Animal Welfare Issues: Research Knowledge and Policy Alternatives

Farm Policy Study Group
Purdue University
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What’s in Store this Afternoon?

- Overview of political landscape
- Purdue’s role in informing public opinion
- Overview of ongoing work in Dairy and Swine
- Overview of ongoing work in Poultry
- Extension efforts
- Lots of discussion
Political Climate

2002 Voter Referenda

Oklahoma—Banned Cockfighting

Florida—Banned Gestation Crates

Political Climate

2006 Voter Referendum

Arizona—Banned Gestation and Veal Crates
Political Climate

2006
HR503 American Horse Slaughter Prevention Act
S1915 Blocked in Ag Committee

2007
Passed, signed into law

2009
S727 Prevention of Equine Cruelty Act

Political Climate

2007 Legislation

Oregon—Banned Veal and Gestation Crates

2008 Legislation

Colorado—Banned Veal and Gestation Crates
Political Climate

2008 Voter Referendum

California—Banned Gestation and Veal Crates and set limits on layer cages “Proposition 2”

2009 Legislation

Maine—Banned Gestation and Veal Crates – effective January 1, 2011

Massachusetts—Proposed ban on gestation crates and battery cages
Political Climate

2009 Proposed legislation

California—Proposed ban on tail docking of any cattle for any cosmetic reason.

Political Climate

- SB1337—prohibits a person from tethering or confining any covered animal, on a farm, for all or the majority of any day in a manner that prevents animal from
  i. Lying down, standing up, and fully extending his or her limbs
  ii. Turning around freely
Political Climate

- SB1336—provides that no person may dock or hire any other person to dock the tail of any living member of the bovine species.
- SB 139—limits situations when a person could dock an animal’s tail or crop its ears without violating the “animal torture” provision of the Humane Care for Animals Act

Political Climate

- HSUS --- 2010 Referendum ala CA Proposition 2
- Legislature---2009 Referendum on Ohio Livestock Care Standards Board

The 13-member board would be appointed by the Governor and the Assembly, and include a family farmer, a food safety expert, a veterinarian, the state veterinarian, a college agriculture dean, a county humane society member, two representatives from statewide farming groups, and two consumer group representatives. The House and Senate would each add a family farm member.
Political Climate

**2009 legislation**
- Puppy Mill legislation
- ??????

HSUS Plan

- 100 point “Change Agenda for Animals”
  1. Humane poultry slaughter
  2. Downers and slaughter plant oversight
  3. Enforcement of existing laws—puppy import ban, Horse Protection Act, etc.
  4. Horse slaughter
  5. Puppy mills
  6. Horse protection Act—funding, prosecution, and eliminate industry self-policing
  7. Intensive confinement—like Prop 2
HSUS Plan

- 100 point “Change Agenda for Animals” (cont.)
  8. CAFOs (climate change)
  9. Pain and Distress—adopt regulatory definition of distress to assure consistency and compliance
  10. Cloning—reconsider food safety—to both humans and animals
  11. Yellowstone Bison
  12. Non-lethal predator control –eg ban Starlicide and Avitrol
  13. Animal cruelty—link animal and human violence
  14. Fur labeling
  15. Free Trade Agreements—include welfare commitments
  16. Antibiotics—Pew commission
  17. Defense—end use of pigs for personnel trauma training

“We believe in the Three R’s—
REDUCING the consumption of meat and other animal-based foods;

REFINING the diet by eating products only from methods of production, transport, and slaughter that minimize pain and distress; and

REPLACING meat and other animal based foods in the diet with plant-based foods.”

Wayne Pacelle
HSUS President
Unintended Consequences

Examples

- Horse slaughter ban
- Intensive confinement
- Tethering

Informing Public Policy

- Sometimes difficult without advocacy
- What constitutes animal pain/stress?
- What husbandry alternatives can be used economically?
- Utilize traditional disciplines together to develop better husbandry systems
  - Genetics
  - Physiology
  - Nutrition
  - Housing
  - Ethology
- Communicate findings to students and public
Purdue Resources

- Purdue Animal Sciences
  - Growth and Development
  - Animal Well Being
  - Sustainable and Efficient Production Management Systems

Purdue Resources

- USDA-Livestock Behavior Research Unit
Purdue Resources

- Center for Food Animal Well-Being

Resources Purdue

- Beef: Lemenager, Claeys, Schoonmaker
- Dairy: Schutz, Nennich, Donkin
- Poultry: Muir, Hester, Garner, Applegate
- Swine: Richert, Pajor, Schinckel, Sutton, Patterson
Resources USDA-LBRU

- Focus on Dairy, Poultry, Swine
- Lay--RL and Behavioral Physiology
- Eicher—Immunology
- Cheng—Neurobiology
- Marchant-Forde—Ethology
- Rastagno—Microbiologist

Animal Welfare Research in Dairy and Swine

Livestock Behavior Research Unit
USDA-ARS
Animal Welfare Guideline

The Brambell Committee introduced “5 F” for animals in animal production system:

- Freedom from hunger and thirst
- Freedom from discomfort
- Freedom from pain
- Freedom to express normal behaviours
- Freedom from fear and distress

The World Organization for Animal Health

- Protect the basic health and normal functioning of animals;
- Protect the psychological well-being of animals;
- Provide living conditions that are considered to be “natural” for the species

Animal Welfare in the U.S.

USDA is the primary Federal agency responsible for animal welfare issue

- The Animal and Plant Health Inspection Service (APHIS)
  
  APHIS --- the Animal Welfare Act (AWA) and the Horse Protection Act --- certain animals

- The Food Safety and Inspection Service (FSIS)
  
  FSIS --- the Humane Methods of Slaughter Act (HMSA), the Federal Meat Inspection Act, the Poultry Products Inspection Act, and the electronic Humane Activities Tracking (HAT, 2004) --- livestock in slaughter plants

- Currently, there are no federal laws for farm animals housed for food, fiber or other agriculture purposes including research.
Livestock Behavior Research Unit (LBRU)
USDA-ARS

The Mission

- To develop scientific measures of animal welfare, through the study of animal behavior, stress physiology, immunology, neurophysiology, and cognition, that will allow an objective evaluation of animal agricultural practices.
- To improve the existing practices and to invent new practices that can enhance animal welfare and increase animal productivity.
- To use and develop its knowledge of stress physiology and animal behavior to address concerns of pathogen contamination of livestock carcasses due to the stress of handling and transportation.
- The goal is to improve animal health, increase productivity, and decrease human exposure to dangerous pathogens.
Scientists

- Don Lay, Jr. (research leader / stress physiology)
- Susan Eicher (immunology / ethology)
- H.W. Cheng (neuroscience /ethology)
- Jeremy Marchant-Forde (ethology)
- Marcos Rostagno (microbiology)

Farm Animal Behavior Laboratory (N & S)
“a legendary story of supernatural happenings”
LAYOUT
Gestation
Barn:
24 Landrace/ 24 Yorkshire

Controlled environment:
➢ Same building
➢ Same management
➢ Temperature and humidity balance
Results were not conclusive

- Gilts housed in groups had greater salivary cortisol during gestation and 1 h after the move to farrowing crates
- Piglets from stall-housed gilts drank more on d 2 after weaning and more required mash
- Piglets from stall-housed gilts grunted more during the isolation test
- Piglets from stall-housed gilts gained less after weaning (35 d)

Introduction: Main Objective

Determine how alleyway width interacts with sow welfare, behavior, and productivity within a free-access gestation sow housing system.
Materials and Methods: Behavior and Social Interactions

- Video recording for 1st week; 24hrs/ wk afterward
- Analyzing
  - Where and how sows spend time
  - Which sows use each area
  - Occurrences and winners of fights
- Dominance relationships
  early, middle, and late gestation

Materials and Methods: Production and Health

- Weekly lesion score
- Early, middle, and late gestation
  - Lameness Score
  - Weight and Body Condition Score
  - Back fat
Materials and Methods: Production and Health

- Additional Sow Data
  - Farrowing Rate
  - % Rebreed
  - Days to estrus
  - Culling rate and reason for culling

- Litter Data
  - # of pigs born alive
  - birth weight
  - litter size

Materials and Methods: Physiology

- Immune Function
  - Blood sampling early, middle, and late gestation
  - Concanavalin A skin test late gestation

- Cortisol
  - Blood sampling early, middle, and late gestation
Results: Current Impressions

- Sows use alleyways in all treatments, but differently
- Only dominant group of sows use alleyways

Results: Current Impressions

- Fighting lasts longest in 7’ alleyway; 3’ alleyway has few fights
- Highest pregnancy losses in 10’ alleyway
Results: Production Data

- Lower farrowing rate in 10’ alleyway
- No apparent differences in
  - Total litter size
  - Number of pigs born alive
  - Mortality
  - Birth weight

Conclusions

Focus of these studies is to create science based recommendations for free-access systems that support good animal welfare and benefit producers.
Tail-docking in dairy cattle

Acute pain: not much in cows, but present in calves
Chronic pain: suggested by thermography results
Fly avoidance: a problem for both calves and cows
Pain Sensitivity Testing and Thermo-photography

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Intact</th>
<th>Docked</th>
<th>Tip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Tail</td>
<td>34.16</td>
<td>34.65</td>
<td>32.7</td>
</tr>
<tr>
<td>Final Tail</td>
<td>35.12</td>
<td>36.08</td>
<td>32.14</td>
</tr>
<tr>
<td>Change</td>
<td>0.96</td>
<td>1.43</td>
<td>-.03</td>
</tr>
</tbody>
</table>

Experimental Design
Speed

Graph showing speed comparison between concrete and rubber surfaces. The y-axis represents speed in mph, ranging from 0 to 2.5, with intervals of 0.5. The x-axis represents the stage of lactation. Bars labeled with 'a' and 'b' indicate statistical differences within treatments (P < 0.01).
Current Dairy Research

Rubber mats for dairy comfort and lameness prevention

Calf social stress / calf environmental stress

Animal Welfare Research
in Poultry

Livestock Behavior Research Unit
USDA-ARS
Major Issues Associated with Welfare in Poultry

- Housing system: Battery cages
- Group size and stocking density
- Beak trimming
- Induced molting
- Bone weakness
- Handling, depopulation, and transportation
- Slaughter (Spent hens)

Current Studies Conducted in the Livestock Behavior Research Unit

- Stress indicators: Various stressors
  (transportation stress, social stress, heat stress)
- Housing: Furnished cages vs. battery cages
- Induced molting: alternatives vs. feed withdrawal
- Genetic selection: Kind gentle birds
- Beak trimming: Infrared beak trimming vs. hot blade beak trimming
Examples of Studies Related to Animal Welfare conducted in the LBRU

- **Pain**
  - Some routine practices in the food production industry may cause pain in the animals.
  - Pigs: tail docking; teeth clipping; ear notching; and castration
  - Dairy cows (Cattle): tail docking, castration, dehorning
  - Laying hens: beak trimming

Cannibalism in Poultry

- It can happen in any kind housing environment
- It causes more than 20% of mortality in laying hens without beak trimming (Algers et al., 1995)
Beak Trimming

◆ **Advantage**
  - Feather pecking
  - Cannibalism

◆ **Disadvantage**
  - Affect normal beak function: eating, drinking, and preening
  - Nerve & Tissue damage --- Pain (acute and chronic)

Histological characteristics of intact beak ---
Masson trichrome staining
Acute Pain --- Transduction System

- Beak tissues (signals)
- Neurons --- Spinal cord
- Neurons --- Brain

Chronic Pain --- Neuroma

- Spinal cord
  - Soma
  - Fibers
  - Terminals

- Beak
  - Normal nerve fibers
  - Regrowth
  - Ending of beak stump
  - Neuroma
  - Degenerating of neuroma
  - Tissue Scar

Neuromas may increase pain sensitivity --- chronic pain
Factors Affect Pain in Trimmed Hens

- Age
- Genetic background
- Lesion size
- Inflammation associated with lesion

Solution for feather pecking and cannibalism

Infrared beak trimmer

Hot blade trimmer
Data --- beak trimming

<table>
<thead>
<tr>
<th>Bird age</th>
<th>Data from previous studies</th>
<th>Data from our new studies</th>
</tr>
</thead>
<tbody>
<tr>
<td>5 wks or older</td>
<td>day old</td>
<td></td>
</tr>
<tr>
<td>Method</td>
<td>hot blade</td>
<td>Infrared</td>
</tr>
<tr>
<td>Lesion</td>
<td>severe</td>
<td>mild</td>
</tr>
<tr>
<td>Pain behavior</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Neuroma</td>
<td>yes</td>
<td>no (?)</td>
</tr>
<tr>
<td>Pain</td>
<td>Acute</td>
<td>Acute (?)</td>
</tr>
<tr>
<td></td>
<td>Chronic</td>
<td>Chronic (?)</td>
</tr>
</tbody>
</table>

Conclusion: -, Infrared beak trimming, unlike hot blade beak trimming, causes acute pain but not chronic pain in beak trimmed hens.

United Egg Producers guideline: beak trimming should be conducted at 10 days of age or younger.

Notes: Should not use old data to against the new practices.

Genetic Selection --- Another Solution for feather pecking and cannibalism

◆ Traditional Selection Program --- Individual
  - A single indicator
    - Production (Breeding)

◆ A New Selection Program --- Group
  - Multiple indicators
    - Production & Survivability resulting from cannibalism
      - KGB (Kind & Gentle Birds) & MBB (Mean & Bad Birds) strains
Genetic selection-induced alterations in the productivity and survivability in hens

<table>
<thead>
<tr>
<th>Trait</th>
<th>KGB line</th>
<th>MBB line</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortality, %</td>
<td>1.3 ± 0.1</td>
<td>8.6 ± 0.5</td>
</tr>
<tr>
<td>Longevity, d</td>
<td>363 ± 0.4</td>
<td>193 ± 2.1</td>
</tr>
<tr>
<td>Egg Number, per hen</td>
<td>298 ± 1.1</td>
<td>108 ± 1.2</td>
</tr>
<tr>
<td>Egg Mass, per hen, g/d</td>
<td>48 ± 0.2</td>
<td>17 ± 1.8</td>
</tr>
<tr>
<td>Egg Weight, g</td>
<td>59.4 ± 0.6</td>
<td>58.9 ± 0.8</td>
</tr>
</tbody>
</table>

*ab* Means within a row with no common superscript differ significantly (*P* < 0.05).

1. The KGB and MBB lines were selected from high and low productivity and survivability resulting from cannibalism and flightiness.
Serotonin System
Genetic Basis of Neurophysiology

Standard curve
Plasma Serotonin

\[ y = 245.374 + 18.042 \]
\[ R^2 = 0.9995 \]

KGB
MBB

* \( P<0.05 \)

IgG Concentrations

<table>
<thead>
<tr>
<th>Group</th>
<th>Western blot (Concen. Index)</th>
<th>Immunoprecipitation (mg/mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KGB</td>
<td>( 1.2 \pm 0.07r )</td>
<td>( 7.5 \pm 0.07s )</td>
</tr>
<tr>
<td>MBB</td>
<td>( 1.4 \pm 0.06b )</td>
<td>( 10.8 \pm 0.70s )</td>
</tr>
</tbody>
</table>

(P<.05)

Line 1, marker; Line 2, IgG positive control; Lines 3-4 from MBB hens; and Line 6-8 from KGB hens.
Data --- genetic selection

- Selection for productivity and survivability differently affected the biological systems in the present chicken lines.
- Genetic selection could be a very useful tool in improving farm animal welfare.
- Animal x environment interaction: Selected animals should be from the same environment, in which animals are going to be housed.

Animal welfare in the U.S.

- Public concern about farm animal welfare and food safety will continue to grow, which challenges current production practices.
- Currently, in the U.S. effects are still primarily confined to the retail sector.
- Pressure for legislation will increase.
  - 50 – 60 bills have been introduced in Congress annually
  - Even greater proliferation at the State level
    - Such as Proposition 2 in CA, and Chapter 272 of Massachusetts,
  - Much more at food retail organizations

McDonald, Burger King, Wendy’s, Kentucky Fried Chicken, and the Food Marketing Institute (FMI) and the National Council of Chain Restaurants (NCCR) ...and food services at 350 universities
Extension Activities

- Indiana Commission on Farm Animal Care
  - Indiana Livestock Care Assistance Project
- Quality Assurance Programs
  - IQ+BEEF
  - ISDA Certified Livestock Producer Program
- FASS—Dairy Cattle Training
- Work with National Commodity Programs
- Representation on National Boards
- Welfare Auditing Standards
- Swine Housing DVD

Needs for Animal Agriculture

- What needs to happen
  - Employee education: continue education and training program
  - Best management practices: develop and apply standards
  - Scientific research: assign a high priority
  - Public education (communication): improve the flow of information to the general public
Outreach needs

- More communication with general public
- Extend youth education beyond 4-H
- Enhancing Ag Productivity and Global Competitiveness (Theme Advisory Group)
- Public Education about CAFOs (Issue Based Action Team)
- Will required cooperation with Animal Agriculture Industry
- Attempt to keep focus on science-backed solutions