ANTI-INFECTION HANDBOOK

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BMed, MMed, FRACGP

ELSEVIER
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Preface

Anti-infection Handbook presents a comprehensive view of various infectious diseases and provides a compact guide for the diagnosis and management of infections. Although most of the infectious diseases included in the book are seen worldwide, it is written from an Australian perspective and does not contain a comprehensive list of all infectious pathogens worldwide. The antibiotic and immunisation policies are also Australian-based and may be different from policies in other countries.

The book is designed to serve the needs of busy hospital doctors, general practitioners, microbiology laboratory staff, infection control staff and nurses who require a quick, concise and up-to-date guide for diagnosis and treatment of infections. It also provides a broad-based overview of infectious diseases for medical students.

The handbook layout makes it easy to find an infection or a pathogen and to check what tests are needed for diagnosis or what antimicrobials should be chosen for the treatment, placing this information right at your fingertips. The information is very useful, practical and convenient.

FEATURES

- **All-in-one**: contains most infections found in Australia and other countries, with more than 275 infectious diseases and conditions related to bacteria, viruses, fungi, protozoa, parasites and insects.
- **A to Z**: infections are arranged in alphabetical order for easy searching.
- **Immunisation** (including travel vaccination): integrated in the relevant diseases and appendices.
- **Pocketbook size**: easy to carry.
How to use this book

To find information on an infectious disease (e.g. pertussis):

- Turn the page directly to Pertussis alphabetically OR
- Find Pertussis from the contents page or the index

To find information on a pathogen (e.g. Helicobacter pylori):

- Turn the page directly to Helicobacter pylori alphabetically OR
- Find Helicobacter pylori from the contents page or index

To find what tests can be ordered for diagnosis of an infectious disease (e.g. malaria):

- Turn the page directly to Malaria alphabetically and look in the laboratory section OR
- Find Malaria from the contents page or index and look in the laboratory section

To find what antimicrobials can be chosen for an infectious disease (e.g. pelvic inflammatory disease):

- Turn the page directly to Pelvic inflammatory disease alphabetically and look in the treatment section OR
- Find Pelvic inflammatory disease from the contents page or index and look in the treatment section

To find alternative antibiotics that are not listed on the sensitivity report of an isolated bacterium (e.g. Enterobacter spp):

- Go to Appendix 6 and follow the instructions there

To find vaccination information on a particular infection (e.g. yellow fever):

- Turn the page directly to Yellow fever alphabetically and look in the vaccination section OR
- Find Yellow fever from the contents page or index and look in the vaccination section OR
- Go to Appendix 5 and find Yellow fever alphabetically

To order a vaccine for a traveller (e.g. rabies):

- Turn the page directly to Rabies alphabetically and look in the vaccination section OR
- Find Rabies from the contents page or index and look in the vaccination section OR
- Go to Appendix 5 and find Rabies alphabetically

To find the duration of school exclusion for an infectious disease (e.g. chickenpox):

- Go to Appendix 7
About the author

Dr Frank Zhu is a general practitioner (family doctor) at the Sydney Medical Centre, Sydney.

He graduated from the Second Military Medical University in Shanghai, China in 1983 and became a Master of Medicine in 1989, and a Physician and Associate Professor in 1992. He was a member of the Hospital Infection Control Committee in China.

He is also the author of the *Handbook of Practical Anti-infection Therapy* and *New Concepts in Antibiotic Treatment*. 
DACRYOCYSTITIS

Other name: tear sac infection

Dacryocystitis is an infection of the nasolacrimal sac (tear sac), usually associated with obstruction of the nasolacrimal duct.

Pathogens

- *Staphylococcus aureus*
- *Streptococcus pyogenes*
- *Pseudomonas* spp

Clinical

- **Acute dacryocystitis**—pain, swelling and redness over lacrimal sac at medial canthus with tearing, crusting and fever; digital pressure over lacrimal sac may extrude pus through punctum; delay of treatment may lead to local abscess
- **Chronic dacryocystitis**—blockage of nasolacrimal duct, swelling of lacrimal sac, usually painless, tearing may be the only symptom
- **Infantile dacryocystitis**—the nasolacrimal duct may not open at birth until the baby is 3 months old; the tear sac tends to be infected and produce sticky discharge

Treatment

1. **Acute dacryocystitis**
   - Warm compresses, massage lacrimal sac and duct, decongestants
   - Lacrimal discharge for culture (massage the tear sac)
   - Early antibiotic therapy may prevent abscess formation
   - **Mild cases**
     - Chloramphenicol (e.g. Chlorsig) eye drops, 1–2 drops qid for 5 days
   - **More severe cases**
     - Flucloxacinil 500 mg (child: 12.5 mg up to 500 mg) PO q6h
     - Cefalexin 500 mg (child: 12.5 mg/kg up to 500 mg) PO q6h
   - If penicillin allergy
     - Seek expert advice
   - If immediate penicillin allergy or MRSA is suspected
     - Seek expert advice
   - If abscess has formed, refer to an ophthalmologist for external drainage

2. **Chronic dacryocystitis**
   - Syringing the lacrimal system regularly
   - If infection occurs, obtain cultures by aspiration
   - Dacryocystorhinostomy (DCR) may be needed—refer to an ophthalmologist

3. **Infantile dacryocystitis**
   - Teach the mother to massage the tear sac (to empty the contents)
     - 4 times a day
• Antibiotic eye drops (e.g. gentamicin) to prevent/treat infection
• If the blockage persists after several months, probing of the duct under anaesthesia may be needed

**DENGUE FEVER**

**Pathogens**
• *Dengue fever*—dengue viruses (1–4), arbovirus
• *Dengue haemorrhagic fever*—dengue HF, a serotype of dengue virus different from dengue viruses 1–4

**Distribution**
• Australia (Queensland and Northern Territory), Southeast Asia, Africa and South America

**Transmission**
• Bite from day-biting mosquitoes (*Aedes aegypti* and *A. albopictus*)
• May also be transmitted via infected blood products and needle-stick injury

**Incubation**
• 2–7 days

**Clinical**
• *Dengue fever*—sudden onset of fever, headache, rash, nausea and vomiting, adenopathy, back pain along with severe myalgia ('break-bone fever') and arthralgia; red maculopapular rash that spares palms of hand and soles of feet
• *Dengue haemorrhagic fever (dengue HF)*—may cause thrombocytopenia, haemorrhagic complications
• *Dengue shock syndrome*—hypotension
• *Dengue meningoencephalitis*—severe headache with stiff neck and neurological signs

Infection with one serotype does not provide immunity to other serotypes

**Laboratory**
• FBC—may have leucopenia, thrombocytopenia (dengue HF)
• LFT—liver damage (serum aminotransferase elevation)
• Dengue virus PCR—early detection
• Dengue virus serology (blood or CSF)—positive IgM to dengue virus or dengue IgG seroconversion or ≥four-fold rise in titre (in the absence of IgM or IgG seroconversion to Murray Valley encephalitis virus, Kunjin virus and Japanese encephalitis virus)
• Dengue viral culture—from blood (in acute phase)
Dental infection

Differential diagnosis

For returned travellers with fever (Table 4.1)

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<td>Low ++</td>
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<td>Enteric fever</td>
<td>High</td>
<td>Low +</td>
<td>Normal</td>
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Treatment

- Supportive treatment
- Avoid aspirin
- For dengue HF—hospital admission, fluid replacement, blood transfusion and corticosteroids

Prevention

- Mosquito control and avoidance
- Dengue vaccine against all 4 strains of the virus is in the stage of clinical trial

DENTAL INFECTION

Other names: tooth infection, toothache, tooth abscess

Dental infections

- Gingivitis (see Gingivitis, p. 129)
- Dental caries (see below)
- Pulpitis and periapical abscess (see below)
- Periodontitis and periodontal abscess (see below)
- Deep dental infection (see below)
- Ludwig's angina (see Ludwig's angina, p. 207)

1. Dental caries

Dental caries damage the structures of teeth, cause tooth decay or cavities. They can lead to toothache, infection and tooth loss.

Pathogens

- Certain types of acid-producing bacteria (e.g. Lactobacillus spp, Streptococcus mutans and Actinomyces spp)

Prevention of caries

- Brushing, flossing, water picks and mouthwashes
- Chewing gum containing xylitol (wood sugar)
- Limiting sweet drinks and not giving bottles to infants during sleep
• Regular dental examinations and cleaning
• Water fluoridation, fluoride supplements, fluoride toothpaste or mouthwash
• Vaccines for dental caries are undergoing clinical trials

2. PULPITIS AND PERIAPICAL ABSCESS
Caries penetrate though tooth enamel and dentin into pulp cavity, leading to infection (pulpitis). The infection may find its way out and form periapical abscesses.

Treatment
• Antibiotic therapy—if facial swelling and systemic symptoms and signs are present (see Deep dental infection below)
• Root canal therapy
• Extraction of the tooth

3. PERIODONTITIS AND PERIODONTAL ABSCESS
Inflammation of the periodontium involving the gingiva, cementum, alveolar bone and periodontal ligaments. This causes progressive, irreversible bone loss around teeth, looseness of teeth and eventual loss of teeth. Sometimes pus is collected in the periodontal space (periodontal abscess).

Pathogens
• Anaerobes, Streptococcal spp, herpes virus

Clinical
• Gum bleeding while brushing teeth or biting into hard food (e.g. apple), recurrent gum swellings, halitosis and bad taste, gingival recession, deep pockets between teeth and gums and loose teeth
• Periodontitis is largely painless, but periodontal abscess (a localised gum swelling) may cause dull pain

Treatment
• Patient education on oral hygiene
• Smoking cessation
• Dental cleaning to remove calculus and plaque
• Periodontal surgery for advanced periodontal disease
• Antibiotic therapy if facial swelling and systemic symptoms and signs are present (see Deep dental infection below)

4. DEEP DENTAL INFECTION
Dental infection spreads from tooth to surrounding soft tissues or into upper neck, may cause trismus (difficulty in opening mouth due to spasm and pain) or airway obstruction.
Diabetic foot infection

Treatment

• Local surgical or dental treatment
• Antibiotic therapy is indicated if:
  • Facial swelling
  • Systemic symptoms and signs

Antibiotics should only be used as an adjunct to dental treatment.

Mild dental infection
• Amoxicillin (or penicillin V) (PO) for 5 days

More severe dental infection
• Option 1: amoxicillin/clavulanate (PO) for 5 days
• Option 2: amoxicillin (PO) plus metronidazole (PO) for 5 days

If allergic to penicillin
• Clindamycin (PO) for 5 days

If fail to respond to antibiotic therapy

Prompt referral to a dentist or periodontist

Dosage of above antibiotics

• Amoxicillin 500 mg (child: 15 mg/kg up to 500 mg) PO q8h
• Penicillin V 500 mg (child: 10 mg/kg up to 500 mg) PO q6h
• Amoxicillin/clavulanate 875 mg (child: 22.5 mg/kg up to 875 mg) PO q12h
• Metronidazole 400 mg (child: 10 mg/kg up to 400 mg) PO q12h
• Clindamycin 300 mg (child: 10 mg/kg up to 300 mg) PO q8h

DIABETIC FOOT INFECTION

Pathogens

• Mixed gram-positive and gram-negative aerobes
• Staphylococcus aureus
• Anaerobes

Treatment

• Uninfected ulcers—cultures and antibiotic treatment are unnecessary
• Wound swab for culture if infected
• Surgical debridement and tissue sent for culture
• Good control of diabetes
• Antibiotic therapy—should cover both aerobes and anaerobes
• Hyperbaric oxygen therapy—may be used for severe or unresponsive infections

Mild to moderate infection

• Option 1: amoxicillin/clavulanate (PO) for at least 5 days
• Option 2: cefalexin (PO) plus metronidazole (PO) for at least 5 days
If immediate penicillin allergy
- Ciprofl oxacin (PO) plus clindamycin (PO) for at least 5 days

**Severe infection** (systemic toxicity, deep ulceration, severe cellulitis, septic shock, necrosis or gangrene, or presence of osteomyelitis)
- Option 1: piperacillin/tazobactam (IV)
- Option 2: ticarcillin/clavulanate (IV)
- Option 3: ciprofl oxacin (IV) plus clindamycin (IV) (If penicillin allergy)

If there is severe limb or life-threatening infection
- Vancomycin (IV) (added to any of above regimen)
- Adjust antibiotic—according to the susceptibility
- Outpatient parenteral antimicrobial therapy—if prolonged IV therapy is required
- Change to oral therapy—after substantial improvement
- Continue antibiotic therapy—until the infection has resolved
- After amputation—cease antibiotic therapy 2–5 days later

**Dosage of above antibiotics**
- Amoxicillin/clavulanate 875 mg PO q12h
- Cefalexin 500 mg PO q6h
- Metronidazole 400 mg PO q12h
- Ciprofl oxacin 500 mg PO q12h
- Clindamycin 300–450 mg PO q8h
- Piperacillin/tazobactam 4 g IV q8h (q6h for *Pseudomonas aeruginosa*)
- Ticarcillin/clavulanate 3 g IV q6h
- Ciprofl oxacin 400 mg IV q12h (q8h for *Pseudomonas aeruginosa*)
- Clindamycin 900 mg IV q8h (slow infusion)
- Vancomycin 25–30 mg/kg IV for the 1st dose (further dosing see p. 462)

**DIARRHOEA—UNKNOWN CAUSE**

**Note**
- Most diarrhoea is due to viral infection—does not require antibiotics
- Most cases of bacterial diarrhoea are self-limiting—do not usually require antibiotics
- Indications for antibiotic therapy in acute diarrhoea of unknown cause:
  1. Severe diarrhoea that is likely to be bacterial in origin
  2. Patient has serious underlying disease or is immunocompromised
  3. Invasive bacterial diarrhoea (bloody diarrhoea [see Fig 4.1] and rigors/fevers)
  4. Persistent diarrhoea (>1–2 weeks)—a trial of antibiotic therapy may be considered (see Fig. 4.2)

Antibiotic treatment should be started after collection of faecal samples for microscopic examination and culture.
Diarrhoea—unknown cause

**Pathogens**
- Bacteria
- Viruses (e.g. cytomegalovirus)
- Parasites (e.g. Cryptosporidium spp, Isospora belli, microsporidia spp)

**Laboratory**
- Cytomegalovirus testing
- Faecal parasites testing

**Treatment**
- Treat the pathogen(s) according to faecal test report
- If bacterial infection is suspected, even in mild disease, consider empirical antibiotic therapy
Dientamoebiasis

Other names: Dientamoeba fragilis infection

Pathogen

- Dientamoeba fragilis—a non-flagellate trichomonad parasite

Prevalence

- In developed countries prevalence rate is 2–4%
- In developing countries (crowded and poor hygiene conditions) prevalence rate is 19–69%
- Higher infection rate in travellers to developing countries
Dientamoebiasis

Transmission
- Direct faecal–oral spread
- Possibly through coinfection of Enterobius vermicularis (pinworm)

Clinical
- The most common age group: children 5–10 years
- Many infected people do not have symptoms
- Symptoms—acute and relapsing diarrhoea with abdominal pain, bloating, fever, fatigue, loss of appetite and loss of weight
- Recurrent diarrhoea may be misdiagnosed as ‘irritable bowel syndrome’

Laboratory
- Faeces OCP microscopy for D. fragilis—to find D. fragilis trophozoites
- Faecal multiplex PCR testing—sensitivity 98–100%, result available in 24 hours

Treatment
- Asymptomatic carrier—no treatment is required
- Symptomatic patient—antibiotic treatment
  - Option 1: doxycycline (PO) for 10 days
  - Option 2: metronidazole (PO) for 10 days
  If no response, use either of following combination therapy
    - Dientamoeba fragilis + Blastocystis hominis infection coexisting
      - Option 1: doxycycline + cotrimoxazole + diloxanide furoate* + secnidazole* (PO) for 10 days
      - Option 2: doxycycline + nitazoxanide* + furazolidone* + secnidazole* (PO) for 10 days

Dosage of above antibiotics
- Doxycycline 100 mg (child >8 years; 2 mg/kg up to 100 mg) PO bid
- Metronidazole 400 mg (child: 10 mg/kg up to 400 mg) PO tds
- Doxycycline 50 mg (child >8 years: 1 mg/kg up to 50 mg) PO bid
- Secnidazole 400 mg PO tds
- Nitazoxanide 500 mg PO bid
- Furazolidone 100 mg PO tds
- Cotrimoxazole 160/800 mg PO bid
- Diloxanide furoate 500 mg PO tds

*Available via Special Access Scheme <www.tga.gov.au/hp/access-sas.htm> or from compounding chemist
Diphtheria may occur in returned travellers from overseas.

Pathogens
- *Corynebacterium diphtheriae*, an aerobic gram-positive bacillus
- Its exotoxin causes an adherent pseudomembrane on the respiratory tract
- The toxin also acts on cells of the myocardium, nervous system and adrenals

Transmission
- By droplets or direct contact with skin sores or articles soiled by infected persons
- It is infectious for up to 4 weeks; carrier may shed bacteria for longer

Incubation
- 2–5 days

Clinical
- Pharyngeal diphtheria—fever, sore throat, tonsillitis, white nasal/throat membrane, hoarseness, dysphagia; may have airway obstruction

Complications
- Cardiomyopathy
- Neuropathy
- Shock (may be fatal)

Laboratory
- Nasal/throat swab—culture for *C. diphtheriae* (specific transport and culture media)
- Histopathological diagnosis of diphtheria

Treatment
- Isolate patient and treat urgently—do not wait for bacteriological confirmation
- Intubation or a tracheotomy—if airway obstruction occurs; ECG monitoring
- Diphtheria antitoxin—should be given immediately
- Antibiotic—hastens recovery and prevents spread of disease to others
Diphtheria antitoxin

- Diphtheria antitoxin* (first give a test dose to exclude hypersensitivity)
  IM or IV

If hypersensitive to diphtheria antitoxin
- Administer diphtheria antitoxin under corticosteroid, adrenaline and antihistamine

Antibiotic treatment

- Benzylpenicillin 1.2 g (child: 30 mg/kg up to 1.2 g) IV q6h for 10 days

Prophylaxis for close contacts (take throat swabs for culture)

- Diphtheria vaccine booster (e.g. ADT or dTpa) 0.5 mL IM st
- Erythromycin 250 mg PO q6h for 10 days

Therapeutic dose of antitoxin will depend on patient’s clinical condition

Diphtheria vaccination

- Primary course: DTPa 0.5 mL IM, 3 doses at (6 weeks or) 2, 4 and 6 months of age
- 1st booster: DTPa 0.5 mL IM, at 3.5–4 years of age
- 2nd booster: dTpa 0.5 mL IM, at 10–17 years of age
- Further booster: dTpa 0.5 mL IM, at 50 years of age (if no dT in previous 10 years)

DIVERTICULITIS

Other names: diverticular disease, diverticulosis

Pathogens

- Overgrowth of normal colonic bacteria

Clinical

- More common in elderly and obese people; 20% of cases <50 years of age
- Left-sided (95%) abdominal pain, nausea, fever and left lower quadrant tenderness
- May have constipation/altered bowel habits
- WBC and CRP elevation; CT abdomen confirms the diagnosis

Treatment

Mild diverticulitis

- If no improvement in 2–3 days—CT abdomen to exclude intra-abdominal abscess
  - Option 1: amoxicillin/clavulanate (PO) for 5 days
  - Option 2: cefalexin plus metronidazole (PO) for 5 days

Donovanosis

Option 3: cotrimoxazole plus metronidazole (PO) for 5 days (if penicillin allergy)

Dosage of above antibiotics
- Amoxicillin/clavulanate 875 mg PO q12h
- Cefalexin 500 mg PO q6h
- Metronidazole 400 mg PO q12h
- Cotrimoxazole 160/800 mg PO q12h

Severe diverticulitis with or without bowel perforation
- Significant systemic signs, fever or with peritonism
- Hospital admission
- Nil-by-mouth, IV fluids, analgesia, IV antibiotics
- CT abdomen; if bowel perforation, abscess or rectal bleeding—surgical referral
- Amoxicillin (or ticarcillin/clavulanate) plus gentamicin plus metronidazole (IV)
  - If gentamicin treatment >72 hours or is contraindicated
  - Piperacillin/tazobactam (or ticarcillin/clavulanate) (IV)
- Ceftriaxone (or cefotaxime) (IV) plus metronidazole (IV) plus clindamycin (IV)
  - If immediate penicillin allergy
- Gentamicin plus clindamycin (IV)

Switch to oral therapy once afebrile for 1–2 days (see mild diverticulitis above)

Dosage of above antibiotics
- Amoxicillin 2 g IV q6h
- Gentamicin 4–7 mg/kg IV for the 1st dose (further dosing see p. 459)
- Metronidazole 500 mg IV q12h
- Piperacillin/tazobactam 4 g IV q8h
- Ticarcillin/clavulanate 3 g IV q6h
- Ceftriaxone 1 g IV daily
- Cefotaxime 1 g IV q8h
- Clindamycin 600 mg (child: 15 mg/kg up to 600 mg) IV q8h

DONOVANOSIS

Other names: Granuloma inguinale, Granuloma venereum

Donovanosis is a chronic destructive bacterial infection of the genital region with ulceration and epitheliomatous hyperplasia.

Distribution
- It is found in central and northern Australia and overseas (Papua New Guinea, India and southern Africa)
Donovanosis

Pathogen
- *Klebsiella granulomatis* (formerly known as *Calymmatobacterium granulomatis*)—a gram-negative rod

Transmission
- Sexually transmitted through contact with open sores

Incubation
- 1–12 weeks

Clinical
- Initially a painless, red nodule that slowly grows into one or more round and raised lumps
- Later the lumps burst and create open, fleshy, oozing ulcers
- The infection continues to destroy tissue until treated
- Sites of infection include penis, scrotum, groin, and thighs in men; and vulva, vagina, groin, and perineum in women
- Extragénital lesions may occur in mouth, lips, throat, and face

Laboratory
- Microscopy of scrapings, aspirates, snip, or punch biopsy—intracellular Donovan bodies (cytoplasmic inclusions)
- PCR for *Klebsiella granulomatis* (from a specimen of a lesion)

Treatment
- Directly observed therapy or hospital admission for supervised therapy may be necessary
- Normally, the infection will begin to subside within a week of treatment
- Follow-up is important as resolution may be slow and recurrence can occur
- If lesions have not healed after 6 weeks, biopsy to exclude other diagnosis
  - Option 1: azithromycin 1 g PO weekly for at least 4 weeks and until resolution
  - Option 2: azithromycin 500 mg PO daily for 7 days
  - Option 3: doxycycline 100 mg PO q12h for at least 4 weeks and until resolution

Prevention
- Avoid sexual contact with individuals in endemic regions
- STI testing before beginning a sexual relationship
- Children born via vaginal delivery to women with active donovanosis should receive prophylactic azithromycin (seek expert advice)