Entamoeba Species

**Entamoeba histolytica**, **Entamoeba coli**, **Entamoeba gingivalis**, **Naegleria**, **Acanthamoeba**, **Endolimax Nana**

Dr. Mohammad Sabri
**Entamoeba histolytica**

**A-MORPHOLOGY**

**1. TROPHOZOITE:**

<table>
<thead>
<tr>
<th>E</th>
<th>F</th>
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</thead>
<tbody>
<tr>
<td>Trophozoite (Vegetative)</td>
<td>![Trophozoite Image]</td>
</tr>
<tr>
<td>Pseudopodia</td>
<td></td>
</tr>
<tr>
<td>Endoplasm with inclusions</td>
<td></td>
</tr>
<tr>
<td>Ectoplasm</td>
<td></td>
</tr>
<tr>
<td>Cytoplasm</td>
<td></td>
</tr>
</tbody>
</table>
| Nucleus | Membrane
Chromatin
Nuclear membrane
Fibrillar network
Karyosome |

**E:** Line drawing of an *E. histolytica* trophozoite.
**F:** *E. histolytica* trophozoite in a direct wet mount stained with iodine.

1. generally 20-30 µm, but range from 10-60 µm in size
2. Motile with blunt pseudopodia, also filopodia
3. Spherical nucleus with central, dark endosome
4. Food vacuoles present, may contain erythrocytes of host
5. Trophozoites passed in diarrhea or unformed stools can not encyst, slow passage or dehydration can stimulated the formation of the precyst
G: *E. histolytica* trophozoite, measuring approximately 16.7 µm, stained with trichrome. The image was taken at 1000× magnification

H: *E. histolytica* trophozoite. The specimen was preserved in poly-vinyl alcohol (PVA) and stained in trichrome. PCR was performed on this specimen to differentiate between *E. histolytica* and *E. dispar*.

**Trophozoite of *E. histolytica* with ingested erythrocytes stained with trichrome.** The ingested erythrocyte appears as a dark inclusion. Erythrophagocytosis is the only characteristic that can be used to differentiate morphologically *E. histolytica* from the nonpathogenic *E. dispar*. 
2-CYST:-

6. Cyst is 10-20 µm and is the infective stage and is passed in the feces, hyaline membrane can resist digestion by stomach acid.
7. Within 24 hours the single nuclei precyst divides to produce 4 nuclei (metacyst)
8. A 4 nucleated cyst is typically seen in the formed stools of infected carriers.

A: Line drawing of an *E. histolytica* cyst.
B: *E. histolytica* in a concentrated wet mount stained with iodine. The cysts are usually spherical and often have a halo. The cyst in A appears uninucleate.
Pathology

Invasion of the large intestine

- Mucosa
- Muscularis mucosa
- Submucosa
- Muscle layers
- Serosa

The primary ulcer
- Invasion of mucosa via crypts
- Repair may:
  - normalise, necrosis with healing
  - keep pace with necrosis causing persistent superficial lesions

- "Flash-shaped" lag behind extension

Extension in mucosa
- Muscularis mucosae relatively resistant
- Accumulation of amebae submucosal to t
- Lateral extension of lytic necrosis

Formation of abscesses
- Abscesses may coalesce under intact mucose
- Later mucose may slough with widespread ulceration

- Deep extension
  - Muscularis mucosae eventually pericard (directly or via vessels)
  - Deep necrosis of submucosae, even muscle and sub-serosa

Complications and sequelae

- Perforation
  - Haemorrhage (rare)

- Secondary infection

- Amoeboma (rare)
  - Clinically simulates neoplasm
  - Infiltration

- Invasion of blood vessels
- Direct extension outside bowel

Peritonitis
- Haemorrhage

Surrounding inflammatory reaction and fibroplastic proliferation
- A mass unio dermato mesenteric to lumen
  - Infiltration of adjacent tissue and amebae
  - Surrounding granulomatosus tissue zone with eosinophilic and lymphocytes
  - Outer terminally fibrotic tissue

Intestinal protozoa
Entamoeba histolytica (causing amoebiasis) (continued)

Extraintestinal lesions in amoebiasis

- Haematogenous spread
  - Invasion of large intestine
  - Direct extension
  - Cutaneous amoebiasis
    - Spreading ulcer
    - Irregular margins
    - Necrotic floor
    - Amoebae laterally

- Further haematogenous spread
  - Secondary invasion, especially in liver
  - Fibrin thrombus containing amoebae trapped in small vessels
  - Amoebae digest pathways into tissue
  - Multiple small loc of necrosis
  - Essentially no surrounding reaction

- Further haematogenous spread
  - Formation of abscess(es)
  - Further direct extension
  - Almost normal tissue invaded by amoebae
  - Later some (slight) polymorph infiltration
  - Red brown fluid
  - Cellular debris with amorphous molecules
  - Usually bacterially sterile
  - Zone of stroma of organ

Direct extension

Lung

- Sub-diaphragmatic abscess
- Skin of abdominal wall after rupture or surgery
- Peritoneal cavity and other abdominal organs

Haematogenous spread

Brain

- May rupture into bronchi (anothy sacs, mucus)
- Pneumonia-pulmonary abscess
- Pericardium (Cardiac tamponade)

- Edematous sites
- Secondary to: Concomitant with
- Independent of
- Liver involvement

Perianal skin, balanitis, vulvitis
Clinical Manifestations

Clinical symptoms can develop as early as two to four weeks after infection with E. histolytica or after asymptomatic periods of months or even years. Patients have acute or chronic diarrhea, which may progress to including blood-tinged, so-called “red currant jelly stools” in which amebas can be detected, including trophozoites containing erythrocytes. Extraintestinal disease may be present as a complication or as a primary problem (e.g., liver, lung or brain abscess, or skin or perianal infection), or other gastro-intestinal symptoms such as abdominal pain or cramps. This non-invasive infection can persist or progress to an invasive disease in which trophozoites penetrate the intestinal mucosa and kill the epithelial cells.

<table>
<thead>
<tr>
<th>Clinical Syndromes Associated with Amebiasis</th>
<th>Amebiasis Progression</th>
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</thead>
<tbody>
<tr>
<td><strong>Intestinal Disease</strong></td>
<td><strong>non-invasive</strong></td>
</tr>
<tr>
<td>• asymptomatic cyst passer</td>
<td>• ameba colony on mucosa surface</td>
</tr>
<tr>
<td>• symptomatic nondysenteric infection</td>
<td>• asymptomatic cyst passer</td>
</tr>
<tr>
<td>• amebic dysentery (acute)</td>
<td>• non-dysenteric diarrhea</td>
</tr>
<tr>
<td>• fulminant colitis</td>
<td><strong>invasive</strong></td>
</tr>
<tr>
<td>• + perforation (peritonitis)</td>
<td>• necrosis of mucosa → ulcer</td>
</tr>
<tr>
<td>• ameboma (amebic granuloma)</td>
<td>• dysentery</td>
</tr>
<tr>
<td>• perianal ulceration</td>
<td>• hematophagous trophozoites</td>
</tr>
<tr>
<td><strong>Extraintestinal Disease</strong></td>
<td>• ulcer enlargement → peritonitis</td>
</tr>
<tr>
<td>• liver abscess</td>
<td>• occasional ameboma</td>
</tr>
<tr>
<td>• pleuropulmonary amebiasis</td>
<td>• metastasis → extraintestinal amebiasis</td>
</tr>
<tr>
<td>• brain and other organs</td>
<td>• via blood-stream or direct extension</td>
</tr>
<tr>
<td>• cutaneous and genital diseases</td>
<td>• primarily liver → amebic abscess</td>
</tr>
<tr>
<td></td>
<td>• other sites infrequent</td>
</tr>
<tr>
<td></td>
<td>• ameba-free stools common</td>
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**D-DIAGNOSIS**

### Intestinal Disease
- stool examination
  - cysts and/or trophozoites
- sigmoidoscopy
  - lesions, aspirate, biopsy
- antigen detection
  - histolytica/dispar

### Extraintestinal (hepatic) Disease
- serology
  - current or past?
- imaging
  - CT, MRI, ultrasound
- abscess aspiration
  - only select cases
  - reddish brown liquid
  - trophozoites at abscess wall

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**E-AMEBIASIS TREATMENT**

<table>
<thead>
<tr>
<th>Drugs</th>
<th>Uses</th>
</tr>
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<tbody>
<tr>
<td><em>Iodoquinol</em> (<em>Yodoxin</em>), <em>Paromomycin, or</em> <em>Diloxanide furoate</em> (<em>Furamide</em>)</td>
<td>Luminal agents to treat asymptomatic cases and as a follow up treatment after a nitroimidazole.</td>
</tr>
<tr>
<td>Metronidazole (<em>Flagyl</em>) or Tinidazole (<em>Fasigyn</em>)</td>
<td>Treatment of nondysenteric colitis, dysentery, and extra-intestinal infections.</td>
</tr>
<tr>
<td>Dehydroemetine or <em>Emetine</em></td>
<td>Treatment of severe disease such as necrotic colitis, perforation of intestinal wall, rupture of liver abscess.</td>
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</table>
# SUMMARY OF GENERAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Genus and Species</th>
<th>Entamoeba histolytica</th>
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<tr>
<td><strong>Etiologic Agent of:</strong></td>
<td>Amoebiasis; Amoebic dysentery; Extraintestinal Amoebiasis, usually Amoebic Liver Abscess = “anchovy sauce”); Amoeba Cutis; Amoebic Lung Abscess (“liver-colored sputum”)</td>
</tr>
<tr>
<td><strong>Infective stage</strong></td>
<td>Cyst</td>
</tr>
<tr>
<td><strong>Definitive Host</strong></td>
<td>Human</td>
</tr>
<tr>
<td><strong>Portal of Entry</strong></td>
<td>Mouth</td>
</tr>
<tr>
<td><strong>Mode of Transmission</strong></td>
<td>Ingestion of mature cyst through contaminated food or water</td>
</tr>
<tr>
<td><strong>Habitat</strong></td>
<td>Colon and Cecum</td>
</tr>
<tr>
<td><strong>Pathogenic Stage</strong></td>
<td>Trophozoite</td>
</tr>
<tr>
<td><strong>Locomotive apparatus</strong></td>
<td>Pseudopodia (“False Foot”)</td>
</tr>
<tr>
<td><strong>Motility</strong></td>
<td>Active, Progressive and Directional</td>
</tr>
<tr>
<td><strong>Nucleus</strong></td>
<td>'Ring and dot' appearance: peripheral chromatin and central karyosome</td>
</tr>
<tr>
<td><strong>Mode of Reproduction</strong></td>
<td>Binary Fission</td>
</tr>
<tr>
<td><strong>Pathogenesis</strong></td>
<td>Lytic necrosis (it looks like “flask-shaped” holes in Gastrointestinal tract sections (GIT))</td>
</tr>
<tr>
<td><strong>Type of Encystment</strong></td>
<td>Protective and Reproductive</td>
</tr>
<tr>
<td><strong>Lab Diagnosis</strong></td>
<td>Most common is Direct Fecal Smear (DFS) and staining (but does not allow identification to species level); Enzyme immunoassay (EIA); Indirect Hemagglutination (IHA); Antigen detection – monoclonal antibody; PCR for species identification. Culture: From faecal samples - Robinson's medium, Jones' medium</td>
</tr>
<tr>
<td><strong>Treatment</strong></td>
<td>Metronidazole for the invasive trophozoites PLUS a lumenal amoebicide for those still in the intestine (Paromomycin is the most widely used)</td>
</tr>
</tbody>
</table>

## Trophozoite Stage

| Pathognomonic/Diagnostic Feature | Ingested RBC; distinctive nucleus |

## Cyst Stage

<table>
<thead>
<tr>
<th>Chromatoidal Body</th>
<th>'Cigar' shaped bodies (made up of crystalline ribosomes)</th>
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<tbody>
<tr>
<td><strong>Number of Nuclei</strong></td>
<td>1 in early stages, 4 when mature</td>
</tr>
<tr>
<td><strong>Pathognomonic/Diagnostic Feature</strong></td>
<td>'Ring and dot' nucleus and chromatoid bodies</td>
</tr>
</tbody>
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