Pertussis Update

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Pertussis Update: Outline

- Background
  - Disease and Epidemiology

- Strategies for prevention of pertussis disease in newborn
  1. Infant
  2. Birth
  3. Cocoon
  4. Pregnancy

- Current pertussis recommendations
  - What’s new?
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Pertussis Disease

• “Whooping cough”
  • *Bordetella pertussis* bacterium

• Respiratory infection
  – Catarrhal phase (mucous membrane)
  – Severe cough (paroxysmal)
  – +/- Inspiratory whoop

• Incubation of 6 to 20 days
  – Usually <14 days

• Highly infectious
  – 2-4 days before cough to 21 days after coughing starts

• Aerosol spread
  – to 90% of susceptible household contacts

• Neither natural infection nor vaccination gives long-term protection
  – Repeat infection may occur
Notified cases of pertussis by month and age group, Victoria, 1 January 1997 to 26 May 2015

Slide courtesy of Kylie Carville, Victorian department of health
Infants < 6 months of age are at highest risk

Highest risk of hospitalisation and severe complications

– Pneumonia complicated by apnoea, hypoxia and resultant brain damage, seizures lung scarring, broken ribs etc
– Or death... case-fatality 0.5% (1 in every 200 cases < 6 months)

Pertussis hospitalisation < 1 year old, Australia 1994 - 2004

Pertussis in infants < 6 months of age (Victoria)

Notified cases of pertussis aged <6 months and proportion hospitalised, Victoria, 1 Jan 2009 to 3 Jun 2015

- Cases aged <6mo
- % hospitalised

Year of notification:
- 2009: 113 cases
- 2010: 158 cases
- 2011: 171 cases
- 2012: 85 cases
- 2013: 59 cases
- 2014: 79 cases
- 2015: 42 cases

1 death

Slide courtesy of Kylie Carville, Victorian deptment of health
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1. Infant immunisation

- **Timely** routine pertussis containing vaccines
  - DTaP/IPV/Hib/HepB (Infanrix hexa)
  - 6 weeks, 4 months and 6 months
  - 8% less cases if 1st dose given at 6 weeks rather than 2 months*

- But need 3 doses for reasonable protection
  - 2 weeks for optimal antibody response

Even with timely infant vaccines, babies may not have adequate protection until after 6 months of age...

Foxwell AR, PIDJ 2011; 30: 161-3
2. Neonatal immunisation

- Current examples: routine Hepatitis B, BCG for high risk
- Few trials past 15 years, small numbers n = 320 *
  - Monovalent acellular pertussis vaccine at birth

- Result in earlier pertussis antibody *(if given at birth AND 1 month of age)*
  - some protection from 6 weeks of age
  - Safe, no hyporesponsiveness

*Knuf et al, J Pediatr 2010; Wood, PIDJ 2010*
2. Neonatal immunisation

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  - some protection from 6 weeks of age
  - Safe, no hyporesponsiveness

- **But** concern re immune suppression and interference
  - Reduced for HepB and Hib ?clinical significance

*Leaves a window of susceptibility... birth-6 weeks*

*Knuf et al, J Pediatr 2010; Wood, PIDJ 2010*
3. Cocooning

- Aims to *indirectly* protect infants who are too young to be vaccinated through vaccination of...
  - **Parents**
  - Others in close contact with newborn babies
    - Other people who live in the house
    - Relatives eg: grandparents
    - Childcare workers
Notified cases 2007 to 2011

Notified cases of pertussis by month and year of notification, 2007-2011, Victoria

Number of notified cases

Year and month of notification

Slide courtesy of Rosemary Lester, Department of Health
3. Cocooning

Victorian government emergency response measure

- June 2009-
  - Free time-limited program dTap vaccine
  - Parents of new babies (including adoptive/foster)
  - Delivery through: Maternity hospitals, GP, MCHN, Council immunisation

(Similar cocooning programs in all states and territories in Australia)

http://danamccaffery.com/openletter.html
3. Cocooning

- Estimated state-wide uptake of Victorian program was:
  - 80% for mothers
  - 70% for fathers

*Previously* little good data for effectiveness...

- Household contact study (Netherlands)*
  - Both parents immunised – up to **55% reduction** in infant cases (< 6 months)

- Case control study (NSW)**
  - Both parents immunised – **51% reduction** in pertussis cases <4 months
  - But poor quality study, lumping immunised before pregnancy or after birth

- Other studies show cocooning to be
  - *inefficient and resource intensive in low incidence setting***

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***Castagnini LA, CID, 2012 and Skowronski, CID, 2012
3. Cocooning

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  - 80% for mothers
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Little good data for effectiveness yet...

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  - Both parents immunised - may reduce up to 55% of infant cases (< 6 months)

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- Other studies show cocooning to be inefficient and resource intensive in low incidence setting

## de Greeff SC, CID 2010, ** Quinn Pediatrics 2014
## Castagnini LA, CID, 2012 and Skowronski, CID, 2012

BUT... new Victorian evidence (Stacey Rowe- CDC Brisbane June, 2015)

- large Victorian case-control study done during the 2009 cocooning program
- effectiveness of pertussis vaccination
  - of both parents
  - after birth and ≥28 days prior to onset
  - Vaccine Effectiveness 76% (95% CI: 5%-94%)

Similar well designed case-control study is being done in Queensland... (Stephen Lambert)
4. Immunisation during pregnancy

- **Passive** in utero transfer of maternal antibody to fetus
  - Protects mother (directly)
  - Protects neonate (indirectly)

Two for one... at no extra cost!
International recommendations...

**US**: ACIP: June 2011
- Universal dTap vaccine: Late 2\textsuperscript{nd} or 3\textsuperscript{rd} trimester (>20 weeks gestation)

**UK**: HPA: October 2012
- *Temporary* dTap vaccine during pregnancy: 28 to 38 weeks

Temporary dTap programs have now been implemented in 18 countries
- New Zealand, Israel, Mexico, Brazil, Colombia, Uruguay, Panama, Costa Rica, Argentina and some provinces in Spain and... now in all states and Territories of Australia...

*Figure 2*: Annual incidence of laboratory-confirmed cases of pertussis by age group. Figure shows incidence from 2001 to 2013 in England only.

Amirthalingham, Lancet, 2014
Only 1 small RCT published to date...

- 48 pregnant women (USA)
  - 33 women received dTap (Adacel) and 15 placebo, 30-32 weeks gestation
  - No increased risk of AE, high pertussis antibodies in infant (birth, 2 months)

*** European Centre for Disease prevention and control: Annual report 2011
Effectiveness of maternal pertussis vaccination in England: an observational study

Screening method
26,684 women (Oct 2012-Sept 2013)
Vaccine coverage 59-66%
VE = 91% (95% CI, 84%–95%)
<3 months of age

A Case-Control Study to Estimate the Effectiveness of Maternal Pertussis Vaccination in Protecting Newborn Infants in England and Wales, 2012–2013

Case control method
58 cases, 55 controls (Oct 2012-Sept 2013)
VE = 93% (95% CI, 81%–97%)
Evaluation of the Association of Maternal Pertussis Vaccination With Obstetric Events and Birth Outcomes

26,229 women (Jan 2010-Nov 2012), USA
All received Tdap vaccine during pregnancy
No increase risk of adverse birth outcome

Safety of pertussis vaccination in pregnant women in UK: observational study

20,074 women (Oct 2012-Mar 2013), UK
Compared to matched historical unvaccinated cohort
No increase rate of maternal or neonatal adverse outcome
(stillbirth, maternal or neonatal death, uterine rupture, placenta or vasa previa, caesarean delivery or low birth weight)
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Notified cases of pertussis by month and age group, Victoria, 1 January 1997 to 26 May 2015

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Pertussis (to 20 Jan 2015)

- 56% increase in 2014 compared to 2013
- 38% increase in cases <6 months age
Increase in pertussis cases - 6 January 2015

Status: Active

Date issued: 6 January 2015

Issued by: Dr Rosemary Lester, Chief Health Officer, Victoria

Issued to: Clinicians and Public Health personnel

Key messages

- Pertussis is a highly contagious respiratory infection that is increasing in incidence.
- Between 1 January 2014 and 6 January 2015 there were a total of 4,606 cases of pertussis notified to increase in cases compared to the same time in 2013.
- Consider the diagnosis and confirm with pertussis PCR of naso-pharyngeal (not throat) swabs.
- Infants aged less than six months are most susceptible to the severe complications of pertussis.
- Treat the patient with appropriate antibiotics.
- Notify all cases to the Department of Health and Human Services in writing within five working days.
Whooping cough: Victoria to reintroduce free vaccination for parents

Posted 18 Jan 2015, 2:33pm

Victoria will reintroduce free whooping cough vaccines for expectant mothers and parents of newborns amid concern about the rise in cases of the disease.

The program was abolished by the previous Liberal government in 2012.

In the past 12 months there was a 58 per cent increase in known cases, from 2,926 in 2013 to 4,615 in 2014.

Under the program, parents gained access to the free vaccine as soon as their child enters the third trimester of pregnancy or is five months old.
Updated National Recommendations

March 2015... dTpa booster (Boostrix or Adacel)

• **Give it...** Third trimester
  - Anytime 28 weeks to delivery
  - Ideally 28-32 weeks gestation
  - With each pregnancy

• **But...** If not given during pregnancy
  - **After delivery** (as soon as possible)
  - before hospital discharge

• **And...** All adult household contacts
  - and carers (e.g.: grandparents)
  - Ideally 2 weeks prior to contact with infant


But..... NOT funded!!
Family of Perth baby who died of whooping cough hope to raise awareness, prevent further deaths

By Courtney Bembridge and staff

Updated 18 Mar 2015, 8:35pm

The family of a four-week-old baby who died from whooping cough say they hope his death will not be in vain, as doctors urge people to vaccinate to protect vulnerable community members.

Riley John Hughes died in Perth’s Princess Margaret Hospital of whooping cough on Tuesday.

His family have taken to social media to share their grief and also a desire to help eradicate the disease.

"RIP to my darling little angel Riley, cruelly cut down before his life had an opportunity to start," his father Greg Hughes posted on Facebook.

"Riley passed away peacefully in the arms of his mummy and daddy ... aged just 32 days - a result of pneumonia-based complications arising from whooping cough."
Funded pertussis vaccine programs...

- Nov 2013: NT
- July 2014: QLD (poor uptake)

------Updated National Recommendations------

- March 2015: SA and WA
- April 2015: NSW
- **June 1 2015...Victoria and Tasmania**
Protect your baby by protecting yourself with a free whooping cough vaccine

1. Get the free whooping cough vaccine in the third trimester of pregnancy.
2. If you miss out, get it as soon as possible after the birth of your baby.
3. Vaccinate ALL your children on time, every time.
4. Encourage people in regular contact with your baby to be vaccinated.

For more information speak to your doctor or immunisation provider or go to www.betterhealth.vic.gov.au
1. Get the free whooping cough vaccine in the third trimester of pregnancy

- **Boostrix (dTap)**

- Ideally between 28 and 32 weeks of gestation
  - May be given ANY time up to delivery
  - 2 weeks for maximum antibody response
  - Active transport across placenta from 30 weeks

- Give EVERY pregnancy
  - regardless of the interval between pregnancies
  - Seropositive mothers (previous pertussis vaccine)
    - < 25% infants have antibodies***

- Partners eligible for free vaccine
  - Once women is 28 weeks pregnant
  - If they have not received a pertussis booster in the last 10 years
  - any person who considers themselves to be a parent or guardian of a newborn baby

*** European Centre for Disease prevention and control: Annual report 2011
2. If you miss out, get it as soon as possible after the birth of your baby

= “Cocoon” strategy

- Preferably give in postpartum period
  - before discharge and ideally prior to 6 weeks after birth
  - Some benefit up to when baby turns 6 months

- Only free for parents/guardians of babies born after 1\textsuperscript{st} June 2015 if
  - Baby is < 6 months of age AND
  - They have not received a pertussis booster \textit{in the last 10 years}
3. Vaccinate ALL your children *on time, every time*

**Dose**

1. 6 weeks (*8% less cases*)
   - DTPa-HepB-IPV-Hib = *Infanrix hexa*

2. 4 months
   - DTPa-HepB-IPV-Hib = *Infanrix hexa*

3. 6 months
   - DTPa-HepB-IPV-Hib = *Infanrix hexa*

1. 4 years
   - DTPa-IPV = *Infanrix IPV*

1. Year 7-10* (12-16 years)
   - dTpa = *Boostrix*
   - From 2016 only in year 7 (12-13 years)
Vaccine Effectiveness in young children: *New data...*

- Matched case-control study in Australia 2005-2009
- 3123 cases, 61636 controls, after 3 infant doses and no booster

![Graph showing vaccine effectiveness](image)

VE 83.5%

VE 70.7%

VE 59%

Quinn HE et al, *Pediatrics* 2014;133:e513-9
3. Vaccinate ALL your children *on time, every time*

**Dose**

1. 6 weeks (*8% less cases*)
   - **DTP** = **Infanrix hexa**

2. 4 months
   - **DTP** = **Infanrix hexa**

3. 6 months
   - **DTP** = **Infanrix hexa**

1. 18 months
   - **DTPa** = *Infanrix? or Tripacel?*

1. 4 years
   - **DTPa-IPV** = **Infanrix IPV**

1. Year 7-10* (12-16 years)
   - From 2016 only in year 7 (12-13 years)
   - **dTpa** = **Boostrix**

Funded on the NIP from 1st October 2015
4. Encourage people in regular contact with our baby to be vaccinated... more “Cocooning”

- All people in close contact with newborn babies
  - Other people who live in the house
  - Relatives eg: grandparents
  - Early childhood carers of children < 4 years of age
  - All healthcare workers

- Ideally 2 weeks prior to contact

- Every 10 years... But...
Vaccine Effectiveness in adolescents: *New data...*

- Matched case-control study during Washington pertussis epidemic
- 450 cases, 1246 controls
  - 5 childhood doses and an adolescent dose at 11-12 years

**VE 73%**

**VE 34%**
Summary: Pertussis Vaccination

Pregnancy: 3\textsuperscript{rd} trimester (and partners)
   Or if not given as soon as possible after birth
   Until baby is 6 months of age

1. 6 weeks (*8% less cases)
2. 4 months
3. 6 months

1. 18 months
   • funded from 1\textsuperscript{st} October 2015
2. 4 years

1. Year 7-10* (12-16 years)
   • From 2016 only in year 7 (12-13 years)

Every 10 years for special risk groups...

50 years of age... give dTpa instead of DT
Travellers ... give dTpa instead of DT
Thank you!

Please work together to protect our most vulnerable.