

Transformation of Smallpox: Control to Eradication

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Armenian Workshop
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Smallpox eradication – the beginning

- 1959 – a Soviet initiative adopted by the World Health Assembly
 - Strategy: all countries to undertake mass vaccination campaigns
- 1959-66 – limited progress
 - Little was done to improve reporting systems
 - Voluntary contributions were sparse and budget was small

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WHO Expert Committee on Smallpox Eradication -- 1964

- Principal strategy is mass vaccination but "vaccination of 80% of the population has proved unsatisfactory in some instances. The target must be to vaccinate 100%"
- Data regarding smallpox are too incomplete to permit conclusions to be drawn regarding trends of disease
- A principal problem – the lack of vaccine

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1966 – proposed strategy change

- Systematic mass vaccination
 - Quality control of vaccine
 - Quality control of performance
- Surveillance – containment
 - Reporting system
 - Epidemiological investigation of all cases
 - Containment of outbreaks

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Smallpox eradication – end result

- 1966 - World Health Assembly decided on \$2.7 million/year to intensify effort
- 1967 – Intensified program began
 - 10 year time target
- 1977 – Last case occurred
 - 9 months and 26 days beyond target
- 1980 – Assembly confirmed eradication and recommended that vaccination be stopped

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The transforming factor -- Surveillance

- A new concept authored in 1950 by Alex Langmuir, then Chief Epidemiologist at CDC
- Before 1950 – surveillance referred to watching individual contacts of certain serious diseases – (plague, typhus, syphilis, etc) – so as to begin early treatment

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Surveillance after 1950

- Langmuir: Surveillance should be applied to specific diseases rather than to single individuals and should be used as an epidemiological tool
- Components
 - Systematic collection of relevant data
 - Continuing evaluation and interpretation of the data
 - Timely dissemination of information to all who need to know and potentially might act on the information
- First used in U.S. – for malaria, polio, influenza

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Global application to smallpox

- Elaboration of the strategy – 1967
 - Create special field surveillance teams
 - Weekly case reports from every hospital and health center
 - Investigation of all outbreaks and intensive 2 to 3 day vaccination in infected areas
 - Continuing epidemiological analyses of data – "every case represents a program failure"
 - Prepare and distribute surveillance reports

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Accepted beliefs – 1966

- Case reporting is poor and impossible to improve until basic health services are fully developed
- Smallpox is highly contagious and spreads rapidly "like a prairie fire"
- Duration of vaccination immunity - 3 to 5 years

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Effective case reporting is impossible

- Within 12-18 months, a reporting network can be set up with >90% of units reporting weekly
- Reason – recognition that reports were being used
 - Surveillance teams responded to reports, tracing chains of infection and vaccinating
 - Surveillance reports made widely available with data and analyses

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Smallpox is highly contagious

- Epidemiological studies show:
 - patients rarely infect more than 2 or 3 others
 - almost all are face-to-face contacts after the patient is ill and in bed
 - cases tend to be geographically concentrated
 - transmission can be rapidly stopped even in poorly vaccinated communities
 - stories of "contaminated houses" and transmission in mail or on carpets were folk lore
- Result: surveillance-containment given top priority

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Immunity lasts only 3-5 years

- Large number of cases in previously vaccinated adults expected but few were found
 - epidemiological studies of household transmission showed that subclinical infections occurred among vaccinated contacts, thus conferring life-time immunity
- Mass vaccination strategy changed to emphasize reaching children

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The message

Keys to smallpox eradication

- Surveillance and field epidemiology
- Continual testing of premises and operations
- Evolutionary alterations of program direction

There is no substitute for shoe leather epidemiology

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SYMPOSIUM SCHEDULE

2:00–2:15 p.m.

Introduction and Opening Remarks

Jonathan Samet, MD, MS

Professor and Chair

Department of Epidemiology

Johns Hopkins Bloomberg School
of Public Health

2:15–2:40 p.m.

*Beyond Gene Discovery: The Role
of Epidemiology in Using Genomic
Information in Population Health*

Muin Khoury, MD, PhD

Director

National Office of Public Health Genomics
Centers for Disease Control and Prevention

2:40–3:05 p.m.

*The Transformation of Smallpox Control
into Eradication*

D.A. Henderson, MD, MPH

Distinguished Scholar

Center for Biosecurity of University
of Pittsburgh Medical Center

3:05–3:30 p.m.

*Strategies for HIV Prevention in South
Asia: Perspectives and Experiences of
an Undifferentiated Epidemiologist*

James Blanchard, MD, PhD, MPH

Associate Professor

Community Health Sciences
University of Manitoba

3:30–3:55 p.m.

*Latency and Exposure-Health Associations
in Gulf War Veterans with Early Fatigue
Onsets: A Case-Control Study*

Katherine Lucas, PhD

Health Insurance Specialist

Centers for Medicare & Medicaid Services

3:55–4:20 p.m.

Somatic Sequelae of Depression

William Eaton, PhD

Professor and Chair

Department of Mental Health

Johns Hopkins Bloomberg School
of Public Health

4:20–5:00 p.m.

Remarks

Haroutune K. Armenian, MD, DrPH, MPH

Professor, Department of Epidemiology
Johns Hopkins Bloomberg School
of Public Health

5:00–5:15 p.m.

Closing Remarks

Michael J. Klag, MD, MPH

Dean, Johns Hopkins Bloomberg School
of Public Health

Reception to follow in the Anna Baetjer Room, W1030

7:00 p.m.*

Dinner

Lebanese Taverna

719 S. President Street

Baltimore, MD

410-244-5533

*transportation will be available to the restaurant