

## Whooping cough: is the vaccine effective?

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The NSW health department (NSW Health) has recently said that the increase in whooping cough incidence in 2008 in that State was not a result of decreasing immunisation but most probably a result of a natural three to four year cyclic peak. In fact the population has never been more heavily immunised against whooping cough. The immunisation rate for infants 0-2 years of age is at 90% and above and programs to immunise adolescents have been in place in schools for several years. It is also interesting to see that the NSW Health is suggesting that whooping cough is now a problem in the 10-14 year age group. Prior to immunisation, whooping cough was mainly a problem for 0-2 year olds, particularly infants under 6 months of age. It was not considered a serious disease in adolescents and adults because natural infection gives long term immunity which reduces the severity of the disease if it re-occurs later in life.

If the vaccine works, why are we still experiencing serious outbreaks of whooping cough? The Royal Australian College of Physicians states that the efficacy of the vaccine declines after two to three years, which is why regular booster shots are required throughout childhood and adolescence. Infants begin a schedule of three doses of whooping cough vaccine from two months of age. However infants are not protected from the disease until they have received all three doses of the vaccine at 6 months of age or later. This means that although the disease is most serious in infants under 6 months of age, they are not protected by the vaccine at this age because it requires three doses to be effective.

There are other issues, too: it is recognized that many fully vaccinated children are still getting whooping cough. In addition, there are three species of bacteria that cause whooping cough but the vaccine only protects against one of them. This means herd immunity from the vaccine will not be established as two other bacteria species can also cause the disease.

In order for parents to determine the advantages of the whooping cough vaccine they need to be informed

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## Whooping cough vaccine is effective

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There are several issues which commonly cause confusion with respect to whooping cough. These include why are immunised children developing whooping cough, and concerns that this vaccine and by implication vaccines in general are predisposing to allergy.

The reason why whooping cough is still around is that immunity to the disease (whether acquired from natural infection or vaccination) comes from immunity to the toxins produced by *Bordetella pertussis* (particularly pertussis toxin) and this wanes over time - whether you are immunised or acquire disease. In fact, there is evidence to suggest that the immunity derived from natural infection wanes rather more rapidly than vaccine-acquired immunity. What the vaccine does is greatly lessens the likelihood of developing symptoms of whooping cough but it does not necessarily stop you getting infected by *Bordetella pertussis*. Fortunately, it protects much better against the most severe manifestations of disease (death, brain damage and seizures, pneumonia and very severe coughing) than it does against any cough. Protection against severe disease is better than 90% but against a cough lasting a week or two (as opposed to the classic "100 day cough" of full blown whooping cough) is only about 40% or so, and decreases over time.

The other problem with whooping cough is that it is hard to diagnose (the tests are often not positive, especially after a few weeks) and that at least until recently doctors often did not order the tests in older children and adults, thinking that this was just a disease of babies or young children. Now, much more sensitive tests are available (the PCR test, which detects small amounts of bacterial DNA for up to several weeks) as opposed to culture of the bug which was usually negative after a week or so (or never positive in the case of re-infected adults) or blood tests (serology for pertussis antigens) which may be falsely negative or sometimes falsely positive. So more tests ordered and better tests mean a lot more reported cases. Nevertheless, in the recent NSW epidemic, over 25% of reported cases in children had not received any doses of whooping cough vaccine (as opposed to less than

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of the percentage of vaccinated infants that may still get whooping cough. This information is not being used in policy development or to convince the public of the need for the vaccine. NSW Health claims that vaccinated children who get whooping cough will get a less severe form of the disease. Parents should be able to access the evidence for this statement which could be provided if the Department collected and published the vaccination status of whooping cough cases that are admitted to hospitals. These are the most severe cases of the disease and it would be reasonable to expect that the majority of these patients would be unvaccinated. Why is the Health Department not using this information to convince parents of the need for the vaccine?

Parents are also entitled to know that the vaccine contains antibiotics, preservatives and aluminium compounds which can cause allergies and autoimmune diseases in some individuals. These chemicals are contained in the vaccine carrier and injected into the tissues of infants at a time when their body systems are still developing. The rate of allergies and autoimmune diseases in children has never been higher and we should be considering all possible causes of this. Therefore it is important that parents have evidence that the whooping cough vaccine is effective before they are encouraged to vaccinate their children.

An increase in the incidence of whooping cough in the Australian population at a time when vaccination rates have never been higher in infants or adolescents suggests we need to know more about the effectiveness of the vaccine.



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5% of the population generally). When you use these data to calculate vaccine effectiveness using the screening method you find that the vaccine is about 75 to 80% effective within 5 years, falling to about 45% after 10 years. Hospitalisation is almost entirely confined to children too young to be vaccinated and among the few older children requiring hospitalisation, most are unvaccinated.

Adults, many of whom have not received whooping cough vaccine for many decades or may have only got one or two doses because of fear of side effects, do develop severe whooping cough, with complications such as fractured ribs, coughing up blood or even, as occurred in one elderly NSW woman recently, death. If you look in the literature from the pre-vaccination era you find that whooping cough in adults was well-recognised. If we want to significantly impact on the occurrence of whooping cough in the community, we will probably need to vaccinate many more adults, especially those in contact with young babies too young to be immunised. Although the effectiveness of vaccines against whooping cough is not as high as the effectiveness for vaccines like measles, whooping cough is a very different disease and the vaccine is best at preventing the most severe cases, which should be our most important goal. Sweden stopped vaccinating against whooping cough in the late 1970s for a period of 15 years but re-introduced vaccination just over 10 years ago - their rates of whooping cough during the non-vaccine era were 10 times even our recent high rates.

With respect to allergy, there have been many systematic studies of this, and most have concluded that there is no significant relationship between allergy, asthma, or autoimmune disease and vaccines. However, like autism, allergy has been increasing of late, as has the use of vaccines, and it will always be tempting to draw the conclusion that the two are related, especially when there are no clear alternative explanations. But as public health practitioners we should resist unscientific conclusions in favour of rigorously designed epidemiology studies at the population level, with some good recent examples from Denmark, the UK and USA.

The NCIRS website ([ncirs.usyd.edu.au](http://ncirs.usyd.edu.au)) has a range of fact sheets and links to overseas web sites which provide comprehensive information on vaccines and on putative side effects. The Australian Immunisation Handbook is also available on line and provides complete information on all vaccine constituents.