Lecture 5

Normal Flora



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Objectives:

- 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:
 - A. Source of opportunistic infection.
 - B. Immunostimulation.
 - C. Nutrition: Vitamins production.
 - D. Production of Carcinogens.
 - E. 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 organisms.
- 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.

Definition

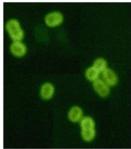
 Normal flora are microorganisms that are frequently found in a particular site in normal healthy individual. "do not cause disease"

Types of Normal Flora

- 1. Commensals: natural relationship with host."متعایشه
- 2. Residents : present for invariable period ."مقيمه"
- 3. Transients : establish itself briefly , excluded by host defense or competition from residents."موجوده في فتره قصيره"some of it are potentially pathogenic
- 4. Carrier state : potentially pathogenic , eg. Streptococcus pneumoniae, Neisseria meningetidis in throat of healthy individual
- 5. "the carrier doesn't have disease ,he transmit it to others"

Origin of Normal Flora

 Newborn sterile in utero the normal flora will appear After birth ,due to the exposed of flora of mother's genital tract, and organisms in the environment.



Streptococcus pneumoniae

| Normal flora effects | | | | | |
|-------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|--|--|--|
| Beneficial effects | Harmful effects | | | | |
| 1- Immunostimulation (antibody development) " partial protection stimulated by normal flora" | 1- May be a source of opportunistic infections. "If there any issues in the immunity system will become pathogenic" e.g. In patients with impaired defense mechanisms. E.g. Staphylococcus epidermidis, E.coli. | | | | |
| 2- Exclusionary effect (vacuum effect) and protection from external invaders. "کانھا حرس حدود" | 2- may cross react with normal tissue components ,eg, antibodies to another ABO group arise because of cross reaction between intestinal flora and the antigens of A &B blood substances. | | | | |

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

(أمراض تأتى عندما تقل المناعه في الإنسان)

3- Production of carcinogens: Some normal flora may modify chemicals in our diets into carcinogens through their enzymes.

eg. artificial sweeteners may be enzymatically modified into bladder carcinogens.

Distribution of normal flora

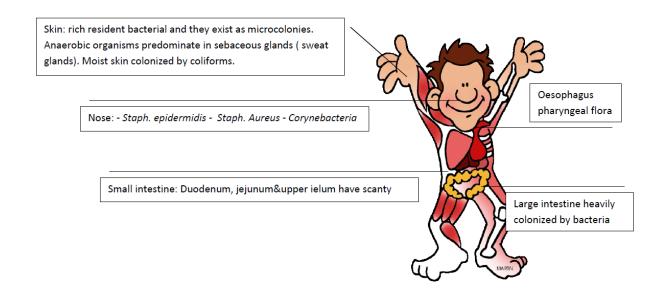
Internal organs (except alimentary tract"GIT") are sterile at health.
 N.B Sterile: NO ORGANISMS

Sterility maintained by:

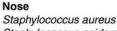
- 1- local defense mechanismse.g. WBC
- 2- chemical substances in serum & tissues eg. Complement, antibodies.
- 3- -phagocytic activity of PMN

Areas of the body with normal flora

- 1. Gastrointestinal tract: mouth & large colon
- 2. Urogenital tract: vagina &distal 1/3 of the urethra
- 3. Skin



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Staphylococcus epidermidis Corynebacterium species

Throat -

Streptococcus species Branhamella catarrhalis Corynebacterium species Haemophilus species Neisseria species Mycoplasma species

Large intestine

Bacteroides fragilis
Escherichia coli
Proteus mirabilis
Klebsiella species
Lactobacillus species
Streptococcus species
Candida albicans
Clostridium species
Pseudomonas species
Enterococcus species

Mout

Streptococcus species Fusobacterium species Actinomyces species Leptotrichia species Veillonella species

Skin

Staphylococcus epidermidis Propionibacterium acnes Pityrosporum ovale

Vagina

Lactobacillus species Streptococcus species Candida albicans Gardnerella vaginalis

Urethra

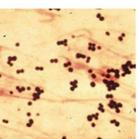
Streptococcus species Mycobacterium species Escherichia coli Bacteroides species

Normal flora of:

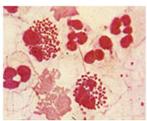
- 1. respiratory tract
 - A. Lower respiratory tract is sterile
 - B. Upper resp. tract colonizes by flora as in mouth &nasopharynx
 - C. Nose: -
 - · Staphylococcus epidermidis
 - Staphylococcus aureus
 - D. Oropharynx:
 - Viridans streptococci
 - Commensal Neisseriae

potential pathogens are:

- Heamophilusinflenzea&Pneumcoccus
- Less common found: Streptococcus pyogenes, Neisseria meningitidis



S. aureus. Gram stain.



Neisseria meningitidis.

2. Gastrointestinal tract

- A. Saliva contains 108 bacteria /ml
- B. Gingival margin debris & dental plaque continually colonized by bacteria.
- C. Oerophyagu"المريع flora same as pharyngeal "البلعوم" flora.
- D. Empty stomach sterile due to gastric acid. "after eating will have some flora"
- E. Duodenum, jejunum & upper ileum have (scanty=small amount) flora
- F. Large intestine heavily colonized by bacteria.

3. Feces

- A. 1/3 of feces wt. is bacteria, mainly dead,
- B. Living bacteria ~ 10¹⁰/gm
- C. 99% anaerobes
- D. Anaerobic environment maintained by aerobic bacteria utilizing free O2.
- E. Bacteroidesfragilis group the dominant anaerobes.
- F. Less common: E.coliisaerobic.

4. Genital tract

- · Female genital tract heavily colonized, why ?because it's short
- 10⁸/ml in normal vaginal secretion.
- In both sexes *Mycobacterium Smegmatis*(AFB) (acid fast bacilli)"تتحمل الاحماض in secretions which contaminate urine-leads to confusion /misdiagnosis.
 - A. Male& Female distal urethra: S.epidermidis
 - B. Female Vulva:
 - S. epidermidis, Corynebacteria, E. coliand other Coliforms & Enterococcus faecalis.
 - C. Vagina:

Lactobacilli (Doderlein's bacilli) (Maintain low phacidic)

Enterococcus faecalis

Yeasts.In small number

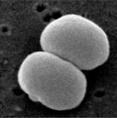
5. Skin

- Skin has rich resident bacterial flora(10⁴/cm²).
- Exist as microcolonies. "مستعمرات صغيره
- Anaerobic organisms predominate in <u>areas with sebaceous glands</u>". "مناطق فيها غدد دهنيه
- Moist skin ,often colonized by <u>coliforms</u>."من القولون

Normal flora of skin:

- 1- Propionibacterium acnes
- 2- S. epidermidis
- 3- S. aureus(less common, potential pathogen)
- A. External auditory meatus"المنطقة الخارجية من الاذن flora:
- S. epidermidis
- Corynebacteria
- AFB (Acid Fast Bacilli)occasionally found in wax.





S. epidermidis.

- Corynebacteriumxerosis
- S.epidermidis

When we blink enzyme called lysozym that destroy bacteria will be secreted.

Summary of Common Normal Flora and existence in Various Body Sites

| | Staph.epidermidis | Staph.aureus | Alpha hemolytic Streptococci | Diphtheroid and propionibacterium | Gram Negative | Enterococcus | Anaerobes | Lactobacillus |
|------------------------|-------------------|--------------|---------------------------------|-----------------------------------|---------------|--------------|-----------|---------------|
| Skin | * | | | * | | | + | |
| Nose, axilla and groin | | * | | | | | + | |
| Oral Cavity | | 1 | * | | | | * | |
| Gastrointestinal tract | | | * | | * | * | * | |
| Female Genital | | | | | | | | * |
| Male Genital | * | | | * | | | - | Same as skir |

Useful link :-

http://textbookofbacteriology.net/normalflora.html

http://suite101.com/article/normal-flora-and-opportunistic-pathogens-a93484

http://www.ankawa.com/forum/index.php?topic=223528.0