Veterinary medicine
Global Health

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Population Growth

In the next 40 years the global population will grow 2.4 billion.

Growth will be equivalent to adding the population of a city the size of Paris (2.3 million) every 2 weeks for the next 40 years.

Population will be predominantly urban.

Urbanization will have the most consequential effect on the structure of society in the 21st Century

trade patterns, food supplies, patterns of disease transmission & environmental health

There are estimates that 900 million people will live in cities in China by 2020
How do you provision these metropolises?
How do you feed all these people without wrecking the environment?

In the next 40 years it is estimated the world will need an increase in food production of 100%

Simmons, J; Economics and Consumers Choice. Technology’s role in the 21st Century
FAO estimates:
20% from added farm land
10% from increased farming intensity
70% from new and existing Technologies
Innovation!

China has 20% of the world’s population but
Only 7% of the arable land.

Increased efficiency of production is critical
Veterinary Medicine, Global Health

Food Production

- Infectious disease
- Lost productivity
- Population Growth
- Urbanization
- World Hunger
- Food security
hunger as the world’s No. 1 public health threat—
killer more people than AIDS, malaria and tuberculosis combined.”

—James T. Morris, Executive Director, U.N. World Food Programme
March 15, 2007
High food prices have pushed more than 1 billion people into hunger

Josette Sheeran
Executive Director U.N. World Food Program, August, 2009
Food must be affordable for food security and political stability

Price of corn increased x 80% in 2007-08
Food riots in 30 countries including Haiti
Veterinary Medicine, Global health

Food Production

Infectious disease
Lost productivity

Population Growth
Urbanization

World Hunger
Food security

The Green Revolution
1960 - 1990 The Green Revolution
Food abundance

The Green Revolution increased intensity of production & was land sparing

Source: USDA

World Grain Yield Per Hectare 1950-1960

Norman Borlaug
The world is moving from 40 years of food abundance to an era of constrained food supplies.

Can genetic engineering of crops change the trajectory?
Veterinary Medicine, Global Health

- Infectious disease
- Lost productivity
- Population Growth
- Urbanization
- World Hunger
- Food security
- The Green Revolution
- Water resources
- Climate change

Food Production
Efficiency of water use & re-use in livestock and poultry production is essential.
President Wen Jiabao, China’s Premier  “I have a dream to provide every Chinese, especially children, with sufficient milk each day.”
Darfur, refugee camp in Chad
Urban populations consume x 2 to x 3 times more animal protein compared to rural populations.

Demand is driven by the development of an urban middle-class. Refrigeration, supermarkets, fast food outlets, ice cream parlors, + obesity & diabetes.
Figure 1. Urban and rural fresh dairy product consumption
### Meat & Milk Consumption estimates

<table>
<thead>
<tr>
<th></th>
<th>1998</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meat consumption per person per year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing world</td>
<td>25.5 Kg/yr</td>
<td>37 Kg/yr</td>
</tr>
<tr>
<td>Industrialized world</td>
<td>88 Kg/yr</td>
<td>slight decrease</td>
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<tr>
<td><strong>Milk consumption per person per year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Developing world</td>
<td>45 Kg/yr</td>
<td>66 Kg/yr</td>
</tr>
<tr>
<td>Industrialized world</td>
<td>212 Kg/yr</td>
<td>slight decrease</td>
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The consequence is an intensifying wildlife, grain production, livestock, human interface that veterinarians must address to preserve biodiversity.


Veterinary Medicine, Global Health

Food Production

- Food safety
- Infectious disease
- Lost productivity
- Population Growth
- Urbanization
- The Green Revolution
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- Water resources
- Climate change
- Practice
- Production efficiency
- Environmental impact
- The Livestock Revolution
- Production efficiency
- Environmental impact
- The Livestock Revolution
Traditional food animal veterinary medicine is in decline.
Economic conditions on the farm & new technologies will accelerate the rate of decline

• The veterinary profession has failed to develop an infrastructure of animal care involving paraprofessionals and animal health care workers
• Modern digital technologies with instant transmission of data including digital images make such systems feasible.
80% of the increase in animal protein production in SE Asia has come from intensive systems of production.

Requires a different system of animal care.

Systems of animal production are inextricably linked with patterns of animal disease.
Sub-clinical disease causes greater losses to production than clinical disease (JB Herrick 1990)

Veterinarians must understand animal productivity
Production medicine
Population medicine

Veterinarian acts as consultant on management of entire farming operation.

Farm records
- nutrition
- reproductive efficiency
- housing
- bio-security
- animal welfare
- animal health economics
- risk analysis, epidemiology
- waste management
Milk Yield/cow, Environmental Impact and Societal Demand

Year 1950

\[
\begin{align*}
\text{Milk/cow/yr} & : 5,314 \text{ Lbs} \\
\text{Cow \# (millions)} & : 22.0 \\
\text{Milk (Billions)} & : 117 \text{ Lbs}
\end{align*}
\]

Externalities | Per Million lbs | Balance Eq. | Envir./cow | Envir./lb milk | Milk/acre

Methane/lb milk | Nitrogen/lb milk | Phosphorus/lb milk

Diet CP%: 8.7%
The dairy industry in the U.S. & China

Average # red tides in S. China sea

Pollution of streams and rivers

Weak veterinary infrastructure  (Livestock’s Long Shadow)
Nutrient management, regional planning

E. Coli 0157H7, Salmonella, ground water contamination
Multidrug resistant organisms
flies, stench & waste of water
Efficiency of waste disposal, water re-use

Rational placement of facilities

Danish organic waste biorefinery
Veterinary Medicine, Global Health

Food Production

- Food safety
- Infectious disease
- Zoonotic diseases

Population Growth
- Urbanization

The Green Revolution
- World Hunger
- Food security

The Livestock Revolution
- Water resources
- Climate change

Regional planning
- Scale of operation
- Production Medicine
- Biosecurity
- Production efficiency
- Environmental impact
Recommendations
Global health is a vast, complex field that involves every discipline on a university campus including veterinary medicine.

There is a tremendous need for veterinarians to be engaged in global health.
Innovation is critical
Will come from interdisciplinary collaborative projects

Students must be inspired to follow their dreams & explore the new horizons of global health across many disciplines

This involves every academic discipline and will require a change in the “siloed” structure of American universities
The field is dominated by the medical profession and schools of public health. They do not understand why veterinary medicine is important.

Veterinary medicine has to re-establish its social relevance with articles about the profession’s critical role in global health in the popular press.
• The veterinary profession should develop new, less expensive systems of animal care.
  – It must develop an infrastructure of animal care involving paraprofessionals and animal health care
  – Should make better use of modern digital technologies with instant transmission of data including digital images
  – Increased efficiency of production
The profession needs leaders with the skills and temperaments to guide governments, international agencies, and producers in formulating policies that ensure the food supply is:

- safe,
- sustainable
- affordable,
- and secure.
The veterinary profession should create a virtual center of excellence in food animal medicine with inter-active, on-line courses in:

- Production medicine
- Paraprofessional education
- Animal welfare
- Water management
- Nutrient management etc

Courses should be available to veterinarians world wide.
Thank you for your attention
World Bank forecasts

• China has 20% of the world’s population but only 7% of global water resources.
• 90% of China’s cities’ groundwater and 75% of rivers and lakes are polluted.
• 700 million people drink contaminated water every day.
• Waterborne diseases have created a rising number of premature deaths.
• The government plans to invest in wastewater treatment facilities.
Production efficiency
Yields of milk in different systems
2007 data, U.S.

<table>
<thead>
<tr>
<th></th>
<th>Conventional/Intensive</th>
<th>Grazing</th>
<th>Organic</th>
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<tbody>
<tr>
<td>Per cow/yr</td>
<td>22,182 lbs</td>
<td>15,903 lbs</td>
<td>16,369 lbs</td>
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Goal should be fewer cows but higher yields less feed, less water use per gallon, less waste