

Public Health Preparedness

The threat of biological organisms

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Taiwan CDC
July 2013

Reasons for a CDC

National laboratories for the identification of microbes date back to the 19th century. Their findings were invaluable but with little knowledge of the cases, their contributions to disease control were limited.

In the 20th century, it became apparent that what was needed for disease control was a public health institution that dealt also with the epidemiological status of infections.

With this in mind, the CDC in Atlanta was established 60 years ago. Factors in its growth have been the growing concerns about the many new threats posed by nature as well as by organisms that might be released with malicious intent.

+ My experience in Taiwan

Relevant career experience

- CDC (1955-1976) post-M.D. and internship 1955-76
Chief, Epidemic Intelligence Service
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Director of CDC West Africa Smallpox Program
Chief Medical Officer/Smallpox (on loan to WHO)
- Dean, Johns Hopkins School of Public Health 1976-90
- Assoc. Director for Science Policy, Office of the President 1990-93
- Deputy Assistant Secretary for Science DHHS 1993-96
- Founding Director, UPMC Center for Health Security 1997-
- Acting Assistant Secretary for Preparedness, DHHS 2001-04

An era of complacency

... from a personal vantage point

- Infectious diseases – 1960s through mid-1980s
Increasing belief:
chronic diseases are the challenge of the future
new antibiotics and vaccines will deal with infectious diseases
tropical diseases are of little immediate concern to the U.S.
- Nobelist Macfarlane Burnett
argued that we are at an end of an era – the demise of infectious diseases
- U.S. Surgeon General William Stewart – 1979
stated that we have effectively probed most frontiers of knowledge in the infectious disease field

Misguided optimism

- Johns Hopkins School of Public Health 1977
One small department dealing in the lab primarily with parasitic infections
One infectious disease epidemiologist who soon left
- Grants and government resources – scarce
- Some infectious disease departments in medical schools absorbed into other departments
- Many infectious disease residencies down-sized or closed

A serious international mistake

- Global malaria eradication started – 1955
Based on discovery of DDT – inexpensive, effective
More than 63 national programs
Over 30% of all WHO funds allocated
- A military operation reporting to heads of state
Research laboratories closed
Far more complex and expensive than expected
Malaria program begins to collapse – 1965 to 1975

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Four events signal change

- CDC occupies its first permanent building –1960
Confirmation of a permanent agency
- Smallpox eradication – 1967
An unexpected approval by World Health Assembly
- AIDS arrives on the scene -- 1981
Secretary of Health predicts a vaccine in 2 years.
- New and Emerging Infections Meeting -- 1989
Dr. Josh Lederberg, President of Rockefeller U.
"Man's only competitors for the dominion of the planet are the viruses ... and the outcome is not fore ordained."

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Smallpox eradication—the beginning

- Director General submits a plan to World Health Assembly-- May 1966
10 year program – WHO budget of \$ 2.4 million/year
DG anticipates that it will be rejected
 - Objections by delegates
 - Malaria eradication (in its 11 year) is failing
 - Not feasible
 - Demand that WHO budget not be further increased
- Voting --58 votes needed; 60 voted in favor

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The Challenge

- A director is chosen
- Status of smallpox – 1967
 - >10,000,000 cases
 - 2,000,000 deaths
 - 43 countries reported cases
- Program staff
 - Headquarters – 6 professional and 3 secretaries
 - International staff – never more than 150

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The strategy

- Vaccination of 80% to minimize spread
- Surveillance
 - To obtain a weekly report from every health center and hospital
- Containment
 - "Fire-fighting teams"
 - Investigate every case
 - Contain outbreaks with ring-vaccination
- Surveillance reports
 - At least monthly; to be widely distributed

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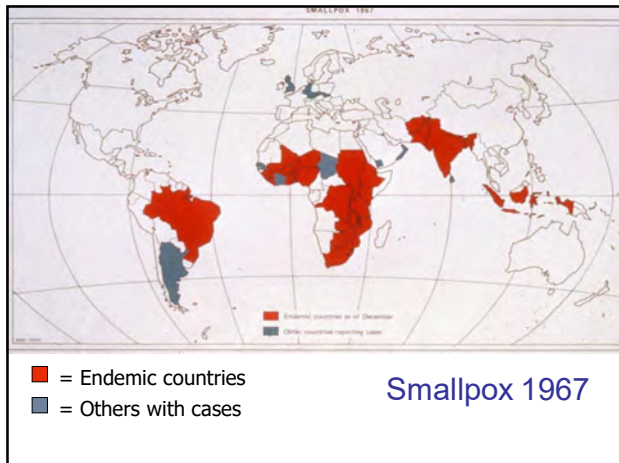
Vaccine and vaccination

- Heat stable vaccine
 - Process for commercial freeze drying -1953
- Vaccine supply – 250 million doses/year
 - Production manual – WHO consultants – 1968
- Potency of vaccine
 - Testing laboratories – Netherlands, Canada – 1969
- The bifurcated needle
 - Invented by Ben Rubin, Wyeth Labs.

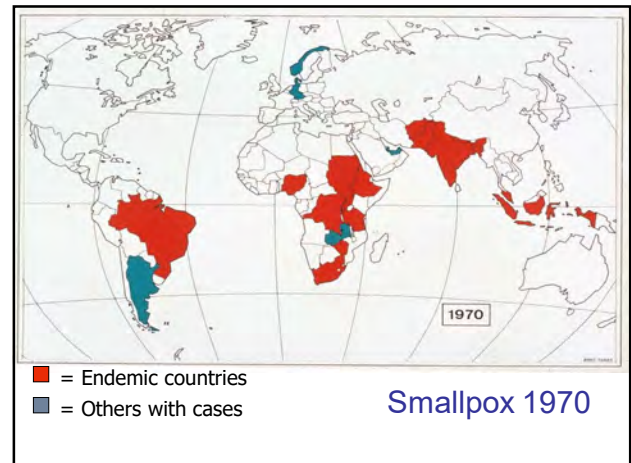
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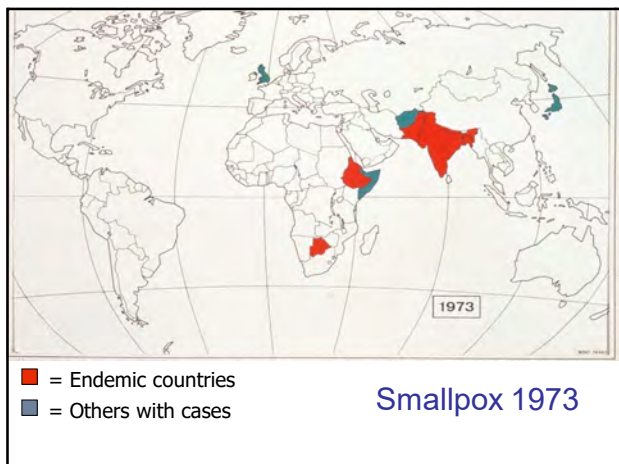
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A new strategy – June 1973

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, some health workers on strike
- Worst floods in three decades
- India detonates an atomic weapon—May 1974

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Indian Independence Day

August 15, 1975

Prime Minister Indira Gandhi

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

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Ali Maalin - 26 October 1977

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Eradication is certified - May 1980

- Vaccination ceased in all countries
- Manufacturers dismantled facilities
- Vaccine availability in 1998 (WHO survey)
WHO -- 5 million doses
Total for all other countries-- ?90 million doses

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Concern about organisms as weapons

- A threat, largely ignored until 1995
Too difficult to grow organisms
Technologically difficult to disseminate
So potentially destructive as to be unthinkable
Not used because of an inherent moral barrier
- Little historical evidence of prior use

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Status and attitudes – 1972-95

- Biological Weapons Convention –1972
Countries pledge to destroy weapons and cease all research on offensive weapons
Signed by all countries
- Academia -- medicine and public health
Biological and chemical weapons are morally reprehensible – not to be further discussed
Little research done on organisms considered to be likely candidates for use
No program or expertise at (U.S.) CDC or NIH

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Watershed event -- 1995

Aum Shinrikyo in Japan

- Religious cult releases Sarin gas in Tokyo subway
Cult - previously unknown to government
Thousands of members, well-funded
Aerosolized anthrax throughout city at least 8 times
Organized team went to Congo to get Ebola virus
- Concern – *unknown, non-state sponsored organization, acting without concern for moral deterrents*

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Watershed Event—1995

Soviet Union

- Major bioweapons program revealed
 - Ken Alibek, Deputy director of USSR program, deserts and describes extensive activities
 - 60,000+ workers in 50 different laboratories
 - Expert, qualified research scientists
 - Preferred agents: smallpox and anthrax
 - Smallpox virus production laboratory capable of producing 20+ tons of virus per year

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Evolving preparedness initiatives

1995-2002

Beginning initiatives of government -- 1995

- Focus initially -- expand existing systems for dealing with events after an explosion, civil disorder, large fires, etc. (Police, fire, emergency rescue teams, etc.)
- Health departments/ personnel not involved
 - Overlooked was the need to educate and involve public health and medical personnel, hospitals, communities in planning and response for any event with large numbers of casualties or spreading disease -- biological weapons attack, emerging infections (SARS, pandemic influenza, MERS), food poisoning, etc.

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From 3 Hopkins staff to a national program

- Symposium at IDSA (national meeting of infectious disease specialists) -- 1997
 - "Who are the first responders?"
- Grand rounds at medical centers
- Center for Biosecurity - 1998
 - One foundation agrees to provide funding (Sloan)
 - First national symposium for medicine and public health
 - "Working Group" decision -- 6 agents of greatest concern (the Class A agents)
- Funds provided to Dept. of HHS -- FY 2000

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N.Y. City -- Attack on Trade Towers

September 11, 2001

- September 16 -- meeting with Secretary Thompson
 - A possible second attack -- smallpox or anthrax
 - Status of country -- smallpox immunity
 - No persons <30 years have ever been vaccinated
 - 75% of population fully susceptible
 - Vaccine --15 million doses, no manufacturers
 - Status of country -- anthrax
 - No immunity
 - No suitable vaccine, no manufacturer
 - Antibiotic supply for 20 million people for 60 days

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The anthrax attack

- October 4, 2001
 - A 63 year old Florida man dies of inhalation anthrax
 - Over the next 6 weeks
 - 11 cases of cutaneous anthrax
 - 10 additional cases of inhalation anthrax; 5 deaths
- Outcome
 - Thousands take antibiotics as a precaution
 - Postal service is disrupted; building evacuations
 - Tens of thousands of alarms involving white powders
 - Cost of the incident -- \$6 billion
- Weapon: 10 grams of anthrax powder in 5 envelopes

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Detection of an attack with a bioweapon

- Who is likely to be the first to detect an attack?
 - Border interdiction or by intelligence -- highly unlikely
 - Biowatch (routine air samplers) -- highly unlikely
 - Biosense (data mining) -- unlikely
 - First responder personnel -- possible
 - Astute physician (probably the i.d.doc) -- the key person
- Examples
 - Anthrax in Florida -- 2001
 - First U.S. cases of West Nile Virus -- New York
 - First known Ebola cases -- Congo

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Elements of a surveillance system

- Central Surveillance Office
 - Receipt and analysis of data from receptor points
 - Hospital epidemiologists
 - State or district reporting offices
 - Laboratories
 - Public media
 - Design and mobilize response for outbreak control
 - Surveillance reports – electronic; at least weekly
 - What is measured can be acted upon;
 - what is published and distributed gets result"
 - Supplementary studies
 - Sample surveys; vaccine evaluation, etc.

Bioweapons threat – Jan. 2010

- "With weapons of mass destruction that could result in the death of many, many people – chemical, biological, nuclear – we assess biological as the more likely. It's better than an even chance in the next five years that an attack by one of those weapons systems will be conducted in some place on the globe.

U.S. Director of National Intelligence
January 2010

- Spoken by some one who has yet to understand that the natural processes of genetic evolution could result in an emergent pandemic virus of even greater potential.

D.A. Henderson, UPMC Center for Biosecurity
July, 2013

~~Nothing said about response~~

~~Vaccine~~
~~Antibiotic~~
~~Environmental outbreak~~

~~Present from one discussion - SARS/MERS/ELU~~

~~Preparedness~~
~~Interagency Coms.~~
~~Response to small pox attack~~

State & local - role
Community response