The Future of Land Grant: Human-Animal Health in a World Community

Farm Foundation Roundtable

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Objectives

Set context and background – "Connexity"

Premise – strategic inflections; need for relevance

Contemporary challenges: for society, land grant institutions, and higher education

Challenges at the human-animal interface specifically

Remarkable opportunities on the horizon

How can we now be successful?

Conclusion and exchange of ideas

Premises

Meeting societal needs Need for transformation Wicked Problems Interdependency Land grant – solving or mirroring problems Slow burning crises Loss of status and trust

Essence of change is strategic partnerships

Changes in higher education are likely permanent

Adopting a One Health mindset

Need for some winning strategies

Future of Animal Agriculture Farm Foundation Report in 2004

Economics – production, processing and marketing

Consumer Demands – product attributes; valueadded

Environmental Issues – conflicts and communities

Community and Labor Issues - relationships

Food Safety and Animal Health – SPS agreements, animal ID and traceability; surveillance

Animal Welfare – standards, verification and research

Additions Over the Last Decade

Emerging and re-emerging infectious diseases

Antimicrobial Resistance

Food and Health – precision health

Public health and animal health synergy

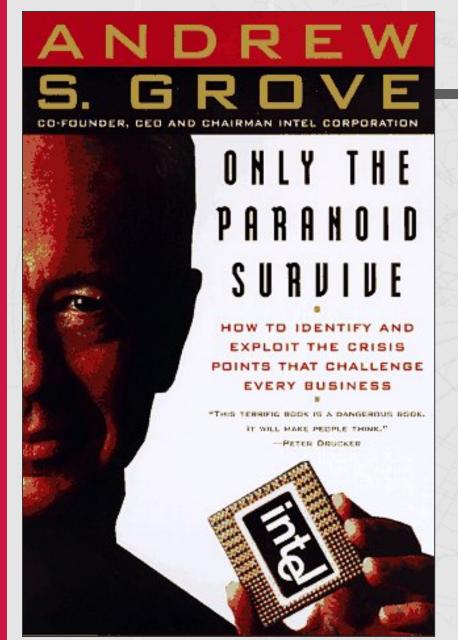
Companion animals and human wellness and health

Food security

Alleviating poverty

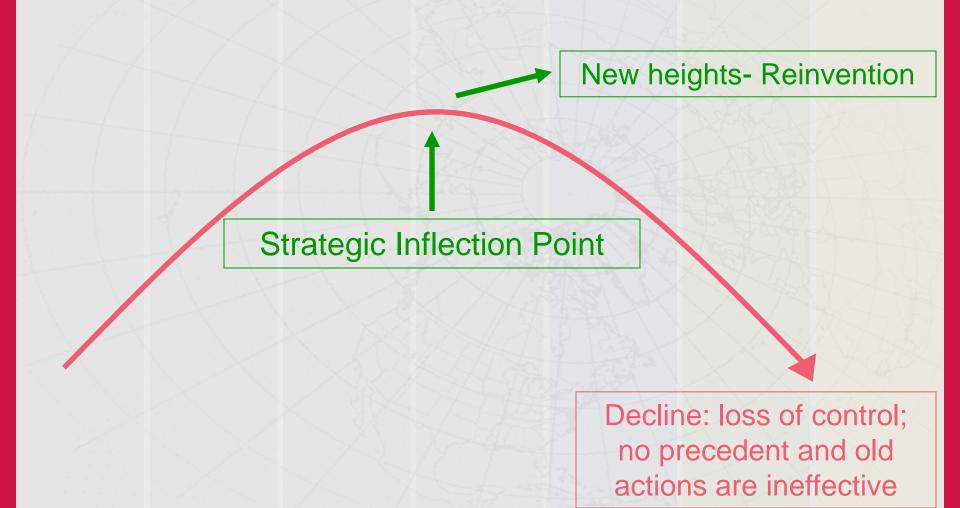
Urban agriculture

Wildlife – human interactions



Only the Paranoid Survive
By Andy Grove, CEO Intel

Strategic Inflection Point



Issues with Land Grant Institutions

Moving beyond education and workforce

Erosion of funding and support

Reduced legislative and political support

Cost of colleges of ag at the university and ROI

Future of USDA partnerships: research, extension service and programmatic support

Tendency toward isolationism and independency

Need for innovation and leading change

Shifting public opinion toward farming and production

Why Diseases Emerge

Genetic and biological factors

Microbial adaptation and change

Human susceptibility to Infection

Physical environmental factors

Climate and weather

Economic development and land use

Ecological factors

Changing ecosystems

Human demographics and behavior

Social, political, and economic factors

International travel and commerce

Poverty and social inequity

War and famine

Lack of political will

Intent to harm



Convergence Model

Genetic and Biological Factors

Physical and Environmental Factors

Animals

EID

Humans

Wildlife

Social, Political, and Economic Factors

Ecological Factors

CDC's Most Significant Global Epidemics Over the Last 15 Years

1993 – Hanta virus 2002 – Norwalk-like viruses

1994 – Plague (India) 2003 – SARS

Ebola virus (Zaire) 2004 – Marburg Virus

1996 – UK Variant of CJD 2005 – H₅N₁ Influenza

H₅N₁ influenza (Hong Kong) 2006 − *E. coli*

1998 - Nipah virus (Malaysia) 2007 - P.I.N.

1999 – West Nile 2008 – Salmonella St Paul

2000 – Rift Valley fever 2009 – H1N1 Influenza

2001 – Anthrax 2010 – Cryptococcus

Ebola, MERS, Tick-borne

Microbial View

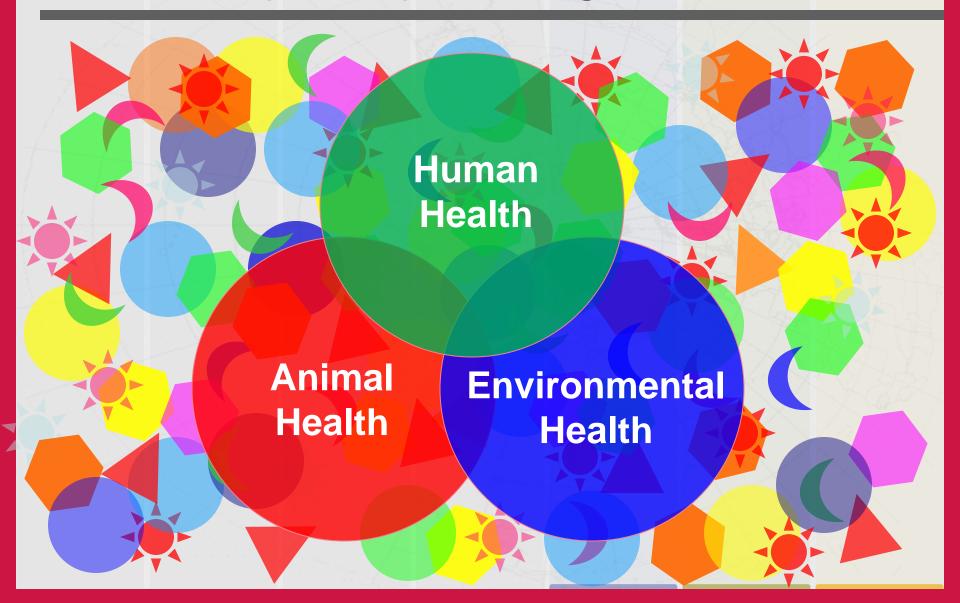


Multihost Pathogens

60% of all human pathogens are zoonotic 80% of animal pathogens Ecological generalists



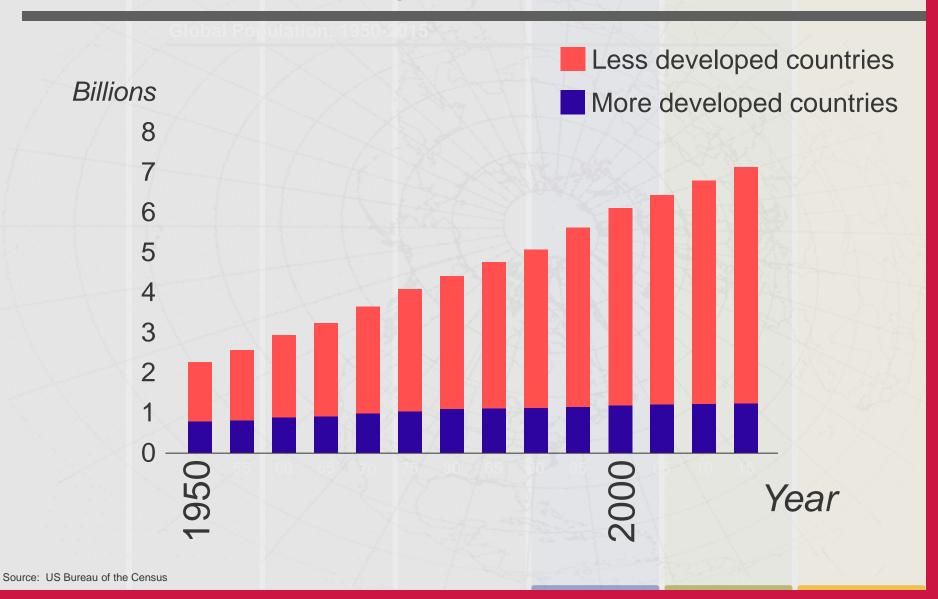
The Convergence: A New Public Health Kaleidoscope Emphasizing One Health



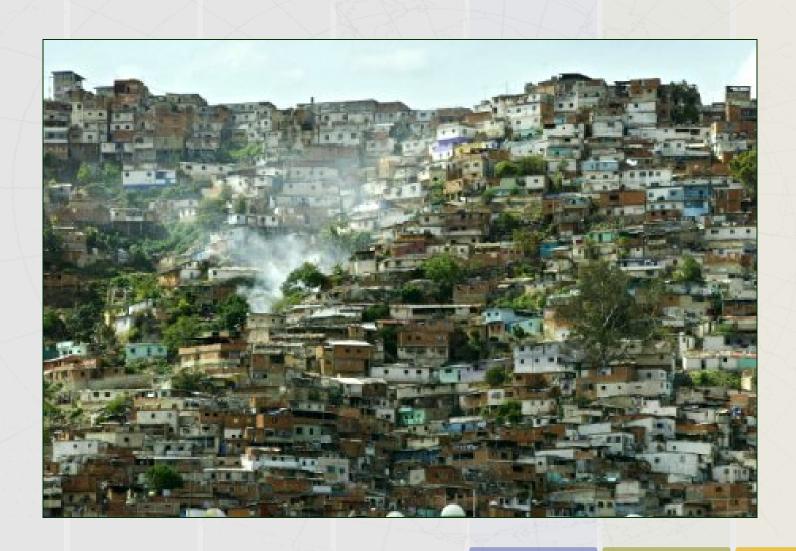
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Trends in Global Population



Peri-Urban Slum



Shift to MegaCities and Urban Sites

Greatest migration of people in history

- 1900 13% urban
- 2007 50%+ urban

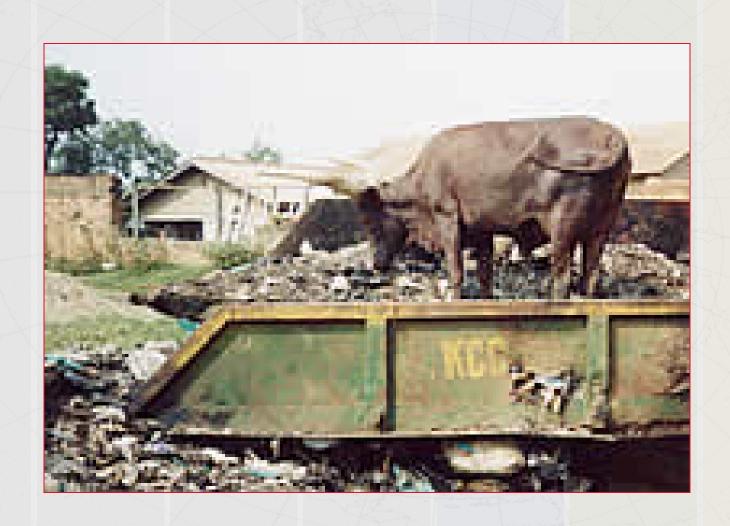
Peri-urban areas – newest sites of confluence

Urbanization is now largely a phenomenon of poor/middle class countries

The Black Death

Creation of new niches for microbes, vectors, and animals

Animals, Waste, and the Risk of Disease Emergence



International Tourist Arrivals, 1950-2020



The Super Vector!

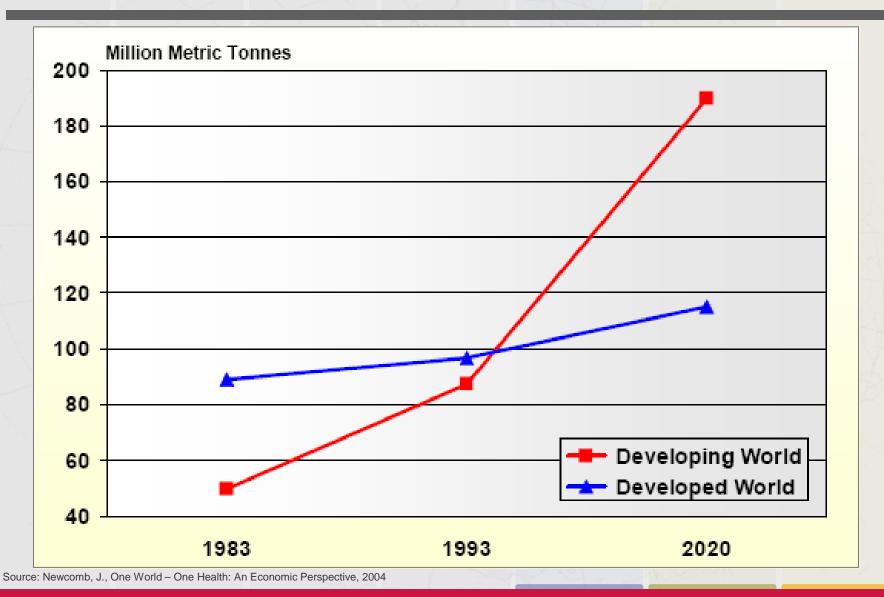


World Flights



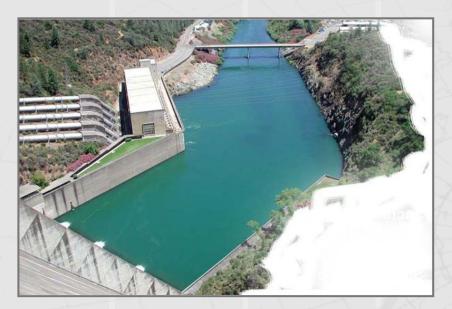


World Meat Consumption, 1983 - 2020





Ecosystem









GLOBAL WARMING

Climbing temperatures.

Melting glaciers. Rising seas.

All over the earth we're feeling the heat.

Why isn't Washington?





Poverty, Hunger, Livestock Keeping and Zoonoses (ILRI)

70% of rural poor and 30% of urban poor depend on livestock

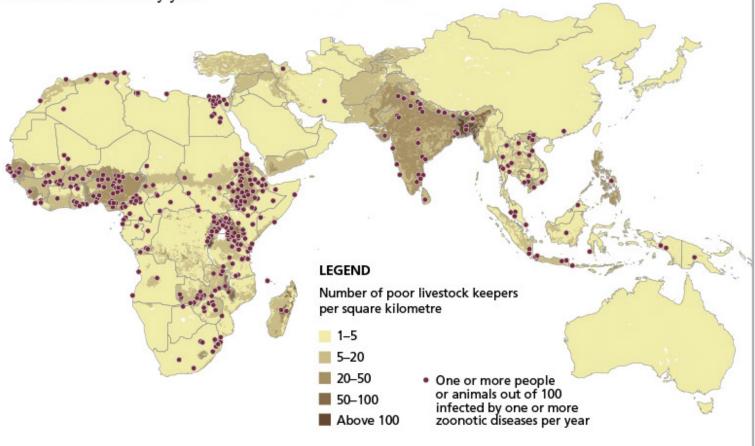
Assessment of 56 zoonoses globally: found they are responsible for 2.5 billion cases of human illness and 2.7 million deaths annually

Massive under-reporting yet huge burden of illness especially in the 1 billion people worldwide earning less than \$2 a day

Of top zoonoses, most have high impact on L/S, wildlife interfaces and agriculturally amenable

Greatest Burden of Zoonoses Falls on One Billion Poor Livestock Keepers

An ILRI study shows that zoonotic diseases are major obstacles in pathways out of poverty for one billion poor livestock keepers. The diseases mapped cause 2.3 billion human illnesses and 1.7 million human deaths a year. In poor countries, the diseases also infect more than one in seven livestock every year.



Map by ILRI, from original published in an ILRI report to DFID: Mapping of Poverty and Likely Zoonoses Hotspots, 2012.

H5N1 Avian Influenza



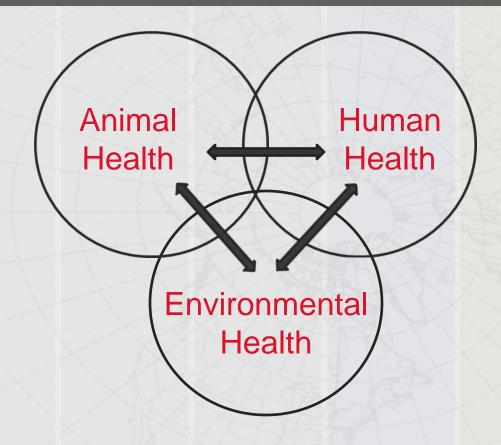
Pandemic Influenza







Dynamics of One Health Domains



Newton's 3rd Law of Motion: in essence, for every action, there is an equal and opposite reaction.

ONE HEALTH

One Health is the collaborative effort of multiple disciplines – working locally, nationally and globally – to attain the optimal health of humans, animals and our environment.

Why is One Health Important?

Interconnectivity of the world

Complex, difficult and "wicked" problems

The great convergence and 21st century mixing bowl

Microbial swarms

A world in rapid motion with collapsed space

Food safety, security and water issues

Climate change and consequences

Infectious disease ecology

Shift to new points of intervention; "upstream" shift from clinical care to prevention (ratio 97%:3%)

A Crisis

Over the past decade, however, antimicrobial resistance has become a crisis. The evolution of antibiotic resistance is now occurring at an alarming rate and is outpacing the development of new countermeasures capable of thwarting infections in humans. This situation threatens patient care, economic growth, public health, agriculture, economic security, and national security.

Changing Landscape in Animal Agriculture

- Phasing out of the use of antimicrobials for growth promotion and feed efficiency
- FDA Guidances 3 year voluntary commitment and drug manufacturer's acceptance
- Shift from OTC products for feed and water to prescription under VFD and veterinary oversight
- Shift to prevention, treatment, and control
- New emphasis on stewardship programs



Food Security

Global population: adding 1 million people per week for the next 40 years

Need to produce more food over the next 40 years

than during the last 500 years

Challenges of Livestock/2020

Urban and rural insecurities

Cost and burdens of endemic zoonoses

Sustainability and One Health





DECEMBER 13TH-19TH 2003

www.economist.com

Gore anoints Dean PASES 12 AND 33

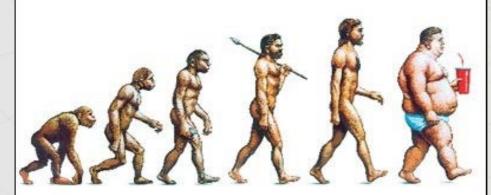
America's Taiwan test PASES 12 AND 29

The future of flight PASES 19-81

A SURVEY OF FOOD

AFTER PASE 52

The shape of things to come









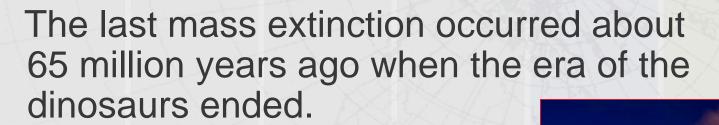






WORLD'S MASS EXTINCTION

Earth is in the midst of its 6th mass extinction of plants and animals with nearly 50% of all species disappearing in our lifetime.



The principle cause is human activities

H.A Interface – Nature Wars Wildlife and People

"Today, more people live in closer proximity to wild animals, birds, and trees in the Eastern U.S. than anywhere on the planet at any time in history.-

James Sterba - Nature Wars







Human-Animal Bond

Animals are family members

Specialization – 20 to 25%

New services and care demanded





Transformation

Universities and Colleges will be transformed; the key question is who will do it?

We cannot transform others unless we first transforms ourselves

Key challenges: Reinventing the Institution

An organization that can't reimagine its deepest sense of what it
is, what it does, and how it
competes and operates will soon be
rendered obsolete.

A Dakota Tribal Wisdom: "When you discover you are on a dead horse, the best strategy is to dismount."



The Human-Animal Interface: Reconciling Challenges and Opportunities

New qualities, values and functions of food

Animal-sourced medicines - precision health

AH-PH – food security and food safety

Urban agriculture – new urban and rural relationships

Climate change

Vulnerability of animal populations to natural and intentionally introduced diseases

Comparative medicine

Sustainability: economic, social and environmental

The Human-Animal Interface: Reconciling Challenges and Opportunities

Emerging and Re-emerging Diseases

Animal welfare and well being

Antimicrobial Resistance - "test" case

Extinctions and ecological/environmental changes

Wildlife - human and animal convergences

H-A Bond – improving human health

Poverty Alleviation

Livestock 2020

Grow Bigger Minds To Solve Bigger Problems

Our horizon has never been more rich nor our possibilities more promising

Need to be responsible, responsive and relevant

Re-imagine the deepest sense of who we are, what we do, and where to focus our resources, time and attention



How to Be Successful as an Interdependent

Public-private-partnerships (what gov't can't do) "Doing well by doing good" - socially responsible Food and health – benefits to health and productivity Preparing for vulnerabilities: risk management Preparing for a non-linear world – VUCA Communications, PR and rebuilding trust R&D – leverage and adopt great science Shift of ag and vet medicine to "center of campus" Innovations and systems thinking

An Outbreak Explodes

Critical Times:

- Before Ebola civil war and no infrastructure
- Missed signals and first cases (3-4 months)
- Slow global response
- Difficulty in scaling-up
- Past Ebola experience was counterproductive





Conclusions

Improve "what is" and create "what isn't" concurrently

Leading and managing change

New concept of community health; One Health

Doing well by doing good – Ag's social conscience

Land Grant tenet – identify and help solve society's problems and improve our communities and people

Find and create strategic partners; span boundaries

GREAT SCIENCE and innovation

Reperceive contemporary land grant and relevance

