THE GRAM STAIN ADVANCED INTERPRETATIONS

Richard (Tom) Thomson, Jr., Ph.D.
Northwestern University Feinberg School of Medicine
Evanston Northwestern Healthcare

REVIEW OF THE BASICS

- Procedural highlights
  - Select area of specimen
  - Prepare smear
  - Low and high power scanning
  - Quantitate cells and microorganisms
  - Interpret by specimen source
  - Slides for review
- Interpret bacterial morphologies
  - Minimum competency
  - Advanced competency

EXTRA GRAM STAIN MORPHOLOGIES INDICATORS OF PATHOLOGY

- White blood cells
  (polymorphonuclear leukocytes)
- Alveolar macrophages
- Squamous/columnar epithelial cells
- Elastin/collagen fibers
- Curschmann’s spirals
- Corpora amylacea

EXTRA GRAM STAIN MORPHOLOGIES INDICATORS OF PATHOLOGY

- Cell necrosis
- Intracellular bacteria/yeasts
- “Antibiotic” treated bacteria
- Crystals
- Respiratory therapy
- Other oddities
GRAM STAIN: PATTERN RECOGNITION

- **Respiratory tract**
  - Pneumonia/bronchitis
  - Aspiration pneumonia
  - Cystic fibrosis
  - Chronic lung disease/COPD

- **Urinary tract**
  - UTI
  - Vesicocolonic fistual

- **Meningitis**
GRAM STAIN: PATTERN RECOGNITION

- **Abscess**
  - Staphylococcal
  - Mixed aerobic/anaerobic
  - Streptococcus milleri/anginosis
  - Nocardia
- **Toxemia**
  - Streptococcal necrotizing fasciitis
  - Clostridium gas gangrene
- **Miscellaneous**
  - BV (bacterial vaginosis)
  - Lemierre’s disease (jugular vein thrombosis)
  - Gonococcal urethritis
  - Crystalline joint disease
AFTER ALL THIS TRAINING

• Can you identify the pathogen in the following case?
  – Newborn sepsis
  – Mother appears at hospital in labor
    • no pre-natal care
  – Peri-partum fever
  – Child delivered vaginally
    • Blood and CSF specimens for stain/culture

CONCLUSIONS

Microbiology Model

• Standardize Gram stain procedure
• Minimum competency for laboratory personnel
• Gram stain review procedure
• Advanced interpretation
  – Indicators of pathology
  – Pattern recognition (diseases)
• Use Gram stain results in culture work-up
• Train physicians to use the Gram stain
• Future?
  – Provide images of diagnostic Gram stains (high resolution monitors)