

*Brief overview
Key factors which laid out eradication
and which governed the likelihood of success*

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The Eradication of Smallpox...

the dynamics and potential applications

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World Health Assembly --1980

- Declares solemnly that the world and all its peoples have won freedom from smallpox
- Smallpox vaccination should be discontinued in every country

» Thirty-third World Health Assembly, 8 May 1980

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A killer throughout written history

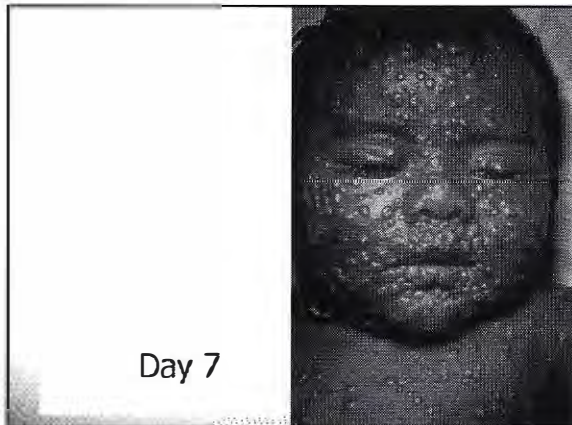
- Antedates the Pharaonic era >3500 yrs B.C.
- Only disease with native deities - Asia and Africa
- Primary factor in the settlement of the Americas
- A contemporary concern - 1967
 - > 10,000,000 cases
 - 2,000,000 deaths
 - Reported from 43 countries
 - US required school-entry vaccination until 1972

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Important factors to eradication

- Virus - face-to-face spread only during rash
 - Distinctive rash, residual facial scars
 - No subclinical cases
- Man is the only host - no animal reservoir
- Death rate was 30%
 - But permanent immunity among survivors
- A heat stable vaccine protects with one dose

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Prior global eradication efforts

• Hookworm	1909-23	14 years
• Yellow fever	1915-32	17 years
• Yaws	1948-66	18 years
• Malaria	1955-73	18 years
• Smallpox	1967-80	14 years

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The commitment to eradication

- 1959 World Health Assembly adopts USSR proposal for global program of mass vaccination
- 1959 -1966
 - USSR is the sole major advocate
 - Annual contribution of 25 million doses of vaccine
 - A lone insistent voice in the Assembly
 - WHO -- 5 staff and a budget of \$100,000 per year

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A plan is developed and approved

- Assembly requires DG to submit a plan --1966
 - Strategy
 - Vaccinate 80% of population
 - Surveillance and containment
 - 10 year program: WHO budget --\$ 2.4 million/year
- Objections by delegates
 - Not feasible
 - Demand for no further increases in WHO budget
- 58 votes needed; 60 voted for approval

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A program director is named

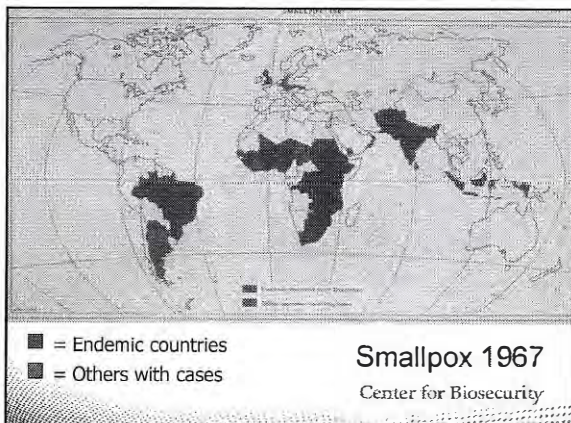
- Director General believes program will fail
- Demands an American serve as Director
 - The candidate declines:
 - Limited resources -- <\$50,000 each for 50 countries
 - Insufficient to buy the vaccine required
 - Headquarters staff -- limited to 10
 - Coordination -- 6 WHO Regional Offices
 - 50 Sovereign Countries

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Major transforming factors

- USAID (through CDC) supports a 5 year program for West Africa
- Principal protagonists CDC Director (Sencer) and USSR Minister Venediktov
- Lab directors -- USSR, U.S., Canada, Netherlands
 - Research, diagnostic, vaccine production and control
- Young, imaginative, determined field staff

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Obtaining quality vaccine

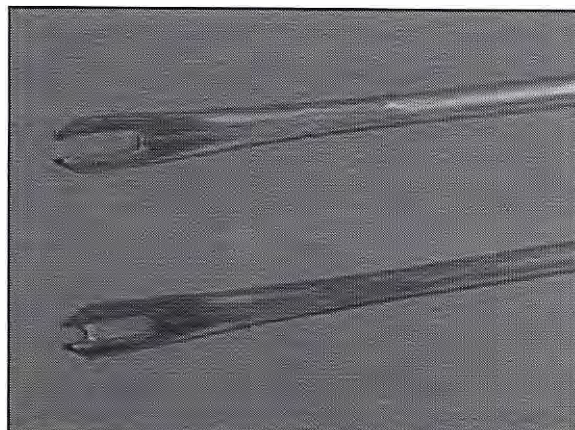
- Heat-stable, potent vaccine was essential
 - Quality control of vaccine -- 10% satisfactory
 - No country to receive WHO assistance unless vaccine meets international standards
 - 42 labs producing vaccine
 - Independent international quality control started
 - Labs in Netherlands and Canada
 - Development of national production capacity
 - Continuing research to improve vaccine

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A new vaccination technique

- Target for coverage – 80%
 - Vaccination teams and evaluation teams
- Research discovers a new method
 - Bifurcated needle /multiple puncture
 - One-fourth as much vaccine required
 - Training time -- 15 minutes
 - Needle is easily sterilized and reused
 - Cost -- \$5 per thousand

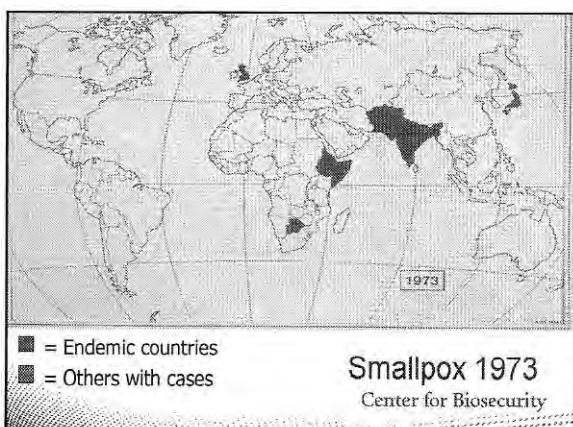
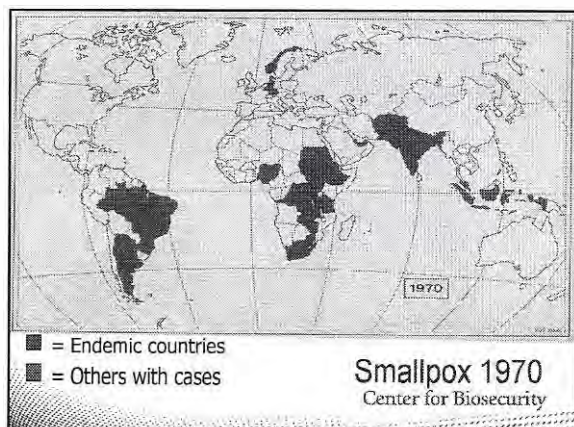
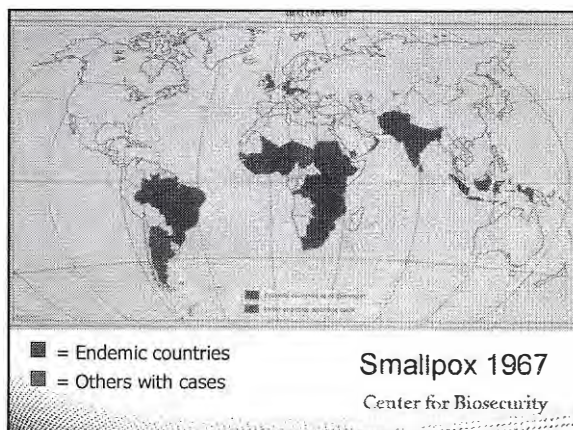
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A critical new strategy

- Surveillance-containment
 - Surveillance – weekly report from every health unit from start of national program
 - Teams – to investigate and contain outbreaks
 - Continuing epidemiological field research
 - The textbooks prove to be wrong
 - "Smallpox spreads like a prairie fire"
 - "Revaccination is needed every 3 to 5 years"

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India -- the pivotal challenge

1973-75

- India – the “home of smallpox”?
 - Population – 550,000,000
 - Surveillance-containment strategy--not working
 - June 1973 – search every village > every house
 - 130,000 health staff for 10 days
 - Results of first search in October
 - Spring 1974 – the darkest days
 - Petrol crisis + strikes by airlines, railway, floods
 - India explodes a nuclear device
 - One goal – “ZERO cases of smallpox”

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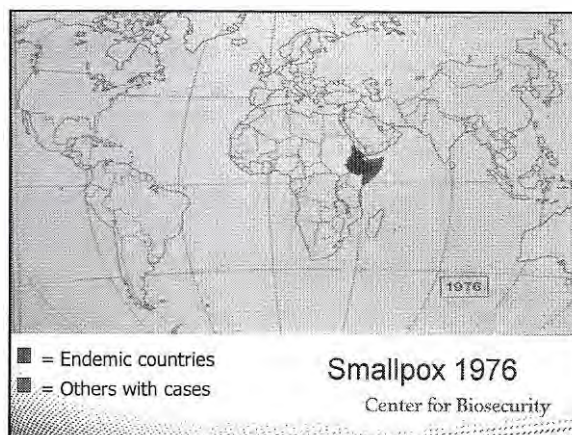
Indian Independence Day

August 15, 1975

Prime Minister Indira Ghandi

- Salutes India on its 28th Anniversary of Freedom
- Announces India's freedom from smallpox for the first time in its written history

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The last strongholds

Ethiopia and Somalia

- Ethiopia
 - Country – twice the size of Texas
 - Largely highland --over 5000 feet
 - Health facilities for 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

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Prospects for disease eradication

* Fogarty Center Conference - May 27, 1980

"No suitable candidates within the foreseeable future"
"Propose that the objective now should be eradication of the word itself"

* What do I foresee, now, 32 years later?

No human disease has been eradicated but perhaps...

- Guinea worm disease (2 to 3 years)
- Poliomyelitis caused by wild polioviruses (2 to 3 years)
 Budget for 2012 Polio eradication is \$1.2 billion
 In today's \$, larger than 14 year total cost of smallpox program
- Malaria (35 years)
 At the outer limit of my perception of "foreseeable future"

* Other possibilities for eradication

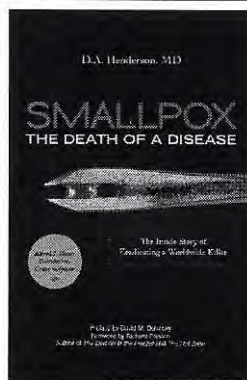
- Measles, rubella, yaws and 10 or more other candidates. So far - dreams.

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Key factors in success

- * Demonstration of feasibility in difficult problem areas
- * Prominent protagonists at national and international levels
- * Surveillance to monitor, evolve strategy and guide program
- * Heat stable one-dose vaccine providing long-term protection
- * Quality-control to monitor vaccine, vaccinators, surveillance
- * Research for better products, strategies, management
- * Motivated, young field staff with field-oriented supervisors
- * Continuing commitments for financial support, even the tenuous

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