

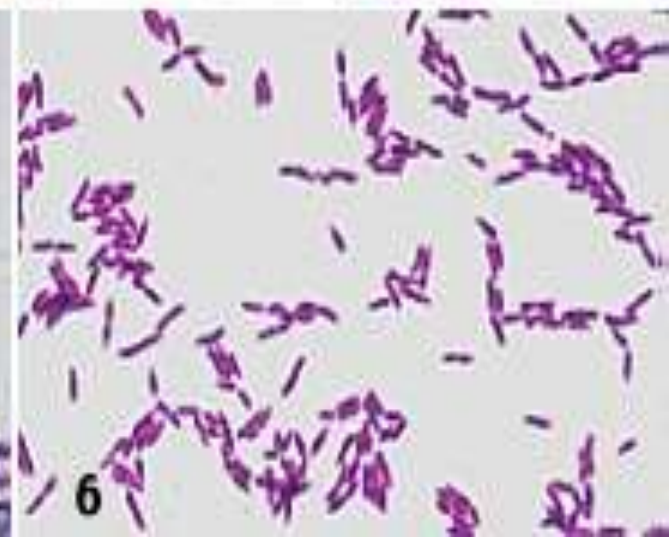
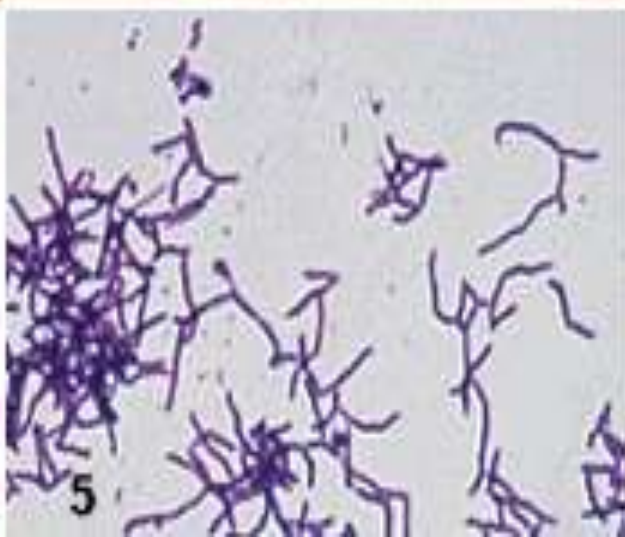
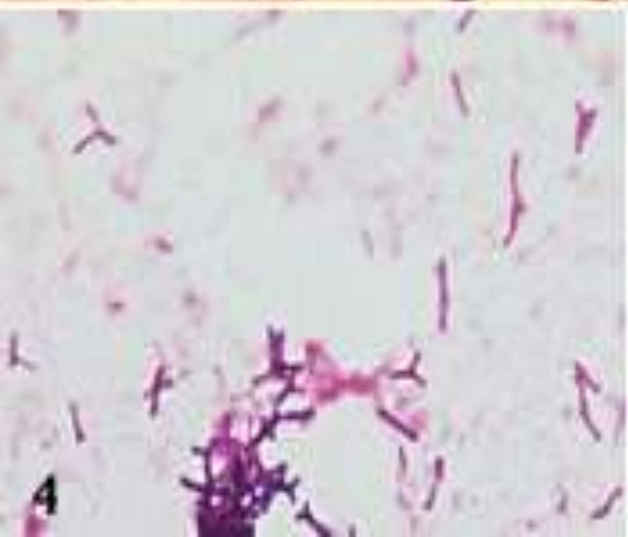
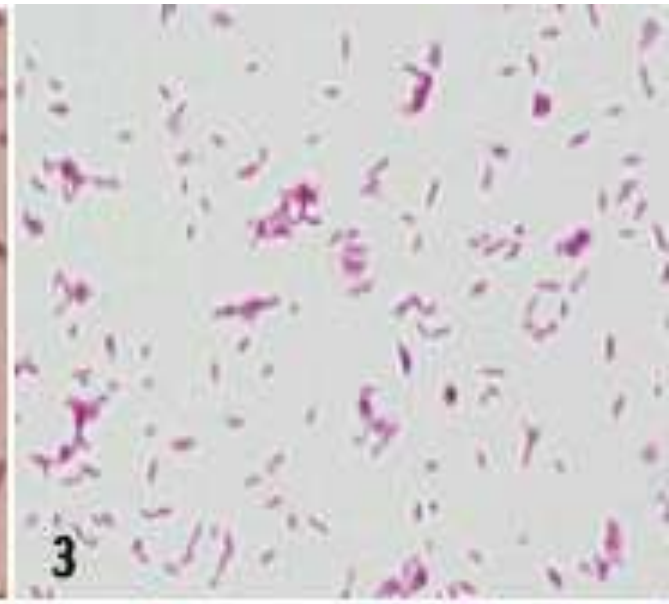
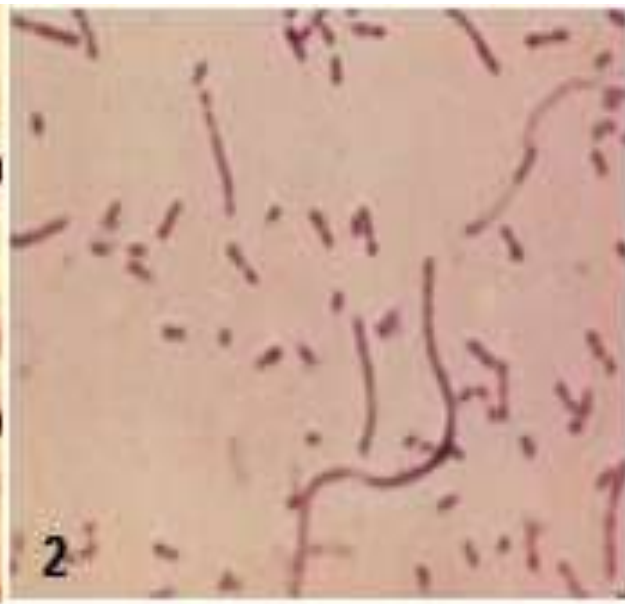
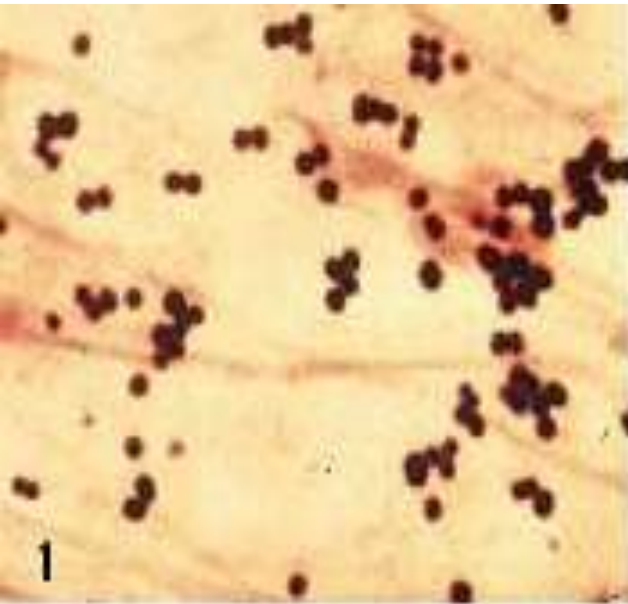
Disinfection & Sterilization

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Bacteria - Normal flora



Normal body Flora Human-1

- A Large variety of microorganisms colonize human body throughout its entire life.
- Human body has actually more bacterial cells than human cells.. harbors about 10^{14} bacteria ,few yeast, rarely ectoparasites (Lice, dust mites) & viruses.
- A large amount of bacteria species (commensals), mostly Anaerobes (about 95%).. **Facultative Anaerobes (5%)** colonize skin pores, sweat glands & air follicles.
- All normal flora competing with pathogens & prevent their adherence effects.. Produce provitamins..inorganic acids, eliminating toxins & radicals, enhancing mucosal & body immunity

Normal Flora -2

- Skin Flora: *Staphylococcus spp.* & *Propionobacterium* may cause localized inflammation.. Wounds.. Sepsis, Surgery
- Oral Cavity and Nasopharyngeal Flora: *Streptococcus spp.*, *Neisseria spp.*, *Corynebacterium spp.* *Haemophilus spp.* Protective against invasion of pathogenic organisms to some extent.
- Intestinal Flora: The colon may contain 10^9 to 10^{11} bacteria per gram of feces. Mostly (95 - 99%) are obligate anaerobes, *Bacteroides*, *Bifidobacterium*, Lactobacilli, Streptococci, *Clostridia*, Enterobacteracea (E. coli, Enterobacter, Klebsiella species), Yeast.

Normal Flora-3

- **Urogenital Flora:** The urogenital tract is normally sterile .. the vagina and the distal 1 cm of the urethra contain: *Lactobacillus* predominate in the vagina.. control acidity.. pH 4.5.. Prevent growth of few Yeast (*Candida* species)..
- The **urethra** may contain predominantly skin microorganisms including: *Staphylococci*, *Streptococci*, *Diphtheroids*.

Physical Control of Microbial Growth

- Definitions: Antiseptic (sepsis-aspesis) process used to destroy microorganisms on living tissues..Skin, mucosa..
Disinfection/Disinfectant.. used for non-living objects to destroy microorganisms..up 99% killing effect.
- Sterilization/Sterile..100% Killing effect against all microorganisms.. Microbial contamination
- Mostly effect cell membrane permeability .. damage proteins & nucleic acids..of organisms.
- Killing vegetative & spore forming *bacteria, Fungi, Viruses, Parasites*
- Bacteriostatic .. Bactericidal .. Microbiocidal ..
- Refrigeration .. Deep Freezing .. Desiccation of Food

Physical Control of Microbial Growth-2

- Sterilization Methods:

- Direct Flaming ..Incineration.. Burning
- Dry Heat/ Hot-air Oven .. 170-180 C / 2 Hours
- Moist Heat/ Steam Under Pressure .. **Autoclave** .. 121C /15 PSI/ 15 Minutes ..Actual Time
- **Ionizing Radiation**..High-Energy Electromagnetic Beams .. Gamma Rays.. Radioactive Cobalt 60..10-5 nm.. Disposable Plastic Wares, Pharmaceutical products, Food.
- Filtration.. Liquids .. Using Nitrocellulose Membrane/
Pore Sizes 0.01-0.2um

Ultraviolet-Autoclave



Sterilization Gases

Alkylating Gases:

– **Ethylene Oxide**..is highly reactive and interact with many cell structures, highly toxic for human respiratory tract & flammable.. Should be mixed with 10% CO_2 , N_2 before used.

- 4-12 Hours, Fiber endoscopes, Heart-lung machine, Textiles, Disposable plastic article,
- Formaldehyde Gas ..Aqueous Solution 37% .. **Formalin** .. 2% Aqueous Glutaraldehyde.. Preservation tissue biopsies.. Patients room as gas vapor..Long Exposure Time (10-24 Hours)..highly toxic for human.

Chemical Control of Microbial Growth-1

- Disinfection Methods: For surgical scrub, cuts/ wound/ skin injury ointment, skin cleansing
- Influencing Factors: Presence of Organic Materials/ Contaminations.. First Cleaning ..Concentration of Agent.. pH Medium.. Contact Time
- Moist Heat.. Boiling Temperature/ Few Minutes,
- Pasteurization 63 C-30 Minutes, 72C-15 Seconds
- UV-Light - 240-280 nm.. 12-24 Hours Exposure
- **Disinfectant /Antiseptics Agents**
 - Alcohols: Ethanol.. Isopropanol (70-90% solution)
 - Aqueous Iodine (3-5%) , Tincture Iodine (Alcohol-Iodine) **Betadine / Povidone-iodine.. 2 minutes**
 - Chlorhexidine.. Cetrимide.. Savlon
 - All should be used for only external use.

2/

- Water-Disinfection: **Chlorine Gas**, Na-Hypochlorite..dissolve Hypochlorous Acid (HOCl in water .. Release Active Cl^{ions}..
- 2-3 PPM.. Kill most pathogens.
- Fecal E. coli.. Used as indicator of water contamination.. Safe drinking water must free of *E.coli*
- Oxidizing Agents: Ozone (O₃)..Disinfect Water .
- hydrogen Peroxide (H₂O₂) Skin & wounds cleansing
- Other chemical agents used for disinfection of innate objects:
 - Phenol compounds.. Hexachlorophene / Dettol.. Lysol
 - Organic Acids.. Sorbic & Benzoic Acid.. Food Preservation, Cosmetic.. For Control Molds/ Fungi, Bacteria
 - Detergents.. Surface-Active Agents.. Positive/negative charged Anions.. Like Soaps, Wash-Powder, Hair-Shampoo



- **Hand washing: A simple way to prevent spread of infection and disease.**
- **Hand washing is a simple habit that can help keep you healthy.**
- **Good hand hygiene .. First step to protect yourself & others and control nosocomial infection.**