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# **Pertussis Cocooning: The Concept, Experiences, and Lessons Learned**

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# Pertussis

- Highly contagious respiratory illness
- Characterized by persistent, violent coughing
- Poorly controlled despite immunization efforts
- Particularly dangerous for infants
  - Higher rates of infection
  - More than ½ hospitalized
  - 1 in 100 dies



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# Pertussis Immunization

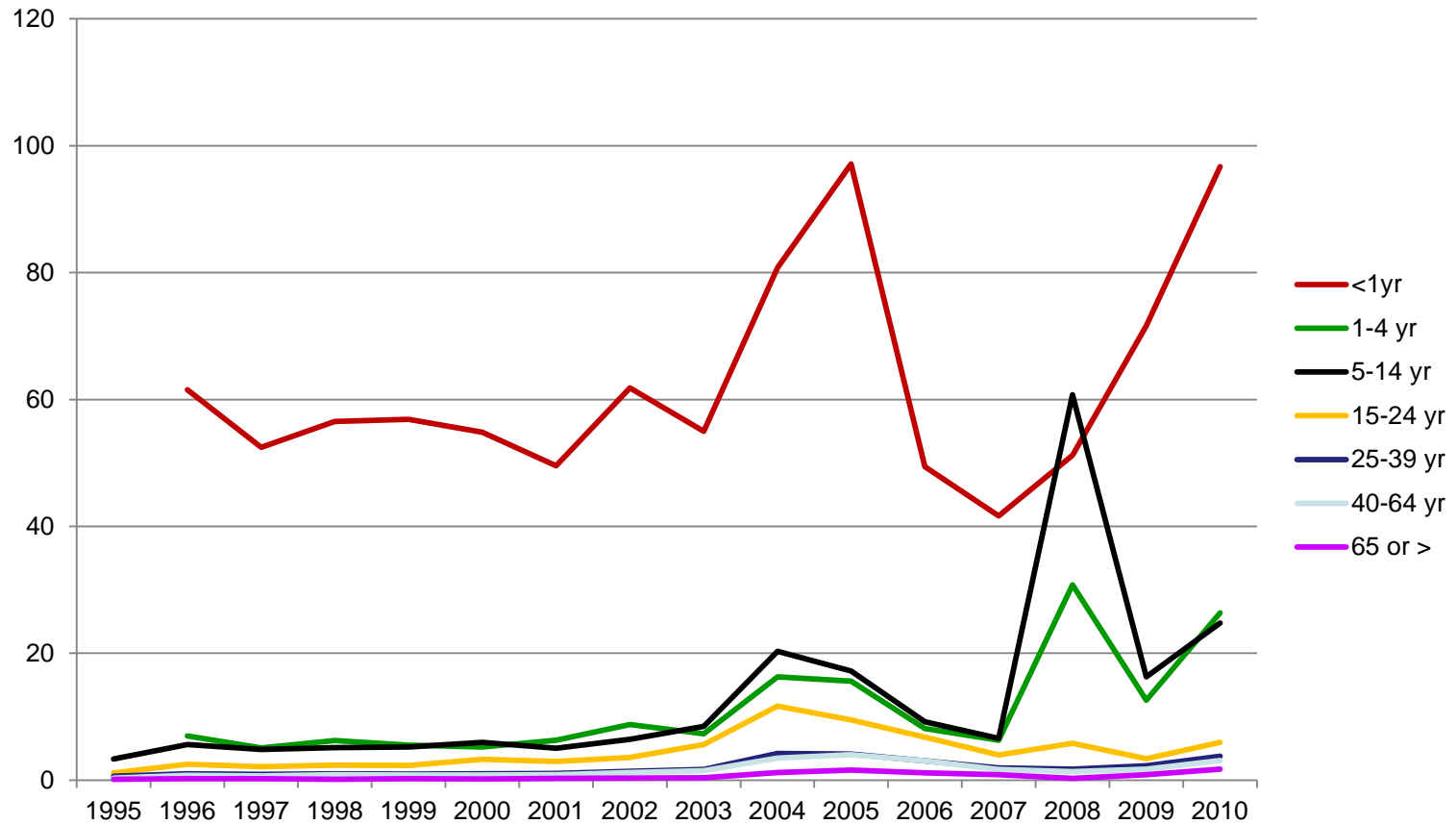
- **DTaP** (higher concentrations of diphtheria & pertussis components)
  - 2,4,6,15-18 months
  - Booster at school entry
- **Tdap**
  - Adolescents, age 11-12 years
  - All adults (one time only)
  - Pregnant women, after 20 weeks gestation



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# Higher Incidence Among Infants

## Pertussis Incidence, by Year and Age Group



Source: Data from U.S. Centers for Disease Control and Prevention, annual Summary of Notifiable Diseases reports



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# The Cocoon Concept

- Protect infants by immunizing close contacts
- Global Pertussis Initiative – 2001 – focus on infant caregivers and close contacts
- ACIP – 2006 – Endorsed concept, recommended implementation in U.S.
- **Strategy**: Immunize caregivers & close contacts within prenatal period or few weeks following birth (*not* pregnant women); immunize mothers in post-partum period



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# Implementation of Cocooning

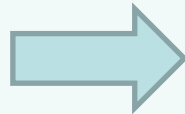
- KDHE pilot project in 2010, several other published reports
- Subsequent expansion of KDHE efforts – results pending
- Focus on post-partum period in hospital setting, prior to discharge
- Most achieved good rates (80% + ) of immunization of mothers
- Immunization rates for fathers, caregivers substantially lower



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# KDHE Pilot Project

4 Hospitals,  
**248 Births**



## Post-partum Women

**208** vaccinated  
(83.9%)

## Primary Caregivers

**42** vaccinated  
(16.9%)



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# Challenges to Hospital-based Cocooning Programs

- Immunization of mothers
  - Reimbursement for vaccine & admin
- Immunization of caregivers
  - Not hospital patients
    - Registration, reimbursement
    - Physician's orders
    - Medical record
  - Low follow-up rates for referrals to LHD with vouchers for immunization





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# Limitations of the Cocooning Approach

- Antibody levels peak 14 days after immunization
  - Post-partum immunization = 2+ weeks of infant vulnerability
- Challenges with caregiver immunization
- Inefficient approach
- Immunizing only postpartum mothers failed to reduce infant pertussis (*Castagnini, 2012*)



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# Limitations of the Cocooning Approach

- Immunizing only postpartum mothers failed to reduce rates of pertussis in infants up to 6 months of age *(Castagnini, 2012)*
- Would need to immunize more than 1 million parents would to prevent 1 infant death from pertussis *(Skowronski, 2012)*



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# Evolving Research Findings

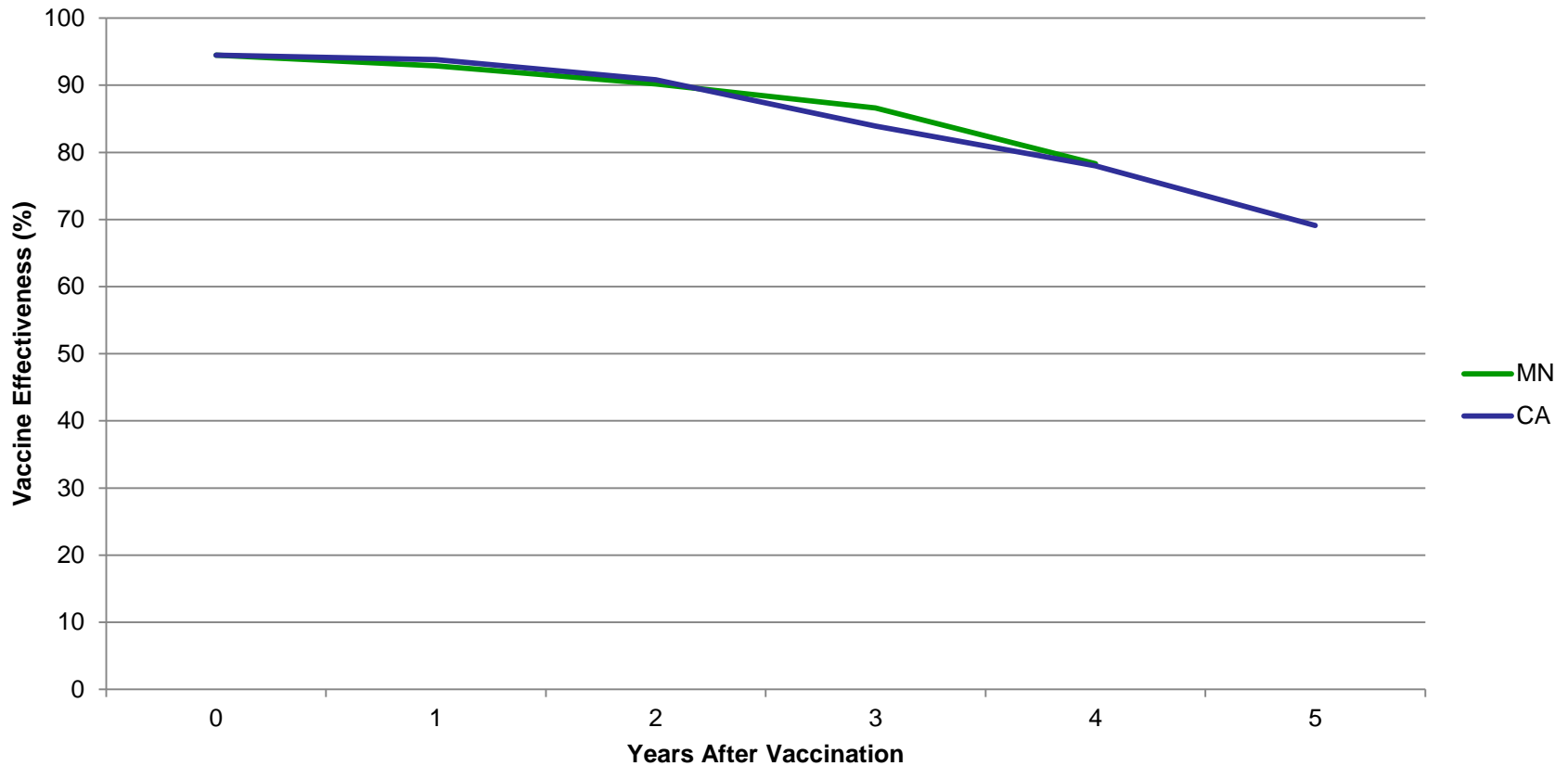
- Waning immunity following Tdap
- Safety of Tdap administration during pregnancy
- Transplacental transport of maternal antibodies to fetus following Tdap administration



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# Waning Immunity

## Waning DTaP Effectiveness Each Year After Vaccination



Source: Clark, T. Pertussis Epidemiology and Vaccination in the United States, August 2011)

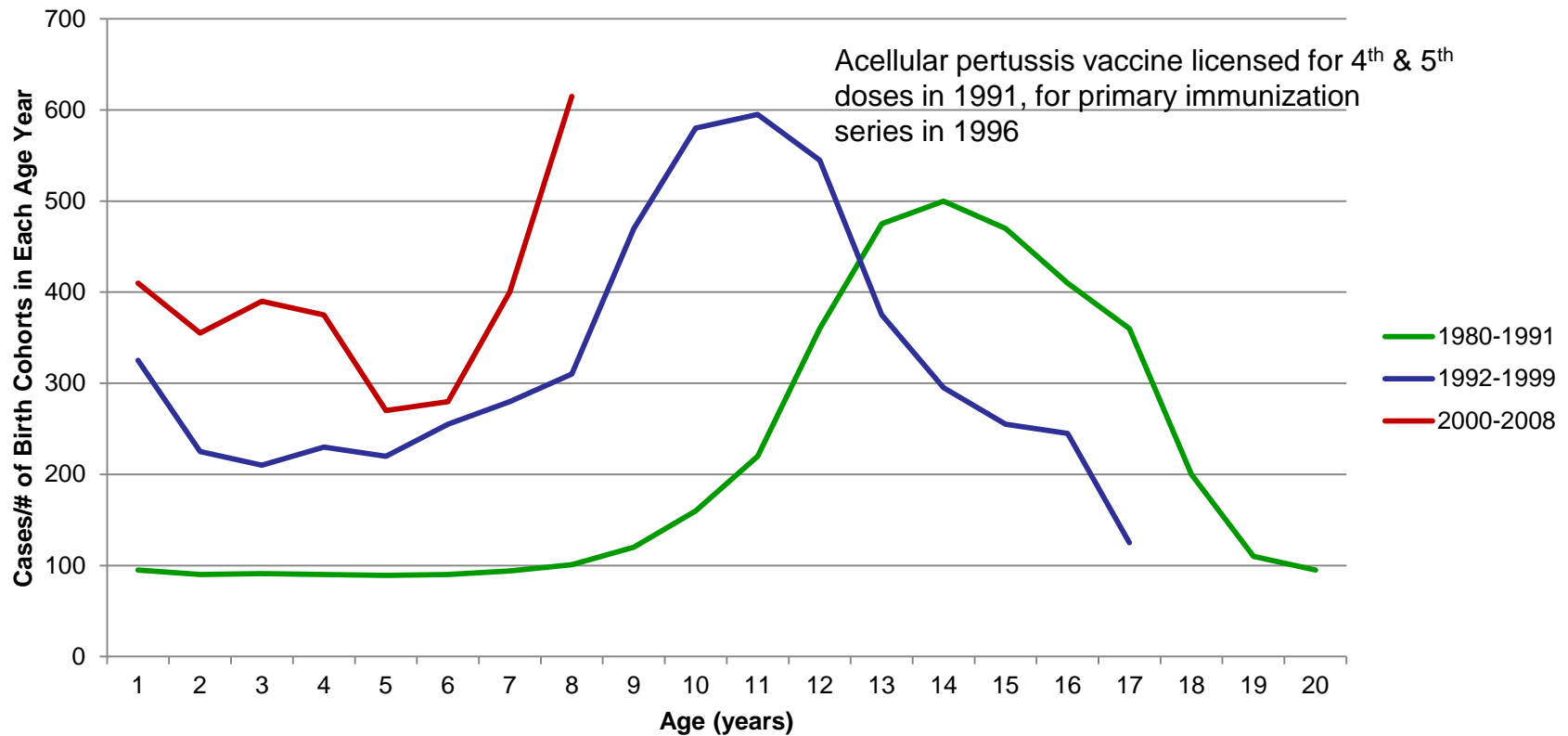


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# Waning Immunity

## Waning Immunity by Vaccine Type

Mean Annual Pertussis Cases by Birth Cohort





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# Evolving ACIP Recommendations

Date	Recommendation
January 2011	Tdap for 1) children aged 7-10 not fully immunized, 2) adolescents 11-18 and 3) Adults 65+ in close contact with infants
June 2011	Tdap to pregnant women <u>who have not previously received</u> the vaccine, preferably after 20 weeks gestation
June 2012	Single dose of Tdap for all adults, age 19+ who have not yet received
October 2012	Tdap to <u>all</u> pregnant women, during each pregnancy, regardless of prior immunization status. If not received during pregnancy, administer immediately postpartum



# Conclusions

- “Cocooning alone is an insufficient strategy to prevent pertussis morbidity and mortality in infants.” (ACIP, 2011)
- “Cocooning is expensive and logistically complicated and does not directly benefit the infant, whereas maternal immunization results in the reduction of disease in women and potentially better protection of infants through antibodies directly acquired from the mother.” (Munoz F & Englund J, *Clinical Infectious Diseases*, 2011; 53(9): 893-896)



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- “Greater reductions in [infant] pertussis hospitalizations would be achieved if parents are immunized  $\geq 2$  weeks prior to delivery than after delivery or the 2-week newborn visit.” (Peters et al, *Vaccine* 2012; 30(37):5527-32.)





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# Conclusions

- All pregnant women should receive Tdap during each pregnancy, regardless of previous immunization. If not, then give immediately postpartum.
- Family and caregiver immunization should also be encouraged during pre-natal period.
- To improve herd immunity - Adolescent booster, single dose of Tdap to all adults who have not previously received



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# Possible IKK Roles

- Encourage providers to administer Tdap to pregnant women
- Encourage providers to promote and offer Tdap to expectant fathers and other caregivers prior to birth of the infant
- Promote Tdap through prenatal educational venues
- Encourage providers to offer adults Tdap in lieu of TD boosters



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