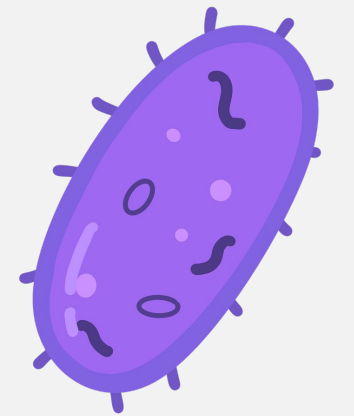
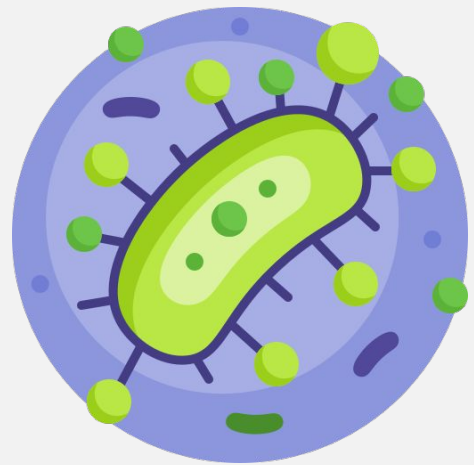


Editing File

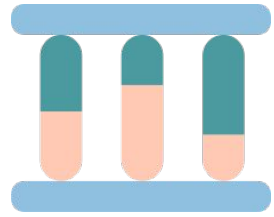
# Normal Flora



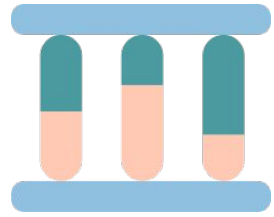
index:

- Main text.
- **Important.**
- In boys slides only.
- In girls slides only.
- Doctors notes.
- Extra info.

# OBJECTIVES



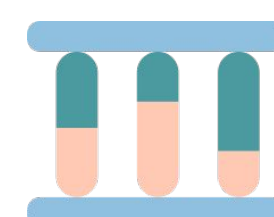
Define the terms: Normal Flora, Transient flora and carrier state



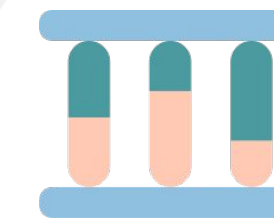
Know the origin of normal flora

Know the effects and importance of normal flora e.g.:

- A. Source of opportunistic infection
- B. Immunostimulation
- C. Nutrition: Vitamins Production
- D. Production of carcinogens
- E. Protection against external invaders



Know areas of the body with normal flora (gastrointestinal tract, urogenital tract, and skin), most common types of organisms in these areas and relation to pathogenicity of these organisms.



Know the sites of the body with no normal flora eg. sterile body sites and the importance of this fact in relation to interpretation of culture results

# Introduction :

## Normal Flora

Definition: A population of microorganisms (mostly bacteria) in a **normal healthy individual** (humans & animals)

It is a symbiotic relationship between the body & the normal flora (close association with no harm)

It is **subject to constant change**

It **can be altered by antimicrobial agents**

They are frequently found in the: skin, mucous membrane, and other sites

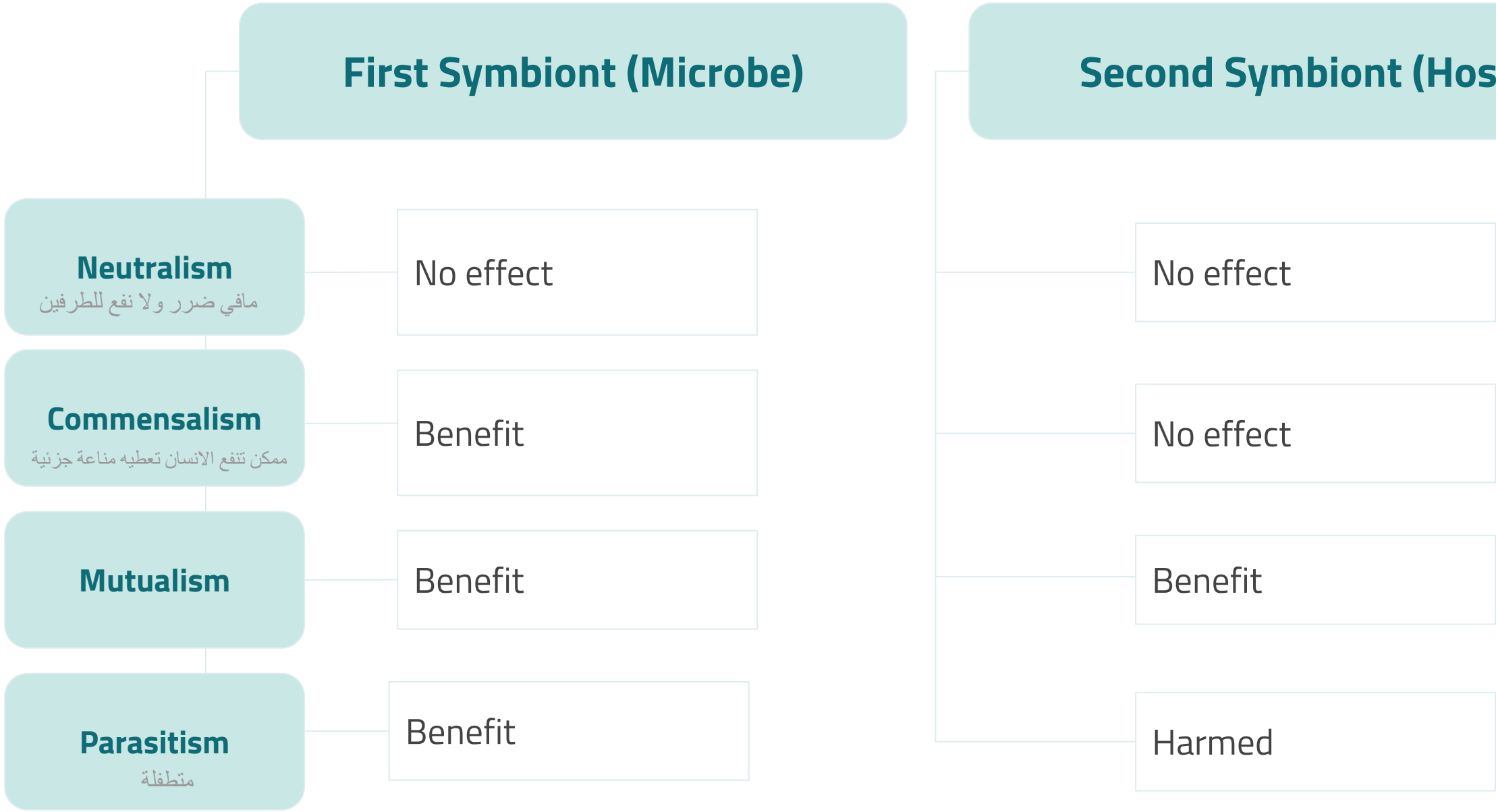
Viruses can't be normal flora.



# Types of Normal Flora :

Commensals	Residents	Carrier State	Transient Flora
<p>Microorganisms that have natural relationship with the host. <b>(No harm to the host)</b></p>	<p>Consist of relatively fixed types of microorganisms. Regularly found in a given area at invariable period. If disturbed promptly re-establish itself.</p>	<ul style="list-style-type: none"> <li>◀ Potentially pathogenic bacteria that are carried by the individual <b>without causing disease.</b></li> <li>◀ However, it is the source of infection to other susceptible (non-immune) individuals.</li> </ul>	<p>.Consist of <b>nonpathogenic or potential pathogenic</b> microorganisms that inhabit the skin or mucous membrane for hours or days.</p> <p>Transient organisms living in the external environment are attracted to moist and warm body sites.</p> <p>Establish itself briefly, excluded by host defense or competition from resident flora <b>(days-weeks)</b></p>
<p>Found in low number and has no benefit or harm. Mainly associated with the GIT.</p>	<p><b>Present for invariable period (months-years)</b></p>	<p>Examples: <b>Neisseria meningitidis (N.meningitidis)</b> and <b>Streptococcus pneumoniae (S. pneumoniae)</b> in the throat of healthy individual</p> <p>Carrier state is not normal flora completely (carried). It's pathogenic.</p>	<p><b>Exist temporarily for the following reasons:</b></p> <ul style="list-style-type: none"> <li>-They are washed by hand wash or bathing</li> <li>-Killed by substances produced by resident flora</li> <li>-Competition by resident flora</li> <li>-May not survive in acidic or alkaline PH of the body site</li> <li>-May be flushed away by body secretions like tears, sweat, oil, urine, and feces</li> </ul>

# Symbiosis :



**Neutralism**  
مافي ضرر ولا نفع للطرفين

No effect

**Commensalism**  
ممکن تنفع الانسان تعطيه مناعة جزئية

Benefit

**Mutualism**

Benefit

**Parasitism**  
متطفلة

Benefit

**Second Symbiont (Host)**

No effect

No effect

Benefit

Harmed

sciencenotes.com

### Symbiosis

Symbiosis is an ecological relationship between organisms of different species.

**Mutualism**  
*both species benefit*  
humans and gut bacteria

**Commensalism**  
*one benefits, other is unaffected*  
cattle egret and cattle

**Parasitism**  
*one benefits, other is harmed*  
ticks and dogs

# Normal Flora :

## Origin:

Fetus (Newborn) is sterile in uterus

After birth, **newborn exposed to the flora of mother's genital tract, skin, respiratory tract flora** of individuals handling him and the organisms in the environment

sterile=مناطق في الجسم تحت الظروف الطبيعية تكون خالية من الكائنات الدقيقة



## Beneficial Effects

### Immunostimulation

Antibody Production/development

### Exclusionary Effect (Vacuum Effect)

Protection from external invaders

### Production of essential nutrients (Vitamin K&B)

By some normal intestinal flora  
Eg. **E.coli**  
Kill other bacteria by producing toxins

### Antagonize

Inhibit or kill (antagonize) non-indigenous bacteria through the production of substances (toxin)

# Normal Flora :

## Facts :

### Opportunistic Infections

May be a source of **opportunistic infections** in patients with impaired defense mechanisms.

For example: **Staphylococcus epidermidis & E.Coli**

تستغل ضعف المناعة وتسبب عدوى

2

### Cross Reacting

Some may **cross react with normal tissue** components, eg. **Antibodies** to various ABO groups arise because of cross reaction between intestinal flora and the antigens of A & B blood substances

يعني الجهاز المناعي يتفاعل مع الفلورا الطبيعية كأنها عامل ممرض وينتج أجسام مضادة

1

### Production of Carcinogens

Some normal flora may modify through their **enzymes chemicals** in our diets into **carcinogens**

Eg. **Artificial sweeteners** may be enzymatically modified into bladder carcinogens

3

### Effects on Normal Flora

Normal flora is affected by: Consuming **antibiotics**, tissue damage, **mechanical procedures**, and **diet change**

4

# Normal Flora :

## True Pathogens (Primary)

Full time bad guys

Causes disease in a healthy person

Associated with a specific & recognizable disease

## Opportunistic Pathogens (Secondary)

Part-time bad guys

Causes disease to people with low/weak immunity (Immunocompromised host)

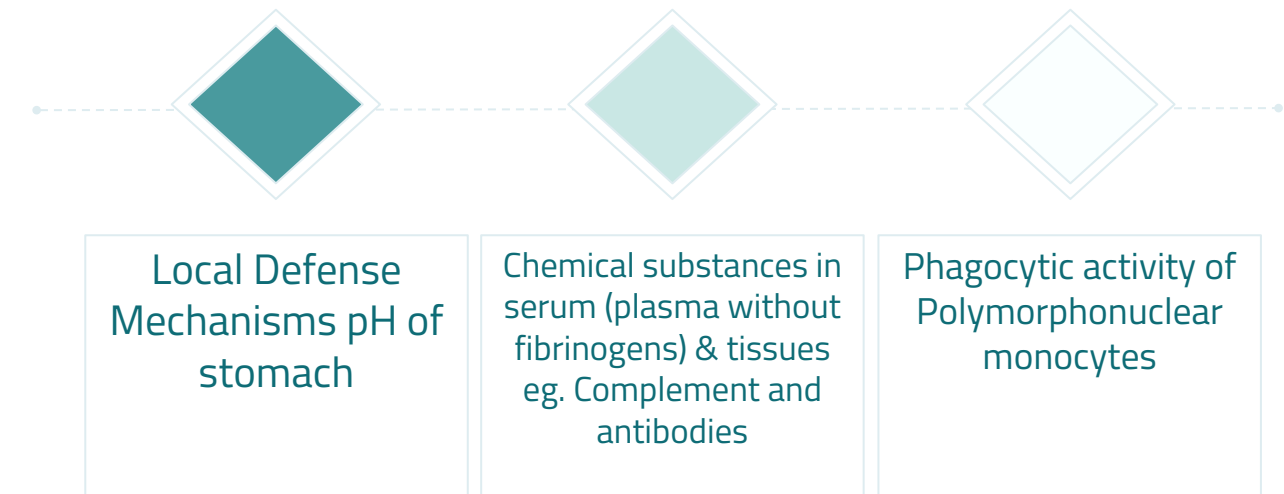
Gain access (Injury) to sterile regions

## Distribution of Normal Flora :

Normal Flora found on external body sites

Internal Organs are sterile at health (except gastrointestinal tract)

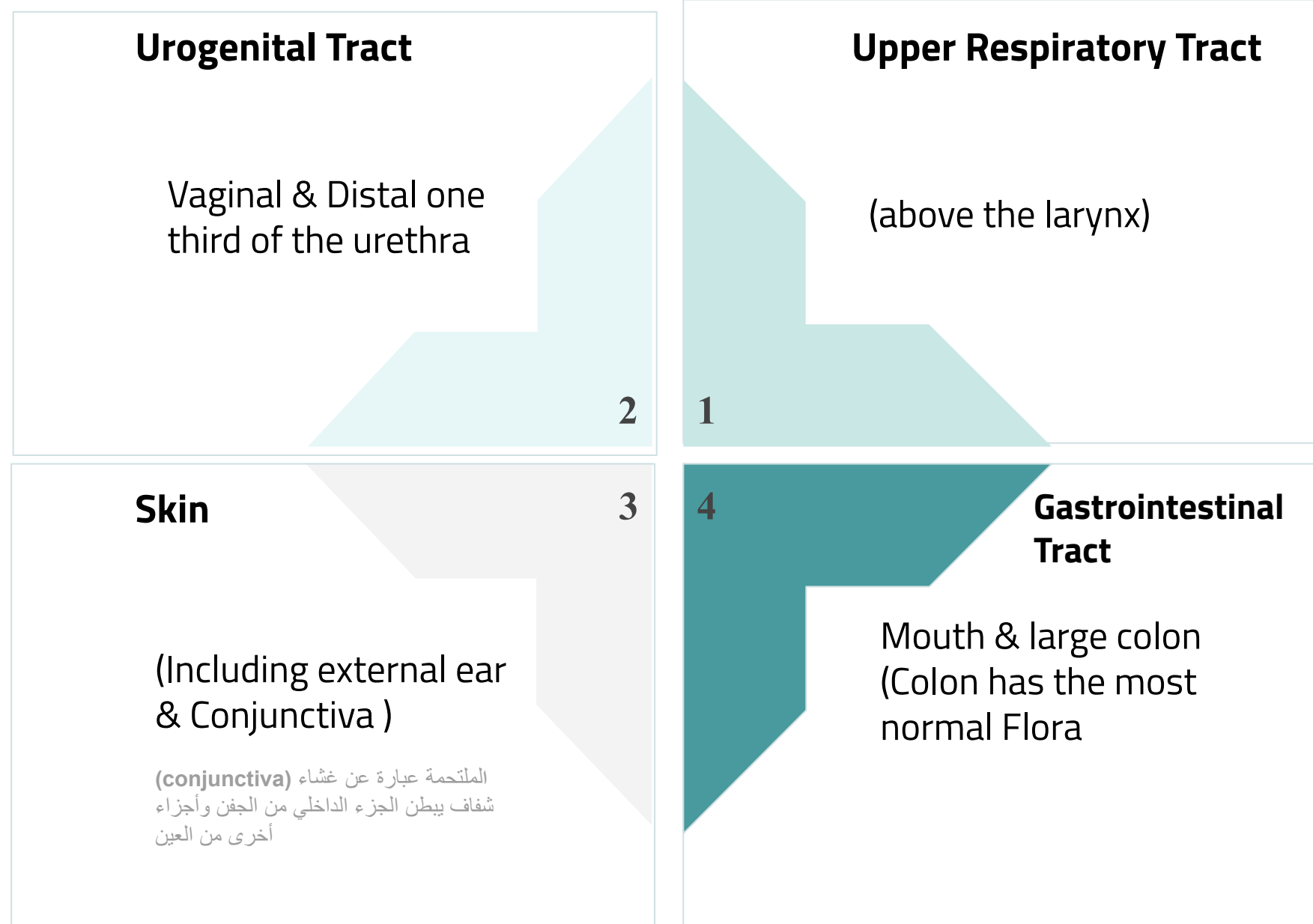
### Sterility of internal organs maintained by:





# Normal Flora :

## Normal Flora in external body:



## Normal Flora in Respiratory Tract:

Upper respiratory tract colonized (full of bacteria) by normal flora as in the mouth and nasopharynx.

Lower respiratory tract is sterile eg. Trachea, lung

### Common nose Flora

**Staphylococcus Epidermidis**

**Staphylococcus Aureus** 30%  
Coagulase(+) It is the main flora in nose, axils and groin

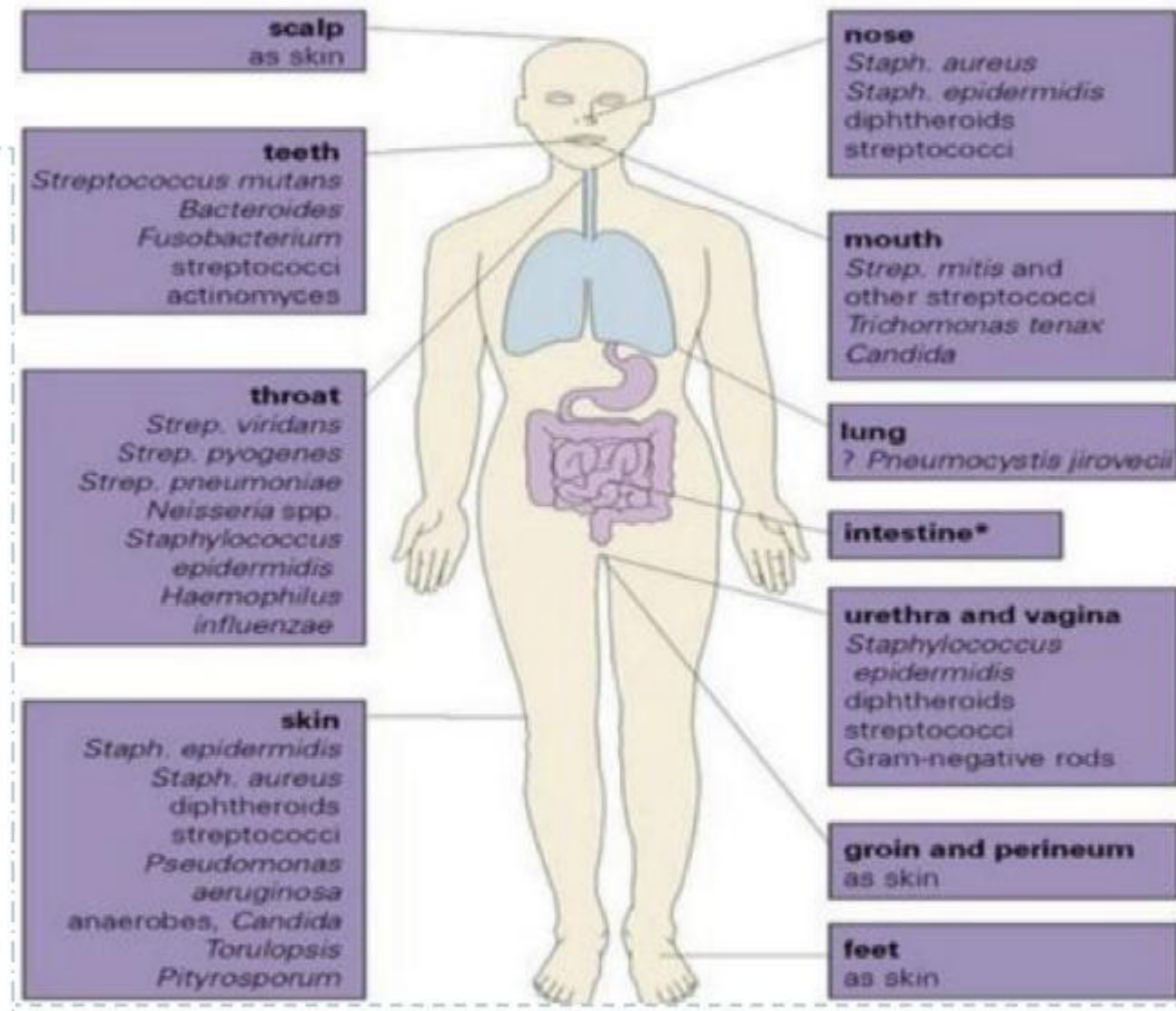
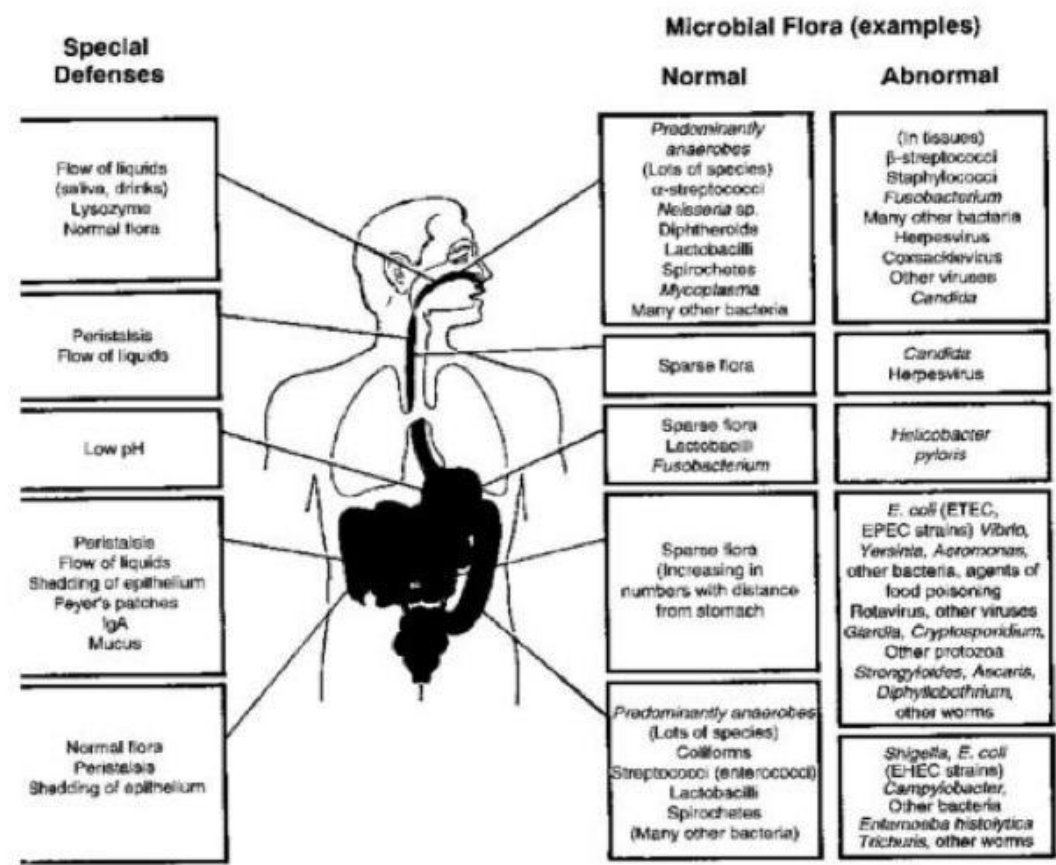
**Corynebacterium Species**

**Note:** Staphylococcus epidermidis is always related to the skin (It's all over the body)

# The sites of Normal Flora in the body:

For your info

No need to memorize all of them, just the ones in our lecture



DISTRIBUTION AND FREQUENCY OF BACTERIA IN THE INTESTINE		
density	frequency of occurrence in population	
oesophagus	lactobacilli	
stomach		
small bowel	lactobacilli streptococci	
duodenum		
jejunum	Enterobacteria Bacteroides spp.	
ileum		
large bowel	Bacteroides spp. Fusobacterium spp. E. faecalis Escherichia coli	Enterobacteria Klebsiella spp. Eubacteria Bifidobacteria
	Lactobacillus Staph. aureus Clostridium spp.	Streptococci Pseudomonas Salmonella
faecal material	Bacteroides spp. Bifidobacteria Eubacteria	Coliforms E. faecalis

# Normal Flora of Oropharynx (Throat):

normally found

- viridans streptococci (MOST COMMON)
- commensal neisseria and moraxella
- corynebacteria
- bacteroides
- fusobacteria, vanella, actinomyces, spirochaetes

potential pathogens

- Haemophilus influenzae
- pneumococcus (streptococcus pneumoniae)
- less common :
- streptococcus pyogenes
- neisseria meningitidis

# Normal Flora Of Feces (stool)

- 1/3 of feces weight is bacteria, mainly dead bacteria.
- living bacteria about  $10^{10}$ /gm of stool.
- mainly gram -ve.

anaerobes (99%) لا هوائية	aerobics هوائية
1) bacteroides fragilis group (dominant anaerobes) 2) bifidobacteria 3) lactobacilli	1) E.coli 2) proteus

Anaerobic environment is maintained by aerobic bacteria utilizing free O<sub>2</sub>  
 البكتيريا الهوائية تمتص الاوكسجين وتخلي الوسط والبيئة مناسبين للبكتيريا اللاهوائية

# Normal Flora Of GIT

gingival margin debris & dental plaque: continually colonized (full) by bacteria.

تراكم الفلورا الطبيعية يكوّن مادة لزجة غير مرئية تتشكل على هيئة طبقة رقيقة على أسطح الأسنان وأنسجة اللثة

esophagus normal flora similar to pharyngeal flora

## Normal flora of GIT

اللغاب: **slavia**  
contains  $10^8$  bacteria /ml

**Stomach has limited flora (sterile) due to gastric acid.** (during eating, it will have bacteria, after digestion it will be gone)

**large intestine: heavily colonized by bacteria**

small intestine: Duodenum, jejunum & upper ileum have scanty flora (from food)



- the colon and large intestine contains anaerobic and both gram - ve and + ve bacteria
- colon has the most normal floral

# Normal Flora of Genital Tract :

- kidney bladder and fallopian tube are sterile.
- Female genital tract heavily colonized because the female's external genital tract is shorter than male's.
- $10^8$ /ml flora in normal vaginal secretion.
- In both sexes **Mycobacterium smegmatis** in secretions contaminates urine and leads to confusion /misdiagnosis of tuberculosis
- Male & Female distal urethra (مجرى البول):
  - **Staphylococcus epidermidis**
  - Corynebacteria.
  - Mycoplasma species

الـ myobacterium smegmtatis الموجودة في الافرازات  
تلوث أو تشوب urine وبالتالي يصير تشخيص خاطئ أحيانا، لأن  
شكلها تحت المجهر يشبه شكل بكتيريا الدرن  
(Mycobacterium tuberculosis)

\*Reason for acidity of the vagina; it provide protection for female

## Normal Flora Of The Female Genital Tract:

Vulva (external part)	Vagina (Inside)
<ul style="list-style-type: none"> <li>▸ <b>Staphylococcus epidermidis</b></li> <li>▸ <b>Corynebacteria</b></li> <li>▸ E.coli</li> <li>▸ other coliforms &amp; Enterococcus faecalis</li> </ul>	<ul style="list-style-type: none"> <li>▸ <b>Lactobacillus</b> (Doderlein's bacilli)</li> <li>▸ Bacteroides melaninogenicus</li> <li>▸ Enterococcus faecalis</li> <li>▸ Corynebacteria</li> <li>▸ Mycoplasma</li> <li>▸ Yeasts</li> </ul>

# Normal Flora of the skin :

- › Fatty acid, lysozymes by sweat glands.
- › Skin has rich resident bacterial flora
- › Exist in microcolonies
- › Anaerobic organisms are predominate in areas with sebaceous glands (الغدد الدهنية)
- (Eg. hair scalp. mostly it will have anaerobic organisms).
- › **moist skin** , often colonized by coliforms ( gram negative bacteria )

## main skin normal flora

**staphylococcus epidermidis**  
Coagulase (-), main flora of skin

**corynebacteria**  
main flora of skin

**propionibacterium acnes**  
it is semi-anaerobic

Anaerobic cocci

coliforms

**staphylococcus aureus (potential pathogen )**  
It is a normal flora, but it is especially dangerous

	Residents	Transient
Site	deeper layers of skin	superficial layers of skin
Duration	permanent	temporary
If distributed	Re- establish themselves	Do not Re- establish themselves
Effect of hand wash	Not removed	easily removed
Association with infection	usually <b>not</b> associated	usually associated

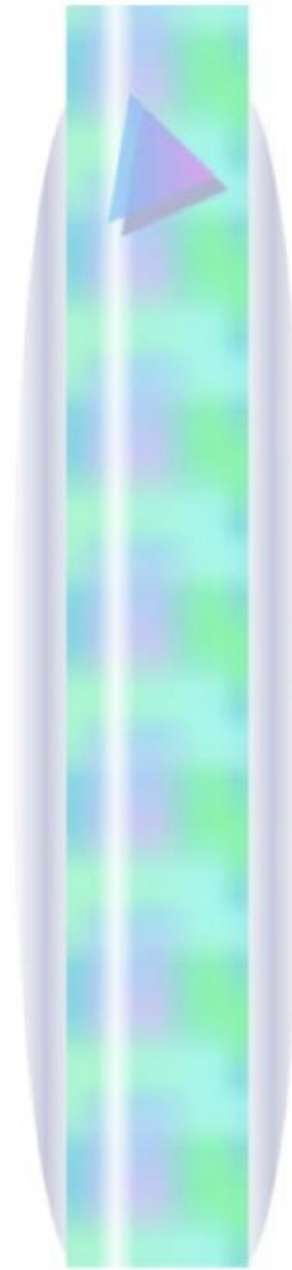
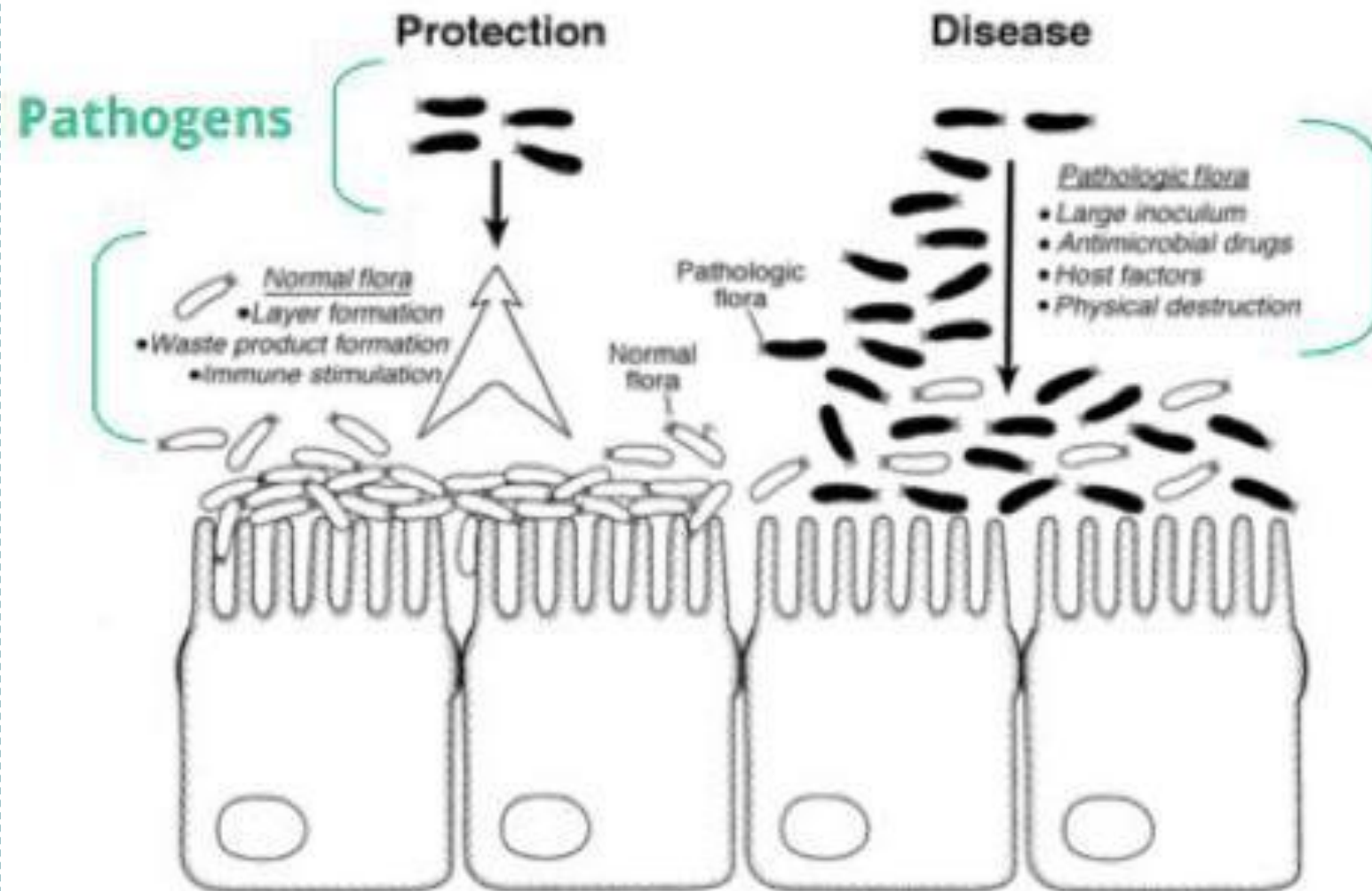
# Normal Flora of the Eye & Ear :

Eye & Ear Flora (both have same as skin but less amount )	
External Auditory Meatus Flora	<ul style="list-style-type: none"><li>- Staphylococcus Epidermidis</li><li>- Corynebacteria</li><li>- Acid Fast Bacilli (AFB) occasionally in wax of the ear</li></ul>
Conjunctiva and Sclera Flora	<ul style="list-style-type: none"><li>- Staphylococcus Epidermidis</li><li>- Corynebacterium Xerosis</li></ul>

- Middle and Inner ear are sterile
- Internal eye is sterile

# Pictures from Slides:

## Normal Flora vs Pathogenic Flora



### **HARMFUL EFFECTS: OPPORTUNISTIC INFECTION**

- Local or generalized host defense mechanisms are compromised
- flora reaches protected areas of body in sufficient numbers
- E. coli → ascend urethra → caused UTI
- Colon perforation → feces in peritoneal cavity (peritonitis)
- Viridians strep → blood → cause bacteremia + physiologic trauma or injury → colonize previously damaged valves → causing bacterial endocarditis



# Summary (the arrows are important)

	Sites	Load / gm	↓ Staphylococcus aureus (Coagulase +)	↓ Other Staph (Coagulase -) Staphylococcus epidermidis	α hemolytic streptococci (streptococci viridans & strept pneumo)	Enterococcus	Neisseria, Moraxella & Hemophilus species	↓ Corynebacteria (diphtheroid)	↓ popionibacterium acnes lactobacillus (the only one found in female's genital tract)	Gram negative bacteria (coliform ie E.coli) قولونيات	pseudomonas	لا هو انبات Anaerobic bacteria (bactericides, fusobacterium & clostridium)	Candida Not bacteria, it's fungi
→	<b>oral cavity / upper respiratory</b>	$10^6$	+ Less		+++		+++					+++	
	<b>Skin</b>			+++				+++	++				
	<b>Eye &amp; ear</b>			+++				+++					
→	<b>Axilla, Groin &amp; nose</b>		+++ More	+++				+++					
	<b>Stomach</b>	$10^2$							+				
→	<b>Small intestines</b>	$10^6$			++				++	++		++	
→	<b>Colon</b> Full of bacteria	$10^{11}$			+++	+++			++	+++	+++	+++	++
	<b>Female genital</b>								+++				

# Quiz

Q1: What place in the body has the most normal flora ?

- |   |      |   |       |   |        |   |       |
|---|------|---|-------|---|--------|---|-------|
| A | skin | B | colon | C | vagina | D | feces |
|---|------|---|-------|---|--------|---|-------|

Q2: Which type of normal flora are potentially pathogenic bacteria that are carried by the individual without causing disease ?

- |   |            |   |           |   |               |   |            |
|---|------------|---|-----------|---|---------------|---|------------|
| A | transients | B | residents | C | carrier state | D | commensals |
|---|------------|---|-----------|---|---------------|---|------------|

Q3: What is an important example of skin flora ?

- |   |                            |   |                    |   |         |   |                       |
|---|----------------------------|---|--------------------|---|---------|---|-----------------------|
| A | staphylococcus epidermidis | B | mycoplasma species | C | E. coil | D | enterococcus faecalis |
|---|----------------------------|---|--------------------|---|---------|---|-----------------------|

Q4: There are multiple types of vagina female genital tract bacteria but the important type is ?

- |   |                             |   |        |   |                                     |   |                |
|---|-----------------------------|---|--------|---|-------------------------------------|---|----------------|
| A | bacteroides melaninogenicus | B | yeasts | C | lactobacillus (doderlein's bacilli) | D | corynebacteria |
|---|-----------------------------|---|--------|---|-------------------------------------|---|----------------|

Q5: What is the main benefit of normal flora ?

- |   |                                   |   |                                     |   |                          |   |                                   |
|---|-----------------------------------|---|-------------------------------------|---|--------------------------|---|-----------------------------------|
| A | helps bacteria to cause infection | B | doesn't produce essential nutrients | C | doesn't produce antibody | D | protection from external invaders |
|---|-----------------------------------|---|-------------------------------------|---|--------------------------|---|-----------------------------------|



# MEET THE TEAM

## Leaders

Leena Shagrani

Abdulaziz Alanazi

Lujain Darraj

Huda bassam

Jenan Al-Sayari

Nora Alturki

Bassmah fahad

Dana Abu Alamah

Madaen Alarifi

Rahaf Alaklabi

Monirah shojaa

AlJawharah alyahya

Layal alkhalfah

Aram alzahrani

Noor AlTalag

Norah Albahily



## Members



Ziyad Bukhari

Fasial Alamoud

Ibrahim Albabtain

Mohammed Alsahali

Abdullah Khalid

Abdulrahman Alnafisah

Khalid Alghamdi

