Animal welfare and the scientific method

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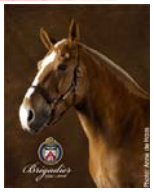
Making decisions about animal care at the societal level

- 93% of people agree that animal suffering should be reduced as much as possible, even though the animals are going to be slaughtered
(Caravan Opinion Research 1993)
- Most people agree that the treatment of (dairy) cows at Hallmark meat packing plant in CA was unacceptable

Recognizing the role of animals as family members: emergency rescue

Legal recognition of honorary "human" status for some animals

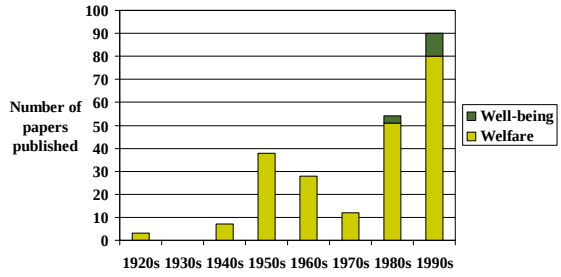


- Some states grant legal status to service animals
- Penalties for harming a police dog or horse in the line of duty are the same as if a (human) police officer was injured or killed

Social contract and the legal status of animals - "partial personhood"

In 1567, a sow was imprisoned by the royal notary of the court in France for murder. She was subsequently convicted and sentenced to hang.

Poultry Science papers identified as "welfare" or "well-being" focus[1]



[1]Term used in title or as keyword in referencing manuscript

What is "animal welfare"

According to the World Animal Health Association,

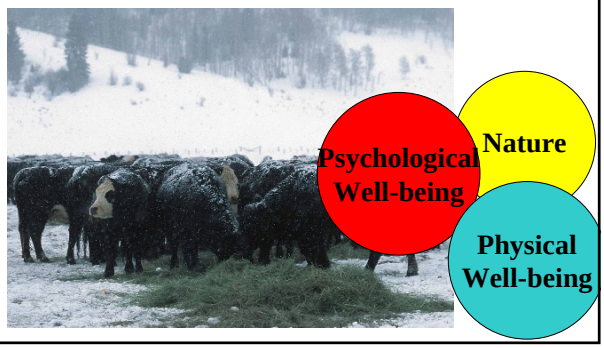
"animal welfare" is to be defined as:

1. The state of being of an individual, involving health and conditions of life

"animal protection", "animal care", "humane treatment", "animal husbandry" are defined as:

2. Human actions, such as provision of social welfare

Understanding what animals need



Scientific method

- Define the question
- Gather current information
- Form *a priori* hypotheses and predictions that can be tested and measured
- Experimental design to reduce bias
- Collect data and statistical analysis
- Interpret, form new hypotheses, publish
- Replication

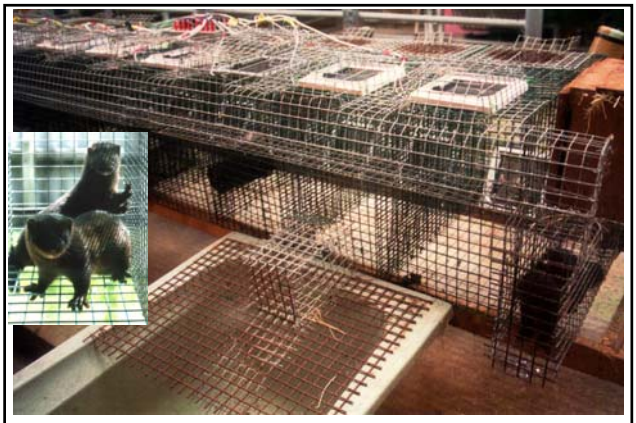
How can we avoid being anthropomorphic?

Consumer demand paradigm to test preferences & motivation (Dawkins MS)

- How much are you willing to pay?
- Elastic/inelastic demand

What resources do hens value?

- How hard will they work?
- How much time will they spend?



Mason, G., Cooper, J.J. and Clareborough, C., 2001. Frustrations of fur-farmed mink. Nature, 410:35-36.

Controlled laboratory experiments: How do we know what is painful?

Investigation of meloxicam (Metacam®) for dehorning pain in dairy calves

- 60 Holstein heifer calves, 6-12 weeks
- Treatments:
  1. Meloxicam (0.5mg/kg IM)
  2. Placebo (0.5mg/kg IM)
- Electric cautery iron & lidocaine cornual nerve block
- Observers and technicians blind to treatments

Experimental Design

- Each calf acts as its own control
- Sham dehorning on to account for effect of handling
- All sampling procedures at same time of day following sham (day -1) and actual dehorning (day 0)

Pain Assessment - Physiology

- Serum cortisol
  - Radioimmunoassay: Coat-a-Count®, DPC
- Samples at: 0, 0.5, 1, 1.5, 2, 4, 6 and 24 hours
- Heart and respiratory rates

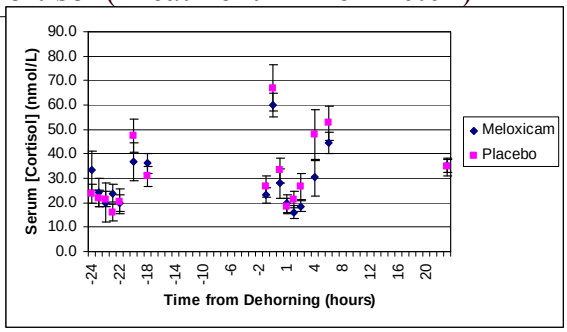
Pain Assessment - Behaviour

- Digital video recording from -24 to +48 hours
- Continuous sampling for five 1-hour periods/day
- Activity meter (Actical®, Mini Mitter® Respironics) attached to left hind leg for total activity
- Feed/Water intake from -24 to +48 hours

Pain Sensitivity

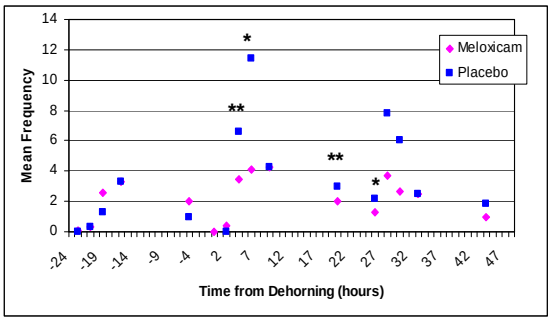
- Pressure algometer
  - Withdrawal reflex
  - Novel method in bovines
- 4 hours post dehorning
- 4 sites around each horn bud
- H_0: Pain sensitivity ↑ after dehorning & NSAID-treated calves less sensitive

Cortisol (Treatment*Time P=0.01)

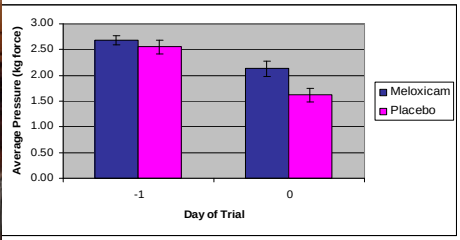


(Heinrich, Duffield, Lissemore, Millman, 2007. ADSA/ASAS Meeting, San Antonio, TX)

Meloxicam calves showed less ear flicking (** P<0.05, *P<0.01)



Pain Sensitivity (Treatment P=0.004)



Recognizing pain in animals: How do we know what is painful?

- By utilizing a variety of types of measurements, we can better understand the "whole animal"
- There is strong evidence about pain associated with dehorning
  - Physiologic responses
  - Biochemical responses
  - Pain sensitivity
  - Subtle behavior changes

Epidemiology approach to welfare

- Variability in response is desired vs. minimized with the goal of understanding interactions
- Identify benchmarks of prevalence for comparisons between farms and comparisons over time
  - Identify risk factors
  - Assess quality of interventions

Assessing welfare in "real world": Slaughter plant audits

Good handling - the crowd pen is only half full

- Temple Grandin began doing slaughter audits in the 1990s for the USDA & retailers
- Benchmarking
  - Vocalizations
  - Slips, falls, balks
  - Stunning
- Improving facility design & training programs
  - Behavior indicators
  - Meat quality
  - (Line efficiency)
  - (Worker safety)

Identifying risk factors: Herd-related incidence of shoulder ulcers in sows

- 23,794 sows from 207 sow herds surveyed post-mortem, 7.2% prevalence
- Factors negatively associated with ulcers
  - Hospital pen use
  - Using own replacement gilts
- Factors positively associated with ulcers
  - Confinement
  - 2 vs. 1 stockperson

Cleveland-Nielsen et al., 2004. Preventive Veterinary Medicine 64:113-122.

Dawkins et al. 2004. Nature 427:342

- Epidemiology-based study examining effects of stocking density on broiler welfare
- 10 commercial companies in UK, 5 stocking densities, 2 houses per stocking rate = 2.7M birds
  - 30, 34, 38, 42, 46 kg/m^2
- Measurements:
  - Engineering parameters: temp., humidity, litter quality, air quality
  - Animal measures: mortality, physiology, behavior, health

Dawkins et al. 2004. Nature 427:342

Parameter	30 kg/m^2	34 kg/m^2	38 kg/m^2	42 kg/m^2	46 kg/m^2
Gait score 0 (%)[1]	80.8 ± 3.7	74.2 ± 4.9	76.1 ± 4.3	68.0 ± 4.2	61.1 ± 4.5
Jostle rate (per minute)[2]	0.316 ± 0.039	0.431 ± 0.046	0.455 ± 0.049	0.566 ± 0.071	0.618 ± 0.111
Growth rate (grams per day)[3]	50.3 ± 0.8	49.9 ± 0.8	49.7 ± 0.9	48.8 ± 0.9	47.7 ± 0.9

[1]P=0.027; [2]P= 0.011; [3]P = 0.05

Dawkins et al. 2004. Nature 427:342

Parameter	Mean(%)	Range(%)	Density	Company
Total mortality	4.1 ± 0.2	1.4 - 14.7	NS	P<0.0001
Leg culls	0.6 ± 0.1	0 - 2.4	NS	P<0.0001
Other culls	1.5 ± 0.1	0.4 - 4.7	NS	P<0.0001
Dead birds	2.0 ± 0.1	0.6 - 4.8	NS	P<0.0001

Dawkins et al. 2004. Nature 427:342

- Authors concluded that company was a better predictor of animal welfare than stocking density
- Litter moisture and air ammonia were likely factors, differed significantly between companies
- 56% of variation in litter moisture could be attributed to heater position and number of drinkers per 1,000 birds
- 73.3% of variation in air ammonia could be attributed to season and ventilation type

Comparing standards: Benchmarking

- Although welfare is often perceived to be better on organic farms, a UK study by Huxley et al (2004, Vet Record 155:237) found that lameness appears similar with convention systems with median scores of ~24% of cows lame
- However, organic farms fared better for nutrition parameters with fewer cows having BCS <2

Using audit data to assess welfare

- Main et al (2003, Vet Record 153:227) compared 28 Freedom Foods certified dairy farms with 25 non-certified farms
- FF farms had better welfare for 12 criteria and poorer welfare for 8 criteria
- Lameness, housing and lying area discomfort criteria were at high levels in both farm types
- No significant difference between farm types in terms of need for intervention

Animal welfare and the scientific method

- The scientific method is important to understand the nature of welfare issues at the individual and population levels and possible solutions
  (what we could do)
  - Interdisciplinary approaches
  - Fundamental research in laboratory
  - Applied research in field conditions
- The ethical framework for what we ought to do about animal welfare will be decided by society, based on relationship to competing concerns such as cost, product quality, public safety, etc