

Prof Chen Distinguished members of Academia Sinica
Guest, colleagues

Why compare to smallpox - first case in Taiwan 1954

Any host who seen a case of smallpox

Most horrible of diseases may tell

FINAL

ACAD SIN

6.25

Smallpox: Death of a Disease:

... miracle and legacy

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"There has been no greater medical – or humanitarian – miracle in modern times than the eradication of smallpox...It is the saga of a day-to-day struggle for international cooperation in a divided world; it offers a winning blue print for the great medical challenges to come."

David Oshinsky – Winner of the 2006 Pulitzer Prize in History

Smallpox -- an ancient scourge

- Most serious of all the pestilential diseases
- Ramses V and three other mummies died of smallpox 3500+ years ago
- Smallpox gods in Asia and Africa

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Sitala Mata



T'ou-Shen Niang-Niang



Pan-chen

Smallpox, the disease

- Last case was 1978 in Merka, Somalia
- Virus disease –
Transmitted by face-to-face contact
- Man is the only host – no latent virus carriers
Survival of the virus depends on a chain of infection
- No treatment -- death rate was 25 to 30%
- Permanent immunity upon recovery

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Smallpox in the 20th century

- Deaths – 300,000,000 died
- NYTimes: 120,000,000 died directly or indirectly as a result of armed conflict
- Compulsory vaccination in the U.S. until 1972
 - Last case in U.S. – 1949
 - Last case in China Taipei – 1954
 - Last case in China – 1965
 - (variola cases only 1961-- 1965)

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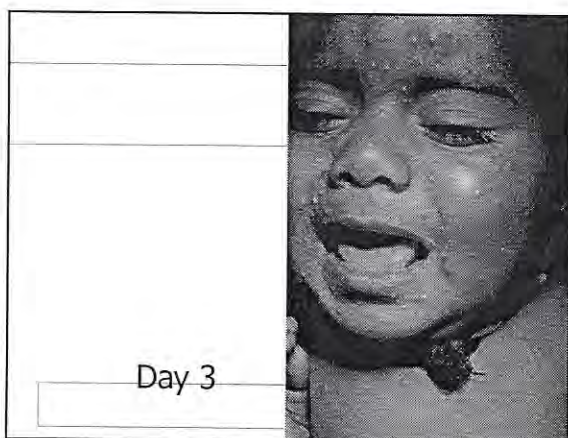
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Summary objectives

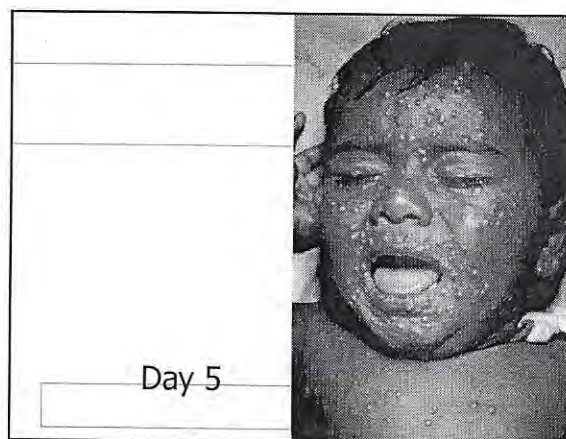
- To portray the principal features of smallpox, a disease last seen in 1978 but still a threat
- To identify the principal landmarks of the eradication campaign
- To highlight the program's legacy

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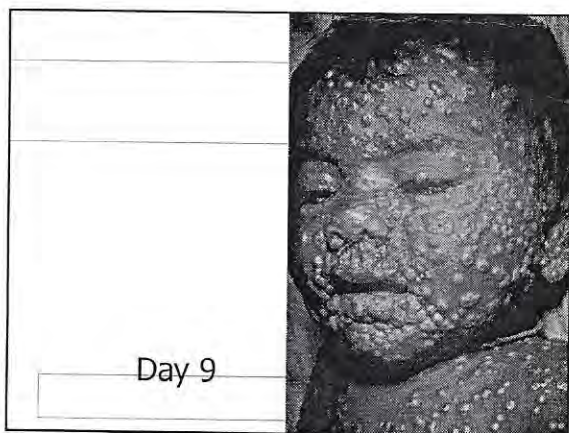
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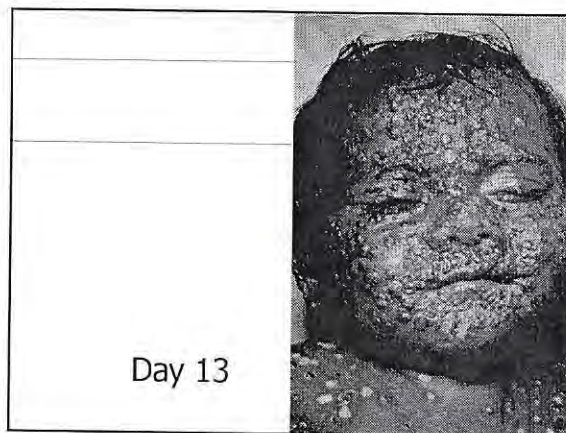
Day 3



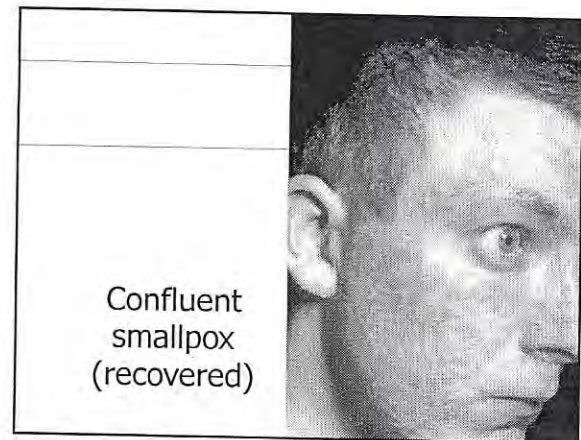
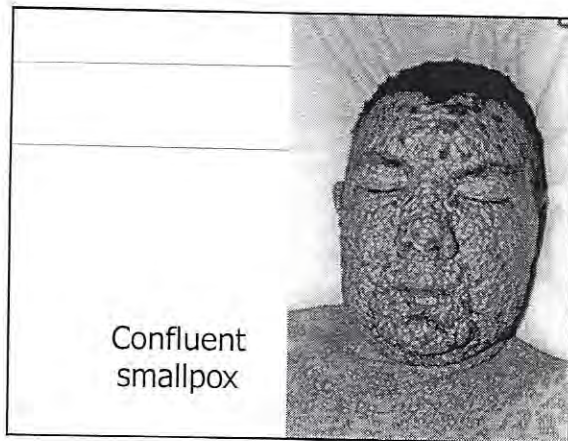
Day 5



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
▪ G. worm infection	1986- ?	26 years +
▪ Poliomyelitis	1988- ?	24 Years +

The WHO Eradication Program

Assembly requires WHO to submit a plan --1966

- Strategy
 - Systematic mass vaccination to reach 80%
 - Surveillance and containment
- 10 year program --budget of \$ 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:
 - Limited resources -- <\$50,000 each for 50 countries
 - Not enough even to buy the vaccine required
 - Inexperience in operating an international program

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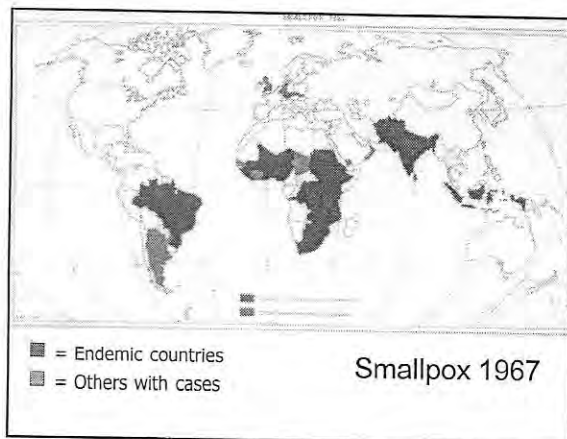
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The Challenge

- Status of smallpox -- 1967
 - >10,000,000 cases
 - 2,000,000 deaths
 - 43 countries reported cases
- Program staff
 - Headquarters -- 10 (includes 6 support staff)
 - Regions -- one each in 4 WHO Regions
 - International staff -- never more than 150

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Vaccine Supply

- Vaccine need – 300 million doses annually
- A heat-stable, freeze-dried vaccine was essential
- Development of national capacity
- Independent international quality control
Labs in Netherlands and Canada

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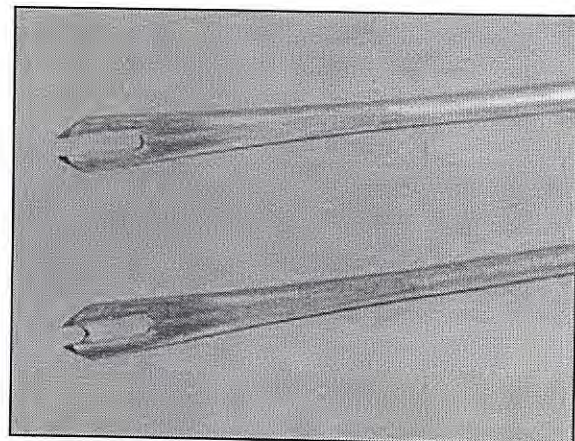
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Vaccination methods

- Research to find faster, better methods
Bifurcated needle—multiple puncture method
One-fourth as much vaccine required
Training time -- 15 minutes
Reusable after sterilization
Cost -- \$5 per thousand
- Target for coverage – 80%
Evaluation teams

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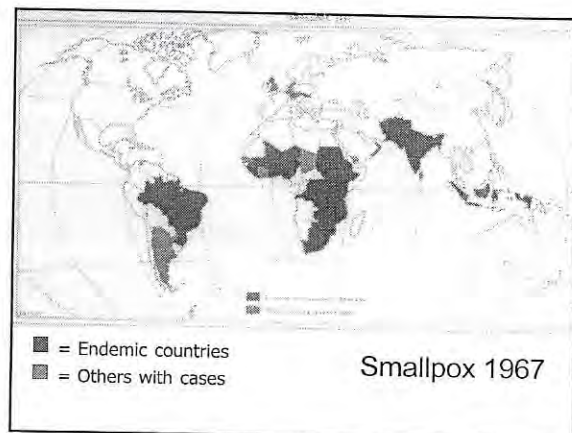


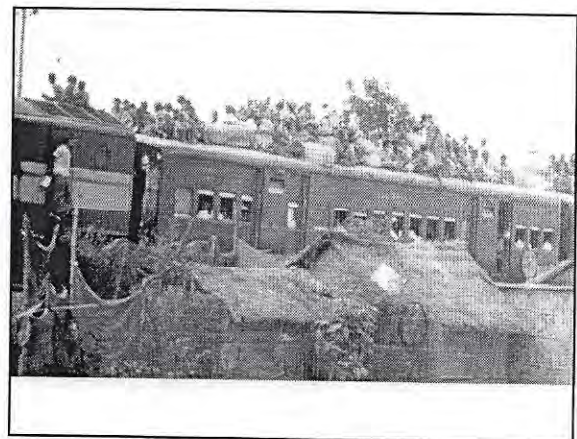
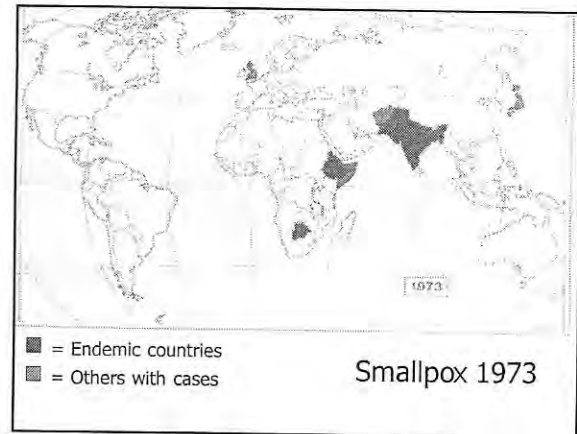
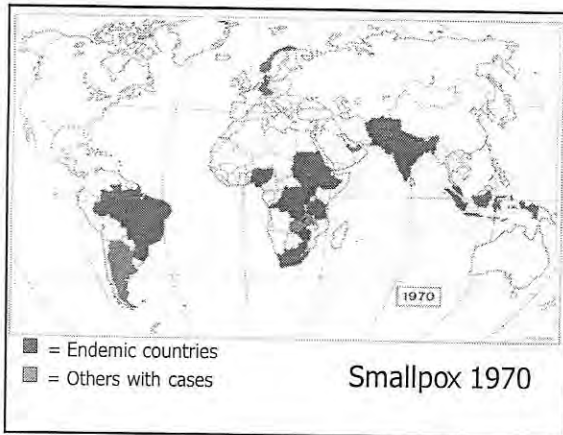
Surveillance-containment strategy

- 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"

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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
 - Gas crisis + strikes by airlines, railway, floods
 - India explodes a nuclear device

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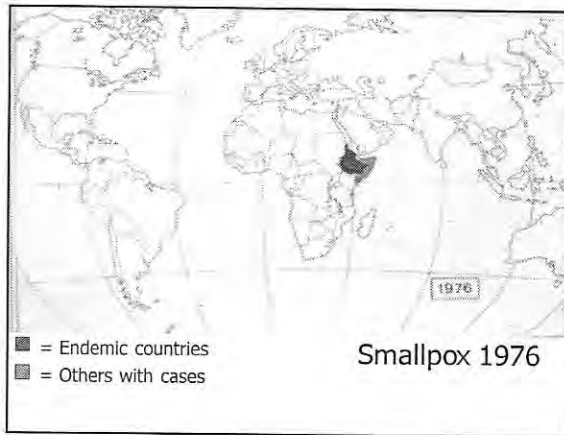
Indian Independence Day
August 15, 1975

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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The last strongholds

Ethiopia and Somalia

- Ethiopia
 - Country – three times the size of Taiwan
 - 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

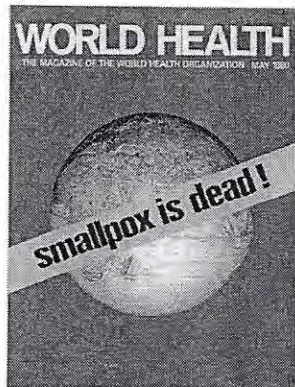
World Health Assembly --1980

- 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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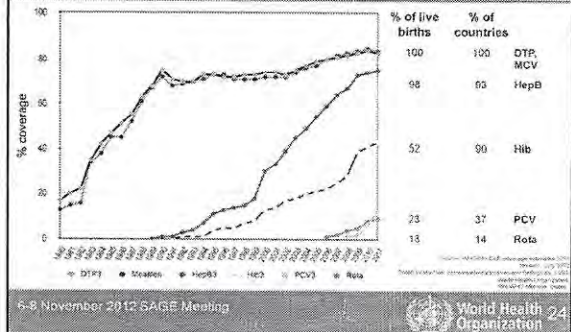
The legacy – beginning of the Vaccine Era

- The genesis -- 1970
 - African vaccine teams average 500/person/day with cooperative village leadership
 - One year = 400,000 vaccinations/4 person team
 - Smallpox – the only nation-wide vaccine program in most developing countries
 - Smallpox unit sponsors international meeting on strategies and targets - 1970

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

Global coverage estimates, 1980-2011 DTP3, Measles, HepB3, Hib3, PCV3 and Rota



Vaccine coverage (%) -- the Americas population – 935,000,000

	1980	1990	2000	2008	2010
DTP*	50	74	91	92	93
Measles	51	80	92	93	92
Polio*	57	75	90	92	92
HepB*	--	--	70	88	92
Hib*	--	--	75	90	93
Rotavirus	--	--	--	?	67

* 3 Doses

Transmission interrupted:

Polio (1991); Measles (2002); Rubella (2009)

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."

