

# Chapter 5

## Infection

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# Chapter 5

## Infection

### 1 ANTIBACTERIAL DRUGS

#### 1.1 BEFORE STARTING THERAPY

The follow must be considered:

- Viral infections should not be treated with antibacterials
- Samples should be taken for culture and sensitivity testing
- Narrow-spectrum antibacterials are preferred to broad-spectrum antibacterials unless there is a clear clinical indication, hence the need to test for the prevalent organism
- The dose varies according to factors including age, weight, hepatic function, renal function, and severity of infection
- Route of administration of an antibacterial often depends on the severity of the infection, usually IV for life-threatening
- Duration of therapy depends on the nature of the infection and the response to treatment, undue prolonged courses encourage resistance, may lead to side-effects and are costly

##### 1.1.1 Pregnancy

Penicillins and cephalosporins are suitable for use during pregnancy. Nitrofurantoin may also be used but it should be avoided at term. Diaminopyrimidines and quinolones should be avoided during pregnancy; trimethoprim should also preferably be avoided particularly in the first trimester.

##### 1.1.2 Renal impairment

Antibacterials normally excreted by the kidney accumulate with resultant toxicity unless the dose is reduced; especially aminoglycosides; tetracyclines, and nitrofurantoin should be avoided altogether.

### 1.2 AMINOGLYCOSIDES

Amikacin, Gentamicin, Neomycin, Streptomycin, Tobramycin

#### Mechanism of action

Bactericidal by irreversibly binding to ribosomes inhibiting protein synthesis; fissure result which enhances antibiotic uptake as well as leakage of cell

contents. Active against some gram +ve bust mostly gram -ve.

#### Indications

Endocarditis, septicaemia, meningitis and other CNS infections, biliary-tract infection, prostatitis, and pneumonia. Amikacin, tobramycin and gentamicin are active against *P. aeruginosa*, streptomycin is active against *M. tuberculosis*.

#### Side-effects

May impair neuromuscular transmission, irreversible ototoxicity, nephrotoxicity. Nausea, vomiting, antibiotic associated colitis, peripheral neuropathy, electrolyte disturbances.

#### Contraindications and cautions

Caution in patients with clinical muscular weakness e.g. myasthenia gravis; avoid concomitant use with ototoxic drugs e.g. cisplatin and furosemide, and nephrotoxic drugs e.g. vancomycin and ciclosporin

#### Other points

Aminoglycosides are not absorbed from the gut and therefore are given parenterally for systemic infections, however neomycin can be given orally for bowel sterilisation prior to surgery or in hepatic failure. Once daily doses preferred over multiple daily doses, need to consult local guidelines.

#### 1.2.1 Gentamicin

*Gentamicin is the aminoglycoside of choice in the UK. Therapy may require loading doses, and it has a narrow therapeutic Range:*

- *multiple daily dose regimens*  
*one-hour (peak) serum concentration should be 5 to 10mg/L (3 to 5 mg/L for endocarditis);*  
*pre-dose (trough) concentration should be < 2mg/L (< 1mg/L for endocarditis);*
- *once daily doses*  
*consult local guidelines*

##### 1.2.1.1 Monitoring (all aminoglycosides)

*Renal function (nephrotoxicity); auditory and vestibular function (ototoxicity which is irreversible); serum-aminoglycoside concentration must be determined in the elderly, all patients receiving parenteral treatment, those with renal impairment, in obesity and cystic fibrosis, and if high doses given.*

### 1.2.1.2 Warning signs

(patients advised to report all to doctor immediately)

- Nephrotoxicity
- Ototoxicity  
(hearing impairment or hearing disturbance)
- Dehydration  
(ensure patient is well hydrated before treatment to prevent dehydration)

### 1.2.1.3 Pregnancy and breastfeeding

Risk of auditory or vestibular nerve damage in 2<sup>nd</sup> and 3<sup>rd</sup> trimester, avoid unless essential

### 1.2.1.4 Drug Interactions

- Increased risk of nephrotoxicity when given with ciclosporin, tacrolimus, vancomycin
- Increased risk of ototoxicity when given with loop diuretics, vancomycin

## 1.3 CEPHALOSPORINS

Five generations of this antibiotic group exist:

1. Cefalexin, cefradine
2. Cefaclor, Cefuroxime
3. Cefixime, Ceftriaxone
5. Ceftazidime, ceftazidime sodium, ceftazidime sodium and ceftazidime sodium injection

### Mechanism of action

Prevent cell wall synthesis by binding to enzymes called penicillin binding proteins (PBPs). They are bactericidal to both gram -ve and gram -ve activity.

### Indications

Pneumonia, meningitis, gonorrhoea, and UTIs

### Side-effects

Antibiotic associated colitis (rare but more common with 2<sup>nd</sup> and 3<sup>rd</sup> generation)

### Contraindications and cautions

Hypersensitivity (0.5-6% of penicillin-sensitive patients will also be allergic to cephalosporins)

### Other points

Cefuroxime is poorly absorbed and needs to be given with food to maximise absorption; 2<sup>nd</sup> and 3<sup>rd</sup> gen are less susceptible to inactivation by beta-lactamases.

## 1.4 GLYCOPEPTIDES

Vancomycin, Teicoplanin, Telavancin

### Mechanism of action

Inhibit cell wall synthesis by binding to the cell wall precursor components, this leads to interference of

the PBP enzymes preventing cell wall synthesis. Active against aerobic and anaerobic gram +ve bacteria including MRSA

### Indications

Clostridium difficile infection, endocarditis, surgical prophylaxis when high risk of MRSA

### Side-effects

Nephrotoxicity, blood disorders, ototoxicity, nausea, chills, fever, rashes, SJS (Steven-Johnson syndrome), flushing of the upper body

### Contraindications and cautions

Avoid vancomycin in elderly, and in patients with a history of auditory problems

### Monitoring

Differs between glycopeptides: blood counts, hepatic and renal function, urinalysis, plasma levels, auditory function in elderly

### 1.4.1 Vancomycin

Loading doses may be required due to long half-life; Therapeutic Range: trough 10 to 15mg/L (15 to 20mg/L for endocarditis or less sensitive strains of methicillin-resistant Staphylococcus aureus or complicated infections caused by S. aureus)

#### 1.4.1.1 Monitoring (all glycopeptides)

blood counts, hepatic and renal function, urinalysis, plasma levels, auditory function in elderly

#### 1.4.1.2 Warning signs

(patients advised to report all to doctor immediately)

- Ototoxicity  
(hearing loss, vertigo, dizziness, tinnitus)
- Red man syndrome  
(flushing of the upper body)
- Blood disorders  
(fever, sore throat, mouth ulcers, unexplained bleeding or bruising)
- Phlebitis  
(drug irritates tissue causing inflammation)
- Nephrotoxicity  
(elevated serum creatinine levels)
- Skin disorders  
(rashes, pruritic, SJS)
- Hypotension and anaphylaxis occur if administered too quickly

#### 1.4.1.3 Pregnancy and breastfeeding

Manufacturer advises to avoid – if used plasma concentration monitoring essential to minimise foetal toxicity; present in milk, significant absorption unlikely

#### 1.4.1.4 Drug Interactions

- Increased risk of nephrotoxicity and ototoxicity when vancomycin given with ciclosporin, aminoglycosides, polymixin antifungals
- Increased risk of ototoxicity when vancomycin given with loop diuretics
- Vancomycin enhances effects of suxamethonium

## 1.5 CLINDAMYCIN (LINCOSAMIDES)

### Mechanism of action

Binds to ribosomes inhibiting cell wall protein synthesis; bacteriostatic action against gram +ve aerobes and anaerobes

### Indications

Staphylococcal joint and bone infections, intra-abdominal sepsis, cellulitis, skin and soft-tissue infections

### Monitoring

Hepatic and renal function in infants, and in all patients where treatment exceeds 10 days

### Side-effects

GI disturbances, oesophageal disorders, taste disturbances, jaundice, blood disorders, rash, and SJS

Antibiotic associated colitis can be fatal, discontinue treatment immediately if diarrhoea develops, and contact GP!

### Contraindications and cautions

Do not use in patients with existing diarrhoea; antibiotic associated colitis is more common in middle-aged and elderly women, especially post-operation.

## 1.6 MACROLIDES

Erythromycin, Azithromycin, Clarithromycin

### Mechanism of action

Binds to ribosomes inhibiting cell wall protein synthesis; similar activity to penicillin thus are an alternative in allergic patients

### Indications

Respiratory tract infections e.g. pertussis (whooping cough); Lyme disease

### Side-effects

GI disturbances mainly with erythromycin; hepatotoxicity, rash (SJS)

### Contraindications and cautions

May aggravate myasthenia gravis; use in caution with patients predisposed to QT interval prolongation (i.e. electrolyte disturbances and taking drugs the prolong QT interval e.g. sotalol)

### Other points

Telithromycin: a derivative of erythromycin; may cause visual disturbances or transient loss of consciousness, may affect performance of skilled tasks and driving; treatment should be discontinued and medical advice sought if hepatotoxicity occurs.

## 1.7 METRONIDAZOLE

### Mechanism of action

Metronidazole is a pro-drug, the active form binds to DNA, disrupts its helical structure, inhibiting bacterial nucleic acid synthesis. It has high activity against anaerobic bacteria and protozoa.

### Indications

An alternative to penicillin treatment for many oral infections where anaerobes are either resistant to penicillin or patients are allergic; H. pylori eradication; acute oral infections; leg ulcers; pressure sores

### Side-effects

GI disturbances, taste disturbances, furred tongue, oral mucositis, anorexia

### Contraindications and cautions

monitoring advised if treatment exceeds 10 days

### Other points

Take with or just after food; disulfiram-like reaction with alcohol (i.e. nausea and vomiting)

## 1.8 PENICILLINS

Beta-lactamase sensitive: Penicillin G & V, Amoxicillin  
Penicillinase-resistant: Flucloxacillin

### Mechanism of action

Inhibit bacterial cell wall synthesis by preventing peptidoglycan cross-linking. They are used for disease due to both gram +ve and gram -ve bacteria

### Indications

Oral infections, otitis media, cellulitis, respiratory tract infections, pneumonia

### Side-effects

Hypersensitivity (1-10%); anaphylaxis (<0.05%); maculopapular rash is common with ampicillin and amoxicillin, diarrhoea; antibiotic associated colitis. CNS toxicity is a rare but serious side effect caused by encephalopathy due to cerebral irritation, occurs at high doses or in renal impairment.

### Other points

Cross-sensitivity to all other penicillins in allergic patients; patients with a history or atopic allergy (e.g. asthma, hay fever, eczema) are at a higher risk of anaphylaxis; a rash that occur 72 hours after administration is not allergic reaction; diarrhoea/antibiotic associated colitis is common with most broad spectrum antibiotics; beta-lactamase producing organisms break down sensitive penicillins giving rise to resistance; must be taken on an empty stomach, an hour before food or 2 hours after.

## 1.8.1 Co-amoxiclav

### Cholestatic jaundice

Can occur either during or shortly after the use of co-amoxiclav. More common in patients above the age of 65 years and in men, rarely been reported in children. The duration of treatment should not exceed 14 days. Jaundice is usually self-limiting and very rarely fatal.

## 1.8.2 Flucloxacillin

### Hepatic disorders

Cholestatic jaundice and hepatitis may occur very rarely, up to two months after treatment. Treatment for more than 2 weeks and increasing age are risk factors. Healthcare professionals are reminded that:

- flucloxacillin should not be used in patients with a history of hepatic dysfunction associated with flucloxacillin
- flucloxacillin should be used with caution in patients with hepatic impairment
- careful enquiry should be made about hypersensitivity reactions to beta-lactam antibacterials

## 1.9 QUINOLONES

Ciprofloxacin, Levofloxacin, Moxifloxacin, Norfloxacin, Ofloxacin

### Mechanism of action

Inhibits enzymes necessary for bacterial DNA replication; active against gram +ve and gram -ve.

### Indications

Respiratory tract infections, anthrax, gonorrhoea, UTIs

### Contra-indications and cautions

Use with caution in patients with a history of joint disorders, epilepsy or predisposition to seizures, G6PD deficiency, myasthenia gravis, children or adolescents (risk of arthropathy); avoid in pregnancy

### Other points

Avoid exposure to excessive sunlight and concomitant use with NSIADs (increased convulsion risk)

### Side-effects

GI disturbances (rarely antibiotic associated colitis); headache; dizziness; moxifloxacin associated with QT interval prolongation and life-threatening hepatotoxicity.

### Side-effects – further information

The CSM has warned that quinolones may induce convulsions in patients with or without a history of convulsions; taking NSAIDs at the same time may also induce them. Discontinue if psychiatric, neurological or hypersensitivity reactions (including severe rash) occur.

Rare risk of tendon damage within 48 of starting treatment. Points to note:

- quinolones are contra-indicated in patients with a history of tendon disorders related to quinolone use
- patients over 60 years of age are more prone to tendon damage
- the risk of tendon damage is increased by the concomitant use of corticosteroids
- if tendinitis is suspected, the quinolone should be discontinued immediately

## 1.10 DIAMINOPYRIMIDINES

Co-trimoxazole, Trimethoprim

### Mechanism of action

Both drugs block different steps in the synthesis of nucleic acids essential to many bacteria; effective against a wide range of gram +ve and gram -ve bacteria.

### Indications

pneumonia, respiratory tract infections, shigellosis, UTIs

### Side-effects

SJS, blood disorders especially in the elderly

### Contraindications and cautions

Blood dyscrasia, asthma, G6PD deficiency, elderly, predisposition to folate deficiency or hyperkalaemia; avoid in first trimester of pregnancy (folate antagonist is teratogenic)

### Monitoring

Blood counts on long-term therapy

### Other points

Maintain adequate fluid intake); seek immediate medical attention if symptoms such as fever, sore throat, rash, mouth ulcers, purpura, bruising or bleeding develop

### Restrictions on the use of co-trimoxazole

Co-trimoxazole is the drug of choice in the prophylaxis and treatment of *Pneumocystis jirovecii* (*Pneumocystis carinii*) pneumonia; it is also indicated for nocardiasis, *Stenotrophomonas maltophilia* infection [unlicensed indication], and toxoplasmosis. It should only be considered for use in acute exacerbations of chronic bronchitis and infections of the urinary tract when there is bacteriological evidence of sensitivity to co-trimoxazole and good reason to prefer this combination to a single antibacterial; similarly, it should only be used in acute otitis media in children when there is good reason to prefer it. Co-trimoxazole is also used for the treatment of infections caused by *Burkholderia cepacia* in cystic fibrosis [unlicensed indication].

## 1.11 TETRACYCLINES

Tetracycline, Doxycycline, Minocycline

### Mechanism of action

Taken up into bacterial cells and inhibit protein synthesis and hence cell growth

### Indications

Chlamydia, rickettsia, acne, rosacea

### Side-effects

GI disturbances, antibiotic associated colitis, dysphagia, oesophageal irritation, hepatotoxicity, blood disorders, photosensitivity, hypersensitivity; headache and visual disturbances indicate increased intracranial pressure (discontinue treatment)

### Contraindications and cautions

Hepatic and renal impairment; avoid in children under 12, pregnant and breastfeeding women (deposition in growing bone and teeth staining); may increase muscle weakness in myasthenia gravis and may exacerbate systemic lupus erythematosus

### Other points

Antacids, aluminium, calcium, iron, magnesium, and zinc salts decrease the absorption of tetracyclines; milk may also reduce the absorption of tetracyclines; tablets and capsules should be swallowed whole with plenty of fluid while standing or sitting to avoid irritation of the jaw and throat; doxycycline should be taken with food

## 1.12 DAPTOMYCIN

If unexplained muscle pain, tenderness, weakness, or cramps develop during treatment, measure creatine kinase every 2 days; discontinue if unexplained muscular symptoms with significantly elevated creatine kinase

## 1.13 LINEZOLID (OXAZOLIDINONES)

### Mechanism of action

Selectively inhibits bacterial protein synthesis; active against gram +ve bacteria and MRSA, as well as vancomycin-resistant cocci

### Indications

Pneumonia, complicated skin & soft-tissue infections

### Side-effects

Diarrhoea, eosinophilia, headache, GI disturbances, taste disturbances, optic neuropathy (see below)

### Contraindications and cautions

Confusional states, bipolar depression, elderly (increased risk of blood disorders), history of seizures, uncontrolled hypertension

### Monitoring

Full blood count weekly

### Monoamine oxidase inhibition

Linezolid is a reversible, non-selective monoamine oxidase inhibitor (MAOI). Patients should avoid consuming large amounts of tyramine-rich foods (such as mature cheese, undistilled alcoholic beverages, and fermented soya bean products). In addition, linezolid should not be given with another MAOI or within 2 weeks of stopping another MAOI. It should also be avoided in those receiving SSRIs, 5HT1 agonists ('triptans'), tricyclic antidepressants, sympathomimetics, dopaminergics, buspirone, pethidine and possibly other opioid analgesics.

### **Blood disorders**

Increased risk in the elderly. It is recommended that full blood counts are monitored weekly. Close monitoring is recommended in patients who:

- receive treatment for more than 10–14 days;
- have pre-existing myelosuppression;
- are receiving drugs that may have adverse effects on haemoglobin, blood counts, or platelet function;
- have severe renal impairment.
- If significant myelosuppression occurs, treatment should be stopped unless it is considered essential, in which case intensive monitoring of blood counts and appropriate management should be implemented.

### **CHM advice (optic neuropathy)**

Severe optic neuropathy may occur rarely, if linezolid is used for longer than 28 days. The CHM recommends that:

- patients should be warned to report symptoms of visual impairment (including blurred vision, visual field defect, changes in visual acuity and colour vision) immediately;
- patients experiencing new visual symptoms (regardless of treatment duration) should be evaluated promptly, and referred to an ophthalmologist if necessary;
- visual function should be monitored regularly if treatment is required for longer than 28 days

## **1.14 ANTI-TUBERCULOSIS DRUGS**

The management of TB is divided into two stages – an initial phase and a continuous phase. The initial phase is designed to rapidly reduce the population of M. tuberculosis, to minimise bacterial resistance. It consists of four drugs (isoniazid, rifampicin, pyrazinamide, ethambutol) and lasts for two months. The continuous phase starts after the initial phase and consists of two drugs (isoniazid and rifampicin) lasting four months.

### **Side effects**

Isoniazid, rifampicin, and pyrazinamide: liver toxicity

Isoniazid: peripheral neuropathy

Ethambutol: ocular toxicity

Rifampicin: orange-red discoloration of secretions

### **Monitoring**

Drug levels, visual acuity, blood counts, hepatic and

renal function, urinalysis, plasma levels, auditory function in elderly

## **1.15 NITROFURANTOIN**

### **Mechanism of action**

Broad spectrum antibacterial active against the majority of urinary pathogens, it is bactericidal in renal tissue and throughout the urinary tract.

### **Side-effects**

Pulmonary reactions, nausea and anorexia, hypersensitivity, peripheral neuropathy, blood disorders

### **Contraindications and cautions**

Pregnancy: prompt treatment essential to prevent acute pyelonephritis; penicillins and cephalosporins are suitable, Nitrofurantoin must be avoided at term

Children: prompt treatment essential to minimise renal scarring

### **Monitoring**

Hepatic and pulmonary function for long-term therapy, especially in the elderly; discontinue if lung function deteriorates

### **Other points**

Take with or just after food; may discolour urine

### **Culture and sensitivity testing**

A specimen of urine should be collected for culture and sensitivity testing before starting antibacterial therapy;

- in men;
- in pregnant women;
- in children under 3 years of age;
- in patients with suspected upper urinary-tract infection, complicated infection, or recurrent infection;
- if resistant organisms are suspected;
- if urine dipstick testing gives a single positive result for leucocyte esterase or nitrite;
- if clinical symptoms are not consistent with results of dipstick testing.

Treatment should not be delayed while waiting for results.

## **2 FUNGAL INFECTIONS**

Immunocompromised patients are at risk of fungal infections and may receive antifungal drugs prophylactically; oral triazole antifungals are the drugs

of choice for prophylaxis. Fluconazole is more reliably absorbed than itraconazole, but Itraconazole is preferred in patients at risk of invasive aspergillosis.

## 2.1 AMPHOTERICIN B

### Anaphylaxis

Can occur with any intravenous amphotericin product and a test dose is advisable before the first infusion; the patient should be carefully observed for at least 30 minutes after the test dose. Prophylactic antipyretics or hydrocortisone should only be used in patients who have previously experienced acute adverse reactions.

### Prescribing information

Different preparations of intravenous amphotericin vary in their pharmacodynamics, pharmacokinetics, dosage, and administration; these should not be considered interchangeable. To avoid confusion, prescribers should specify the brand to be dispensed.

## 2.2 ITRACONAZOLE

### Heart failure

Caution is advised when prescribing itraconazole to patients at high risk of heart failure; risks include:

- patients receiving high doses and longer treatment courses;
- older patients and those with cardiac disease;
- patients with chronic lung disease associated with pulmonary hypertension;
- patients receiving treatment with negative inotropic drugs, e.g. calcium channel blockers.
- Itraconazole should be avoided in patients with ventricular dysfunction or a history of heart failure unless the infection is serious

### Hepatotoxicity

Rare risk of life-threatening hepatotoxicity; discontinue if signs develop. Avoid or use with caution if history of hepatotoxicity with other drugs or in active liver disease.

Monitor liver function if treatment continues for longer than one month, if receiving other hepatotoxic drugs, if history of hepatotoxicity with other drugs, or in hepatic impairment

### Patient advice

Patients should seek prompt medical attention if symptoms such as anorexia, nausea, vomiting, fatigue, abdominal pain or dark urine develop. Oral preparations should be taken on an empty stomach.

## 2.3 VORICONAZOLE

Patients and carers are advised to keep the alert card with them at all times.

### Hepatotoxicity

Hepatitis, cholestasis risk is increased in patients with haematological malignancy. Consider treatment discontinuation if abnormalities in liver function tests.

Patients should be advised to seek immediate medical attention if symptoms such as persistent nausea, vomiting, malaise or jaundice develop

### Phototoxicity

Phototoxicity occurs commonly. If phototoxicity occurs, consider treatment discontinuation; if treatment is continued, monitor for pre-malignant skin lesions and squamous cell carcinoma, and discontinue treatment if they occur.

Patients should be advised to avoid intense or prolonged exposure to direct sunlight, and to avoid use of sunbeds. In sunlight, patients should cover sun-exposed areas of skin and use a sunscreen with a high sun protection factor. Patients should seek medical attention if they experience sunburn or a severe skin reaction following exposure to light or sun.

### Monitoring

renal function; hepatic function before starting treatments, then at least weekly for 1 month, then monthly during treatment

## 2.4 KETOCONAZOLE

### CHM advice

MA for treatment of fungal infections should be suspended as risk of hepatotoxicity greater than benefit of treatment.

### Monitoring

- ECG
- Adrenal function  
can cause adrenal insufficiency i.e. fatigue, anorexia, vomiting, hypotension, hyponatraemia, hypoglycaemia
- Hepatic function  
signs of liver toxicity include; severe abdominal pain, dark urine, jaundice, nausea, vomiting, fatigue



### 3 HELMINTH INFECTION

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Most are parasitic worms that infect the large intestine of humans

#### Threadworm

itching around the anus and vagina, loss of appetite, weight loss, and sleep disturbance

#### Whipworm

GI disturbances, colitis, bloody-diarrhoea

#### Hookworm

Most people don't have any symptoms, severe infections may cause weight loss and anaemia

#### Roundworm

high temperature, dry cough, worm in stools

Mebendazole is the drug of choice for treating most helminth infections; same dose for adults and children over 2

### 4 MALARIA PROPHYLAXIS

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#### 4.1 PROTECTION AGAINST BITES

Prophylaxis is not absolute; breakthrough infection can occur. Personal protection against being bitten is very important i.e. long sleeves and trousers worn after dusk, mosquito nets impregnated with permethrin, mats and vaporised insecticides.

Diethyltoluamide (DEET) 20–50% formulations is safe and effective when applied to the skin of adults and children over 2 months of age. It can also be used during pregnancy and breast-feeding. DEET reduces the SPF of sunscreen, so a sunscreen of SPF 30-50 should be applied, DEET should be applied after the sunscreen.

#### 4.2 LENGTH OF PROPHYLAXIS

Prophylaxis should generally be started one week before travel into an endemic area; 2–3 weeks in the case of mefloquine, and 1–2 days for Malarone® or doxycycline. Prophylaxis should be continued for 4 weeks after leaving; except for Malarone® which should be stopped 1 week after leaving.

#### 4.3 RETURN FROM MALARIAL REGION

Any illness within 1 year and especially within 3 months of return might be malaria. Travellers should go immediately to a doctor if they develop any illness.

#### 4.4 ADVICE FOR SPECIFIC PATIENT GROUPS

##### Epilepsy

Chloroquine and mefloquine are unsuitable due to neuropsychiatric reactions

##### Asplenia

Increased risk of severe malaria, need to be extra cautious against contracting malaria

##### Renal impairment

Proguanil should be avoided, and Malarone® should not be used in patients with EGFR <30.

##### Pregnancy

Travel to malarious area should be avoided. If taking proguanil, folic acid should be given for the first trimester. Doxycycline is contra-indicated during pregnancy, but can be used after 15 weeks' gestation. Malarone® should be avoided during pregnancy.

##### Breast-feeding

Breast-fed infants require prophylaxis; amounts in breast-milk are too variable to provide protection

##### Anticoagulants

Travellers taking warfarin should begin chemoprophylaxis 2–3 weeks before departure; INR should be stable before departure, and should be measured before starting chemoprophylaxis, 7 days after starting, and after completing the course.

#### 4.5 CHLOROQUINE (AVLOCLOR)

##### Ocular toxicity

Risk is very low if the dose does not exceed 4mg/kg daily; nevertheless, screening for ocular toxicity is recommended

#### 4.6 MEFLOQUINE (LARIAM)

##### Neuropsychiatric reactions

Mefloquine is contra-indicated in those with a history of psychiatric disorders. Abnormal dreams, insomnia, anxiety, and depression occur commonly. Psychosis, suicidal ideation, and suicide have also been reported. Psychiatric symptoms such as nightmares, acute anxiety, depression, restlessness, or confusion should be regarded a sign of a more serious event. If neuropsychiatric symptoms occur, patients should be advised to discontinue mefloquine and to seek immediate medical attention. Adverse reactions may occur up to several months after discontinuation because mefloquine has a long half-life.

**Driving**

Dizziness or a disturbed sense of balance may affect performance of skilled tasks (e.g. driving); effects may occur and persist up to several months after stopping mefloquine

**4.7 QUININE****Dose equivalence and conversion**

Quinine bisulfate contains a significantly smaller amount of quinine compared to other salt forms.

Quinine (anhydrous base) 100 mg

- bisulfate 169 mg
- dihydrochloride 122 mg
- hydrochloride 122 mg
- sulfate 121 mg

Hence, when using quinine for malaria, doses are valid for quinine hydrochloride, dihydrochloride, and sulfate, NOT bisulfate.

**5 VIRAL INFECTION****5.1 HERPESVIRUS INFECTIONS**

Drugs used include aciclovir, famciclovir, valaciclovir

**5.1.1 Herpes simplex**

Herpes infection of the mouth and lips and in the eye, is generally associated with HSV-1. Genital infection is most often associated with HSV-2 as well as HSV-1. Treatment should start as early as possible and usually within 5 days of the appearance of the infection.

Mild superficial infections are treated with topical antiviral drug e.g. aciclovir cream. More severe infections and genital herpes require treatment with a systemic antiviral drug e.g. aciclovir tablets.

**5.1.2 Varicella-zoster (chickenpox virus)**

Neonates should be treated with a parenteral antiviral to reduce the risk of severe disease; otherwise in healthy children between 1 month and 12 years it is usually mild and antiviral treatment is not usually required. Chickenpox is more severe in adolescents and adults than in children; antiviral treatment started within 24 hours of the onset of rash may reduce the duration and severity of symptoms.

In herpes zoster (shingles) systemic antiviral treatment should be started within 72 hours of the onset of rash and is usually continued for 7–10 days.

**5.2 HIV INFECTION**

Currently no cure, but a few antiretroviral drugs halt disease progression. Main aim of treatment is to prevent mortality and morbidity whilst minimising drug toxicity, as well as reducing the risk of HIV transmission to sexual partners. Treatment includes a combination of drugs known as ‘highly active antiretroviral therapy’. Drugs used include zidovudine, abacavir, didanosine, lamivudine, tenofovir.

**5.3 INFLUENZA**

Oseltamivir and zanamivir reduce replication of influenza A and B viruses. They are most effective for the treatment of influenza if started within a few hours of the onset of symptoms.

**6 COMMON ILLNESSES****Varicella Zoster (chicken pox)**

Red rash, itchy spots that turn into fluid-filled blisters after 12 hours. Blisters will crust over after a week.

**Herpes Zoster (shingles)**

Pain, followed by a tingling / numb rash that develops into itchy blisters, similar in appearance to chickenpox.

**Herpes simplex (cold sores)**

Tingling, itching or burning sensation around your mouth, small fluid-filled sores then appear.

**Tinea cruris**

Fungal groin infection; itchy inflammation with a visible patch of dry scaly skin

**Impetigo**



Red sores, quickly burst leaving behind thick, golden crusts typically around 2cm across.

**Measles / Rubella (rash for 3 days)**



Cold-like symptoms, with red-brown blotchy rash

**Hand, foot and mouth disease**

Mouth ulcers after one or two days, soon after a rash made up of small, raised red spots on the skin. The spots may then turn into small grey blisters.

**Molluscum contagiosum**



Small, firm, raised, flesh coloured spots on the skin; thick yellowy-white substance released if spots pop

**Tinea corporis (ringworm)**



Affects arms and legs; round, red or silvery patch of skin that may be scaly, inflamed and itchy.

**Scarlet fever**



sore throat, headache, swollen glands; red rash that feels like sandpaper; red cheeks; white or red tongue

**Mumps**



swollen salivary glands, fever, headache, joint pain

**Scabies**



intense itching, rash with tiny red spots; burrow marks can be seen as wavy, silver-coloured lines on the skin

**Slapped cheek syndrome**



bright red rash on the cheeks; temperature; sore throat; runny nose; headache

**Verrucas**



soles of the feet; white with a black dot in the centre; flat rather than raised

**Warts**



round or oval shaped; firm and raised