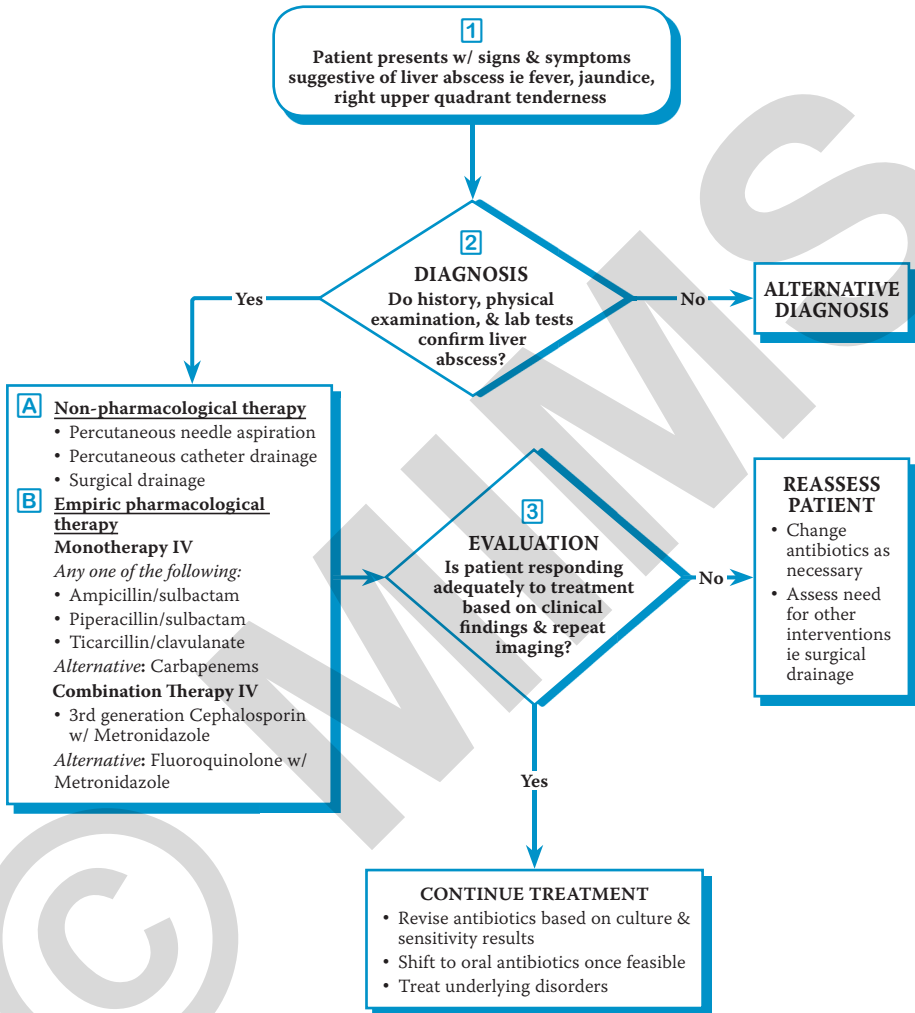


Liver Abscess (1 of 11)



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1 CLINICAL PRESENTATION

- Liver abscess may result from peritonitis & bowel leakage via portal circulation, direct spread from biliary disease, or from hematogenous seeding

Signs & Symptoms

- Classical presentation: Fever, jaundice, right upper quadrant symptoms (pain, guarding, rocking & rebound tenderness)
 - Liver abscess diagnosis is not excluded w/ negative right upper quadrant findings
- Chills, malaise, fatigue, anorexia, weight loss, abdominal pain, vomiting
- Cough or hiccups from diaphragmatic irritation
- Pain referred to the right shoulder

Other Clinical Presentations

- Patients w/ liver abscess may occasionally be afebrile
- Elderly patients often present insidiously with low-grade fever, dull abdominal pain & other non-specific systemic symptoms
- Patients w/ multiple abscesses tend to present more acutely than those w/ a solitary abscess

Risk Factors

- Biliary tract disease is the most common cause of bacterial liver abscess
 - Suppurative cholangitis following biliary obstruction (eg from stones, malignancy, stricture, congenital conditions), recurrent pyogenic cholangitis
 - Post-op complication in patients who have undergone endoscopic sphincterotomy for bile duct stones or surgical biliary-intestinal anastomosis
- Cholecystitis, infections in organs in the portal bed
- Penetrating & blunt trauma to the liver
- Subphrenic or perinephric abscess may result in direct spread of infection from a contiguous focus
- Systemic bacteremia eg endocarditis, pyelonephritis that may result in spread of organisms to the liver through the hepatic artery
- Systemic illnesses including diabetes mellitus, malignancy, cirrhosis, cardiopulmonary disease, severe malnutrition, inflammatory disease
- Immune system deficiencies eg chronic granulomatous disease, hematologic malignancy, liver transplant
- Severe periodontal disease especially in alcoholics
- Amoebic liver abscess should be considered in patients from endemic areas or have traveled to an endemic area
 - 10 times more common in men as in women
- Inmates of residential institutions, patients w/ underlying immunosuppression & men who have sex w/ men are at increased risk
- Other possible factors include pancreatoduodenectomy, chemoembolization or radiofrequency ablation in the presence of infected bile, necrosis of a primary tumor, or superinfection of metastases

Causative Organisms

- Most pyogenic liver abscesses are polymicrobial (eg enteric facultative & anaerobic species)
- Common etiologic agents of pyogenic liver abscess are *E coli*, *K pneumoniae*, *Proteus* sp & other Enterobacteriaceae, *Pseudomonas* sp, *Streptococcus* sp, *S aureus*, Enterococci, *B fragilis*, *F necrophorum*
 - Usual pathogens in patients w/ underlying biliary disease: Enterococci, enteric Gram-negative bacilli
 - Usual pathogens in patients w/ underlying colonic or biliary source of infection: Anaerobes, coliforms
 - *S aureus* may be isolated from patients w/ liver abscess resulting from hematogenous spread of microbes from a distant source
 - *Entamoeba histolytica* if amoebiasis is a potential consideration

2 DIAGNOSIS

- Diagnosis of liver abscess is made by history, physical examination, imaging, & culture of abscess material

History

- Inquire about patient's medical history, recent procedures, place of residence, history of travel

Physical Examination

- Fever, jaundice
- Tender, enlarged liver w/ or w/o a palpable mass
- Epigastric tenderness may be found in patients w/ left hepatic lobe abscess
- Decreased breath sounds on the base of the right lung w/ signs of atelectasis & pleural effusion
- Pleural or hepatic friction rub
- Rare: Ascites, splenomegaly

2 DIAGNOSIS (CONT'D)**Imaging**

- Imaging of the liver is essential in making the diagnosis of liver abscess
- Ultrasound and computed tomography (CT) scan are the initial imaging procedures of choice
- Cannot distinguish pyogenic liver abscess from amoebic abscess

Ultrasound

- Inexpensive & accurate
- Recommended for patients w/ suspected biliary disorders & those who cannot be exposed to radiation or receive contrast dyes
- Useful for guiding needle aspiration of abscess
- Abscesses are seen as hypoechoic masses w/ irregularly shaped borders, w/ or w/o internal septations

CT Scan

- More sensitive than ultrasound
 - Can detect abscesses smaller than 1 cm better than ultrasound
- Superior to ultrasound for guiding complex drainage procedures
- Can be used to assess the relationship of an abscess to adjacent structures, to evaluate for a concurrent disorder in the abdomen & pelvis & to detect gas in the abscess
- Abscesses are seen as hypodense structures w/ or w/o a rim of contrast enhancement

Chest X-ray

- About half of patients will have basilar atelectasis, elevation of the right hemidiaphragm, & right pleural effusion
- May initially lead to a wrong diagnosis of pneumonia or pleural disease

Cultures**Culture of Abscess Fluid**

- Aspirated abscess fluid should be Gram stained & cultured to establish the microbiologic diagnosis
 - Other causes of liver abscess are amoeba & fungi, most commonly *Candida* species
- Culture from drains is not recommended due to contamination w/ skin flora

Blood Culture

- Positive in about half of patients w/ liver abscess
- Samples should be taken for both aerobic & anaerobic cultures
- Results of blood & abscess fluid cultures are not always concordant

Other Laboratory Examinations**Tests to Detect Amoebic Infection**

- Enzyme-linked immunosorbent assay (ELISA) should be done to detect *E histolytica* in patients who are from endemic areas or have traveled to endemic areas
- Indirect hemagglutination may also be used in serologic diagnosis, but is less sensitive than ELISA
- Other serologic tests include indirect immunofluorescence & Latex agglutination technique
- Fecal exam to detect *E histolytica* trophozoites & cysts

Liver Function Tests

- Alkaline phosphatase elevation is seen in two-thirds of patients & tends to deviate from the normal range more than the other liver function tests
- Hypoalbuminemia is also common
- Abnormalities in ALT, AST & bilirubin levels are variable

Complete Blood Count

- Leukocytosis w/ neutrophil predominance
- May reveal anemia of chronic disease

Alternative Diagnosis

- Cholecystitis
- Biliary disorders
- Hepatocellular carcinoma, inflammatory pseudotumor of the liver
- Acute gastritis
- Pleuropulmonary empyema

3 EVALUATION

- Monitor patient's clinical response & follow-up imaging studies to decide duration of antibiotic therapy & need for other interventions
 - May follow temperature, white blood cell count, & serum C-reactive protein
 - Resolution of abnormalities on imaging lag behind clinical or lab marker improvement
- Surgical drainage may be needed in a patient w/ failed percutaneous drainage, persistent jaundice, renal impairment, multiloculated abscess

A NON-PHARMACOLOGICAL TREATMENT**Indications for Drainage**

- Most pyogenic abscesses require drainage
 - If multiple abscesses are present, only the largest abscess may require aspiration
 - Dispensing w/ a drainage procedure (ie giving antibiotics alone) should be considered only in patients w/ small abscesses not amenable to drainage or in those for whom drainage is too risky
- Patients w/ amoebic abscesses require drainage only for very large lesions & for those in whom rupture is imminent

Percutaneous Needle Aspiration

- Done under CT scan or ultrasound guidance; often the initial diagnostic procedure performed for a single abscess ≤ 5 cm
- Requires only local anesthesia & minimal sedation
- Allows sampling of small &/or multiple lesions for culture; may do away w/ the need for catheter placement

Percutaneous Catheter Drainage

- Standard of care for most liver abscesses
- Entails placement of a catheter under ultrasound or CT guidance followed by daily flushing
- Should be the initial intervention for small abscesses < 5 cm & for single abscess > 5 cm
- May be used for draining multiple abscesses
- Advantages: Does not require general anesthesia, allows gradual drainage, faster recovery rate
- Contraindications: Complicated thick-walled abscess w/ viscous pus, peritonitis, complicated access

Surgical Drainage

- Indications for surgical drainage: Treatment of underlying intra-abdominal disorders including peritonitis, failure of previous percutaneous catheter drainage, multiple & loculated abscesses, ruptured abscess, viscous abscess obstructing the drain, large abscesses > 5 cm
- Open drainage may be through the transperitoneal or transpleural approach
- Laparoscopic drainage enables exploration of entire abdomen w/ significantly reduced patient morbidity
- Possible complications of drainage include recurrent pyogenic hepatic abscess, intra-abdominal abscess, kidney or liver failure, surgical wound infection

Endoscopic Retrograde Cholangiopancreatography (ERCP)

- May be used in patients w/ prior biliary procedures & whose infection is connected w/ the biliary tree

B PHARMACOLOGICAL THERAPY**Principles of Empiric Antibiotic Therapy**

- Antibiotics should be started as soon as pyogenic liver abscess is considered
- Antibiotic therapy alone w/o drainage should be considered only in patients w/ small abscesses ($< 3-5$ cm) that are not amenable to drainage & in those in whom drainage will pose an unreasonable risk
- Initial antibiotics should be broad spectrum to cover common causative pathogens of pyogenic liver abscess
- Metronidazole should be part of the initial therapy to provide empiric treatment for both anaerobes & *E histolytica*
- Antibiotics should be based on local antimicrobial resistance patterns & modified based on culture & sensitivity testing results

B PHARMACOLOGICAL THERAPY (CONT'D)**Antibiotic Options**

- Ampicillin + Aminoglycoside
 - Should be part of antibiotic regimen when a biliary source is suspected
- Cephalosporins
 - 2nd or 3rd generation cephalosporins are recommended when a colonic source is considered
 - Provide excellent coverage for enteric bacilli
 - Some cephalosporins have coverage against anaerobes
- Metronidazole or Clindamycin
 - Should be included in antibiotic regimen to cover for anaerobes if other antibiotics being used do not have anaerobic coverage
 - If amoebiasis is suspected, Metronidazole should be started
- Other antibiotics/antibiotic combinations that may be used for pyogenic liver abscesses include:
 - Antipseudomonal penicillins w/ or w/o beta-lactamase inhibitor
 - Carbapenems
 - Recommended for patients w/ diabetes mellitus due to risk of ESBL infection
 - Fluoroquinolone + Metronidazole +/- aminoglycoside
 - Vancomycin + Metronidazole +/- aminoglycoside

Drugs for Amoebic Liver Abscess

- Chloroquine
 - May be used as an adjunct w/ Metronidazole in patients w/ large & multiple abscesses
 - Active against *E histolytica* trophozoites, achieves high concentrations in hepatic tissue
- Metronidazole
 - Highly lethal to *E histolytica* trophozoites
 - Absorbed quickly through the gut w/ excellent bioavailability
- Secnidazole, Tinidazole
 - May be substituted for Metronidazole in uncomplicated cases of invasive amoebiasis
- Luminal amoebicides eg Diloxanide furoate, Etofamide, Iodoquinol, Nitazoxanide & Paromomycin are active against *E histolytica* cysts & trophozoites in the intestine

Duration of Antibiotic Therapy**Pyogenic Liver Abscess**

- Duration of therapy should be based on severity of infection & patient's response
- IV antibiotics should be continued for at least 2 wk; therapy may be continued through the oral route afterwards for up to 6 wk
- Multiple abscesses may need up to 12 wk of antibiotic treatment

Amoebic Abscess

- IV Metronidazole should be given for 5-10 days
- Following a course of Metronidazole, an oral luminal amoebicide should be given for 7 days to eradicate residual amoeba in the intestines

Dosage Guidelines

AMINOGLYCOSIDES		
Drug	Dosage	Remarks
Amikacin	15 mg/kg/day IM/IV divided 8 hrly, 12 hrly or 24 hrly	Adverse Reactions - Ototoxic effects (can cause irreversible ototoxicity resulting in hearing loss, dizziness, vertigo); Renal effects (reversible nephrotoxicity; acute renal failure has been reported usually when other nephrotoxic drugs have also been administered); Neuromuscular effects (neuromuscular blockade resulting in resp depression & muscular paralysis); Hypersensitivity reactions Special Instructions - Ototoxicity & nephrotoxicity are most likely in dehydrated patients, those w/ renal impairment, in patients who are receiving high doses or for long periods or who are also receiving or have received other ototoxic/nephrotoxic drugs - Consider monitoring of serum concentrations &/ or peak serum concentrations/MIC ratio in these patients - Use w/ caution in patients w/ conditions associated w/ muscle weakness (eg myasthenia gravis), patients w/ pre-existing renal dysfunction, vestibular or cochlear impairment
Dibekacin	1-3 mg/kg/day IM/IV divided 12 hrly	
Gentamicin	3-5 mg/kg/day IM/IV divided 8 hrly 5 mg/kg IV 24 hrly	
Isepamicin	15 mg/kg/day IM/IV divided 12-24 hrly Max dose: 1.5 g/day	
Netilmicin	4-6 mg/kg/day IV divided 8-12 hrly	
Sisomicin	3 mg/kg/day IM/IV divided 8 hrly	

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Dosage Guidelines

CEPHALOSPORINS		
Drug	Dosage	Remarks
Cephalosporin (1st Generation)		Adverse Reactions • Hypersensitivity reaction (urticaria, pruritus, severe reactions eg anaphylaxis can occur); GI effects (diarrhea, N/V, rarely antibiotic-associated diarrhea/colitis); Other effects (Candidal infections, inj site inflammation) • High doses may be associated w/ CNS effects (encephalopathy, convulsions); Rarely hematologic, hepatic & renal effects have occurred • Prolonged prothrombin time (PT), prolonged activated partial thromboplastin time (APTT), &/or hypoprothrombinemia (w/ or w/o bleeding time) have been reported & occurs most frequently w/ N-methylthiotetrazole (NMTT) side chain-containing cephalosporins Special Instructions • May be taken w/ food to decrease gastric distress • Ceftriaxone is contraindicated in hyperbilirubinemic neonates • Avoid simultaneous administration of Ceftriaxone w/ IV Ca-containing soln • Use suspension containing sodium benzoate w/ caution in neonates as this has been associated w/ gasping syndrome • Use w/ caution in patients allergic to Penicillin, there may be 10% chance of cross sensitivity; & patients w/ renal impairment & GI disease esp w/ history of colitis
Cefazolin	1-4 g/day IM/IV divided 8-12 hrly	
Cephalosporins (2nd Generation)		
Cefotiam	0.5-2 g/day IM/IV divided 6-12 hrly 200- 400 mg PO 8 hrly	
Cefoxitin	1-2 g IM/IV 8 hrly	
Cephalosporins (3rd Generation)		
Cefmenoxime	1-2 g IV/day divided 6-12 hrly	
Cefoperazone	1-2 g IV 12 hrly Max dose: 12 g/day	
Cefoperazone-sulbactam	2-4 g/day IV divided 12 hrly Max dose: 8 g/day (4 g of Cefoperazone)	
Cefotaxime	1-2 g IM/IV 8 hrly Max dose: 12 g/day Infant & childn: 50- 100 mg/kg/day IM/IV divided 6-12 hrly	
Ceftazidime	1-6 g IM/IV divided 8-12 hrly Max dose: 9 g/day	
Ceftizoxime	1-2 g IM/IV 8-12 hrly	
Ceftriaxone	1-4 g/day IV 24hrly	
Cephalosporin (4th Generation)		
Cefepime	2 g IV 12 hrly	

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Dosage Guidelines

PENICILLINS		
Drug	Dosage	Remarks
Aminopenicillins w/ or w/o Beta-lactamase Inhibitors		Adverse Reactions - Hypersensitivity reactions (rash, urticaria, pruritus, severe reactions eg anaphylaxis can occur); GI effects (diarrhea, N/V, rarely antibiotic-associated diarrhea/colitis); Other effect (Candidal infections) - Rarely hematologic effects; Renal & hepatic effects have occurred; High doses may be associated w/ CNS effects (encephalopathy, convulsions) Special Instructions - Avoid in patients w/ Penicillin allergy - Use w/ caution in patients w/ renal impairment
Amoxicillin	0.25-1 g PO 8 hrly 0.25-0.5 g IM/IV 6-8 hrly	
Amoxicillin/ clavulanic acid (Amoxicillin/ clavulanate, Co-amoxiclav)	375- 625 mg PO 8 hrly 1.2 g IV 6-8 hrly	
Ampicillin	250- 500 mg IM/IV 6 hrly	
Ampicillin/ sulbactam (Sultamicillin: Pro-drug of Ampicillin/ sulbactam)	375- 750 mg PO 12 hrly 1.5-12 g/day IV divided 8-12 hrly Max dose: 4 g Sulbactam	
Antipseudomonal Penicillins w/ or w/o Beta-lactamase Inhibitors		
Piperacillin	2-4 g IM/IV 4-6 hrly	
Piperacillin/ tazobactam	2.25-4.5 g IM/IV 6-8 hrly	
Ticarcillin/ clavulanic acid (Ticarcillin/ clavulanate)	3.2 g IV 4-6 hrly	

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Dosage Guidelines

OTHER BETA-LACTAMS

Drug	Dosage	Remarks
Carbapenems		Adverse Reactions - GI effects (diarrhea, N/V, antibiotic-associated diarrhea/colitis, tongue/tooth discoloration, altered taste); Hypersensitivity reactions ranging from mild (eg rash) to severe (eg anaphylaxis) can occur; Other effect (Candidal infections) - CNS effects (mental disturbances, confusion); Rare dermatologic reactions (exfoliative dermatitis, Stevens-Johnson syndrome etc); Rare hepatic effects Special Instructions - Use w/ caution in patients allergic to penicillins, cephalosporins or other beta-lactams, patients w/ renal impairment - Use w/ caution in patients w/ CNS disorders (eg epilepsy)
Doripenem	500 mg IV 8 hrly	
Ertapenem	1 g IM/IV 24 hrly	
Imipenem/cilastatin	1-2 g/day divided 6-8 hrly Max dose: 4 g/day	
Meropenem	0.5-1 g IV 8 hrly	

QUINOLONES

Drug	Dosage	Remarks
Ciprofloxacin	500 mg PO 12 hrly 200 mg IV 12 hrly	Adverse Reactions - GI effects (N/V, diarrhea, abdominal pain, dyspepsia, diarrhea, rarely antibiotic-associated diarrhea/colitis); CNS effects (headache, dizziness, sleep disorders, restlessness, drowsiness); Dermatologic effects (rash, pruritus, photosensitivity); hypersensitivity reactions can range from mild (eg rash) to severe/life-threatening (eg Stevens-Johnson syndrome) - Rarely hematologic effects; hepatic & renal effects - Some quinolones have the potential to prolong the QT Special Instructions - Administer at least 2 hr before or 3 hr after Al- or Mg-containing antacids, dietary supplements containing Zn or Fe or buffered dcl preparations - Avoid exposure to strong sunlight or tanning beds - Use w/ caution in patients w/ epilepsy or history of CNS disorders, in patients w/ impaired renal or hepatic function & in those w/ G6PD deficiency
Levofloxacin	500-750 mg IV 24 hrly	
Moxifloxacin	400 mg PO 24 hrly 400 mg IV 24 hrly	

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Dosage Guidelines

OTHER ANTIBIOTICS		
Drug	Dosage	Remarks
Glycopeptide		Adverse Reactions
Vancomycin	500 mg IV 6 hrly 1 g IV 12 hrly	• “Red neck syndrome” related to too rapid infusion: Flushing, erythema, rash over face & upper torso, hypotension & shock-like symptoms may occur • Hypersensitivity reactions (anaphylactoid reactions, Stevens-Johnson syndrome); Hematologic effects have occurred; Renal effect (nephrotoxicity may occur esp at high doses in patients w/ predisposing factors); Ototoxic effects (ototoxicity, which is more likely w/ high plasma concentrations or in renal impairment, may be irreversible; tinnitus may precede hearing loss & can be used as a sign to discontinue treatment) Special Instructions • Avoid in patients w/ a history of impaired hearing • Monitoring of serum concentrations may be done to help avoid renal toxicity, monitoring of CBC & renal function during treatment is suggested along w/ monitoring of auditory function • Use w/ caution in premature neonates & young infants because of their renal immaturity & potential to have increased serum concentrations
Imidazoles		Adverse Reactions
Metronidazole	500 mg IV 8 hrly 500 mg PO 8 hrly Amoebic liver abscess: 500- 750 mg PO 8 hrly	• GI effects (N/V, metallic taste, diarrhea, constipation); CNS effects (weakness, dizziness, headache, mood changes); Other effects (Candidal infection, darkening of urine) • Hematologic & hepatic effects have occurred; Rarely hypersensitivity reactions • High dose or prolonged use has caused peripheral neuropathy & epileptiform seizures Special Instructions • Use w/ caution in patients w/ hepatic impairment, CNS disease, blood dyscrasias • If given >10 days, recommend monitoring CBC & clinical monitoring for CNS effects • Tinidazole: Use w/ caution in patients <3 yr of age since safety & efficacy have not been established
Secnidazole	1.5 g PO 24 hrly	
Tinidazole	2 g PO 24 hrly	

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Dosage Guidelines

OTHER ANTIBIOTICS (CONT'D)

Drug	Dosage	Remarks
Lincosamide		
Clindamycin	150- 450 mg PO 6 hrly 1.2-2.7 g/day IM/IV divided 6-8 hrly	Adverse Reactions - GI effects (diarrhea, severe antibiotic-related pseudomembranous colitis, N/V, abdominal pain, metallic taste); Hypersensitivity reactions (rash, urticaria, rarely anaphylaxis) - Severe dermatologic effects have occurred (erythema multiforme, exfoliative & vesiculobullous dermatitis); Hematologic & hepatic effects have occurred; Other effect (polyarthrititis) Special Instructions - Use w/ caution in patients w/ GI disease esp w/ history of colitis - Use w/ caution in atopic patients & in patients w/ renal or hepatic impairment - Discontinue if diarrhea occurs

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