

Acellular pertussis combined with diphtheria and tetanus toxoids for adolescents and adults

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Sources of information:

- Acellular pertussis vaccine for adolescents and adults. Statement from Health Canada's National Advisory Committee on Immunizations (NACI). NACI is made up of immunization experts in public health, infectious diseases (children and adults), travel medicine, infection control, nursing, obstetrics/gynecology and the military.
- Canadian Immunization Guide, 6th Edition 2002, authored by NACI, published by Health Canada.
- Your Child's Best Shot, 2nd Edition 2002, author Dr. Ron Gold, published by the Canadian Paediatric Society (CPS).

Questions	Whooping cough or pertussis - Answers
<i>What is the name of the infectious agent?</i>	<i>Bordetella pertussis</i> (a bacterial agent. Note that it is <i>not</i> a virus).
<i>Are there many types of this infectious agent?</i>	No, there is only one species.
<i>How does it spread?</i>	The bacteria are spread by droplets from the nose and throat of one person to another. It is <i>very</i> contagious, but close (face-to-face) contact is necessary for spread to occur.
<i>How common is it?</i>	In the 1980s and 90s, an average of about 750 cases occurred for each million people in Canada. The number varies widely and outbreaks are known to occur every 3-5 years. Every year, 1-3 infants die from pertussis in Canada.
<i>What age groups does it strike?</i>	Three-quarter of the cases occur under 5 years of age. In the last decade, whooping cough has increasingly affected adolescents and young adults.
<i>Where does it strike in the body?</i>	The bacteria reside in the nose, throat and upper airways of the lung. The bacteria attach to the cells lining the airways and release toxins which cause local inflammation. A lot of mucus is produced. The infected person develops intense coughing spells to try and clear the mucus. Unfortunately, the airway cells are so damaged that they cannot transfer the mucus up into the mouth despite the intense coughing. Young children cough so hard that they get short of breath and have to take a sudden deep breath at the end of the cough, causing a "whooping" sound. Others vomit at the end of the coughing spell. Older persons usually do not "whoop" or vomit during the coughing spells.

<p><i>What is the usual outcome of this infection?</i></p>	<p>An infected person goes through different phases. About 7-20 days after the exposure, the person develops a runny nose, which lasts for 2-7 days. The severe coughing spells (or “paroxysms”) then take over and last 1-2 weeks. The severe cough can cause nosebleeds and/or some bleeding in the whites of the eyes. A slow recovery of the cough then occurs over the next 6-12 weeks. For months thereafter, children can have further coughing spells if they breathe in cigarette smoke, cold air or catch the common cold.</p> <p>Adolescents and adults with pertussis develop a cough which disturbs sleep in 50%, and lasts more than 3 weeks in 75%. Infected persons can be treated with antibiotic, which will clear the nose and throat of the bacteria so that the person is no longer infectious. Antibiotic treatment usually does not make the cough better any faster.</p>
<p><i>What is the worst thing that can happen with this infection?</i></p>	<p>Children with pertussis can have small areas of lung collapse because the mucus blocks the airways. Secondary bacterial pneumonia can develop, which may need intravenous antibiotic treatment.</p> <p>About 25% of infants with pertussis are so sick that they need prolonged hospitalized stay. Some infants temporarily stop breathing rather coughing (referred to as “apnea”). Brain damage occurs in 1 of every 400 infants who are hospitalized because of pertussis. This is due to the apnea or from interference with the blood flow to the brain during the coughing. About 1 in 400 hospitalized infants die as a result of pneumonia or brain damage. Infants who survive pertussis can have learning and behaviour problems later in childhood.</p> <p>Adolescents and adults with pertussis have to miss school and/or work for variable periods of time.</p>
<p><i>Are there specific persons at risk for the worst outcomes from the infection?</i></p>	<p>Persons of <i>any age</i> can catch pertussis, but the most severe outcomes occur in infants. Pertussis occurring in persons during the child-bearing years is worrisome, as infected women and men can infect newborn infants. While pertussis is not life-threatening in adults, it is a significant threat to infants.</p>
<p><i>What is the name of the adolescent/adult acellular pertussis vaccine?</i></p>	<p>Historically, pertussis vaccine has been available in Canada since the 1940s. The old vaccine was made from the whole (killed) bacterial cell, and given to children at 2, 4, 6 and 18 months, with a booster in preschool. In the 1980s and early 90s, it was combined with diphtheria, tetanus, polio and Haemophilus influenzae b (bacterial meningitis) vaccines, and given the name “Penta”. Significant side effects were observed after Penta vaccination, commonly blamed on the whole cell pertussis component. Penta was also only about 60-80% effective against pertussis. Penta was not used in persons older than 7 years of age because the side effects are more severe in older persons.</p> <p>In 1997, the whole cell pertussis was replaced throughout Canada by the acellular vaccine, combined with the same other components. This combination vaccine was given the name Pentacel, and is the current one used in infants. The acellular vaccine is associated with a much lower risk of side effects, including in persons older than 7 years of age.</p> <p>In September 2003, Saskatchewan replaced “Td” (tetanus-diphtheria toxoids) with “dTap” (trade name Adacel) for Grade 8 students. Adacel has tetanus and diphtheria combined with acellular pertussis vaccine.</p>
<p><i>When did this vaccine become available in Canada?</i></p>	<p>Adacel was licensed in May, 1999 (Aventis Pasteur).</p>

<i>What is the acellular pertussis vaccine made of?</i>	Unlike its predecessor, the acellular vaccine does not have the whole cell, but only small components (or parts) of the bacterial cell. These components are responsible for the inflammation in the respiratory airways. They are not alive, so the vaccine cannot cause disease. The components in Adacel are called: pertussis toxin (PT), filamentous hemagglutinin (FHA), pertactin (PRN) and fimbriae (FIM).
<i>How does the acellular pertussis vaccine work?</i>	The acellular components stimulate the person's immune system, so that immune memory is induced. Should the body be exposed to the pertussis bacterium in the future, the memory cells produce a large quantity of antibodies, which prevents the disease outright or lessens its severity.
<i>How effective is it in preventing infection?</i>	It is thought to be 85% effective. It is still too early to determine if the Grade 8 program will reduce the number of cases in adolescents and young adults. However, since the vaccine induces a significant amount of antibody, it should help prevent disease.
<i>Which vaccine is preferred?</i>	There currently is only one acellular pertussis vaccine available for adolescents and adults. Others may become available in the near future.
<i>At what age(s) can it be given?</i>	Adacel is licensed for use in persons 11-54 years of age. At the present time, only a single dose is needed in this age group, provided there has been at least 5 years since the last dose of vaccine containing diphtheria and tetanus toxoids. It is not known whether the vaccine can be given at an interval shorter than the stated 5 years. The concern is that severe local side effects may occur if diphtheria and tetanus toxoids are given too close together. Unfortunately, the adolescent/adult acellular pertussis vaccine is not available by itself, only combined with dT.
<i>How is the adolescent/adult acellular pertussis vaccine given?</i>	A 0.5 ml dose is given into the muscle (intramuscular).
<i>For whom is the acellular pertussis vaccine recommended?</i>	The goal in recommending the acellular pertussis vaccine is to reduce the number of cases occurring in adolescents and adults, especially if it can also prevent these persons from infecting newborns and infants. This can be best achieved if provinces and territories have a publicly-funded one time adolescent Adacel program. Adults up to 54 years of age can also be protected with a one time dose of Adacel, paying attention to the required interval since the last dT booster.
<i>Can it be given with other routine childhood vaccines?</i>	Yes, Adacel can be given at the same time as any one of Hepatitis B, meningococcal conjugate C, Pneumo-23, and influenza vaccines, but at separate sites using separate syringes and needles.
<i>Who should not receive the adolescent/adult acellular pertussis vaccine?</i>	Those who had anaphylaxis to a previous dose of acellular pertussis vaccine or tetanus and diphtheria toxoids (because of the combination).

<p><i>What side effects are common with the adolescent/adult acellular pertussis vaccine?</i></p>	<p>Local reactions are common, including pain in 90%, redness in 10% and swelling in 15%. These are usually transient and mild. Headache, nausea, diarrhea, fever, decreased energy and body aches occur in 10-40%, and most of these are mild.</p>
<p><i>What would happen to pertussis if the vaccine could be widely given to children in Canada?</i></p>	<p>As of Jan 2004, eight provinces and territories (NF, PEI, QC, ON, MB, SK, NU, NW) have implemented the adolescent Adacel program. Newfoundland was the first to start, about 5 years previously. Data are awaited as to whether the programs have, or will reduce the number of pertussis cases occurring in the adolescent and adult population.</p>
<p><i>How long does immunity last after immunization, and will booster doses be needed as the child grows older?</i></p>	<p>Booster doses of dT are recommended for every ten years after the preschool dose. The Grade 8 program simply provides acellular pertussis vaccine in the first booster, but it is unknown how long immunity would last or whether a booster of the acellular vaccine is needed ten year later (or every subsequent ten years). Until more information becomes available, only the single dose at Grade 8 is recommended.</p>
<p><i>Do we need to test for antibody after immunization, to determine whether the person has developed immunity?</i></p>	<p>No, there is no need to test for pertussis antibodies after immunization with the acellular pertussis vaccine. The tests are not readily available. Vaccination is expected to protect about 85% of immunized adolescents and adults.</p>
<p><i>What steps can be taken to prevent or lessen the severity of the infection if your child is not vaccinated, but becomes exposed to someone else with the disease in the future?</i></p>	<p>The major goal of pertussis prevention is to protect infants. Adolescents and adults who have been in close contact with a confirmed pertussis case should be given a preventive antibiotic (either erythromycin, clarithromycin or azithromycin) if there is any possibility they can spread the infection to infants or pregnant women close to delivery. On a practical level, this means they are treated only if there is a pregnant woman in her last trimester or an infant at home. This is a Canadian recommendation made at the Montreal pertussis consensus conference in 2002, and differs quite a bit from older Canadian (and U.S.) guidelines.</p> <p>Adacel can also be offered to the close contact, whether they receive the preventive antibiotic or not, in order to give them protection in the event of further exposures.</p> <p>Clearly, being immunized well <i>before</i> any exposure has occurred is a much better preventive measure.</p>
<p><i>Weren't there older vaccines for these diseases - if so, why can't they be used to immunize adolescents and adults?</i></p>	<p>The whole cell pertussis vaccine cannot be used in persons older than 7 years of age, because of the risk of side effects. On the other hand, the acellular pertussis vaccine can be used across the age spectrum – in infants, children, adolescents and adults.</p>
<p><i>Can't we just immunize those children who are at the highest risk for complications from these infectious diseases, and not the healthy children?</i></p>	<p>No, everyone is at risk from pertussis, since it strikes persons of all ages, whether or not they have immune deficiency diseases. Infants are at the highest risk for poor outcomes, partly because the routine infant Pentacel schedule starting at 2 months cannot induce immunity for some months. Therefore, it is important to stop cases occurring in persons of child-bearing or child-caring ages, in order to stop the spread of the disease to infants.</p>

<p><i>Summarizing why adolescents and adults should be immunized with the adolescent/adult acellular pertussis vaccine</i></p>	<p>Important benefits:</p> <ul style="list-style-type: none"> • Pertussis occurring in adolescents and adults can be moderately severe and last for at least several weeks. The vaccine is safe, and is expected to reduce the burden of disease in these populations. It may have the added benefit of indirectly protecting the infants around them. • For students reaching Grade 8, the vaccine is provided by the publicly-funded program in Saskatchewan.
<p><i>Summarizing the potential disadvantages of the adolescent/adult acellular pertussis vaccine</i></p>	<p>Potential disadvantages:</p> <ul style="list-style-type: none"> • Moderate to severe local reactions may occur, the closer one is to a previous dT booster dose. • Adults have to purchase the vaccine themselves.
<p><i>Where can you get the adolescent/adult acellular pertussis vaccine in Saskatoon, and how much does it cost?</i></p>	<p>Adolescents in Grade 8 receive Adacel via the publicly-funded program in Saskatchewan. This started in September 2003.</p> <p>Adolescents who received dT in the 4 years before Sep 2003 should not receive Adacel until 5 years have passed. In the future, vaccine specialists may reduce this interval, as more safety information becomes available. It is likely parents will have to purchase the catch-up vaccine dose themselves.</p> <p>Adults can also receive an Adacel dose if 5 or more years have passed since their last dT booster. Your physician can write you a prescription, and a vaccine dose costs approximately \$38 through a local pharmacy. The vaccine dose should be administered immediately after purchase; otherwise, it must be refrigerated.</p> <p>Please have your physician or public health nurse record the Adacel dose in your or your child(ren)'s immunization record.</p>