Global Overview of Hepatitis A Vaccination Programs:
Prevention Effectiveness

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Outline

• Background
  – Hepatitis A vaccines
  – Control and prevention strategies
• Importance of childhood vaccination
• Global overview of hepatitis A vaccination programs
• Summary
Hepatitis A Vaccines

• Available since early 1990’s

• Four inactivated hepatitis A vaccines available worldwide
  – Safe
  – Effective
  – Long lasting protection *

Hepatitis A Vaccines
Control and Prevention Strategies

• Population groups at increased risk (e.g., international travelers, injection drug users)
• “Mass vaccination”
  – Routine infant/childhood
  – Outbreaks
Hepatitis A Vaccines
Control and Prevention Strategies

• Population groups at increased risk (e.g., international travelers, injection drug users)

• “Mass vaccination”
  – Routine infant/childhood
  – Outbreaks
Reasons to Vaccinate Children

- Generally have the highest disease and infection rates
- Herd immunity results in benefits outside of vaccinated cohorts
- Eventually results in immunity in entire population as vaccinated cohorts age
## Selected Countries with Routine Childhood Hepatitis A Vaccination Programs; 2007

<table>
<thead>
<tr>
<th>Country</th>
<th>Target Ages</th>
<th>Year Begun</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zhejiang Province, China</td>
<td>1-15 years</td>
<td>1992</td>
<td>Single dose live attenuated vaccine</td>
</tr>
<tr>
<td>North Queensland, Australia</td>
<td>18 months; catch-up to age 6 years</td>
<td>1999</td>
<td>Indigenous population</td>
</tr>
<tr>
<td>United States</td>
<td>2-18 (regional)</td>
<td>1999</td>
<td>2006 - national (12 months)</td>
</tr>
<tr>
<td>Puglia Region, Italy</td>
<td>15 months 12 years</td>
<td>1997</td>
<td>A/B vaccine for adolescents</td>
</tr>
<tr>
<td>Israel</td>
<td>18 months</td>
<td>1999</td>
<td>Two dose</td>
</tr>
<tr>
<td>Argentina</td>
<td>12 months</td>
<td>2005</td>
<td>Single dose</td>
</tr>
<tr>
<td>Minsk, Belarus</td>
<td>6 years</td>
<td>2003</td>
<td>Single dose</td>
</tr>
</tbody>
</table>
China: Hepatitis A Vaccination of Children

- Shengsi County and Jiaojiang City, Zhejiang Province, China
- Begun as demonstration project in 1992
- Initial vaccination of children ages 1-15 years
- Subsequent ongoing vaccination of each new cohort
- Single dose live attenuated vaccine (ZhePu)
- Estimated coverage 85%-91%

Reported Hepatitis A Cases among Children < 16 years and Hepatitis A Vaccine Coverage, Shengsi County and Jiaojiang City, Zhejiang Province, China (1983 to 2002)

Australia: Childhood Hepatitis A Vaccination Program in Queensland

• Two large outbreaks in 1991 and 1998
• Program begun in 1999
• Disproportionate number among indigenous children
• Two doses (18 month; 2 years)
• Routine childhood immunization

Australia: Childhood Hepatitis A Vaccination Program in Queensland

Number of cases in 2000-2003: 12 fold reduction since 1996-1999

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<tbody>
<tr>
<td></td>
<td>&lt; 5 years</td>
<td>&gt; 5 years</td>
</tr>
<tr>
<td>Indigenous</td>
<td>41 cases</td>
<td>196 cases</td>
</tr>
<tr>
<td>Non indigenous</td>
<td>33 cases</td>
<td>517 cases</td>
</tr>
</tbody>
</table>
Israel: Childhood Hepatitis A Vaccination Program

• July 1999

• Vaccination of all 18 month old children

• Vaccine provided free of charge, as part of regular immunization program

• Estimated first dose coverage in vaccinated cohorts – 90%; second dose – 85%

Source: Dagan et al, JAMA 2005
Hepatitis A Incidence, by Age and Population Group, Israel, 1993-2004

1-4 years

5-9 years

10-14 years

15-44 years

Source: Dagan et al, JAMA 2005
Argentina: Childhood Hepatitis A Vaccination Program

- Universal single-dose hepatitis A immunization program
- June 2005
- Children aged 12 months
- Most vaccines provided free of charge
- Vaccine coverage 95% in 2006

Source: Vacchino et al, J Viral Hepat. 2008
Reported Incidence and Number of Hepatitis A Cases, Argentina, 1995-2007

Source: Vacchino et al, J Viral Hepat. 2008
Hepatitis A incidence by age groups, Argentina, 1998-2002 (baseline) and 2007

Source: Vacchino et al, J Viral Hepat. 2008
Italy: Childhood Hepatitis A Vaccination Program in Puglia region

- Begun in 1998 after a large outbreak
- Vaccine offered free of charge to children 15-18 months, adolescents – 12 years old
- Until 2002, combined Hepatitis A/B vaccine
- Since 2003 only hepatitis A
- Coverage < 20% in toddlers; 65% in adolescents

Source: Lopalco, et al. EID 2008
Vaccination coverage and incidence of hepatitis A in Puglia region and Italy, 1998-2006

Source: Lopalco, et al EID 2008
Belarus: Childhood Hepatitis A Vaccination Program in Minsk city

- Universal hepatitis A vaccination
- Begun in 2003
- Children aged 6 year (school entry age)
- Coverage: 98.6% of 6-9 year age cohort

Source: Fisenka et al, Vaccine 2008
Hepatitis A Incidence in 6 Year Old Children and Vaccine Coverage, Minks, Belarus, 2000-2006

Source: Fisenka et al, Vaccine 2008
Hepatitis A Incidence Rate by Age Group Before and After Vaccination Program Implementation, Minsk, Belarus, 2000-2006
### Hepatitis A incidence in vaccinated and non-vaccinated children aged 1-17 years, 2003-2006

<table>
<thead>
<tr>
<th></th>
<th>n</th>
<th>Hepatitis A cases</th>
<th>Incidence (per 10000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccinated</td>
<td>65 171</td>
<td>2</td>
<td>0.31</td>
</tr>
<tr>
<td>Non-vaccinated</td>
<td>210 900</td>
<td>131</td>
<td>6.2</td>
</tr>
</tbody>
</table>

Source: Fisenka et al, Vaccine 2008
United States: Incremental Recommendations for Hepatitis A Vaccination of Children
Advisory Committee on Immunization Practices (ACIP)

- 1996
  - Children living in communities with the highest disease rates
  - Persons at high risk for infection

- 1999
  - Children living in states and communities with consistently elevated rates during “baseline period”
  - 17 primarily Western and Southwestern states
  - Approximately one third of US population

- 2006
  - Nationwide
  - 12-23 month old cohort
ACIP 1996 Recommendations

FIGURE 1. Rates* of reported hepatitis A cases, by race/ethnicity — United States, 1994

*Per 100,000 population.

1999 ACIP Recommendations
for Statewide Routine Hepatitis A Vaccination of Children*

* Based on average incidence rate during baseline period (1987-97)
Hepatitis A Vaccine Coverage (≥1 dose) among 24-35 Month Old Children, National Immunization Survey (NIS), United States, 2005

Coverage range among 11 states: 13-71%

Coverage range among 6 states: 2-57%

Source: CDC, MMWR. 2007 Jul 13;56(27):678-81
Hepatitis A Vaccination Coverage Among Adults Aged 18–49 Years in the United States by age groups, NIS-Adult 2007

12.1% adults aged 18-49 had ≥ 2 doses

Source: Peng-jun Lu et al, Hepatitis A vaccination coverage among adults aged 18–49 years in the United States, Vaccine 27 (2009) 1301–1305
Hepatitis A Incidence*, United States, 1980-2006

* - per 100000 population

Hepatitis A incidence based on passive reporting – All ages

1987–1997

2007

*Per 100,000 population

Rate*
- 0 – 4
- 5 – 9
- 10 – 19
- ≥ 20

*Per 100,000 population

NNDSS, CDC unpublished
Medstat MarketScan Database

Comparing baseline (1996-97) to 2004, statistically significant declines:

- Hospitalizations – 69%
- Ambulatory visits – 42%

Adjusted to US population, medical expenditures for hospitalizations and ambulatory visits declined:

- 68% reduction
- $29.1 million (baseline) to $9.3 million (2004)

Age-Adjusted Hepatitis A Mortality Rates, United States, 1990-2004

Source: Vogt et al; JID in press

32%
ACIP 2006 Recommendations

• Implement routine nationwide hepatitis A vaccination
  – Vaccine licensed for use in children 12-23 months old

• Make existing childhood vaccination programs sustainable

• Integrate the vaccine into routine childhood vaccination program
Current ACIP recommendations for Hepatitis A vaccination

- Children at age 1 year (i.e. 12-23 months)
- Persons at high risk for infection:
  - Traveling to or working in countries with high or intermediate endemicity
  - MSM
  - Persons who use injection and/or noninjection drugs
  - Persons who have occupational risk for infection
  - Persons with clotting-factor disorder
  - Persons with chronic liver disease
  - Non traveling contacts of international adoptees
Impact of Childhood Hepatitis A Vaccination Programs Summary

• Results indicate considerable public health impact
  – Effective in protecting vaccinated individuals
  – Reduction of hepatitis A incidence with modest vaccination coverage
  – Evidence of considerable herd immunity among unvaccinated children and adults
Current Issues

• International cooperation
  – recommendations for countries considering implementing programs

• Better surveillance and disease burden data
  – increase in the number of susceptible persons due to epidemiological shift

• Vaccination strategies
  – level of endemicity, socio-economic development and sanitation, and the risk of outbreaks, vaccine costs and cost-effectiveness analyses
Thank you!