

Scientific Program Information

FEB 6
2011

Keynote Session CME

The Eradication of Smallpox: A Continuing Saga

Sunday, February 6, 4:30 PM – 6:00 PM

Regency Ballroom



DONALD A. HENDERSON, MD; Center for Biosecurity of UPMC, Baltimore, MD.

Donald Ainslie Henderson, known as D.A., was born in Lakewood, Ohio, in 1928, to David and Grace Henderson. He received his bachelor of arts degree from Oberlin College in 1950. In 1951, he married Nana Irene Bragg. The couple have three children. Henderson received his medical degree from the University of Rochester in 1954 and was an intern and resident at the Mary Imogene Bassett Hospital in Cooperstown, New York. From 1955 to 1966 he also worked for the Centers for Disease Control.

Henderson ran the World Health Organization's smallpox eradication program from 1966 to 1977. During the 20th century, at least 300 million people died of smallpox. As late as 1960, about five million people a year died of the disease. The eradication of smallpox has been called "perhaps the greatest medical feat of all

time." "An ancient, contagious and particularly hideous disease, smallpox kills a third of those infected with it, and Dr. Henderson is one of the few doctors in this country today to have actually seen a case," noted Sheryl Gay Stolberg in an article in the *New York Times*, dated November 18, 2001. "The World Health Organization's smallpox eradication program, which Dr. Henderson ran from 1966 to 1977, was, he said, the effort of countless public health workers who toiled under grueling conditions, often living in villages without electricity and running water, in nations torn apart by war. They operated under the principle of 'ring vaccination,' containing outbreaks by vaccinating every patient infected, and everyone around those patients, moving outward in concentric circles until the virus stopped spreading."

Smallpox experts believe the eradication effort, carried out with the former Soviet Union during the Cold War, succeeded because of Henderson's determination. When the health minister of Ethiopia would not cooperate with him, Henderson made his way into the country and got to know the personal physician of the country's emperor, Haile Selassie. When Henderson suspected the Russians were giving him an inferior smallpox vaccine, he traveled to Moscow — violating orders from his superiors, who were worried about a diplomatic nightmare — and demanded a better vaccine.

After finishing his work with the World Health Organization, Henderson served as dean of the Johns Hopkins School of Public Health from 1977 to 1990. He then worked for the administration of President George Bush, serving as science adviser to the White House from 1991 to 1993, as associate director of the Office of Science and Technology Policy. Henderson worked for the Department of Health and Human Services (HHS) from 1993 to 1995 as deputy assistant secretary of HHS for health and science. He left in 1995 because he felt he was being underutilized and returned to the Johns Hopkins School of Public Health as a professor. Because of his fears about bioterrorism, in 1997, Henderson founded and became director of the Johns Hopkins University Center for Civilian Biodefense Studies, a research institution.

9th ASM Biodefense and Emerging Diseases Research Meeting

Program-at-a-Glance

	SUNDAY <i>February 6</i>	MONDAY <i>February 7</i>	TUESDAY <i>February 8</i>	WEDNESDAY <i>February 9</i>
Registration	10:00 AM – 7:00 PM	7:30 AM – 5:00 PM	7:30 AM – 3:30 PM	See an ASM staff member for assistance.
Focus Sessions	12:00 PM – 2:00 PM 2:15 PM – 4:15 PM			
Keynote Session	4:30 PM – 6:00 PM			
Plenary Sessions		8:30 AM – 12:00 PM	8:30 AM – 12:00 PM	8:30 AM – 12:00 PM
Lunch		12:00 PM – 1:00 PM	12:00 PM – 1:00 PM	
Exhibits	6:00 PM – 8:00 PM	12:00 PM – 3:30 PM	12:00 PM – 3:30 PM	
Poster Presentations		1:00 PM – 3:00 PM	1:00 PM – 3:00 PM	
Highlighted Oral Abstract Sessions		3:00 PM – 4:00 PM	3:00 PM – 4:00 PM	
Concurrent Symposia		4:15 PM – 6:15 PM	4:15 PM – 6:15 PM	
Discussion Roundtable		6:30 PM – 7:30 PM	6:30 PM – 7:30 PM	
Opening Reception	6:00 PM – 8:00 PM			

Complimentary lunch for all attendees will be available in the Exhibit Hall from 12:00 PM – 1:00 PM, Monday and Tuesday, February 7th and 8th.

The Eradication of Smallpox

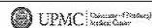
.... a continuing saga

D.A. Henderson, MD, MPH

Johns Hopkins University Distinguished Service Professor
Professor of Medicine and Public Health, U. of Pittsburgh

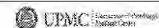
ASM Biodefense and Emerging Diseases Research
Washington, D.C.
February 6, 2011

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Neither I nor my family have financial conflicts of interest
pertaining to commercial activities re: smallpox

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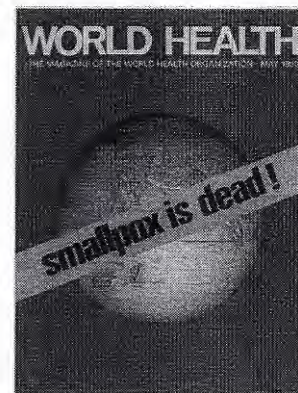


World Health Assembly --1980

- 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*

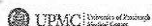
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A challenge through the ages

- A disease which antedates the era of the Pharaohs
- One of the greatest of pestilences throughout history
- Sole disease represented by deities in Asia and Africa
- Primary factor in the European 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

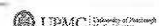
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- *"This may well have been the greatest lifesaving achievement in the history of medicine"*
Richard Preston, author
- *"The success of the eradication campaign is a testament to the difference the global public health community can make when it truly comes together for a common purpose"*

Secretary of Health and Human Services Thompson

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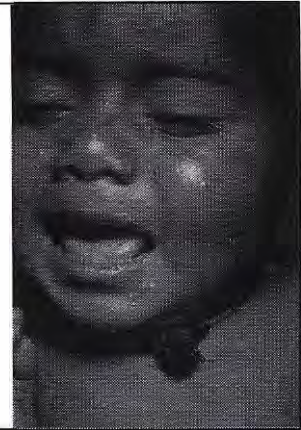
Smallpox, the disease

- Virus – face-to-face spread only during rash
- Man is the only host
 - Chain of infection going back more than 3500 years
- Death rate was 30%
 - But permanent immunity among survivors
- A highly stable vaccine protects with one dose

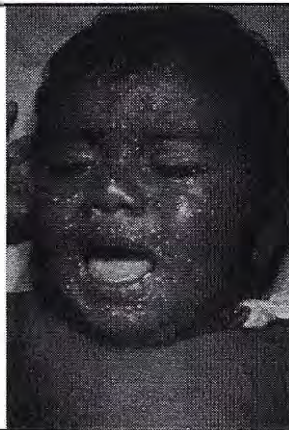
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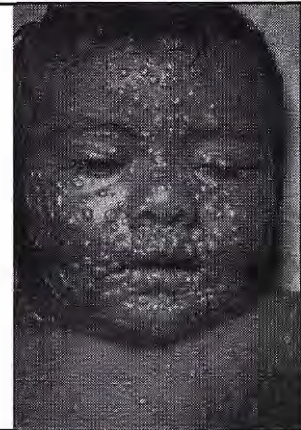
Day 3



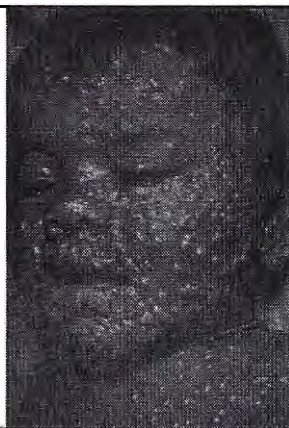
Day 5



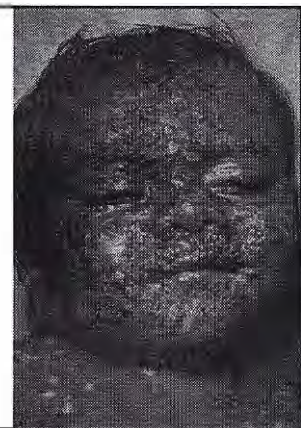
Day 7

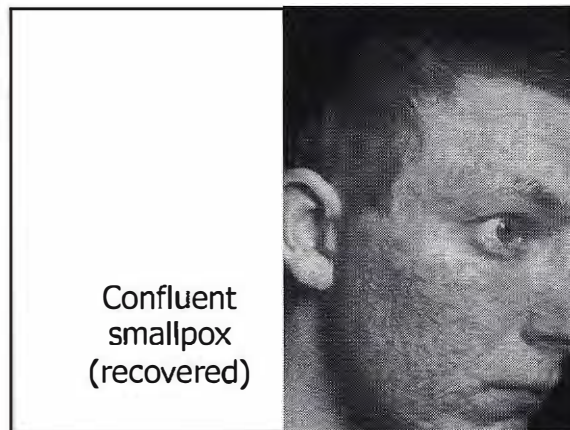
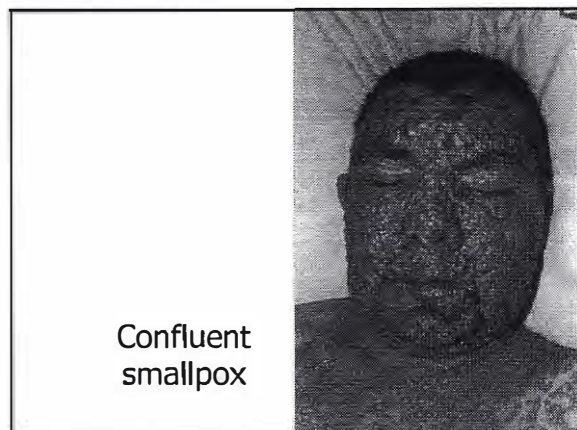


Day 9



Day 13





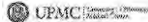
Global efforts to eradicate a disease

• 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
• <i>G. worm infection</i>	1986- ?	24 years +
• <i>Poliomyelitis</i>	1988- ?	22 Years +

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Global smallpox eradication

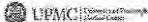
- 1959 World Health Assembly adopts USSR proposal for a global program
- 1959 -1966
 - Strategy: mass vaccination (few complied)
 - Budget of <\$100,000 per year
 - Five staff members

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Meanwhile -- West Africa 1962-66

- U.S.-Upper Volta measles vaccine study -- 1962-64
 - National programs (USAID) extended to 9 countries
 - CDC asked to provide technical support
- CDC proposal to USAID -- 1965
 - Smallpox eradication and measles control in 20 countries

Rejected by USAID -- Spring, 1965
Accepted by White House -- Fall, 1965

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The WHO Eradication Program

Assembly requires DG to submit a plan --1966

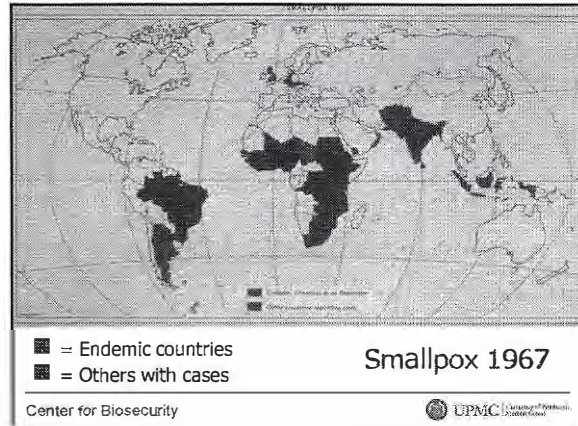
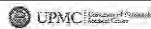
- Strategy
 - Large-scale vaccination
 - Surveillance and containment
- 10 year program: WHO budget = \$ 2.4 million/year
- Objections by delegates
 - Not feasible
 - Demand for no further increases in WHO budget
- 58 votes for acceptance; 60 voted for approval

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Program leadership

- Director General believes program will fail (malaria eradication collapsing)
- Demands an American serve as Director
 - The candidate declines:
 - Responsibilities for new CDC African program
 - Limited resources -- <\$50,000 each for 50 countries
 - Not enough even to buy the vaccine required
 - Headquarters staff of 10 (including 3 secretaries)

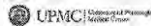
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Vaccine Supply

- Heat-stable, potent vaccine is essential
 - Quality control of vaccine
 - No country to receive WHO assistance unless vaccine meets international standards
 - 42 labs producing vaccine
 - Independent international quality control
 - Labs in Netherlands and Canada
- Development of national capacity

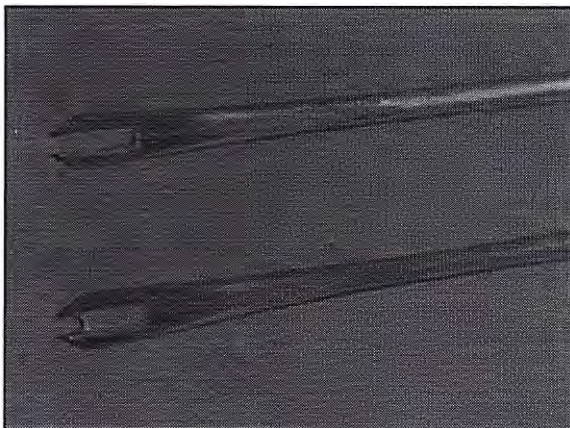
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Vaccination

- Target for coverage – 80%
 - Evaluation teams
- Research to find faster, better methods
 - Jet Injector gun
 - Bifurcated needle—multiple puncture method
 - One fourth as much vaccine required
 - Training time -- 15 minutes
 - Easily sterilized and reused
 - Cost -- \$5 per thousand

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Surveillance-containment strategy

- Operational plan
 - Surveillance – weekly report from each health unit
 - 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"

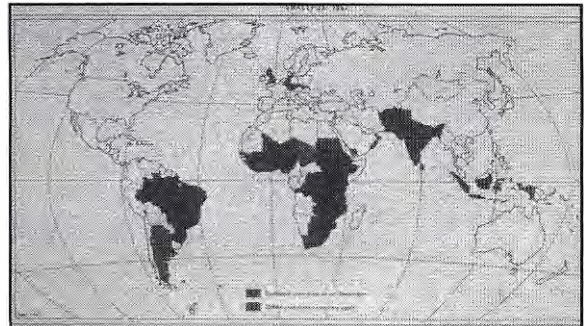
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Operational principles

- **Management strategy**
 - Delegation of responsibility and authority
 - Adapt program to the country
 - Direct contact with the field- at least 1/3 time
 - Communicate regularly and frequently
- Accept "red tape" as inevitable but recognize:
 - It is sometimes better to act first and question later
 - Exceptions to rules are always necessary
 - A second opinion from another attorney/boss often helps

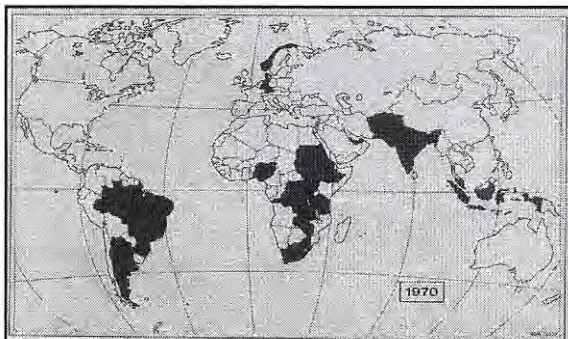
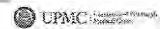
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■ = Endemic countries
■ = Others with cases

Smallpox 1967

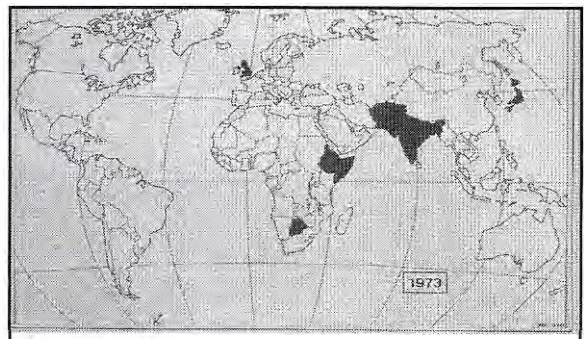
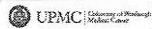
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Smallpox 1970

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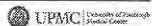
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Smallpox 1973

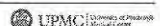
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India -- the pivotal challenge

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 in 10 days
 - Results of first search – October
- Spring 1974 – the darkest days
 - Petrol crisis + strikes by airlines, railway, health staff
 - India explodes a nuclear device
- Containment methods tightened

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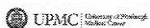
Indian Independence Day

August 15, 1975

Prime Minister Indira Gandhi

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

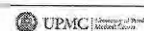
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Smallpox 1976

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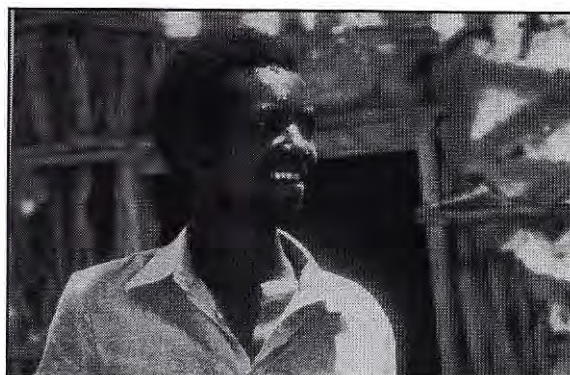
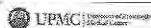


The last strongholds

Ethiopia and Somalia

- Ethiopia
 - Country – twice the size of Texas
 - 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

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Ali Maalin - 26 October, 1977

The legacy – beginning of the Vaccine Era

• The genesis

- African vaccinators average 500/persons/day with cooperative village leadership
One year = 400,000 vaccinations/4 person team
- Smallpox – the only nation-wide vaccine program in developing countries in 1967
- Smallpox unit sponsors international meeting on recommended targets - 1970

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Expanded Program on Immunization-1974

- A global program for vaccination for all children --smallpox, measles, DPT, polio
- Surveillance of vaccine-preventable diseases
- UNICEF and Rotary make this a high priority
- Target: 1990 – 80% coverage

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Vaccine coverage (%) -- the Americas

	1980	1990	2000	2008
DTP*	50	74	91	92
Measles	51	80	92	93
Polio*	57	75	90	92
HepB*			70	88
Hib*			75	90

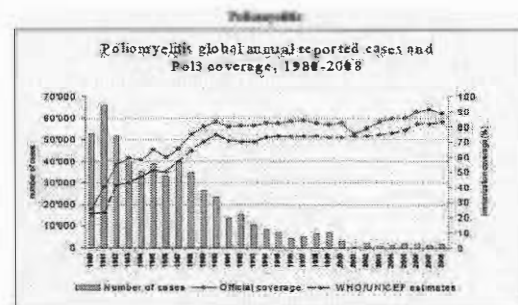
* 3 Doses

Transmission interrupted:

Polio (1991); Measles (2002); Rubella (2008)

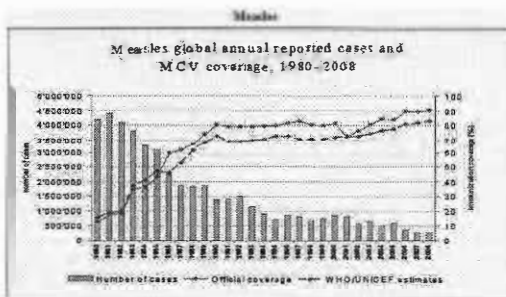
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Important lessons learned

- Vaccines – the best cost-benefit medical interventions (ref: World Bank study)
Critical vaccine elements
 - Efficacy
 - Potency
 - Heat stability
 - Ease of administration
- Management – surveillance based
 - Delegated responsibility, flexible, responsive to social setting
 - Quality controls
 - Simplification of reporting requirements

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Coda

- From *Smallpox: death of a Disease*.

"We are only beginning to realize the potential of public health...It is a field begging for fresh, resourceful ideas and a new generation of professionals who are not constrained by 'knowing' what can't be done. So it was with so many who contributed so much to making smallpox eradication a possibility."

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