

+ Prof. Knapp, Prof. ~~CRAWLEY~~
Pross. Sorenson

South Carolina - Thank you -
Opportunity to meet today
many faculty & students
Clear - land of excellence here & promise future.

Spox lesson.

A Dark Side to 21st Century Biology

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The J. Ives Townsend Lecture
University of South Carolina
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+ Discovery of the double helix - ushered in new era.

50 years ago

+ About this time Enders, Robbin, Woltow - T.C.

+ Not much later - 1959 - 1st organ transplant.

+ ALAN BROMLEY - Physics - dominant science
BROWLEY - 21st century.

In all of this progression nothing -
microbial organisms.

- Man's only competitors for the dominion of the planet are the viruses - and the ultimate outcome is not foreordained.

Joshua Lederberg

Organisms pose a unique, new threat

- New and Emerging Infections
- Biological Weapons
- New Creations

"...one can think of the middle of the twentieth 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 Macfarlane Burnet--1962

Dypts. of Micros

Inf. Dis. Resid. Enceps

1977 - when Dengue - I D E P I -
2 people.

Clouds on the Horizon

- June 1981 - first cases of AIDS diagnosed
- February 1983 - first 1000 cases identified
- April 1984 - "Today's discovery (of HIV) represents the triumph of science over a dreadful disease"

Secretary Margaret Heckler

HIV/AIDS - as of 2003

- 15,000 new cases per day
- Since 1981
 - 60 million cases
 - 20 million deaths
 - 3 million deaths (2003)
- Protective vaccine - none
- Curative drug - none

\$2 billion/year in research

A PERIOD OF RAPID CHANGE -
 FEW APPROACHES LOW GROWTH
LOW RISK

ELABORATE

New and Emerging Infections

- 1989 - 1st conference on emerging infections
- 1992 - Institute of Medicine publication *Emerging Infections - microbial threats to health*
- Notable examples
 - TSE (Mad cow disease) ← 800,000
 - Influenza virus - H5N1
 - E.coli O157:H7

A Fertile Ground for New Microbial Agents

- Rapidly growing urban populations
 - 1800 2%
 - 1950 20%
 - 2010 67%
- Urban areas with a population
 - >7.5 million - 1950 - 2 cities
 - 2003 - 30 cities
 - >15 million - 2003 - 7 cities

TRAP / SUBTROP
 POOR COUNTRIES
 CROWDED
 MALNOURISHED

Transmitters of New Agents

- Hospitals in the developing countries
 EBOLA - HIV
- International travel
- Food supply
 - Internationalized
 - Industrialized

Industrialization of the food supply

- Shigellosis from an airline flight kitchen
 - 9000 cases on 219 flights
 - 24 states and 4 foreign countries
- E.coli 157 Jack in the Box epidemic
 - Contaminated lots of beef from cattle
 - U.S., Canada, New Zealand
 - Most likely supplier -
 - 443 cattle from 6 states, 5 slaughter houses

Is there a real need to be concerned?

Has any epidemic disease ever threatened civilization?

- Black death - plague in Europe
 - 1347-1350
 - Killed one-third of European population
 - Population size of 1350 did not recover until 300 years later
- Smallpox in the New World
 - Populations decimated; tribes destroyed
 - Population of Americas in 1500 estimated to be equivalent to that of Europe.

• ? HIV
 ? vaccine

Biological Weapons

- A threat, largely ignored until 1995
 - Technologically too difficult to grow and spread
 - So potentially destructive as to be unthinkable
 - Seldom used because of an inherent moral barrier that none would transgress

Not frequently used

Biological weapons in history

- 1346 Tatar attack on the port of Caffa
Plague victims catapulted into the port
- 1754-67 – British in French-Indian War
Distributed blankets to Indians
- 1776-80 – British in Revolutionary War
Smallpox patients employed
- 1940-44 – Japanese used weapons on many occasions to attack Chinese cities
 - Anthrax, botulism, brucellosis, cholera, dysentery, gas gangrene, plague, paratyphoid, typhoid

UNIT 731

Biological weapons –1973-95

- Biological Weapons Convention –1973
 - Countries pledge to destroy weapons and cease all research on offensive weapons
 - Signed by U.S., USSR, Iraq, et al
- U.S. Military funding –sharply reduced
- U.S. Public Health Service– no activities
- Medical and Public Health Academia
 - Activity of any sort with biological or chemical weapons generally shunned
 - Little research or training re: exotic diseases that are considered candidates for weapons

Concerned – Iraq early 90's

1995 --Watershed events Iraq

- Hussein Kamal deserts
 - Research reports reveal a much more extensive and sophisticated program than UNSCOM had been able to uncover
- Concern: If so much activity could continue undiscovered despite UNSCOM and other intelligence, how many other countries may be similarly engaged?

1995 – Aum Shinrikyo in Japan

- Religious cult releases Sarin gas in Tokyo subway
 - Cult - previously unknown to intelligence
 - Thousands of members, well-funded
 - Tried to aerosolize anthrax and botulinum toxin throughout city at least 8 times
 - Organized team to go to Congo to obtain Ebola virus
- Concern – unknown, non-state sponsored organization, acting without concern for possible moral deterrents

1995 – USSR Program

- Essentially unknown until 1989 deserter
- 1992 – Ken Alibek, Deputy Director of USSR bioweapons program, deserts to U.S. and by 1995, information he provides is widely known and confirmed
- Bioweapons program consisted of about 60,000 persons in 50 different labs.

"On May 8, 1980, WHO announced that smallpox had been eradicated from the planet. Soon after the WHO announcement, 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

60 000 / 50 / > nuclear

Russia today

- More than half of the scientists are no longer working in the old biological weapons labs. Many have gone abroad
- The major production lab for smallpox virus, at Sergiyev Posad, remains a secret facility
- The major viral weapons research lab continues work on smallpox, Ebola, et al
- Former Vice-Minister of Health Burgasov admits (2002) aerosolized smallpox was released on Voz Island in 1971 for studies

Biological Agents of Greatest Concern

- Smallpox
- Tularemia
- Anthrax
- Botulinum Toxin
- Plague
- Hemorrhagic fevers
Ebola, Marburg, etc.

Agents that, if released, could threaten the integrity of civil government

DOD / DOS / HHS

New Creations

- Advances in biotechnology-- the possible deliberate creation of recombinants
 - Readily able to be done in many labs
 - Comparatively inexpensive
 - Internet availability
 - Rent a scientist

Acquisition

- Until one year ago, instructions for the weaponization of several major agents were detailed on the internet
- Anthrax was available from 46 labs in many parts of the world

Solutions

- Better knowledge of the world
 - International surveillance
 - Intelligence
- Medical and public health preparedness
- Expanded research program
- Rapidly responsive biotech industry

Bank birds can't if not
Best thing to do

One year ago \$1 billion

24/7 STATE/LOCAL

>100 LABS

STOCK PILE -

SMALLPOX VACCINE

HHS

COMMAND CENTER = CDC

Steady by.

No gas masks / no duct tape / no plastic.

How do you stop an airplane
I have confidence!

Appreciate invitation to be with you at this important meeting and to have been invited to offer this plenary address. In the troubled times today,

^{we are} facing both chemical and biological threats of a type and nature which we

never imagined ^{horrible} not so long ago — It is encouraging to know that ^{in developing} ~~new~~ means for detection and therapy that we can

build on the depth and breadth of expertise that you here represent. We

all hope that our readiness will not be tested. But to a significant

degree, that depends on our being prepared.

^{We are continually reviewing the potential}

^{of these things} ~~the~~ ^{one} which is ^{greatest} ~~of~~ concern, is smallpox because of its capacity to spread, because of its high death rate — 30%, ^{which could be deployed.} ~~and~~ the fact today that

probably 70 to 80% of the population is fully susceptible, and the fact there is no therapy.

~~Today - smallpox~~

To appreciate ^{smallpox} ~~the disease~~ one has to know what it looks like and

^(the most feared of all the pathogens) ^{with that as introduction} what it has meant to the world. (I will then talk about the vaccines

and, finally, what we are doing about it.

For me, it is especially dispiriting as we had thought at one time to have closed

the door on smallpox