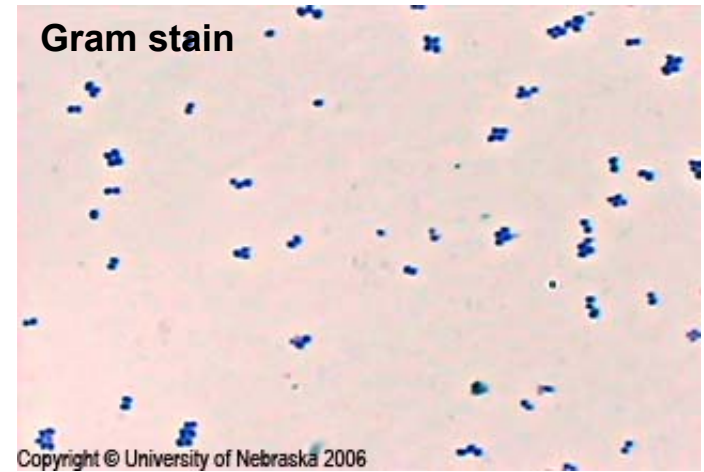


# *Micrococcus* species

- Gram Stain

- Gram positive cocci
- Characteristically in tetrads
- Usually larger than *Staphylococcus* species



- Colony morphology

- *Micrococcus luteus* = yellow pigment
- *Micrococcus roseus* = pink pigment

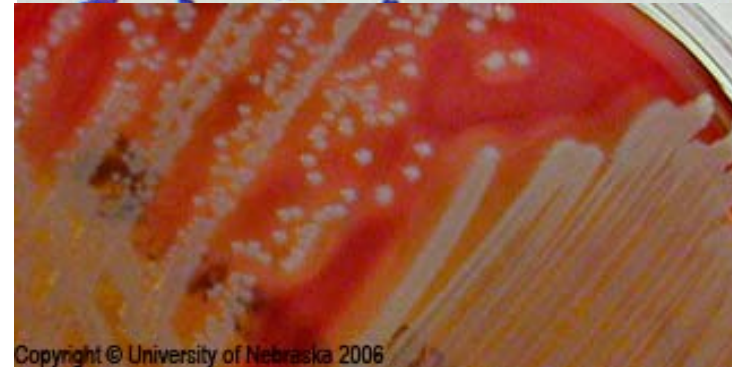
- Biochemical tests

- Catalase positive
- Modified oxidase positive



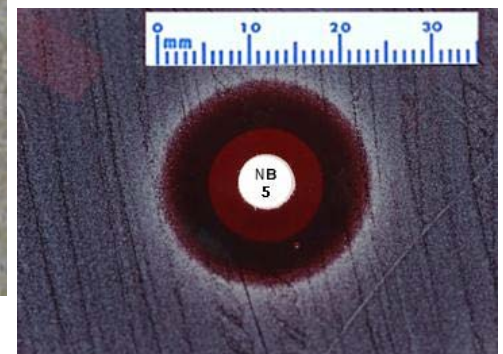
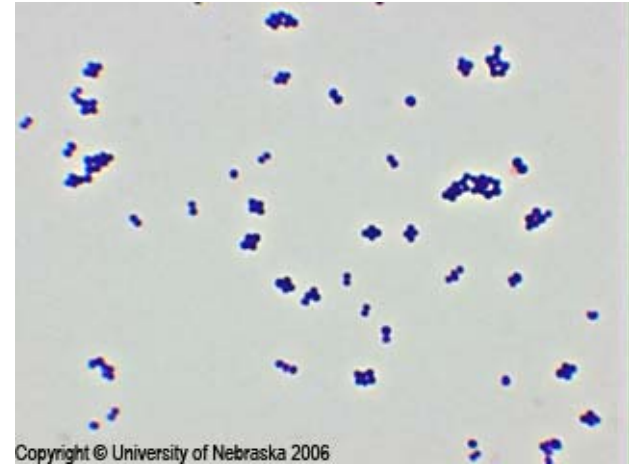
# *Staphylococcus aureus*

- Gram Stain
  - Gram positive cocci in clusters
- Colony morphology
  - Round, smooth, white, creamy colonies with beta-hemolysis
  - May have yellow pigment with extended incubation
- Biochemical tests
  - Catalase positive
  - Coagulase positive
- Pathology
  - Wound & skin infections, toxic shock syndrome, food poisoning, pneumonia, osteomyelitis, bacteremia, etc.



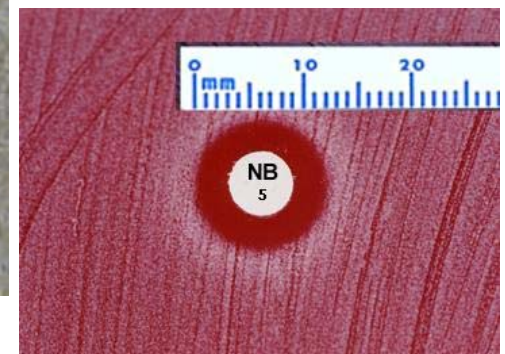
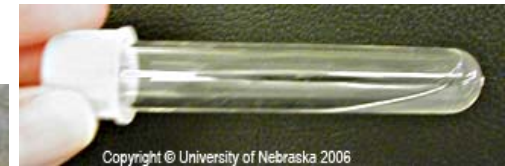
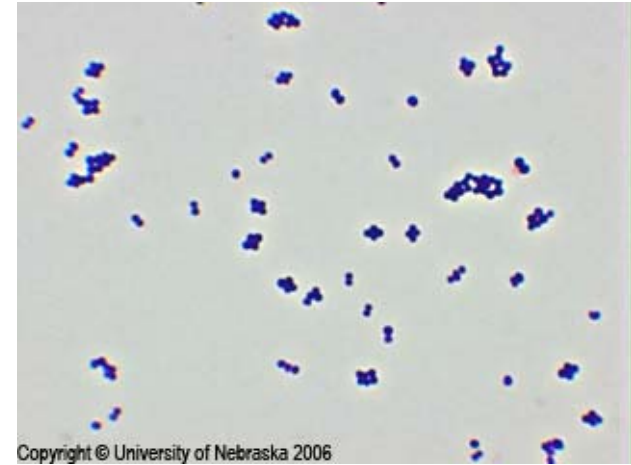
# *Staphylococcus epidermidis*

- Gram Stain
  - Gram positive cocci in clusters
- Colony morphology
  - Round, smooth, white, creamy colonies, no hemolysis
- Biochemical tests
  - Catalase positive
  - Coagulase negative
  - Novobiocin “S”
- Pathology
  - Normal skin flora, nosocomial infections, prosthetic valve endocarditis, catheters, septicemia



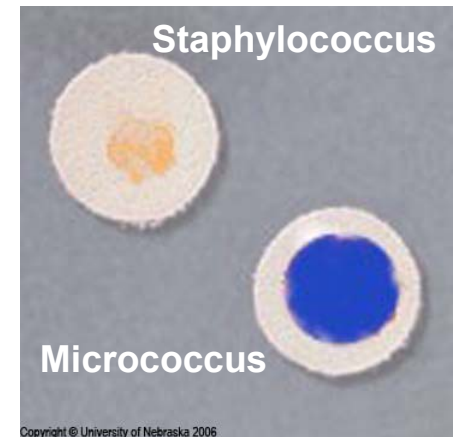
# *Staphylococcus saprophyticus*

- Gram Stain
  - Gram positive cocci in clusters
- Colony morphology
  - Round, smooth, white, creamy colonies, no hemolysis
  - May have yellow pigment
- Biochemical tests
  - Catalase positive
  - Coagulase negative
  - Novobiocin “R”
- Pathology
  - UTI’s in young, sexually active females



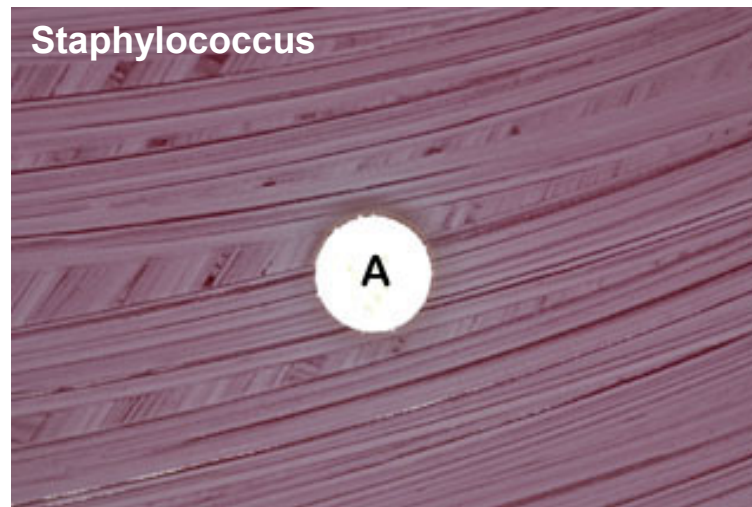
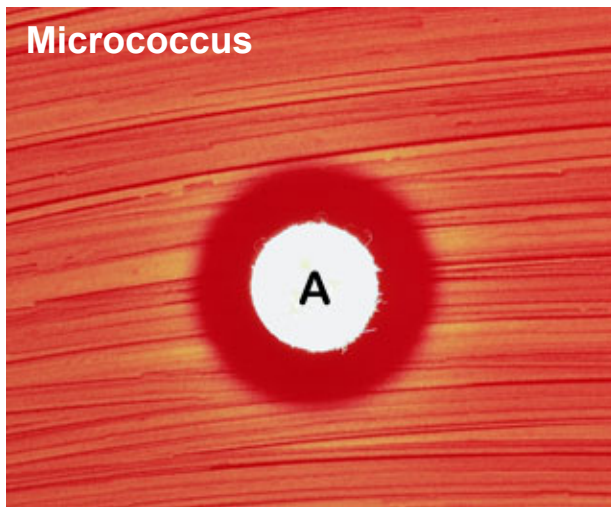
# Microdase (Modified Oxidase) Test

- Rapid test
  - Two minutes for reaction
  - Detects enzyme – cytochrome oxidase
  - Based on oxidase reaction but contains DMSO to release cytochrome oxidase
- Used to differentiate between
  - *Staphylococcus* species
    - No color change = negative for cytochrome C
  - *Micrococcus* species
    - Blue color = positive for cytochrome C



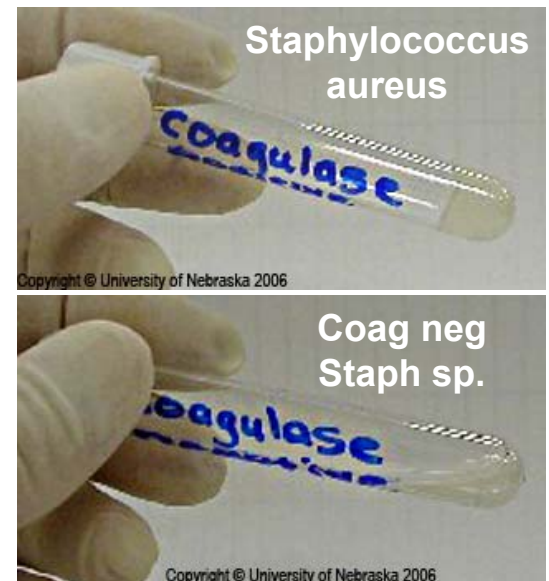
# Bacitracin (“A”, “BC”) Disk

- Overnight disk diffusion test
- Concentration of bacitracin is 0.04 UI
- Used to differentiate between
  - *Micrococcus* species = “S” (zone of no growth)
  - *Staphylococcus* species = “R” (growth right up to disk)



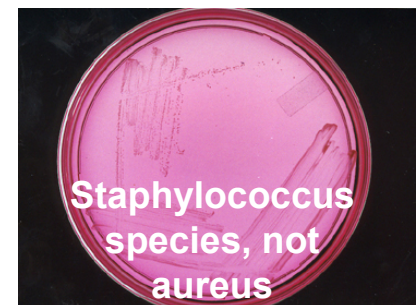
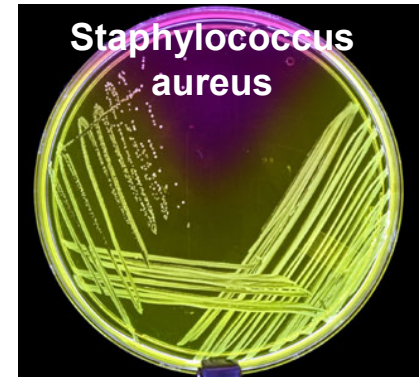
# Coagulase Tube Test

- Tests for free coagulase – an extracellular enzyme that causes a clot to form when bacterial cells are incubated in rabbit plasma
- Used to differentiate between
  - *Staphylococcus aureus* = positive (clot at 4 hours)
    - Some strains of *Staph. aureus* may lyse the clot (due to staphylokinase) so it is important to check reaction every ½ hour for the first 4 hours)
  - Other *Staphylococcus* species = negative (no clot at 24 hours)
    - Report as “Coagulase negative *Staphylococcus* species”



# Mannitol Salt Agar

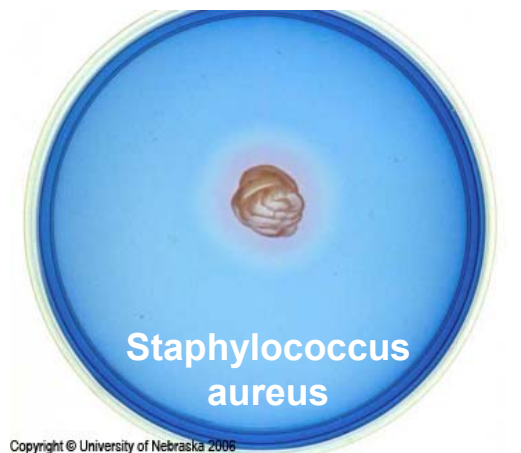
- Media classified as selective and differential
  - Selective for *Staphylococcus* species ( $\uparrow$  NaCl)
  - Differential for the fermentation of mannitol, the sole carbohydrate in the media
    - Mannitol fermented  $\rightarrow$   $\downarrow$  pH  $\rightarrow$  indicator turns pink to yellow
- *Staphylococcus aureus* = positive, yellow colonies surrounded by yellow zone
  - Note: some coag neg *Staph* can be +
- Other *Staphylococcus* species & *Micrococcus* species = negative, reddish colonies – no color change of media





# DNase Agar

- Media classified as differential
- Inoculum is a dime-sized area of growth
- Used to detect the production of an active DNase exoenzyme by aerobic bacteria
- Used to differentiate
  - *Staphylococcus aureus* = positive, pink color around growth
  - Other *Staphylococcus* species = negative, no color change



# Novobiocin Disk

- Disk diffusion test using novobiocin (antibiotic) at a concentration of 5  $\mu\text{g}$  for the presumptive identification of *Staphylococcus saprophyticus* in urine cultures
- *Staphylococcus saprophyticus* = “R”
  - Organism grows up to the disk or a zone  $\leq 16$  mm
- Other *Staphylococcus* species = “S”
  - Organism’s growth is inhibited by antibiotic with a zone  $> 16$  mm

