Study Overview

- The purpose of the Study is to determine if exposure from oil and gas emissions impacts animal health in western Canada.
- The geographic scope of the Study is British Columbia, Alberta and Saskatchewan.
- The Study started in 2000 and will conclude by 2005.
- Cost of the Study is expected to be $17 million with governments (including the Oil and Gas Commission) and industry providing funding.

Study Details

- The “Western Canada Study on Animal Health Effects Associated with Exposure to Emissions from Oil and Natural Gas Field Facilities” (the Study).
- The Study has these components:
  - Beef cattle productivity
  - Immune system structure and function in beef cattle
  - Wildlife Health/Immunotoxicology
  - Water quality analysis
  - Feed analysis
  - Exposure monitoring
- Since this presentation is intended for general audiences, we have attempted to reduce the technical terminology.

Study Design

- How does this study differ from previous studies?
  - Larger geographic scope – a western Canadian Study
  - Larger sample size – approximately 30,000 individual animals in 200 herds
  - Includes a sentinel wildlife specie – European Starling

About WISSA

- The Western Inter-provincial Scientific Studies Association (WISSA) was created to manage the Study.
- WISSA is managed by a Board of Directors with day-to-day operations handled by the Study Manager and research and analysis being conducted by a team of experienced university and private sector researchers.
- A Science Advisory Panel, comprised of eleven internationally renowned scientists from across North America, reviews and evaluates all proposals and reports relating to the Study in terms of objectives, design, methodology and other matters that may affect the scientific merit or quality of the Study.
Study Components
- Beef Cattle Productivity
- Beef Cattle Immunotoxicology
- Wildlife Health/Immunotoxicology
- Exposure Assessment
- Water Quality Sampling
- Feed Analysis

Beef Cattle Productivity
Objective
Beef Cattle Productivity will examine whether beef cattle exposed to emissions from oil and gas batteries and other field facility sites are at a greater risk of productivity failure and disease than cattle that are not exposed.

Outcome:
- Objective and verifiable reproductive outcomes
  - Risk of non-pregnancy
  - Abortion
  - Stillbirth
  - Calf mortality
  - Calving interval

Other Outcomes:
- Disease-specific mortality in cattle
  - Respiratory related losses
  - Neuropathology
- Immune system function in cattle

Herd Selection
Objective is to maximize the range of exposure available for Study
- High exposure herds selected based on location relative to oil and gas facilities and air monitoring data
- Little/no exposure herds also selected
Beef Cattle Productivity Activities

- Selection of herds completed April 2001
- Herd and animal health, productivity, management and nutrition data collected
- Animals’ body condition scored
- Pasture quality assessment summer 2001

Beef Cattle Productivity Activities

- Infectious disease study Fall 2001 – blood samples collected from 2,500 cows in 65 herds
- Pregnancy testing and inventory checking Fall 2001 with data for more than 30,000 cows
- Cows examined and bulls tested spring 2002
- Calving data, blood samples and calf livers collected

Beef Cattle Productivity Activities

- Field and histopathological necropsies conducted on mortalities to end of May 2002
  - Tissue samples on 1,900 animals from the following classes:
    - Abortions
    - Stillbirths
    - Calves of various ages
    - Adults

Beef Cattle Productivity Activities

- Infectious disease study repeated Fall 2002
  - Calves born in 2002 from selected herds
  - Compare low mortality herds with high mortality herds
- Pregnancy checking and herd inventory completed in Dec. 2002

Beef Cattle Productivity Activities

- Oil and gas field facility operating data requested from regulatory authorities
- Meteorological data requested from Environment Canada

Study Components

- Beef Cattle Productivity
- Beef Cattle Immunotoxicology
**Beef Cattle Immunotoxicology Activities**
- Examined exposure, nutritional and infectious disease factors of yearling heifers and their association with immune system structure and function
- Field research activities completed June 2002
- 27 herds with an average of 20–25 animals per herd participated in the research

**Analyses includes:**
- Rabies vaccine antibody titer response
  - Primary and secondary humoral immune response
- Lymphocyte phenotyping
- Trace mineral (copper, zinc, selenium) and vitamin (A & E) assessment
- BVD virus isolation and serological profile over time

**Study Components**
- Beef Cattle Productivity
- Beef Cattle Immunotoxicology
- Wildlife Health/Immunotoxicology

**Wildlife Health/Immunotoxicology Activities**
- Data collected on reproductive, nestling and fledgling success and immune function
- Biological samples collected for purposes of immunotoxicology research

**Exposure Assessment**
- Two field seasons: Spring 2001 and spring 2002
- 24 sites in Alberta for Spring 2001 and 2002
- 6 additional sites in Saskatchewan for Spring 2001

**Study Components**
- Beef Cattle Productivity
- Beef Cattle Immunotoxicology
- Wildlife Health/Immunotoxicology
- Exposure Assessment
Exposure Assessment Activities

- Exposure assessments have been completed with:
  - Passive samplers
  - Particulate monitors

Exposure Assessment Activities

- Sensitive passive samplers placed near cattle herds
- Measures cumulative monthly exposures of
  - H₂S
  - SO₂
  - VOCs

Exposure Assessment Activities

- Passive samples taken:
  - SO₂ – 15,735 (April 01 to December 02)
  - VOC – 12,629 (April 01 to December 02)
  - H₂S – 8,457 (September 01 to December 02)

The number of samples taken are greater in the summer than in the winter.
- This is because cattle are moved to open pastures for the summer so more samplers are required for the larger geography.

Exposure Assessment Activities

- The data from continuous monitoring stations obtained
- Exposure assessment at a subset of sites continued in 2002
  - 32 sites where particulate matter samplers established
  - Additional sites representative of a range of exposures from high to low
  - Approx. 240 sampling sites per month for July - December 2002

Quality Assurance (QA) and Quality Control (QC)

- Field personnel have been audited for QA/QC and standard operating procedures.
- Laboratory audits have been conducted in accordance with ISO 17025
  - The private sector consultants conducting this component have been audited by external auditors using ISO 9000 standards.
Study Components

- Beef Cattle Productivity
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Water Quality Sampling

- Water samples collected from deep wells:
  - 53 sites including particulate matter sites and selected passive monitoring sites
- Includes water the cattle would have been exposed to from the beef cattle immunotoxicology study

Water Quality Sampling

- Water samples to be analyzed for:
  - Purgeable hydrocarbons (C₆ – C₁₀) and BTEX (benzene, toluene, ethyl benzene and xylenes)
  - Acid extractable hydrocarbons C₁₁ – C₃₆ (phenolics)
  - Base/neutral hydrocarbons (PAHs and others)
  - Metals, electrolytes, arsenic, selenium and sulfate

Feed Analysis

- Feed samples collected spring 2002
  - Hay, silage, greenfeed and straw
- Feed to be analyzed for:
  - Protein
  - Energy
  - Minerals
  - Trace minerals
  - Vitamins

- Findings to be used together with the nutritional status, feeding questionnaires and toxicology data to assess possible interactions with histological data

Study Timelines

- Data Collection
  - Completed
- Data Entry and Analysis
  - Summer/Fall 2004
- Reporting
  - Spring/Summer 2005
Thank You!

Western Interprovincial Scientific Studies Association

Western Canada Study on Animal Health Effects Associated with Exposure to Emissions from Oil and Natural Gas Field Facilities

Science and Community Environmental Knowledge Fund Forum/ Workshop

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