

## Update on pertussis

Australia is currently experiencing an epidemic of pertussis. The youngest infants who catch the disease are the most severely affected and at the highest risk of hospitalisation. This update reviews the clinical presentation, diagnosis, treatment and prevention of pertussis.

### CLINICAL FEATURES

#### Children

Children are more likely to experience "classical pertussis", with an incubation period of seven to ten days (with a range of five to twenty-one days), followed by three phases of illness: catarrhal (non-specific prodromal coryzal illness, mild cough, lasting one to two weeks) then paroxysmal (spasmodic cough, post-tussive vomiting and inspiratory whoop lasting four to six weeks), and finally convalescent phase (symptoms slowly improving over one to two weeks). Complications are more common in non-immune infants and include pneumonia, failure to thrive (from post-tussive vomiting), seizures, encephalopathy, cerebral hypoxia,

secondary bacterial infection, pulmonary hypertension, subconjunctival haemorrhage and rectal prolapse. Very young infants may have apnoea as the only presenting symptom. Most deaths from pertussis are in children under six months old, particularly under one month of age.

#### Older Children, Adolescents and Adults

Pertussis infection in older children, adolescents and adults can range from "classic pertussis" to mild cough to asymptomatic. In the UK, 37% of consecutive children, aged five to sixteen years, presenting to primary care with cough more than fourteen days had well-documented serological evidence of pertussis. Adults and adolescents usually present late in the course of the infection, often after four or more weeks of coughing, though diagnostic delay by clinicians is also frequent. Adults, particularly parents, are the most important source of infection for infants. Complications in adults can be severe, including hospitalisation, inguinal hernia, fractured ribs (<4%), carotid artery dissection, intracranial haemorrhage, pneumonia

(< 5%), cough syncope (<6%). Death can occur, especially in the very elderly.

### DIAGNOSIS

There are three main ways to diagnose pertussis infection: culture, serology and polymerase chain reaction (PCR).

#### Culture

Culture from a nasopharyngeal swab is considered to be the gold standard. However its sensitivity decreases steeply if the specimen is taken more than two weeks after onset of cough and is reduced by prior immunity from previous disease or immunisation.

#### Serology

Ideally acute sera (less than two weeks of illness onset) and convalescent sera (four weeks post-acute sera measurement) are obtained, however serology is frequently used to diagnose infection late in the course of illness when acute sera have not been obtained. Serology, especially serum IgA, is not useful in children under two years old. Serology is most useful in older children and adults, as delayed presentation makes other diagnostic methods such as culture and PCR less likely to be positive. As most adolescents and adults are partially immune from previous vaccination or infection, ideally two samples are needed to demonstrate a rise in antibody titre. The most specific serologic test is IgA and IgG to pertussis toxin, because it is unique to B. Pertussi. For this reason, a single high IgA or IgG to pertussis toxin has been used as a marker of acute pertussis infection with estimates of IgG PT sensitivity (76%) and IgG PT specificity (99%).

#### Polymerase chain reaction (PCR)

PCR testing of a nasopharyngeal aspirate or throat swab is used to support the diagnosis of pertussis when the case meets the clinical case definition. This definition includes greater than two weeks



of coughing associated with paroxysms, whoop or post-tussive vomiting. PCR testing is particularly useful in acutely unwell infants, as specimens are easier to obtain than serology and the latter can be affected by maternal transfer of pertussis antibodies, making serology interpretation difficult. PCR testing and single titre serology are more useful than culture when confronted with patients coughing for one to three weeks (PCR) and for more than three weeks (serology) or in those with preceding antibiotic therapy.

Cases of pertussis should be notified to public health authorities.

### MANAGEMENT

#### Acute Pertussis Infection

Infants who contract pertussis when aged less than six months may require hospitalisation for supportive care of complications, for example apnoea, hypoxia or feeding difficulties. Treatment with antibiotics does not significantly shorten the clinical course in infected patients but aims to reduce transmission to other persons. The Antibiotic Therapeutic Guidelines recommend that azithromycin should be used for neonates under one month of age, with erythromycin, clarithromycin, or azithromycin acceptable

for the treatment of pertussis in persons aged over one month (see Table). Azithromycin and clarithromycin are more resistant to gastric acid, achieve higher tissue concentrations and have a longer half-life than erythromycin, allowing less frequent administration (one to two doses per day) and shorter treatment regimens (five days), possibly with improved adherence to therapy. Roxithromycin is not currently recommended for treating pertussis.

Cases should be excluded from (for example) childcare facilities and school, until they have taken five days of antibiotic treatment.

Chemoprophylaxis should be given to close contacts of cases, such as incompletely vaccinated children under two years old, pregnant women (last trimester), and within twenty-one days of onset of any symptoms in the case. This should be discussed with the local public health unit, as the decision to administer post-exposure prophylaxis is made after considering the infectiousness of the patient, the intensity of exposure and potential consequences of pertussis in the contact.

#### Current vaccine recommendations include:

- Universal adolescent booster (dTpa) vaccination between twelve and seventeen years of age.
- Indirect protection of infants by immunisation of parents, and possibly others in close contact with the newborn (such as grandparents and healthcare workers).
- Administration of first infant DTPa containing the vaccine "on time" at two months of age.
- Adults who work with young children, and routinely for all adults at fifty years of age or older.

### SUMMARY

- A pertussis epidemic is currently occurring in Australia, and the youngest infants are most severely affected.
- Adolescents and adults (usually parents) are the commonest source of infection for infants and often their diagnosis is delayed. A combination of serology, PCR testing and culture is more useful early on in the disease.
- On time administration of the first DTPa vaccine to infants at six to eight weeks of age should be advised. Encourage parents and other carers of newborn children to receive a dTpa booster vaccine shortly after the birth of the child.

TABLE: Antibiotics and their regimen when used to treat acute pertussis.

	Erythromycin	Azithromycin	Clarithromycin	Trimethoprim-sulphamethoxazole
Dose	Adult: 250mg  Child: 10 mg/gk/dose maximum 1g/day	Adult: 500mg single dose on day 1 then 250mg single dose days 2-5  Child >6 months 10mg/kg on day 1 then 5mg/kg days 2-5  Child <6 month 10mg/kg/dose daily maximum 500mg/day	Adult: 500 mg  Child >1 month: 7.5mg/kg/dose up to 500mg	Adult: TMP 160mg and SMX 800mg  Child >2 months: 4mg/kg/dose (TMP) 20mg/kg/dose (SMX)
Interval	6 hourly	Daily	12 hourly	12 hourly
Duration	7 days	5 days	7 days	7 days

No conflict of interest declared.

#### References

NSW Department of Health Infectious Diseases Fact Sheet on Pertussis:  
[www.health.nsw.gov.au/factsheets/infectious/pertussis.html](http://www.health.nsw.gov.au/factsheets/infectious/pertussis.html)



Dr Nicholas Wood  
MBBS, FRACP,  
Immunisation Research  
Fellow, National Centre  
for Immunisation  
Research and Surveillance  
of Vaccine Preventable  
Diseases, The Children's  
Hospital at Westmead,  
University of Sydney,  
Sydney, NSW