Formulary 2009-2011

An Essential Medicines Dosing Guide Based on the WHO Model Formulary
**ANTI-INFECTIVES**

**WHO MODEL FORMULARY 2008 NOTES:**

The following should be considered before starting antimicrobial therapy:

1. **Viral infections** should not be treated with antibacterials. But antibacterials are occasionally helpful in controlling secondary bacterial infection (e.g. acute necrotising ulcerative gingivitis secondary to herpes simplex infection);

2. Where possible samples should be taken for culture and sensitivity testing; ‘blind’ antibacterial prescribing for unexplained pyrexia usually leads to further difficulty in establishing the diagnosis;

3. Knowledge of **prevalent organisms** and their current sensitivity is of great help in choosing an antibacterial before bacteriological confirmation is available;

4. The **dose** of an antibacterial varies according to a number of factors including age, weight, hepatic/renal function, severity of infection. The prescribing of the so-called 'standard' dose in serious infections may result in failure of treatment; therefore it is important to prescribe a dose appropriate to the condition. An inadequate dose may also increase the likelihood of antibacterial resistance. On the other hand, for an antibacterial with a narrow margin between the toxic and therapeutic dose (e.g. aminoglycoside) it is also important to avoid an excessive dose and the concentration of the drug in the plasma may need to be monitored;

5. The **route** of administration of an antibacterial often depends on the severity of the infection. Life-threatening infections require IV therapy. Antibacterials that are well absorbed can be given by mouth even for some serious infections. Whenever possible painful intramuscular injections should be avoided in children;

6. **Duration** of therapy depends on the nature of the infection and the response to treatment. Courses should not be unduly prolonged because they encourage resistance, they may lead to side-effects and they are costly. However, in certain infections such as tuberculosis or chronic osteomyelitis it is necessary to treat for prolonged periods. Conversely a single dose of an antibacterial may cure uncomplicated urinary-tract infections.

**SUPERINFECTION.** In general, broad-spectrum antibacterial drugs such as the cefalosporins are more likely to be associated with adverse reactions related to the selection of resistant organisms for example fungal infections or antibiotic associated colitis (pseudomembranous colitis); other problems associated with superinfection include vaginitis and pruritus ani.
WHO MODEL FORMULARY 2008 NOTES:

Beta-lactam antibiotics including penicillins, cefalosporins and carbapenems share a common structure; they are bactericidal, their mechanism of action resulting from inhibition of peptidoglycan, a mucopeptide in bacterial cell walls. Benzylpenicillin and phenoxyethylpenicillin are active against susceptible strains of Gram-positive bacteria and Gram-negative bacteria, spirochaetes, and actinomycetes, but are inactivated by penicillinase and other beta-lactamases. Benzathine benzylpenicillin and procaine benzylpenicillin are long-acting preparations which slowly release benzylpenicillin on injection. A range of penicillins with improved stability to gastric acid and penicillinases have been produced by substitution of the 6-amin position of 6-aminopenicillanic acid. Cloxacillin is an isoxazoyl penicillin which is resistant to staphylococcal penicillinase. Broad-spectrum penicillins such as ampicillin are acid-stable and active against Gram-positive and Gram-negative bacteria, but are inactivated by penicillinase. Beta-lactamase inhibitors such as clavulanic acid are often necessary to provide activity against beta-lactamases produced by a wide range of both Gram-negative and Gram-positive bacteria.

Cefalosporins are classified by generation, with the first generation agents having Gram-positive and some Gram-negative activity; the second generation drugs have improved Gram-negative activity and the third generation cefalosporins have a wider spectrum of activity, although may be less active against Gram-positive bacteria than first generation drugs, but they are active against Gram-negative Enterobacteriaceae and Pseudomonas aeruginosa.

Carbapenems are semisynthetic derivatives of Streptomycetes cattleya. They have a broad spectrum of activity and are stable to most penicillinases. They should be reserved for severe infections resistant to other antibiotics.

Penicillins may cause encephalopathy due to cerebral irritation. This rare, but serious adverse effect may result from very high doses or in severe renal failure. Penicillins should not be given by intrathecal injection because they can cause encephalopathy which may be fatal.

HYPERSENSITIVITY. The most important adverse effect of penicillins is hypersensitivity which causes rashes and, occasionally anaphylaxis, which can be fatal. A careful history should be taken with regard to previous allergic reactions. If rash develops, another antimicrobial should be substituted. Allergic reactions to penicillins occur in 1-10% of exposed individuals, while anaphylactic reactions occur in fewer than 0.05% of treated patients. Individuals with a history of anaphylaxis, urticaria, or rash immediately after penicillin administration are at risk of immediate hypersensitivity to a penicillin. These individuals should not
receive a penicillin, a cefalosporin or another beta-lactam antibiotic. Patients who are allergic to one penicillin will be allergic to them all because the hypersensitivity is related to the basic penicillin structure and about 10% of penicillin-sensitive patients will be allergic to cefalosporins and other beta-lactams. Individuals with a history of a minor rash (a non-confluent rash restricted to a small area of the body) or a rash occurring more than 72 hours after penicillin administration are possibly not allergic to penicillin and in these individuals a penicillin should not be withheld unnecessarily for a serious infection; however, the possibility of an allergic reaction should be borne in mind and facilities should be available for treating anaphylaxis.

6.01a PENICILLINS

**Benzylpenicillin** [Penicillin G] remains an important and useful antibiotic but it is inactivated by bacterial beta-lactamases. It is effective for many streptococcal (including pneumococcal), gonococcal and meningococcal infections and also for anthrax, diphtheria, gas gangrene, leptospirosis, tetanus and treatment of Lyme disease in children. Pneumococci, meningococci and gonococci often have decreased sensitivity to penicillin and benzylpenicillin is no longer the first choice for pneumococcal meningitis. Benzylpenicillin is given by injection as it is inactivated by gastric acid and absorption from the intestinal tract is low. **Phenoxymethylpenicillin** [Penicillin V] is suitable for oral administration; it has a similar spectrum of activity but is less effective than benzylpenicillin. Do not use for serious infection as absorption and plasma concentration are variable.

**Ampicillin** is active against certain Gram-positive and Gram-negative organisms. It is used to treat a wide range of infections including otitis media, respiratory-tract and urinary-tract infections, and gonorrhoea due to susceptible bacteria. However, ampicillin is inactivated by penicillinases including those produced by *Staphylococcus aureus* and by common Gram-negative bacilli such as *Escherichia coli*; many strains of *Haemophilus influenzae*, *Moraxella catarrhalis*, *Neisseria gonorrhoeae*, and *Salmonella* and *Shigella* spp. are resistant. There are geographical variations in the incidence of resistance, an awareness of local patterns is important. In some areas, oral use should be restricted to treatment of *Shigella* infections; it is given in an oral dose of 1 g every 6 hours for 7–10 days.

**Amoxicillin** has a similar spectrum of activity to ampicillin, but is also inactivated by penicillinases. However, it is better absorbed after oral administration than ampicillin and higher plasma and tissue levels are achieved. Amoxicillin is preferred to ampicillin for the treatment of some infections including otitis media and respiratory-tract and urinary-tract infections.
Clavulanic acid is a beta-lactamase inhibitor. It has no significant antibacterial activity but in combination with amoxicillin widens amoxicillin’s spectrum of activity and allows its use against amoxicillin-resistant strains of bacteria. It is used in respiratory-tract, genito-urinary and abdominal infections, cellulitis, animal bites, and dental infections. Cloxacillin is used to treat infections due to penicillinase-producing staphylococci which are resistant to benzylpenicillin. It is acid-stable and may therefore be given by mouth as well as by injection.

These antibiotics may also be administered with an aminoglycoside to increase their spectrums of activity. The penicillin and aminoglycoside should not be mixed before or during administration, because loss of aminoglycoside activity can occur on mixing.

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<th>GENERIC (TRADE) NAME</th>
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<tbody>
<tr>
<td>Amoxicillin Cap 250mg, 500mg, Suspension 250mg/5ml (Amoxyl)</td>
<td>IDA</td>
<td><em>By mouth</em>, Adult/Child &gt; 10 yo 250mg every 8 hours doubled in severe infections; Child up to 10 yo 125mg every 8 hours doubled in severe infections. Severe/recurrent purulent respiratory infections: Adult 3g every 12 hours. Pneumonia: Adult 0.5-1g 8 hourly. Dental abscess (short course): Adult 3g repeated once after 8 hours. Urinary-tract infections (short course): Adult 3g repeated once after 10-12 hours. Chlamydia: Adult 500mg every 8 hours for 7 days. Otitis media (short course): Child 3-10 yo 750mg twice daily for 2 days. Surgical prophylaxis: Adult 3g; child &lt; 5 yo 750mg; &lt; 10 yo 1.5g, given 1 hour pre-procedure, repeated 6 hours later if needed.</td>
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<tr>
<td>Amoxicillin 1g with Clavulanate 200mg Inj [Co-Amoxiclav] (Augmentin Inj 1.2g)</td>
<td>IDA</td>
<td>NOTE. ALL DOSES EXPRESSED AS AMOXICILLIN. Infections due to susceptible beta-lactamase producing organisms: <em>By mouth</em>, Adult and Child &gt;12 yo, 250 mg every 8 hours, doubled in severe infections; Child under 1 yo, 20 mg/kg/DAY in 3 divided doses; 1-6 yo, 125 mg every 8 hours; 6-12 yo, 250 mg every 8 hours. Severe dental infections: <em>By mouth</em>, Adult 250mg every 8 hours for 5 days.</td>
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<tr>
<td>Amoxicillin 500mg with Clavulanate 125mg Tab [Co-Amoxiclav] (Augmentin Tab 625mg)</td>
<td>IDA</td>
<td>Infections due to susceptible beta-lactamase producing organisms: <em>By slow intravenous injection</em> over 3-4 minutes or IV infusion (diluted in 100ml NS/WFI over 30-40 minutes), Adult/Child &gt;12 yo 1g every 8 hours increased to 1g every 6 hours in severe infections; Neonate 25 mg/kg every 12 hours; Infant up to 3 months, 25 mg/kg every 8 hours; Child 3 months to12 yo 25 mg/kg every 8 hours increased to 25 mg/kg every 6 hours in severe infections. Surgical prophylaxis: <em>By slow IV inj</em>, Adult 1g at induction, with up to 2-3 further doses of 1g every 8 hours if increased risk of infection.</td>
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<tr>
<td>Amoxicillin 250mg with Clavulanate 125mg Tab [Co-Amoxiclav] (Augmentin Tab 375mg)</td>
<td>IDA</td>
<td>Infections due to susceptible beta-lactamase producing organisms: <em>By IM inj</em>, slow IV inj or infusion, Adult 500mg every 4-6 hours; Child &lt; 10 half adult dose. Meningitis: <em>By slow IV injection</em>, Adult 1-2g every 3-6 hours (max 14g/DAY); Child 150-200mg/kg daily in divided doses.</td>
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<tr>
<td>Amoxicillin 250mg with Clavulanate 62mg Suspension [Co-Amoxiclav] (Augmentin 250/62mg/5ml)</td>
<td>IDA</td>
<td></td>
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<tr>
<td>Amoxicillin 125mg with Clavulanate 31.25mg Suspension [Co-Amoxiclav] (Augmentin 125/31.25mg/5ml)</td>
<td>EML</td>
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<tr>
<td>Ampicillin Sodium Inj 500mg [Sodium content: 2.8mmol/g = 2.8mEq/g]</td>
<td>IDA</td>
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<tr>
<td>Cloxacillin Sodium Inj 500mg [Sodium content: 2mmol/g = 2mEq/g]</td>
<td>IDA</td>
<td>By IM inj, Adult 250mg every 4-6 hours (doubled in severe infections); by slow IV inj, Adult 1-2g every 6 hours; Child &lt; 2 yo quarter adult dose; 2-10 yo half adult dose. Reconstitute IM inj in 1.7ml WFI, for IV inj dilute 500mg in 4.8ml WFI and inject slowly over 2-4 minutes (max concentration 50mg/ml).</td>
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<tr>
<td>Cloxacillin Sodium Cap 250mg &amp; 500mg, Suspension 125mg/5ml</td>
<td>IDA</td>
<td>By mouth, Adult 500mg 4 times daily (doubled in severe infections); Child 2-10 yo 250mg, &lt; 2 yo 125mg, given 4 times daily. Administer oral dose 30 minutes before food.</td>
</tr>
<tr>
<td>Penicillin G/ Benzylpenicillin Inj 600mg [=1 mega unit MU] (Crystapen)</td>
<td>MSL</td>
<td>IM, slow IV or IV infusion, Adult 0.3g (0.5 MU) every 6 hours, doubled in severe infections; Neonate 50mg/kg/DAY in 2 divided doses; Infant 1-4 weeks 75mg/kg/DAY in 3 divided doses; Child 1 month-12 yo 100mg/kg/DAY in 4 divided doses. Bacterial endocarditis: IV route only, Adult max 7.2g (12 MU) daily in 6 divided doses. Meningococcal disease: by slow IV inj or IV infusion, Adult 2.4g (4 MU) every 4-6 hours; Neonate 100mg/kg/DAY in 2 divided doses; Infant 150mg/kg/DAY in 3 divided doses; Child 1 month-12 yo 180-300mg (0.25-0.5 MU)/kg/DAY in 4-6 divide doses. IV infusion dilute in NS, give over 15-60 minutes, at conc 100000-500000 units/ml (60-300mg/ml) for Adults, or for Infants 50000 units/ml (30mg/ml).</td>
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<tr>
<td></td>
<td>IDA</td>
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**GENERIC (TRADE) NAME** | **CAT.** | **INDICATION/DOSE**
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Penicillin V/Phenoxymethylpenicillin Tab 250mg Suspension 125mg/5ml | IDA | By mouth, Adult 500mg every 6 hours (doubled in severe infections); Child < 1 yo 62.5mg, 1-5 yo 125mg, 6-12 yo 250mg, given every 6 hours. Rheumatic fever secondary prophylaxis: by mouth Adult 500mg twice daily; Child 1-5 yo 125mg, 6-12 yo 250mg, given twice daily. Administer dose at least 30 minutes before or 2 hours after food.

**COMMENT/CAUTIONS:**
- Phenoxymethylpenicillin is poorly absorbed orally; take on an empty stomach. Large doses (especially benzylpenicillin) may cause electrolyte disturbances due to excess sodium.

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**6.01b CEFALOSPORINS AND IMIPENEM WITH CILASTATIN**

**WHO MODEL FORMULARY 2008 NOTES:**

Cefalosporins are classified by generation, with the first generation agents having Gram-positive and some Gram-negative activity; the second generation drugs have improved Gram-negative activity and the third generation cefalosporins have a wider spectrum of activity, although may be less active against Gram-positive bacteria than first generation drugs, but they are active against Gram-negative Enterobacteriaceae and Pseudomonas aeruginosa.

**Cefazolin** is a first generation cephalosporin. Cefazolin is active against Gram-positive bacteria such as *Staphylococcus aureus* and *Streptococcus* spp., and Gram-negative bacteria including *Escherichia coli* and *Klebsiella* spp. Cefazolin is used for surgical prophylaxis of infection in clean surgery where there is no inflammation present, and where the respiratory, alimentary, or genitourinary tract are not entered. These include herniorrhaphy, cardiac, vascular, neurological, orthopaedic, and breast surgery. Cefazolin is also used for prophylaxis in surgery where contamination can be controlled such as caesarian section and abdominal hysteroscopy.

**Cefixime, ceftazidime and ceftriaxone** are third generation cefalosporins. Cefixime is orally active and is used for the treatment of uncomplicated gonorrhoea. Ceftriaxone is used for serious infections such as septicaemia, pneumonia and meningitis; it is used as a reserve antimicrobial to treat meningitis due to *Streptococcus pneumoniae* in some areas where penicillin

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resistance is found. Ceftazidime is active against Pseudomonas aeruginosa and other Gram-negative bacteria; it is used in the treatment of pseudomonas infections and in some areas is restricted to use only where gentamicin resistance is high.

**Imipenem** is a broad-spectrum antibiotic. As it is partially inactivated by enzymatic activity in the kidney, it is administered with **cilastatin** which inhibits the renal metabolism of imipenem. It is active against many aerobic and anaerobic Gram-positive and Gram-negative bacteria; in some areas it is kept in reserve for the treatment of infections due to *Acinetobacter* spp. and *Ps aeruginosa*, which are resistant to other more usual treatments.

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<tr>
<td>Cefaclor Tab 250mg &amp; 500mg (Distaclor)</td>
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<td><em>By mouth</em>, Adult 250-500mg every 8 hours, max 4g/DAY. Child 1-5yo 125mg, &gt; 5yo 250mg, every 8 hours; <em>or</em> 20mg/kg/DAY given in divided doses 8 hourly, max 1g/DAY.</td>
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<tr>
<td>Cefalexin Cap 250mg &amp; 500mg, Suspension 250mg/5ml (Ceporex) [Cephalexin]</td>
<td>IDA</td>
<td><em>By mouth</em>, Adult 250mg every 6 hours, doubled in severe infections; Child 25-50mg/kg/DAY every 6-12 hours, max 1g/DOSE, 4-6g/DAY.</td>
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| Cefazolin Inj 1g (Ancef/Kefzol) | EML | *By IV/IM inj*, Adult usual doses, 500mg-1g every 6-12 hours, max 4g/DAY; Child usual doses (IV only) 25-50mg/kg/DAY given every 6-8 hours, max 100mg/kg/DAY.  
Reconstitute IM 1g with 2.5ml WFI and inject into a large muscle mass. For IV injection further dilute 1g with 10ml WFI and inject slowly over 3-5 minutes, for IV infusion further dilute 1g with 50-100ml D5/NS/RL and infuse over 20-60 minutes. |
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| Ceftazidime Inj 1g (Fortum) | EML | Deep IM, slow IV inj or infusion (IV route only in children or if single dose > 1g), Adult 1g every 8 hours or 2g every 12 hours; severe up to 3g every 12 hours (elderly max 3g/DAY, IM dose > 1g divide between 2-4 sites). Child > 2 months 30-100mg/kg/DAY given 8 hourly. Neonate, severe infection 25-60mg/kg/DAY given 12 hourly. Meningitis: by IV inj or infusion, Child > 2 months up to 150mg/kg/DAY in 3 divided doses (max 6g/DAY).
| | | Reconstitute IM 1g with 3ml WFI or 2-3ml 1% lidocaine and inject into a large muscle mass. Slow IV further dilute 1g with 10ml WFI, inject over 3-5 minutes; IV infusion further dilute 1g with 50-100ml of D5/NS, infuse over 15-30 minutes. |
| Ceftriaxone Inj 1g (Rocephin) | IDA | Deep IM, slow IV or IV infusion, Adult/child > 12yo 1-2g once daily, max 4g/DAY (IM dose > 1g divide between 2-4 sites). Infant/child < 50kg 20-50mg/kg once daily; severe infection IV infusion over 10-30 minutes 50-80mg/kg once daily. Neonates IV infusion over 60 minutes, 20-50mg/kg once daily. |
| | | Reconstitute IM 1g in 3.6ml WFI or 2-3ml 1% lidocaine and inject into a large muscle mass. For IV inj, dilute 1g with 10ml WFI and inject slowly over 2-4 minutes. For IV infusion further dilute 1g in 50-100ml of D5/NS, infuse over 10-30 minutes (over 60 minutes in neonates). |
### Cefuroxime

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<tr>
<td>Cefuroxime Inj 750mg (Zinacef)</td>
<td>MSL</td>
<td><em>By IM, slow IV or IV infusion,</em> Adult 750mg every 6-8 hours, doubled in severe infections; IV only for single doses &gt; 750mg. Surgical prophylaxis: <em>by IV inj</em> Adult 1.5g then 750mg every 8 hours for 24-48 hours. Child 10-30mg/kg every 8 hours. Reconstitute IM/slow IV 750mg with 3ml WFI (or IM in 2ml 1% lidocaine), inject into a large muscle mass. or slow IV over 3-5 minutes, IV infusion further dilute 750mg with 50-100ml of D5/NS/RL and infuse over 15-30 minutes (max conc 30mg/ml).</td>
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**COMMENT/CAUTIONS:**
- **Adverse effects:** 10% of patients with hypersensitivity to penicillin will also be allergic to cefalosporins.

### Imipenem

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<tr>
<td>Imipenem 500mg with Cilastatin 500mg Inj (Primaxin)</td>
<td>EML</td>
<td>NOTE: ALL DOSES ARE IN TERMS OF IMIPENEM. Infections due to susceptible organisms: <em>By IV infusion,</em> Adult 1-2g daily (in 3-4 divided doses); Less susceptible organisms: Adult up to 50mg/kg daily (max 4g/DAY) in 3-4 divided doses; Child over 3 months, 60mg/kg daily (max 2g/DAY) in 4 divided doses; Child over 40kg, adult dose. Reconstitute IV 500mg vial in 10ml D5/NS then further dilute with at least 90ml D5/NS and infuse over 20-30 minutes (max conc 5mg/ml).</td>
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6.01c QUINOLONES

WHO MODEL FORMULARY 2008 NOTES:

Ciprofloxacin is active against both Gram-positive and Gram-negative bacteria. It is particularly active against salmonella, shigella, campylobacter, neisseria, Bacillus anthracis and pseudomonas. It is also active against chlamydia and some mycobacteria. Most anaerobic organisms are not susceptible. Ciprofloxacin is used with doxycycline and metronidazole to treat pelvic inflammatory disease.

USE IN CHILDREN: Ciprofloxacin causes arthropathy in the weight-bearing joints of immature animals and is therefore generally not recommended in children and growing adolescents. However, the significance of this effect in humans is uncertain and in some specific circumstances short-term use of ciprofloxacin in children may be justified. Ciprofloxacin is used for pseudomonal infections in cystic fibrosis (for children over 5 years), and for treatment and prophylaxis of inhalational anthrax.

TENDON DAMAGE: Tendon damage (including rupture) has been reported rarely in patients receiving quinolones. Tendon rupture may occur within 48 hours of starting treatment. Healthcare workers should be aware that:

1. Quinolones are contra-indicated in patients with a history of tendon disorders related to quinolone use;
2. elderly patients are more prone to tendonitis;
3. the risk of tendon rupture is increased by the concomitant use of corticosteroids;
4. if tendonitis is suspected, the quinolone should be discontinued immediately.

SKILLED TASKS: Ciprofloxacin may impair ability to perform skilled tasks, for example operating machinery, driving.
**GENERIC (TRADE) NAME** | **CAT.** | **INDICATION/DOSE**
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Ciprofloxacin (as HCl) Tab 250mg & 500mg (Ciprobay) | MSL IDA | By mouth, Infections due to susceptible organisms: Adult 250-750mg twice daily. Shigellosis, chancroid: Adult 500mg twice daily for 3 days. Cholera: Adult 1g as a single dose. Gonorrhoea and gonococcal conjunctivitis: Adult 500mg as a single dose. Pelvic inflammatory disease: Adult 500mg twice daily. Surgical prophylaxis: Adult 750mg 60-90 minutes before procedure. Prophylaxis of meningococcal meningitis: Adult 500mg single dose.

**COMMENT/CAUTIONS:**
- Equivalent plasma concentrations when given orally or IV.
- Cautious use in pregnancy, children and epilepsy.
- Adverse effects: may cause tendon damage, at the first sign of unexplained pain or inflammation, discontinue treatment and rest the affected limb until tendon symptoms have resolved.

**6.01d MACROLIDES**

**WHO MODEL FORMULARY 2008 NOTES:**

Erythromycin is a macrolide; it has an antibacterial spectrum that is similar but not identical to penicillin and is used as an alternative in penicillin-allergic patients. It is effective in respiratory infections, whooping cough, legionnaires’ disease and campylobacter enteritis. Azithromycin is more active than erythromycin against some Gram-negative organisms such as Chlamydia trachomatis. The concentration and persistence of azithromycin is much higher in the tissue than in plasma; a single dose of azithromycin is used in the treatment of uncomplicated genital chlamydia and trachoma. Azithromycin is not recommended if there is a possibility of gonorrhea because macrolide resistance emerges rapidly when it is used in this setting.

[NOTE: Mercy Ships stock clarithromycin in place of azithromycin. Their ranges are comparable but please refer to respective drug monographs for details.]
### GENERIC (TRADE) NAME | CAT. | INDICATION/DOSE
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Clarithromycin Tab 250mg (Klacid) | IDA, EML | *By mouth*, Adult 250mg twice daily; doubled in severe infections, treat for 5-7 days.
Erythromycin Stearate Tab 250mg & 500mg | MSL, IDA, EML | *By mouth*, Adult/Child > 8 yo, 250-500mg every 6 hours; max 4g/DAY in divided doses for severe infection.
Erythromycin Stearate Suspension 125mg/5ml | IDA, EML | *By mouth*, Child up to 2 yo 125mg, 2-8 yo 250mg, given every 6 hours, doubled in severe infections.

**COMMENT/CAUTIONS:**

- **Clarithromycin Indications:** Please use for the treatment of complicated infections especially respiratory tract infection, unresponsive to standard macrolides or in patients intolerant or allergic to standard macrolides.
- **Macrolides Adverse effects:** nausea/vomiting, diarrhoea, and arrhythmias, avoid concomitant use with astemizole, terfenadine, cisapride, disopyramide, amiodarone & other arrhythmogenic drugs.
- **Macrolides Drug interactions:** As P450 enzyme inhibitors they may increase levels of anticoagulants, antiepileptics, antipsychotics, anxiolytics, hypnotics, ciclosporin, theophylline.

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**6.01e TETRACYCLINES**

**WHO MODEL FORMULARY 2004 NOTES:**

Doxycycline is a tetracycline and is a broad-spectrum antibiotic effective for conditions caused by chlamydia, rickettsia, brucella and the spirochaete, *Borrelia burgdorferi* (Lyme disease). It is the preferred tetracycline since it has a more favourable pharmacokinetic profile than tetracycline. It is deposited in growing bone and teeth causing staining and occasionally dental hypoplasia. It should not be given to children under 8 years or pregnant women; in some countries, use in children under 12 years is contraindicated.
**GENERIC (TRADE) NAME** | **CAT.** | **INDICATION/DOSE**
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Doxycycline Cap 100mg (Vibramycin) | MSL IDA | *By mouth*, Adult & Child > 8 yo, General infections: 200mg on first day then 100mg daily; severe infection 200mg daily. Cholera: Adult 300mg, Child > 8 yo 100mg, given as a single dose. Malaria treatment & prophylaxis, see section 6.03. Swallow capsules whole with plenty of fluid while sitting or standing to prevent oesophageal irritation. May be given with milk or food.

**COMMENT/CAUTIONS:**
- **Drug Interaction**: Antacids and iron and zinc salts may reduce absorption.
- **Adverse effects**: see notes above. May cause photosensitivity - avoid skin exposure to direct sunlight or sun lamps.

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**6.01f AMINOGLYCOSIDES**

**WHO MODEL FORMULARY 2008 NOTES:**

Aminoglycosides including *gentamicin* are bactericidal and active against some Gram-positive and many Gram-negative organisms including *Pseudomonas aeruginosa*. Aminoglycosides are not absorbed from the gut and must therefore be given by injection for systemic infections. Excretion is mainly by the kidney and accumulation occurs in renal impairment. Restrict gentamicin use to trained health personnel, ensure correct dosage and do not exceed duration of treatment as most adverse effects are dose related. The most important adverse effects are ototoxicity and nephrotoxicity and they are most common in the elderly and in patients with renal impairment. These groups and, if possible, all patients should be monitored for ototoxicity by audiometry. If there is impairment of renal function the dose interval must be increased; in severe renal impairment, the dose should also be reduced. Serum concentration monitoring avoids both excessive and subtherapeutic concentrations and can prevent toxicity and ensure efficacy. If possible serum concentrations should be monitored in all patients, but **must** be measured in infants, the elderly, in obesity, in cystic fibrosis, in high-dosage regimens, in renal impairment, or if treatment lasts for longer than 7 days. Loading and maintenance doses are based on the patient’s weight and renal function (e.g. using a nomogram) with adjustments based on plasma gentamicin concentration. High doses are used occasionally for serious infections.
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<tr>
<td>Gentamicin Inj 80mg/2ml (as sulphate)</td>
<td>IDA</td>
<td>By IM, slow IV Inj (over at least 3 minutes) or IV infusion (max conc 10mg/ml), Adult 3-5mg/kg/DAY in divided doses given every 8 hours or 4-7mg/kg/DAY given every 24 hours; Child up to 2 weeks, 3mg/kg/DOSE every 12 hours; 2 weeks - 12 yo 2mg/kg/DOSE given every 8 hours. Streptococcal/Enterococcal Endocarditis (as part of combination therapy, see current guidelines): by slow IV inj (over at least 3 minutes), Adult 80mg twice daily or 1mg/kg/DOSE every 8 hours. For IV infusion, reconstitute every 80mg in 100ml of D5/NS to infuse over 30-60 minutes.</td>
</tr>
<tr>
<td>Gentamicin Sulphate Impregnated Collagen Fleece, containing 467mg collagen, 58mg gentamicin sulphate &amp; 175mg gentamicin crobefate 5 x 8 cm (Septocoll)</td>
<td>EML</td>
<td>To fill affected cavity as needed, for use in surgery in wound infection treatment or prophylaxis.</td>
</tr>
</tbody>
</table>

**COMMENT/CAUTIONS:**

- **Adverse effects**: Dose-related, ototoxicity & nephrotoxicity; avoid concurrent use with ototoxic diuretics e.g. frusemide, cephalosporins, amphotericin.
- If plasma level monitoring is available: first assay 24 hours after starting, twice weekly, peak levels taken 1 hour after dosing (range 5-10mg/L), trough levels taken just before the next dose (range < 2mg/L or 2 micrograms/ml).
**6.01g OTHER ANTIBACTERIALS**

**WHO MODEL FORMULARY 2008 NOTES:**

*Clindamycin* is a bacteriostatic antibacterial with activity against Gram-positive aerobes and a wide range of anaerobes. However, its use is limited because of adverse effects. Antibiotic-associated colitis can occur with a wide range of antibacterials, but occurs most frequently with clindamycin. It may be fatal and is most common in women and the elderly; it can develop during or after treatment with clindamycin. Patients should discontinue treatment immediately if diarrhoea develops. Clindamycin is recommended for the treatment of staphylococcal bone and joint infections and for intra-abdominal sepsis. It is also used for endocarditis prophylaxis when a penicillin is not appropriate.

Chemoprophylaxis with *isoniazid* can prevent the development of clinically apparent tuberculosis in persons in close contact with infectious patients, and also prevent the reactivation of previously dormant disease in other persons at high risk particularly those who are immunodeficient. [Mercy Ships note: Isoniazid is in the formulary STRICTLY for this indication.]

*Metronidazole* has high activity against anaerobic bacteria and protozoa (section 6.04).

*Nitrofurantoin* is bactericidal *in vitro* to most Gram-positive and Gram-negative urinary-tract pathogens and it is used to treat acute and recurrent urinary-tract infections. It is also used prophylactically in chronic urinary-tract infections.

The usefulness of sulfonamides is limited by an increasing incidence of bacterial resistance. For many indications they have been replaced by antibiotics that are more active and safer. *Sulfamethoxazole* is used in combination with *trimethoprim* because of their synergistic activity. In some countries, indications for the use of this combination (summarized as *co-trimoxazole*) have been restricted. The treatment of *Pneumocystis carinii* infections must only be undertaken with specialist supervision where there are appropriate monitoring facilities. *Trimethoprim* is also used alone for respiratory-tract infections and, in particular, for urinary-tract infections. [Mercy Ships note: see current guidelines for treatment of respiratory-tract infections.]

*Vancomycin* is not significantly absorbed from the gastrointestinal tract and must be given intravenously for systemic infections which cannot be treated with other effective, less toxic antimicrobials. It is used to treat serious infections due to Gram-positive cocci including methicillin-resistant staphylococcal infections, brain abscess, staphylococcal meningitis and septicaemia.
<table>
<thead>
<tr>
<th>GENERIC (TRADE) NAME</th>
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<th>INDICATION/DOSE</th>
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<tbody>
<tr>
<td>Clindamycin Cap 150mg (Dalacin C)</td>
<td>IDA</td>
<td><em>By mouth,</em> Osteomyelitis/peritonitis: Adult 150-300mg every 6 hours; severe max 450mg every 6 hours; Child 3-6mg/kg every 6 hours. Take capsules with a glass of water. Discontinue immediately and contact doctor if diarrhoea develops.</td>
</tr>
<tr>
<td>Co-trimoxazole Tab 960mg (Sulfamethoxazole 800mg with Trimethoprim 160mg) (Bactrim/Septrin 960mg)</td>
<td>IDA</td>
<td>[Dose expressed as Co-trimoxazole] Severe infections due to susceptible organisms (not susceptible to other antibacterials), <em>by mouth,</em> Adult 960mg every 12 hours, doubled in severe infections.</td>
</tr>
<tr>
<td>Co-trimoxazole Suspension 240mg/5ml (Sulfamethoxazole 200mg with Trimethoprim 40mg/5ml) (Bactrim 240mg/5ml)</td>
<td>IDA</td>
<td>[Dose expressed as Co-trimoxazole] Child 6 weeks - 5 months 120mg; 6 months-5 yo 240mg; 6-12 yo 480mg; dose given every 12 hours.</td>
</tr>
<tr>
<td>Co-trimoxazole Tab 480mg (Sulfamethoxazole 400mg with Trimethoprim 80mg) (Bactrim/Septrin 480mg)</td>
<td>IDA</td>
<td></td>
</tr>
<tr>
<td>Isoniazid Tab 300mg</td>
<td>IDA</td>
<td><em>By mouth,</em> tuberculosis prophylaxis: Adult 300mg daily for at least 6 months; Child 5mg/kg daily (max 300mg/DAY) for at least 6 months. Take on an empty stomach. Liver disorders: patients or carers should be told how to recognize signs and advised to discontinue treatment and seek medical help if symptoms such as nausea, vomiting, malaise or jaundice develop.</td>
</tr>
<tr>
<td>GENERIC (TRADE) NAME</td>
<td>CAT.</td>
<td>INDICATION/DOSE</td>
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</tr>
<tr>
<td>Metronidazole Tab 200mg, Suspension 125mg/5ml (Flagyl)</td>
<td>MSL</td>
<td><strong>By mouth</strong>, Anaerobic infections: Adult 800mg initially then 400-500mg every 8 hours; Child 7.5mg/kg/DOSE every 8 hours; usually treated for 7 days.</td>
</tr>
</tbody>
</table>
|                                                           | IDA  | Bacterial vaginosis: Adult 2g single dose or 400mg twice daily for 7 days  
|                                                           |      | Leg ulcers and pressure sores: Adult 400mg every 8 hours for 7 days.  
|                                                           |      | Acute ulcerative gingivitis: Adult 200-250mg every 8 hours for 3 days; Child 1-3 yo 50mg every 8 hours,  
|                                                           |      | 3-7 yo 100mg every 12 hours, 7-10 yo 100mg every 8 hours, for 3 days.  
|                                                           |      | Antibiotic-associated colitis: Adult 800mg initially then 400mg 3 times daily for 10 days.  
|                                                           |      | Tablets should be swallowed whole with water, during or after a meal; Suspension should be taken one hour before a meal.  |
|                                                           | EML  |                                                                                                                                              |
| Metronidazole Inj 500mg/100ml (Flagyl)                    | MSL  | **Treatment**: *IV infusion only*, (in NS over 20-60 minutes of 5-8mg/ml), Adult 500mg every 8 hours. Child loading dose 15mg/kg, maintenance 7.5mg/kg/DOSE (max 600mg),  
|                                                           | IDA  | Neonate given every 12 hours, Child > 4 weeks given every 8 hours.  
|                                                           |      | Surgical prophylaxis: *IV infusion*, Adult 500mg at induction, up to 3 further doses of 500mg may be given every 8 hours for high-risk procedures; Child 7.5mg/kg/DOSE.  |
|                                                           | EML  |                                                                                                                                              |

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<th>GENERIC (TRADE) NAME</th>
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<tbody>
<tr>
<td>Nitrofurantoin Tab 100mg (Furadantin)</td>
<td>MSL IDA</td>
<td>By mouth, Acute uncomplicated urinary tract infections (UTI): Adult 100 mg every 12 hours or 50 mg every 6 hours with food for 7 days; Child &gt; 3 months, 3 mg/kg/DAY in 4 divided doses. Severe recurrent UTI: Adult 100 mg every 6 hours with food for 7 days (reduce dose to 200mg/DAY in divided doses if severe nausea). Prophylaxis of UTI (see Caution notes): Adult 50-100 mg at night; Child &gt; 3 months 1 mg/kg at night.</td>
</tr>
<tr>
<td>Trimethoprim Tab 100mg</td>
<td>EML</td>
<td>By mouth, Acute infections: Adult 200 mg every 12 hours; Child 6 weeks–5 months, 25 mg twice daily; 6 months–5 yo, 50 mg twice daily; 6–12 yo, 100 mg twice daily. Chronic infections and prophylaxis: Adult 100 mg at night; Child 1–2 mg/kg/DOSE at night. Urinary-tract infection treatment: Adult 200-300mg 1-2 times daily for 3-7 days or 1200mg single dose; prophylaxis 100-300mg at night.</td>
</tr>
<tr>
<td>Vancomycin Inj 1g Specified indications only (see Comment).</td>
<td>EML</td>
<td>By intravenous infusion, Serious staphylococcal infections: Adult 500mg every 6 hours or 1g every 12 hours; Elderly (&gt; 65 yo), 500mg every 12 hours or 1g once daily; Neonate up to 1 week, initially 15 mg/kg then 10 mg/kg every 12 hours Infant 1-4 weeks, 15 mg/kg initially, then 10 mg/kg every 8 hours; Child &gt; 1 month, 10 mg/kg/DOSE every 6 hours. Reconstitute 1g with 10ml WFI, further dilute with 100-200ml D5/NS to give conc 5-10mg/ml, infuse 500mg over 60 minutes or 1g over 100 minutes, max rate 10mg/minute.</td>
</tr>
</tbody>
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COMMENT/CAUTIONS:

- **Isoniazid**: Counsel patients or their carers to recognize signs of liver disorder.
- **Metronidazole Adverse effects**: avoid alcohol, may cause a disulfiram-like reaction (flushing, palpitations etc). Also unpleasant taste, furred tongue, dizziness/headache, dark urine, leucopenia rarely peripheral neuropathy.
- **Nitrofurantoin**: Monitor lung and liver function if on long-term therapy (discontinue if lung function deteriorates). May cause false positive urinary glucose (if testing for reducing substances), may colour urine yellow or brown.
- **Trimethoprim** – Avoid in the first trimester of pregnancy.
- **Vancomycin indications**: 1) Confirmed MRSA infection; 2) MRSA prophylaxis in ICU; 3) septicaemia in IV drug users; 4) bone infections (haematogenous, prosthetic joint); 5) gastroenteritis with *Clostridium difficile* toxin & positive antibiotic associated colitis. **Vancomycin** is not absorbed orally, use oral route only for treating pseudomembranous colitis.
- **Vancomycin Adverse effects**: Monitor renal & auditory function in patients prescribed concurrent drugs that are neurotoxic and/or nephrotoxic e.g. aminoglycosides, amphotericin B and frusemide.
- **Vancomycin Injection**: Avoid rapid IV infusions, may lead to anaphylactoid reactions. If plasma level monitoring is available: target peak level (1 hour after end of infusion) 29-45mg/L, trough level (just before next dose) 5-10mg/L or 5-10 micrograms/ml.

### 6.02 ANTIFUNGALS

**WHO MODEL FORMULARY 2008 NOTES:**

Fungal infections can be superficial (affect only the skin, hair, nails or mucous membranes) or systemic (affect the body as a whole). Systemic fungal infections are sometimes caused by inhalation, ingestion or inoculation of primary pathogens, and sometimes by opportunistic invasion of commensals in patients with lowered host resistance. They are increasing in prevalence not only because of the pandemic of HIV infection, but also because of the rise in illicit IV drug use, and greater use of broad spectrum antibiotics and invasive medical procedures. In immunodeficient patients systemic fungal infections are often disseminated.

**Amphotericin B** is a lipophilic polyene antibiotic; it is fungistatic against a broad spectrum of pathogenic fungi, including *Candida* spp., *Aspergillus* spp., *Cryptococcus neoformans*, *Histoplasma capsulatum*, *Blastomyces dermatitidis*, *Coccidioides immitis*, *Paracoccidioides brasiliensis*, *Mucor*, *Absidia* and *Phicopes* spp.; it is active against algal *Prototheca* spp. and against the *Leishmania protozoa*. It is used for the empirical treatment of serious fungal infections and is used in conjunction with flucytosine to treat cryptococcal meningitis and systemic candidosis. Amphotericin B has to be administered parenterally as there is little or no absorption from the gastrointestinal tract; it can be nephrotoxic. Duration of
therapy depends on initial severity of the infection and patient’s clinical response. In some infections several months of continuous treatment may be needed.

**Clotrimazole** is an imidazole antifungal which is effective in short courses for vaginal candidosis treatment (insertion of pessaries/vaginal tablets or cream high into the vagina including during menstruation). Recurrent infection may be treated with a single dose clotrimazole 500-mg pessary every week for 6 months. **Fluconazole**, an orally active synthetic imidazole derivative, possesses fungistatic activity against dermatophytes, yeasts and other pathogenic fungi. It is widely used in the treatment of serious GI and systemic mycoses as well as in the management of superficial infections. **Griseofulvin** is a fungistatic antibiotic derived from *Penicillium griseofulvum* with selective activity against the dermatophytes causing ringworm, *Microsporum canis, Trichophyton rubrum* and *T. verrucosum*. It has no activity against pityriasis versicolor or candida infections. Griseofulvin is deposited selectively in keratin precursor cells of skin, hair and nails where it disrupts the mitotic apparatus of fungal cells thus preventing fungal invasion of newly-formed cells. It is unsuitable for prophylactic use. Close attention should be given to hygiene and to possible reservoirs of reinfection in clothing, footwear and bedding. **Nystatin**, a polyene antifungal antibiotic derived from *Streptomyces noursei*, is effective against infections caused by a wide range of yeasts and yeast-like fungi. It is poorly absorbed from the GI tract and it is not absorbed from skin or mucous membranes when applied topically. It is used for the treatment of candidosis.

<table>
<thead>
<tr>
<th>GENERIC (TRADE) NAME</th>
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<th>INDICATION/DOSE</th>
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<tbody>
<tr>
<td><strong>Amphotericin B (as sodium deoxycholate complex) Inj 50mg (Fungizone)</strong></td>
<td>IDA</td>
<td>Systemic fungal infections, <em>by IV infusion</em>, Adult &amp; Child initial test dose of 1 mg over 20-30 minutes, then 250 micrograms/kg daily, gradually increased up to 1 mg/kg daily or in severe infection, up to 1.5 mg/kg given daily or on alternate days. Prolonged treatment usually necessary; if interrupted for longer than 7 days, recommence at 250 micrograms/kg daily and increase gradually as above. See Caution notes below for admin/test dosing.</td>
</tr>
<tr>
<td>°Fridge Item</td>
<td>EML</td>
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<th>GENERIC (TRADE) NAME</th>
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</thead>
<tbody>
<tr>
<td>Clotrimazole Vaginal Tab 500mg &amp; Cream 1%, 20g (Canesten)</td>
<td>MSL IDA EML</td>
<td>Vulvovaginal candidiasis: <em>Insert a single dose vaginal tab</em> 500mg at night and/or <em>apply cream</em> to affected area 2-3 times daily for 7 days.</td>
</tr>
<tr>
<td>Fluconazole Tab 50mg &amp; 150mg (Diflucan)</td>
<td>IDA EML</td>
<td><em>By mouth</em>, Systemic mycoses: Adult 200 mg daily for at least 6 months; Child over 2 yo 3–6 mg/kg daily for at least 6 months. Systemic candidosis (in patients unable to tolerate amphotericin B), Adult 400 mg as initial dose, then 200 mg daily for at least 4 weeks; Child 6-12 mg/kg daily (Neonates up to 2 weeks old give dose every 72 hours, 2-4 wks old every 48 hours) Oesophageal and oropharyngeal candidosis: Adult 200 mg initial dose, then 100 mg daily until symptoms resolved; up to 400 mg daily in very resistant infections; Child 3-6 mg/kg on the first day, then 3 mg/kg daily (Neonates up to 2 weeks old give dose every 72 hours, 2-4 wks old every 48 hours) Vaginal candidosis, <em>by mouth</em>, Adult 150 mg as a single dose.</td>
</tr>
<tr>
<td>Griseofulvin Tab 500mg (Grivin)</td>
<td>IDA EML</td>
<td>Superficial fungal infections, <em>by mouth</em>, Adult 500mg daily in 1-2 divided doses; Child 10 mg/kg/DAY in 1-2 divided doses. Duration of treatment depends on the infection and thickness of keratin at site of infection; at least 4 weeks for skin and hair, at least 6 weeks for scalp ringworm and in severe infection, up to 3 months; 6 months for fingernails and 12 months or more for toenails Administer dose with or after food.</td>
</tr>
</tbody>
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<tr>
<th>GENERIC (TRADE) NAME</th>
<th>CAT.</th>
<th>INDICATION/DOSE</th>
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</thead>
<tbody>
<tr>
<td>Itraconazole Cap 100mg (Sporanox)</td>
<td>IDA</td>
<td>Pityriasis versicolor: <em>By mouth</em>, Adult 200mg daily for 7 days; Tinea corporis/cruris 100mg daily for 15 days; Vulvovaginal candidiasis: 200mg twice daily for 1 day.</td>
</tr>
<tr>
<td>Ketoconazole Tab 200mg (Nizoral)</td>
<td>IDA</td>
<td><em>By mouth</em>, Systemic fungal infection: Adult 200mg daily with food for 14 days. Child 3mg/kg/DAY.</td>
</tr>
<tr>
<td>Nystatin Suspension 100 000 units/ml (Mycostatin)</td>
<td>IDA</td>
<td><em>By mouth</em>, Oral candidosis: Adult &amp; Child &gt; 1 month, 100 000 units after food 4 times daily; Intestinal/oesophageal candidosis: Adult 500 000 units 4 times daily; Child &gt; 1 month 100 000 units 4 times daily; continue for 48 hours after clinical cure. Place dose in mouth after food.</td>
</tr>
</tbody>
</table>

**COMMENT/CAUTIONS:**

- **Amphotericin B** lipid complex (Abelcet), liposomal (Ambisone) and colloidal (Amphotec/Amphocil) formulations have different drug profiles compared to conventional Amphotericin B (Fungizone). Consult individual product information for dosing details.
- **Amphotericin B** is toxic when given parenterally. Reconstitute each 50mg vial with 10ml WFI to produce a 5mg/ml solution, then dilute further in 490ml of D5 to a 100 micrograms/ml (1mg/10ml) solution (pH of glucose must not be below 4.2); give initial test dose of 1mg in 10ml over 20-30 minutes, observe patient, if no adverse reaction after 30 minutes infuse dose as required over 2-4 hours, protect from light, incompatible with saline solutions.
- **Amphotericin B adverse effects:** fever, chills, hypotension, nausea, nephrotoxicity and thrombophlebitis. Monitor for hypokalaemia and weekly blood counts are advisable. Systemic corticosteroids may be needed. Avoid giving other nephrotoxic drugs concomitantly.
- **DRUG-INDUCED CANDIDOSIS:** oral thrush and other stomatitis are sometimes induced by broad-spectrum antibiotics and cytotoxics (withdraw if possible) or inhaled corticosteroids (reduce by using spacer device, or rinsing/wiping mouth with water after inhalation).
- **Ketoconazole** is associated with liver damage and fatal hepatotoxicity respectively, monitor liver function during treatment (also for fluconazole and itraconazole), discontinue if signs or symptoms of hepatic disease occur.
6.03 ANTIMALARIALS

WHO MODEL FORMULARY 2008 NOTES:

[This section is an adaptation of the WHO recommendations for Mercy Ships according to antimalarials available on the Mercy Ships formulary:]

Malaria, which is transmitted by anopheline mosquitoes, is caused by four species of plasmodial parasites. *Plasmodium vivax* is extensively distributed. *P. falciparum* is also widespread, and causes the most severe infections which are responsible for nearly all malaria-related deaths. *P. ovale* is mainly confined to Africa and is less prevalent, while *P. malariae*, which causes the least severe but most persistent infections, also occurs widely. Certain tissue forms of *P. vivax* and *P. ovale* which persist in the liver for many months and even years are responsible for the relapses. Such latent forms are not generated by *P. falciparum* or *P. malariae*. Recrudescence of these infections results from persistent blood forms in inadequately treated or untreated patients.

TREATMENT OF MALARIA

Blood schizontocides, which suppress malaria by destroying the asexual blood forms of the parasites, are the mainstay of the treatment of acute malaria and some are used for prophylaxis. They include the 4-aminoquinolines (*amodiaquine* and *chloroquine*), the related arylaminoalcohols (*mefloquine* and *quinine*), and *artemisinin* and its derivatives (*artemether* and *artesunate*). Blood schizontocides are not active against intrahepatic forms and therefore they do not eliminate infections by *P. vivax* and *P. ovale*. Combinations of some antimetabolites act synergistically, e.g. a combination of *pyrimethamine* with *sulfadoxine* is an effective blood schizontocide; on their own these substances are of little value because they act slowly. Some antibiotics (e.g. *doxycycline*) are blood schizontocides; the tetracyclines are used primarily as adjuncts to quinine where multiple-drug-resistant *P. falciparum* is prevalent.

TREATMENT OF UNCOMPPLICATED FALCIPARUM MALARIA.

Consider *artemether with lumefantrine*. Treatment failure more than 14 days after initial treatment can be retreated with the same drug. If treatment failure occurs within 14 days of initial treatment, consider *quinine* (10mg/kg three times a day) plus either *doxycycline* or *clindamycin* or *tetracycline* for 7 days each.

For crew returning to non-endemic countries, consider one of the following (if malaria chemoprophylaxis was taken, use a different drug for treatment):

- *artemether with lumefantrine* (see below for dose);
- *quinine* (10mg/kg every 8 hours) plus either *doxycycline* (3.5mg/kg once daily) or *clindamycin* (10mg/kg twice daily), for 7 days each;
- **atovaquone with proguanil** (15mg/6mg/kg; usual adult dose 4 tablets once a day for 3 days).
- In the first trimester of pregnancy, **quinine + clindamycin** for 7 days is the treatment of choice; this combination can be used throughout pregnancy. If clindamycin is not available, give quinine as a monotherapy. In the second and third trimesters give artemether with lumefantrine for 7 days.
- **Breastfeeding** women should receive standard antimalarial treatment (including artemether with lumefantrine) except tetracyclines and dapsone.

TREATMENT OF SEVERE FALCIPARUM MALARIA.

Parenteral **artemether** or **quinine** is required. Parenteral antimalarials are also used to initiate treatment in patients unable to take oral treatment. The risk of death in severe malaria is greatest in the first 24 hours; give the first dose of parenteral treatment before further referral to a health facility. Combination antimalarial treatment should start as soon as patients are able to take oral medication.

Patients with HIV infection who develop malaria should receive standard antimalarial treatment regimens, but avoid sulfadoxine with pyrimethamine if they are receiving sulfamethoxazole with trimethoprim for prophylaxis against opportunistic infections (increased risk of adverse reactions to sulfonamides).

TREATMENT OF BENIGN MALARIAS.

**Chloroquine** is the drug of choice for *P. vivax* infection; **primaquine** is added for a radical cure (to destroy parasites in the liver and thus prevent relapses). Alternatives in chloroquine resistant areas include an **artemisinin** derivative or **mefloquine**, in all cases followed by **primaquine** for radical cure. Treat severe/complicated vivax malaria as for severe falciparum malaria (see above). Treat *P. ovale* or *P. malariae* malaria with **chloroquine**. For radical cure of *P. ovale*, **primaquine** is added as for vivax malaria, see above. In **pregnant patients** with *P. vivax* or *P. ovale* infection, radical cure with primaquine should be postponed until after delivery; chloroquine at a dose of 600 mg (as the base) each week can be given until then.

**Chloroquine**, a rapidly acting schizontocide, is well tolerated, safe and inexpensive. It can be used to treat malaria wherever the parasites remain susceptible. However, widespread resistance has limited its value in the treatment of falciparum malaria. Chloroquine-resistant strains of *P. vivax* have been reported in parts of Oceania, Indonesia, East Timor, and Peru. *P. malariae* and *P. ovale* remain fully sensitive to chloroquine.
The combination of sulfadoxine with pyrimethamine is also used in combination with other antimalarials for the treatment of uncomplicated *P. falciparum* infection (see above). Resistance to sulfadoxine with pyrimethamine is now widespread, particularly in south-east Asia and South America and it occurs at low prevalence in east and central Africa. Because sulfonamides are associated with haemolysis and methaemoglobinaemia in the newborn, quinine is preferred for chloroquine-resistant malaria during pregnancy (see below).

**Mefloquine** resistance is common in Thailand, Myanmar and Cambodia, and has occurred in the Amazon region of South America and occasionally in Africa. A parenteral preparation is not available and it is thus suitable only for patients who can take drugs by mouth. It is generally well tolerated but some adverse effects have been reported (see below).

**Quinine**, given orally, is used in combination with clindamycin or doxycycline to treat relapses of *P. falciparum* infections which occur within 14 days of treatment and are likely to be unresponsive to other drugs. Resistance to quinine was, until recently, rare, but the prevalence of resistant strains is now increasing in parts of south-east Asia and South America. Doxycycline is given with quinine except in pregnant women and children under 8 years.

Preparations of **artemisinin** or its derivatives (**artemether** or **artesunate**) are used in combination with other antimalarial drugs for the treatment of falciparum malaria. When given alone or in combination with other rapidly eliminated antimalarials a 7-day course is required, but when given in combination with slowly eliminated antimalarials, a 3-day course is effective. They should not be used in the first trimester of pregnancy except where no other effective antimalarial medicine is available. Parenteral artemether or artesunate are effective alternatives to quinine for the treatment of severe falciparum malaria and are preferred in areas with decreased efficacy of quinine. A fixed-dose oral formulation of **artemether with lumefantrine** is available for the treatment of uncomplicated falciparum malaria; the combination is not for use in this first trimester of pregnancy.

[Mercy Ships note: please refer to the current Mercy Ships’ protocol on malaria treatment and prophylaxis.]

**PROPHYLAXIS AGAINST MALARIA**

No drug regimen gives assured protection to everybody, and indiscriminate use of antimalarials can increase the risk of inducing resistance. Avoidance of mosquito bites using insect repellents, mosquito nets (preferably impregnated with an insecticide), and door and window screens is important. When possible pregnant women should avoid travel to malarious areas; when travel is unavoidable effective prophylaxis is essential.
**Chloroquine**, which is usually well-tolerated at the required dosage, is preferred where *P. falciparum* remains fully sensitive. The combination of proguanil with chloroquine may overcome mild chloroquine resistance. Chloroquine is best started 1 week before exposure, and continued for at least 4 weeks after the last exposure in non-immune individuals. This is sufficient to ensure elimination of *P. falciparum* and *P. malariae*, but not of *P. vivax* and *P. ovale*, whose residual hepatic forms survive. Chloroquine can be used during pregnancy.

**Mefloquine** may be used for prophylaxis in areas of high risk or where multiple-drug resistance has been reported. Where possible prophylaxis should be started 2-3 weeks before travel to enable any adverse reactions to be identified before exposure (over three-quarters of adverse reactions occur by the third dose) and should be continued for 4 weeks after last exposure. Mefloquine may be used for prophylaxis during the second and third trimesters. It should be used in early pregnancy only if alternative drugs are either not available or unlikely to be effective and when it is impracticable for the woman to leave the endemic area.

*[Mercy Ships Note: Due to the special risk to self and others in a ship situation, mefloquine should only be prescribed as malaria prophylaxis if there are no alternatives, and when it is the choice of the personal physician and the patient conversant with possible adverse effects. Crew must seek immediate medical attention at first signs of any psychiatric adverse effects.]*

**Doxycycline** is an alternative to mefloquine in areas of high risk or multiple-drug resistance; it should not be given during pregnancy.

**Proguanil**, a predominantly tissue schizontocide with little blood schizontocidal activity, is active against pre-erythrocytic intrahepatic forms, particularly of *P. falciparum*. The latent persistent liver forms of *P. ovale* and *P. vivax* are unresponsive. However, there is evidence that it may be effective against *P. vivax* only immediately after the initial infection. *P. falciparum* resistance to proguanil or related compounds can occur in malaria endemic areas and particularly where it has been used for mass prophylaxis. Proguanil is used for prophylaxis with chloroquine in areas where there is resistance to chloroquine but a low risk of infection because it may give some protection against *P. falciparum* and may attenuate symptoms if an attack occurs. Proguanil and chloroquine can also be used prophylactically in areas of high risk or multi-drug resistance as a third choice where mefloquine or doxycycline are not appropriate. There is no evidence that proguanil is harmful in prophylactic doses during pregnancy. Because of the vulnerability of pregnant women to falciparum malaria, it should be used at full prophylactic dosage wherever the disease is prevalent and likely to be responsive to proguanil, if chloroquine is not available. Proguanil can be given with chloroquine if chloroquine alone is unlikely to be effective. Folic acid 5 mg daily should be given with proguanil during pregnancy.
[NOTE: Please refer to current local & national guidelines and the Mercy Ships’ protocol for malaria prophylaxis and treatment. Warn crew about importance of avoiding mosquito bites, taking prophylaxis regularly, and immediate visit to the doctor if ill within 1 year and especially within 3 months of return].

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<tr>
<th>GENERIC (TRADE) NAME</th>
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<th>INDICATION/DOSE</th>
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<tbody>
<tr>
<td>Artemether Injection 80mg/ml</td>
<td>IDA</td>
<td>Treatment of severe <em>P. falciparum</em> malaria (if quinine resistance): <em>by IM inj</em>, Adult/Child &gt; 6 months, loading dose 3.2 mg/kg, then 1.6 mg/kg daily until patient switch to oral dose or to max 7 days; followed by mefloquine single dose 15 mg/kg (or if needed 25 mg/kg) to effect a radical cure. Since small volumes are required for children, a 1-ml syringe should be used to ensure correct dosage. <em>May cause dizziness.</em></td>
</tr>
<tr>
<td>Artemether 20mg with Lumefantrine 120mg Tab [Co-Artemether] (Riamet)</td>
<td>IDA</td>
<td>Treatment of uncomplicated falciparum malaria: <em>by mouth</em>, Adult &amp; Child &gt; 12 yo and &gt; 35 kg, initially 4 tablets followed by 5 further doses of 4 tablets each at 8, 24, 36, 48 and 60 hours (total 24 tablets over 60 hours); Child 10-14 kg, 6 timed doses of 1 tablet, 15-24 kg, 6 timed doses of 2 tablets, 25-34 kg, 6 timed doses of 3 tablets; time scale as above for adult dosing. Repeat dose if vomiting occurs within 1 hour of administration.</td>
</tr>
<tr>
<td>Artemether 15mg with Lumefantrine 90mg in 5ml Suspension [Co-Artemether]</td>
<td>IDA</td>
<td>Treatment of uncomplicated falciparum malaria: <em>by mouth</em>, Adult &amp; Child, 4mg Artemether/kg body weight once daily for three days, round to the nearest ml, or body weight 5 to 7.4kg 7ml per dose, 7.5-9.9kg 10ml, 10-12.4kg 14ml, 12.5-14.9kg 17ml, 15-17.4kg 20ml, 17.5-19.9kg 24 ml, dose given once daily for three days; confirm dose with manufacturer’s product leaflet.</td>
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<th>GENERIC (TRADE) NAME</th>
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<tr>
<td>Atovaqone 250mg with Proguanil 100mg Tab (Malarone)</td>
<td></td>
<td>By mouth, Treatment: Adult &amp; child &gt; 40 kg, 4 tablets daily, Child 11-20kg 1 tab daily, 21-30kg 2 tabs daily, 31-40kg 3 tabs daily; for 3 days. Prophylaxis: Adult or &gt; 40kg, 1 tablet daily, start 1 week before travelling to malaria region and continue 1 week after leaving malaria region [1-2 days Before – 1 week After].</td>
</tr>
<tr>
<td><strong>NOTE:</strong> Limited stock on board, please use for treatment only, and when co-artemether is ineffective or inappropriate.</td>
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<tr>
<td>Chloroquine Tab 150mg (base), Suspension 10mg/ml (base)</td>
<td>IDA</td>
<td>[Dose expressed as base.] By mouth, Benign malaria treatment (P. vivax, ovale &amp; malariae): Adult initially 600mg (4 tablets) then 300mg (2 tabs) after 6-8 hours, then 300mg (2 tabs) daily for 2 days. Child initial dose of 10mg/kg followed by 5mg/kg after 6-8 hours, then 5mg/kg on next 2 days (or 10 mg/kg for 2 days, followed by 5 mg/kg daily on day 3); total dose, 25 mg/kg over 3 days. Prophylaxis: Adult 300mg (2 tabs) once a WEEK, Child 5mg/kg once a WEEK, with proguanil. [1 week Before – 4 weeks After]. Give dose after meals to minimize nausea/vomiting; if vomiting occurs readminister same dose immediately</td>
</tr>
<tr>
<td>[250mg phosphate salt = 150mg base]</td>
<td>EML</td>
<td></td>
</tr>
<tr>
<td>Doxycycline Cap 100mg (Vibramycin)</td>
<td>MSL</td>
<td>By mouth, supplement to malaria treatment (see notes above): Adult &amp; Child &gt; 8 yo, 100mg twice daily for 7-10 days. Malaria prophylaxis: Adult 100mg daily; Child &gt; 8 yo 1.5 mg/kg daily. [1 day Before – 4 weeks After]. Swallow capsules whole with plenty of fluid while sitting or standing to prevent oesophageal irritation. May be given with milk or food. See Section 6.01e Tetracyclines for more notes on Doxycycline.</td>
</tr>
<tr>
<td></td>
<td>IDA</td>
<td></td>
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<tr>
<td></td>
<td>EML</td>
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[NOTE: Please refer to current local & national guidelines and the Mercy Ships’ protocol for malaria prophylaxis and treatment. Warn crew about importance of avoiding mosquito bites, taking prophylaxis regularly, and immediate visit to the doctor if ill within 1 year and especially within 3 months of return].

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<tbody>
<tr>
<td>Mefloquine Tab 250mg (Lariam)</td>
<td>IDA</td>
<td>[Dose expressed as base]. By mouth, Treatment of malaria (see notes above): Adult &amp; Child 25mg/kg/DOSE given over 2-3 days. Prophylaxis: once a WEEK dosing, Adult 250mg, Child over 5kg, 5mg/kg [1-3 weeks Before – 4 weeks After]. Note: Please refer to WHO notes above on its prophylaxis use for ship crew.</td>
</tr>
<tr>
<td>Primaquine Tab 15mg (base)</td>
<td>IDA</td>
<td>[Dose expressed as base]. By mouth, Radical treatment of P. vivax or P. ovale malaria (after standard chloroquine therapy): Adult 250 micrograms/kg (or 15mg) daily, Child 250 micrograms/kg daily, for 14 days; in G6PD deficiency, Adult/Child 500-750 micrograms/kg once a week for 8 weeks. Gametocytocidal treatment of P. falciparum (after routine blood schizontocide therapy): Adult/Child 500-750 micrograms/kg single dose.</td>
</tr>
<tr>
<td>Proguanil Tab 100mg</td>
<td>IDA</td>
<td>By mouth, Prophylaxis of malaria, with chloroquine: Adult (or &gt; 45 kg), 200mg daily after food, Child &lt; 1 yo (or &lt;6kg) 25mg, 1-4 yo (6-10kg) 50mg, (10-16kg) 75mg, 5-8 yo (16-25kg) 100mg, 9-14 yo (25-45kg) 150mg, dose given daily. [1 week Before – 4 weeks After].</td>
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| Quinine Sulphate Tab 300mg  
[300mg salt = 250mg base] | IDA  | [Dose expressed as salt]. Treatment of multiple-drug resistant *P. falciparum* malaria: *By mouth*, Adult 600mg (2 tablets), Child 10mg/kg, give every 8 hours for 3, 7 or 10 days (duration depending on local susceptibility and whether other antimalarials are used, see notes.) Give dose after meals to minimize nausea and vomiting; if part or all of dose is vomited, readminister the dose immediately. |
|                      | EML  | NOTES: may cause severe thrombocytopenia, and use with caution in cardiac disease. |
| Quinine DiHCl Inj 600mg/2ml | IDA  | [Dose expressed as salt]. Treatment of multiple-drug resistant *P. falciparum* malaria (in patients unable to take quinine by mouth), *by slow IV infusion only* (over 4 hours), Adult loading dose 20 mg/kg (or max 1.4g), then after 8-12 hours maintenance dose 10 mg/kg (or max 600mg) every 8 hours; Child loading dose 20 mg/kg then 10 mg/kg every 12 hours; until patient can swallow tablets to complete 7 day course (see WHO notes above). Half loading dose if during previous 12-24 hours patients have received quinine, quinidine or mefloquine. For IV infusion dilute 600mg with 50-100ml D5/NS, infuse over 4 hours. |
|                      | EML  | NOTES: may cause severe thrombocytopenia, and use with caution in cardiac disease. |
| Sulfadoxine 500mg + Pyrimethamine 25mg Tab  
(Fansidar) | IDA  | *By mouth*, Treatment as single dose with chloroquine for benign malaria (*P. vivax, ovale & malariae*) or with quinine for susceptible *P. falciparum* malaria (see WHO notes above): Adult 3 tablets as a single dose; Child 5-10kg half tablet; 11-20kg 1 tab; 21-30kg 1.5 tab; 31-45kg, 2 tabs, as a single dose with last chloroquine/quinine dose. |
|                      | EML  | NOTES: |
COMMENT/CAUTIONS:
- Please refer to current local & national guidelines and the Mercy Ships’ protocol for malaria prophylaxis and treatment. Warn crew about importance of avoiding mosquito bites, taking prophylaxis regularly, and immediate visit to the doctor if ill within 1 year and especially within 3 months of return.
- **Chloroquine adverse effects:** hepatic/renal impairment, avoid concurrent therapy with hepatotoxic drugs. May cause reversible retinal damage (ophthalmic examinations in long term treatment), avoid in history of epilepsy.
- **Mefloquine adverse effects:** Due to the special risk to self and others in a ship situation if psychiatric adverse effects occur, mefloquine should only be prescribed as malaria prophylaxis if there are no alternatives. Advise crew to seek immediate medical attention at first signs of such adverse effects.
- **Quinine:** Quinine (anhydrous base) 100 mg = quinine bisulfate 169 mg = quinine dihydrochloride 122 mg = quinine sulfate 121 mg. Quinine bisulfate 300 mg tablets provide less quinine than 300 mg of sulphate or diHCl. **Cautious use** in cardiac disease, may cause severe thrombocytopenia.
- **Proguanil:** If used in pregnancy for prophylaxis, give 5mg folic acid oral supplement daily.

### 6.04 OTHER ANTIPROTOZOALS

**WHO MODEL FORMULARY 2008 NOTES:**

**AMOEBIASIS.** Amoebic dysentery is caused by *Entamoeba histolytica*. It is transmitted by the faeco-oral route and infection is usually caused by ingestion of cysts from contaminated food and drink. Asymptomatic carriers are common in endemic areas. In non-endemic areas, symptomless carriers should be treated with a luminal amoebicide which will reduce the risk of transmission and protect the patient from invasive amoebiasis. Diloxanide furoate is most widely used, but other compounds, including *clefamide*, *etofamide*, and *teclozan* [all not available on Mercy Ships list], are also effective. Treatment with diloxanide furoate is regarded as successful if stools are free of *E. histolytica* for one month. Several specimens should be examined in evaluating response to treatment.

Symptomatic (invasive) amoebiasis may be classified as intestinal or extra-intestinal. Intestinal amoebiasis is either amoebic dysentery or non-dysenteric amoebic colitis. Extra-intestinal amoebiasis most commonly involves the liver, but may involve the skin, genito-urinary tract, lung and brain. Invasive amoebiasis is more likely in malnutrition, immunosuppression and pregnancy. Amoebic dysentery may take a fulminating course in late pregnancy and the puerperium; treatment with **metronidazole** may be life saving. In less severe infection, metronidazole should, if possible, be avoided in the first trimester. All patients with invasive amoebiasis require treatment with a systemically active compound such as **metronidazole**, followed by a luminal amoebicide in order to eliminate
any surviving organisms in the colon. Combined preparations are useful. In severe cases of amoebic dysentery, tetracycline given in combination with a systemic amoebicide lessens the risk of superinfection, intestinal perforation and peritonitis. Hepatic abscesses should be lanced by needle aspiration.

GIARDIASIS. Giardiasis is caused by *Giardia intestinalis* and is acquired by oral ingestion of *Giardia* cysts. Giardiasis can be treated with a single dose tinidazole or with metronidazole; both are highly effective and should be offered when practicable to all infected patients. Treat family and institutional contacts as well. Larger epidemics are difficult to eradicate due to high proportion of symptomless carriers and excreted cysts survive for long periods outside the human host.

TRICHOMONIASIS. Trichomoniasis is an infection of the genito-urinary tract caused by *Trichomonas vaginalis* and transmission is usually sexual. In women it causes vaginitis although some are asymptomatic. It is usually asymptomatic in men but may cause urethritis. Patients and their sexual partners should be treated with metronidazole or other nitroimidazole.

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<th>GENERIC (TRADE) NAME</th>
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<tr>
<td>Metronidazole Tab 200mg, Suspension 125mg/5ml, Inj 500mg/100ml (Flagyl)</td>
<td>MSL IDA</td>
<td>By mouth, Invasive amoebiasis: Adult/Child 30 mg/kg/DAY in 3 divided doses or Adult 400-800mg every 8 hours for 8-10 days. Or Child 1-3 yo 600mg/DAY, 3-7 yo 800mg/DAY, 7-10 yo 1.2g/DAY; in 3-4 divided doses for 8-10 days. Or by IV infusion, Adult/Child 30mg/kg/DAY in 3 divided doses (until oral route ok to finish course); consider course of luminal amoebicide (see WHO notes above). Giardiasis: By mouth, Adult 2g once daily for 3 days; Child 15mg/kg/DAY in 3 divided doses for 5-10 days. Urogenital trichomoniasis: By mouth, Adult 2g as a single dose or 400-500mg twice daily for 7 days (treat sexual partners concomitantly).</td>
</tr>
</tbody>
</table>

COMMENT/CAUTIONS:
- **Metronidazole Adverse effects**: avoid alcohol, may cause a disulfiram-like reaction (flushing, palpitations etc). Also unpleasant taste, furred tongue, dizziness/headache, dark urine, leucopenia rarely peripheral neuropathy.
INTESTINAL ANTHELMINTICS

CESTODE INFECTIONS (tapeworms) include intestinal taeniasis and cysticercosis, hymenolepiasis (dwarf tapeworm), diphyllobothriasis and echinococcosis (hydatid disease). Cysticercosis is a systemic infection caused by the larval form (cysticercus) of *Taenia solium*. Neurocysticercosis occurs when the infection involves the brain. In man, echinococcosis is due to the larval stage of *Echinococcus granulosus* or *E. multilocularis*. The larvae (oncospheres) develop by expansion (cystic echinococcosis) or tumour-like infiltration (alveolar echinococcosis), respectively, in the liver, lungs, or other organs. In animal studies, *albendazole* and *mebendazole* have been found to be teratogenic. They are contraindicated for treatment of cestode infections in pregnancy; pregnancy should be excluded before treatment with albendazole (non-hormonal contraception during and for 1 month after treatment). For single-dose or short-term use in pregnancy, see below under ‘Hookworm Infections’.

In TAENIASIS, *praziquantel* is well tolerated and extensively absorbed and kills adult intestinal taenia worms in a single dose. Praziquantel also kills *T. solium* cysticerci when taken for 14 days in high doses and it can therefore be used to treat neurocysticercosis. However, because dying and disintegrating cysts may induce localized cerebral oedema, treatment with praziquantel must always be undertaken in a hospital setting. In addition, a corticosteroid is usually given to reduce the inflammatory response. *Albendazole* also kills neurocysticerci when given daily for one month; a corticosteroid or an antihistamine is also given to reduce any inflammatory reaction. Surgery may be preferred for treating neurocysticercosis in some cases. The longer-established *niclosamide* [not on Mercy Ships list] acts only against the adult intestinal worms. Cestode infections, due to *T. solium*, during pregnancy should always be treated immediately (with praziquantel or niclosamide but not albendazole) because of risk of cysticercosis.

NEMATODE INFECTIONS

ASCARIASIS is an infection, usually of the small intestine, caused by *Ascaris lumbricoides* (ROUNDWORM). Single doses of *levamisole* or *pyrantel* [both not on Mercy Ships list] are effective; *albendazole* or *mebendazole* are also effective. ENTEROBIASIS is an infection of the large intestine caused by *Enterobius vermicularis* (PINWORM, THREADWORM). All household members should be treated concurrently with a single dose of *mebendazole*, albendazole or pyrantel [not on Mercy Ships list]. Since reinfection readily occurs, at least one further dose should be given 2-4 weeks later.
HOOKWORM INFECTIONS are caused by *Ancylostoma duodenale* (ancylostomiasis) and *Necator americanus* (necatoriasis); they are a major cause of iron-deficiency anaemia in the tropics and sub-tropics. Ideally all cases of hookworm infection should be treated. However, when this is impracticable, priority should be given to women in second- and third-trimester of pregnancy, children and debilitated patients. In hookworm, broad-spectrum anthelmintics are preferred wherever other nematode infections are endemic. Both *mebendazole* and *albendazole* are effective. In animal studies, *albendazole* and *mebendazole* have been found to be teratogenic. There is some evidence to suggest that the use of mebendazole in pregnancy is not associated with an increased incidence of adverse effects on the fetus. However, neither mebendazole nor albendazole should be used during the first trimester of pregnancy to treat nematode infections. Both drugs are contraindicated for the treatment of cestode infections in pregnancy (see above). Patients with iron-deficiency anaemia caused by hookworm infection require supplementary iron salts (e.g. ferrous sulfate 200 mg daily for adults) for at least 3 months after the haemoglobin concentration of 12 g/100 ml is obtained.

STRONGYLOIDIASIS is an infection of the small intestine caused by *Strongyloides stercoralis*. All infected patients should be treated. *Ivermectin* [not on Mercy Ships list] in a single dose of 200 micrograms/kg or 200 micrograms/kg/day on two consecutive days is the treatment of choice for chronic strongyloidiasis but it may not be available in all countries. *Albendazole* 400 mg once or twice daily for 3 days is well tolerated by both adults and children over 2 years old and it may eradicate up to 80% of infections. *Mebendazole* has also been used but, to be effective, it must be administered for longer periods as it has a limited effect on larvae and hence the prevention of autoinfection.

TRICHURIASIS is an infection of the large intestine caused by *Trichuris trichiura* (WHIPWORM). Chemotherapy is required whenever symptoms develop or when faecal samples are found to be heavily contaminated (up to 10 000 eggs per gram). A single dose of *albendazole* (400 mg) or *mebendazole* (500 mg) can be effective in mild to moderate infections; heavier infections require a 3-day course.

DRACUNCULIASIS (DRACONTIASIS, GUINEA-WORM infection) is caused by infection with *Dracunculus medinensis*, acquired through drinking water containing larvae that develop in small freshwater crustaceans. *Metronidazole* (section 6.04) (25 mg/kg daily for 10 days, daily max 750 mg for children) provides rapid symptomatic relief, and weakens the anchorage of worms in subcutaneous tissues; they can then be removed by traction. However, since it has no effect on the larvae of pre-emergent worms, it does not immediately prevent transmission.
VISCERAL LARVA MIGRANS (TOXOCARIASIS) is caused by infection with the larval forms of *Toxocara canis* and less commonly, *T. cati* (which infect dogs and cats). Treatment should be reserved for symptomatic infections. A 3-week oral course of *diethylcarbamazine* kills the larvae and arrests the disease, but established lesions are irreversible. To reduce the intensity of allergic reactions induced by dying larvae, dosage is commonly commenced at 1 mg/kg twice daily and raised progressively to 3 mg/kg twice daily (adults and children). Ocular larva migrans occurs when larvae invade the eye, causing a granuloma which may result in blindness. In order to suppress allergic inflammatory responses in patients with ophthalmic lesions, prednisolone should be administered concurrently, either topically or systemically.

**TREMATODE INFECTIONS**

SCHISTOSOMIASIS, a waterborne parasitic infection is caused by several species of trematode worms (blood flukes). Its socioeconomic impact as a parasitic disease is outstripped only by that of malaria. Intestinal schistosomiasis is caused principally by *Schistosoma mansoni* as well as *S. japonicum*, *S. mekongi*, and *S. intercalatum*. Urinary schistosomiasis is caused by *S. haematobium*. The latter is an important predisposing cause of squamous cell cancer of the bladder. *Praziquantel* has transformed the treatment of schistosomiasis and is often effective in a single dose, against all species of the parasite. It can be of particular value in patients with mixed infections and those who do not respond adequately to other drugs. It is also extremely well tolerated and well suited for mass treatment control programmes. Extensive use over years has provided no evidence of serious adverse effects or long-term toxicity, nor has mutagenic or carcinogenic activity been shown in experimental animals.

[Mercy Ships note: Please refer to the WHO Formulary 2008 for the full notes on anthelmintics treatments including angiostrongyliasis, anisakiasis, capillariasis, cutaneous larva migrans, filariasis, hymenolepiasis, loiasis, onchocerciasis, trichinellosis, trichostrongyliasis and other fluke infections.]
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<tbody>
<tr>
<td>Albendazole Tab Chewable 200mg &amp; 400mg</td>
<td>IDA</td>
<td><em>By mouth</em>, Neurocysticercosis: Adult &gt; 60kg, 800mg daily in 2 divided doses for 8-30 days; Adult &lt; 60kg, 15 mg/kg daily in two divided doses (max 800mg/DAY) for 8-30 days. Ascariasis, hookworm infections, enterobiasis: Adult/Child &gt; 2 yo, 400mg as a single dose; 12 months-2 yo, 200mg as a single dose. Trichuriasis ( whipworm): Adult &amp; Child &gt; 2 yo, 400mg single dose (moderate infections) or 400mg daily for 3 days (severe infections); Child 12 months-2 yo, 200mg single dose (moderate infections) or 200mg initially then 100mg twice daily for 3 days (severe infections). Strongyloidiasis: Adult &amp; Child &gt; 2yo, 400mg 1-2 times daily for 3 days.</td>
</tr>
<tr>
<td>Diethylcarbamazine Tab 50mg (Hetrazan)</td>
<td>IDA</td>
<td><em>By mouth</em>, Treatment of microfilariae and adults of <em>Loa loa, Wuchereria bancrofti</em> and <em>Brugia malayi</em>: Adult initially 1mg/kg/DAY on day 1, doubled dose on day 2 and 3, then adjusted to 2-3mg/kg 3 times daily for a further 18 days. Always consult local/country treatment regimens before treatment, caution in heavy infection (meningoencephalitis risk).</td>
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### Mebendazole Tab Chewable 100mg (Vermox)

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<tbody>
<tr>
<td>Mebendazole Tab Chewable 100mg (Vermox)</td>
<td>MSL IDA</td>
<td>By mouth, Ascariasis: Adult &amp; Child &gt; 1yo, 500mg as a single dose or 100mg twice daily for 3 days. Hookworm infections, trichuriasis: Adult &amp; Child &gt; 1yo, 100mg twice daily for 3 days; may be repeated after 3-4 weeks; alternatively (for mass treatment control programs), 500mg as a single dose. Enterobiasis: Adult &amp; Child &gt; 1yo, 100mg single dose, may be repeated after 2-3 weeks; treat all household &gt; 2yo at the same time. Take doses between meals.</td>
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### Praziquantel Tab 600mg (Cysticide)

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<tr>
<td>Praziquantel Tab 600mg (Cysticide)</td>
<td>IDA</td>
<td>By mouth, Adult &amp; Child &gt; 4yo, <em>Taenia saginata/solium</em> infections (tapeworm): 5-10 mg/kg single dose. Cysticercosis: 50 mg/kg daily in 3 divided doses for 14 days with prednisolone given 2-3 days before and throughout treatment period. Dermal cysticercosis: 60 mg/kg daily in 3 divided doses for 6 days. Schistosomiasis: 40-60 mg/kg single dose; or 3 doses of 20 mg/kg on one day at intervals of 4-6 hours.</td>
</tr>
</tbody>
</table>

**COMMENT/CAUTIONS:**
- Anthelmintics should be combined with hygienic measures to break the autoinfection cycle – advise patients to wash hands and scrub fingernails before meals and after visits to the toilet and to bath/shower daily. If patient has normal bowel movements a purgative is not needed. All members of the household require treatment.
6.06 ANTIVIRALS

WHO MODEL FORMULARY 2008 NOTES [Edited]:

HERPES SIMPLEX VIRUS (HSV) INFECTION. Aciclovir is active against herpes viruses but does not eradicate them. It is only effective if started at onset of infection; it is also used for prevention of recurrence in the immunocompromised. Genital lesions, oesophagitis and proctitis may be treated with oral aciclovir. HSV encephalitis or pneumonitis should be treated with intravenous aciclovir. Valaciclovir [not included on WHO Model List or Mercy Ships list], a prodrug of aciclovir, can be given by mouth as an alternative treatment for herpes simplex infections of the skin and mucous membranes (including initial and recurrent genital herpes).

VARICELLA–ZOSTER INFECTIONS. Chickenpox in neonates should be treated with parenteral aciclovir to reduce the risk of severe disease. Otherwise, antiviral treatment is generally not required except for immunocompromised patients and those at special risk (for example because of severe cardiovascular or respiratory disease or chronic skin disorder); aciclovir should be given for 10 days with at least 7 days of parenteral treatment. Specialist advice should be sought for the treatment of chickenpox during pregnancy.

While most HIV positive patients with ZOSTER experience only one self-limiting course, some will experience repeated episodes. Treatment should be reserved for debilitating disease and when there is high risk of serious complications, e.g. advanced HIV disease. Aciclovir is the treatment of choice and it can be administered in high oral dose or in lack of response to oral therapy or CNS involvement, it should be given intravenously. Parenteral antiviral ganciclovir [not on Mercy Ships list] arrests retinochoroiditis and enteritis caused by CMV in HIV infected patients. Maintenance therapy with oral ganciclovir should be given to prevent relapse of retinitis. Alternative therapy with IV foscarnet [not on Mercy Ships list] can be used if needed.

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<th>GENERIC (TRADE) NAME</th>
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<tbody>
<tr>
<td>Aciclovir Cream 5% (Zovirax)</td>
<td>IDA</td>
<td>Herpes simplex infections: begin treatment as early as possible (intact blisters); apply to lesions 4 hourly (5 times daily) for 5 days.</td>
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<tbody>
<tr>
<td>Aciclovir Tab 200mg (Zovirax)</td>
<td>IDA</td>
<td><strong>By mouth</strong>, Herpes simplex infection, Adult/Child &gt; 2 yo 200mg (400mg in immunocompromised) 5 times daily; Child &lt; 2 yo half adult dose; treat for 5 days (or longer if new lesions appear during treatment or if healing incomplete.) Varicella/herpes zoster: Adult 800mg 5 times a day for 5-10 days; Child 20mg/kg max 800mg 4 times daily for 5 days or child &lt; 2 yo 200mg 4 times daily, 2-5 yo 400mg 4 times daily, &gt; 6 yo 800mg 4 times daily.</td>
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<td></td>
<td>EML</td>
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<tr>
<td>Indinavir Cap 400mg (Crixivan)</td>
<td>EML</td>
<td>ONLY for post-exposure prophylaxis among health workers in high risk HIV occupational exposure: <strong>by mouth</strong>, Adult 800mg every 8 hours, before food with plenty of water (~1.5 litre every day), for 4 weeks.</td>
</tr>
<tr>
<td>Lamivudine 150mg with Zidovudine 300mg Cap (Combivir) [Zidovudine=AZT or Azidothymidine]</td>
<td>EML</td>
<td>ONLY for post-exposure prophylaxis among health workers in high risk HIV occupational exposure: <strong>By mouth</strong>, Adult one capsule every 12 hours, for 4 weeks.</td>
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</tbody>
</table>

**COMMENT/CAUTIONS:**
- **Aciclovir:** higher doses may be required in immunocompromised patients. To reduce risk of nephrotoxicity with IV route it is essential to give infusion over 60 minutes, maintaining adequate hydration and avoiding concurrent administration of other nephrotoxic drugs.
- **Post-Exposure Prophylaxis (PEP)** – to start preferably within first 6 hours of exposure with monitoring, please refer to current PEP guidelines.