Welfare Research at The Ohio State University

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Ohio USA

- 107,000 km^2 (Vic: 238,000 km^2)
- 12,000,000 people (Vic: 5,110,000)
- 112 people/km^2 (Vic: 22 people/km^2)
- Important agricultural sectors:
  - Dairy (11^{th} in milk production)
  - Pigs (10^{th} in total pigs, but only 2.6% of national herd)
  - Laying hens (2^{nd} in egg production)
  - Turkeys (11^{th} in number raised)
  - Corn and soybeans

The Ohio State University

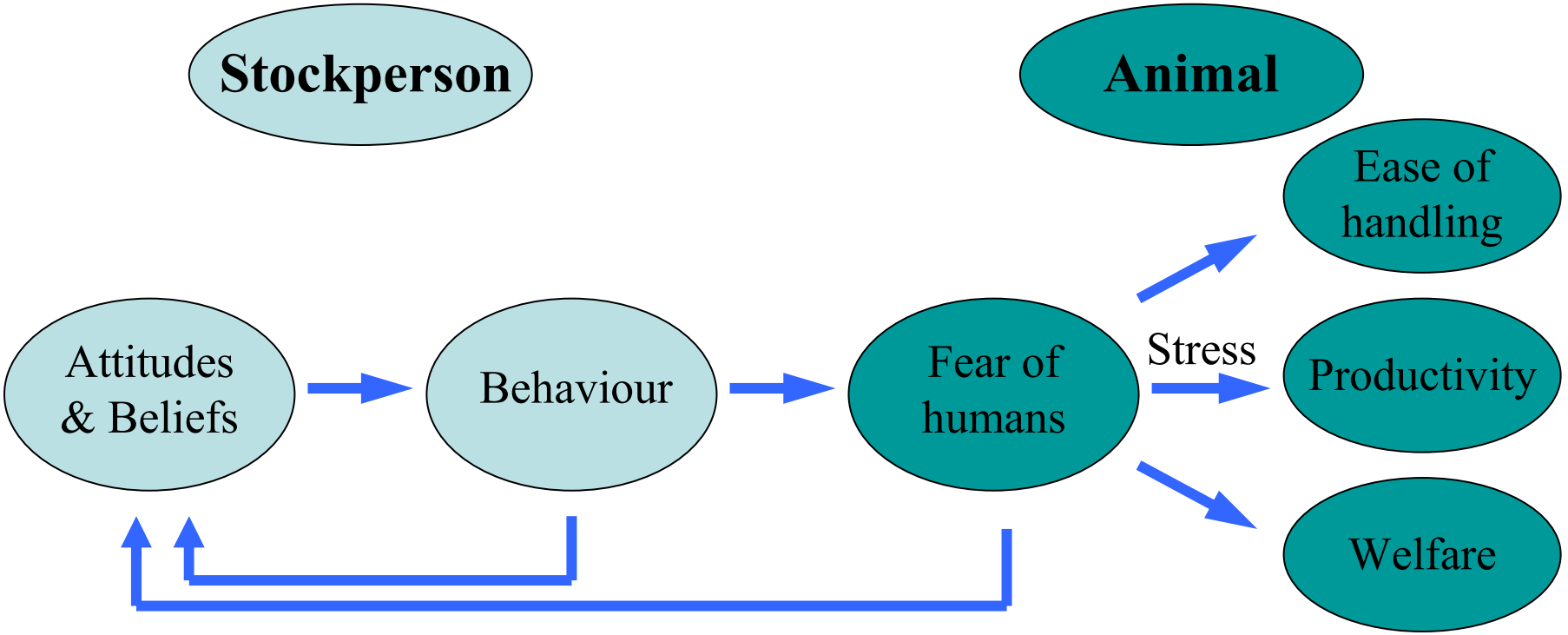
- Founded in 1870
- Almost 60,000 students

- Formal relationship between the AWSC and the Department of Animal Sciences

ProHand Pigs

Human-Animal Interactions

- Research has shown that human-animal interactions can have **profound effects** on the behaviour and stress physiology of animals



ProHand Pigs

- A training program that targets the key attitudes and behaviour of stockpeople that have been shown to have a direct effect on the pigs' fear of humans

Cooper Farms, NW Ohio

- Turkeys, Pigs, Laying hens
  - 15,000 sows / 350,000 market pigs
  - Hatch 15,000,000 turkeys
  - 35,000,000 dozen table eggs
  - Processing, Feed production
- Trained several key personnel to be trainers
- Most team members subsequently trained over a short timeframe
  - New team members trained as needed

Productivity changes

- Average annual changes across all units:
  - Farrowing rate: 89.9 to 92.2
  - Av. total pigs/litter: 12.0 to 12.5
  - Av. pigs born alive/litter: 11.0 to 11.5
  - % stillborn pigs: 6.6 to 6.0
  - % mummies: 1.8 to 1.7
  - Pigs weaned/litter: 9.9 to 10.1

Roll-out of ProHand

- Introduce at one farm
- This farm serves as a testimonial to other farms
- Introduce to other large producers, such as Smithfield (20% of the National herd)
- Eventually roll out nationally
  - Interest from the National Pork Board

Human-Animal Interactions in Poultry

Laying hen research

- Follow-on from PhD research by Lauren Edwards
- Lauren had birds that received:
  - Additional or Minimal contact during rearing
  - Positive or Negative handling during the 1st 20 wks of production
  - High proximity or Low proximity to treatment
  - Birds housed individually

Details of Ohio study

- Combination of fear of humans and social stress factors
  - Birds receive positive or negative interaction
  - Some birds housed individually, some in pairs

Methods

- Assess fear of humans at 30, 35 and 40 weeks of production
  - Feed conflict test
  - Stroll test
  - Approaching human test
- Collect egg production records
- Physiology
  - Blood sampling at 30 and 40 weeks

Alternative measures of stress

- Collecting blood samples to determine plasma corticosterone concentrations is itself a stressful procedure
- However, corticosterone and its metabolites can also be measured in eggs, faeces, etc.
- But, what is the relationship between plasma corticosterone concentrations and corticosterone concentrations in these alternative samples?
  - i.e., during which stage of egg formation does corticosterone enter the egg, is it in equilibrium or does it accumulate?

Methods

- Determination of relationship between plasma corticosterone and yolk/albumin corticosterone concentrations
  - Blood sample on one day
  - Eggs collected for 2 days before, on day of, and for 2 days after day of blood sampling
  - Analyse relationships between plasma, yolk and albumin corticosterone concentrations

Turkey research

- In response to request from Cooper Farms
- Details about farm
  - 12th largest producer in the USA
  - Hatch 15,000,000 poults/yr
  - Contract grow 5,000,000
  - 10,000,000 sold to other companies
  - Own processing plant and further processing

Experimental design

- 106 male poults
  - 53 Commercial strain
  - 53 Random-bred strain (similar to a turkey of the 1960s)
- Two rooms, 8 pens per room
- From hatching to 2 woa, brooded in two groups per strain, in each room
- At 2 and 4 woa, each group divided in two, such that at 4 woa birds were in final groups of 6-7 birds/pen

Treatments

- 2 treatments:
  - Minimal human contact
    - Routine husbandry
  - Additional human contact
    - Routine husbandry + 2 min of additional human contact, twice daily
- Treatment = Room
  - Due to ventilation issues

Assessing fear of humans

- Behavioural tests at 5 and 10 woa
  - Stroll test
  - Feed conflict test
- Growth performance at 5 and 10 woa
- Physiological response at 10 woa
  - Plasma corticosterone
    - Baseline and Acute response to handling

Feed conflict test results

- No significant difference between Handling treatment, Strain, or Interaction
  - Latency to approach feeder
  - Latency to feed
  - Number of birds close to feeder throughout test
  - Number of birds feeding throughout test
- Possibly due to large variation

Stroll test – Week 5

- No significant differences during movement phase of test
- Number of birds close during stationary phase of test
  - Handling treatment: P=0.044
    - More Additional contact birds close
  - No significant difference between Strains, or Interaction

Stroll test – Week 10

- Number of birds close during movement phase
  - Handling treatment: P=0.020
    - More Additional contact birds close
  - Strain treatment: P=0.074
    - More Commercial birds close
- Number of birds close during stationary phase
  - Handling treatment: P=0.083
    - More Additional contact birds close
    - No significant difference between Strains, or Interaction

Liveweight

- Significant difference between rooms in Wk 0 (P=0.003)
  - Strain: P=0.000 (Commercial birds heavier)
  - Interaction: NS
- Week 5 (Wk 0 weight as covariate)
  - Handling treatment: P=0.050
    - Minimal contact birds heavier
  - Strain: P=0.000 (Commercial birds heavier)
  - Strain x Handling Interaction: P=0.018

Liveweight – Week 10

- Handling treatment: P=0.031
  - Minimal contact birds heavier
- Strain: P=0.000
  - Commercial birds heavier
- Strain x Handling Interaction: P=0.059

Preliminary conclusions

- Stroll test results suggest that birds receiving additional human contact were less fearful of humans
- Conversely, liveweight results suggest that birds receiving minimal human contact grew faster
  - Additional contact birds more active?
  - Confounding between Handling treatment and Room
    - Repeat experiment with treatments reversed

On-farm study

- Conduct an on-farm study at Cooper Farms
- Assess birds at several ages
  - Observe human behaviour
  - Assess fear of humans
  - Collect productivity records
    - Growth performance
    - Morbidity and mortality

Dairy cow research

Mastitis

- Inflammation of the mammary gland in response to intramammary infection
- The most prevalent disease in dairy cows
  - More than 25% of cows in a well-managed herd may experience mastitis each lactation
  - Almost 30% of all cows culled are for udder health or mastitis problems, and 17% of all mortalities are attributed to mastitis

The cost of mastitis

- The most costly disease affecting the industry
  - Monetary losses fall into 7 major categories:
    - Decreased milk production, Discarded milk, Increased replacement costs due to early culling, Monies invested in therapeutic agents (antibiotics, etc.), Extra facilities and labour for treating the patient and cleaning the facilities, Veterinary fees, Loss of the cow and her genetics
  - The NMC estimates the monetary loss in discarded milk alone to be $1b annually, with an overall loss to animal agriculture of $2b (~ $180 per cow)

Pain and welfare

- Pain is one of the most important aspects determining the welfare of animals
- Animals are capable of experiencing or suffering pain when subject to injury, disease or other noxious events
    - But farm animals often receive no, or inadequate, pain control in such situations
- The welfare of many dairy cows may be at risk due to pain associated with mastitis

Current treatment

- Most commonly treated by use of broad spectrum antibiotics for 2-3 days
- Limitations of this therapeutic regime include:
  - The antibiotics approved for use in lactating cows are marginally effective
  - Provide a potential means for transfer of antibiotic resistance among both veterinary and human pathogens
  - Present a threat to antibiotic adulteration of dairy products if improperly handled
- Many veterinarians and producers have adopted the approach of not treating mastitis because of these limitations

To treat or not to treat?

- An ethical dilemma has evolved as to whether the welfare of the mastitic cow is compromised by not using antibiotics
- The use of analgesics may be an acceptable alternative if pain is reduced and the welfare of cows is enhanced by administering these drugs
    - Improvement in behaviour, particularly feeding

Previous research

- Lying time decreased for 13 h
- Ruminating decreased for 4-8 h
- Body temp. started to rise 4 h after induction, reaching peak values 6 h after induction and returned to normal 12 h after induction
- HR, SCC started to increase after 6 h

Details of study

- 2 x 2 factorial
  - Experimentally induced mastitis
    - Intramammary infusion of a non-replicating bacterial subunit that rapidly elicits symptoms of clinical mastitis, along with rapid elimination and recovery
  - Treatment with NSAID
    - Flunixin meglumine
- Behaviour observed for 1 wk prior to and for 1 wk after induction of mastitis
  - Cows housed in tie-stalls

Other measures

- Milk yield and SCC
- Feed intake
- Plasma cortisol concentration
- Milk serum amyloid A
- Temp and HR
- Hock-hock distance
- Nociceptive threshold

Lameness

- Also a very prevalent disease
  - Mean incidence of more than 20% in a lactation
- Perhaps the most important welfare problem for dairy cows (Rushen, 2001)
- Also economically costly
  - Reduced milk production
  - Discarded milk due to antibiotic use
  - Reproductive problems
  - Culling due to direct or reproduction effects

Causes of lameness

- Likely to be many
  - Higher production per cow
  - More indoor housing (Free-stalls)

Effect of housing

- Complex – depends on the details
  - Stall size and design
  - Bedding surface
  - Walking surfaces – CONCRETE
- Rubber mats in the alleys and at the feed bunk

Flooring at the feed bunk

- Cows given a choice to feed from a concrete or sawdust-filled platform:
  - Cows spent more time eating, standing without eating, and more total time on the sawdust surface (Tucker et al., 2006)
- Rubber mats in front of the feed bunk:
  - No difference in time spent eating (Fregonesi et al., 2004)
  - More time eating, more time standing without eating (Olsson et al., 2005; Tucker et al., 2006)

Rubber flooring

- Cows clearly prefer to stand on softer surfaces
- Providing a softer surface may increase the time cows spend in the feed bunk area, including time spent eating

Potential benefits

- Reduced lameness
- Reduced slipping and injuries
- Improved detection of heat