Anna Baetjer lecture

It is, for me, a special honor to be asked to give this lecture which honors one of the most exceptional persons who have ever served on a School of Public Health faculty -- a pioneer in defining the field of environmental health. None have been more dedicated nor served so long with such commitment. Anna's tenure encompassed a period extending almost 60 years during which public health emerged as the respected professional entity we know today and environmental health sciences became a well-established area of specialization.

Johns Hopkins, as you know, was the first school of public health and Anna enrolled little more than a year after it accepted its first students. She was one of the first to be awarded the degree, Doctor of Science, and she was appointed to the faculty fully 3 years before the School's first building was completed. Deans came and Deans went but Anna soldiered on, serving for many years as the only faculty member in her Department and with a budget that, at one time, amounted to only $5000 – for the year. To a new Dean when he arrived in 1977, it was apparent that she was one of the most enthusiastic,

innovative, tireless spirits I had ever encountered. During my tenure, some, with admiration, referred to her as the model for the "Energizer Bunny".

But a few points in her remarkable life.

It was in 1924 that she was appointed as Instructor in what was then called the Department of Physiological Hygiene. Its studies were of "general conditions promoting human health" – a broad charter indeed! Its principal emphases were air quality, ventilation, industrial hygiene and radiation. There were only two other faculty members, William Howell, the dean from 1926 until 1931 and one Associate Professor, Janet Clark. However, Howell retired in 1931 and four years later, Clark accepted another position. That left only Anna. The Dean at that time proposed amalgamating the Department of Physiological Hygiene with another Department but Anna would have none of it. She believed that the subjects of her concern would not receive due attention if buried within another department. Thus, she continued as a one faculty member department, eventually to be called the Department of Environmental Health Sciences. For 15 years, she taught all courses, mentored all students and did research. Finally, in 1962, just 38 years after joining the faculty,

she was made a full professor. Twenty years later, the University conferred on her the degree, Doctor of Humane Letters, an honorary degree rarely conferred by a University on its own faculty

Anna was not afraid to take on major issues. She was a force for change.

Thus, it seemed appropriate for this lecture to elaborate upon contemporary challenges in effecting a significant change within the field of public health. You might assume this to be a prelude, a discussion of smallpox but it is not. Rather I would like to take up the subject of "New and Emerging Infections", a critical problem area, as I shall illustrate, and one with which public health has only belatedly and somewhat reluctantly begun to address seriously.

#6

Anna Baetjer Lecture

D.A.Henderson, MD, MPH

Dean Emeritus
University Distinguished Service Professor

14 March 2007

New and Emerging Infections

The anatomy of some responses
to a new set of challenges

"Conquest" of the infectious diseases
1950s-70s

- Dramatic changes post WW II
  - Vaccines
  - Antibiotics
  - Nutrition
  - Housing
  - Sanitation
- Decline or elimination of many diseases in the industrialized world
  - Smallpox, diphtheria, whooping cough, tetanus, polio, measles, *et alia*

- *"One can think of the middle of the 20th century as the end of one of the most important social revolutions in history, the virtual elimination of the infectious diseases as a significant factor in social life"*

Sir Macfarland Burnet

Nobel Laureate, Australia 1962

A cloud on the horizon

- June, 1981 – first cases of AIDS diagnosed
- April, 1984 – HIV is identified
  "the triumph of science over a dread disease"
  "a vaccine will be available in 2 years"
- 2007 -a world-wide pandemic in progress
  - 4th leading cause of death world-wide
  - No vaccine
  - No curative drug

Other threats ?

- 1989 Conference on Emerging Infections
- *Man's only competitors for the dominion of the planet are the viruses – and the ultimate outcome is not foreordained.*

Joshua Lederberg

Nobel Laureate, USA

Continuing reminders

- More than 30 new agents in 25 years
  - SARS – from Asia
  - West Nile encephalitis – from Middle East
  - Monkeypox – from Africa
  - TSE – "mad cow" disease – from UK
  - Hanta virus pulmonary syndrome – U.S.
  - H5N1 influenza – from Asia
- IOM Committee on Emerging Infections
  - 1991-92 – *National Academy Press, 1992*

Why now?

- Growth in urban populations
  - Population of cities
    - 1950 -- 2 with more than 5,000,000
    - 1975 – 5 with more than 10,000,000
    - 2004 – 6 with more than 15,000,000
  - By 2015
    - 5 cities with more than 20,000,000 persons
    - 55% of world's population in urban areas

Why now?

- Growth in urban populations
- International travel
  - Volume
    - 18 million commercial air flights yearly
    - 1.6 billion air passengers per year
  - Remote destinations – tropics, rain forest
  - All cities less than 36 hours from all others

Why now?

- Growth in urban populations
- Travel
- Growth of hospitals in endemic areas
  - Major sites for disease distribution
  - Problem of blood borne diseases
  - Development of antibiotic resistance

Why now?

- Growth in urban populations
- Travel
- Growth of hospitals in endemic areas
- Food supply
  - Internationalized
  - Industrialized
    - Animal husbandry
    - Food processors

The future

- The threat of new and emerging infections is increasing
- Sources of the threat:
  - Natural mutation of microbes
  - Emergence of organisms from remote areas
  - Biological terrorism
- The threats are international

A beginning response to these events – since 1980

- Infectious disease departments
  - Hopkins – 3 faculty in 1980
    55 faculty in 2007
- Departments of Microbiology
- Research funds
- Journal – "Emerging Infectious Diseases"

Concerns about terrorism –pre 1995

- Little concern about terrorism of any type
- Control of nuclear arms development believed to be effective
- Unwarranted confidence in the Biological Weapons Convention of 1972
- Intelligence capabilities limited

Intentional release of biological agents

- Rationale for ignoring the threat until mid -1990s
  - Too difficult to grow organisms
  - Technologically difficult to disseminate
  - Not used because of a moral barrier

Watershed events
Iraq -- 1995

- Papers of Iraqi bioweapons program became available
- Production and testing of anthrax
  - Aerosol studies
  - Use of drone aircraft

Concern: Deliberate development of anthrax as a weapon by a nation-state

Watershed events
Aum Shinrikyo -- Japan

- Religious cult released Sarin gas in Tokyo subway (1995)
- Cult - previously unknown to intelligence
  - Thousands of members, well-funded
  - Tried to aerosolize anthrax and botulinum toxin throughout Tokyo at least 8 times
- *Concern – unknown, non-state sponsored organization, acting without concern for moral deterrents*

Watershed events
USSR Bioweapons Program

- Secret program – not suspected until 1989
- 1992 – Ken Alibek, Deputy Director of bioweapons program, deserts
- 1995 – Full scope of program apparent
  - 60,000+ persons in 50 different labs
  - 30 metric tons of anthrax spores in storage
  - Large capacity to produce smallpox virus
- *Concern – Expertise and possibly specimens now dispersed world-wide. Still a secret program*

Civilian counter-terrorism initiatives
1995-99

- Presidential Decision Directive #39 – 1995
- For terrorist events -- emergency response
  - First responders -- police, fire, emergency medical
  - DoD to do the training
  - FBI to find the bad guys
  - Public health and medical treatment – ignored
- Assumption that chemical and biologic weapons required the same response
  - A new word "CHEMBIO"

Biological weapons
"the poor man's nuclear weapon"

- Growing number of labs and expertise
- Necessary ingredients available
- Can be produced in small facilities
- Inexpensive
- Few technical staff required
- Small quantities produce a major effect
- Easily transported

New World Coming

- Besides nuclear weapons, biological weapons are the only weapon class with the capacity to take the nation past the "point of non-recovery"

Admiral Stansfield Turner, former CIA Director

Medical and public health interest
1997

- Biological weapons a taboo subject in most of academia
- CDC/NIH – no program and no interest
- Research in potential weapons – nil
  - Smallpox, anthrax, tularemia, bot tox, etc
- Secretary of HHS – not involved
- Locus of competence – Fort Detrick

Reassessment of priorities –
1997-2001

- Plenary panel at IDSA – September 1997
- JHU Ctr for Civilian Biodefense Strategies--1998
  - Working group to decide priority (Class A) agents
  - Two national symposia for medical and public health professionals
  - HHS funding -- $8m > $173m > $300m
  - The Dark Winter exercise (June 2001)
- The anthrax attacks (October 2001)

DHHS --Office of Public Health Emergency Preparedness-2001

Emergency appropriation – January 2002
$3 billion

- State directors for preparedness and planning
- Surveillance and epidemiologists
- Laboratory capacity
- IT systems
- Training and education
- Research on principal agents

Funds for Public Health Emergency Preparedness

- State and local health departments
  - $1 billion with flexibility to allocate funds
- Schools of Public Health
  - Twenty grants of $1 million each to strengthen education programs and work with state and local health departments
- Public health diagnostic laboratories

Biological Agents of Greatest Concern

- Smallpox
- Anthrax
- Plague
- Tularemia
- Botulinum Toxin
- Hemorrhagic fevers

Agents that if released, could threaten the integrity of government

Smallpox – a serious but now diminished concern

- Risk is small but potential for global catastrophe
  - Acquisition of smallpox virus – Former Soviet labs
  - Dissemination as aerosol – not difficult
- Response
  - **Educational programs on clinical features**
  - Stockpile -- from 90,000 to 300 million doses
  - Diagnostic labs -- 2 to >100

Anthrax – the greatest concern

- B. anthracis – easy to obtain
  - Former Soviet laboratories
  - Natural infections occur around the world
  - Until 2003 – 46 labs offered specimens
- Demonstrable intent and capability to use
  - Aum Shinrikyo
  - Iraq
  - Russia
  - U.S. terrorist "x" of 2001

Production and dispersal of anthrax

- Methods of production widely known
  - Only a small lab needed
- Aerosols – either from powder or slurry
  - Crop dusters
  - Ambient sprayers-- easily obtained
  - Ventilation systems

Prevention and detection measures

- Prevention
  - Interdiction of terrorists – unlikely
  - Large scale vaccination – vaccine supply limited
- Detection
  - Biowatch air sampling – technology inadequate
  - Biosense reporting -- unproven, untested
  - Early, rapid diagnosis – difficult

Response to anthrax release

- Vaccination and antibiotic distribution
  - A logistics nightmare
  - Available vaccine – reactogenic, limited supply
  - Limited tolerance of antibiotic for 60 days
- Clean-up of environment
  - Cumbersome, expensive, uncertain
- Hospital care
  - Limited capacity to care for casualties

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Pandemic Flu --a test for preparedness

- H5N1 -- unprecedented behavior of a flu strain with massive deaths in poultry and 50% death rate in humans
- Influenza – 1918 – H1N1
  - Case fatality rate – about 2%
  - Deaths U.S. 675,000
    World > 50,000,000
- H5N1 influenza – 2004-2007
  - >250 cases, about 125 deaths

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Status – March 2007

- Infected wild fowl, chickens, ducks, turkeys
  - Asia
  - Much of Eastern Europe
  - Africa
- Human cases – contacts of birds (a few patients)
  - Asia and Africa
- Vaccination programs
- Massive slaughter of fowl in infected areas
- Embargo on fowl from infected areas

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Prospects for the U.S.

- Avian H5N1–likely means of importation
  - Migratory birds
  - Bird smugglers
- Human pandemic flu
  - Will it occur?
  - When might it occur?
  - Can it be slowed or stopped?
- Reality and myth

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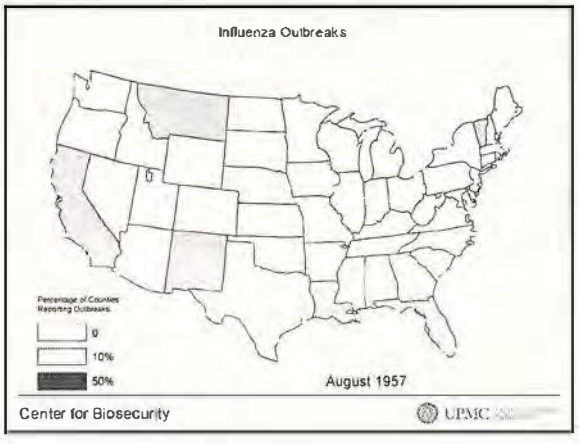

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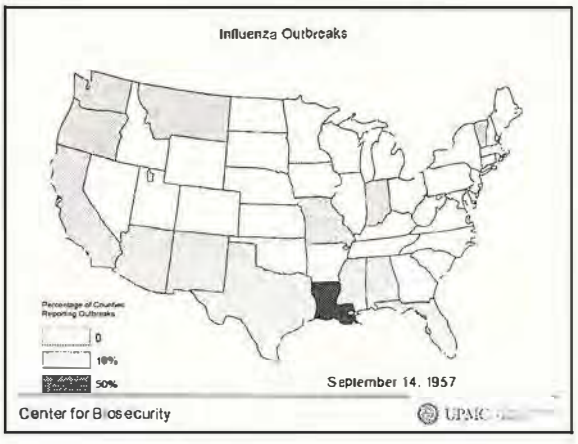

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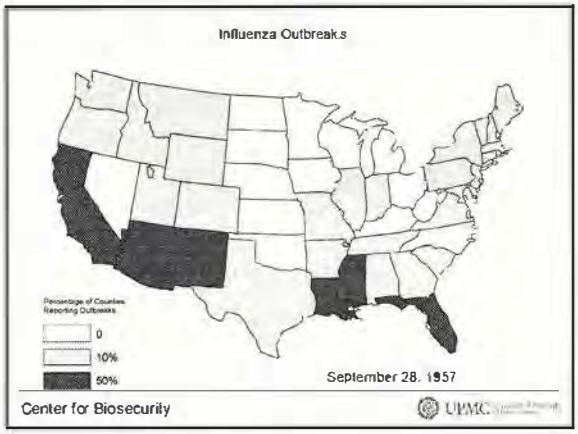

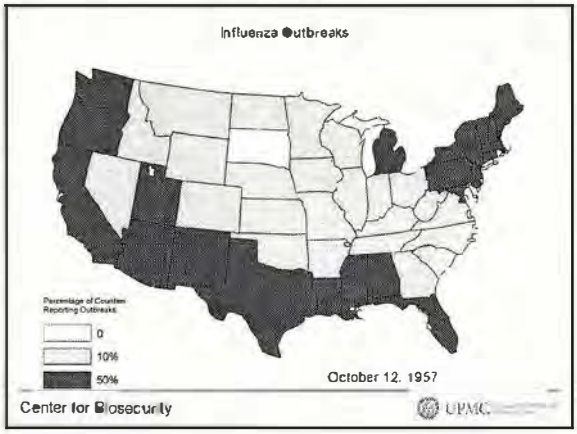

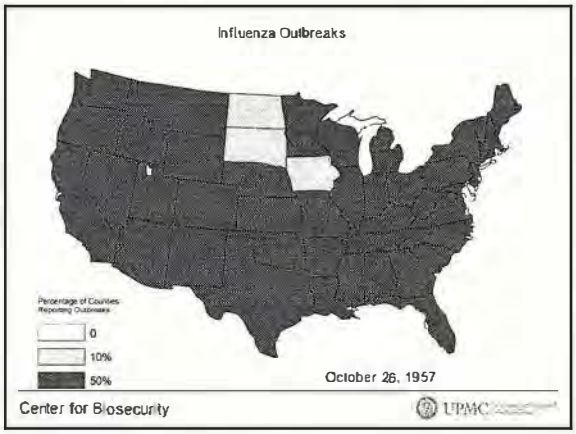

Key facts in planning responses

- Expected attack rate -- about 25 %
  - 75% do not develop illness
- Duration of outbreak in a city – 10-12 weeks
- Illness lasts ~10 days
  - Peak absentee rate because of illness = <15%
- Patients with flu begin spreading virus one to two days before symptoms
- No quarantine measure has done anything to slow the spread of pandemic flu

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Actions to deal with pandemic flu

constructive steps

- Vaccination – the most important measure
  - No vaccine will be available until specific strain identified and produced in quantity – 6 months+
  - Research promises a more broad-based antigen
- Antiviral agents in treatment
  - Tamiflu – uncertainties about side-effects, development of resistance, utility
- Isolate sick patients
- Provide for care of large numbers of patients

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A menu of other measures

advocated by some but of doubtful practicality

- Close borders and/or screen arriving air passengers from abroad or ? other states
  - 317 ports of entry into the U.S.
  - 1.1 million passengers and pedestrians daily
- Screening in Asia for SARS
  - 3.5 million screened for temperature- 0 cases

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A menu of other measures
advocated by some but of doubtful practicality

- Reduce contact among individuals
  - Quarantine all infected households
  - Isolate neighborhoods
  - Shelter in place – for 3 months?
  - Close churches, schools, malls, events – for 3 months ?
  - Station workers 3 feet apart
- Implications for paralyzing commerce
  - Just-in-time delivery issues – food, drugs
  - Hourly workers

Principal tenets for dealing with pandemic flu -- 2006-2007

- Alleviate anxiety; avoid panic
- Change the normal social activities of the city as little as possible
- Provide care for those who are ill
  - Community-wide efforts are requisite to plan for the care of a tidal wave of patients
  - A likely scenario if response is inadequate

Challenges for public health leadership

- Planning for and organizing community-wide preparations for response
- Curricula for education
- Communication with Congress for sustained support of funds for public health preparedness

- Influenza pandemics caused by new strains are certain. It is not a matter of "if" but "when".
- New and emerging infections of types we cannot anticipate will occur.
- As predicted, extreme weather conditions are recurring more frequently.
- Sophisticated terrorist events are increasing

Community-wide planning and preparation are essential. Public health should be taking a lead role. But is it?

What would Anna have done?