Animal Health key for Future Food

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Agenda

– Impact disease on food production

– Animal Health, zoonotics and antibiotics

– How to meet increased food demand
Food Security

According to The United Nations’ World Health Organization (WHO), food security is built on three pillars:

**Food availability:** sufficient quantities of food available on a consistent basis.

**Food access:** having sufficient resources to obtain appropriate foods for a nutritious diet.

**Food utilization:** appropriate use based on knowledge of basic nutrition and care, as well as sufficient water and sanitation.


What is the value of the Animal Health industry to Society

- Contribute to ensure adequate supply of sustainable, safe and wholesome animal protein food for a rapidly growing population

- Improve the health and well-being of animals

- Improve the human health status by preventing zoonotic transfer of infectious agents

- Improve well-being of humans by extending the pet-pet owner relationship
Our Patients?

Or this one?

Animal disease is a key constraint in Africa

- Animal disease is a key constraint: Remove it and animal productivity increases greatly
- As livestock systems intensify in developing countries, diseases may increase

### Annual mortality of African livestock

<table>
<thead>
<tr>
<th></th>
<th>Young</th>
<th>Adult</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cattle</td>
<td>22%</td>
<td>6%</td>
</tr>
<tr>
<td>Sheep</td>
<td>28%</td>
<td>11%</td>
</tr>
<tr>
<td>Poultry</td>
<td>70%</td>
<td>30%</td>
</tr>
</tbody>
</table>

(Over 8, Chibamba, IAEA)
Effect of disease

(Hogeveen, WUR)

- More resources for same production
- Less production with same resources
- Optimal level of production changes as well

Impact of disease in food animals

- Altered Feed intake
- Altered feed digestibility
- Altered nutrient utilisation
- List A diseases: culling or removal from market place
- Premature death
- Lower value of animals
- Reduced BW
- Reduced yield milk, eggs, wool, ..
- Reduced capacity for work
- Altered production of dung (fuel, fertiliser)
- Reduced fertility
- Reduced productive live
- Reduced ability to select for genetic merit

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Porcine Epidemic Diarrhea Virus outbreak US

- 7 million piglets died in 2014
- 50% of all sows infected in one year
- Infected litters had 50-100% mortality

For the United States as a whole the PEDv outbreak caused a decline in national economic welfare of about $1.5 billion. Pork prices increased by about 20% as a result

Vaccines are under development

U.S. hog industry quarterly litter rates, 2000-14

**Figure 1. Total Mortality Regardless of Cause of Death (Circovirus Vaccine Trial)**

<table>
<thead>
<tr>
<th>Vaccine Treatment Groups</th>
<th>Total Mortality, % *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suvaxyn PCV-3 (1x2 ml)</td>
<td>1.0%</td>
</tr>
<tr>
<td>Suvaxyn PCV-5 (1x2 ml)</td>
<td>3.0%</td>
</tr>
<tr>
<td>Suvaxyn PCV-3+5 (2x1 ml)</td>
<td>4.0%</td>
</tr>
<tr>
<td>BL-PCV-3 (1x1 ml)</td>
<td>3.5%</td>
</tr>
<tr>
<td>Intervet PCV-3+5 (2x2 ml)</td>
<td>2.0%</td>
</tr>
<tr>
<td>Controls-Water (2x2 ml)</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

*Statistically significant difference between each vaccinated group and controls (P < 0.02), but no statistically significant difference between each vaccinated group.

Source: Data compiled by Joe Conner, DVM, Carthage Veterinary Service, Ltd., Carthage, IL

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**FMD outbreak costs: example S.Korea 2010/11**

Duration: 5 months  
Control method: vaccination and stamping out  
Number of animals slaughtered: 3,470,000  
Direct costs: $2.8 Billion  

Average annual global direct costs FMD: $5 Billion
The essence of the Sustainability & One-Health concept
- Recognizing that human and animal health are inextricably linked.

–Humans and animals have socio, economic and environmental interactions through direct or indirect physical contact or the food chain.

–Therefore, the health and welfare of all species can only be safeguarded by enhancing cooperation and collaboration between physicians, veterinarians, and other scientific health & environment linked professionals.

–This in order to better assess, treat, and prevent cross-species disease or resistance transmission and provide safe and wholesome sustainable animal protein food.

Agenda One Health Initiative

• Development of vaccines against infectious and zoonotic diseases for animals and humans

• Reducing the burden on humans of antimicrobial resistant organisms from the animal sector

• Reducing the infectious disease pressure in food-producing animals

• Extension of early warning systems, incl. risk assessment and the development of diagnostics to identify and monitor infectious diseases in animals and humans and monitor antibiotic resistance

• Development of efficient evaluation and monitoring systems for human health impact by animal farming;
Political and social pressure...

The Antibiotic Time Bomb....

World Wild Fish Catch and Farmed Fish Production, 1950-2012

Note: 2011 is an estimate, 2012 is a projection.

Source: FAO

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Food safety and sustainability

- Disease control is based on treatment rather than prevention
  - Usage of antimicrobials and other drugs
  - Wide variety of antimicrobials available without prescription
  - Risk of drug residues and antimicrobial resistance
Prevention Salmonella infections in Humans

Examples of existing vaccines against zoonotic diseases

**POULTRY**
- Salmonella Gallinarum
- Salmonella E + T
- E.coli
- Avian Influenza

**HORSES**
- Equine encephalitis
- West Nile Virus

**SWINE**
- E.coli
- Streptococcus suis
- Leptospira
- Erysipelas
- Influenza
- Salmonella cholerasuis
- Clostridium perfringens

**COMPANION ANIMALS**
- Leptospira
- Chlamydia psittaci
- Influenza
- Lyme disease
- B. bronchiseptica
- Leishmania
- Rabies

**Ruminants**
- Toxoplasma gondii
- Q-fever
- Rift Valley Fever
- Leptospira hardjo
- Chlamydia psittaci
- Chlamydia abortus
- Salmonella T + D
- Clostridia
- E. coli
Why We Need 2 Glasses

The Importance of Meat, Milk and Eggs (Over 5 School Terms)

When diets are supplemented with meat or milk, learning and test scores improve. Quality of nutrients versus just quantity of calories matter.


Big productivity gaps, largely due to poor animal health, persist between rich and poor countries

Some developing-country regions have gaps of up to 430% in milk

Milk (kg/cow/yr)

<table>
<thead>
<tr>
<th>Region</th>
<th>1980</th>
<th>2005</th>
<th>Industrialized Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Africa</td>
<td>411</td>
<td>307</td>
<td>6350</td>
</tr>
<tr>
<td>Latin America</td>
<td>1021</td>
<td>1260</td>
<td></td>
</tr>
<tr>
<td>South Asia</td>
<td>617</td>
<td>904</td>
<td></td>
</tr>
</tbody>
</table>

Stehfeld et al. 2006
What will it take to fill the gap?

1 Cow ➔ 32 glasses of milk currently produced each day + HALF a glass of milk to meet future demand

Examples:
• Fresh, clean water
• Feed optimization
• Vaccines
• Disease control
• Improved housing & comfort
• 3x a day milking
• Long-day lighting

Using innovation, not adding cows, would save:

We can freeze the footprint and have 66 million fewer cows.

Applying Today’s Technology Saves Precious Resources — Dairy Producers Could Save:

66 Million Cows

747 Million Tons of feed and

388 Million Acres of farmland — the size of Alaska

618 Billion Gallons of water — the annual domestic use of Germany, France and the UK combined

What’s missing is many farmers can’t take advantage of current innovations, practices or products. Solutions exist; access doesn’t.
Meeting Today’s Demand

Today 56 billion chickens deliver 3X more meat per person than 40 years ago to meet consumer demand.

1972: 73 grams per week
2010: 243 grams per week


What Will it Take to Continue Meeting Demand?

More Birds: Without innovation, we will need 131 billion birds in 2050 to meet consumer demand. That’s a 134% increase.

More Innovation: Continuing to rely on innovative practices will allow us to meet needs with about 32 billion fewer birds.
Effect of genetics and feed improvement 1957 vs 2001 (Havenstein et al 2003)

<table>
<thead>
<tr>
<th></th>
<th>1957</th>
<th>1957</th>
<th>2001</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>genetics</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>feed</td>
<td>1957</td>
<td>2001</td>
<td>1957</td>
<td>2001</td>
</tr>
<tr>
<td>LBW (g) (42 days)</td>
<td>539</td>
<td>578</td>
<td>2126</td>
<td>2672</td>
</tr>
<tr>
<td>Feed conversion</td>
<td>2.34</td>
<td>2.14</td>
<td>1.92</td>
<td>1.62</td>
</tr>
</tbody>
</table>

The 2001 broiler requires only 30% of resources and produces about 30% waste nutrients as compared to the 1957 broiler. 85% is genetics and 15% nutritional.

Using Innovation, Not Adding Chickens Would Save:

- **Feed Saved**: 146.9 Million Metric Tonnes of feed
- **Land Saved**: 39.45 Million Hectares of land
- **Water Saved**: 293.8 Billion Liters of water

The Innovative Path: Is it Possible?

Yes! And these are the types of farming best practices and innovations that are already making it a reality.

- Improved Animal Health Practices
- Genetic Selection
- Nutritional Advances
- Improved Sustainability