NJDHSS Smallpox Vaccination Preparedness: Vaccine Education

NJHA - January 10, 2003
• Background
  – Clinical and epidemiologic overview
  – Public health response and management
• Vaccine information
  – Contraindications
  – Expected and adverse events
  – Medical management
  – Risks v. benefits
Background

• Last naturally-acquired case: October 1977, Somalia
• Last case: laboratory exposure, 1978
• Global eradication 1979 (WHO)
• No cases identified since
Smallpox

- Infection with variola virus (Orthopoxvirus)
- Systemic disease with sudden onset
  - Fever, malaise, headache, prostration, severe backache, abdominal pain, vomiting
- After 2-4 days: fever decreases, deep-seated rash
Characteristic Rash

- Centrifugal distribution
- Same stage development
- Progression:
  - *Macules* (flat red lesions) →
  - *Pustules* (pus-filled) →
  - *Crusts* (in second week) →
  - *Scabs* (3-4 weeks)
Transmission and Incubation

- Transmission: person-to-person
- Incubation: 12 days (range: 7 to 17 days) following exposure
Period of Communicability

• Most contagious: first week illness (pre-eruptive period)
  – Sores in oropharyngeal area
  – Virus to saliva
  – Aerosol droplets

• Not infectious: after scabs fall off, 3-4 weeks after onset of rash
Prognosis

• Majority of cases recover
• Case-fatality rate: up to 30%
Treatment

- No proven treatment
- On-going research for new antiviral agents
- Supportive therapy
Differential Diagnoses

- Varicella
- Disseminated herpes zoster
- Impetigo
- Drug eruptions
- Contact dermatitis
- Erythema multiforme

- Enteroviral infection
- Disseminated herpes simplex
- Scabies; insect bites
- Molluscum contagiosum
Chickenpox (Varicella)

- Primary infection with varicella-zoster virus
- Dormant in body for life
Shingles (Herpes Zoster)

- Reactivation of dormant varicella-zoster virus
<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Smallpox</th>
<th>Chickenpox (varicella)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Febrile prodrome</td>
<td>Severe, 1-4 days before rash; systemic complaints</td>
<td>Rare in children; older children and adults may have mild fever, malaise 1-2 days before rash</td>
</tr>
<tr>
<td>Appearance lesions</td>
<td>Hard/firm, well-circumscribed pustules; may become confluent, umbilicated</td>
<td>Superficial vesicles, surrounding erythema</td>
</tr>
<tr>
<td>Stage of lesions</td>
<td>All in same stage on any part of body</td>
<td>Different stages (within 24 hours rash onset → papules, vesicles, crusts)</td>
</tr>
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<td>-----------------</td>
<td>----------------------------------------------------</td>
<td>---------------------------------------------</td>
</tr>
<tr>
<td>Distribution</td>
<td>Centrifugal (face and extremities; fewer lesions on trunk)</td>
<td>Centripetal (trunk; fewer lesions on extremities, face and scalp)</td>
</tr>
<tr>
<td>Initial lesions</td>
<td>Oral mucosa, face, forearms</td>
<td>Face and trunk</td>
</tr>
<tr>
<td>Oral lesions</td>
<td>Yes-- early on</td>
<td>May occur</td>
</tr>
<tr>
<td>Severity illness</td>
<td>Very ill; toxic</td>
<td>Most not severe; rarely critically ill unless complications develop</td>
</tr>
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</table>
## Differentiating smallpox (variola) from chickenpox (varicella)

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<tr>
<td>Rate evolution rash</td>
<td>Slow; each stage 1-2 days</td>
<td>Rapid; macules → papules → crusts in &lt;24 hours</td>
</tr>
<tr>
<td>Lesions on palms or soles</td>
<td>In majority cases</td>
<td>Rare</td>
</tr>
<tr>
<td>Hemorrhagic lesions</td>
<td>In highly lethal variant</td>
<td>Can occur</td>
</tr>
<tr>
<td>Exposure to varicella or herpes zoster</td>
<td>N/A</td>
<td>50-80% cases aware of exposure 10-21 days before rash onset</td>
</tr>
<tr>
<td>History of prior chickenpox</td>
<td>N/A</td>
<td>Second cases very rare-- makes varicella less likely</td>
</tr>
</tbody>
</table>
*Chickenpox (Varicella)*

Centripetal distribution
- Trunk concentration
- Frequently on face and scalp
- Fewer on extremities
- Rarely palms and soles
Smallpox (Variola)

Centrifugal distribution

• Face, extremities concentration
• Fewer on trunk
• Palms and soles
Public Health Response

• One suspected case = public health emergency
• Surveillance
  – Detection
  – Diagnosis
  – Prevention
Public Health Management

• Report immediately to state/local health department
  – Isolation
  – Laboratory specimen collection
• State HD evaluates case
• If high risk, state HD only contacts CDC (770-488-7100)
EVALUATING PATIENTS FOR SMALLPOX:
ACUTE, GENERALIZED, VESICULAR OR PUSTULAR RASH ILLNESS PROTOCOL
(adapted from CDC websites, http://www.cdc.gov/nip/smallpox and http://www.bt.cdc.gov/EmContact/index.asp)

Febrile Prodrome*

Yes

AND Major Smallpox Criteria (see below)

Classic Smallpox Lesions†

AND Lesions in same stage of development‡

HIGH RISK of Smallpox

REPORT IMMEDIATELY (see Notification Protocol)

No

AND ≥ 4 of the Minor Smallpox Criteria (see box lower right)

CLASSIC SMALLPOX LESIONS

AND Lesions in same stage of development‡

MODERATE RISK of Smallpox

LOW RISK of smallpox

Manager patient as clinically indicated

AND < 4 of the Minor Smallpox Criteria (see box lower right)

Minor Smallpox Criteria:

• Centrifugal distribution: greatest concentration of lesions on face and distal extremities

• First lesions on oral mucosa/palate, face or forearms

• Patient appears toxic or moribund

• Slow evolution: lesions evolve from macules to papules → papules over days (each stage lasts 1-2 days)

• Lesions on palms and soles

Major Smallpox Criteria

*Febrile prodrome: 1-4 days before rash onset; fever ≥101°F and at least one of the following: prostration, headache, backache, chills, vomiting, or severe abdominal pain

†Classic smallpox lesions: deep-seated, firm/hard, round well-circumscribed vesicles or pustules; as they evolve, lesions may become umbilicated or confluent

‡Lesions in same stage of development: on any one part of the body (e.g., face or arm) all the lesions are in the same stage of development (i.e., all are vesicles or all are pustules

09/02 Bioterrorism Surveillance Unit, NJDHSS
Public Health Management

• Isolation of those with disease
• Vaccination of contacts
Isolation Precautions

- Private, negative airflow room (airborne infection isolation)
- Door closed all times
- Staff and visitors should wear respirators, gloves and gowns
- Patient should wear surgical mask outside of isolation room; gowned and wrapped to fully cover rash
Smallpox Vaccine

- Vaccinia virus, not variola virus
- "Live"
- Low potential for spread to non-immune contacts
- Highly effective
- Generally safe
Smallpox Vaccine: Background

- **1960s**: vaccination programs and quarantine regulations → risk for smallpox importation reduced
- **1972**: vaccination in U.S. ended
- **1983**: distribution to civilian population discontinued
- **1990**: military vaccination ceased
Length of Protection

- High level immunity 3 – 5 years, decreasing afterwards
- Revaccination → longer immunity
- Effective in prevention: 95% vaccinated
Benefit of Vaccine Following Exposure

- Within 3 days– prevent or significantly lessen severity of symptoms
- 4 – 7 days after exposure– some protection, may modify severity
Post-Vaccination Care

- Cover site loosely with gauze bandage, using medical tape
- Change bandage Q 1 – 2 days
- Wash hands after direct contact with bandage or site
- Keep site dry
- Put bandage in sealed plastic bag
- Wash clothing or other material
- Throw away scab
Contraindications
(Vaccinees Only)

- Are allergic to vaccine or ingredients
- Are younger than 12 months
- Children <18 years, non-emergency use
- Moderate or severe short-term illness
- Current breastfeeding
Contraindications (Both Vaccinees and Household Contacts)

- Eczema or atopic dermatitis
- Skin conditions—burns, chickenpox, shingles, impetigo, herpes, severe acne, psoriasis
Contraindications (Both Vaccinees and Household Contacts)

• Weakened immune system
• Pregnancy or plans to become
Screening

- HIV
- Pregnancy testing
REMEMBER: There are no contraindications to the smallpox vaccine if someone has been exposed to the smallpox virus!
Adverse Reactions

- Adverse reactions usually benign but alarming in appearance
- Serious and treatable reactions
- Life-threatening reactions
- Fatal reactions
Local Reactions

- Swelling and tenderness of lymph nodes, 3-10 days after; persist up to 2–4 weeks
- Normal variants
- 36% adult primary vaccinees—“sufficiently ill”
Normal Variant: Satellite Lesion
Normal Variant: Lymphangitis
Normal Variant: Edema
Normal Variant: Viral Cellulitis
Systemic Reactions

- Fever
- Malaise
- Soreness at vaccination site
- Myalgia
- Local lymphadenopathy
- Erythematous, urticarial rashes in 1 per 3,700 vaccinated
Inadvertent Inoculation

• Transfer of vaccinia from primary site
• Most frequent complication: 529 per million primary vaccinees
• Most lesions heal without specific treatment
Generalized Vaccinia

- Vesicles, pustules on normal skin distant from vaccination site
- 242 per million primary vaccinees
- Vaccinia viremia
- Self-limited, supportive therapy
Eczema Vaccinatum

- Localized or systemic
- 10-39 per million primary vaccinees
- Autoinoculation
- Eczema, atopic dermatitis → increased risk
- Hospitalization, VIG
Vaccinia Keratitis

- Lesions of cornea, accidental implantation
- Potentially threatening to eyesight
- 10 days after transfer virus
- Untreated → corneal scarring
- Topical antiviral agents
Progressive Vaccinia

- Vaccinia necrosum → progressive necrosis in area of vaccination, often with metastatic lesions
- 1 – 2 per million primary vaccinees
- Prompt hospitalization, VIG
- No proven antiviral therapy
Post-Vaccinial Encephalitis

- 3 – 12 per million primary vaccinees
- ? Autoimmune, allergic v. viral
- 15-25% affected die
- 25% develop permanent neurological sequelae
- No specific therapy
- VIG not effective, not recommended
Fetal Vaccinia

• Rare
• < 50 cases reported; usually after primary vaccination of mother in early pregnancy
• Usually results in stillbirth or infant death soon after delivery
• No known congenital malformations
Death

- Rare
- 1 – 2 primary vaccinees per million
- Most often result of postvaccinial encephalitis or progressive vaccinia
Medical Management

• Vaccine immune globulin (VIG)
• Cidofovir

IND protocol
Benefits

• Best protection if exposed to smallpox virus
• Prevent or lessen severity of symptoms
Risks

Per 1 million primary vaccinees:
- 1,000 serious reactions
- 14 – 52 potentially life-threatening reactions
- 1 – 2 deaths
Risks v. Benefits?

• Decision lies in the volunteer
Additional Resources

