

BENEFICIAL ROLES OF NORMAL FLORA

1. **Synthesize and excrete vitamins** in excess of their own needs, which can be **absorbed as nutrients** by their host.

For example, in humans, enteric bacteria secrete **Vitamin K and Vitamin B12**, and **lactic acid bacteria** produce certain B- vitamins.

2. **Prevent colonization** by pathogens by competing for attachment sites or for essential nutrients.
3. **Antagonize other bacteria** through the production of substances which **inhibit or kill nonindigenous species**. The intestinal bacteria produce a variety of substances like fatty acids and peroxides to highly specific bacteriocins, which inhibit or kill other bacteria.

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- 4. Stimulate the development of certain tissues, i.e., the caecum and certain lymphatic tissues (Peyer's patches) in the GI tract.**
- 5. Stimulate the production of natural antibodies.** Since the normal flora behave as antigens in an animal, low levels of antibodies produced against components of the normal flora are known to cross react with certain related pathogens, and thereby prevent infection or invasion.

NORMAL FLORA OF THE SKIN

- The **skin microflora** are microorganisms that are resident on our skin. Also called as the **skin microbiota or the skin microbiome**.
- An average adult human is covered with approximately 2m² of skin. It has been estimated that this **surface area supports about 10¹² bacteria**.

NORMAL FLORA OF THE SKIN

Resident microorganisms- Resident microbiota are found in the upper parts of the **epidermis and congregated in and around the hair follicles.**

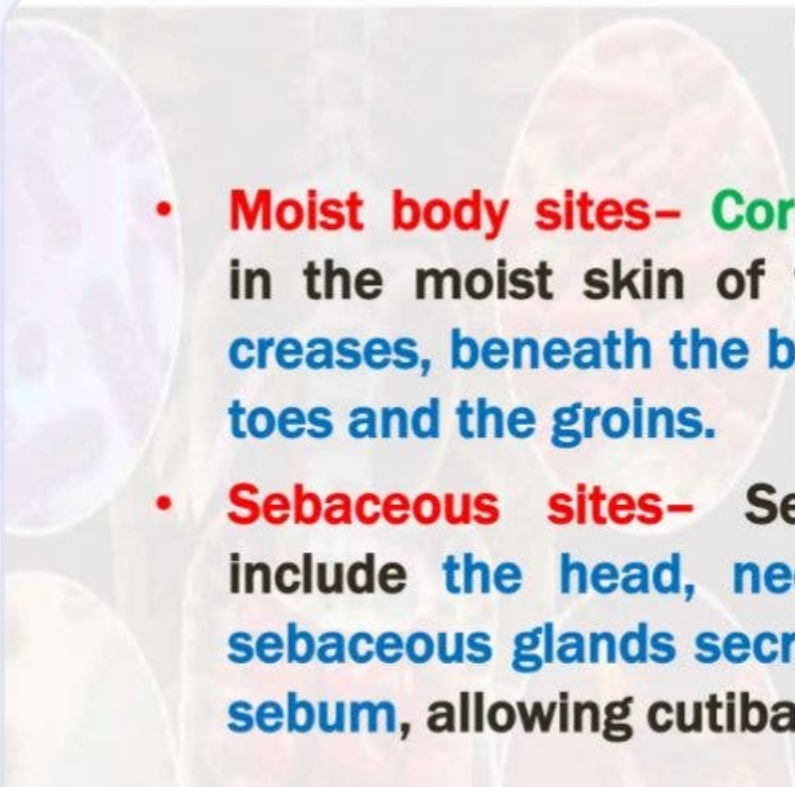
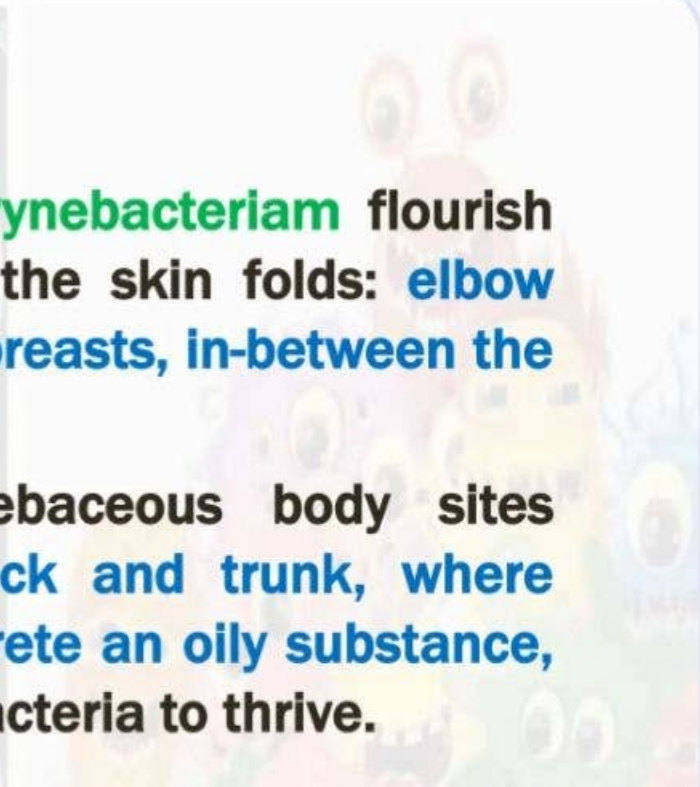
They include:

- Staphylococcus
- Micrococcus
- Corynebacterium
- Brevibacterium
- Dermabacter
- Malassezia Transient bacteria

SKIN SITES

Skin sites can be grouped into three types:

- Dry
- Moist
- Oily
- **Dry body sites**– Dry sites include the forearms, hands, legs and feet. They have the most diverse microbiota, due to high exposure to the external environment.

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- **Moist body sites**– **Corynebacterium** flourish in the moist skin of the skin folds: **elbow creases, beneath the breasts, in-between the toes and the groins.**
 - **Sebaceous sites**– Sebaceous body sites include the head, neck and trunk, where sebaceous glands secrete an oily substance, **sebum**, allowing cutibacteria to thrive.

NORMAL FLORA OF THE CONJUNCTIVE

- The conjunctiva is relatively free from bacteria due to the flushing action of tears due to the **presence of lysozyme**.
- The prominent organisms are *corynebacterium xerosis* *staph. Epidermidis*, *moraxella apecies* and non hemolytic streptococci.

NORMAL FLORA OF NOSE AND NASOPHARYNX

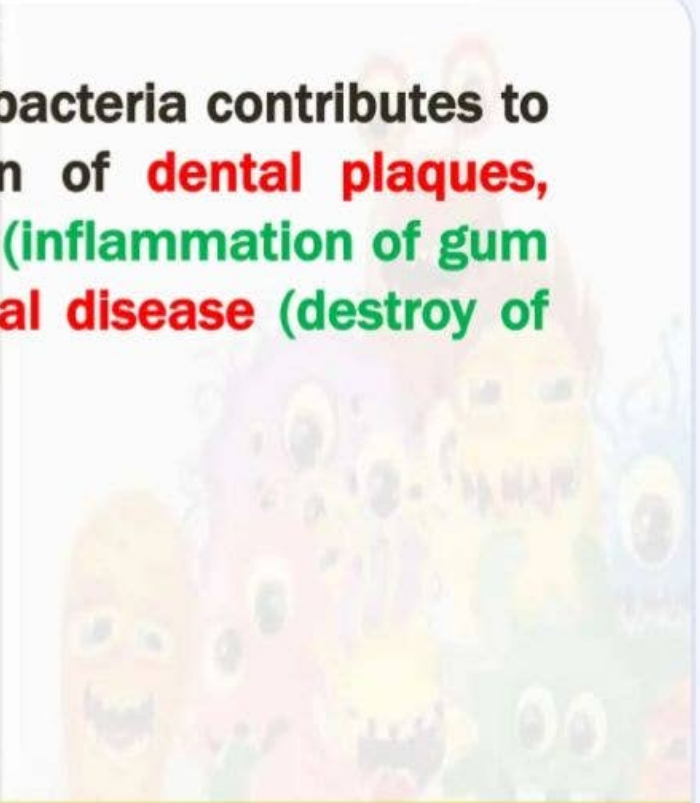
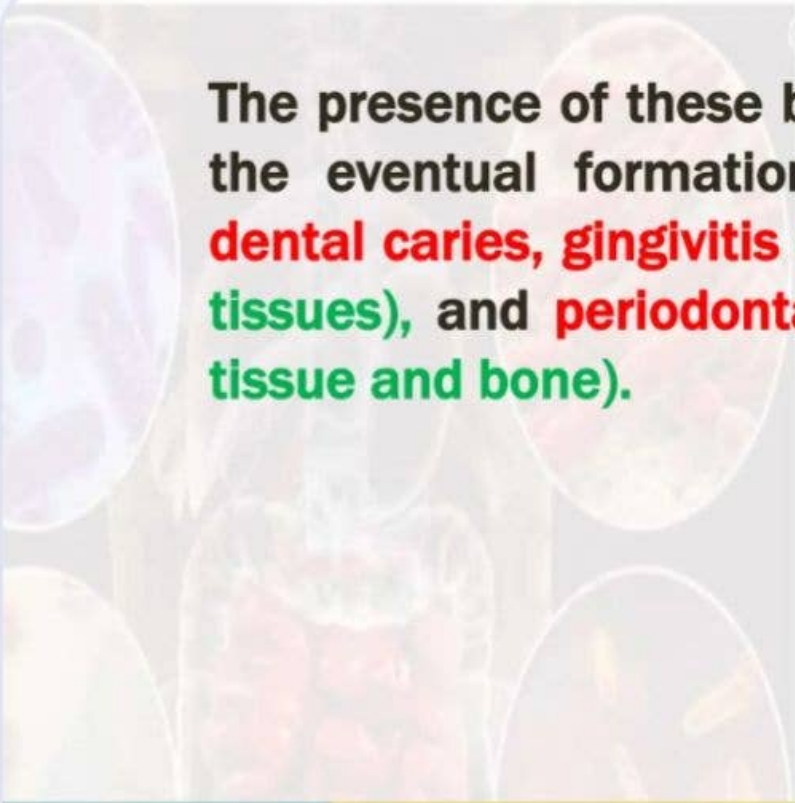
- The flora of nose harbor, **diptheroids**, **staphylococci**, **streptococci** and *hemophilus* species.
- The **nasopharynx** is a natural habitat of the common pathogens which cause infections of the **nose, throat bronchi and lungs**.

NORMAL FLORA OF ORAL CAVITY

- The **oral cavity or mouth** is totally free of microorganisms at the time of birth, but it is colonized by microorganisms from the surrounding environment within hours after a human baby is born.
- In the beginning the microbial flora that establish in the mouth belong to the **genera Streptococcus, Neisseria, Actinomyces, Veillonella, Lactobacillus, and some yeasts.** These initial microorganisms are **aerobes and obligate anaerobes.**

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- When the first teeth erupt, the **anaerobic forms** (e.g., **Porphyromonas**, **Prevotella**, **Fusobacterium**) dominate as the space between the **teeth and gums is anaerobic**.
- Later on, **Streptococcus spp.** come on to the **enamel surfaces of teeth**, and also attach to the **epithelial surfaces and colonize saliva**.



The presence of these bacteria contributes to the eventual formation of **dental plaques**, **dental caries**, **gingivitis** (inflammation of gum tissues), and **periodontal disease** (destroy of tissue and bone).

NORMAL FLORA OF RESPIRATORY TRACT

- A large number of bacterial species inhabit the upper respiratory tract.
- The normal microflora of the nose occurs just inside the nostrils, and consists of Staphylococci, Streptococci, Neisseria, Haemophilus, etc. Out of these *S. aureus* and *S. epidermidis* occur predominantly in approximately the same numbers as on the skin of the face.

The background of the slide is a composite image. On the left, there are several circular inset images showing microscopic views of various microorganisms, including what appear to be bacteria and fungi. On the right, there is a cartoon illustration of a group of colorful, friendly-looking microorganisms with large eyes and smiling faces. The text is overlaid on the left side of this background.

The **lower respiratory tract (trachea, bronchi, and lungs)** has no resident microflora, despite the large numbers of **microorganisms** potentially able to reach this region during breathing.

NORMAL FLORA OF THE DIGESTIVE TRACT

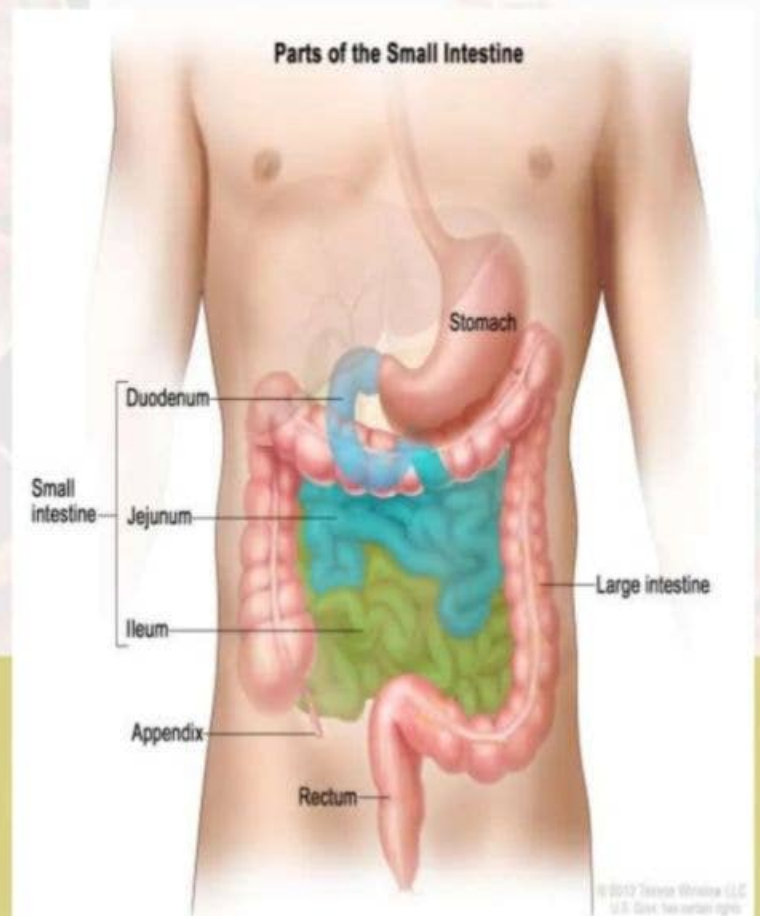
- The **stomach** contains fewer bacteria due to its high acidity nature. However, there are some bacteria that survive there like the **Helicobacter Pylori** that is currently proving to be the cause of most cases of **gastritis and peptic ulcers**.

- Likewise, the **small intestine** contains small numbers of **Streptococci, Lactobacilli, and yeasts**, particularly **Candida albicans**. Nevertheless, bigger numbers of these bacteria are found **in the lower parts of the ileum**.
- The colon is the main site for bacteria in the body.
- Several bacteria like **Bacteroides, Bifidobacterium, Eubacterium, Coliforms (e.g. E. coli), Streptococcus, Lactobacillus and Clostridium** reside in the large intestine.

NORMAL FLORA OF THE DIGESTIVE TRACT

Normal flora of the small Intestine

The small intestine is anatomically divided into three areas: the duodenum, jejunum, and ileum.



- The **duodenum**, adjacent to the stomach, is fairly acidic and contains few **microorganisms** (**gram- positive cocci and bacilli bacteria**) because of the combined influence of the acidic fluids of stomach and the inhibitory effect of bile and pancreatic secretions. **Lactobacilly diphtheroids, Enterococcus faecalis, and Candida albicans (yeast) occasionally occur in the jejunum.**

- In **ileum**, the distal part of the small intestine, the pH becomes more alkaline and, as a result, **anaerobic gram- negative bacteria** and members of the family **Enterobacteriaceae** occur in it.

NORMAL FLORA OF THE DIGESTIVE TRACT LARGE INTESTINE

- The **large intestine or colon** contains the **largest number of bacterial** community in human body.
- The large intestine or colon acts as a **fermentation vessel**, and the microflora of it consists primarily of **anaerobic, gram-negative, nonsporing bacteria** and **gram-positive, spore-forming, and nonsporing bacilli**.

NORMAL FLORA OF THE UROGENITAL (GENITOURINARY) TRACT

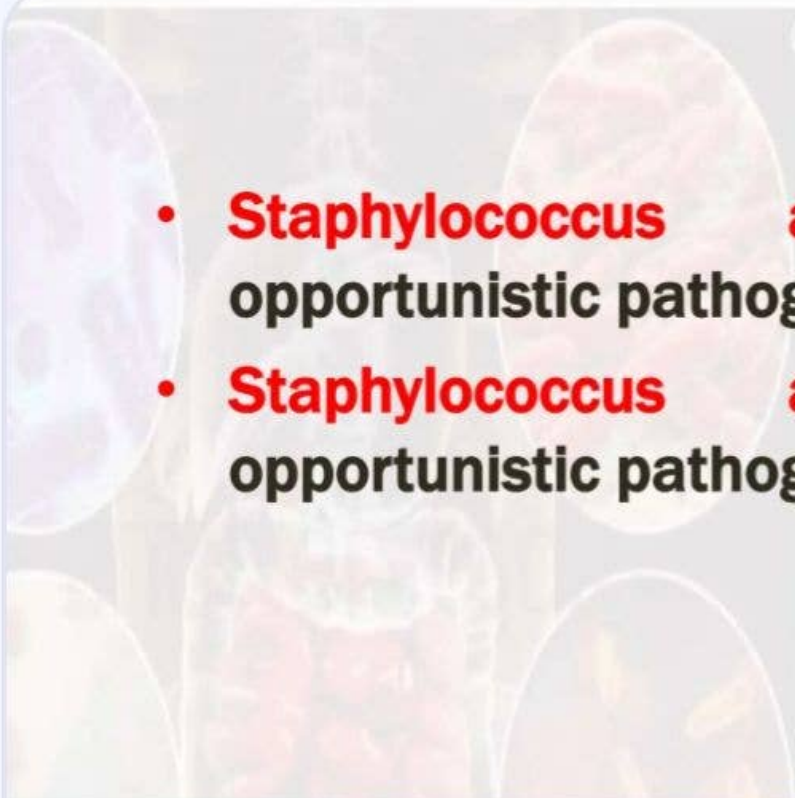
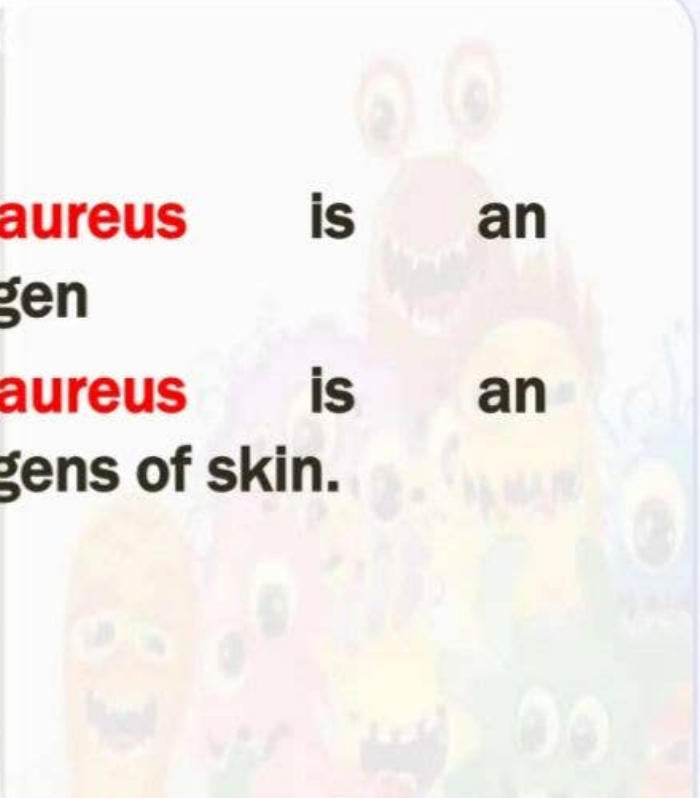
- The **uninary bladder** itself is sterile in both male and female urogenital tracts, but the **epithelial cells lining the urethra are colonized** by **gram-negative facultatively aerobic cocci and bacilli bacteria** (e.g., *Staphylococcus epidermidis*, *Enterococcus faecalis*, *Corynebacterium* spp)
- The **genital tract (vaginal tract)** of an adult female, because of its large surface area and mucous secretions, possesses complex microflora.

NORMAL FLORA OF THE UROGENITAL (GENITOURINARY) TRACT

- It is weakly acidic and contains significant amounts of the **polysaccharide glycogen**. **Lactobacillus acidophilus** ferments glycogen to produce lactic acid and maintains the acidic condition.
- Other microbes such as **yeasts (Torulopsis and Candida species)**, **Streptococci**, and **E. coli** may also be present.
- Vaginal microflora constantly changes between puberty and the menopause.

OPPORTUNISTIC PATHOGENS

- A pathogen is a microorganism that is able to produce disease. **Salmonell typhi cause typhoid disease so it's a pathogen.**
- An infectious microorganism that is normally a commensal or **does not harm its host** but can **cause disease when the host's resistance** is low is called as opportunistic pathogens.

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- **Staphylococcus aureus** is an opportunistic pathogen
 - **Staphylococcus aureus** is an opportunistic pathogens of skin.

- In normal condition **S. aureus** lives as commensal in skin but it causes **opportunistic wound infection** when skin is damaged by **burn, wound, biting, scratching etc.** from the damaged skin, bacteria enters into **deeper tissue and multiplies to give pus filled lesions.**
- **Staphylococcus aureus** is also as opportunistic pathogen of upper respiratory tract.

- In normal condition, **S. aureus** is commensal in nasal chamber but **it causes secondary bacterial pneumonia in immunocompromised host.**
- Patient infected with influenza or measles virus infection are **at very high risk of S. aureus infection.** Virus infection **damages the mucus lining of respiratory tract** so that deeper soft tissue is exposed to commensal flora **i.e. Streptococcus aureus** which penetrates and causes secondary bacterial infection.