Normal Microbial Flora of the Human Body

Definitions:

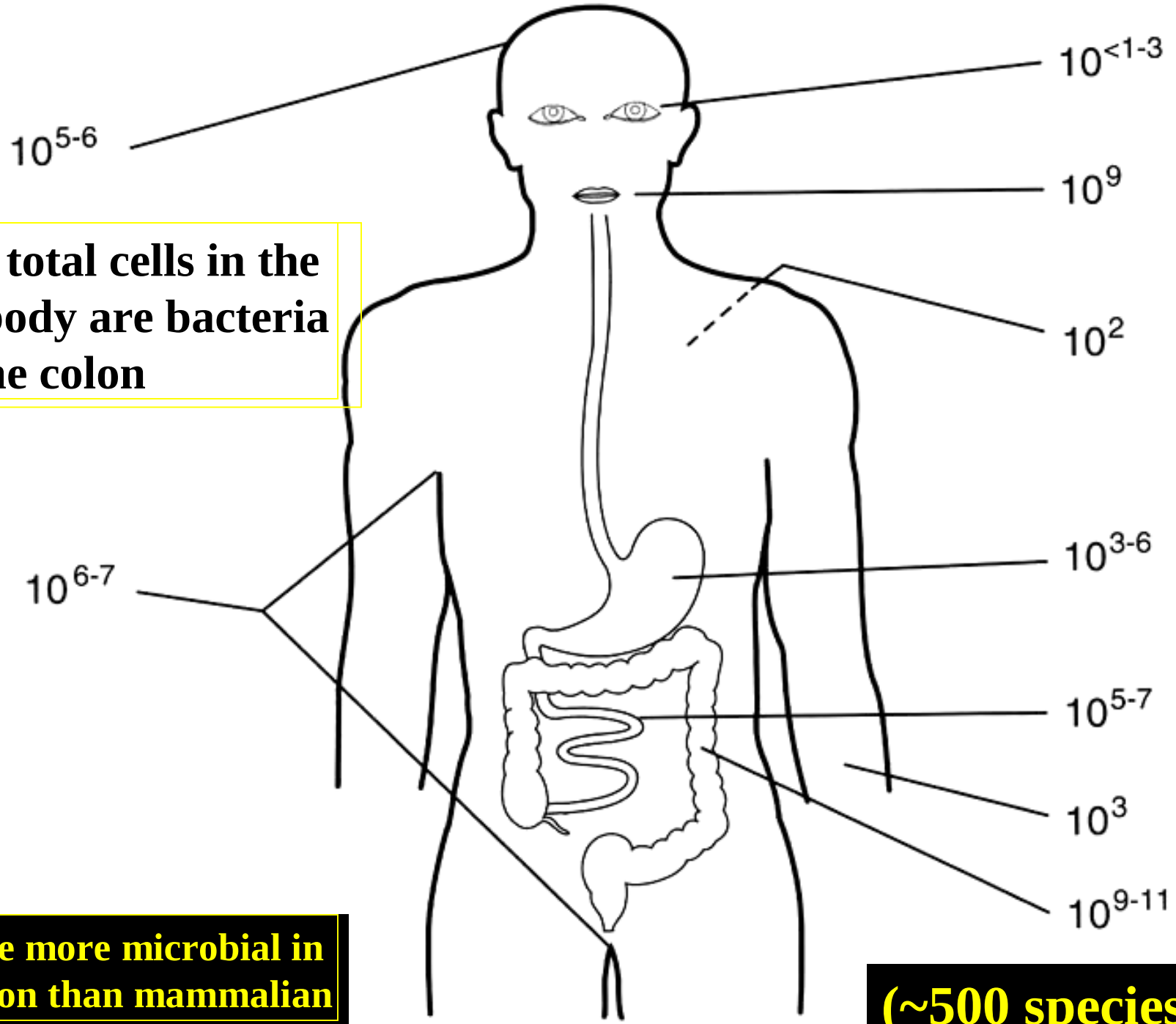
Normal microbial flora

Resident population

Transient population

Carrier state

~95% of total cells in the human body are bacteria within the colon



Human are more microbial in Composition than mammalian

(~500 species)

Role of the resident flora

- Host nutrition
- prevents colonization
  - competing for receptors or binding sites
  - competing for nutrients
  - producing antibiotics or bacteriocins.
  - Production of toxic products
  - Stimulation of natural antibodies that cross react with pathogenic organisms

Normal flora may produce disease under certain Circumstances

- N.F. introduced into bloodstream or tissues

  Streptococci viridans introduced into the bloodstream following tooth extraction or tonsillectomy
- Bacteroides of the large intestines introduced into peritoneal cavity
- Members of the resident flora found in disease may be called *opportunists*
- They can cause disease in immunocompromised + debilitated individuals

Normal flora is found in the

- Mouth
- Upper respiratory tract (URT): throat nose, nasopharynx
- Intestines
- Vagina
- Skin
- Conjunctive of the eye
- Outer ear

Role of the normal mouth flora in dental caries

- Caries is a disintegration of the teeth
  - surface enamel is demineralized
  - decomposition of the dentin and cement
- Essential 1st step
- Plaque – gelatinous deposits of glucans
- *S. mutans, peptostreptococci*
- Essential 2nd step
- formation of acid (pH < 5) → Demineralize enamel → initiate caries.

Development of caries depend on

- Genetic
- Hormonal
- Nutritional
- Other factors

Control of caries

- Removal of plaque
- Limitation of sucrose intake
- Reduction of acid production
- Good nutrition – adequate protein
- Fluoride application to teeth or in water

Control of periodontal disease

- –removal of calculus (calcified deposit)
- –good mouth hygiene

Benefits of normal flora

1. Prime the immune system.

- * Enhanced cytokine production.
- * Enhanced phagocytosis.
- * Maturation of the GALT.
- * Maturation of IgA producing cells

Germ free animals have problems due to infections or allergies

sterile animals have undeveloped GALT

Benefits of normal flora

2. Maintain integrity of the GI mucosa

N.F essential for normal development of GI mucosa

3. "Controlled inflammation" of the GI

Constant stimulation of the immune system

4. Processing of food Ags, digestion, and absorption of nutrients and vitamins

Benefits of normal flora

5. Suppression of immune response to dietary antigens in allergic subjects
6. Production of vitamins (B & K)
7. N.F. share Ag's with pathogenic bacteria
8. Compete with pathogens

Imbalance of the GI normal flora

* Diarrhea: e.g. post-antibiotic therapy
* Inflammation of the GI tract
* Processed and sterile diet
* Disrupt integrity of the GI mucosa
  *Leakage of food-derived proteins into the blood stream
  * Food allergies
* Problems in digestion and absorption

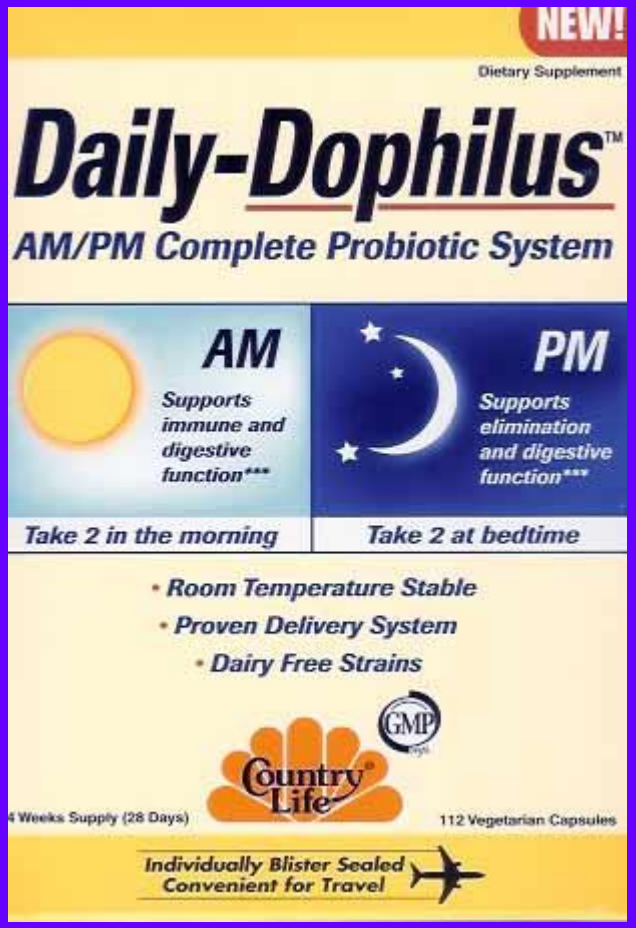
Probiotics

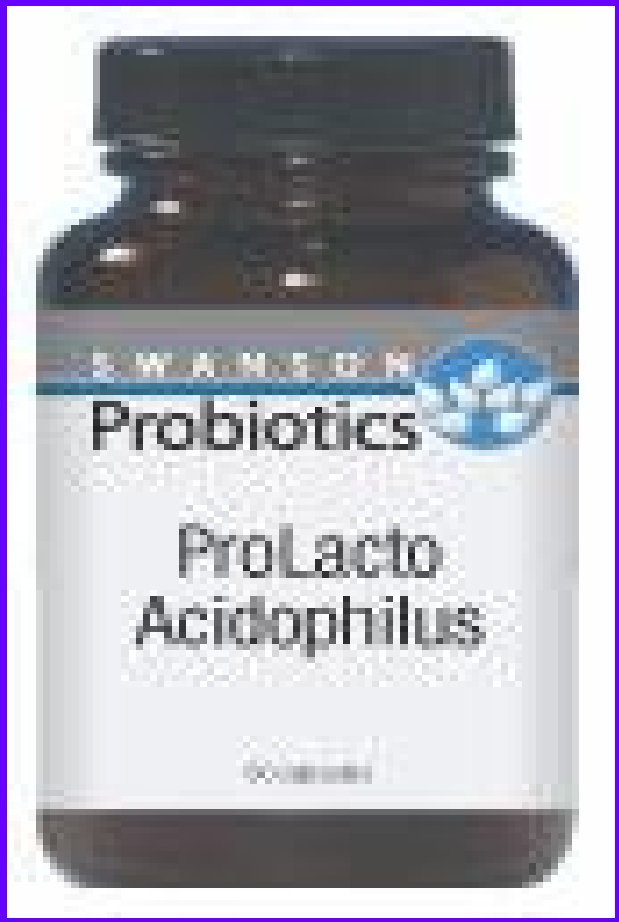
- * The use of normal flora of the GI tract to treat diseases

* It stabilizes the composition of the Normal flora

- * 10^9-10^{10} organisms

Probiotics





Probiotics

Classification of a Probiotic strain:

- **Beneficial physiological effect**
- **Strain is of human origin**
- **Safe for human use**
- **Stable in acid and bile**
- **Adhere to intestinal mucosa**

***Most common: *Lactobacilus acidophilus*, *Bifidobacterium bifidum*, and *Streptococcus thermophilus*.**

Use of Probiotics in diseases

1) Treatment and prevention of diarrhea
   * Rotavirus diarrhea in children
   * Travelers' diarrhea and enteritis
   * Post-antibiotic diarrhea
   * long-term use of antibiotics

2) Alleviate symptoms of lactose intolerance

3) Food allergies: e.g. milk

Use of Probiotics in diseases

4) Treatment of GI inflammations associated with disruption of the mucosal barrier/permeability:

* **Crohn's disease**
* **Food allergies**
* **Atopic eczema**

Potential use of Probiotics

* Treatment of inflammatory diseases
* Treatment of inflammatory bowl disease
* Cancer prevention
* Immunomodulation: e.g. arthritis
* Reduction in respiratory disease:e.g. Pneumonia in cystic fibrosis ingesting *Lactobacillus*

Harmful effects of the normal flora

1) If imbalanced: disrupts mucosa

2) Causes disease in immunocompromised

3) If moved from normal site: Disease

4) Quorum sensing by invading pathogens
   cell-cell communication via autoinducers occurs both within and between bacterial species

5) Gingivitis and dental caries

6) Halitosis

Factors Altering N.F

- diet
- antibiotics
- disease state
- moisture
- debris

Main bacteria of the normal respiratory tract

Nose	***Staphylococcus epidermidis***
	Staphylococcus aureus
	Corynebacteria
	Streptococci
Oropharynx	**Viridans streptococci**
	Commensal neisseriae
	Corynebacteria
	Bacteroides Mainly ***B. melaninogenicus, B.oralis***
	Fusobacteria
	Spirochaetes
	Prevotella sp. (P. melaninogenica)
	Lactobacilli
	Veillonella
	Actinotnyces
	Haemophilus influenzoe
	Streptococcus pneumonia
	Candida sp.
Less common:	***Streptococcus pyogenes***
	Neisseria meningitidis
	Eikenella corrodens

- **Infection of the mouth and respiratory tract often include anaerobes**
- **Periodental infections, prioral abscesses, sinusitis, mastoiditisinvolve-**
- ***P. melaninogenica***
- ***Fusobacterium***
- ***Peptostreptococci***

Bacteria of the large intestine

- ***Bacteroides***
- ***Bifidobacteria***
- ***Annerobic cocci***
- ***Escherichia coli***
- ***Streptococcus faecalis***
- ***Clostiridia***
- ***Lactobacilli***
- **Less common inhabitants:**
- **Klebsiella species**
- **Proteus species**
- **Enterobacter species**
- **Pseudomonas aeruginosa**

Main bacteria of the male and female genital tracts

- **Female**

- **Vulva**
  Staphylococcus epidermidis
  Corynebacteria
  Escherichia coli and other coliforms
  Streptocossus faecalis
  Yeasts

- **Vagina**
  Lactobacilli
  Bacteroides
  Streptococcus facealis
  Corynebacteria

- **Male and female**
  Distal urethra
  Staphylococcus epidermidis
  Corynebacteria

Main bacteria of the skin flora (Sweat glands, hair follicles)

- ***Propionibacterium acnes***
- **Anaerobic cocci**
- ***Staphylococcus epidermidis***
- **Micrococci**
- ***Corynebacteria***
- ***Candida ablicans***
- **Less common :**
- ***Staphylococcus aureus*** **This potential pathogen is present in about 50% of normal adults**
- **Coliforms**

Degerming of skin

- pH 5-5.5
- Fatty acids
- Lysozyme
- Drying