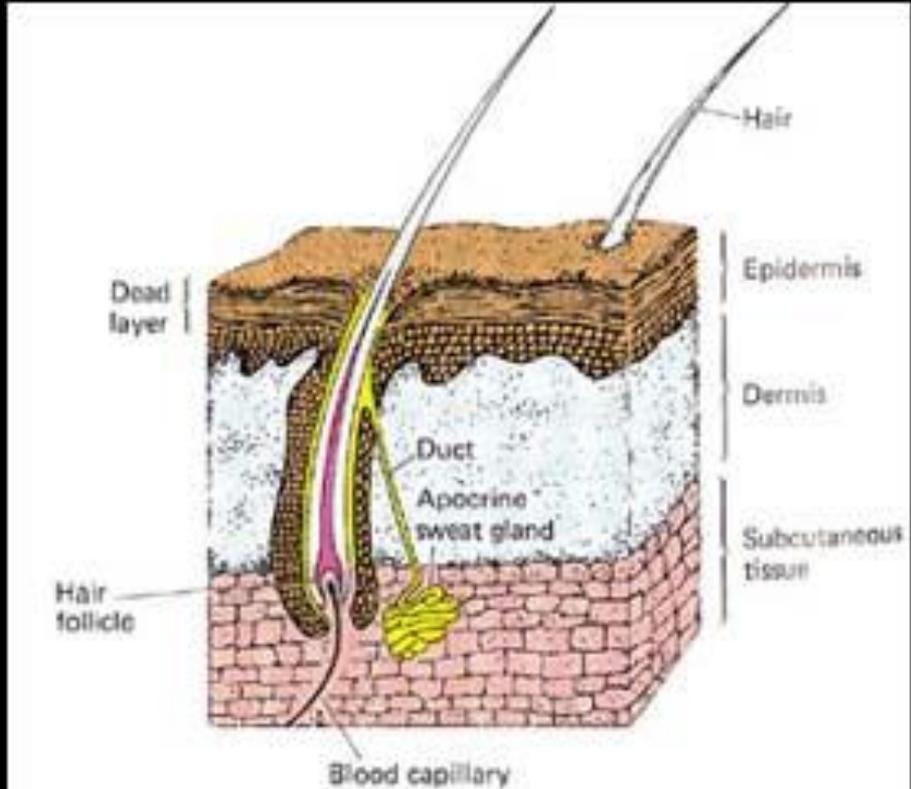
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Normal Microbial Flora



Skin

- Contact with the environment of skin resulted
 - Resident flora
 - Transient flora



Anatomy of the human skin. Microbes are associated primarily with the sweat ducts and the hair follicles.

Skin

- Resident microorganisms of the skin
 - Aerobic and anaerobic diftheroid bacilli (corynebacterium, propionobacterium)
 - Staphylococci (S.aureus, KNS, S.epidermidis)
 - Streptococci (viridans streptococci, enterococcus)
 - Gram (-) bacilli and acinetobacter
 - Fungi and yeast (skin fold)
 - Non-pathogenic mycobacteria occur in areas rich in sebaceous secretions (genitalia, external ear)

Skin

- Transient flora eliminating of skin by
 - Low Ph of skin
 - Fatty acids
 - Sebaceous secretions
- Profuse sweating, washing and bathing can eliminate resident flora, but the flora is replenished from sebaceous and sweat glands, contact with other skin areas and environment

Conjunctiva

- Diphtheroids,
- S.epidermidis,
- Non-hemolytic streptococci,
- Neisseriaea,
- Moraxella species are present in conjunctiva.
- Conjunctival flora held in check by the flow of tears (lysozyme)

Oral cavity

- The mucose membranes of mouth and pharynx are often sterile at birth.
- Within 4-12 hours after birth viridans streptococci become most prominent members of the oral cavity and remain so for life.

Oral cavity

- Early in life :
 - Staphylococci
 - Neisseria
 - Moraxella
 - Diphtheroids
 - Lactobacilli are added.

Oral cavity

- When the teeth erupt :
 - Anaerobic spirochetes
 - Prevotella, Fusobacterium, Rothia
 - Vibrios, Lactobacilli
 - Actinomycetes
 - Yeast
 - Various protozoa are added.

Upper Respiratory Tract

- The flora of nose consist of : S.aureus, S.epidermidis, Streptococci, Propinobacterium
- Pharynx and trachea flora :
 - Non-hemolytic and alfa-hemolytic streptococci
 - Neisseriae, staphylococci,difteroides, pneumonococci,
 - Haemophili , mycoplasma and prevetollea a

Upper Respiratory Tract

- Small bronchi and alveoli are normally sterile.
- Infections of mouth and respiratory tract are usually caused by oronasal flora.
- Aspiration of saliva may result in pneumoniae, lung abscesses, empyema.

Intestinal Tract

- At birth intestine is sterile.
- Breast-fed children intestine colonized with streptococci and lactobacilli.
- Bottle-fed children intestine colonized with mixed flora.
- Newborns in ICU bowels colonized with enterobacteriaceae.

Intestinal Tract

- In normal adult esophagus contains bacteria.
- Stomach contains 10^3 - 10^5 bacteria gram of content.
- Acid Ph of stomach protect against infection with enteric pathogens.
- Intestinal Ph is alkaline, resident flora increase in bowel.

Intestinal Tract

- Anatomic location bacteria per gr
- Adult duodenum: 10^3-10^6
- Jejunum and ileum: 10^5-10^8
- Cecum and transvers colon 10^8-10^9
- Sigmoid colon and rectum $>10^{11}$

Intestinal Tract

- In the upper intestine lactobacili and enterococci predominant,
- Lower ileum and cecum the flora is fecal.
- Adult colon %96-99 resident flora consist of anaerobs
 - Bacteroides
 - Fusobacterium
 - Anaerobic lactobacilli
 - Clostridia
 - Anaerob gr(+) cocci

Intestinal Tract

- Adult colon %1-4 flora consist of facultative aerobs
 - Gr(-) koliform acteria
 - Enterococci
 - Pseudomanas
 - Lactobaclli
 - Candidae
- More than 100 distint types of bacteria regularly can occur in fecal flora.

Intestinal Tract

- Intestinal bacteria are important:
 - Synthesis of vitamin K
 - Conversion of bile pigments and bile acids
 - Absorption of nutrients and breakdown products
 - Antagonism to microbial pathogen

Anterior urethra

- The anterior urethra of both sexes contains small numbers of bacteria, same types with skin and perineum.
- These organisms regularly appear in voided urine in numbers of 10^2 - 10^4 ml.

Vagina

- Soon after birth, aerobic lactobacilli appear in the vagina, persist several weeks. (Ph acid)
- When the Ph becomes neutral a mixed flora bacilli and cocci is present (until puberty)
- In puberty aerobic lactobacilli reappear in large numbers (Ph acid)

Vagina

- In puberty reappears of lactobacilli is an important mechanism to preventing harmful microorganisms in the vagina
- If lactobacilli are suppressed by the way, yeast and various bacteria increase in numbers and cause irritation and inflammation
- After menopause, lactobacilli decreases and mixed flora return

Vagina

- The normal flora includes group B streptococci in as many as 25% of women childbearing age.
- During the birth baby infected group B streptococci, which subsequently may cause neonatal sepsis and meningitidis.

Blood

- Occasionally commensals bacteria from mouth, nasopharynx and GIS are carried into the blood.
- Under normal conditions, they are eliminated
 - By normal defense mechanisms
 - Phagocytosis by RES

Blood

- Simple manipulations
 - Chewing
 - Tooth brushing
 - Dental work
 - Genitourinary catheterization
 - Endoscopic examination
 - Can be resulted with transieny bacteremia.

Blood

- This simple manifestations are little consequence in the normal host.
- In the presence of
 - Abnormal heart valves
 - Prosthetic heart valves
 - Other prosthetic devices
 - These bacteremias may lead to colonization and infection

Don't forget

