

• ~~At the time of the smallpox outbreak~~

• Advice

• How many who have seen a case?

• For those who have and esp. for those who experienced

disaster -
unforgettable

Saga of Smallpox Eradication

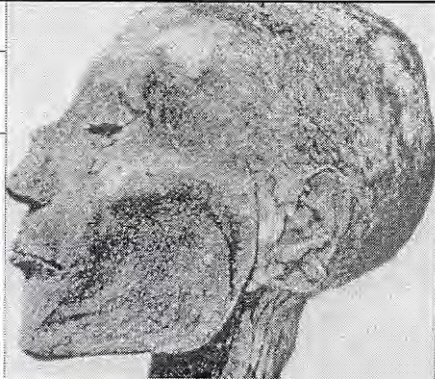
Great Decisions Lecture

University of North Carolina
Wilmington

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21 February 2006



Ali Maalin - 26 October 1977



Ramses V



Sitala Mata



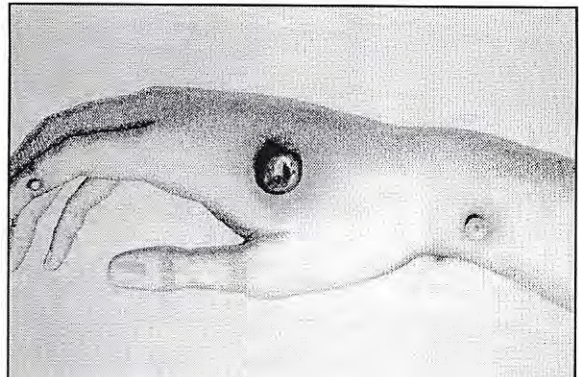
Sapona

"That disease was the most terrible of all the ministers of death. The horror of the Plague...visited our shores only once or twice within living memory but the smallpox was always present, filling the churchyards with corpses...and making the eyes and cheeks of the betrothed maiden objects of horror to the lover."

Macauley, A History of England



Edward Jenner



Cowpox on the hand of Sarah Nelmes

Deaths in the 20th Century

Due directly or indirectly to armed conflict:

100,000,000

Due to smallpox

300,000,000+

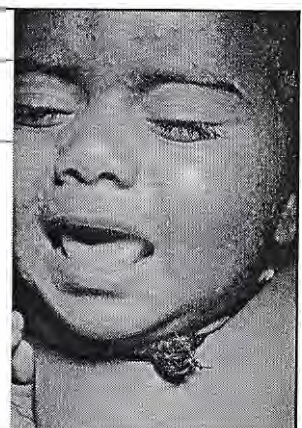
Smallpox -- characteristics

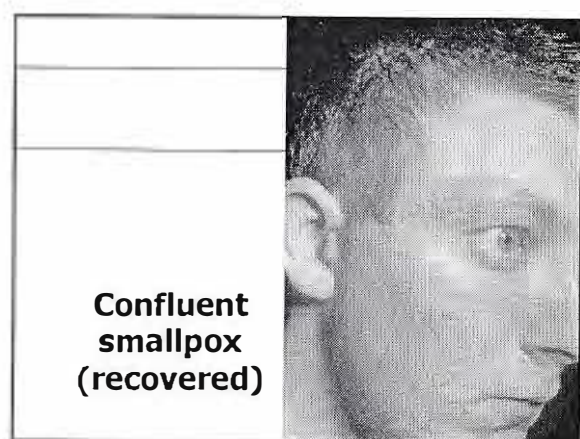
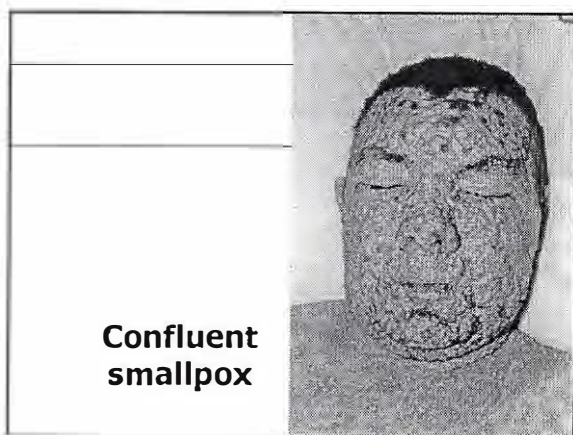
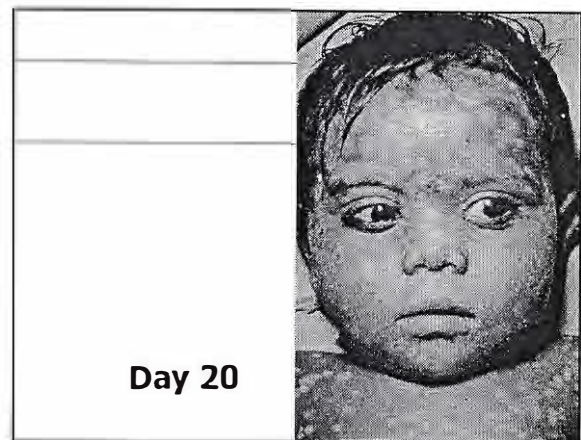
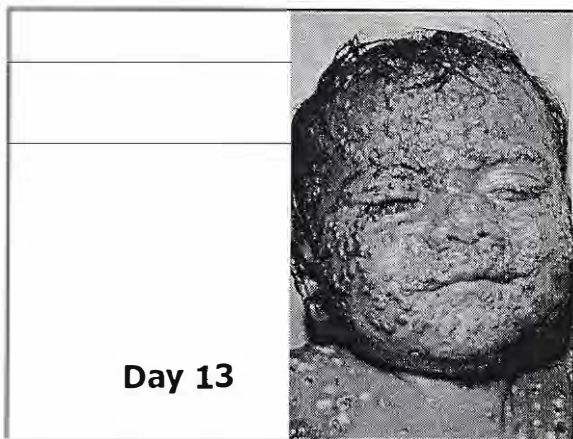
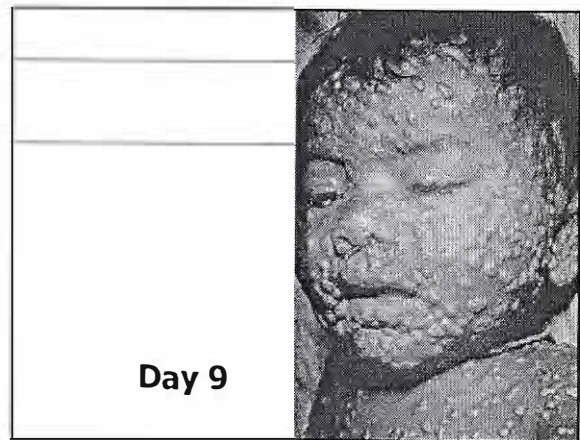
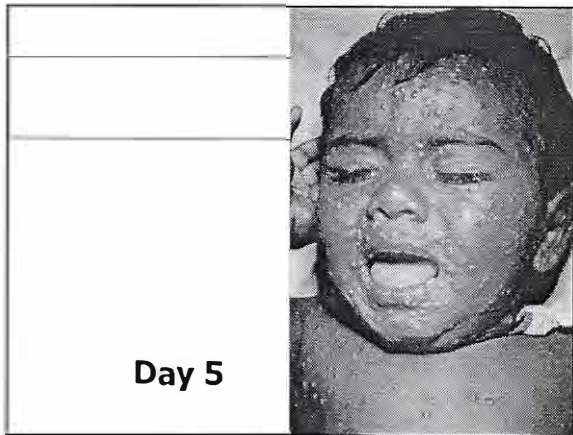
- Time -- infection to illness is 12 days
- Fever, flu-like symptoms then rash
- No therapy available
- Case fatality rate --30 %

Day 1



Day 3







Characteristics Favoring Eradication

- Only man can be infected
- Not infectious until patient is ill and with rash
- Virus spreads by face-to-face contact
- Permanent immunity after recovery
- Transmission stops spontaneously in remote areas
- Vaccine provides long-lasting protection

Landmarks

- 1959 Soviet Vice-Minister proposes eradication
 - WHO staff of 4 and little money = little progress
- 1966 U.S. and USSR propose intensified effort
 - World Health Assembly agrees by margin of 2 votes
 - A 10 year goal is established
 - A Chief Medical Officer for smallpox is named

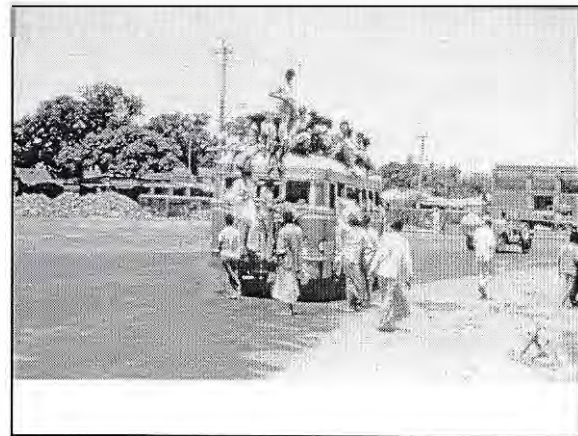
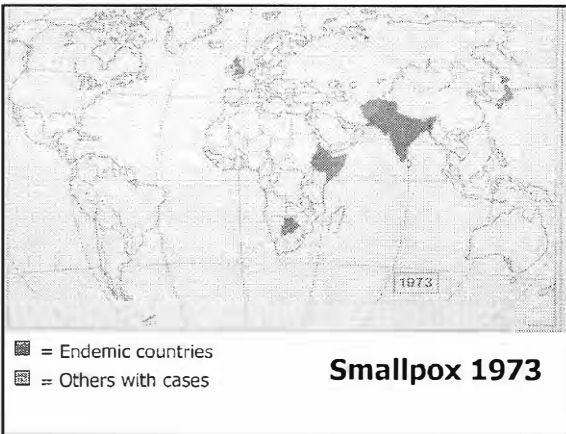
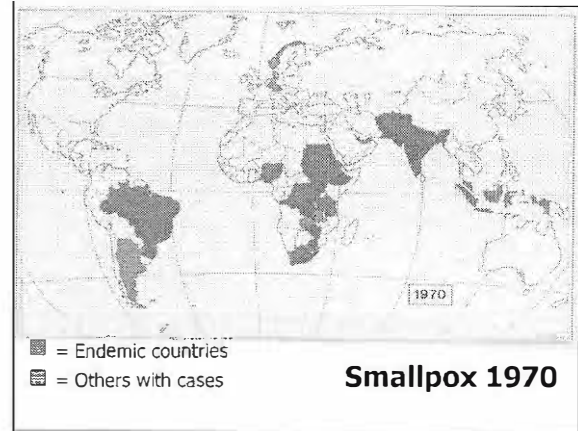
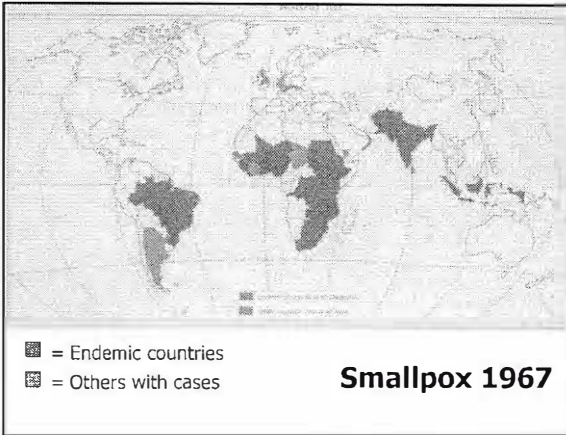
The Challenge

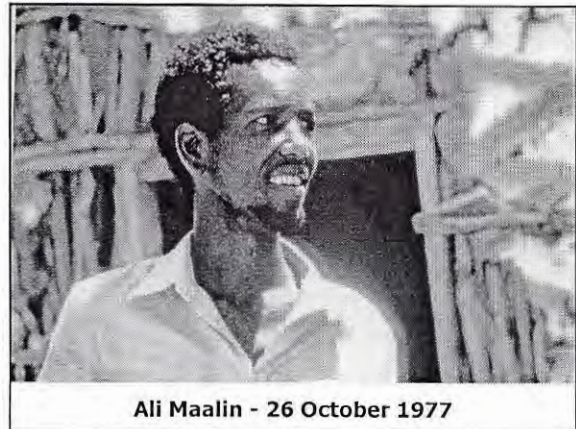
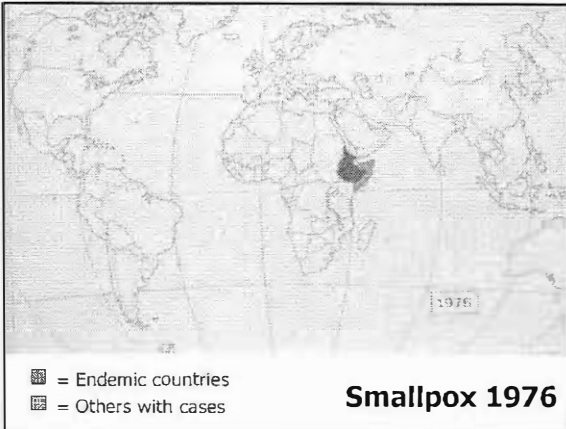
- Global status of smallpox -- 1967
 - 10,000,000 --15,000,000 cases
 - 2,000,000 deaths
 - 43 countries reported cases
- WHO smallpox program
 - Budget -- \$2.5 million
 - Headquarters -- 10 persons (5 nationalities)
 - Never more than 100 international staff
 - 73 nationalities -- 40% under age 40

The Strategy

- Vaccination
 - Target: 80% of population
 - Freeze-dried vaccine
 - Quality control
- Surveillance-containment
 - Report every week from each health center
 - Team to investigate and do "ring vaccination"







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*

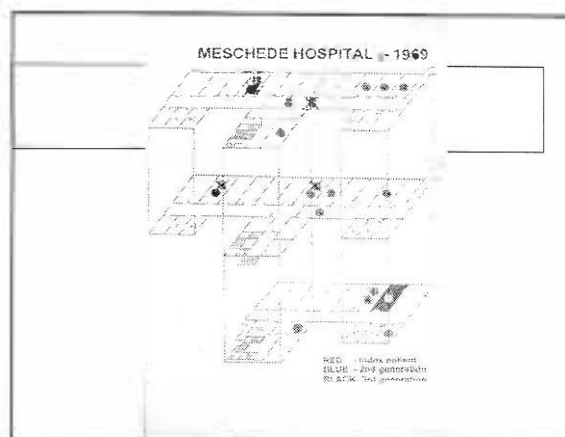
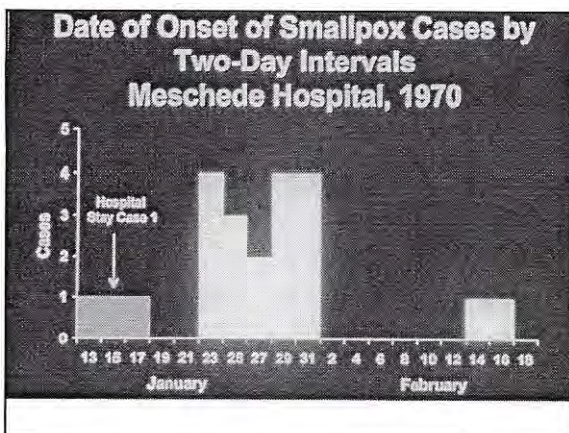
Meanwhile

- Expanded Program on Immunization adopted in 1974
 - Goal: By 1990, vaccination of 80 % of children throughout the world with other vaccines -- measles, polio, diphtheria, whooping cough, tetanus, tuberculosis
- Polio eradication began in 1985

Post-eradication

- Smallpox virus
 - Destroyed in all but 2 WHO Reference Laboratories (Atlanta and Moscow)
- Vaccine manufacturing – stopped
- Smallpox - possible biological weapon?
 - 1973 Biological Weapons Convention
 - 1991 Suspicions about USSR





"Soon after the WHO announcement (of eradication), smallpox was included in a list of viral and bacterial weapons targeted for improvement in the 1981-85 Five-Year Plan.... Where other governments saw a medical victory, the Kremlin perceived a military opportunity...the Soviet military command issued an order to maintain an annual stockpile of 20 tons."

Alibek, 1998

- ### Susceptibility of US Population to Smallpox -- 2001
- Vaccination stopped in 1972
 - None under 30 years of age had been vaccinated -- 40% of population
 - Persons vaccinated before 1972 had limited immunity- 35% of population
 - Overall -- 75% of population susceptible

- ### Epidemic Response Capability September 18, 2001
- Vaccine manufacturers
 - U.S. None
 - World None
 - Vaccine in storage
 - U.S. 15 million doses
 - World ? 80 million doses
 - Ready for emergency shipment
 - 90,000 doses of vaccine
 - Limited quantities -- needles

- ### Preparations for a disaster
- Smallpox vaccine --
 - Stockpiled--300 million doses packed to send
 - Each metro region
 - to have plan to vaccinate widely in 7-10 days
 - To be able to hospitalize 500+ patients per million
 - Every ER to have negative pressure rooms for examining rash and fever patients

Options for Vaccination Before an Event

- Vaccinate no one
- Vaccinate those at highest risk, candidates:
 - Health care workers
 - First responders
 - Truck drivers
 - Essential personnel
- Vaccinate anyone desiring to be vaccinated
 - Recommend vaccination
 - Recommend against vaccination
- Make vaccination compulsory

A Balance of Risks

- Probability that smallpox would be used as a weapon
- Frequency of adverse reactions and public response
- How rapidly could an outbreak be controlled?

Expected Adverse Events

- Life-threatening complications (per million)
 - Post-vaccinal encephalitis (3)
 - Progressive vaccinia (1)
 - Eczema vaccinatum (12)
- Less serious
 - Generalized vaccinia
 - Accidental inoculation
 - Rash and fever
- If 100 million vaccinated, 100+ deaths might occur

Outbreak control

- Smallpox doesn't spread readily
- Patient transmits only after symptoms
- Vaccine protects even when given 3-4 days after infection

Importations into Europe: 1958-1973

- Outbreaks: 34
- Cases: 573
 - Transmission in hospital: 277 (48%)
 - Transmission in home: 143 (25%)
- Hemorrhagic cases— a threat to hospitals
 - Bradford, UK (1961) 10 cases
 - Germany (1970) 16 cases
 - Yugoslavia (1972) 38 cases

Outbreak control I

- Vaccinate and isolate patient
- Vaccinate all persons and their household members who had been in a room with the patient since illness
- Place contacts under surveillance with twice daily temperatures
 - If contact develops fever, isolate

Outbreak control II

- Make vaccine available to all in the area who want it
- Communicate with public frequently and promptly (anticipate CNN)
- Not desirable:
 - Compulsory vaccination
 - Quarantine of city or groups of people
 - Closure of airports, suspension of transport

- Other chapters remain to be written
- May they be few and and may they be brief