Pertussis (Whooping cough)

FactSheet For Parents and Caregivers

Immunisation Advisory Centre
Āraiṅga Mate
THE UNIVERSITY OF AUCKLAND

What is whooping cough?

Whooping cough, also known as pertussis, is a highly infectious disease[1,2] with symptoms that can last for weeks to months. It is caused by the *Bordetella pertussis* bacterium.[1] Outbreaks of the disease occur every 3–5 years[1,2] because whooping cough protection decreases with time after having either the disease or immunisation.[1,3]

How common is it? How do you catch it?

Whooping cough occurs worldwide. The bacteria can be transferred from person to person through close contact with droplets of saliva. A person with whooping cough is most likely to pass the infection on from the week before they start coughing to three weeks after they start coughing.[1]

Up to 90% of people who are not protected from the disease and living in the same house as a person with whooping cough will catch it. Without immunisation almost every child will catch whooping cough at some time.[1]

Infants less than six months of age who are too young to have completed their first three immunisations are most likely to catch whooping cough from their mother.[4] Siblings, adolescents and adults in the household, and health care workers are also sources of infection for this age group.[2,5] School children and adolescents tend to be infected by another student or friend.[2,5]

What are the symptoms of whooping cough?

After exposure it usually takes 7–10 days before coughing begins.[1,6]

During the week before the cough begins a person may notice mild cold-like symptoms including a runny nose.[2,6] Typically the cough is initially dry and non-productive, then progresses to fits of coughing to expel thick mucous sometimes followed by vomiting.[1,2,6] Coughing fits may be started by eating or drinking, talking or crying, or even hearing another person coughing.[1]

After the coughing fit ends a strong breath in against a narrowed throat causes the whoop sound.[6] The coughing fits and whooping sound may last for four or more weeks. An irritating cough can continue for weeks before settling, then often returns whenever the person gets a cold or similar virus in the following year.[1]

Symptoms can present differently in infants. They may stop breathing or even die suddenly instead of having apparent coughing fits.[2] Older children, adults and those who have been immunised or previously exposed to the disease may have a milder cough.[1,2,7]

Who is at risk from whooping cough? How serious is it?

Infants too young to have been fully immunised, those who have had any one of their immunisations delayed or have only just completed their first three immunisations and not yet had time to develop protection, are at highest risk of catching whooping cough and developing serious complications.[1,4,5,8] Unimmunised children, older children and adolescents who did not have their booster immunisation at four and 11 years of age, and adults also have a high risk of catching the disease.[1,4]

Infants less than 12 months of age, particularly those less than six months of age, have the highest risk of hospitalisation and death.[1,2] Prior to immunisation, whooping cough was a major cause of infant death.[1]

Possible complications of whooping cough are described in detail on the last page. Generally severe complications are more common for infants and young children, and include problems relating to not being able to feed/eat and drink, vomiting at the end of coughing fits, needing to be in hospital for supportive treatment, pneumonia and, particularly for infants less than 12 months of age, death. Adults can develop complications from whooping cough including problems relating to not being able to eat and drink, collapsing after severe coughing, broken ribs, and pneumonia.

How do you prevent infection?

Protection of infants less than 12 months of age is the most important strategy because they have the highest risk of developing serious complications.[8,9]

On-time immunisation at six weeks, three months and five months of age is the most effective way to protect infants against whooping cough.[8,9]

As neither immunisation nor having the disease provides lifelong protection against whooping cough, ensuring older siblings are up-to-date with immunisations and adult household members in close contact with an infant are protected against whooping cough can reduce the risk of the infant being exposed to the disease.[2]

Children with whooping cough are advised not to attend early childhood services, school or other public places for three weeks after they started coughing or five days after starting antibiotic medicine.[1] Adults are advised not to attend work or public places for the same periods of time.[6]

Close contacts of a person with whooping cough who attend early childhood services, are in contact with infants less than 12 months of age or pregnant women, or who are health care workers can complete a course of antibiotic medicine to reduce their risk of developing the disease.[1,2] A whooping cough booster immunisation will not prevent the disease developing if there has been a recent exposure.[1,2,6]

A whooping cough booster immunisation can be offered to adolescents and adults, including pregnant women after 20 weeks of pregnancy and breastfeeding women, to protect against future disease exposure.[10,11]

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When a pregnant woman receives the whooping cough booster immunisation before 36 weeks of pregnancy some of her protection against the disease crosses over the placenta to the fetus in the weeks before birth. The circulating protection in the newborn is likely to protect them from severe whooping cough for up to six weeks after birth.[2,12] A booster immunisation can be given at or after 36 weeks of pregnancy but is expected to only protect the mother from the disease.[12]

How do you treat it?

The bacterium uses multiple ways to invade the body and cause the disease symptoms.[1,2] Antibiotic medicine may change the development of whooping cough if it is started before the cold-like symptoms become obvious. Once the cold-like symptoms are obvious or the cough has started, antibiotics decrease the risk that the person will pass the infection onto another person but will not reduce the disease symptoms.[1-3]

Supportive treatment for infants less than 12 months of age is essential because they have the highest risk of developing complications with long term consequences.[2,6] Infants may need to be hospitalised for oxygen treatment and have mucous removed from their nose and throat with suction. Sometimes they need to be given fluid directly into their bloodstream and liquid nutrition directly into their stomach.[6]

Which vaccines protect against whooping cough?

Whole-cell whooping cough vaccines were developed in the 1940s and are still used in other countries. More modern vaccines called acellular vaccines were developed in the 1970s. They are made using some of the toxins produced by the bacterium instead of the whole-cell.[2] New Zealand began using acellular vaccines for all infants in August 2000.[13]

All the vaccines that protect against whooping cough are combination vaccines that include protection against other diseases. There is no whooping cough-only vaccine licensed or available.[13]

The vaccines on the National Immunisation Schedule that protect against whooping cough are Infanrix®-hexa given at six weeks, three months and five months of age, Infanrix®-IPV given at four years of age and Boostrix® given at 11 years of age and to women between 28–38 weeks of pregnancy.

For most adolescents and adults one immunisation is expected to effectively boost existing whooping cough protection whether they have previously been immunised or not.[3,14]

An adolescent or adult can receive a tetanus/diphtheria/whooping cough booster immunisation even if they recently had a tetanus/diphtheria booster immunisation. There is no minimum time to wait before receiving the additional whooping cough protection.[15]

How safe are the vaccines?

The acellular whooping cough vaccines used in New Zealand cause lesser vaccine reactions than the whole-cell vaccines.[1,16]

Common and uncommon reactions to the vaccine

Infants and children may experience a fever, decreased appetite, vomiting and/or diarrhoea, irritability or restlessness, fatigue or sleepiness, and unusual crying after immunisation.[16,17] Soreness/pain, redness and/or swelling around the injection site may occur after any dose of acellular whooping cough vaccine but are more commonly seen in children after the fourth and fifth dose. Extensive redness and swelling of the injected limb is occasionally seen, reflecting a robust immune response after the latter immunisations.[17-19] These local reactions resolve without treatment and with no long term consequences.[17,19]

In adolescents and adults redness, swelling and/or pain around the injection site are common whilst fever, headache, nausea and fatigue are possible but occur less frequently.[20-22]

Rare and very rare reactions to the vaccine

More severe vaccine responses are rare occurring once in 1,000–10,000 doses or very rare occurring once in 50,000–500,000/1,000,000 doses.

Rarely, a hypotonic hyporesponsive episode (HHE), a period of decreased muscle tone and responsiveness, will occur within 48 hours after immunisation. An HHE can last for a few minutes to several hours and resolves with no long term consequences. Other rare but possible reactions include persistent inconsolable crying for more than three hours or convulsions (seizures) that resolve with no long term consequences.[17,23,24]

Very rarely an allergic skin reaction (urticaria) or severe allergic reaction (anaphylaxis) to a component in the vaccine occurs.[25]

In the late 1970s brain inflammation (encephalopathy) with subsequent seizures and developmental delay was thought to be a possible reaction to vaccines containing whole-cell whooping cough components. More current research has not been able to show a link between whooping cough vaccines and encephalopathy.[26]

Vaccine safety in pregnancy

Pregnant women have been immunised in the U.S. since 1957 using tetanus and inactive polio vaccines, and worldwide since the 1970s using tetanus vaccines. Since 1988 several trials using other inactive viral and bacterial vaccines have also been conducted. No evidence of harm for the course of the pregnancy, fetus or newborn has been identified from the use of inactive vaccines, including the tetanus/diphtheria/acellular pertussis vaccines, during pregnancy.[12,20]

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How protective are the vaccines?

During the first year after immunisation almost everyone will be protected from severe disease, around nine in 10 protected from typical disease and around seven in 10 protected from mild disease.

After the first year the initial protection against whooping cough begins to decrease[2] in a similar way that protection after having the disease decreases. Studies have shown that protection lasts between four and six years after immunisation.[1,2,7,14]

Protection against whooping cough gained after immunisation or after exposure to the disease, whether symptoms were present or not, can be boosted by a single immunisation in adolescents and adults[4,14] or by being exposed to whooping cough in the community.[7]

Newborn protection

Newborns may have temporary protection against severe whooping cough when their mother has high levels of protection against the disease towards the end of pregnancy. This protection is likely to be lost quite rapidly over 4–6 weeks after birth.[20,27]

Are the vaccines changing?

Small changes in *B. pertussis* bacterium have been studied since the late 1990s.[28] Some changes are possibly a result of the use of vaccines.[29] Monitoring of the bacterium's characteristics[28,29] and development of whooping cough vaccines that provide protection for longer is ongoing.[30]

Even with the small changes in the bacterium on-time immunisation with the vaccines that are currently available can prevent the disease.[29,30]

Who should have the whooping cough vaccine?

Infants

All three immunisations at six weeks, three months and five months of age are needed for best protection against whooping cough.[31] Some studies have shown that the risk of an infant less than 12 months of age dying from whooping cough is significantly reduced after a single immunisation and needing hospitalisation is significantly reduced after two immunisations.[31,32]

Infants and children with a personal history of a hypotonic hyporesponsive episode (HHE) within 48 hours of a previous whooping cough immunisation[33,34] or convulsions with or without a fever within three days of a previous whooping cough immunisation can safely be given their remaining immunisations.[34]

Preschool children and adolescents

The immunisations at four and 11 years of age are important to boost protection against whooping cough during the years at school.[1,2,4,5]

Adults

Adults at any age,[35] including pregnant women from 20 weeks of pregnancy (preferably during the third trimester)*[12] and breastfeeding women can be immunised.[11]

*Boostrix® is free for women between 28–38 weeks of pregnancy.

The combined tetanus/diphtheria/whooping cough vaccine is preferred, but not funded, over the tetanus/diphtheria vaccine when a tetanus booster immunisation is required after sustaining a tetanus risk wound.[12,35]

Adults who recall having a severe allergic reaction to a tetanus 'vaccine' especially prior to 1960 and were told at the time never to have another tetanus vaccine can be vaccinated.[36]

Who should not have the vaccine?

Anyone with severe allergy (anaphylaxis) to a previous dose of the vaccine or any component of the vaccine should not receive the vaccine.

Immunisation should be postponed for people suffering an acute illness or high fever. The presence of a minor infection is not a reason to delay immunisation.

Who should seek specialist advice before immunisation?

There is potential for confusion about the role of immunisation whilst infants and children have an evolving neurological condition, e.g. uncontrolled epilepsy or a deteriorating neurological state. The risks and benefits of withholding immunisation until the clinical situation has stabilised should be considered on an individual basis.

Comparison of disease versus vaccine

The risks of whooping cough disease are compared with possible vaccine side effects in a table on the last page.

The list of references is available on request.

Vaccines are prescription medicines. Talk to your doctor or nurse about the benefits or any risks.

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Disease

A highly contagious bacterial illness lasting for weeks to months that may cause uncontrollable coughing fits.

Effects of disease (listed from common to rare)

Infants less than 12 months of age
• Not able or wanting to feed[37]
• Dehydration[37]
• Vomiting at the end of coughing fits[1]
• Weight loss[1]
• Lack of oxygen (hypoxia) during coughing fits[1]
• Middle ear infection (otitis media)[1,37]
• **Admission to hospital[1,37]
• Bleeding in the eye (sub-conjunctival haemorrhage)[1]
• A weak area or hole in the abdominal or groin muscle (hernia)[37]

**Infants needing to be hospitalised[1,37]	5 in 10 (50%)
• Slowed or stopped breathing (apnoea)[38]	6 or 7 in 10 (60–70%)
• Lung inflammation (pneumonia)[1,17,23,38]	1 in 4 (25%)
• Convulsions (seizures)[1,17,38]	1 or 2 in 100 (1–2%)
• Death[1,17,38]	1 or 2 in 100 (1–2%)
• Brain inflammation (encephalopathy)[1,17,38]	1 in 300 (0.33%)

Children from 12 months of age, adolescents & adults		
	Children	Adolescents & adults
• Not able or wanting to eat or drink[23,37]	✓	✓
• Dehydration[37]	✓	✓
• Vomiting at the end of coughing fits[1,23]	✓	✓
• Weight loss[1,37]	✓	✓
• Urinary incontinence[17,37]		✓
• Middle ear infection (otitis media)[1,23,37]	✓	✓
• Nose bleeds (epistaxis)[1,23,37]	✓	✓
• Worsened existing chronic lung problems[3]		✓
• Collapsing (syncope)[17,23,37]		✓
• Lung inflammation (pneumonia)[1,17,23,37]	✓	✓
• Admission to hospital[23,37]	✓	✓
• Bleeding in the eye (sub-conjunctival haemorrhage)[1,23]	✓	✓
• Broken ribs[1,17,23,38]		✓
• A weak area or hole in the abdominal or groin muscle (hernia)[1,38]	✓	✓
• Convulsions (seizures)[1,23,38]	✓	✓ (rare)
• Brain inflammation (encephalopathy)[1,23,38]	✓	✓
• Death[1,23]	✓ (rare)	✓ (very rare)

Side effects of the vaccine

Common/Uncommon

- Soreness/pain, redness and/or swelling around the injection site
- Fever over 38°C
- Decreased appetite, vomiting and/or diarrhoea
- Irritability, restlessness
- Unusual crying
- Fatigue, sleepiness
- Extensive swelling of the vaccinated limb, or one or both lower limbs

Rare/Very rare

Once in 1,000–10,000 doses or 50,000–500,000/1,000,000 doses

- Persistent (more than 3 hours) inconsolable crying
- A temporary period of decreased muscle tone and responsiveness, within 48 hours of immunisation (hypotonic, hyporesponsive episode)
- Allergic skin reaction (urticaria)
- Severe allergic reaction (anaphylaxis)
- Convulsion (seizure) within 2 days of immunisation