Genomics and Swine Health: The Next Steps

Breakout Session #6
Swine Health & Genomics
Application of Genomics to Improve Disease Resilience and Sustainability in Pork Production

An international industry/research partnership

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The Challenge of Managing Disease

Animal Health & Production

- Major cost to producers
  - Reduced production efficiency
  - Cost of treatment
- Animal welfare
  - Consumer perceptions
  - Producer morale
- Threat to sustainable & secure pork production
  - Supply chain
  - Access to export markets

PRRSV  PEDV  Swine Dysentery  Salmonella
The Project

Focus on Disease Resilience in Pigs

- Combination of resistance and tolerance to diseases

Multidisciplinary Approach

- *Animal Models – Stages of Production*
  - Evaluate individual variation in disease susceptibility

- *Host-Microbial Interactions*
  - Role of microbes in disease resilience

- *Genomic Analysis*
  - Gene and gene networks associated with physiological and immune responses related to resilience

- *Socio-Economic Considerations*
  - Acceptance and uptake of genomic-based innovations
Research – Approach

- Animal Models – Health Phenotypes
  - Identify resilient animals at various stages of production
  - Ability to predict the health and productivity of pigs in a commercial environment

- Data – Different Stages of Production
  - Grow-finish Model
  - Gilt Models
    - Gilt Acclimation
    - Pregnant Gilt Model

- Immune Response Measures
Research – Approach

- **Host-Microbe Interactions**
  - Characterize gut microbiome associated with health & immune response
  - Microbiome Management
    - Enhance disease resilience & production efficiency

- **Enteric/Gastrointestinal Diseases – In vitro challenge**
  - Evaluate resilience to enteric diseases
  - Develop a representative In vitro challenge model
Research – Approach

- Genomic Technologies
  - *Genotyping* – SNP – host variation
  - *Microbiome* – microbial colonization & gut health
  - *Transcriptomics* – blood transcriptome
  - *Epigenetics* – maternal effects

- Integration of deliverables
  - ✓ *Breeding Programs* – select for disease resilience
    - Gene and gene networks associated with physiological and immune responses related to resilience
  - ✓ *Management* – health & nutrition – reduce antibiotics
Social & Economic Benefits
GE³LS research

Identify and measure the social value, for Canada and global markets, of using genomics in breeding for resilience to disease in pigs

✓ Producer Adoption
✓ Public Acceptance & Requirements
✓ Market Analysis

*All pork and chicken is raised without the use of hormones*
Partnership
Benefits to Canadian Pork Production

Expected Outcomes:

- Increase the rate of **genetic improvement** in pig health & **annual productivity**

- Increase **global competitiveness** of the high-value and desirable pork products and make Canada a major contributor to **global food safety and security**

- Improve the **competitiveness** and **market access** of Canadian genetics in export markets, especially in developing countries with substantial health challenges
THANK YOU !!!
Overview

- Significant **benefits to Canadian industry & society** (within 5 years from project-end)
- **Creates synergy** to provide timely deliverables impossible without this funding
- Provides the tools & resources to **address industry and societal needs**
- **Able to deliver** through strong international collaborations
- **End-user engagement & industry application**
Canada phasing out antibiotic use in livestock

BY MARGARET MUNRO, POSTMEDIA NEWS    APRIL 11, 2014

*All pork and chicken is raised without the use of hormones.

Consumers taking over debate on safety of antibiotics in meat production
Genome Canada
Large Scale Applied Research Project

• Genomics & Feeding the Future
  – use genomics to address challenges and opportunities related to global food safety, security and sustainable production, and thereby contribute to the Canadian bioeconomy and the well-being of Canadians.

• Builds on Previous Genome Canada Project
  – Application of Genomics to Improve Swine Health and Welfare
    • Porcine Circovirus (PCV)
    • Porcine Respiratory and Reproductive Syndrome (PRRS).