

Vaccination Strategies to Contain a Smallpox Outbreak

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Public Health Factors in Choosing a Vaccination Strategy

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

Eradication Strategy of the 1970s

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

Smallpox Realities in 2002

- 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

- 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

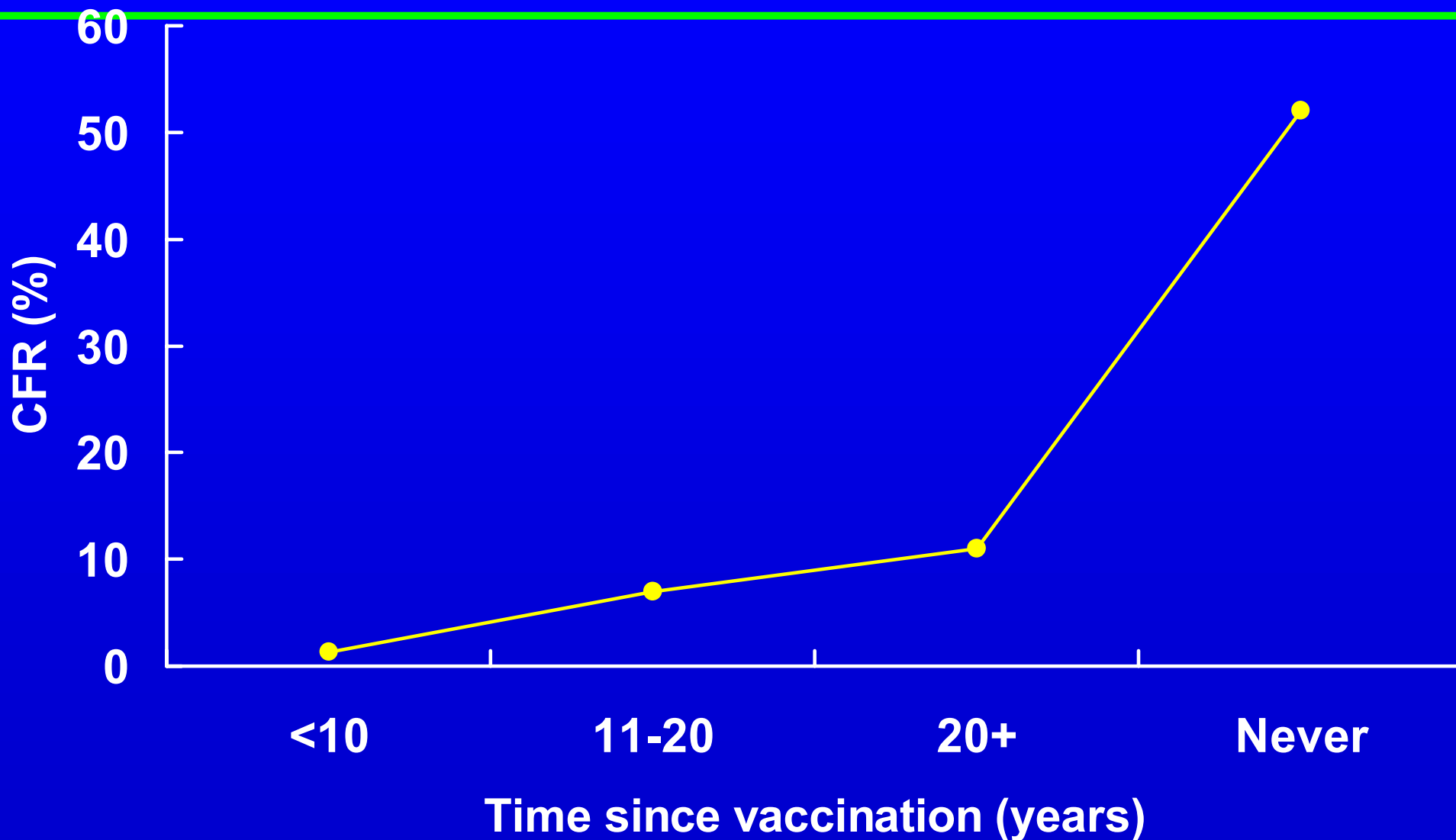
Smallpox Vaccine Stockpile

- ~15 million doses, Wyeth Dryvax[®]
- 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

- 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

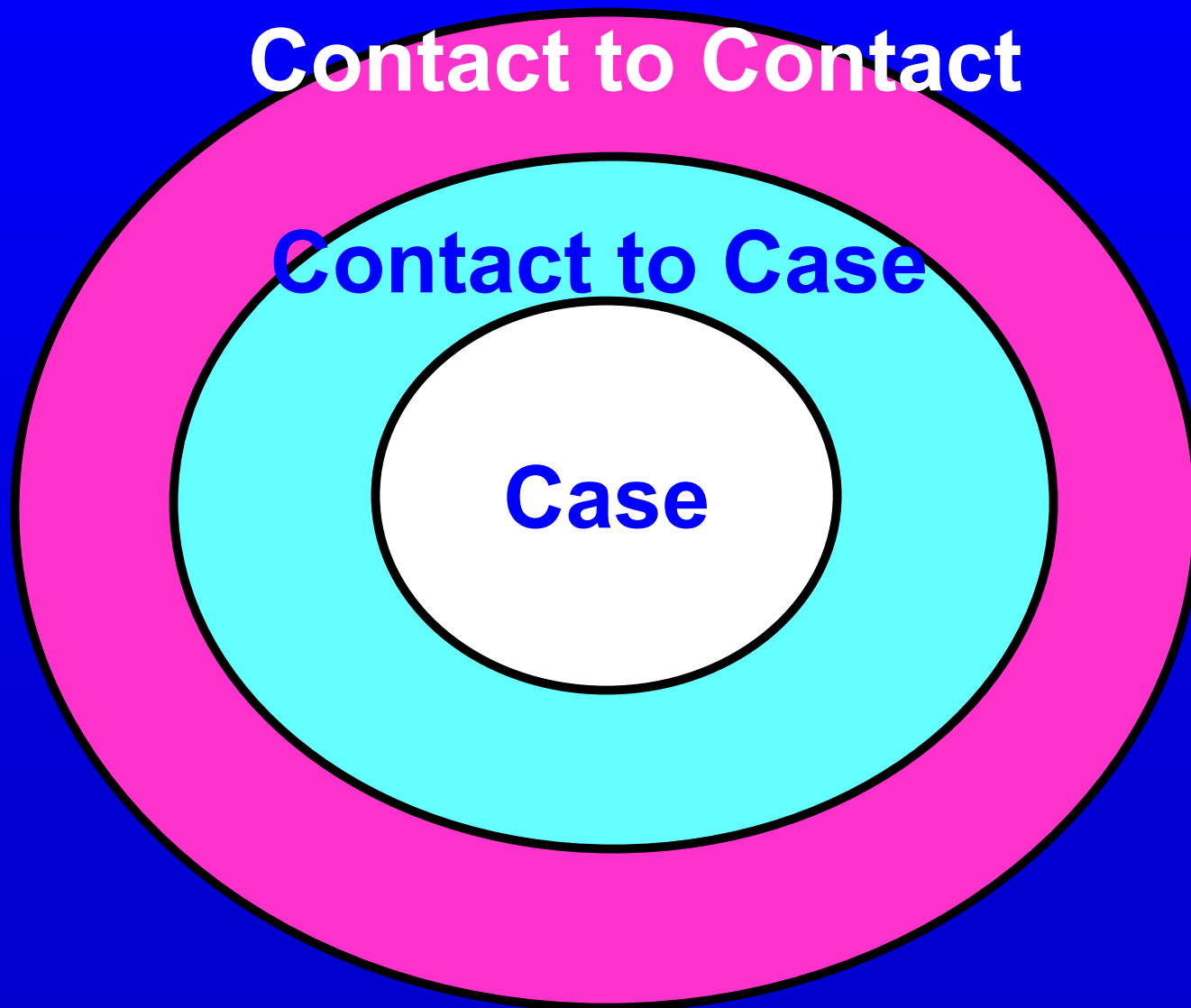
- Inadvertent autoinoculation
- Eczema vaccinatum
- Generalized vaccinia
- Progressive vaccinia
(vaccinia necrosum)
- Postvaccinial encephalitis

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
Total	1254	108

*Cases per million vaccinations

Ring Vaccination Strategy



Ring Vaccination Strategy

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

Contact Vaccination

- **Face-to-face contact (≤ 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

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

- 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)

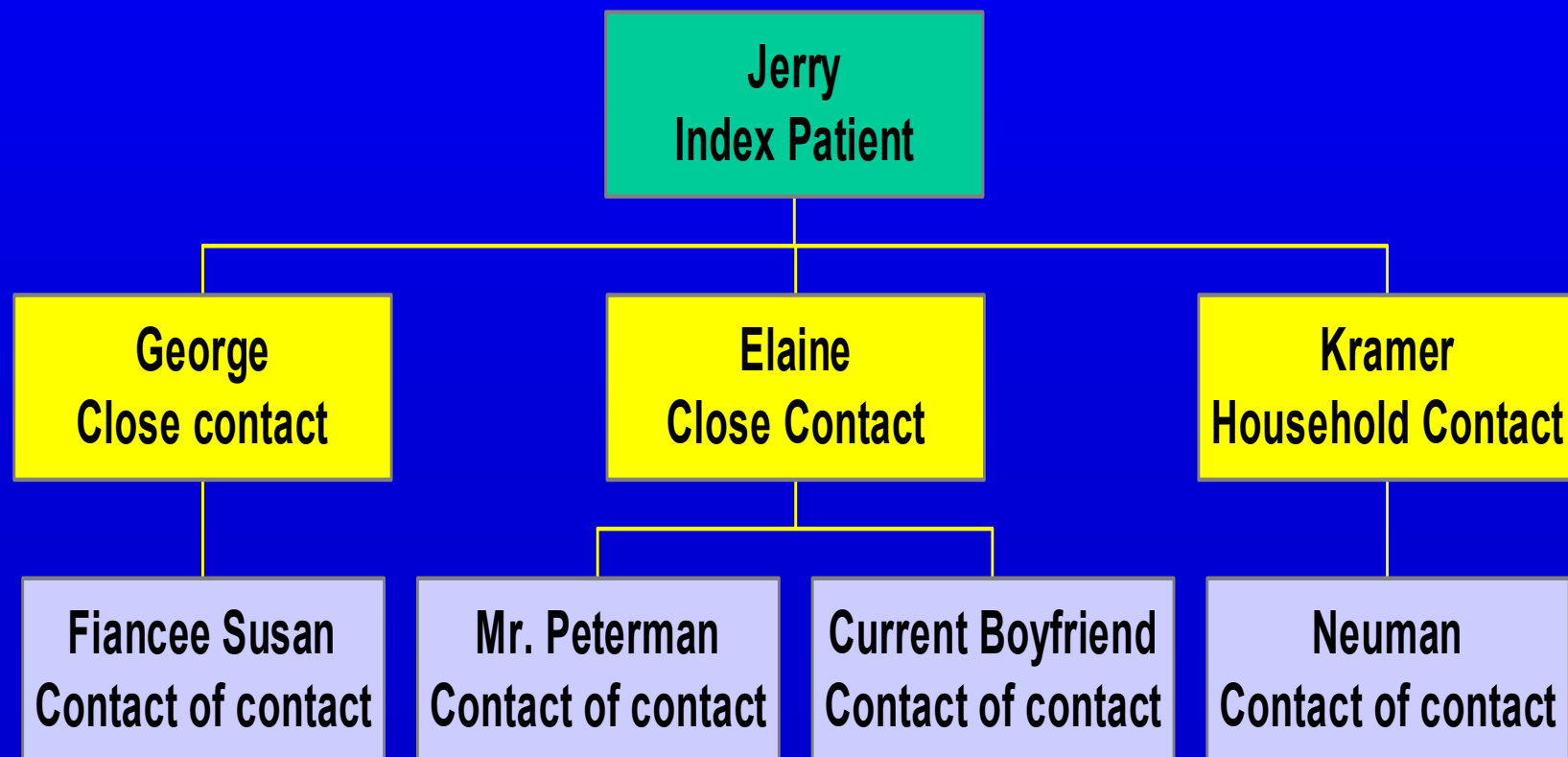
Contraindications for Vaccination of Contacts of Contacts

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

- 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

- 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

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

Vaccination Clinics

• Why?

- Minimizes vaccine wastage
- Security issues
- IND product

Vaccine Mobilization

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

Vaccine Deployment

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

Supplemental Vaccine Deployment

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

Supplemental Strategies

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

- 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

- 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

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