University of Saskatchewan

The Health of Workers in the Swine Industry:

Research, Education and Surveillance

Jim Dosman Shelley Kirychuk

Canadian Centre for Health and Safety in Agriculture (CCHSA), University of Saskatchewan, Saskatoon, Saskatchewan

Who Are We?

- *CCHSA was created in 2006 as the successor to the Centre for Agricultural Medicine, Canada's only organization devoted to health issues in agriculture.*

What we do

CCHSA is engaged in:

SERVICE,
EDUCATION,
PREVENTION, AND
RESEARCH ACTIVITIES

Four Competencies

- ***Agricultural:*** *specific to farmers, their families, workers and others involved in agricultural production. Areas include injury prevention, and health effects of dust, chemicals and other hazards.*
- ***Rural:*** *the health of rural and remote communities. Includes acute and chronic health care, emergency services*
- ***Environmental:*** *air and water. Includes pesticide exposure, ecosystem health, as well as risk assessment.*
- ***Occupational Health:*** *aimed at farm, forestry, and other rural based industries and workers.*

Swine Farming: Types of Exposures

- *Dusts and Gases (respiratory)*
- *Noise*
- *Animal Handling*
- *Infectious Disease*
- *Chemicals*
- *Confined Space*
- *Other (pressure washers, slips, falls)*

Respiratory Exposures

- *Dusts (dander, feces, urine, feed, bedding, viruses, bacteria, mold)*
- *Endotoxin*
- *Gases*
  - *Hydrogen Sulphide*
  - *Ammonia*
  - *Carbon Dioxide*

Respiratory Exposures Dust and Endotoxin

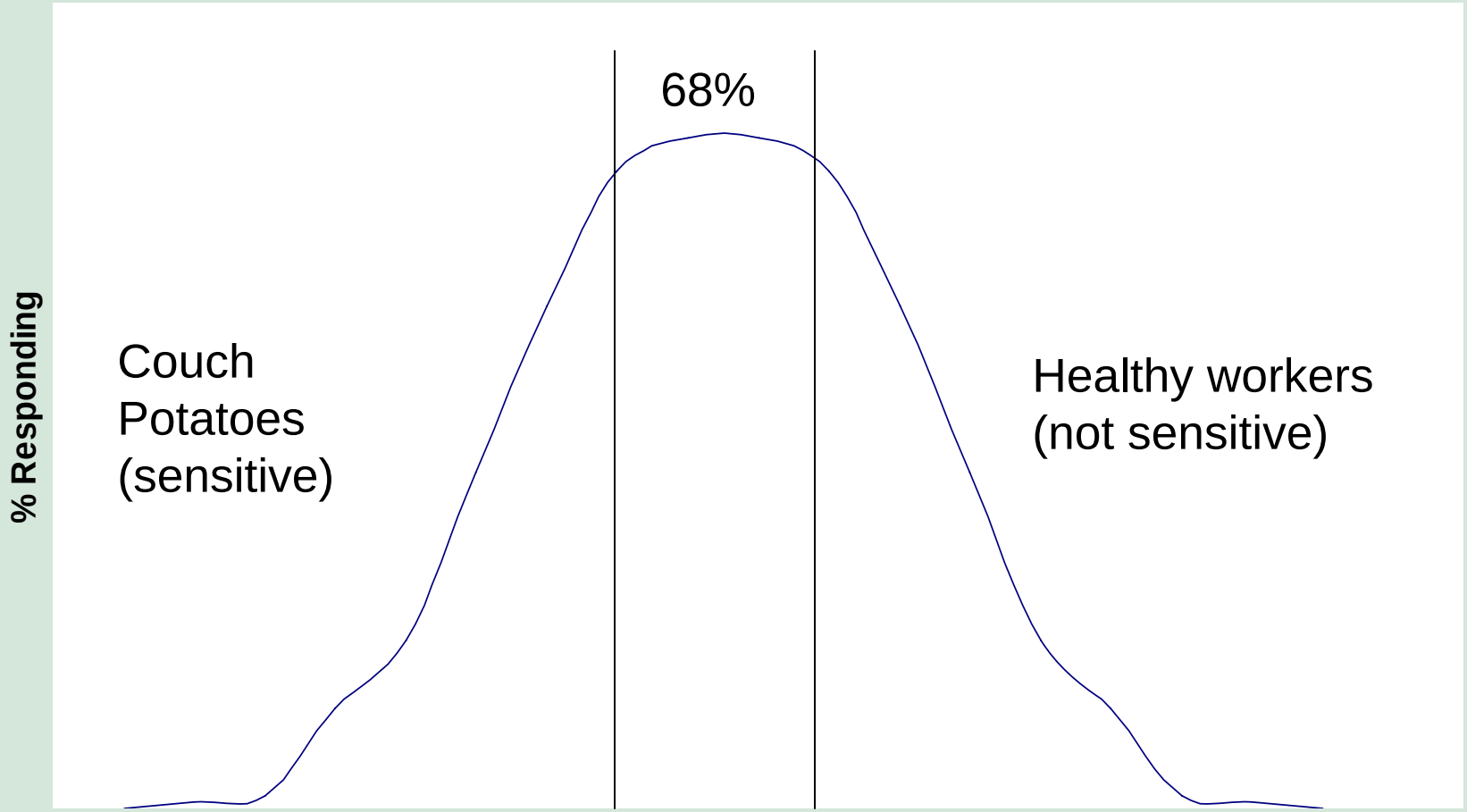
- *Always present*
- *Risk =*
  - *Exposure time*
  - *Dust level*
  - *Size of particles*
  - *Other contaminants present*
  - *PPE*

Respiratory Hazards Dust and Endotoxin – Hazards

- *Dust, endotoxin and gases will always be present:*
  - *Person variable*
  - *Acute and/or chronic respiratory effects can occur*

Person Variable

Normal (two tailed) dose response curve



Respiratory Hazards Dust and Endotoxin - Hazards

- *Acute health symptoms*
  - *Occur soon after exposure (eye irritation, nasal stuffiness, itchy throat, cough, wheeze)*
- *Chronic health symptoms*
  - *Occur over time and develop without being noticed (chronic cough, chronic phlegm, changes in lung function)*

Swine Industry

- *We have been working with the swine industry since 1988*
- *Research, education and surveillance*

Evolving Industry

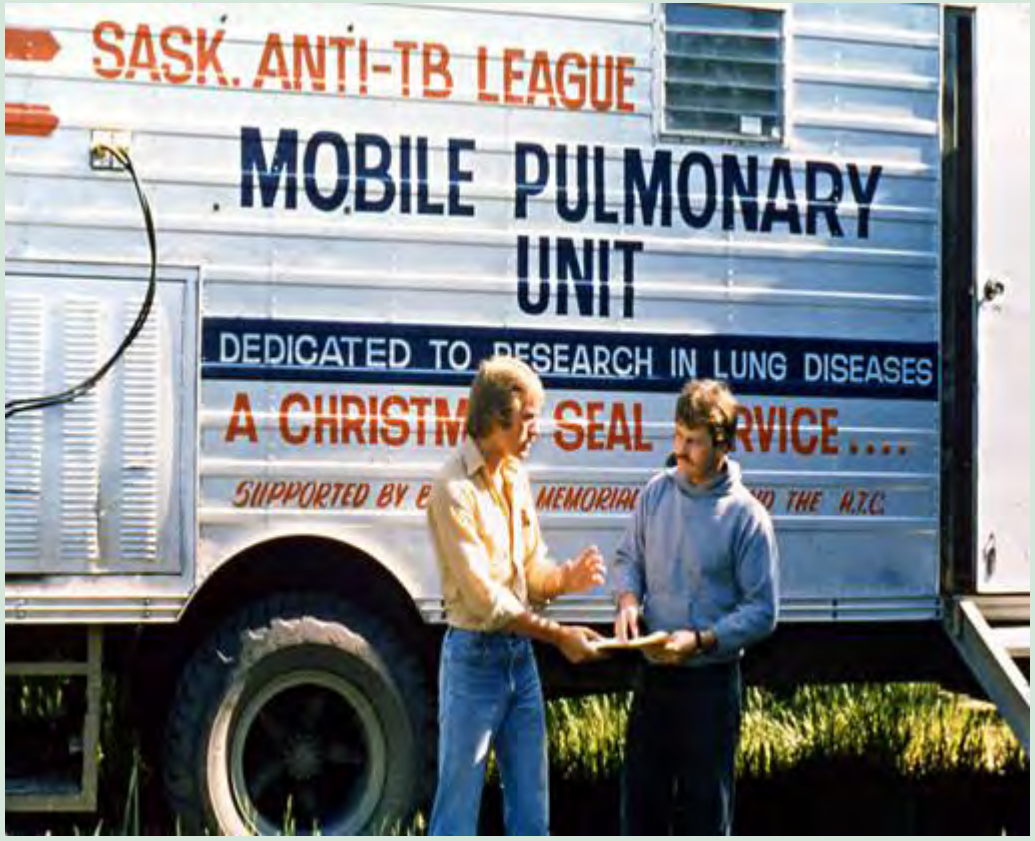
Family Swine Farm

- *Usually family run*
- *Maybe one hired worker*
- *Owner was the prime worker, family members helped out*
- *Few hours/day exposure*
- *Few hundred animals/farm*

Saskatchewan Farmers Survey (1980's)

504 swine farmers

448 non-exposed men from the town of Humboldt, Saskatchewan



Dosman et al J Occ Med 30: 715-720, 1988

Swine farmers in Saskatchewan had more respiratory symptoms than control men

	Farmers (n=504)	Controls (n=448)	Sig
Age (yr)	42.2	39.7	p<.05
Smoking (pk yr)	13.6	13.2	ns
Wheeze	29.2%	10.3%	p<.001
SOB	32.1%	19.4%	p<.001

Dosman et al J Occ Med 30: 715-720, 1988

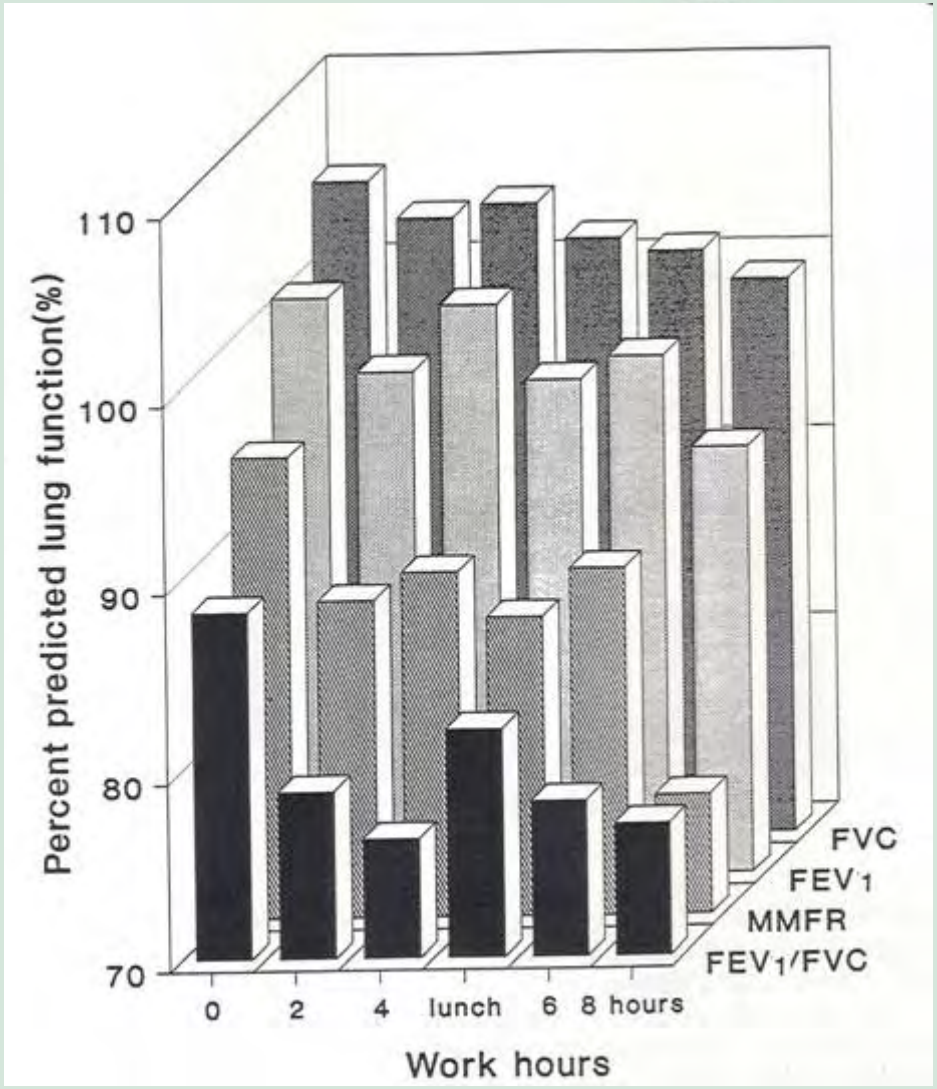
Swine farmers in Saskatchewan had lower values for lung function than control men

	Farmers (n=504)	Controls (n=448)	Sig
FEV_1 (pred)	95.5%	103.6%	p<.001
FVC (pred)	97.3%	106.8%	p<.001

Dosman et al, J Occ Med 30: 715-720, 1988

Across Work-shift Changes

Swine farmers had significant reductions in lung function over an 8-hour work shift



Zhou, C, PhD Thesis, University of Saskatchewan, 1994

Saskatchewan Swine Farmers Over Time (family-type operations)

Over a four year period between 1990/91 and 1994/95 there was significant accelerated lung function decline in swine farmers vs non-exposed control subjects

Senthilselvan et al Chest 111:1733- 41, 1997

Annual Rate Change in FEV_1 1990/91 – 1994/95 (vs 171 controls)

Grain Farmers *-16.4 ml's* *p=0.03*
(n=218),16 ml/year excess loss over control subjects

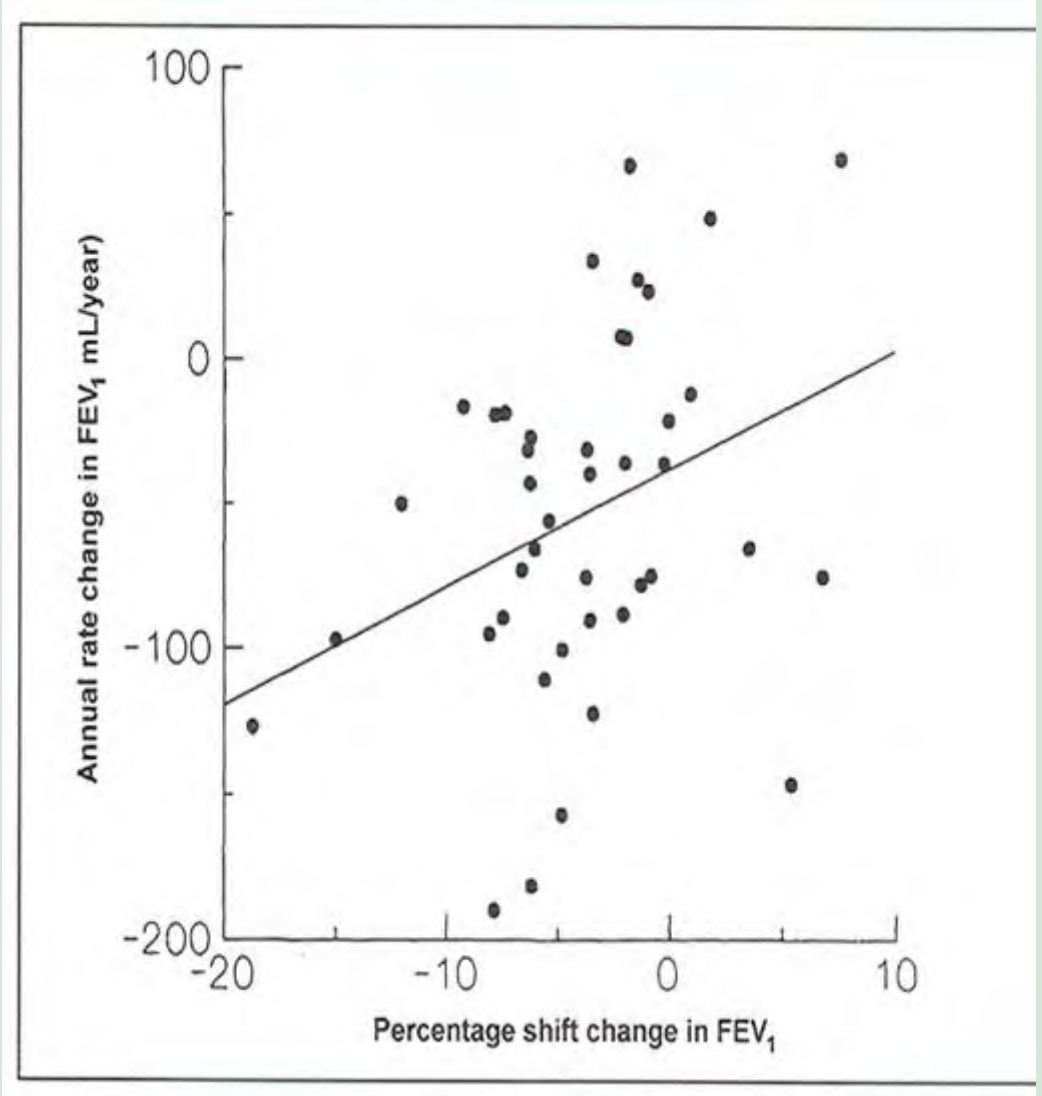
Swine Farmers *-26.1 ml's* *p<0.0005*
(n=217), 26 ml/year excess loss over control subjects

Senthilselvan et al Chest 111:1733- 41, 1997

Predictors of Lung Function Change

The best predictor of yearly decline in FEV_1 over a four-year period was the 8 hr across work-shift change in FEV_1 on the initial observation (1990)

Kirychuk et al Can Resp J, 5: 472-478, 1998



Respiratory Health Status in Swine Producers Relates to Endotoxin Exposure in the Presence of Low Dust Levels

Total Dust = 2.93 ± 0.92mg/m^3

	FVC	FEV_1
Airborne endotoxin	**-0.35***	**0.17**
Airborne endotoxin x hrs/day	**-0.42***	**0.28****

***p<.05 **p=.06**

Zejda et al, JOM 36: 49-56, 1994

Respiratory Hazards Dust and Endotoxin - Controls

Three general methods for controlling worker exposure to dusts:

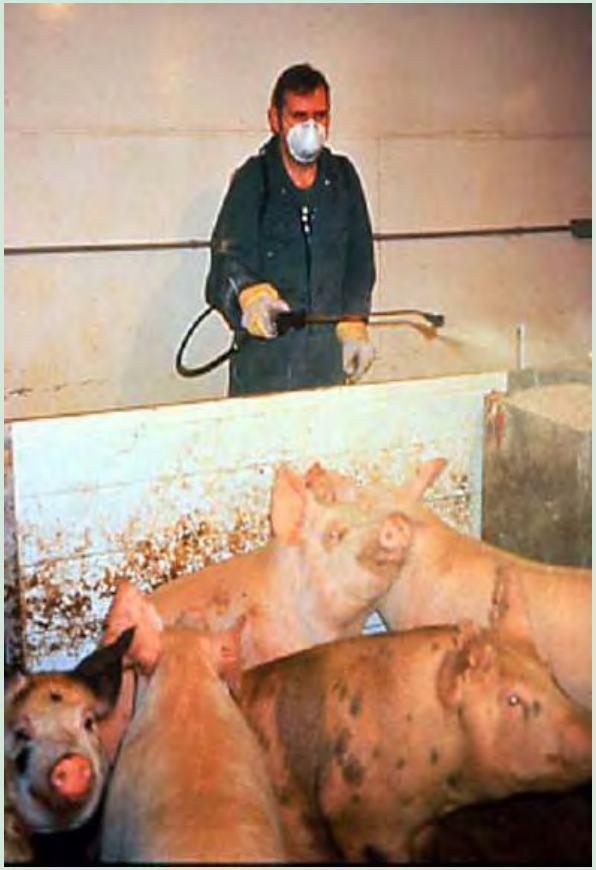
1. *Engineering controls (ventilation, oil sprinkling, dust reduction methods)*
2. *Substitution/Administration (automatic versus manual feeders, wet versus dry housekeeping)*
3. *PPE (wearing a respirator/mask at least during high exposures)*

Respiratory Hazards Dust and Endotoxin - Controls

Engineering Control versus a Mask

Always better to directly control environment but masks may be a good short-term alternative

Engineering Control – Oil Sprinkling



Respiratory Hazards Dust and Endotoxin - Controls

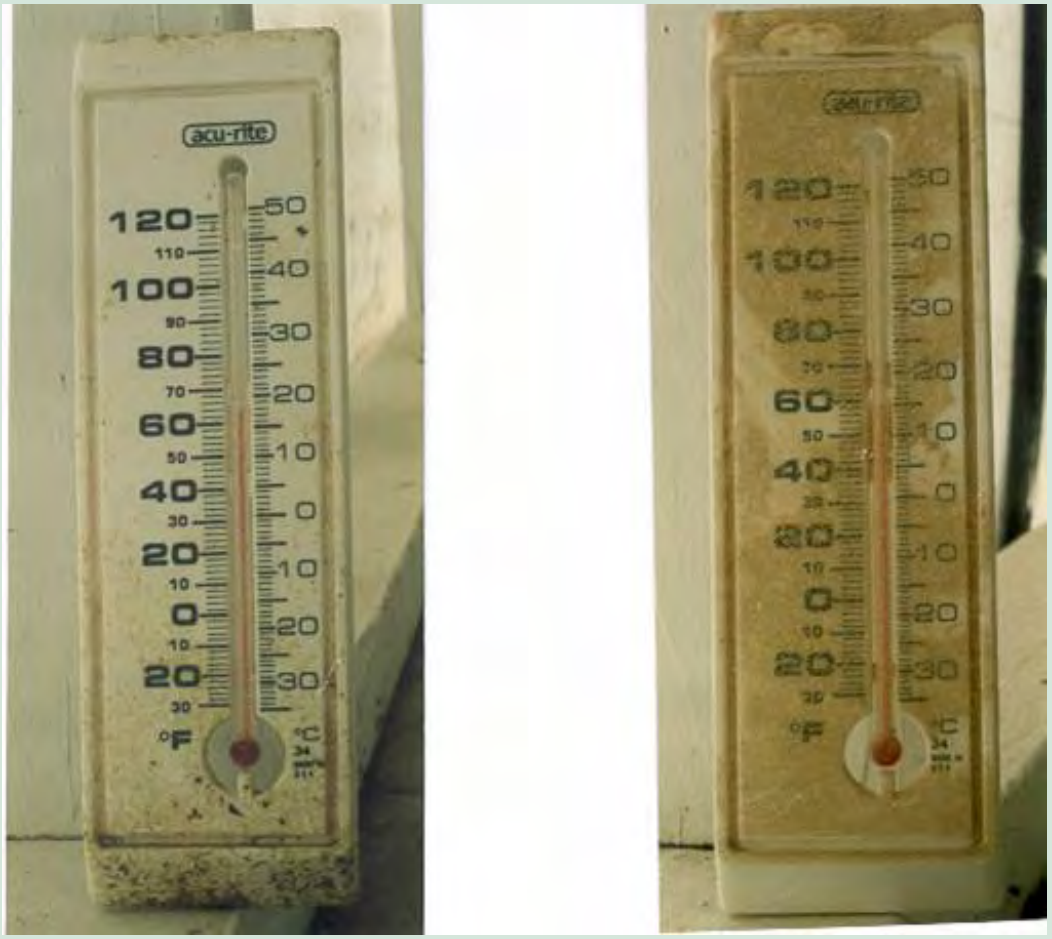
Engineering:

Oil Sprinkling

Naïve subjects exposed to a room sprinkled with 1 tsp oil/m^2 and exposed to a regular grow finisher room

Engineering Control – Oil Sprinkling

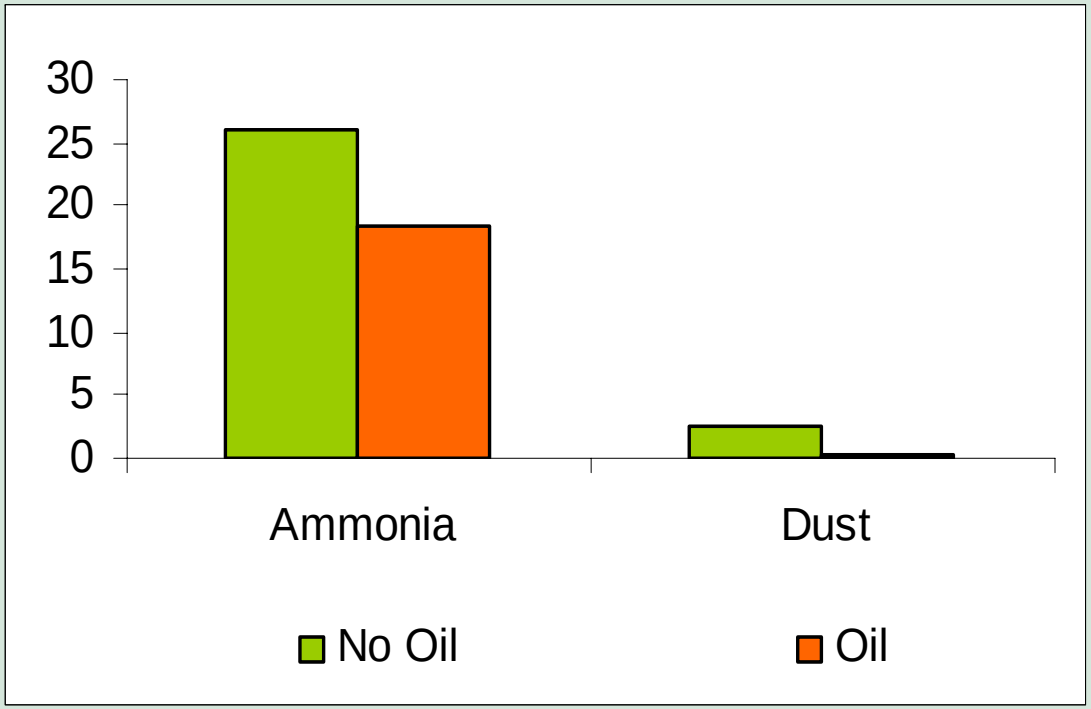
- *The difference between a room sprinkled with oil and not sprinkled with oil was visible*
- *Research results indicate dramatic decreases in dust and endotoxin levels*



Oil Sprinkling Effect on Dust and Gas Levels

94% reduction in dust concentration

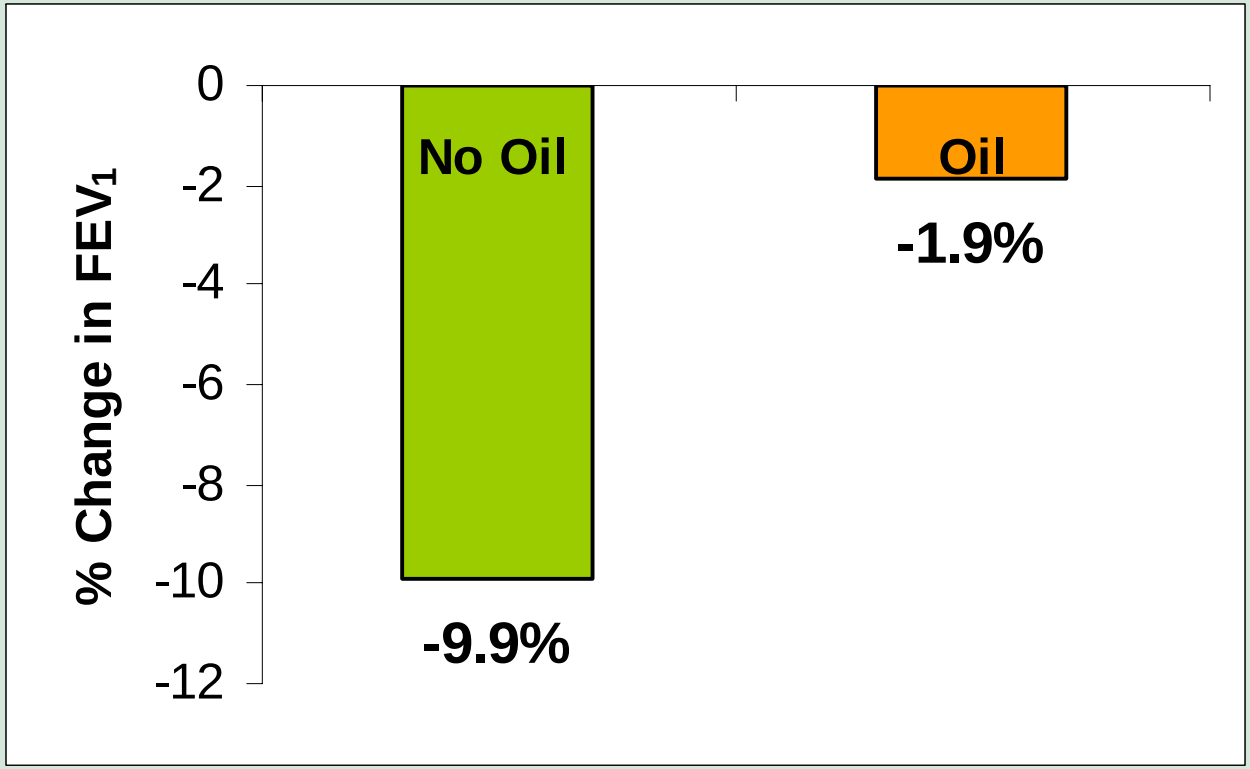
30% reduction in ammonia concentration



Oil Sprinkling Effect on Health

Five hour exposure

Significant difference in respiratory effects



Engineering Control – PPE

Mask

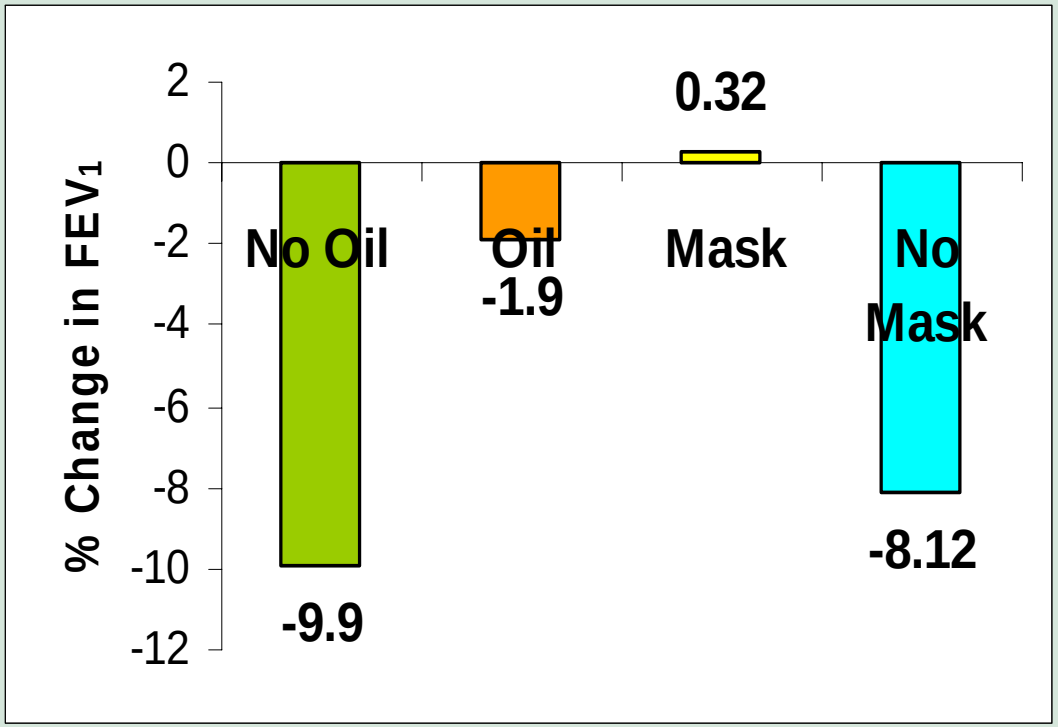
Respiratory Hazards Dust and Endotoxin - Controls

Mask Study

Naïve subjects exposed wearing a mask and again to a regular grow finisher room with no mask

A Comparison

- *Use of oil still results in some respiratory changes over a five hour period*
- *Use of a mask resulted in little change over the five hour period*



Baseline and interim lung function predicts healthy worker survival in swine farmers

RESULTS OF A 14 YEAR FOLLOW UP IN SWINE FARMERS

Chenard L, et al, Chest; 2007, 131(1):245-254

14 year follow-up in swine farmers and control subjects

Subjects tested in *1990/91*

1994/95

2003/04

Still, the family type operation – unless the worker had moved to a larger operation

14-year Follow-up

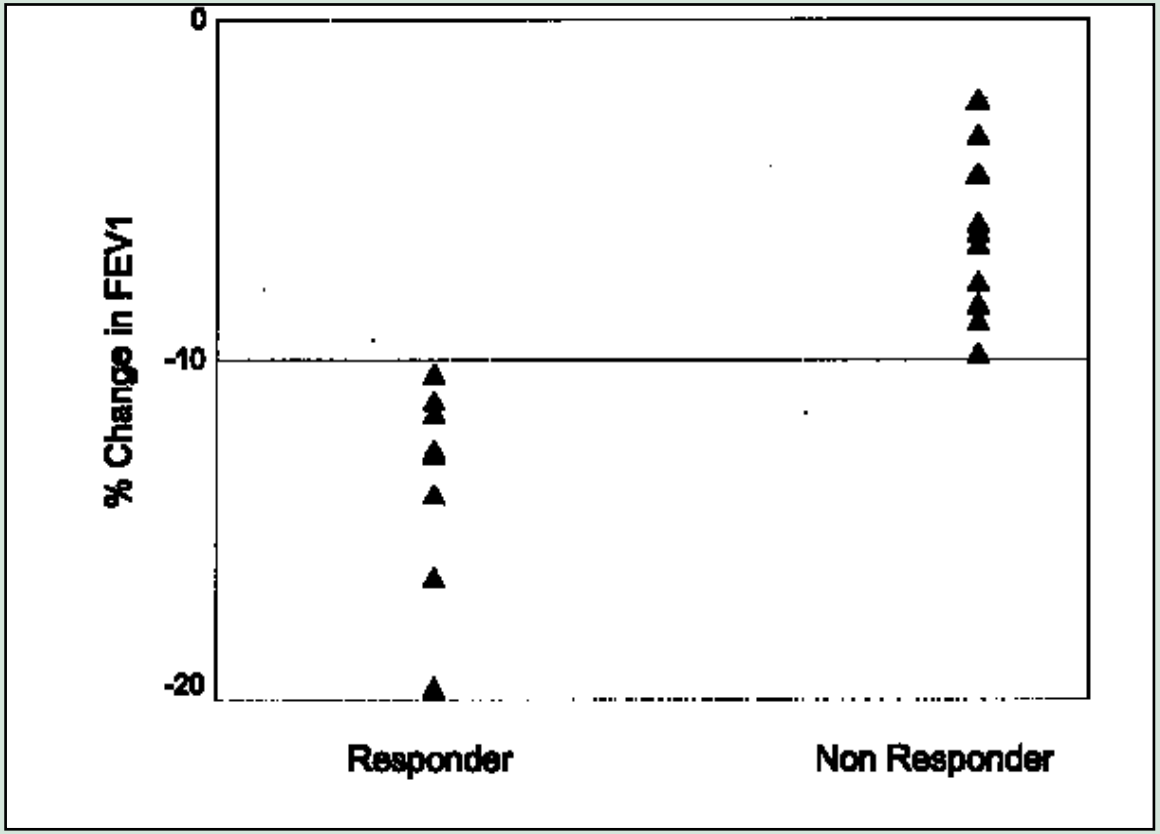
- *There is a significant healthy worker effect among farmers who continue to work in swine confinement facilities*
- *Continued work in the industry may be predicted by baseline and interim lung function.*
- *Genetic make-up may be a factor in the healthy worker effect*

Chenard L, et al, Chest; 2007, 131(1):245-254

Non-Responders to Endotoxin are Different From Responders

- "Responders" and "Non-responders" have different WBC and cytokine characteristics at baseline

- either precondition or sensitive system by which the body adjusts to minimal baseline exposure.



Dosman et al, Am J Ind Med 2006, 49:761-766

Today's Industry

- *Different exposures (often 8-hour's/day)*
- *Employees vs family members*
- *Different facilities*
  - Ventilation controls
  - Dust/housekeeping practices
  - Number of animals
  - Animal/person entry practices

New Studies

- *We are just starting work in the new swine confinement facilities*
- *Respiratory effects and environmental levels*

What we may find?

- *May be no different than the previous studies*
- *“those who can will”, those who can’t will do something different*

Occupational Health Services:

Canadian Centre for Health and Safety in Agriculture (CCHSA)

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GOAL:

Healthy animals and workers

Thank You

Any Questions?

Support for this presentation

Canada

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Association canadienne de sécurité agricole
Canadian Agricultural Safety Association