

Critical Dialogues on Avian Influenza

**Woodrow Wilson Center
Washington, D.C.**

November 30, 2005

Lonnie J. King

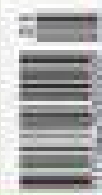
**Dean, College of Veterinary Medicine
Michigan State University**

TIME

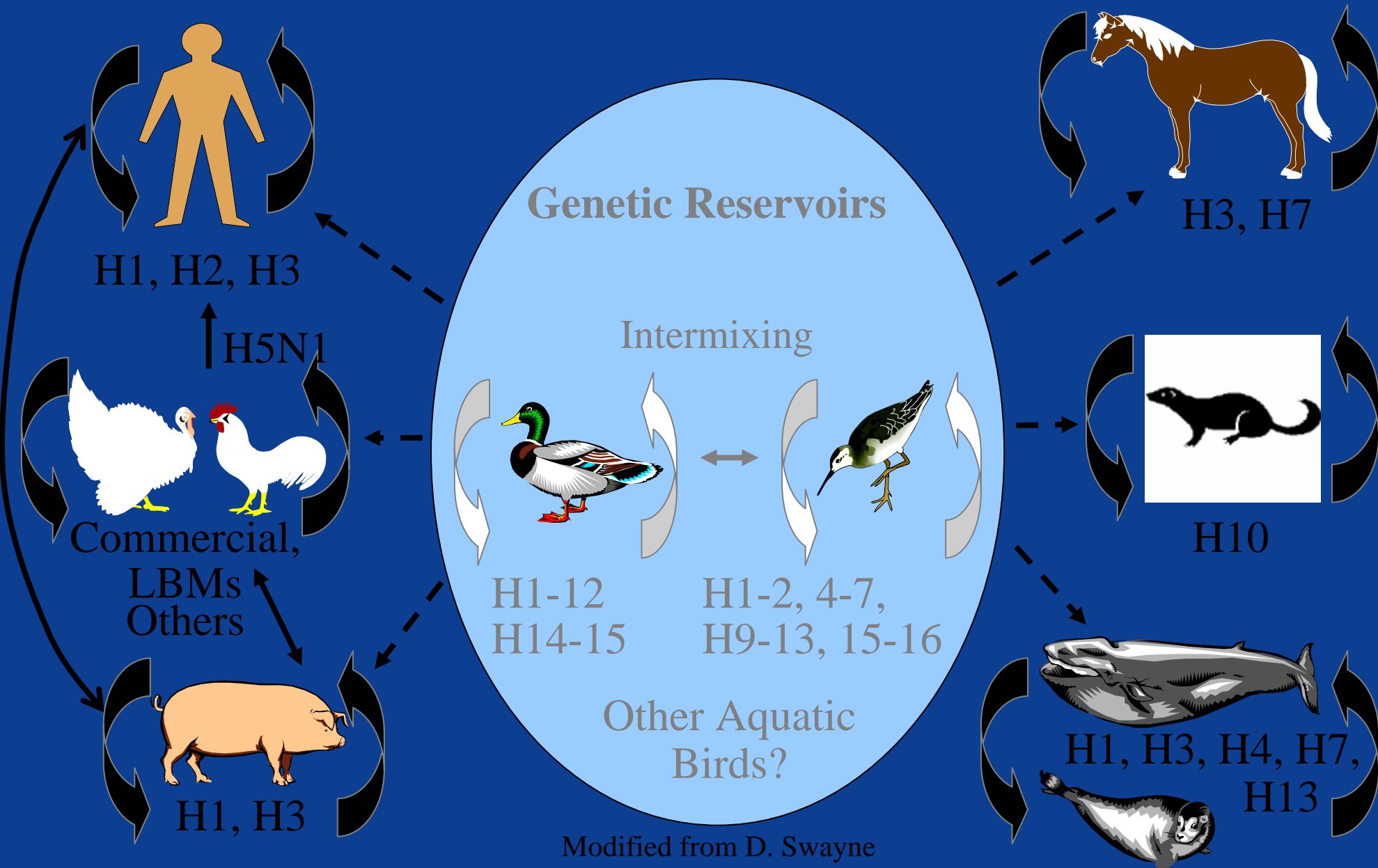


BIRD FLU

Is Asia
hatching
the next human
pandemic?

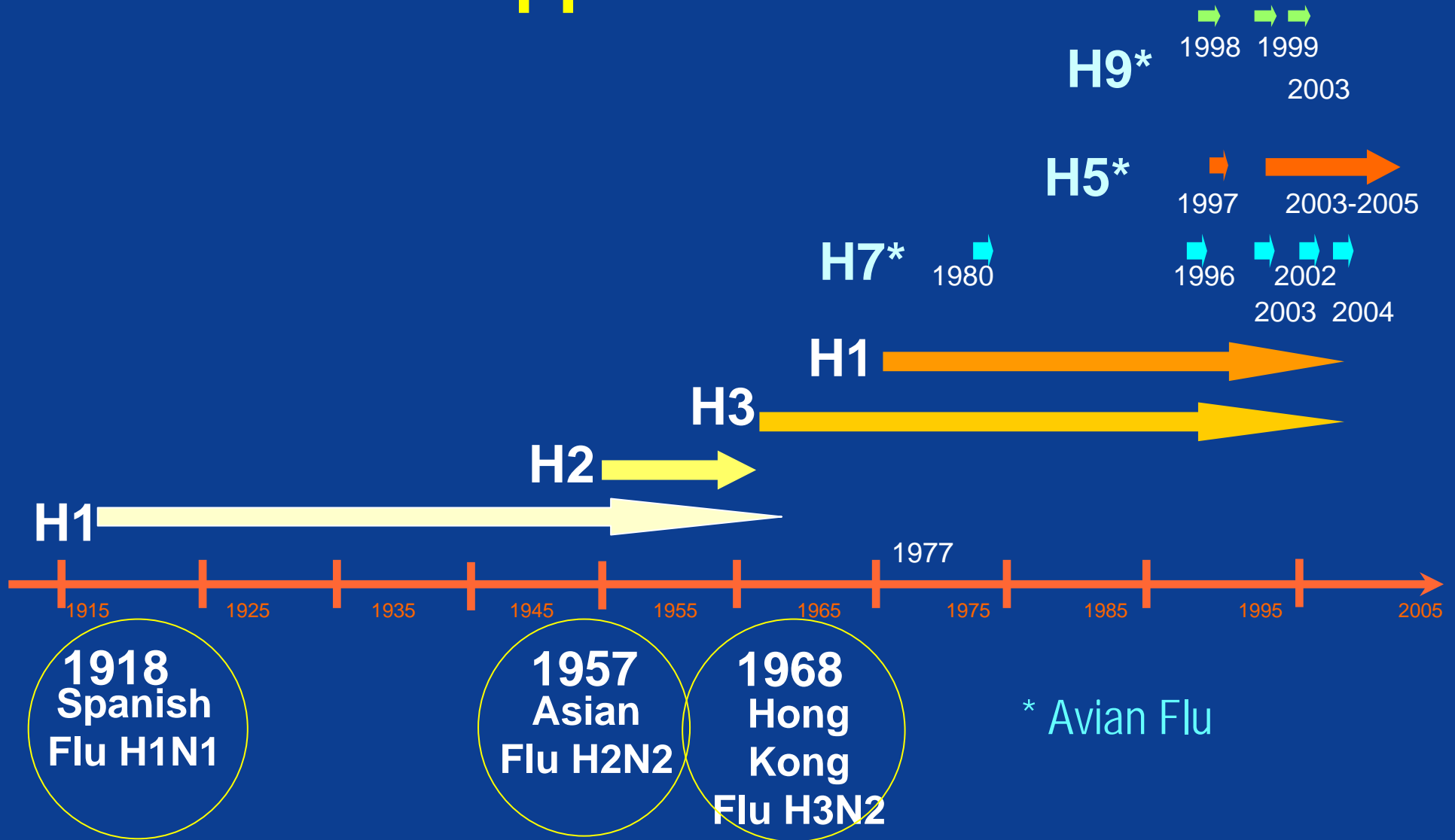


Ecology of Influenza



Modified from D. Swayne

Pandemics Happen!



Situation Report: Avian Influenza

- ✓ Widespread and spreading prevalence in migratory birds; broad host range
- ✓ Continued outbreaks among domestic poultry
- ✓ Mammalian infection (cats, pigs, etc.) lethal virus is evolving
- ✓ Sporadic human cases (>120 reports to date) Most in young and healthy. Case-fatality 50%
- ✓ Sustained and rapid person-to-person transmission

WHO Periods and Phases

Interpandemic Period- No new subtypes in humans

Phase 1: Low risk from animal subtype

Phase 2: “Substantial risk” from animal subtype

Pandemic Alert Period

Phase 3: Human case(s), but no or rare human-to-human transmission

Phase 4: Small cluster of human-to-human transmission

Phase 5: Increased transmission, but still localized

Pandemic Period

Phase 6: Sustained transmission in general population

H5N1 Concerns Today

- **Pathogenic scope: housecats (Netherlands), tigers (Thailand), and pigs (China)**
- **Viral shedding in ducks – asymptomatic but longer shedding time with more virus**
- **Movement through migration of birds**
- **Lack of natural immunity in mammalian populations**

H5N1 Concerns Today (continued)

- **Resistance to amantadine and rimandatine**
- **Reporting of cases in remote locations**
- **Disincentives for reporting of cases**
- **Significant case fatality rate – true ratio is unknown**

H5N1 Concerns Today (continued)

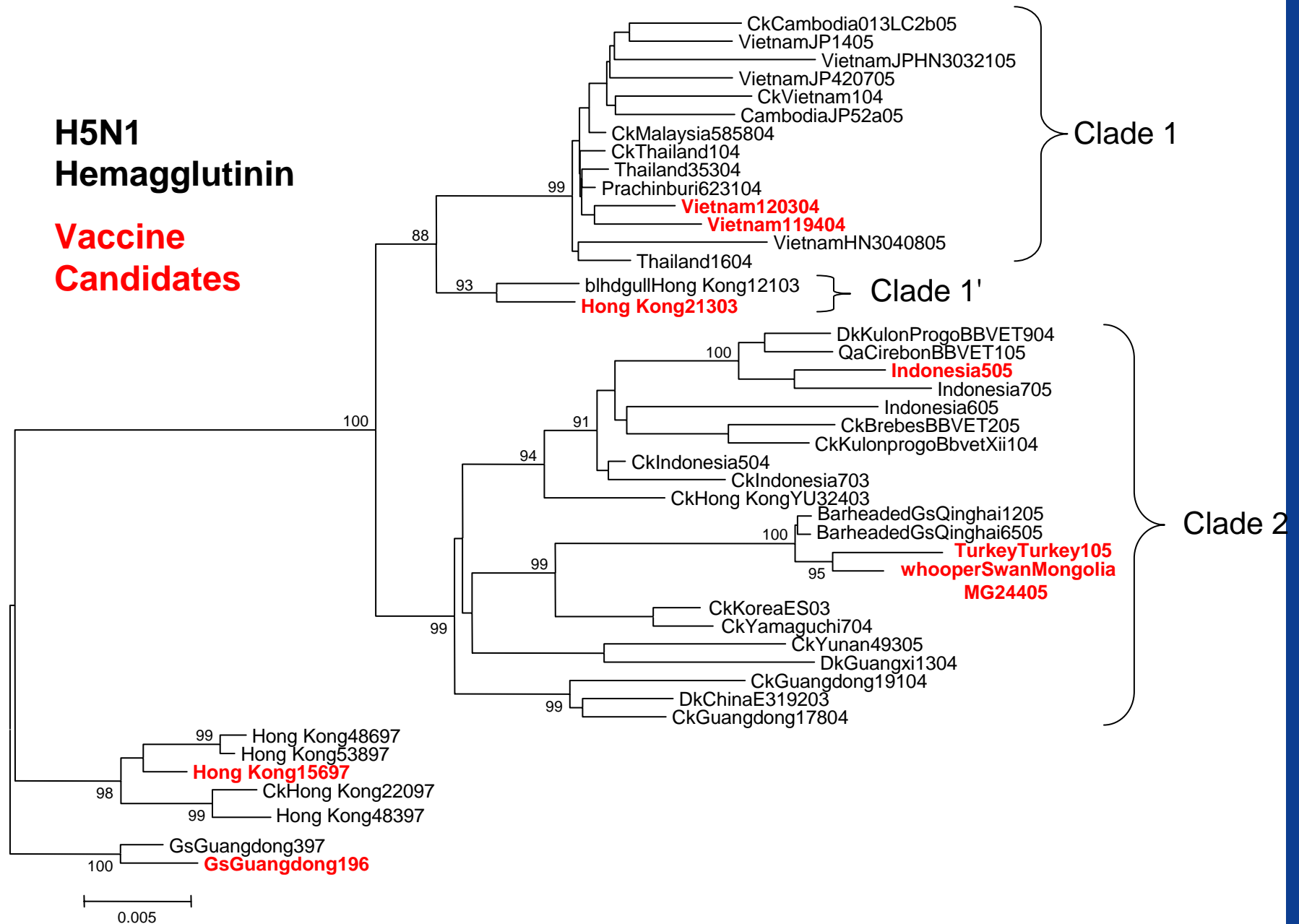
- **Macroeconomic consequences of a pandemic**
- **Levels of global preparedness**
- **The great mixing bowl of future pathogens: a virtual genetic reassortment lab**
- **Little evidence of success in dealing with H5N1 at the non-commercial animal production level**

H5N1 Concerns Today (continued)

- **Global quarantine and isolation practices and authorization**
- **Potentially widespread and inconsistent practices and policies for vaccinating poultry**
- **Disproportionate preparedness and resources directed to root cause and at its source**
- **Two distinct clades of H5N1 are now circulating, but both are derived from the same avian progenitor virus**

H5N1 Hemagglutinin

Vaccine Candidates



Pandemic Influenza



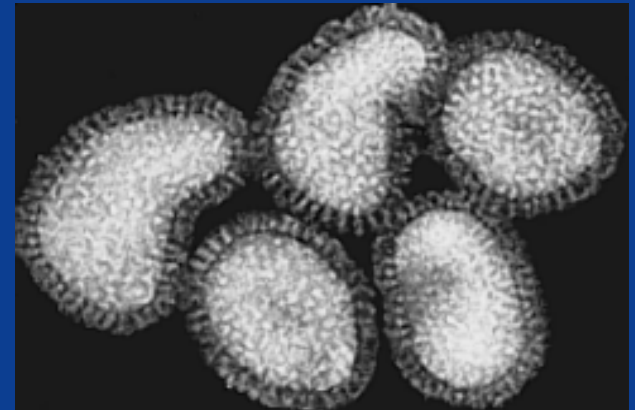
The “Microbial” Perfect Storm

Due to special combinations and circumstances

Relatively common occurrence

Doesn't dissipate, but may perpetuate or accelerate

Convergence model



Factors in Emergence

Microbial adaptation and change

Host susceptibility to infection

Climate and weather

Changing ecosystems

Economic development and land use

Human demographics and behavior

Technology and industry

Factors in Emergence

continued

International travel and commerce

Breakdown of public health measures

Poverty and social inequality

War and famine

Lack of political will

Intent to harm

Movement and Interactions of People and Commerce

Distance and speed of travel increased
1000 fold since 1800

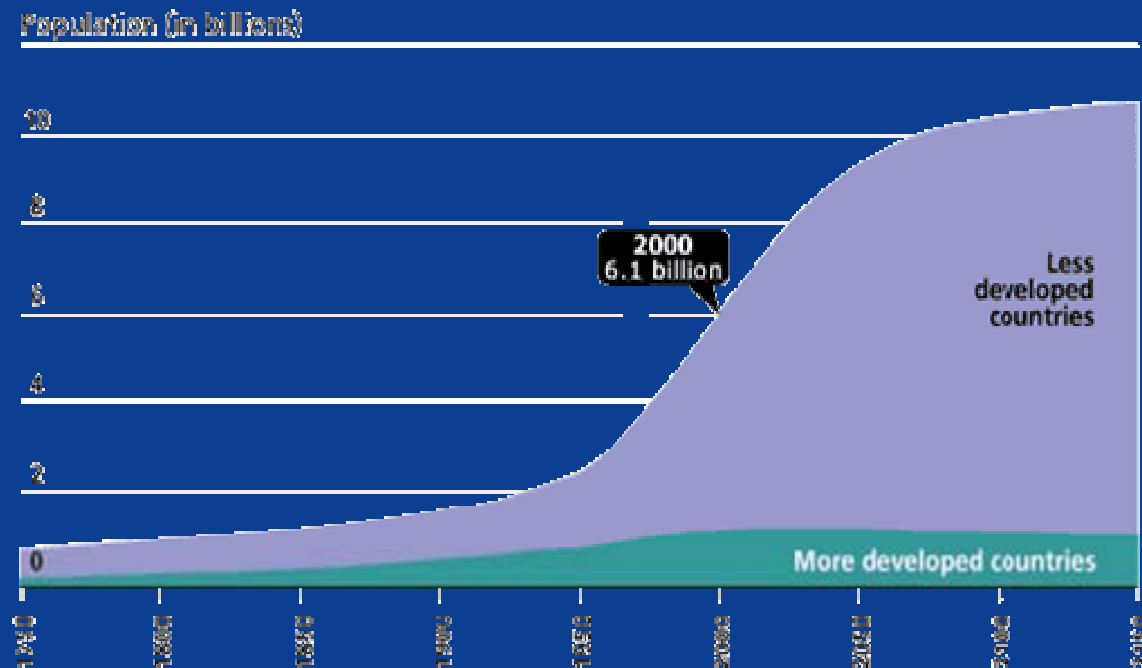
1.4 billion air travelers/year

50 million foreign visitors, to US year
through, 102 sites

Antibiotic resistance

Global trade of food, animals and plants

Rapidly Increasing Human Population



6.1 Billion people
in 2000

~9.4 to 11.2 Billion in
2050

Source: United Nations, *World Population Prospects, The 1998 Revision*; and estimates by the Population Reference Bureau.

Multihost Pathogens

60% of all human pathogens are zoonotic

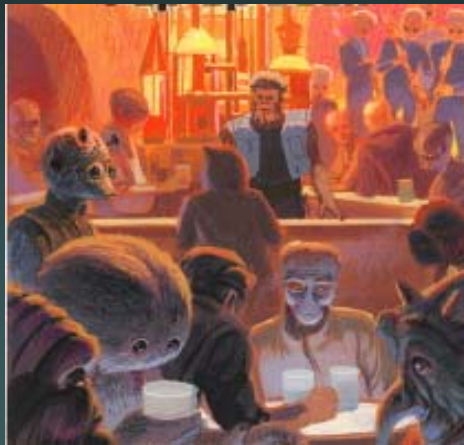
80% of animal pathogens

Ecological generalists

Last year, over 21 billion food animals were produced to help feed a population of over 6 billion people resulting in trillions of pounds of products distributed worldwide. Projections toward 2020 indicate that the demand for animal protein will increase by 50%, especially in developing countries.

There are more microbial cells in the
human body than human cells.

“The Microbial Club Med!”



CDC's Most Significant Global Epidemics Over the Last Decade

1993 – Hanta virus

1994 – Plague (India)

Ebola virus (Zaire)

1996 – New Variant of
CJD (UK)

H₅N₁ influenza (Hong
Kong)

1998 – Nipah virus
(Malaysia)

1999 – West Nile

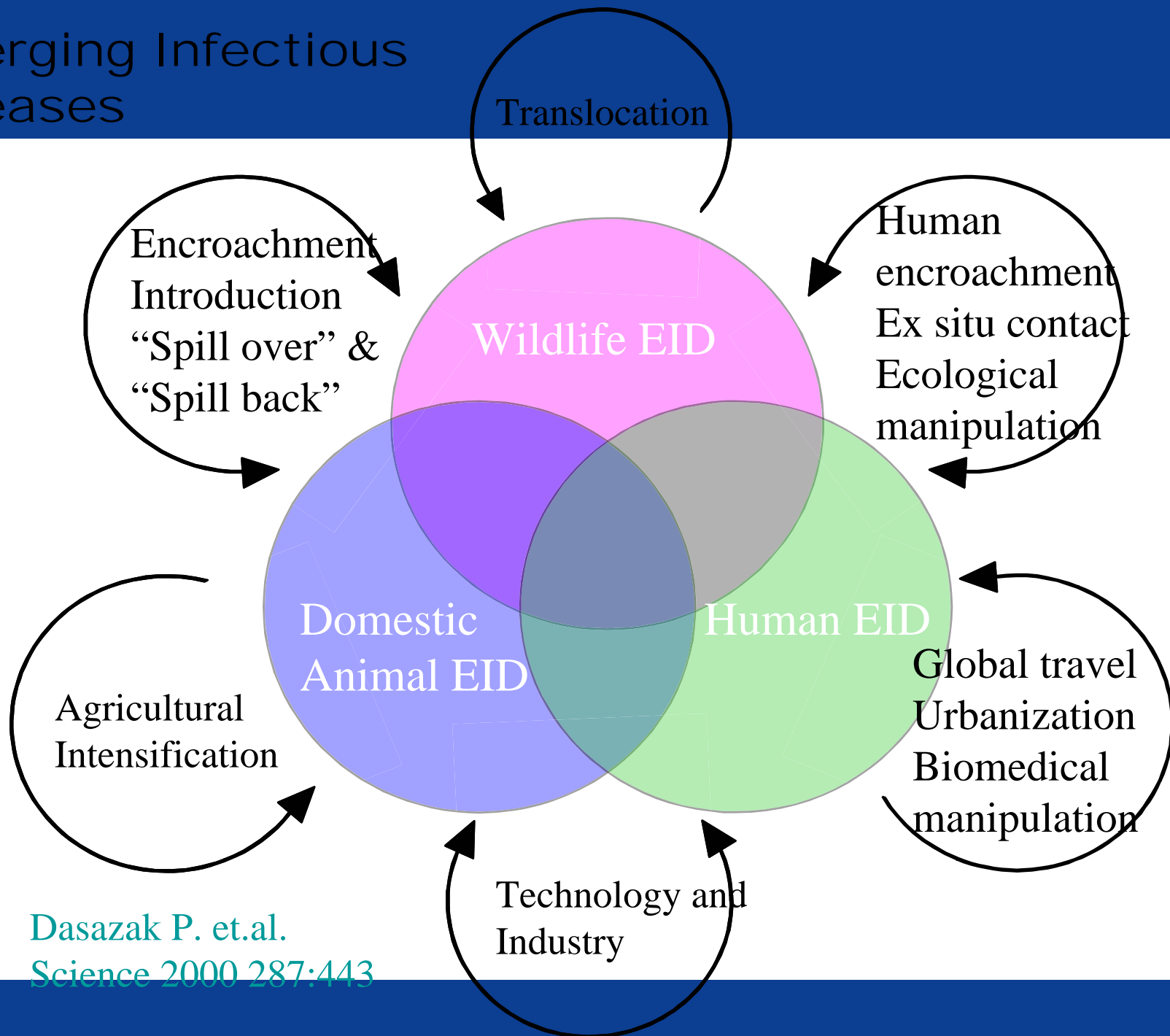
2000 – Rift Valley
Fever

2001 – Anthrax

2002 – Norwalk-like
viruses

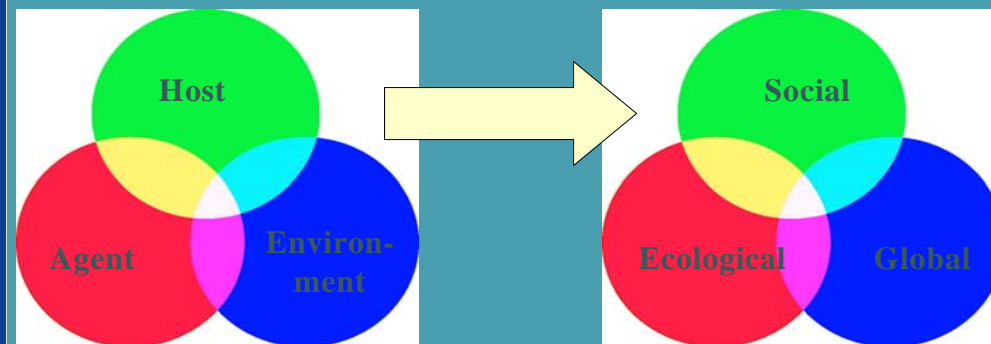
2003 - SARS

Emerging Infectious Diseases



Daszak P. et.al.
Science 2000 287:443

Shifting Epidemiological Model



Implications of Emerging Diseases

Political

Social

Economic

Psychological

Environmental

Interdependency: The new paradigm for animal agriculture

- WTO**
- “Glocals”**
- Global food system**
- Macroeconomics and public policy**
- Smaller world translates into bigger threats**
- Livestock 2020**
- Emerging and re-emerging zoonoses**
- Strategic partnerships**

Implications for Agriculture

H5N1 poultry outbreaks are the largest and most severe on record

Death or destruction of an estimated 150 million birds, resulting in severe economic impact

Virus is now considered endemic in many parts of Southeast Asia, and control of the disease in poultry is expected to take years.

The Reality Check for H5N1

- **An endemic disease in Southeast Asia since 1997**
- **Domestic animal – wildlife – human interface**
- **Solutions cannot focus on single aspect of the problem**
- **Avian Influenza is a serious problem for the poultry industries already**
- **The clash of cultures between animal and public health**
- **The added complexity of multihost pathogens**
- **Reconciliation of 9/11 vs. 11/9 thinking – “The World is Flat”**

The Reality Check for H5N1 (continued)

- **Commercial poultry production, backyard flocks, and wild birds are the critical dynamic**
- **H5N1 is an animal disease**
- **The scope, scale, and implications of a pandemic are unprecedented**
- **H5N1 is only a single example of a zoonotic disease in a new epidemiologic era**
- **H5N1 is not going away any time soon**
- **The factors of disease emergence continue unabated**
- **Regional or local problems can become our problems in 24 hours**

Addressing Local Practices



Addressing Local Practices





Shifting Themes for H5N1

Epidemiological triad	⇒	Larger affected domains
Global or local	⇒	“Glocals”
Individual problem	⇒	Managing dilemmas
Stovepipes	⇒	Integrated animal health – public health strategy
Single host pathogen	⇒	Emerging multihost pathogen
Disease	⇒	Multideterminants of health in populations

Shifting Themes for H5N1 (continued)

Science and technology	⇒	Policies and politics
Reaction response	⇒	Proactive plan
Short-term actions	⇒	Long-term solutions
“Silo” leaders	⇒	Meta leaders
Fragmentation	⇒	One medicine
Avian Influenza	⇒	Era of EID and new zoonoses

“We cannot solve today’s complex problems adopting the same level of thinking we used to create them.”

**– Albert Einstein
(paraphrase)**

Solutions

- **Integration of animal health – public health strategies and actions**
- **Reconciling animal agriculture production systems**
- **Implementing biosecurity measures**
- **Building infrastructure and health systems in developing countries**

Solutions (continued)

- **Vaccines and antivirals are important responses but are not long-term solutions**
- **Global surveillance for domestic poultry, wildlife, and humans**
- **Reductions of pathogen load to susceptible populations**
- **Public – private partnerships at source**
- **National plans that are pragmatic and practiced**

Solutions (continued)

- **Combine short- and long-term actions**
- **Balance human health response with animal health plans and activities**
- **Implement prototype projects in developing agricultural systems and build on best practices, including incentives**
- **Comprehensive understanding and strategies based on the convergence of animal health – public health, e.g.**
- **Med-Vet-Net**