How scientific advances are being used to meet consumers' needs and ensure public health

**Intrinsic**
- Safety and health
- Sensory properties
- Shelf life
- Reliability
- Convenience

**Extrinsic**
- Marketing/image
- Production systems
- Welfare
- Environment
- Pesticides
- Antibiotic use
- Biotechnology

Peter Davies BVSc, PhD
College of Veterinary Medicine
University of Minnesota
What are consumers’ needs?
Sherwin Gardner, Senior VP for Science and Technology, Grocery Manufacturers of America, Inc.

- Consumers have a right to
  - expect that the foods they purchase to be safe and of high quality, and
  - voice their opinions about the procedures that government and industry use to ascertain the food supply has these characteristics

- The ultimate responsibility for investing the resources to achieve appropriate controls lies with the food industry

- Industry needs standards that permit flexibility and efficiency in producing and marketing foods
ME NOT HAPPY
NO EXIT

THE HISTORY OF TECHNOLOGY

ME NOT HAPPY

STILL NOT HAPPY!
As we move forward as a society we create more problems

Higher economic growth and consumerism leads to more stress as people work more and society falls behind

The better things become, the worse they are perceived

The more we know, the more we have to discover
Paradox of Progress

As industry gets better, perceptions get worse

Societal & Industry evolution has created new problems
Communicate successes

Residue violations in market hogs

- 1978 Market Hogs - violative residues (USDA)
  - 5.6% for antibiotics
  - 9.7% for sulfonamides

- 2016 Market hogs
  - No violative residues in 800 DS samples (random)
  - 4 (0.02%) violative residues in 18,754 IG samples

- 2016 Sows
  - 1 (0.13%) violative residues in 769 DS samples (DDT)
  - 21 (0.3%) violative residues in 6,461 IG samples
Communicate successes

Reduced incidence of key foodborne pathogens

- ~20-30% reduction in *Listeria, Campylobacter, STEC O157*
- ~ 50% reduction in *Yersinia*
- ~ 0% change in *Salmonella*
Improved pork safety

Foodborne outbreaks linked to pork (CDC)

Toxoplasma in market hogs

Human Trichinella Cases in US

Salmonella on carcasses

Baseline prevalence 1994
Baseline prevalence 1997
AMR - what really matters?

- Are food animal industries doing harm, and how much?
- How are antibiotics used in food animals?
  - What is effective and what is necessary?
  - What is philosophically defensible?
- How good is the evidence?
- How to do better, regardless of impact
- How to measure and communicate progress
Reducing the impact of antibiotic use in food animals on human health
What are the alternatives?

- Reduce consumption of animal products
- Reduce bacterial contamination of animal food products
- Preharvest (on-farm) control of bacteria of concern
- Reducing selection pressures for AMR in food animals
  - Restrict antibiotic use in food animal populations
  - Optimize antibiotic use in food animals
  - Reduce the need for antibiotic use in food animals
Reduce consumption of animal foods

- “As a society, if we want to reduce the selection of antibiotic-resistant bacteria, and thereby reduce the risk of antibiotic-resistant infections, we should be consuming less meat”
- “This real, transformative opportunity has had insufficient attention at the level of national health and commerce policy” (Spellberg et al, 2016)
Reduce contamination of animal food products


- Multiple hurdle technologies
  - CO₂
  - Peroxyacetic acid
  - Acidic calcium sulfate
  - Activated lactoferrin
  - Cetylpyridium chloride
  - Ozone
  - Essential oils and plant extracts
  - Bacteriophages, parasitic bacteria, bacteriocins
- ‘Intelligent packaging’, high pressure processing, ...
Preharvest control of bacterial pathogens and/or commensals

- Easier said than done
- Control of normal flora and common commensals unlikely with facile interventions in management
- *Salmonella* remains the premier concern in most industries (monogastrics)
- Holy grail of preharvest control
  - Perennial opportunity for alternative products
  - Efficacy to, or at, point of slaughter
  - Reproducibility, generalizability
Reducing selection pressures for AMR bacteria in food animals

- Restrict/ban antibiotic use in food animals
  - Need for alternative products
  - Alternatives need to mitigate resistance (zinc and MRSA)
- Optimize antibiotic use for clinical benefits in animals
  - Reduction vs. Antibiotic stewardship
- Reduce the need for antibiotic use in food animals
Reduce the need for antibiotic use in food animals

- Improvement of housing and management
  - Biosecurity, pig flow, hygiene,…
  - Big data, monitoring
- Improve host resistance to infection
  - Genetics, gene editing,…
  - Vaccination, nutrition
- Products that promote health (‘alternatives’) particularly in vulnerable populations
  - Neonates, recently weaned, stressed (transport)
What does the future look like?

- “The past is a foreign country: they do things differently there”
  
  L.P. Hartley

  - So, therefore, is the future

- “The future is already here – just unevenly distributed”

  William Gibson