WHY SMALLPOX – TODAY
2 ONLY HUMAN DIS ERADICATED
UNIQUE – ① THROUGHOUT WRITTEN Hx –
② NO GUARANTEE THAT WE HAVE SEEN THE LAST OF SMALLPOX
1980 –
– Important! smallpox Today

The Eradication of Smallpox

... and the discovery of Pandora's box

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"The success of the eradication campaign is a testament to the difference the global health community can make when it truly comes together for a common purpose"

Secretary of the Department of Health and Human Services
The Honorable Tommy G. Thompson

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Smallpox in history

- The most serious of all the pestilential diseases with a case fatality rate of 25 to 30%
- Spread by face-toface contact in any climate
- Man was the only host
- Ramses V and three other mummies died of smallpox 3500+ years ago
- Smallpox gods in Asia and Africa

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T'ou-Shen Niang-Niang

Pan-chen

Smallpox in the 20th century

- Deaths – 300,000,000 died of smallpox
- *NYTimes*: 120,000,000 died directly or indirectly as a result of armed conflict
- Last U.S. smallpox case of smallpox -- 1949
  Compulsory vaccination in U.S. schools until 1972

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Smallpox, the disease

- Incubation period – 7 to 12 days
- Onset – abrupt, incapacitating, with high fever
- Rash and ability to transmit virus begins day 3 to 4
- No therapy available

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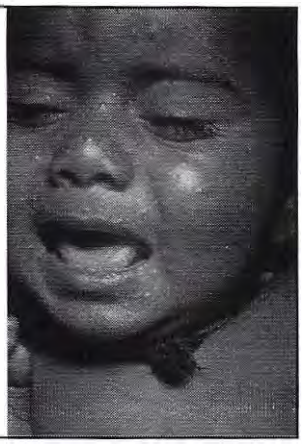
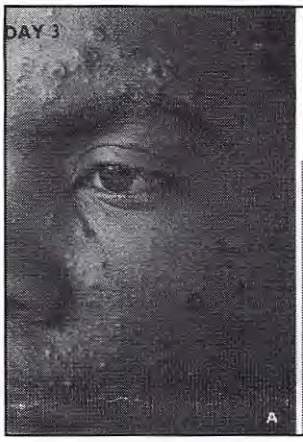
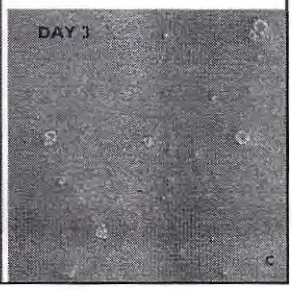
Smallpox

Day 3

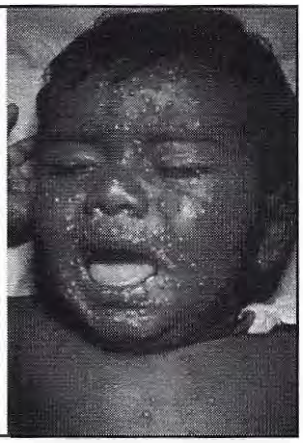




Varicella

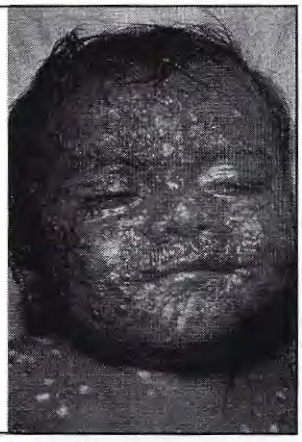


Day 5

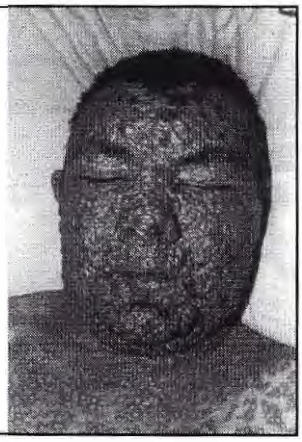


Day 9

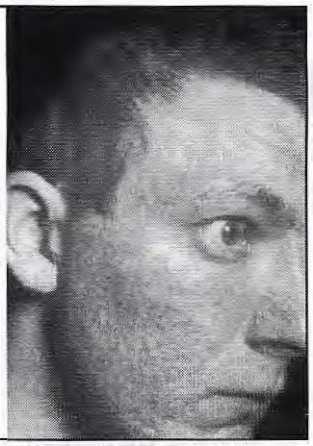
Day 13



Confluent smallpox



Confluent smallpox (recovered)



WHO Smallpox eradication program

...a brief reprise

Director-General submits a plan --1966

- Strategy
  - Systematic mass vaccination to reach 80%
  - Surveillance and containment
  - 10 year program -- WHO budget of $ 2.4 million/year
- Objections by delegates
  - Not feasible – *"can't be done"*
  - Demand for no further increases in WHO budget
- 58 votes needed; 60 voted for approval

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Surveillance-containment strategy

- Operational plan
  - Surveillance – weekly report from all health units
  - Teams – to investigate and contain outbreaks
  - Epidemiological research on smallpox

    The textbooks prove to be wrong

    "Smallpox spreads like a prairie fire"

    "Revaccination is needed every 3 to 5 years"

    "Areas of special risk—schools, buses, crowds"

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Vaccination method

- Traditional in U.S. – multiple pressure
- Research to find a better method
  - Bifurcated needle— 15 multiple punctures
  - One-fourth as much vaccine required

    Training time -- 15 minutes

    Reusable after sterilization

    Cost -- $5 per thousand
- Target for coverage – 80%

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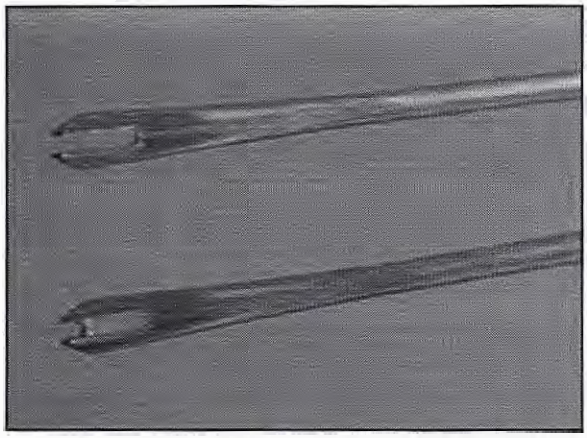
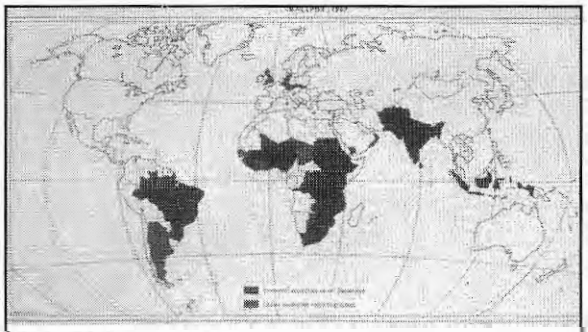
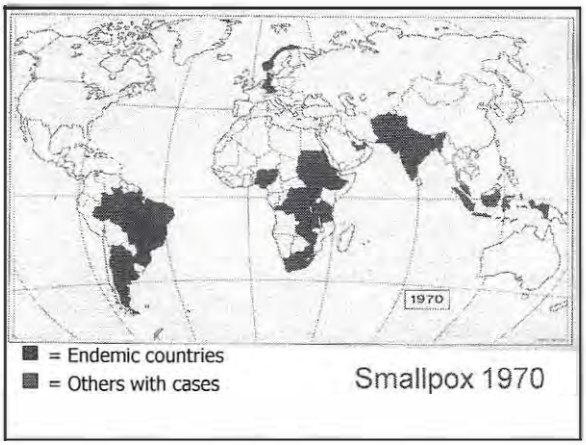


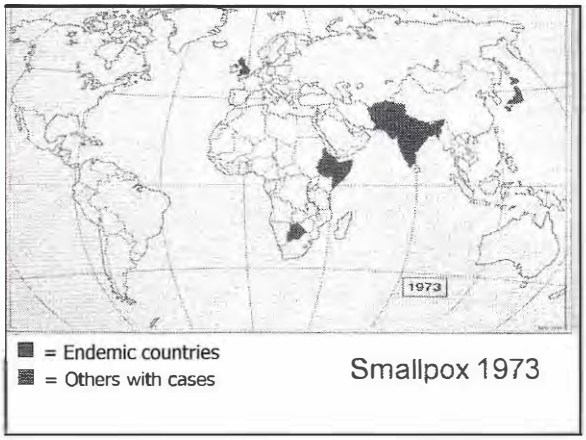


■ = Endemic countries

■ = Others with cases

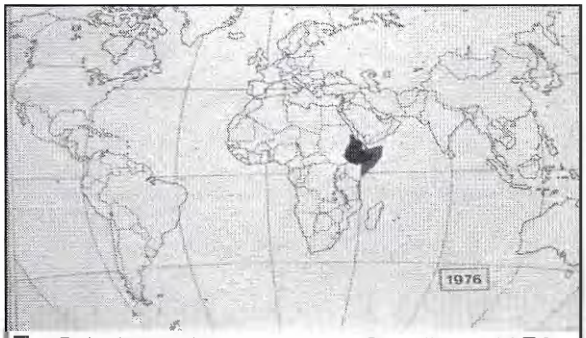
Smallpox 1967





A new strategy – June 1973

- Search every village in India in 10 days
  - 120,000 health staff
  - Containment teams to go to every outbreak
  - By the third round, every house was being visited
- Catastrophic problems Jan. to May 1974
  - Gasoline crisis
  - Railroads, airlines, health workers on strike
  - Worst floods in three decades
  - India detonates an atomic weapon—May 1974



The last strongholds

Ethiopia and Somalia

- Ethiopia – almost 3 times the size of California
  - Largely highland –over 5000 feet
  - Health facilities serve 5% of 30 million people
  - Travel largely by donkey and on foot
  - Emperor is assassinated; Marxist take-over
    - No foreign staff outside of Addis except smallpox teams
- Civil war, floods, famine, kidnapping, hostages
- Somalia – the final chapter

Ali Maalin - 26 October, 1977

World Health Assembly
May 8, 1980

Eradication program, begun in 1967, concludes

- The World Health Assembly declares solemnly that the world and all its peoples have won freedom from smallpox
- Smallpox vaccination should be discontinued in every country

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Post-eradication
1980-2003

- Vaccine production stopped in 1980; manufacturers dismantled facilities
- Vaccination stopped world wide – 1982
- Smallpox virus kept in 2 labs (U.S., Russia)
- WHO vaccine reserves: <50 million doses

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The surprise in Pandora's box-- smallpox as a biological weapon

- 1972 Biological weapons convention
  Signed by all countries but no verification
- 1989-92 Suspicion about Soviet BW program
- 1992 Soviet BW program is confirmed
  Smallpox and anthrax are priority weapons

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A defector provides details -- 1993

- Deputy Director of USSR bioweapons program
  60 laboratories with 50,000 staff
  Smallpox virus production capacity of 20 million tons
- USSR dissolves – 1992-1993
  Laboratory staffs cut by half or more
  Many scientists leave the USSR for Europe, U.S., other countries

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The threat– medical views until 1998

- Biological weapons are morally repugnant
  - Limited or no instruction or research re: BW agents and diseases in universities
  - No staff or programs at CDC, NIH
- A turning point– IDSA Infectious Diseases Annual Meeting - September 1997
- Multiple hospitals organize Grand Rounds
- Hopkins Center for Biosecurity created(1998)

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Sept. 11, 2001 and a changed world

- Sunday, September 16 – an evening meeting
- Intelligence intercepts – a second attack
- Decision to create an Office of Emergency Preparedness with Asst. Secretary
- The first of 22 anthrax cases becomes known two weeks later
- Congress provides emergency appropriation of $3 billion

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Implications of a smallpox virus release

- 75% of U.S. population was susceptible
  - Persons under 30 years --not vaccinated (45% of population)
  - Vaccinees pre-1972– limited or no immunity
- World population
  - No better protected

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Emergency decisions

- Top priority -- vaccine (at least 40 million doses)
  - CDC stockpile of 15 million doses
  - only 90,000 doses available (diluent had gone bad)
- Commercial production – 5 year minimum
- Emergency measures
  - 200 million doses delivered in 18 months
  - Vaccine shelf life at -20°C.-- indefinite

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Strategy for smallpox vaccine use a balance of risks

Probability of smallpox use as a weapon:

- Less less likely than several other possible microbes but potential for spread if not able to be contained.

Vaccine adverse reactions:

- Viewed as alarmingly high by some investigators
- Actual data show per million vaccinations
  - 10 to 15 serious reactions; 1 death
  - Cases of myopericarditis but no sequelae

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Effectiveness of outbreak control

- Smallpox spreads slowly
- Patient transmits only after rash appears
- Isolation of contacts is very effective
- Most contact spread is in home or hospital
  - Few or none were infected at work or school
- Vaccine protects even when given 3-4 days after infection

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Smallpox virus status today

- Restricted to 2 laboratories (U.S. and Russia)
  - Research continues for a new vaccine which protects with one dose and has no adverse reactions and for an anti-viral drug to treat cases.
- Virus destruction to be debated at 2014 WHO Assembly

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The legacy of smallpox eradication

- What it is not!
  - An impetus to undertake other eradication campaigns!
  - Conference 1980: "What next to we eradicate?"
    - Keynote speaker: "The word, eradication"
- It was a demonstration of how much can be accomplished in a public health program with how few resources and despite unimaginable obstacles, given a creative staff and a continually evolving program driven by epidemiological and laboratory research
- The result: the Expanded Program of Immunization-1974

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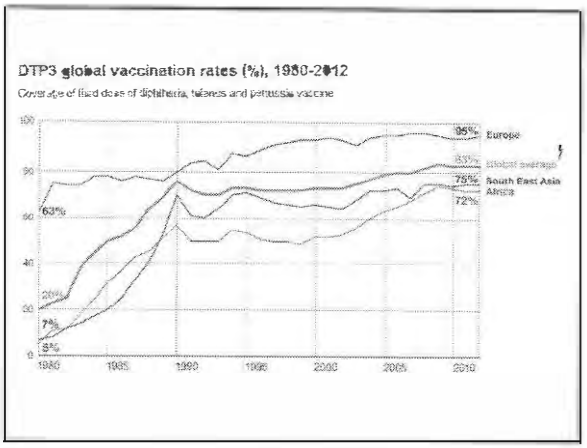

EPI – notable landmarks in the Americas

- Polio elimination -- 1985 1991
- Measles elimination -- 2001
- Rubella elimination -- 2008