MICROBIOLOGY TEAM 435

هذا العمل لا يغني عن المرجع الأساسي للمذاكرة

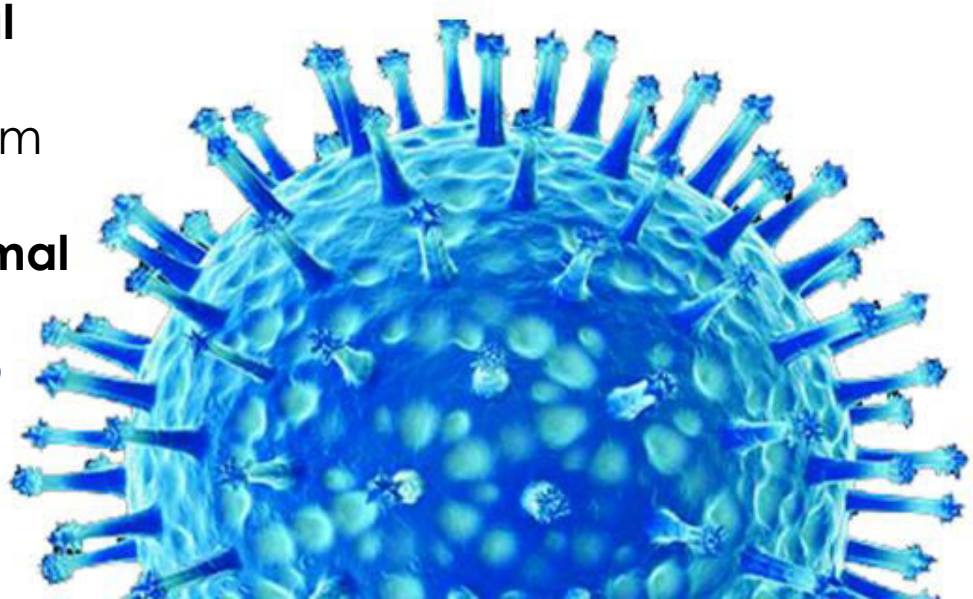
Lecture 2

Normal Flora

● Important ● Term ● Extra explanation ● Additional notes

Objectives

- **Define** the terms: **Normal Flora**, **Resident flora**, **Transient flora and carrier state**.
- **Know** the **origin of normal flora**.
- **Know the importance of normal flora** with examples, including importance as:
- **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** (GIT, urogenital tract, and skin) and most **common types** of organism and relation to **pathogenicity**.
- **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.



Normal Flora, Origin Types, Beneficial Effects & Facts

What is Norma flora ?

- **Microorganisms** that are frequently found in a particular site in **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**.

Prof. Hanan said it is **symbiotic** not **symbolic**

Origin of Normal Flora

- **Newborn** is **sterile in uterus**.
- 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.

Types of Normal Flora

- **Commensals**: have natural relationship with the host.
- **Residents**: present for invariable period .
- **Transients**: establish itself briefly , excluded by host defense or competition from residents.
- **Carrierstate** :**potentially pathogenic** , e.g. Streptococcus Pneumoniae, Neisseria meningitides in throat of healthy individual. (not normal flora)

(once the status of the immunity of the individual becomes depressed)

They can cause the disease once the immune system is depressed but it does not affect healthy individuals.

Beneficial Effects of Normal Flora:

1- **Immuno-stimulation:** (**antibody production**)

NOTE: protects the body from pathogenic species by making the immune system stronger.

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

3-**Production of essential nutrients** (**Vit. K & B**) by some normal **intestinal flora** e.g.. *E.coli*.

Facts About Normal Flora :

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

sick or weak immunity

- 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. **e.g..** artificial sweeteners may be enzymatically modified into bladder carcinogens.

Distribution of Normal Flora

external body sites

All external body sites contain normal flora:

- **GIT**: mouth & large colon
- **Urogenital tract**: vagina & distal 1/3 of the urethra.
- **Skin** (including external ear & conjunctiva)

Internal organs (except **alimentary tract** -digestive tract-) are sterile at health

Note: alimentary tract is the mouth and the lower GIT

(Peritoneal = brain) it is sterile.

- **Sterility of internal organs maintained by** :

1/ Local defense mechanisms (e.g. white blood cells)

2/Chemical substances in serum & tissues

eg. Complement , antibodies.

3/Phagocytic activity of Polymorphnuclear Monocytes

Normal Flora

The Respiratory Tract
- **Upper respiratory tract** colonized by normal flora as in mouth & nasopharynx
- **Lower respiratory tract** is **sterile**
- Nose Flora : - Staph.epidermidis
- Staph. aureus
-Corynebacteria

Feces (Stool)
- **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 O_2.
- **Bacteroides fragilis group** is the **dominant anaerobes**, bifidobacteria , Lactobacilli…etc
- **Less common aerobics**: E.coli ,Proteus,….etc.

Genital Tract
- Female genital tract heavily colonized , why ?
- 10^8/ml flora in normal vaginal secretion.
- In both sexes Mycobacterium smegmatis in secretions which contaminate urine and leads to confusion /misdiagnosis.
- Male & Female distal urethra:
  - S.epidermidis
  - Corynebacteria
  - -Mycoplasma species

Oropharynx
- Viridance streptococci
- Commensal neisseriae
- Corynebacteria
- Bacteroides
- Fusobacteria , Veillonella, Actinomyces, Spirochaetes.
- Heamophilus inflenzea & Pneumcoccus are **potential pathogens**.
- **Less common potential pathogens** : S.pyogenes , N.meningitidis

Female Genital Tract
- **Vulva** : S. epidermidis , Corynebacteria, E.coli and other coliforms & E. faecalis.
- **Vagina** : -Lactobacillus (Doderlein's bacilli) - Bacteroides melaninogenicus - E.faecalis - Corynebacteria - Mycoplasma – Yeasts

GIT (Gastrointestinal Tract)
- **Saliva** contains 108 bacteria/ml
- Gingival margin debris & dental Plaque continually colonized by bacteria.
- **Oesophagus** has normal flora similar to **pharyngeal** flora.
- **Empty stomach** sterile due to gastric acid.
- **Duodenum**, **jejunum** & upper **ielium** have **scanty flora**
- **Large intestine** heavily colonized by bacteria.

External Auditory Meatus
External ear has the following normal flora:
- S. epidermidis
- Corynebacteria
- Acid fast bacilli (AFB)(occasionally in wax).

Middle and inner ear are sterile.

Conjunctival Sac
Conjunctiva has normal flora eg.
- Corynebacterium xerosis
- Staphylococcus epidrmidis

Internal eye is sterile.

Skin
- Skin has **rich** resident bacterial flora(10^4/cm^2).
- Exist as **microcolonies**.
- **Anaerobic** organisms **predominate** in areas with **sebaceous** glands.
- Moist skin often colonized by coliforms.

Main Skin Flora:
- Propionibacterium acnes
- Anaerobic cocci
- Staphylococcus epidermidis
- Corynebacteria
- Staphylococcus aureus (potential pathogen)
- Coliforms

NOTES

* When it's epidermidis then the S. → Staphylococcus
when it's pyogenes then the S. will be → Streptococcus

* **Streptococcus pyogenes**: A common bacteria that causes strep throat (streptococcal pharyngitis), impetigo, other skin infections, rheumatic fever, scarlet fever, glomerulonephritis and invasive fasciitis.

* **Staphylococcus** is a bacterium of a genus that includes many pathogenic kinds that cause pus formation, especially in the skin and mucous membranes.

* **How is the anaerobic environment maintained in the large intestine?** The aerobic bacteria utilize the oxygen so the intestine becomes free from it.

* **Female genital tract heavily colonized**(by normal flora**), 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.

* Sebaceous glands. = a small gland in the skin which secretes a lubricating oily matter (sebum) into the hair follicles to lubricate the skin and hair.

* The upper and lower fornices, or **conjunctival sacs**; it is the looseness of the conjunctiva at these points that makes movements of lids and eyeball possible.

* Any skin has Staph epidrmidis & Corynebacteria

DISTRIBUTION AND FREQUENCY OF BACTERIA IN THE INTESTINE

density	frequency of occurrence in population	
oesophagus stomach	lactobacilli	
small bowel duodenum	lactobacilli streptococci	
jejunum ileum	Enterobacteria *Bacteroides* spp.	
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*

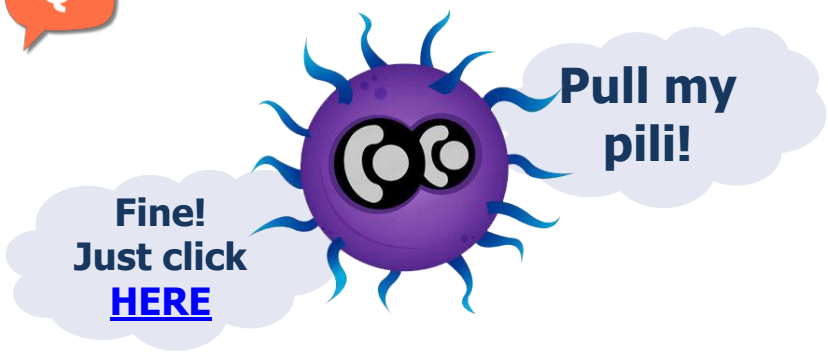
The colon is heavy colonized with Normal Flora

All the Normal Flora that were mentioned in the slides

Name	Location	Information
S. Epidermidis (Staphylococcus Epidermidis)	• Oropharynx • The External Auditory Meatus (External ear) • Genital tract • The female genital tract (vulva) • The Conjunctival Sac • The Respiratory Tract (Nose flora) • Skin	• May be a source of **opportunistic infections** in patients with **impaired defense mechanisms**. • **Potential pathogens**.
E .coli (Escherichia coli)	• Feces (stool) • The female genital tract (vulva)	• **Production** of essential nutrients (Vitamin **K** & **B**) by some normal **intestinal flora** • May be a source of **opportunistic infections** in patients with **impaired defense mechanisms**.
• ***N.Meningitidis*** (Neisseria meningitidis) • ***Heamophilus inflenzea*** • ***Pneumcoccus***	Oropharynx	**potential pathogens**.
Proteus	Feces (stool)	**Aerobics**
Corynebacteria	• The Respiratory Tract (nose flora), • The External Auditory Meatus (External ear) • The female genital tract (vagina) • The female genital tract (vulva) • Skin	
Staph. Aureus (Staphylococcus aureus)	• The Respiratory Tract (nose flora) • Skin	**potential** pathogens.
Corynebacterium xerosis	The Conjunctival Sac	
Acid fast bacilli (AFB**)**	The External Auditory Meatus (External_ear).	
E.Faecalis (Enterococcus faecalis)	• The female genital tract (vagina) • The female genital tract (vulva)	
• **Yeasts** • **Mycoplasma** • **Lactobacillus (Doderlein's bacilli)** • **Bacteroides melaninogenicus**	The female genital tract(vagina).	
• **Propionibacterium acnes** • **Anaerobic acnes** • **Corynebacteria** • **Coliforms**	Skin	

Location	Group	Information
Oropharynx	•Viridance streptococci •Commensal neisseriae •Corynebacteria •Bacteroides •Fusobacteria , Veillonella, Actinomyces, Spirochaetes.	
Feces (Stool)	•Bacteroides fragilis •Anaerobes, bifidobacteria •Lactobacilli	
Genital Tract	Mycobacterium	In both sexes Smegmatis (Mycobacterium smegmatis) in secretions which contaminate urine and leads to confusion /misdiagnosis.

Online Quiz



Videos

http://youtu.be/1X8p0vhsWRE
http://youtu.be/4BZME8H7-KU
http://youtu.be/_ZoMYw3BC9

Books that could help you

- Microbiology made ridiculously simple
- Sherris Medical Microbiology

MiCRObiology

TEAM 435

Boys Team

- Ali Alzahrani
- Khalid Sharahily
- Ahmad Alzahrani
- Zeyad Alsalem
- Muhammad Dossary
- Meshal Alhazmy
- Hamzah Alfiar

Girls Team

- Lamya Alsaghan
- Nojood Alhaidri
- Monera Alayuni
- Alanoud AlOmair
- Shahad Alenezi
- Aisha Al-Sabbagh
- Bodour Julaidan
- Noura AlTawil
- Deema AlFaris
- Sara Al-Hussein
- Suha Alenezy
- Latifah Alsukait
- Dalal Alhuzaimi
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إن أصبنا فمن **الله** عز وجل، وإن أخطأنا فمن **أنفسنا والشيطان**