

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**

Differentiating smallpox (variola) from chickenpox (varicella)

Characteristic	Smallpox	Chickenpox (varicella)
Febrile prodrome	Severe, 1-4 days before rash; systemic complaints	Rare in children; older children and adults may have mild fever, malaise 1-2 days before rash
Appearance lesions	Hard/firm, well-circumscribed pustules; may become confluent, umbilicated	Superficial vesicles, surrounding erythema
Stage of lesions	All in same stage on any part of body	Different stages (within 24 hours rash onset → papules, vesicles, crusts)

Differentiating smallpox (variola) from chickenpox (varicella)

Characteristic	Smallpox	Chickenpox (varicella)
Distribution	Centrifugal (face and extremities; fewer lesions on trunk)	Centripetal (trunk; fewer lesions on extremities, face and scalp)
Initial lesions	Oral mucosa, face, forearms	Face and trunk
Oral lesions	Yes-- early on	May occur
Severity illness	Very ill; toxic	Most not severe; rarely critically ill unless complications develop

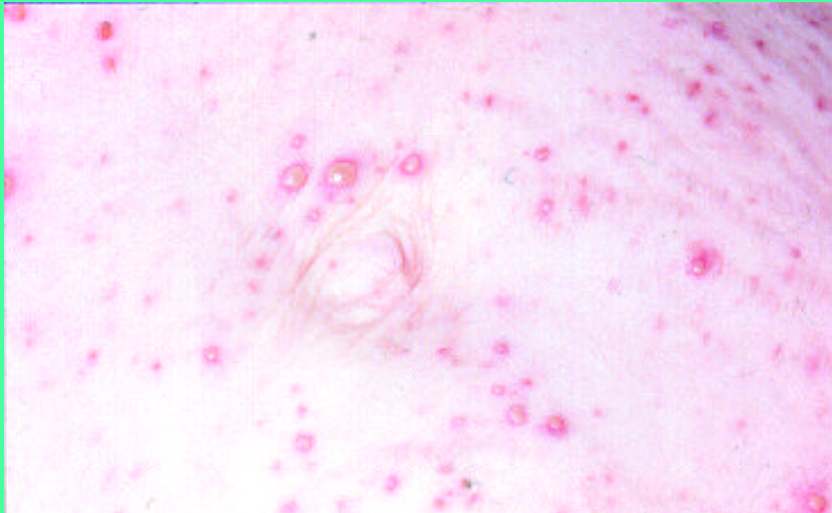
Differentiating smallpox (variola) from chickenpox (varicella)

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

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**

















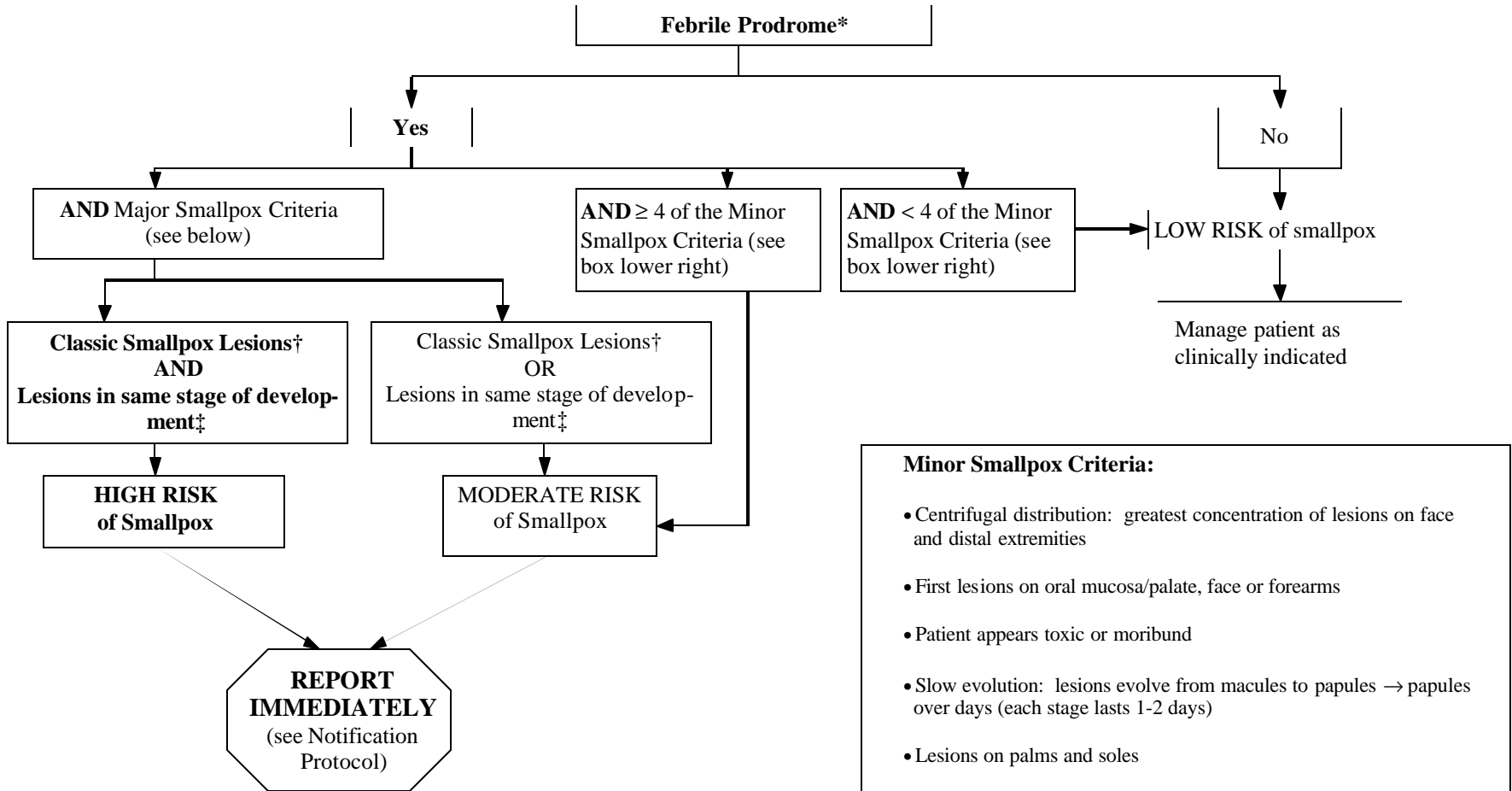
Public Health Response

- **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>)



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 $\geq 101^{\circ}\text{F}$ 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)

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”**



Day 4 (8-13-02)



Day 6 (8-15-02)



Day 8 (8-17-02)

Normal Variant: Satellite Lesion



Normal Variant: Lymphangitis



Source: NEJM

Normal Variant: Edema



Source: NIH

Normal Variant: Viral Cellulitis



Source: NIH

Systemic Reactions

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



Source: V. Fulginiti MD



Source: V. Fulginiti MD

Inadvertent Inoculation

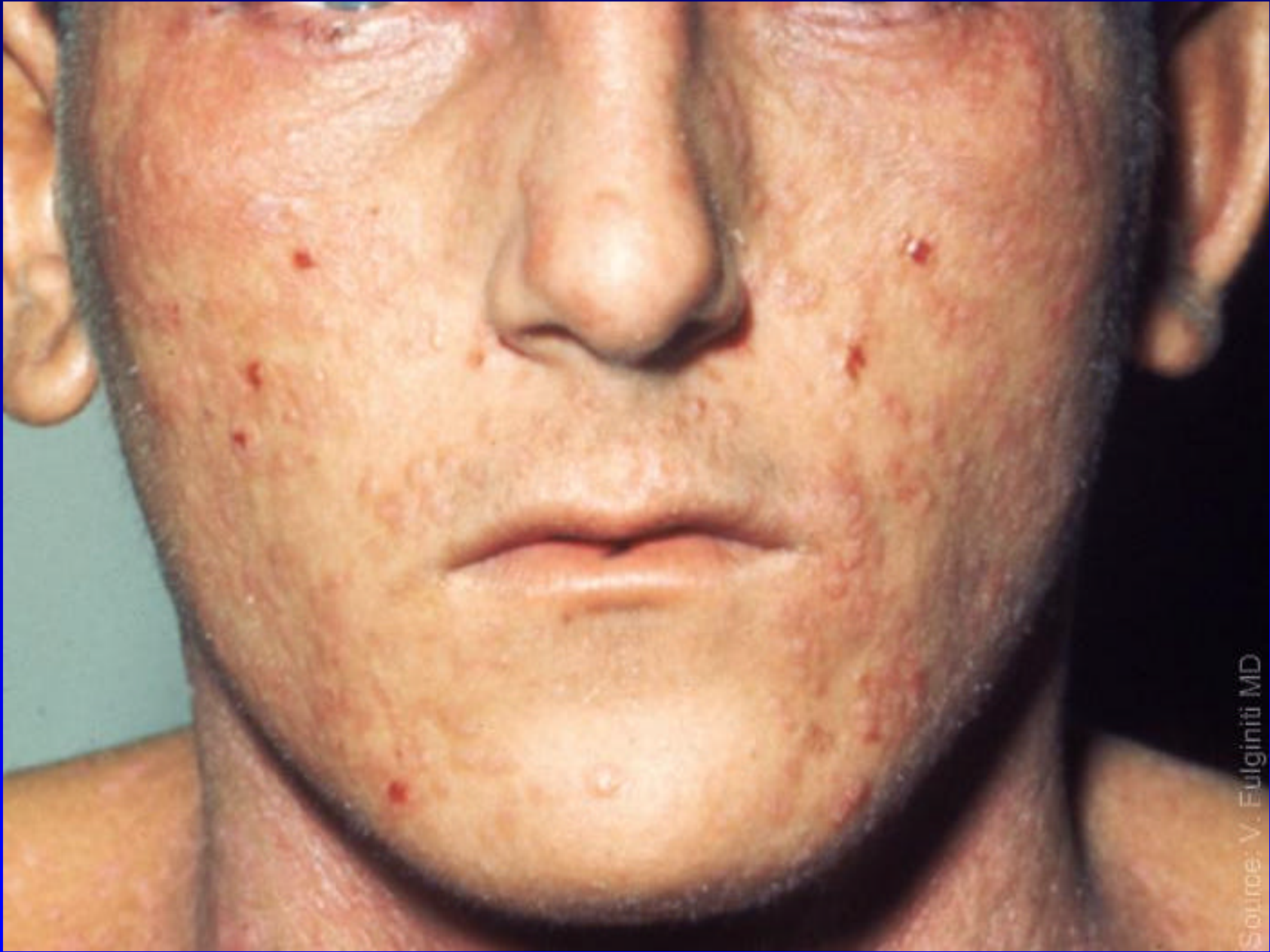
- **Transfer of vaccinia from primary site**
- **Most frequent complication: 529 per million primary vaccinees**
- **Most lesions heal without specific treatment**



Source: V. Fulginiti, MD.



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Generalized Vaccinia

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



Source: CDC

Eczema Vaccinatum

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



Source: H. Kempe MD



Source: CDC

Vaccinia Keratitis

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



Source: V. Fulginiti MD

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**



Source: V. Fulginiti MD

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

[http://www.bt.cdc.gov/agent/smallpox/
index.asp](http://www.bt.cdc.gov/agent/smallpox/index.asp)

[http://www.bt.cdc.gov/agent/smallpox/
reference/resource-kit.asp](http://www.bt.cdc.gov/agent/smallpox/reference/resource-kit.asp)

