

New and Emerging Infections: Challenge of the 21st Century

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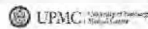
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- *Man's only competitors for the dominion of the planet are the viruses -- and the ultimate outcome is not foreordained.*

Joshua Lederberg
Nobel Laureate, USA

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The competitors are increasing

- New and emerging infections have been increasing in number
- The sources of the threat:
 - Natural mutation of microbes
 - Emergence of organisms from remote areas
 - Biological terrorism
- The threats are international

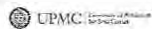
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"Conquest" of the infectious diseases 1950s-70s

- Dramatic changes: 1950-1970
 - Vaccines
 - Antibiotics
 - Nutrition
 - Housing
 - Sanitation
- Decline or elimination of many diseases in the industrialized world
 - Smallpox, diphtheria, whooping cough, tetanus, polio, measles, *et alia*

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- *"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

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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"
- 2006 -a world-wide pandemic in progress
 - 4th leading cause of death world-wide
 - No vaccine
 - No curative drug

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HIV is not the only surprise

- 1989 Conference on Emerging Infections
- An illustrative additional inventory
 - SARS – from Asia
 - TSE – “mad cow” disease – from UK
 - West Nile encephalitis – from Africa
 - H5N1 pathogenic influenza – from Asia
 - E. coli O157:H7 – from ? Europe
- More than 30 new agents in 25 years

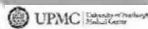
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Why now?

- Growth in urban populations
 - City populations
 - 1950 - 2 with more than 5,000,000
 - 1975 - 5 with more than 10,000,000
 - 2006 - 20 with more than 10,000,000
 - 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

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Why now?

- Growth in urban populations
- International travel
 - Volume
 - 18 million commercial air flights yearly
 - 1.6 billion air passengers per year
 - Remote area destinations
 - All cities less than 36 hours away

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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

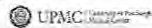
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Why now?

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

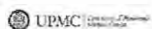
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Intentional release of biological agents

- A threat, largely ignored until 1995
 - Too difficult to grow organisms
 - Technologically difficult to disseminate
 - Not used because of a moral barrier

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What has changed?

- Advances in biotechnology
 - Numbers and sophistication of laboratories
 - Information access – internet
 - Trained microbiologists
 - Aerosolization devices
- Growth of independent terrorist groups

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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*

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Watershed events USSR Bioweapons Program

- A secret program – unknown until 1989
- 1992 – Ken Alibek, Deputy Director of bioweapons program, deserts
- 1995 – Full scope of program apparent
 - 60,000+ persons in 50 different labs
- *Concern – Expertise and possibly specimens now dispersed world-wide. Still a secret program*

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"On May 8, 1980, WHO announced that smallpox had been eradicated..Soon after, smallpox was included in a list of biological 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 military command issued an order to maintain an annual stockpile of 20 tons (of smallpox virus)."

Alibek, 1998

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Coping with the new threats

- Detection and diagnosis
 - Mechanisms for reporting "24/7"
 - Laboratory capability
- Communication – local, state, federal
- Emergency investigation teams
- Strategic National Stockpile
 - Vaccines, antibiotics, other supplies

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Coping with the new threats

- Planning and preparation
 - Collaborative participation of many groups
 - Health care staff and hospitals
 - Voluntary organizations such as Red Cross
 - Pharmaceutical and medical supply providers
 - Law enforcement
 - Education and transportation departments
- Establishment of a command center
- Communication
 - Public
 - Local, national, international – political and professional

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Special needs for the future

- Greatly strengthened network of international cooperation and communication
 - Cooperative international centers for epidemiology and laboratory diagnosis in all countries
 - A far more generously supported WHO effort to orchestrate the many national initiatives
- A focused research and development program

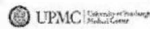
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- "Today's world is truly a global village, characterized by growing concentrations of people in huge cities, increasing global commerce and travel...One can safely predict that infectious diseases will continue to emerge...Depending on present policies and actions, this situation could lead to a catastrophic storm of microbial threats."

*Institute of Medicine/ National Academy of Sciences
Microbial Threats to Health, 2003*

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- *International collaboration and cooperation is not an option for dealing with infectious diseases. it is a necessity for survival.*

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