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National Pertussis Workshop

Strategies to prevent severe pertussis in the next decade



NCIRS hosted a successful 2-day national pertussis workshop at Darling Harbour on 25–26 August to discuss current and future strategies to prevent severe pertussis in Australia and other countries. We were lucky to have four outstanding international speakers join some of Australia's leading experts on pertussis: Professor Scott Halperin, Canadian Center for Vaccinology; Dr Tom Clark, Centers for Disease Control, USA; Dr Camille Locht, Institut Pasteur de Lille, France; and Dr Kathleen Harriman, Department of Public Health, California.

The 150 workshop attendees saw presentations on a variety of topics including:

- Overview of pertussis in Australia – how much, what is causing it?
- How well are our current vaccines working – in Australia and in the US
- 'Cocooning' young infants to protect against pertussis – is it working?
- New strategies to protect against pertussis – immunising newborns or pregnant women?
- New vaccines

The workshop concluded with a panel discussion on next steps in Australia and North America. The Australian Government's Acting Chief Medical Officer, Professor Chris Baggoley, joined the panel, chaired by Professor Terry Nolan, Chair of the Australian Technical Advisory Group on Immunisation (ATAGI).

Thanks are due to NSW Health and the Australian Government Department of Health and Ageing for their support of NCIRS, and to GlaxoSmithKline and Sanofi Pasteur for their sponsorship of the meeting.



National Pertussis Workshop Summaries



Predictors of severe disease in children hospitalised with pertussis infection during an epidemic

A/Prof Helen Marshall, Vaccinology and Immunology Research Trials Unit (VIRTU), Women's and Children's Health Network, Adelaide

There is limited data on the severity of disease in hospitalised children with a primary diagnosis of pertussis particularly during an epidemic period. A pertussis severity scoring system (a clinical scoring system for pertussis based on symptoms of the disease for community cases of pertussis) was developed (based on the RSV 'Brisbane' scoring system) and validated in this study. The cross-sectional, multicentre study described the clinical severity, risk factors and genotypes associated with severe pertussis infection in hospitalised children, over a 12-month period (1 May 2009 to 30 April 2010), during an epidemic in Australia. There were 134 hospitalised children enrolled in the study out of which 61.2% were classified as mild (pertussis severity score <7) and 38.8% as severe (pertussis severity score ≥7). Almost half of the children admitted to hospital were less than 2 months of age and too young to start their course of immunisations. Other risk factors identified were presence of co-infection, bradycardia, post-tussive vomiting, respiratory distress and lymphocytosis >20,000. The study concluded that early identification of hospitalised children at increased risk of severe morbidity from pertussis may result in reduced deaths from pertussis.

What do we know about source of infant infection?

A/Prof Kristine Macartney, Deputy Director of Government Programs, National Centre for Immunisation Research and Surveillance

This presentation covered a systematic review of papers that examined 'who' gives pertussis to young infants and 'when'. The literature review was conducted using the MEDLINE and EMBASE databases to identify papers published in English between January 1999 and May 2010. The 12 identified studies were assessed for quality using the STROBE statement (a 22-point scale). The studies varied by design, disease epidemiology, demographics, and vaccination of contacts, among other factors. No published studies reported on the presence (or not) of recently vaccinated adult contacts. Mothers were more likely to be the source of infection for infants less than 3 months of age. Siblings were identified as a source of infection in recent studies. It was difficult to ascertain non-household member contacts. The review concluded that better prospective studies are needed to address the gaps in the literature.





Pertussis strains – do they matter?

A/Prof Ruiting Lan, School of Biotechnology and Biomolecular Sciences, University of New South Wales

The incidence of pertussis is increasing despite high pertussis vaccine coverage. A significant factor contributing to this may be the adaptation of *Bordetella pertussis* to the acellular vaccine (ACV). Most changes in the organism are single nucleotide polymorphisms (SNPs). SNP typing was done on isolates collected over the past 40 years. SNP typing involves classification into 63 types which are divided into 6 groups or clusters. There has been a gradual increase in the frequency of 'cluster 1' in 2011.

The recently emerged cluster 1 isolates mostly carry the non-vaccine prn2 gene allele and have significantly increased in frequency since the introduction of ACV. This suggests that this cluster has emerged and expanded following the introduction of ACV with the potential to evade induced immunity from the vaccine and cause more serious disease. These changes will have an impact on disease control.

National Pertussis Workshop Summaries

Correlates of protection from pertussis vaccines – one, many or none?

Prof Peter McIntyre, Director, National Centre for Immunisation Research and Surveillance



Vaccine efficacy (VE) estimates for acellular and whole cell pertussis vaccines are largely derived from a series of studies from Sweden, Italy and Senegal in the 1980s. VE is largely dependent on case definition, including the stringency of clinical criteria (duration of cough symptoms) +/- the use of culture or other methods of confirmation. Taken together, these studies indicate that pertussis vaccines provide greater protection against severe or classic pertussis (~90%) than against mild pertussis 'cough illness' (~70%) or against asymptomatic infection. There is some evidence that 5-component acellular pertussis vaccines are marginally more effective than 3-component vaccines. By comparison, previous whole cell vaccines are very heterogenous in composition and efficacy (ranging from 40% to >90%).

Unlike for many other vaccine preventable diseases, no immunological correlates of protection for pertussis have been clearly established with most data relating to correlates of protection coming from household contact studies. Taken together, these studies suggest that anti-pertussis toxin (PT) antibodies provide protection against severe disease, but that the presence of anti-pertactin (PRN) and anti-fimbriae (FIM) antibodies correlate with protection against less severe infection. Having anti-PT, anti-PRN and anti-FIM antibodies is associated with the highest level of protection, while having none correlates with absence of protection. These correlates are even less clearly established for whole cell vaccines than for acellular vaccines, for which alternative humoral or cellular effector mechanisms may be important.

Pertussis vaccine effectiveness in Australia

Dr Helen Quinn, Research Fellow, National Centre for Immunisation Research and Surveillance



The large increase in notifications of pertussis in Australian children less than 5 years of age during 2008–2010, in contrast to very low rates in the preceding years, raised the question of decreased vaccine effectiveness (VE). In particular, the discontinuation of the 18-month booster and the impact of this on notifications was of concern. To evaluate this, both the screening method and a case control study approach were used, utilising data on immunisation coverage at the population and individual level from the Australian Childhood Immunisation Register (ACIR). The screening method to estimate VE relies on knowing the immunisation status of

cases and population coverage in the relevant age group. For earlier data this was the only practical method. For children who were eligible to receive an 18-month booster dose of DTPa, VE was 88.5% (95% CI: 86.3–90.4%) which was significantly higher than the estimate for children not eligible for this dose (81.6% [95% CI: 79.7–83.3%]). The lowest estimate was in 3-year-olds (72%), and estimates for the 2009 epidemic (62% for 3-year-olds) were lower than those for the most recent epidemic in 2001. The analysis also showed that VE estimates were lower for children who received DTPa vaccines for their primary series, compared with those who received DTPw. A case control approach was also used by individually matching cases to de-identified children with similar dates of birth on the ACIR. Using this approach, VE estimates for hospitalisation due to pertussis were higher than for non-hospitalised cases in the <1-year age group.

For infants less than 6 months of age, both hospitalised and not hospitalised, 2 doses of vaccine had higher VE than 1 dose (87% vs 56% and 61% vs 48%, respectively). In children aged 1 to 3 years, the 3-dose VE estimate decreased with age, so that by 3 years of age, the VE against notified pertussis was 59.0% (95% CI: 46.1–68.9%).

Both methodologies found VE in the expected range within 2 years of birth. There was evidence of decreased VE estimates in children 2 years and older, consistent with waning immunity prior to the pre-school booster dose of DTPa scheduled at 4 years of age.

National Pertussis Workshop Summaries

Pertussis vaccine schedules – what can serosurveillance and modelling tell us?

A/Prof Jodie McVernon, Vaccine and Immunisation Research Group, University of Melbourne

Rationale:

- Clinical case finding contains multiple sources of bias
- Serosurveillance is an objective assessment of recent exposure
- Antibody concentration thresholds infer evidence of recent exposure
- Do undetectable antibody concentrations correlate with population susceptibility?

How models can help:

- Simulate how pertussis spreads
- Isolate the effect of previous changes on observed disease experience
- Simulate situations where exact information is not readily obtained, e.g. duration of immunity, to determine most likely values
- Introduce different interventions to compare the likely outcomes



What questions can a model answer?

Basic hypothesis: Vaccines are detectable by serosurveillance

- How have changes to the vaccine schedule impacted on protection? Age at administration and vaccine formulation
- How have changes in pathogen circulation impacted on duration of protection?
- Has widespread immunisation selected for vaccine-escape mutants?



Maternal immunisation – can we do it, what can we expect?

Prof Scott Halperin, Head, Paediatric Infectious Diseases, Dalhousie University, IWK Health Centre, Canada

While childhood vaccination has made a positive impact in the control of pertussis, infants less than 6 months of age continue to suffer morbidity and mortality. Therefore, other vaccination strategies need to be considered.

Immunisation of women during the later stages of pregnancy will potentially provide protection to the foetus through transplacental transfer of antibodies, and to the newborn through maternal antibodies in breast milk.

Previous trials conducted in small numbers of pregnant women with whole cell vaccine revealed some benefit of maternal pertussis immunisation. Two randomised clinical trials are presently examining the safety of pertussis immunisation during pregnancy. Interim results have shown that acellular vaccine is well tolerated during pregnancy. A small amount of adverse event registry data has also shown very few adverse events of concern. Antibody levels in newborn babies of vaccinated mothers were shown to be significantly higher than in babies whose mothers were not vaccinated, with some interference noted in the infants' active antibody response to DTaP at 7 months of age.

A formal survey of women who accepted the vaccine, and those who did not accept it, has been incorporated into one of the trials to determine factors which might influence acceptability of the vaccine. The results will be forthcoming once the trial is complete.

National Pertussis Workshop Summaries



Neonatal immunisation: can we do it, what can we expect?

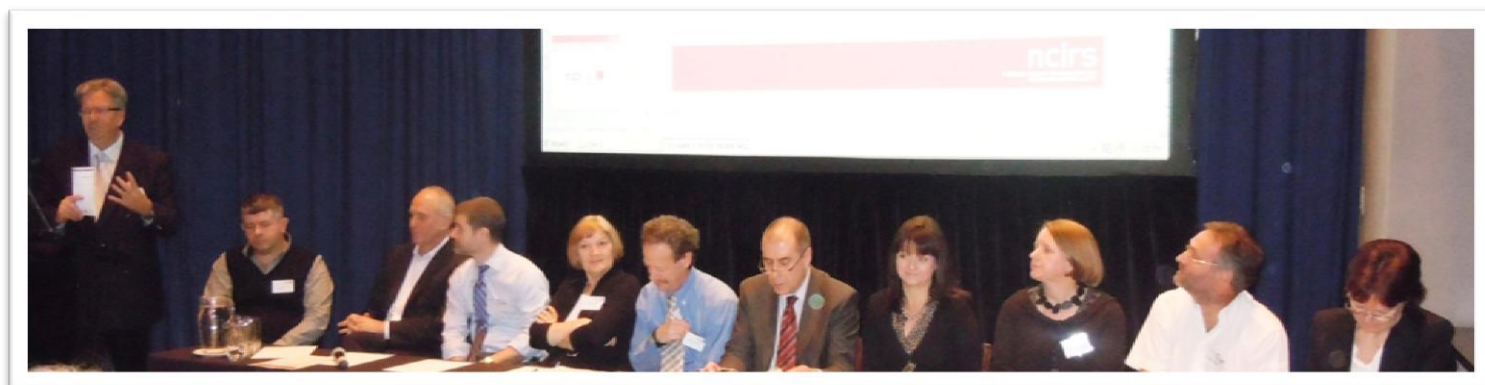
Dr Nick Wood, Clinical Research Fellow, National Centre for Immunisation Research and Surveillance

Recognition of the high burden of pertussis in early life has resulted in renewed interest in neonatal vaccination. Trials of whole cell pertussis vaccine at birth in the 1940s and 1950s suggested that 'immune tolerance' resulted and raised concerns about vaccinating at birth. However, four neonatal acellular pertussis (Pa) vaccine trials have recently been published. Data from these small studies, involving a total of 317 infants worldwide, found that monovalent Pa vaccine was well tolerated and immunogenic, and identified vaccine interference as a critical issue to address, particularly with Hib and hepatitis B responses. Pertussis-specific Th-memory cells elicited at birth displayed a strong Th2 bias with higher IL-5 and IL-13 responses; however, this polarisation had diminished by the second year of life. Blunting of immune responses in the presence of maternal antibodies, particularly in the context of higher maternal levels achieved with adult booster vaccines, has not been sufficiently examined. In addition, public and provider acceptance, cost-effectiveness and impact of newborn Pa vaccination require further investigation.

Towards a live attenuated nasal vaccine to control pertussis

Dr Camille Locht, Center for Infection and Immunity of Lille, Institut Pasteur de Lille, France

Control of pertussis may require a completely new vaccine. Locht and colleagues have developed BPZE1, a live attenuated nasal vaccine, by the genetic inactivation or elimination of three toxins. In mouse models, BPZE1 has been found to be safe and immunogenic. A single nasal BPZE1 administration induced strong anti-*Bordetella* B and Th1 T cell responses, protected against challenge (rapidly) and provided long-lasting (≥ 1 year) protection. In addition immunity is able to be successfully transferred to SCID mice. Interestingly, BPZE1 also protected against lethal influenza virus infection in mice (Li et al *Journal of Virology* 2010). The vaccine strain has now commenced phase I safety trials in humans and preliminary immunogenicity data are expected by the end of 2011. This is an exciting initiative that may herald a new era of improved control of pertussis.



Left to right: Terry Nolan, Stephen Lambert, Peter McIntyre, Tom Clark, Kathleen Harriman, Scott Halperin, Chris Baggoley, Helen Marshall, Jodie McVernon, Camille Locht and Rosemary Lester.

NCIRS Student awarded Prize of Excellence



The University of Sydney Discipline of Paediatrics and Child Health organises a postgraduate student conference annually for students to share their research findings.

Maria Chow, NCIRS PhD student, who is supervised by Julie Leask, Angie Morrow and Robert Booy, was one of seven students awarded a Prize of Excellence at the University of Sydney 2011 Postgraduate Research Student Conference. Her presentation topic was ***Quality of life of parents of children with influenza-like illness: qualitative interviews.***

In total there were 68 students who presented at the conference. It provided a great opportunity for students to interact and provide feedback with students from different health fields also completing postgraduate research through the discipline.

Maria presented results from her social research project which aims to explore the impact of a child's influenza-like-illness (ILI) on parental quality of life (QoL). After interviewing 23 parents of children demonstrating ILI, Maria found that the sudden onset of illness in children resulted in disruptions to normal family life, work and social activities. Perceived practical and emotional support from extended family, friends and doctor visits appeared to modulate the impact.

NCIRS postgraduate students Kerrie Wiley, Catherine King, Gulam Khandaker and Kevin Yin also presented their PhD research at the conference, and their presentations were well received by fellow students.

Australian Immunisation Professionals Network

NCIRS is pleased to announce that there are now over 500 Australian immunisation professionals subscribed to the NCIRS-AIP email discussion list.

NCIRS-AIP is an electronic discussion group designed to facilitate communication between professionals involved in immunisation in Australia, whether at the level of research, policy development, or as immunisation providers. It is modelled on a similar group in the UK. NCIRS-AIP provides:

- Notifications of news items, publications and meetings of interest, regular international updates on immunisation news, and summaries and commentaries on recent papers presented and discussed at the NCIRS Immunisation Journal Club.
- A forum for questions and feedback.
- An avenue for rapid information about media controversies.

NCIRS welcomes into the group all Australian professionals, as well as professionals in other countries who wish to learn more about immunisation in Australia, and/or wish to communicate their experience with us. To subscribe, go to <http://mailman.ucc.usyd.edu.au/mailman/listinfo/ncirs-aip>

Q fever epidemiology and control in Australia, and the recent outbreak in The Netherlands



Heather Gidding, an infectious diseases epidemiologist and biostatistician working at the Kirby Institute, gave an overview of the epidemiology and control of Q fever in Australia and the impact of Australia's National Q fever Management Program, as well as relating Australian control methods to the outbreak in The Netherlands.

Q fever is caused by the bacterial pathogen *Coxiella burnetii*. Worldwide *C. burnetii* infects a wide range of animals; however, in Australia the main sources of infection are cattle and sheep. Humans are infected by contact with the infected animal or animal products usually via inhalation of infected aerosols. In Australia, a majority of Q fever cases are in males, particularly in the 18–24 year age group, which correlates with the age of new workers in farming/abattoir industry. The majority of cases now, as in the pre-vaccine era, are reported in south western Queensland and northern New South Wales. In the early 1980s CSL developed an inactive whole cell vaccine against Q fever, which was licensed for use in Australia in 1989. In October 2000, a government funded vaccination program against Q fever was announced, and rolled out in all states except the Northern Territory in 2001–2002. This program had two phases: the first targeting abattoir workers and shearers; the second targeting farmers, their employees and families. Depending on the jurisdiction, the government funded program was ceased in all states by June 2007.

An evaluation of the Q fever program carried out by NCIRS identified a number of strengths. Overall, the program increased awareness for the vaccine and the capacity to deliver it. This resulted in an estimated national coverage among the target group of 50–54% and, in turn, a dramatic and targeted decline in Q fever notification rates was observed in the years following the introduction of the program. In 2010, Heather presented the results of the NCIRS evaluation of Australia's National Q fever Management Program at the inaugural Groningen Vaccination Days meeting in The Netherlands, which was convened in response to the largest Q-fever outbreak ever reported. This outbreak was first identified in farm animals and then in humans in the following years, with more than 2,300 human cases reported in 2009. Q fever incidence rates were highest in areas that had the highest density of goat farms. In response to this outbreak a number of control measures were introduced both in the animal population and also in humans. In comparison to what has been seen in The Netherlands, in Australia there is a higher proportion of Q fever cases among males, no seasonality with Q fever notifications is apparent, and Q fever seems to be restricted to high risk workers, whereas in The Netherlands it seems to be a community wide issue.

Based on the situation in Australia and in Holland, Heather recommended a number of key factors important for the control of Q fever, including both animal and human Q fever surveillance, continuing education campaigns for at-risk groups and providers, and enhanced Q fever notification data.

Susceptibility to vaccine preventable diseases among NSW prison entrants

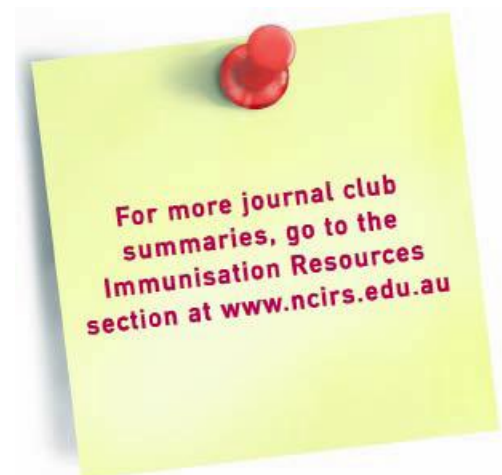
Dr Sarah Larney from Justice Health presented insights and data obtained from a questionnaire and serosurvey undertaken among new inmates within the NSW Justice system. Sarah laid the foundation regarding the health state of NSW inmates with alarming statistics regarding the complexity of issues facing inmates and Justice Health staff caring for this population. The vast majority of inmates are from the most marginalised and disadvantaged parts of our society. Many spend less than 6 months in prison; however, more than 65% have already had previous prison time. Males (93%) outnumber females (7%) in the prison system but the numbers of females is increasing. The younger age groups are over-represented in the prison system with ~55% aged less than 35 years. Our Indigenous population is also over-represented with 22% of inmates identifying as Indigenous. The 2010 NSW Health Inmate Survey reported that placement as a child, unemployment, having a parent in prison and being homeless was associated with a large proportion of inmates. More than 80% reported a mental illness and 53% of males reported a prior head injury that resulted in unconsciousness. With regards to drug abuse, among male inmates, smoking and alcohol abuse were the most commonly reported drugs, whereas women inmates reported opioid abuse most commonly.

Justice Health falls under the umbrella of NSW Health and is independent of NSW Prison Services. There are multiple arms of Justice Health including primary care, population health, women's health, Indigenous health, drug and alcohol, mental health, adolescent health and forensic health. Transmission of disease within the prison population and visiting populace is readily possible. There are dozens of entries each day through prison receptions, visitor day or work release, court attendances, shared cells, shared showers, recreation areas and other visitor contact. Approximately 3% of the prison population are HBsAg positive but hepatitis C is the most common blood borne disease. Either hepatitis B or C is acquired through shared IV drug apparatus through 'home-made' syringes/needles and in prison tattooing devices. Sex, while a mode of transmission, is not as common as the wider public thinks.

Justice Health has implemented a vaccination policy. At reception inmates are offered hepatitis B vaccination where there is no prior history. In 2009/2010, 3,603 inmates were vaccinated. Hepatitis A is offered on a risk assessment basis in terms of OHS, whether they are HIV or HepB/C positive or if the inmate suffers from liver cirrhosis or liver failure. Influenza (annually) and pneumococcal vaccination are also offered to inmates based on risk factors. Other vaccines such as MMR are used in outbreak situations, as was the case in 2010. Immunosuppressed inmates are assessed and offered vaccination as required. The reasons underlying the prevalence of VPDs within prisons was thought to be potentially due to missed childhood vaccinations and increased exposures.

There are seven prison receptions in NSW and, during 2010, 311 new inmates (not prison-to-prison transfers) were asked to participate in a questionnaire and serosurvey. 211 agreed but unfortunately women were under-represented in this sample. ICPMR undertook the serology for HBsAb, MMR and varicella. Community data was also weighted to match sex and age of the inmates for comparison. Of the 211 inmate participants more than a third reported being homeless and 71% did not complete schooling to year 10 level. Serosurvey results indicated that 13% were susceptible to measles, 41% were susceptible to mumps, 16% were susceptible to rubella and 10% were susceptible to varicella. 52% were found to be HBsAb negative and, of these, more were susceptible among those who had never been in prison previously and who had no IV drug use. Of the 45% found to be immune, 26% reported prior hepatitis B infection and 64% reported prior hepatitis B vaccination. The final 3% were found to be chronic hepatitis B carriers. There appeared to be decreased susceptibility to these VPDs in comparison with the community-matched sera.

Further steps include attempting to increase the prison population willing to partake in these surveys and to engage clinical staff to increase participation. It is also important to increase the female inmate participation rate.



Publications – complete list at www.ncirs.edu.au

Khandaker G, Doyle B, Dwyer DE, Yin J, Heron L, Booy R. Outbreak of viral respiratory infections in an aged care facility in NSW – lessons about a pandemic virus. *Influenza and Other Respiratory Viruses* 2011;5(Suppl 1):312-6.

Macartney KK, Porwal M, Dalton D, Cripps T, Maldigri T, Isaacs D, Kesson A. Decline in rotavirus hospitalisations following introduction of Australia's national rotavirus immunisation programme. *Journal of Paediatrics and Child Health* 2011;47:266-70.

Leask J. Target the fence-sitters. *Nature* 2011;473:443-5.

Quinn P, Gold M, Royle J, Buttery J, Richmond P, McIntyre P, Wood N, Lee S, Marshall H. Recurrence of extensive injection site reactions following DTPa or dTpa vaccine in children 4-6 years old. *Vaccine* 2011;29:4230-7.

Mahajan D, Menzies R, Cook J, Macartney K, McIntyre P. Supplementary report: surveillance of adverse events following immunisation among children aged less than 7 years in Australia, 1 January to 30 June 2010. *Communicable Diseases Intelligence* 2011;35:21-8.

Petousis-Harris H, Poole T, Booy R, Turner N. Fever following administration of two inactivated influenza vaccines – a survey of parents of New Zealand infants and children 5 years of age and under. *Vaccine* 2011;29:2933-7.

Cooper Robbins SC, Leask J, Booy R. Parents' attitudes toward the influenza vaccine and influencing factors. *Journal of Paediatrics and Child Health* 2011;47:419-22.

Cooper Robbins SC, Leask J, Hayles EH, Sinn JK. Midwife attitudes: an important determinant of maternal postpartum pertussis booster vaccination. *Vaccine* 2011;29:5591-4.

Christie D, Viner RM, Knox K, Coen PG, Wang H, El Bashir H, Legood R, Patel BC, Booy R. Long-term outcomes of pneumococcal meningitis in childhood and adolescence. *European Journal of Pediatrics* 2011;170:997-1006.

Van Damme P, McIntyre P, Grimprel E, Kuriyakose S, Jacquet JM, Hardt K, Messier M, Van Der Meeren O. Immunogenicity of the reduced-antigen-content dTpa vaccine (Boostrix[®]) in adults 55 years of age and over: a sub-analysis of four trials. *Vaccine* 2011;29:5932-9.

Yin JK, Wang H, Skinner SR, Salkeld G, Booy R. Assessing seasonal vaccine-related cross-protection from 2009 pandemic H1N1 influenza through teacher absenteeism [letter]. *Australian and New Zealand Journal of Public Health* 2011;35:393-4.

Yin KJ, Khandaker G, Rashid H, Heron L, Ridda I, Booy R. Immunogenicity and safety of pandemic influenza A (H1N1) 2009 vaccine: systematic review and meta-analysis. *Influenza and Other Respiratory Viruses* 2011;5:299-305.

Isaacs D, Kilham HA, Alexander S, Wood N, Buckmaster A, Royle J. Ethical issues in preventing mother-to-child transmission of hepatitis B by immunisation. *Vaccine* 2011;29:6159-62.

Ridda I, Seale H, Katelaris AL, Heywood AE, Tan TC, MacIntyre CR, Dwyer DE. Pneumococcal colonisation following influenza infection [letter]. *Vaccine* 2011;29:6444-5.

Quinn HE, McIntyre PB. The impact of adolescent pertussis immunization 2004 to 2009 – lessons from Australia. *Bulletin of the World Health Organization* 2011;89:666-74.

Menzies R, Andrews R. Immunisation issues for Indigenous Australian children. *Journal of Paediatrics and Child Health* May 2011 [Epub ahead of print]

Yin JK, Lahra MM, Iskander M, Lambert SB, Heron L, Nissen MD, Rost L, Murphy J, Sloots TP, Booy R. Pilot study of influenza vaccine effectiveness in urban Australian children attending childcare. *Journal of Paediatrics and Child Health* June 2011 [Epub ahead of print]

Khandaker G, Zurynski Y, Lester-Smith D, Kesson A, Heron L, Dwyer DE, Elliott EJ, Booy R. Clinical features, oseltamivir treatment and outcome in infants aged less than 12 months with laboratory-confirmed pandemic influenza A (H1N1) 2009. *Antiviral Therapy* July 2011 [Epub ahead of print]

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