

# Vaccination Strategies to Contain a Smallpox Outbreak

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# Public Health Factors in Choosing a Vaccination Strategy

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- ï Vaccine Supply
- ï Extent of Outbreak
- ï Risk and acceptability of vaccine-related adverse events

# Eradication Strategy of the 1970s

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- ï Vaccination of close contacts of cases
- ï Occasionally supplemented with broader campaigns
- ï Vaccine was readily available

# Smallpox Realities in 2002

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- ï No cases of smallpox
- ï Threat unknown
- ï Susceptible population
- ï Many people at risk for adverse events from vaccination
- ï Limited vaccine supplies

# Smallpox (vaccinia) Vaccine

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- Calf lymph with seed virus derived from NYCBOH strain
- Contains trace amounts of polymyxin B, streptomycin, chlortetracycline and neomycin
- Multiple puncture technique with bifurcated needle

# Smallpox Vaccine Stockpile

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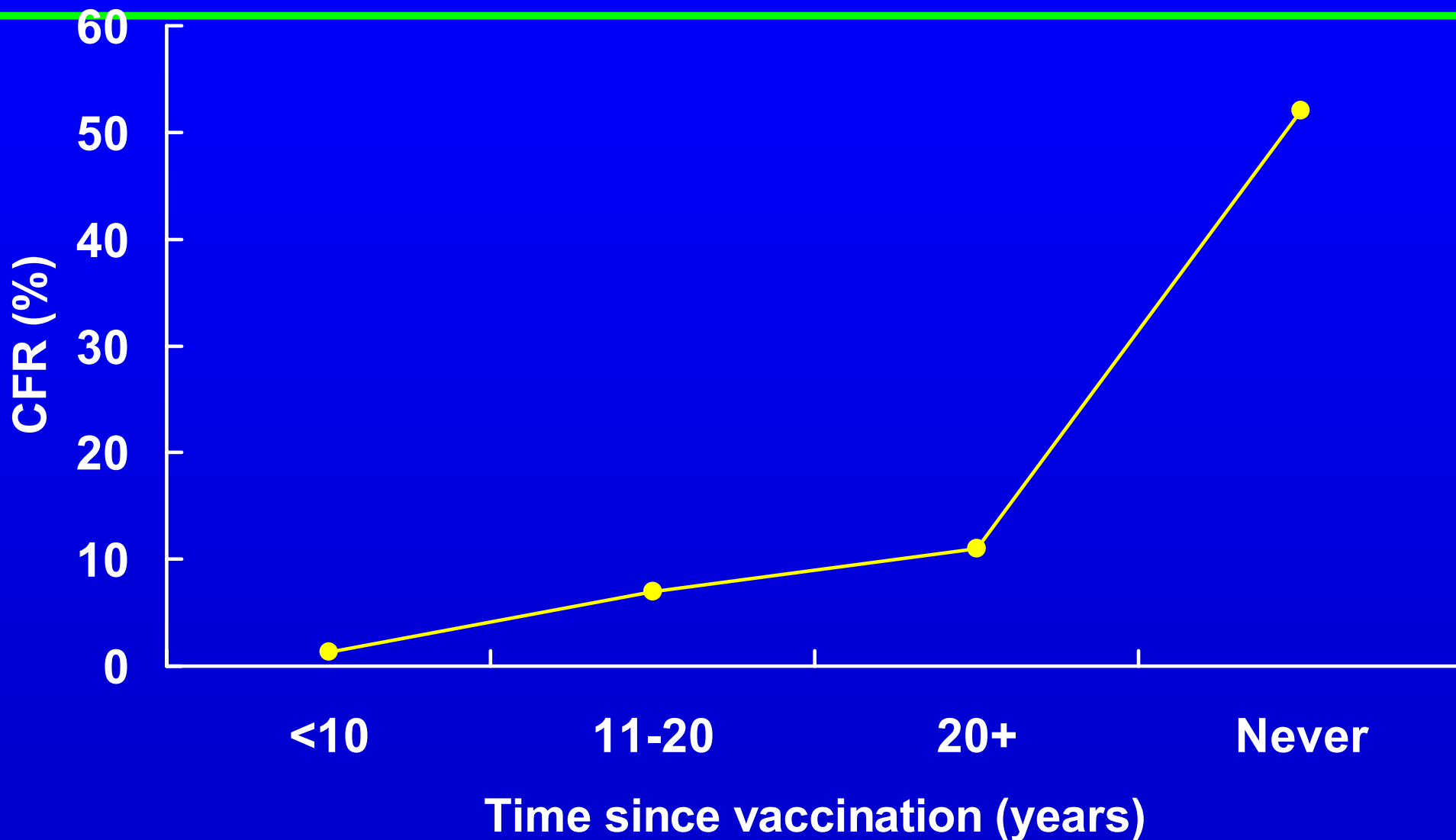
- ~15 million doses, Wyeth Dryvax<sup>®</sup>
- 100-dose vials
- Contracts for additional 209 million doses by end of 2002
- NIH vaccine dilution study results pending
- All to be used under IND

# Antibody Persistence

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- Level of antibody that protects against smallpox infection unknown
- Neutralizing antibody  $\geq 1:10$  persists up to 30 years following 3 doses

# CFR by Vaccination Status, Europe, 1950-1971



Cases and deaths after importations of smallpox into Europe, 1950-1971. Mack TM. J Infect Dis 1972;125:161-9.



# Major Complications of Smallpox Vaccination

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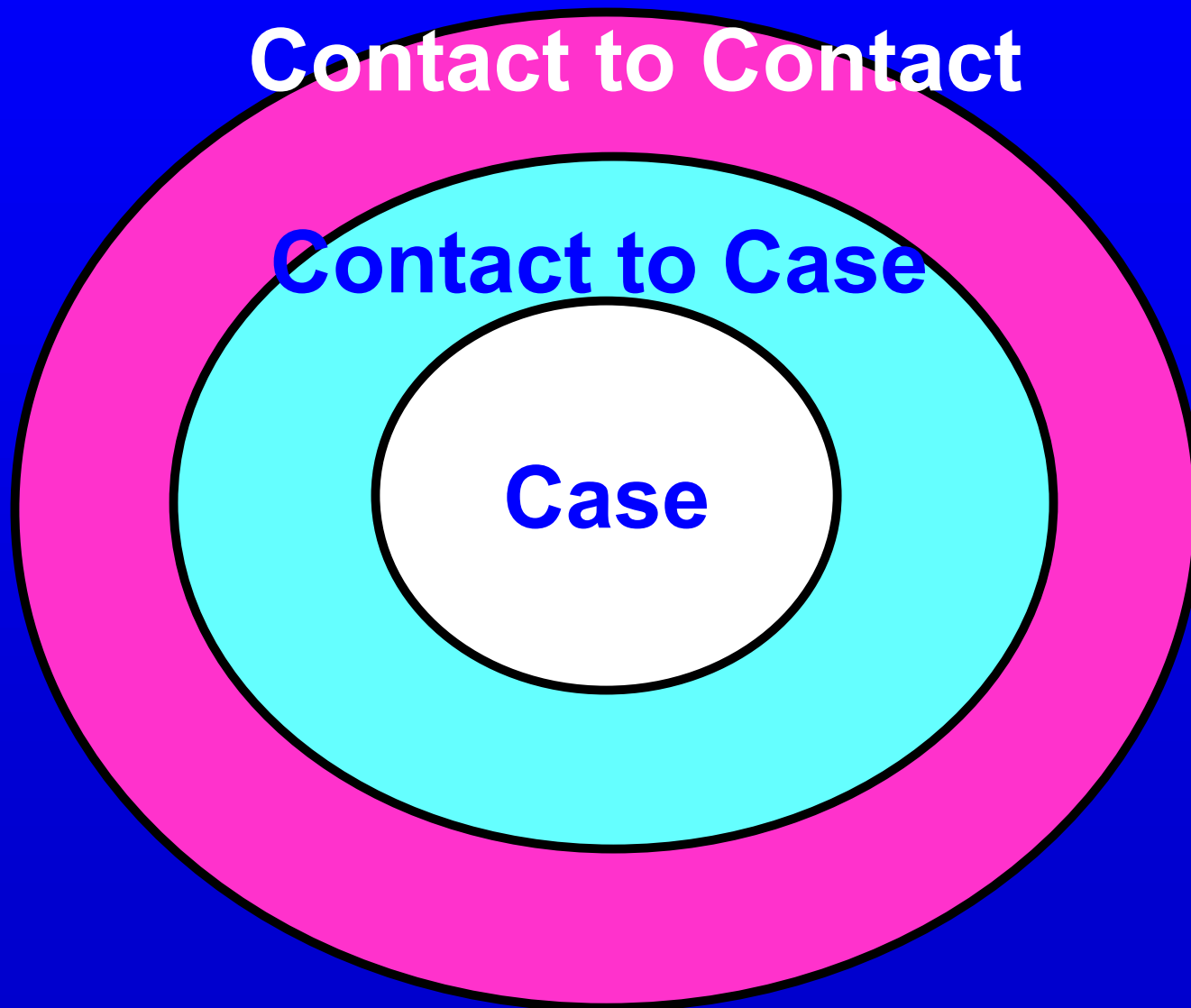
- Inadvertent autoinoculation
- Eczema vaccinatum
- Generalized vaccinia
- Progressive vaccinia  
(vaccinia necrosum)
- Postvaccinial encephalitis

# Rates\* of Reported Complications Following Smallpox Vaccination ñ U.S., 1968

Complication	Primary Vaccination	Revaccination
IA	529	42
GV	242	9
EV	39	3
PV	1.5	3
PE	12	2
<b>Total</b>	<b>1254</b>	<b>108</b>

\*Cases per million vaccinations

# Ring Vaccination Strategy



# Ring Vaccination Strategy

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- **Primary strategy to stop transmission**
- **Depends upon prompt identification of contacts**
- **Judicious use of vaccine supply**
- **Minimizes risks of adverse events**

# Contact Vaccination

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- **Face-to-face contact ( $\leq 6.5$  feet) and household members at greatest risk**
- **May prevent or lessen severity of disease (4-day window)**
- **Followed by monitoring for fever**

# Contraindications for Vaccination of Contacts

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**NONE**

In general, the risk of developing smallpox for face-to face contacts **outweighs** the risk of developing vaccine complications for those contacts with contraindications to vaccination.

# Vaccination of Contacts of Contacts

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- ï Household members of a contact without contraindications
- ï Household members of a contact with contraindications, who are not vaccinated, must avoid the contact (18 days)

# Contraindications for Vaccination of Contacts of Contacts

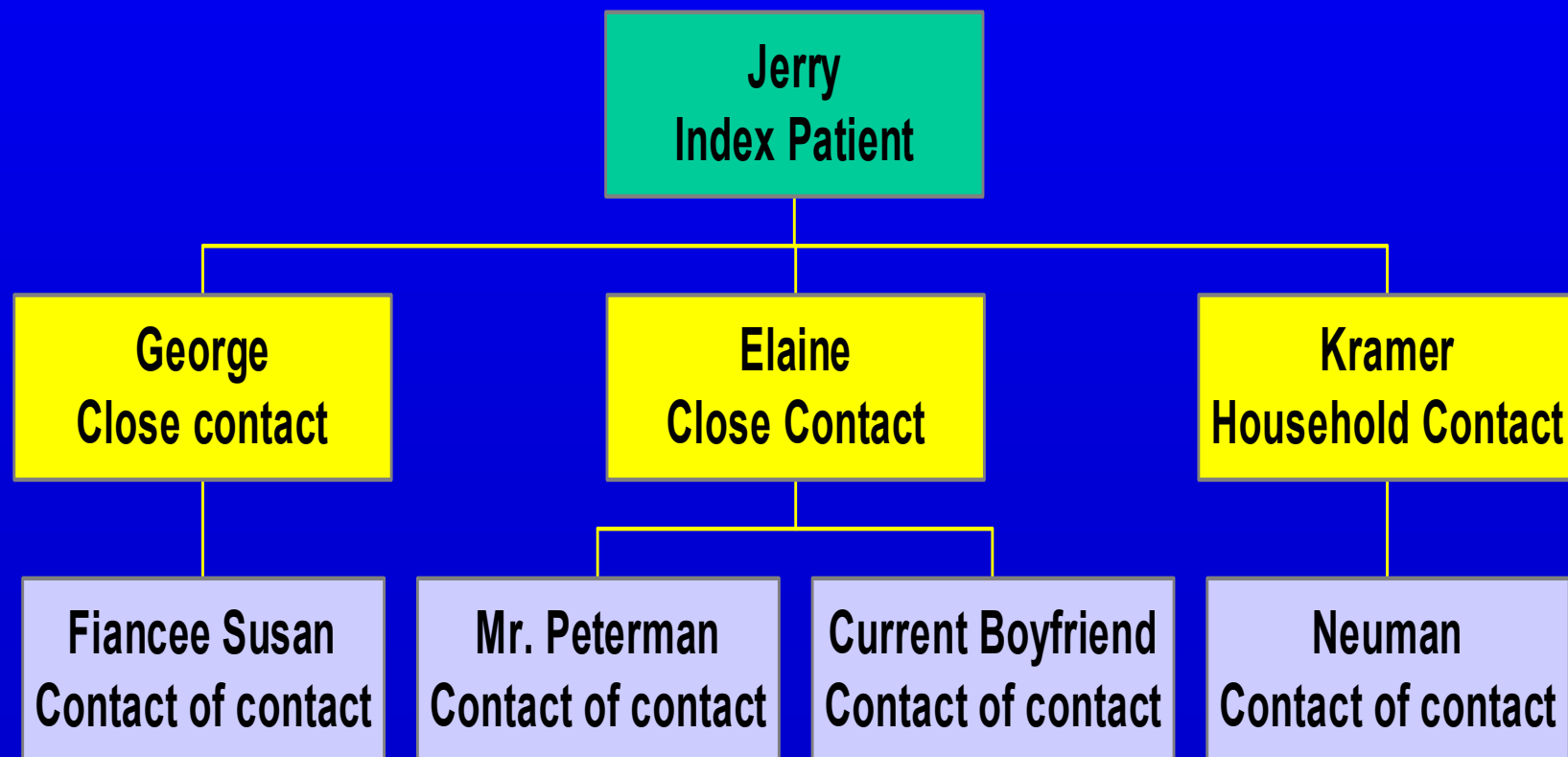
1. Immunodeficiency \*
2. Allergies to polymyxin B, streptomycin, tetracycline, or neomycin
3. Eczema; including past history \*
4. Pregnancy
5. Acute or chronic skin conditions (until resolved)

\* Risk of accidental inoculation from household vaccinee's site



# Ring Vaccination Example

## Contacts & Contacts of Contacts



# Ring Vaccination Example

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- Would you vaccinate:
  - Patrons at the comedy club where Jerry performed the night before developing rash
  - Residents in Jerry's apartment building
  - Jerry's parents who stayed at his apartment a week ago
  - Patrons at the diner where the gang hangs out
  - The waitress at the diner

# High-Risk Priority Groups for Vaccination

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- Exposure to initial virus release
- Close contacts
- Public health, medical, and transportation personnel
- Laboratory personnel
- Laundry, housekeeping, and waste management staff
- Support of response: law, military, emergency workers
- Others at hospitals

# Vaccine Administration Support

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- Establish vaccination sites for contacts
- Establish vaccination sites for personnel
- Establish adverse events reporting and tracking system

# Vaccination Clinics

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## • Why?

- Minimizes vaccine wastage
- Security issues
- IND product

# Vaccine Mobilization

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- Released by Director of CDC
- Priority given to:
  - Areas with confirmed cases
  - Areas with probable cases

# Vaccine Deployment

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- Amount determined by:
  - Number of cases
  - Number of contacts
  - Number of areas affected
  - Number of personnel to be vaccinated
  - Vaccination strategy

# Supplemental Vaccine Deployment

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- ï Federal assessment of continued need, in consultation with state officials
- ï Vaccine availability



# Supplemental Strategies

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## ï Dilution of vaccine

- ñ May stretch vaccine supply

- ñ Evaluation of 1:10 dilution;  
only 70% vaccine take

- ñ Studies of 1:5 dilution;  
results pending

# Dilution of Vaccine

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- May provide valuable alternative for personnel with time to verify vaccine take
- Decisions will be made at the Federal level (use, dilution, vaccination group)

# Supplemental Strategies

- ï Broader vaccination campaign possible, if:
  - ñ Number of cases or locations too large for effective contact tracing
  - ñ No decline in number of new cases after 2 generations
  - ñ No decline after 30% of vaccine has been used

# Mass Vaccination

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- ï Who? When? How?
- ï Not a first-line strategy
- ï If used, would supplement ring vaccination process of search and containment

# Conclusions: Vaccination Strategies

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- Ring vaccination most effective
- Groups for vaccination must be prioritized
- Strategy may change as the situation develops