



Managing pertussis in adults

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Summary

Pertussis or whooping cough is typically characterised by paroxysms of coughing with a whooping sound during inhalation. It is thought to be under-diagnosed generally. Whooping cough is caused by *Bordetella pertussis* and is highly contagious. Although childhood immunisation has been effective in preventing the disease, outbreaks in Australia have been associated with waning immunity in older children and adolescents. The peak incidence of infection now occurs in people aged 15 or older. When given early in the illness, antibiotics can decrease the infectious period, but have no effect on the duration or severity of disease. Symptomatic treatment of cough has shown no clear benefit. Antibiotic prophylaxis of contacts is recommended for certain high-risk groups, but there is limited evidence of its effectiveness. Although infants remain the most at risk for severe, life-threatening disease, it is adolescent and adult booster immunisation which remains critical for prevention programs.

Key words: antibiotics, vaccination, whooping cough.

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Introduction

Pertussis, also known as whooping cough, is a highly contagious disease caused by the bacterium *Bordetella pertussis*. It is generally thought to be under-diagnosed and remains the least well controlled of all the vaccine preventable diseases targeted by the Australian National Immunisation Program.¹ Epidemics occur every 3–4 years. This is despite immunisation continuing to increase, with more than 90% of one-year-olds being fully vaccinated.

The literature suggests that epidemics result from waning immunity in later childhood and adolescence. The peak incidence of whooping cough in Australia occurs in adolescents

and adults with more than 70% of pertussis notifications occurring in people older than 15 years in 2004–05. Data suggest that 10–35% of subacute coughing illnesses in adults are due to pertussis infection.² Death in individuals older than 10 years of age is rare and non-immunised infants remain the most likely group to have severe life-threatening disease requiring hospitalisation.¹

Clinical presentation

The classic presentation of pertussis is one of spasms of coughing with a characteristic inspiratory whoop. However, this is less common in older children and adults. The first 1–2 weeks of illness with *B. pertussis* resembles other upper respiratory tract infections, with runny nose and mild cough. This is followed by the paroxysmal coughing phase in the second and third weeks.

Diagnosis

As classic symptoms of whooping cough do not usually exist in adults, exposure to others with prolonged cough is used by some as an indicator of pertussis infection. Although less frequent in adults, post-tussive vomiting may also indicate pertussis. It is therefore important to remember *B. pertussis* when reviewing all adolescents and adults with a chronic cough.

A number of investigations can be performed to support the diagnosis of pertussis. These include:

- bacterial culture, polymerase chain reaction (PCR) or immunofluorescence assays of nasopharyngeal swab or aspirate samples
- serological testing to detect rises in immunoglobulin (Ig) A or IgG titres to *B. pertussis* antigens
- lymphocyte count (raised counts are a non-specific indicator of infection).

For patients presenting early (within the first three weeks) and before the start of antibiotic therapy, PCR, immunofluorescence and culture may be useful. For patients who present later, serological testing – which is reliant on an immune response – is often more helpful.³ Pertussis-specific IgA is only produced after natural infection, whereas IgG rises with vaccination and natural infection. While a positive IgA test confirms the diagnosis of pertussis, a negative result does not exclude the

possibility of infection. (It is important to remember that a small proportion of the population has an IgA deficiency.) Paired samples showing rising titres of specific IgA or IgG are a more reliable indication that the patient has pertussis.

PCR-based testing is the most sensitive and specific of all investigations, particularly early in the illness. It is sensitive for longer than culture and is less likely to be affected by antibiotic treatment (0% detection via culture after seven days antibiotics).³ Although direct immunofluorescence is highly specific, it has limited sensitivity. Its main advantage is speed.

Antibiotic treatment

Antibiotics are recommended in the initial catarrhal phase of infection when they are effective in eliminating *B. pertussis* from the nasopharynx and reducing the infectious period. However, after three weeks of coughing, antibiotics have no measurable effect on reducing the infectious period and are not recommended. Patients should avoid contact with susceptible individuals until at least five days of antibiotics have been taken.

Table 1 lists the proven antimicrobial therapies in nasopharyngeal eradication of *B. pertussis*. Erythromycin has been commonly regarded as the treatment of choice for pertussis infections. A 14-day erythromycin course is often recommended, although studies have shown similar efficacy with a seven-day regimen.⁴

The newer macrolides, such as clarithromycin and azithromycin, have replaced erythromycin as the standard treatment. (However, there is not enough clinical evidence to recommend roxithromycin for pertussis infection.) The newer macrolides have fewer gastrointestinal adverse effects and reach higher concentrations in respiratory secretions. This improved safety profile is of particular importance in a therapeutic regimen aimed at eradication of organisms rather than improvement

of symptoms. Studies have shown that patients are more compliant when taking the newer macrolides compared with erythromycin. Trimethoprim with sulfamethoxazole can be used as an alternative to macrolides if necessary, but is not the first choice of therapy.

Symptomatic treatment

A Cochrane review found that some symptomatic treatments for the cough associated with pertussis had no clear benefits.⁵ The treatments reviewed included antihistamines, dexamethasone, salbutamol and pertussis immunoglobulin. It is possible that immunoglobulin offers some improvement in mean number of whoops, but further well-designed good quality trials need to be developed to determine this.

Managing household contacts

B. pertussis is highly contagious and a significant proportion of contacts become infected (70–100% of household members). The incubation period is typically 7–10 days (range of 4–21 days). Although there is insufficient evidence that antibiotic prophylaxis of close contacts reduces the number of new cases or improves clinical symptoms⁴, it is recommended primarily because of the high risks of morbidity and mortality in non-immunised infants (see box).

It is suggested that prophylaxis be given as soon as possible, but within three weeks of symptom onset in the infected contact. The dose and duration of antibiotics for prophylaxis are the same as for treatment (see Table 1).

As three or more injections are required to confer protection, infant vaccination is not helpful in controlling a pertussis outbreak.¹ However, unvaccinated contacts aged eight years or older can be offered a diphtheria, tetanus and acellular pertussis vaccine and younger contacts can be given a catch-up course.

Table 1

Effective antibiotic treatment for pertussis

Drug	Adult dose	Daily frequency	Duration
clarithromycin*	500 mg (7.5 mg/kg up to 500 mg)	twice	7 days
erythromycin	250 mg (10 mg/kg up to 250 mg)	four times	7 days
azithromycin*†	10 mg/kg (up to 500 mg)	once	3 days
azithromycin*	day 1: 500 mg first day (10 mg/kg up to 500 mg) days 2–5: 250 mg (5 mg/kg up to 250 mg)	once	5 days
trimethoprim with sulfamethoxazole	160 + 800 mg (4 + 20 mg/kg up to 160 + 800 mg)	twice	7 days

* best regimens for microbiological clearance with fewer adverse effects⁴

† this regimen is documented in a Cochrane systematic review⁴ although not in Australian antibiotic guidelines⁶

Antibiotic prophylaxis for 'high-risk' contacts of pertussis cases¹

- Women in their last month of pregnancy, irrespective of vaccination status
- Members of a household which includes a child less than 2 years who is not fully vaccinated*
- Children and adults who attend a childcare facility where children under 2 years are not fully vaccinated
- Healthcare workers and babies (if exposed for >1 hour) in a maternity ward or newborn nursery

* Fully vaccinated = three effective doses of pertussis vaccine given at least four weeks apart¹

Important role of immunisation in adults

Immunisation remains the mainstay of prevention of *B. pertussis* infection. The current Australian immunisation schedule¹ recommends that a child formulation of a diphtheria, tetanus and acellular pertussis vaccine is given at two, four and six months of age with a booster at four years. Another booster is recommended at 12–17 years of age using the adolescent/adult formulation which has a lower concentration of pertussis antigens than childhood vaccinations. It is vital to remember that adult and adolescent vaccination is an effective means of controlling *B. pertussis* and will have positive health ramifications within the community.¹ There are no data on the duration of immunity following vaccination in teenagers, but this is unlikely to be required at intervals less than 10 years. A single booster dose is recommended for adults planning a pregnancy or for parents of a new infant, preferably before hospital discharge. Other household members such as grandparents or carers should also be vaccinated. Likewise, adults working in health care or childcare should be given a booster vaccination. Pertussis booster vaccination can also be considered along with a routine diphtheria and tetanus booster at age 50.

Conclusion

When *B. pertussis* is diagnosed early in the illness, antibiotics can decrease the infectious period, but have no effect on the duration or severity of disease. Antibiotic prophylaxis with macrolides, such as clarithromycin and azithromycin, is recommended for certain high-risk contacts. Symptomatic treatment of cough has not been proven to be significantly helpful in decreasing *B. pertussis* cough. Adolescent and adult booster immunisation remains critical for preventing disease outbreaks.

References

1. National Health and Medical Research Council. Pertussis. In: The Australian Immunisation Handbook. 9th ed. Canberra: Department of Health and Ageing; 2008. p. 227-39.

2. Kapaskelis AM, Vouloumanou EK, Rafailidis PI, Hatzopoulou P, Nikita D, Falagas ME. High prevalence of antibody titers against *Bordetella pertussis* in an adult population with prolonged cough. *Respir Med* 2008;102:1586-91.
3. Wolf J, Daley AJ. Microbiological aspects of bacterial lower respiratory tract illness in children: atypical pathogens. *Paediatr Respir Rev* 2007;8:212-9.
4. Altunajji S, Kukuruzovic R, Curtis N, Massie J. Antibiotics for whooping cough (pertussis). *Cochrane Database of Systematic Reviews* 2007, Issue 3. Art. No.: CD004404. DOI: 10.1002/14651858.CD004404.pub3.
5. Pillay V, Swingler G. Symptomatic treatment of the cough in whooping cough. *Cochrane Database of Systematic Reviews* 2003;CD003257. [withdrawn, as authors could not update the review]
6. Therapeutic Guidelines: Antibiotic. Version 13. Melbourne: Therapeutic Guidelines Limited; 2006.

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Self-test questions

The following statements are either true or false (answers on page 55)

3. PCR testing is the most sensitive method to detect *Bordetella pertussis* in nasopharyngeal samples.
4. Macrolides are recommended for pertussis infection if the patient has had a chronic cough for more than four weeks.

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