Infection Control: Source of Infection

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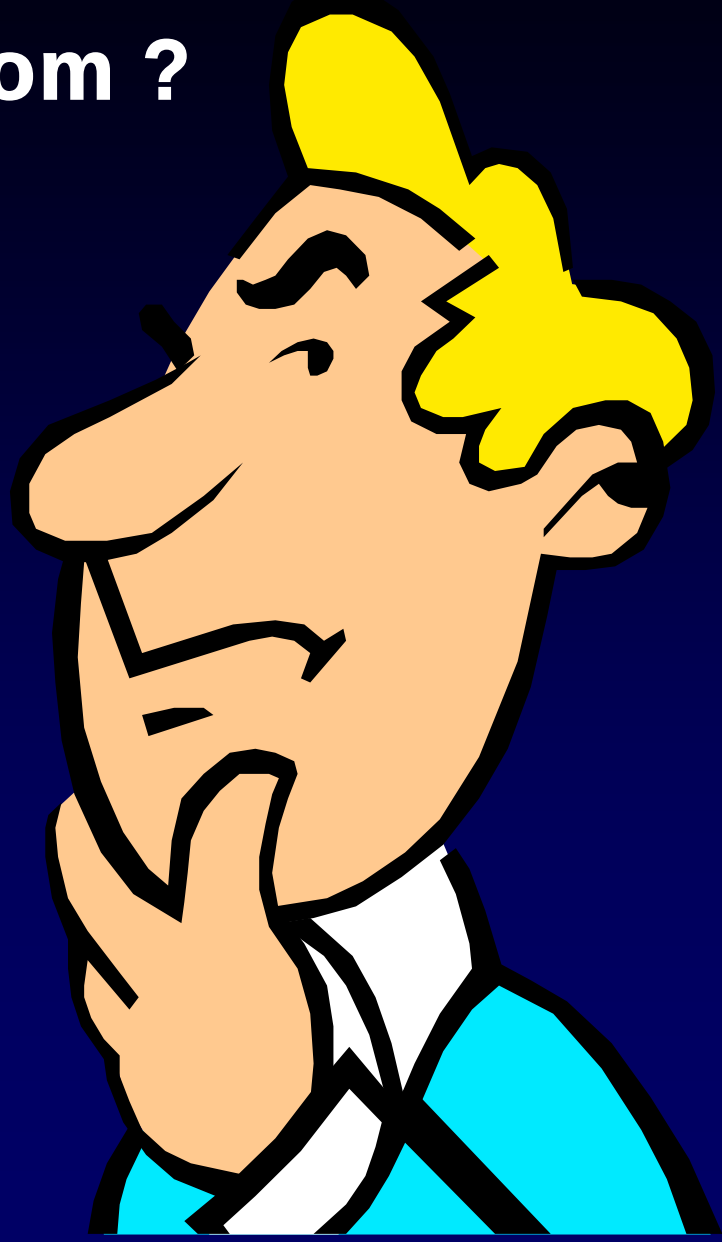
Your taxes at work

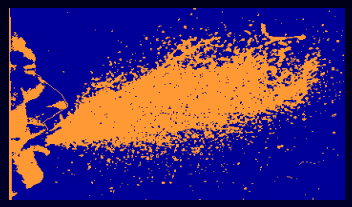
Where do Nosocomial Infections come from ?

- Colonization
- Food & Water
- Hands: HCW, visitors

- Others:
  - Fomites
  - Environment

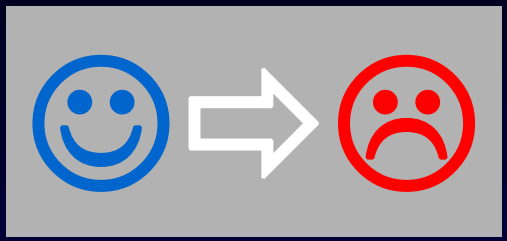


Colonization: Definition



- **Colonization** = presence of a microorganism on/in a host, with growth and multiplication of the organism, but without interaction between host and organism (no clinical expression, no immune response).
- **Carrier** = individual which is colonized + more
- **Subclinical or inapparent infection** = presence of microorganism and interaction between host and microorganism (sub clinical response, immune response). Often the term colonization is applied for relationship host-agent in which the immune response is difficult to elicit.
- **Contamination** = Presence of a microorganism on a body surface or an inanimate object.

Shifts in Colonization Flora



- General shift towards

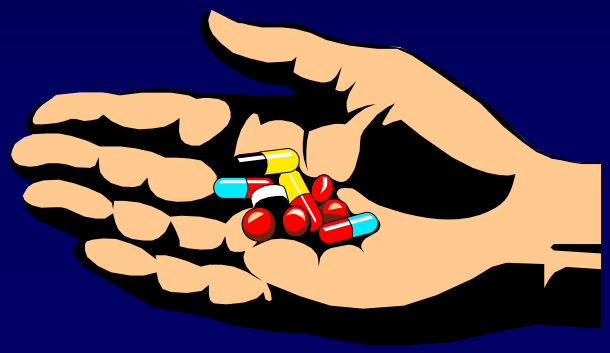
Gram negative flora in hospitals

- Modification of the skin environment due to skin changes still poorly understood
- Invasive procedures provides portal of entry to different flora:
- Antibiotic therapy:
  - In a study of patients on ampicillin long term Rx, 90 % colonized by ampicillin resistant enterobacteria, controls only 10 %
  - In animal studies: Number of bacteria to colonize gut
    - Normal animal, 10,000,000
    - Germ free animal, 100

Skin Hand Flora

- RESIDENT FLORA
- Survives on the skin more than 24 hours
- Not easily removed, hours of scrubbing
- Complete stelirization impossible
- Low virulence
- Staphylococci, diphteroides,
- mostly Gram + ,
- very few Gram -

Humans sheds # 300,000,000 squames/day (4 to 25 mm) able to carry bacteria



- TRANSIENT FLORA
- Survive on skin less than 24 hours
- Easily removed with soap and water
- Acquired during contacts with contaminated areas mouth, nose, perineal area,genitals, anal area
- catheter, bedpan, urinal, patient care casual contact
- May have high virulence Enterobacteria, Gram-bacilli, Pseudomonas...

Flora at Colonization Sites

OROPHARYNX

Streptococcus viridans group
Streptococcus pyogenes
Streptococcus pneumoniae
Staphylococci
Moraxella catarrhalis
Neisseria spp
Corynebacterium spp
Haemophilus spp
Anaerobes: Bacteroides
Candida albicans

NASOPHARYNX

Staphylococci
Streptococci
Moraxella catarrhalis
Neisseria spp
Haemophilus spp

CONJUNCTIVA

Staphylococci
Corynebacteria
Haempphilus

SKIN

Staphylococci
Corynebacteria
Propionibacteria
Candida
Malassezia furfur

UPPER INTESTINE

Streptococci
Lactobacillus spp
Candida spp

GENITOURINARY TRACT

Staphylococci, Streptococci
Enterococci
Lactobacillus spp, Corynebacterium
Neisseria spp, Anaerobes
Candida albicans

LOWER INTESTINE

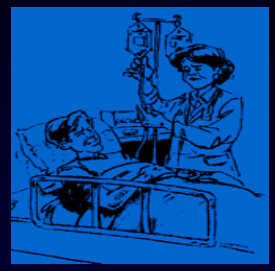
Aerobic G- bacilli: E.coli, Klebs
Enterobacter, Proteus, Serratia
Providencia, Bacteroides, Anaerobic
Enterococci, Streptococci, Candida

Origin of Nosocomial Infection Microorganisms: Colonization

COLONIZATION: 50%

- Study of 48 leukemic patients with neutropenia *(Schmipf 72, Ann Int Med 77:707).*
- Weekly cultures at nose, gingiva, axilla, rectum
- Identification of nosocomial infections
- The patients developed 87 infections
- (particularly during phases with severe neutropenia) including
  - 40 Bacteremias.....42% due to colonizers
  - 37 Other infections.....62% due to colonizers

Origin of Nosocomial Infection Microorganisms: Colonization



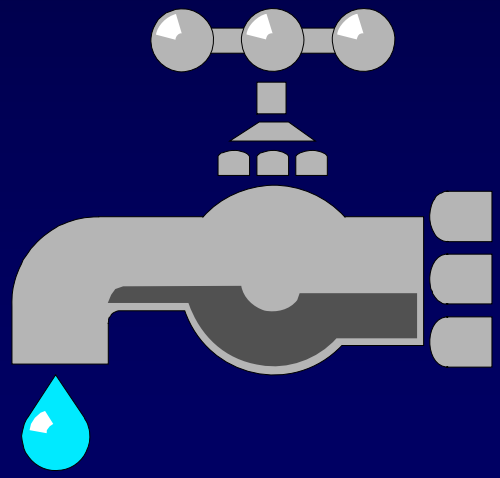
- Study of 42 patients with cancer
- *(Khabbaz 1987, Alimentary tract as source of S.epi bacteremia in patients with cancer. 27th Int.Sci.Confce Antimicr.&Chemoth. NY)*
- 42 patients with

  cancer + bacteremia + Hickman catheter
- 23 (55%) grew Staph.epi from catheter
- 35 (83%) grew Staph.epi from the gut
- 6 (14%) of the bacteremia strains match catheter strain
- 35(83%) of the bacteremia strains match gut strain

Origin of Nosocomial Infection Microorganisms: WATER

- Splash from sink drain, toilet flushing
- Faucet aerator, faucet, water lines
- Plants harbor Aeromonas, Pseudomonas, Acinetobacter
- Water from vase in surgical ward with 8 E6 CFU/ml of water

Aeromonas, Acinetobacter, Pseudomonas, Flavobacterium, Flavimonas, Legionella, Mycobacteria



Origin of Nosocomial Infection Microorganisms: Food

- Bacteria from food infect immunocompetent patients
- Pseudomonas, Enterobacter, Kliebsella, Citrobacter, Serratia
- frequently found on vegetables: typical kitchen salad from a hospital had 200,000 /g

Origin of Nosocomial Infection Microorganisms: Hands

- Activity — Number of Klebsiella on nurse's hand
- Pulse / Blood pressure — 100 - 1,000
- Touching hand — 10 - 100
- Touch shoulder — 7,000
- Oral Temperature — 100 - 1,000
- *Caswell & Phillips, British Med J Nov 1977: 1316*

Hands of nurses washed and cultured:

Patient care Activity

Klebsiella cultured

➔no Klebsiella