Thank you for participating in SowBridge 2011-12.

To start this presentation, advance one slide by pressing enter or the down or right arrow key.

Euthanasia Issues #2
- Welfare issues
- Economics
- Caretakers
- Euthanasia in today's society
- Sick pigs
- Euthanasia issues for the farm
- Culling runts/compromised pigs
- Mass depopulation in an emergency

The Context #3
- New Perceptions of Animal Agriculture
  (David Fraser, JAS 2001. 79:634-641)
  - Detrimental to animal welfare
  - Controlled by corporate interest
  - Motivated by profit
  - Causing increased world hunger
  - Producing unhealthy food
  - Harming the environment

Companion Animal Euthanasia #4
- Most people responsible for the euthanasia of companion animals suffer grief
- Such a dilemma can result in work dissatisfaction or alienation.
- If unresolved, these feelings can result in absenteeism, belligerence, or careless and callous handling of animals and high staff turnover.
- We believe swine technicians experience a similar aversion.

Owners: Companion v's Food #5
- Companion Animal
  - Likes animals
  - Limited resources
  - Strong bonding
  - Give it a chance
  - Struggle with timing
  - Spend time and money
  - Vet available
  - Individual being
- Food Animal
  - Likes animals
  - Income source
  - Weaker bonding
  - Give it a chance
  - Struggle with timing
  - Less money, little time
  - Vet not available
  - Object
The Concerns: #6

- In my opinion very few stockpeople like killing animals they are trying to raise. Those who do often worry me.
- By far and away the most popular form of "euthanasia" is *benign neglect*. This is especially true in farrowing crates where the majority of sick piglets do not hang on for long.
- Due to the displeasing nature of the work and the lack of time to devote to unanticipated activities on a modern swine unit, caretakers generally decide on a day and round up the poor doing pigs and carry out the unpleasant task. Some of these pigs have been doing poorly for months and some for days.

The Reality: #7

- In young pigs (farrowing), most people that I can get to euthanize pigs prefer blunt trauma.
- Usually have one to two people on a sow farm that get stuck doing it as others refuse.
- CO₂ is a battle to get done.
- Even though they see no reflexes of pig after blunt trauma, they don’t know whether or not they have performed blunt trauma correctly.

The Reality ....continued #8

- I’ve even put timers/controllers on CO₂ carts and told them to walk out of earshot, but they still won’t use them consistently.
- Most believe that controlled blunt force trauma works really well, but is a stop gap measure (10-25 years) but will ultimately be disallowed.
- Most have shied away from CO₂ as their only experience has been with uncontrolled gradual-fill systems that result in a great deal of vocalization and thrashing.
- Most believe that we need to move to a single-step captive bolt (if this is going to remain viable) as NOBODY bleeds or piths outside of the research and government communities, and firearms are moving out (especially for large farms) due to legal and insurance restrictions.

On-Farm Euthanasia of Swine Recommendations for the Producer

AVMA 2007 Guidelines-Swine
Revise Guidelines due 2012 #11

Acceptable* (refer to Appendix 2 and text for details)  Conditionally acceptable† (refer to Appendix 3 and text for details)

<table>
<thead>
<tr>
<th>Method</th>
<th>Acceptable*</th>
<th>Conditionally acceptable†</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barbiturates</td>
<td></td>
<td>Inhaled anesthetics</td>
</tr>
<tr>
<td>CO₂</td>
<td></td>
<td>CO</td>
</tr>
<tr>
<td>Potassium chloride</td>
<td></td>
<td>Chloral hydrate (IV, after sedation)</td>
</tr>
<tr>
<td>Penetrating captive bolt</td>
<td></td>
<td>Gunshot</td>
</tr>
<tr>
<td>Blow to the head (&lt; 3 weeks of age)</td>
<td></td>
<td>Electrocution</td>
</tr>
</tbody>
</table>
Blunt Trauma #12

- Blunt mechanical trauma is safe, humane, cheap, and expeditious.
- Unfortunately:
  - It looks terrible.
  - Many people dislike doing it, and
  - some people refuse to.
  - It’s very bad PR

Carbon Dioxide: Mode of Action #13

- CO₂ stunning causes unconsciousness in swine, not due to hypoxia, (Erhardt, 1989)
- Plasma cortisol levels are not further increased (Forslid, 1988)
- After ataxia and loss of righting reflex the convulsions, vocalization, reflex struggling, breath holding, and tachypnea, can be attributed to Guedel's second stage of anesthesia (Erhardt, 1989 and Thurmon 1996)

Carbon Dioxide: Mode of Action #14

- Inhalation of CO₂ causes respiratory acidosis and produces a reversible anesthetic state by rapidly decreasing intracellular pH (Martoft, 2002).
- Both basal and evoked neural activity are depressed soon after inhalation of 100% CO₂ (Martoft, 2002; Raj, 1997; Ring, 1988; Forslid 1987).
- Decrease in intracellular pH (≤6.7) with 90% CO₂ inhalation:
  - Carbon dioxide (CO₂) exerts its influence on the central nervous system (CNS) by crossing cell membranes, causing an increase in intracellular bicarbonate and hydrogen ions, and the increase in intracellular hydrogen ions lowers the intracellular pH. (Martoft et al., 2003).
  - In doing so, CO₂ suppresses nerve cell function and cerebral electrical activity. (Meduna 1958, Woodbury et al. 1958, Woodbury & Karler 1960, Krujten et al. 1965) and causes anesthesia (Eisele et al. 1967).

Carbon Dioxide #15

- Need a source of CO₂
- For effective euthanasia, pigs require a constant exposure of 60% carbon dioxide for at least 5 minutes.
- It’s reversible!
- Pre-charged or fill gradually?

Wash-in #17

- Low carbon dioxide concentration:
  - Time to unconsciousness is increased.
  - 1.3 to 2 minutes @20% CO₂ inflow rate.
  - During induction the pigs breathe very heavily.
  - Lengthen the time to unconsciousness (Von Hertrampf and Von Mikkwitz, 1979).
  - A similar conclusion was reached after castration of pigs under CO₂ anesthesia (Kluvers-Poodt et al., 2008, ASG rapport 85; Gerritzen et al., 2008).
Butina, Denmark  
info@butina.dk  
www.butina.dk

The Gondola, full immersion #19
- After exposure of pigs to high concentrations of 80 to 90% of CO₂ the pigs:
  - remain quiet for the first 10 to 20 s and  
  - Move for the next 10 s (Forslid, 1987).
  - It is difficult to know what the pig experiences during this period:
    - At best, it may be mildly unpleasant.
    - At worst, it could be very unpleasant.

We Understand CO₂Stunning #20
- Exposure to 80% to 90% CO₂ in air produces:
  - Unconsciousness in swine within 13 to 30 seconds without signs of pain and suffering, as determined by behavior, physical signs, and electroencephalographic activity;
  - Unconsciousness equivalent to stage 2 barbiturate anesthesia occurs prior to myoclonic activity (twitching).

  Forslid A. Transient neuronal, hippocampal and amygdaloid EEG silence induced by one minute inhalation of high concentration CO₂ in swine. Acta Physiol Scand. 1987; 130: 1-10.

Gas mixtures #21
- Adding Oxygen
  - Induction time to unconsciousness was lengthened by reduction in carbon dioxide concentration and that during the induction phase the pigs breathe very heavily.
  - Pigs that receive a mixture of 30% CO₂ plus 30% O₂ the period of distress can last for up to 5 minutes.

Gas Mixtures #23
- Argon
  - Industrial Argon $0.0574/cu ft
  - Industrial CO₂ $0.0234/cu ft
- MIG welding 75% Argon; 25% CO₂
  - $0.0568/cu ft
- Custom mixes are more expensive

| Table 1: Mean (s) times (seconds) to loss of posture, onset and end of convulsions, and onset of vocalisation in groups of 12 pigs exposed to argon, carbon dioxide or a mixture of argon and carbon dioxide |

<table>
<thead>
<tr>
<th>Gas mixture</th>
<th>Loss of posture</th>
<th>Onset of convulsions</th>
<th>End of convulsions</th>
<th>Onset of vocalisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argon (90%)</td>
<td>15 (4-19)</td>
<td>31 (5-7)</td>
<td>54 (16-3)</td>
<td>76 (4-3)</td>
</tr>
<tr>
<td>Carbon dioxide (80-90%)</td>
<td>22 (8-2)</td>
<td>29 (6-7)</td>
<td>27 (14-6)</td>
<td></td>
</tr>
<tr>
<td>Argon (90%) and Carbon dioxide (50%)</td>
<td>18 (4-6)</td>
<td>21 (5-7)</td>
<td>44 (9-4)</td>
<td>30 (3-4)</td>
</tr>
<tr>
<td>NS Not significant</td>
<td></td>
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</tbody>
</table>

CASH Special Captive Bolt Stunner

Zephyr Pneumatic Stun Gun

Non-Penetrating Captive Bolt #28
- Tina Widowski et al 2008, A.D. Leman
  - The Zephyr was variable farm-to-farm
    - 13 of 58 piglets showed return to sensibility
    - Subsequent adjustments improved performance; reduced to 0 of 41 piglets.
  - The 3 Zephyr devices (guns) varied in depth of penetration.
  - Blunt trauma (control) is a rapid, effective, and humane method of euthanasia.

Swine Euthanasia #29
- Most people do not enjoy the task.
- Many people entering the swine industry nowadays do not have a farming background.
- Many of the technicians in the farrowing facilities, where most pigs are killed, are women.
- Women and Hispanics are more averse to euthanizing piglets.
Most of the swine employees:
- Did not feel stressed by having to perform euthanasia as long as the animal appeared sick.
- Viewed euthanasia of a sick pig as a humane alternative to letting the animal die naturally.
- Prefer to use a process that is less painful to the pig even though it may take longer.
- Prefer to be trained on the farm.
- Perceive blunt trauma to be the safest method for the 1 to 12 pound pig.
- Perceive carbon dioxide gas to be safer than blunt trauma or the bolt gun method.
- Did not have a problem performing euthanasia as a part of their daily job functions.


Thank you

Any questions?