MED437
KING SAUD UNIVERSITY

MICROBIOLOGY
437

Microbiology – Lecture 2
Normal Flora

TEAM 437

Red: important
Green : doctor notes
Black : original slides
Grey: extra information

In this link, you will find any corrections or notes unmentioned in the team's work. Please check the link below frequently.

https://docs.google.com/presentation/d/1yIQt3G8UDFG6xYMRhXkTk-dS54NeTfhJaPe_y0M-kjk/edit?usp=sharing

Objectives

MICROBIOLOGY
437

1. Define the terms: Normal Flora, Resident flora, Transient flora and carrier state
2. Know the origin of normal flora.
3. Know the importance of normal flora with examples, including importance as: Source of opportunistic infection., Immunostimulation, Nutrition: Vitamins production, Production of Carcinogens, Protection against external invaders.
4. Know areas of the body with normal flora (GIT, Urogenital tract, and skin) and most common types of organism in these areas and relation to pathogenicity of these organism.
5. Know sites of the body with no normal flora e.g. sterile body sites and the importance of this fact in relation to interpretation of culture results.

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437

Normal flora

What is **Normal flora?**

They are a population of microorganisms that are frequently found on the skin ,mucous and other sites in a normal healthy individual.

Some are found in association with humans and animals. The Majority are bacteria.

- Has symbolic relationship with the host.
- Subject to constant changes.
- Altered by antimicrobial agents.

Origin of Normal Flora:

1) Newborn is sterile in uterus.

2) After birth , newborn is exposed to flora of mother's genital tract, skin, respiratory tract, flora of those handling him , and the organisms in the environment.

Beneficial Effects of Normal Flora

1- I**mmunostimulation** (*antibody production*)

2- **Exclusionary effect** (*vacuum effect*) and protection from external invaders.زي حرس الحدود

3- **Antagonize** other bacteria through the production of substances that inhibit or kill non-indigenous bacteria.

4-**Production of essential nutrients** (Vitamin K & B) by some normal intestinal flora eg. *Eschericia coli (E.coli).*

Facts About Normal Flora

May be a **source of opportunistic infections** in patients with impaired defense mechanisms. eg. *Staphylococcus epidermidis & E.coli*. Found in skin

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

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.

Especially to those who use them often

Affected by antibiotics, tissue damage, mechanical procedures and diet change.

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437

Types of Normal Flora

متعايشة
Commensals

Microorganisms that have natural relationship with the host. Found in low number and has no benefit or harm .
Mainly associated with the GIT.

Residents

Consist of relatively fixed types of microorganisms . Regularly found in a given area at invariable period. If disturbed promptly re-establish itself .

Note: they are subject to constant changes

Transients

Consist of **nonpathogenic** or **potential pathogenic** microorganisms that inhabit the skin or mucous membrane for hours or days. Establish itself briefly , excluded by host defense or competition from residents flora.

Carrier flora potentially pathogenic and are present without symptoms because the person caring it has immunity

Carrier state

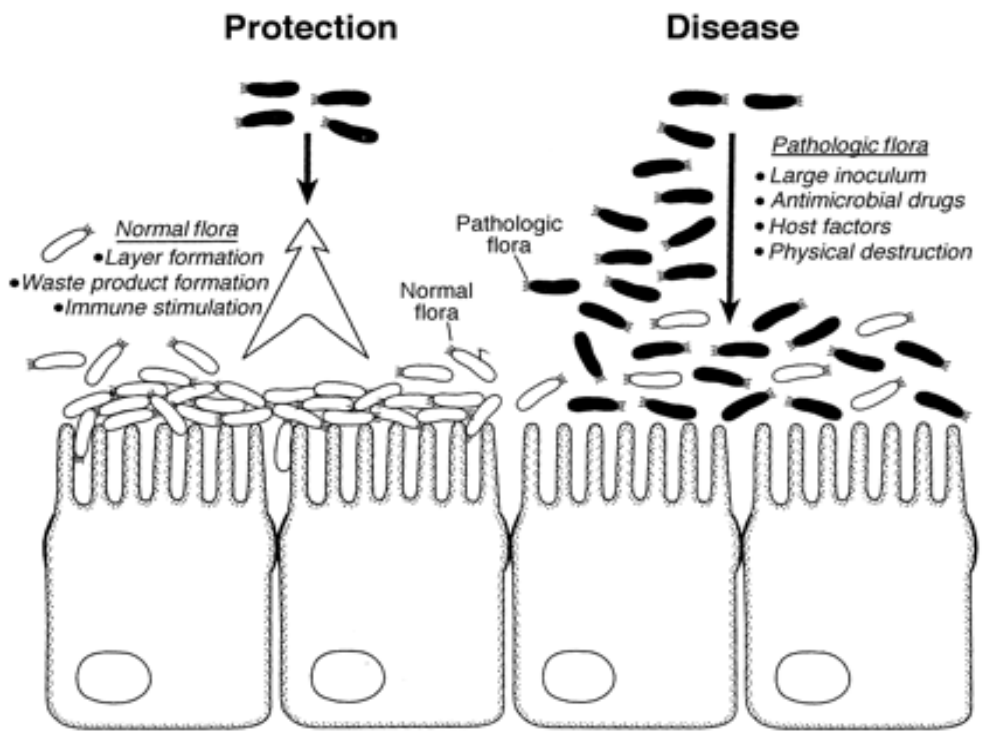
Potentially pathogenicthat are carried by the individual without causing disease. However, it is the source of infection to other susceptible (non-immune) individual. , eg. *Streptococcus pneumoniae, Neisseria meningetidis* in throat of healthy individual

Transietes cont.

Exist temporarily for the following reasons:

- they are washed by hand wash or bathing
- competition by resident flora
- killed by substances produced by resident flora
- may not survive in acidic or alkaline PH of the body site
- may be flushed away by bodily secretions like tears, sweat, oil urine,feces,..etc.

Normal Flora *vs* Pathogenic Flora



Distribution& Body Sites With Normal Flora

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- All external body sites contain normal flora. Each site having a predominant bacteria.
- Gastro intestinal tract (GIT): mouth & large colon.
- Urogenital tract: vagina & distal one third of the urethra.
- Skin: including external ear & conjunctiva.
- Upper respiratory tract.

Internal organs are sterile at health "except the Gastrointestinal (alimentary)tract".

Sterility maintained by : ❑

Local defense mechanisms ✓

Chemical substances in serum & tissues e.g.: complement, antibodies. ✓

Phagocytic activity of (PMN) Polymorphonuclear Monocytes ✓

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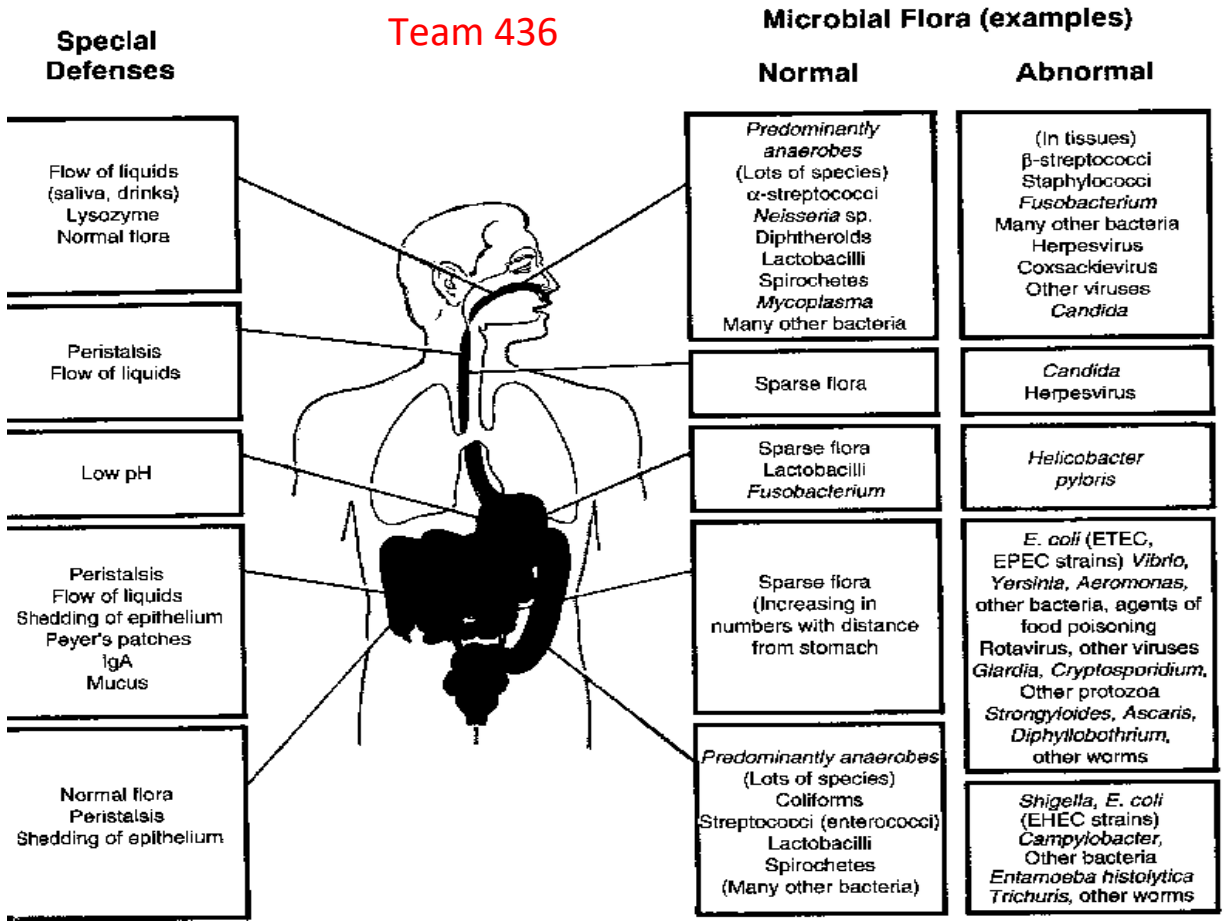


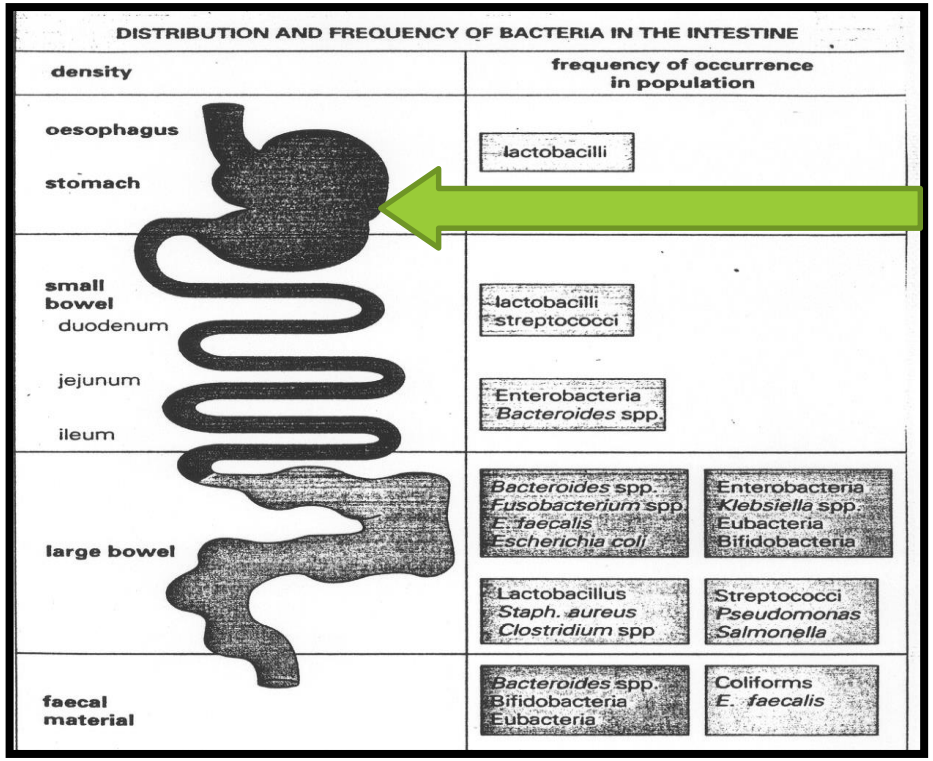
المهم في الصورة هو نعرف توزيع الفلورا في الجسم وكيف أنها تختلف كمية ونوعًا في كل منطقة، فمنطقة الفم والمرئ مليئة بالفلورا، بينما المعدة شبه معقمة، والأمعاء تتواجد فيها الفلورا لكن بشكل أقل من الجزء العلوى من الجهاز الهضمي.

Area	Sites	Normal Flora		Sterile Site	Information
Skin	Anaerobic organisms predominate in areas with sebaceous glands.	Main skin flora: 1) Corynebacteria. 2) Propionibacterium acnes. 3) Anaerobic cocci. 4) Staphylococcus epidermidis. 5) Coliforms {gram negative, moist skin often colonized by it}.	Potential pathogen: Less common: 1) Staphylococcus aureus.		* Skin has rich resident bacterial flora(10^4/cm^2). * Exist as microcolonies. * Fatty acid, lysozymes by sweat glands.
Eye	Conjunctival Sac.	1) Corynebacterium xerosis. 2) Staphylococcus epidrmidis.		Internal eye.	
Ear	External auditory meatus.	1) S. epidermidis. 2) Corynebacteria. 3) Acid fast bacilli (AFB) {occasionally in wax}. Note ;Its normal non-pathogenic		Middle and inner ear.	

MICROBIOLOGY 437

435 note
Any skin has **staph epidermidis** and **corynebacteria**

Area	Site	Normal Flora		Sterile Site	Information
Respiratory Tract	Upper respiratory tract colonized by normal flora as in: 1) mouth. 2) nasopharynx.	Nose Flora: 1) Staphylococcus epidermidis. 2) Staphylococcus aurues 3) Corynebacteria.		Lower respiratory tract e.g.: lung.	
Oropharynx		1) Viridance streptococci. 2) Commensal neisseriae. 3) Corynebacteria. 4) Moraxella. 5) Bacteroides. 6) Fusobacteria. 7) Veillonella. 8) Actinomyces. 9) Spirochaetes.	Potiential pathogen: Most common: 1) Heamophilus inflenzea. 2) Pneumcoccus. Less common: 1) Streptococcus pyogenes. 2) Niesseria meningitidis.		Gram negative bacteria in hospitalize patient.
GIT	Mouth: * Saliva contains 10^8 bacteria/ml. * Gingival margin debris & dental Plaque continually colonized by bacteria. Oesophagus: has normal flora similar to pharyngeal flora. Small Intestine: Duodenum, jejunum& upper ielium have scanty flora. Large intestine: heavily colonized by bacteria.			Empty stomach due to gastric acid.	**Important**: GIT contain mainly Anaerobic, gram–ve and enterococcus bacteria. (but it has 6 types we need to know). **Note**: GIT has Mostly Anaerobic bacteria (highest) because No oxygen in GIT.



Empty stomach is sterile because of low ph

Skin Flora

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Resident organisms	Transient organisms
• In deeper layers of skin	• In superficial layers of skin
• Permanent flora	• Temporary flora
• If disturbed reestablish themselves	• Usually do not reestablish themselves
• Not removed by routine hand wash	• Easily removed by routine hand wash
• Usually not associated with transmission of infection	• Usually associated with transmission of infection

Area	Sites	Normal Flora	Sterile Site	Information
Feces(stool) Site with most normal flora		Anaerobics: Bacteroides fragilis group is the dominant anaerobes. 2) Bifidobacteria. 3) Lactobacill. Aerobics: 1) E.coli. 2) Proteus.		* 1/3 of feces weight is bacteria, mainly dead. * Living bacteria about 10^{10}/gm. * 99% anaerobes. Anaerobic environment maintained by aerobic bacteria utilizing free O2. Less common aerobes.
Urinary tract			Kidney & bladder.	

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437

Area	Sites	Normal Flora	Sterile Site	Information
Genital Tract	In both sexs Distal urethra:	Mycobacterium smegmatis in (AFB) secretions which contaminate urine and leads to confusion /misdiagnosis. Distal urethra: 1) S.epidermidis. 2) Corynebacteria. 3) Mycoplasma species.		
	In Female: Vulva Vagina	Vulva: 1) S. epidermidis. 2) Corynebacteria. 3) E.coli. 4) coliforms. 5) Enterococcus faecalis. Vagina: 1) Lactobacillus (Doderlein's bacilli). 2) Bacteroides melaninogenicus. 3) Enterococcus faecalis. 4) Corynebacteria. 5) Yeasts. 6) Mycoplasma.	Fallopian tube.	* Female genital tract heavily colonized, Why? - {Because it is short compared to the male genital tract. Also, the bacteria from the colon will come to colonize it. This is why we find that the flora in the genital tract is the same as in the colon.} * 10^8/ml flora in normal vaginal secretion.

GIT flora **similar** with the oral cavity with ***2*** types of bacteria •
Oral cavity **differ** then GIT with ***one*** type bacteria •
GIT **differ** with Oral cavity by ***4*** different types •

GIT = most contaminated with 6 types of bacteria

Female genital = least contaminated (only one type)

MICROBIOLOGY 437

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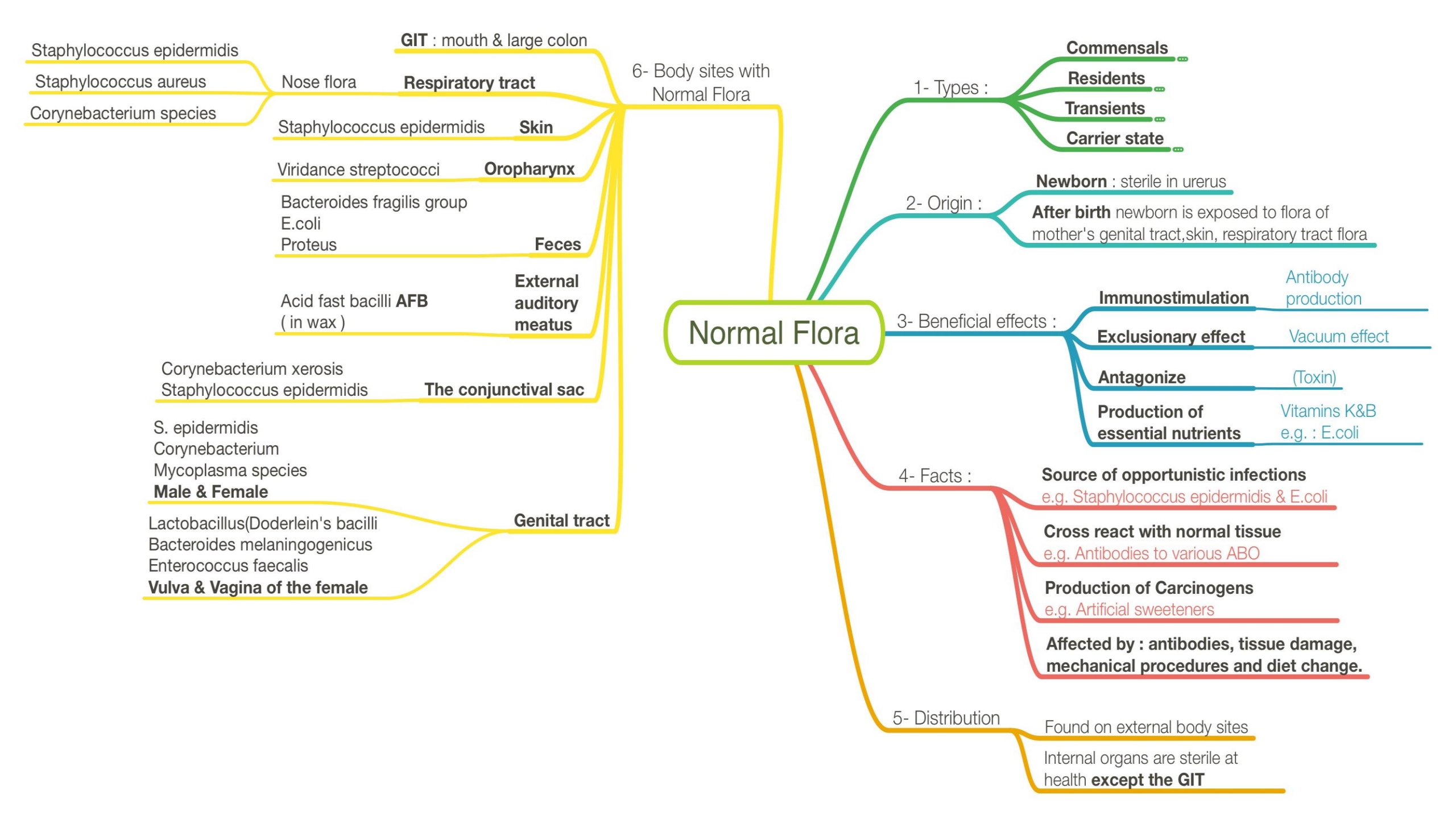
	Staphylococcus aurous (Coagulase +)	*Other Staph(Coagulase -)*	*Alph Hemolytic Streptococci (viridians Streptococci and strept pneumo*	*Enterococcus*	*Neisseria ,Moraxella and Heaomophilus*	*Corynebacteria (diphtheroid)* *Popionibacterium* *Only in skin!!*	*Lactobacillus* note: found in sexually active. i.e. 15 – 45 yrs	*Gram Negative Bacteria (coliform ie E.coli) Pseudomonas*		*Anaerobic bacteria (Bactericides, fusobacterium and clostridium)*
Oral Cavity			+++		+++					+++
Skin		+++				+++				
Eye and ear		+++				+++				
Axilla, Groin and nose	+++	+++				+++				
GIT			+++	+++			+++	++ +	+++	+++
female Genital							+++			


Normal Flora
1- Types :
Commensals
Residents
Transients
Carrier state
2- Origin :
Newborn : sterile in urerus
After birth newborn is exposed to flora of mother's genital tract,skin, respiratory tract flora
3- Beneficial effects :
Immunostimulation
Antibody production
Exclusionary effect
Vacuum effect
Antagonize
(Toxin)
Production of essential nutrients
Vitamins K&B
e.g. : E.coli
4- Facts :
Source of opportunistic infections
e.g. Staphylococcus epidermidis & E.coli
Cross react with normal tissue
e.g. Antibodies to various ABO
Production of Carcinogens
e.g. Artificial sweeteners
Affected by : antibodies, tissue damage, mechanical procedures and diet change.
5- Distribution
Found on external body sites
Internal organs are sterile at health except the GIT
6- Body sites with Normal Flora
GIT : mouth & large colon
Staphylococcus epidermidis
Staphylococcus aureus
Corynebacterium species
Nose flora
Respiratory tract
Staphylococcus epidermidis
Skin
Viridance streptococci
Oropharynx
Bacteroides fragilis group
E.coli
Proteus
Feces
Acid fast bacilli AFB
(in wax)
External auditory meatus
Corynebacterium xerosis
Staphylococcus epidermidis
The conjunctival sac
S. epidermidis
Corynebacterium
Mycoplasma species
Male & Female
Lactobacillus(Doderlein's bacilli
Bacteroides melaningogenicus
Enterococcus faecalis
Vulva & Vagina of the female
Genital tract

Quiz

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437

1- Beneficial effects of normal flora includes:

A)Immunostimulation

B)Production of vitamins C and E by GI flora

C)Production of inhibiting or killing substances against foreign bacteria

D)A&C

2. A resident normal flora is:
a) Microorganisms that have natural relationship with the host
b)Regularly found in a given area at invariable period.
c)Consist of nonpathogenic or potential pathogenic microorganisms that inhabit the skin

3. The type of relationship between normal flora and host is:
a)complicated
b)parasitic
c)symbolic
d)reversible

4.Which one of the following is the most common bacteria in the skin?

A)Staphylococcus epidermidis

B)Coliforms

C)Proteus

D)E.coli

Quiz

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5.Which one of the following is sterile?

A)jejunum

B)skin

C)vagina

D)peritoneum

6.Which of the following is not sterile?
a)Heart
b)uterus
c) GI Tract
d) liver

8. Among the normal flora found in the vagina is?
a)E.coli
b)Lactobacillus
c)Enterococcus faecalis

7. which is sterile?
a)Empty stomach
b)Inner ear
b)Internal eye
d)all of the above

Answer key:
1.d
2.b
3.c
4.a
5.d
6.c
7.d
8.b

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