Electron Microscopy in Diagnosis of Infectious Diseases

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Outline Part 1

B. Other organisms
   1. Bacteriology
   2. Mycology
   3. Photology (algae)
   4. Protozoology

Questions/Discussion
Bacteriology
Identification of Bacteria—Shape/Replication

- Spherical
- Rod-shaped
- Branching
- Clusters
Identification of Bacteria—Wall Structure

Gram Negative Bacteria

Gram Positive Bacteria

Cytoplasm

7-8 nm Peptidoglycan 20-80 nm

Wall

Cytoplasmic Membrane

Trends Microbiol.
Identification of Bacteria—Wall Structure

Gram Negative Bacteria

![Gram Negative Bacteria Image](image1)


Gram Positive Bacteria

![Gram Positive Bacteria Image](image2)

*Brit J Nutrit.* 1990;63;563-578

Gram Negative Bacteria

*J Bacteriol.* 1978;135;687-702
Identification of Bacteria—Capsule

E. coli

P. aeruginosa

S. oneidensis

G. sulferreducens
Identification of Bacteria—Location

Salmonella typhimurium inside cells

Surface bacteria

Summary: Identification of Bacteria

- Shape: coccoid/baciliform (rod-shaped)
- Size: diameter/length
- Cell wall type: Gram negative/positive
- Location: intracellular/extracellular
- Variety: all one kind or mixed
- Replication: clusters, chains
- Numbers: many, few
Mycology (Fungi)
Identification of Microsporidia

Polar tubes

Pattern of growth inside cells

http://www.palaeos.com/Eukarya/Units/Microsporidia/Microsporidia.000.html

www.dpd.cdc.gov/dpdx
Septated parasitophorous vacuoles of *Encephalitozoon intestinalis* in jejunum

Polar tubes in 2 rows
Identification of Yeasts

Size: ~5 nm
Ovoid
Thick cell wall
Budding
Encapsulated

Yeast invading cells

From Dr. Soumitra Ghoshroy
Univ So Carolina

Yeast invading cells

Yeasts in BAL

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Identification of Yeasts-Location

C. albicans epithelial invasion

Published online 2012 May 14. doi: 10.1371/journal.pone.0036952
Algae Pathogens

- Most algae with chloroplasts are not pathogenic, except to those with immunosuppression.
- Most common pathogenic alga is *Prototheca*.
- *Prototheca* does not have chloroplasts.
Prototheca species

• Wide range of infections in humans, including cutaneous infections, olecranon bursitis, and disseminated disease.
• Can occur in both immunocompetent and immunosuppressed patients.
• More severe and disseminated infections tend to occur in immunocompromised individuals.
• Found in water; seen in water-contaminated wounds.
Prototheca wickerhami

6-10 μm

No chloroplasts

Internal septations

Protozoology

Big: 10 to 52 μm, up to 1 mm

Specialized organelles:

- Rhoptries
- Micronemes
- Conoids

http://palaeos.info/eukarya/glossary/glossaryL.htm
Protozoology

Cryptosporidium
http://www.fao.org

Coccidium

Dis Aquat Org 1993;17:182-189
Summary: Higher Organisms

- Is it big?
- Does it have a nucleus?
- Is it a yeast? (ovoid, budding)
- Does it have hyphae? (filamentous)
- Does hyphae have segments, branches?
- Does it have polar tubes, rhoptries, chloroplasts, other identifying organelles/characteristics?
- Where is it? extracellular/intracellular; lung; how specimen obtained?
- Is it a mixed infection?
Characteristics for Identification
References for Protocols:

Negative Staining Electron Microscopic Protocol for Rash Illness. [Website](http://www.bt.cdc.gov/labissues/)
Then click on title above.

Electron Microscopy for Rapid Diagnosis of Emerging Infectious Agents. [Website](http://wwwnc.cdc.gov/eid/article/9/3/02-0327_article.htm)

