Is Australia the World Capital of pertussis?

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World - Land Area
World – Population
Global Immunization 1980-2009, DTP3 coverage

Global coverage at 82% in 2009

Source: WHO/UNICEF coverage estimates 1980-2009,
July 2010  Date of slide: 13 July 2010
Pertussis incidence rate by WHO region
World – Meat Exports
What is going on?
Changes impacting on pertussis in Australia since 1991

- **Vaccines**
  - Coverage
  - Schedule, Vaccine type

- **Diagnosis – tests and awareness**
  - Serology – 1990s
  - PCR – 2000+

- **Surveillance systems**
  - NNDSS
  - Laboratory notification
Australian Pertussis Schedule - 1975 onwards

- 1975
  - DTPw 3,4,5 mth + 15-18 mth booster
- 1978
  - 15-18 mth booster removed
- 1982
  - DTPw 2,4,6 mth
- 1985
  - 18 mth booster reintroduced
- 1994
  - DTPa at 18 mth + 4 yr
- 1997
  - 4-5 yr booster introduced
- 1999
  - DTPa for all doses
- 2003
  - dTpa 15-17 yr
  - 18 mth booster removed
DTP immunisation at 12 months: Australia 1989 to 2000

- All DTP doses:
  - 1989 (ABS): 55.1
  - 1995 (ABS): 82.7
  - 1998 (ACIR): 82.4
  - 2000 (ACIR): 89.3
  - 2008 (ACIR): 93

- No DTP doses:
  - 1989 (ABS): 20.4
  - 1995 (ABS): 3
  - 1998 (ACIR): 3
  - 2000 (ACIR): 3
  - 2008 (ACIR): 0
Measuring pertussis - diagnostic tests

- PCR
- Serology
- Clinical
- Culture
## Diagnostic tests

<table>
<thead>
<tr>
<th>TEST</th>
<th>Profile</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Culture</td>
<td>Insensitive; Highly specific</td>
<td>Unimmunised infants</td>
</tr>
<tr>
<td>PCR</td>
<td>More sensitive; Specific</td>
<td>All; &lt; 21 days</td>
</tr>
<tr>
<td>Serology</td>
<td>Most sensitive; Standardisation problematic</td>
<td>Not infants; &gt; 21 days</td>
</tr>
</tbody>
</table>
Trends in PCR use by age - NNDSS

<1 yr olds

1-10 yr olds

10+ yr olds

Proportion of notifications (%)

Year

Serology
PCR/NAT
Culture
Antigen detection

Serology
PCR/NAT
Culture
Antigen detection

Serology
PCR/NAT
Culture
Antigen detection

Serology
PCR/NAT
Culture
Antigen detection

Serology
PCR/NAT
Culture
Antigen detection

ncirs
NATIONAL CENTRE FOR IMMUNISATION RESEARCH & SURVEILLANCE
Notifications

Australian notification is highest internationally and has been since early 1990s
Pertussis notification rate, Australia 1995 to 2010, by age group
Proportion of notifications by age 1995 to 2010

The chart shows the proportion of notifications by age group from 1995 to 2010. The age groups are divided into 0-1 year, 1-4 years, 5-9 years, 10-19 years, 20-59 years, and ≥60 years.

The chart indicates that the highest proportion of notifications is for the <1 year age group, followed by the 1-4 year and 10-19 year age groups. The proportion of notifications decreases as age increases, with the proportion for the ≥60 years age group being the lowest.
Figure 5. Pertussis notification rates in infants 0-11 months of age, 1995–2010, Australia
Importance of disease severity

Notifications vs
Hospitalisations and Deaths
Hospitalisations
Hospitalisations coded as pertussis – Australia 1995 - 97

* Data to 30 June 2009 - rates have been annualised.
Hospitalisations coded as pertussis – Australia 1995 - 97

* Data to 30 June 2009 – rates have been annualised.
Incidence of hospitalisation in US infants by month of age and estimated vaccination coverage: 1993-2004

Cortese et al Pediatrics 2008; 121:484
Cumulative percentage of pertussis hospitalisation in infants aged <1 year, Australia, 1995 to July 2008
Deaths
Pertussis deaths
– routine national collections by country 1995-2004

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>Years</th>
<th>Total (&lt;6m)</th>
<th>Incidence (per 10^6)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>95-2003</td>
<td>15 (12)</td>
<td>0.8</td>
</tr>
<tr>
<td>US</td>
<td>95-2003</td>
<td>154 (140)</td>
<td>0.6</td>
</tr>
<tr>
<td>Netherlands</td>
<td>95-2003</td>
<td>8 (8)</td>
<td>0.5</td>
</tr>
<tr>
<td>UK</td>
<td>95-2003</td>
<td>50 (45)</td>
<td>0.9</td>
</tr>
<tr>
<td>Finland</td>
<td>95-2003</td>
<td>4 (4)</td>
<td>0.8</td>
</tr>
<tr>
<td>Sweden</td>
<td>97-2007</td>
<td>8 (6)</td>
<td>0.8</td>
</tr>
</tbody>
</table>

1. With thanks to Dr Jussi Mertsola (Finland), Dr Joop Shellekens (Netherlands), Dr Liz Miller (UK), Dr Shelley Deeks (Canada), Dr Trudy Murphy (US)
Age at death - pertussis
Australia 1967 to 2009 in 3 time periods (N=60)

<table>
<thead>
<tr>
<th>Year of death</th>
<th>0-2mths</th>
<th>3-11mths</th>
<th>1-2 yrs</th>
<th>&gt;80 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967-83 (17yrs)</td>
<td>10</td>
<td>11</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>1984-99 (16yrs)</td>
<td>13</td>
<td>5</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>2000-09 (10 yrs)</td>
<td>11</td>
<td>4</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

4.2 per million live births
US = 3.8 per million

Pertussis notification rates and deaths, 1995-2010  Australia
Deaths from pertussis under 12 months of age
Australia 1995 to 2009  N=25

- 0 to <1 months: 6
- 1 to <2 months: 12
- 2 to <3 months: 4
- 3 to <4 months: 1
DANA Elizabeth McCaffrey died in March 2009 at 4 weeks of age from Whooping cough (Pertussis).

Sadly, she is one of three babies that has died from this totally vaccine preventable disease in Australia this year.
9 May 2009

Call for review of Whooping Cough education and prevention

“I urge new parents, grandparents … who regularly care for infants under 12 months old to get vaccinated against whooping cough”

Mr Della Bosca raised the issue at the Australian Health Workforce Ministerial Council in Melbourne yesterday (8 May).

“parents and GPs are asked to bring the first dose forward to 6 weeks”
Timeliness of DTP1 immunisation, NSW, 2009

60% of doses before 8 weeks

% immunised

Month received DTP1

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec

Media release

<6 weeks  6–<8 weeks  8–<9 weeks  >9 weeks
Is Australia the World Capital of pertussis?
Re-introduction of pertussis vaccination – the Swedish experience

Fig. 2. Age-specific incidence of laboratory-confirmed pertussis in Sweden during 10 calendar years before and 11 calendar years after introduction of pertussis vaccination (using aP-containing vaccines) into the general vaccination programme in 1996 (mean incidence rates per 100,000 population 1986–1995 and 1997–2007). An enlarged version of the bar chart for the age groups 10 years and above is shown in the insert [2].

1. Carlsson and Trollfors Vaccine 2009
Acknowledgements

- NCIRS surveillance staff
  - Helen Quinn  Epidemiologist
  - Han Wang Statistician
- CDNA – NNDSS data
- AIHW & ABS – Hospitalisation and death data
- Medicare Australia – ACIR data
- Department of Health and Ageing