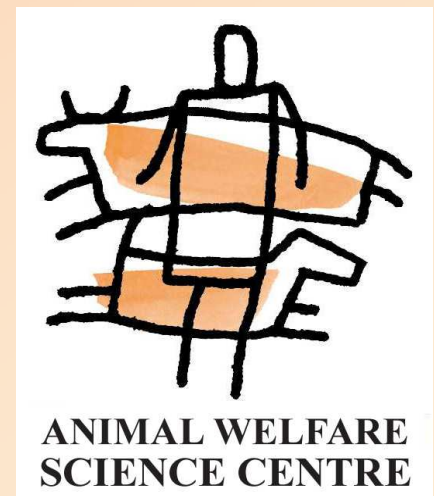


“Impact of human-animal interactions on health & productivity of farm animals”

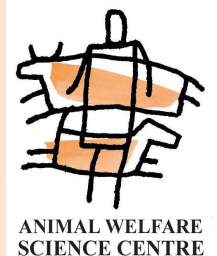
Paul Hemsworth

Animal Welfare Science Centre, University of Melbourne, Australia.

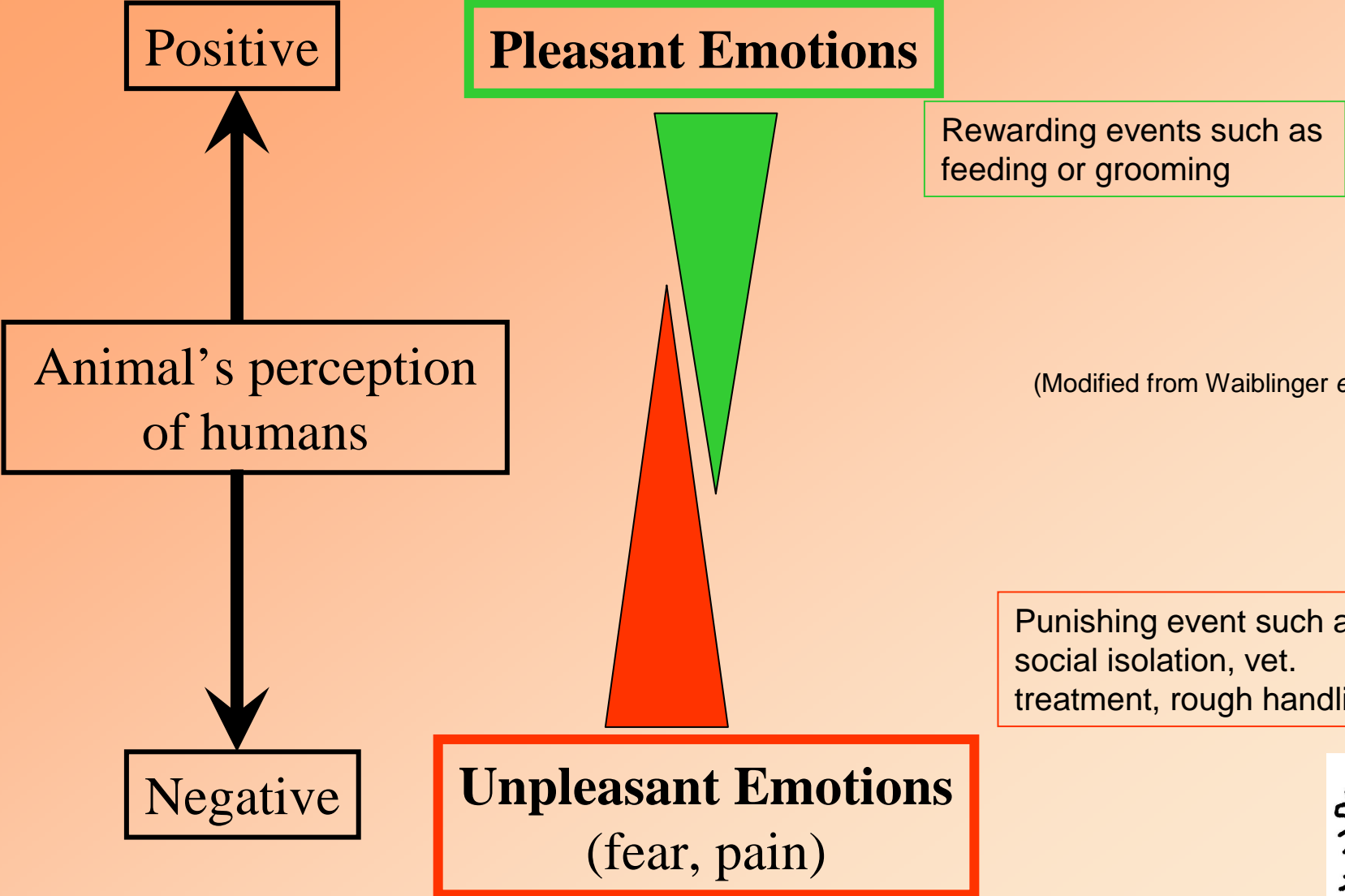


The human-animal relationship

Farm animals can be frequently and intensively “handled” by humans and research has shown that these human-animal interactions can have **profound effects** on the behaviour and stress physiology of these animals.

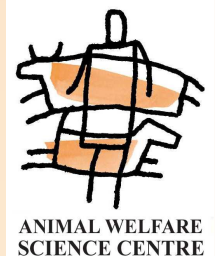


Emotional dimensions affecting the animal's response to humans

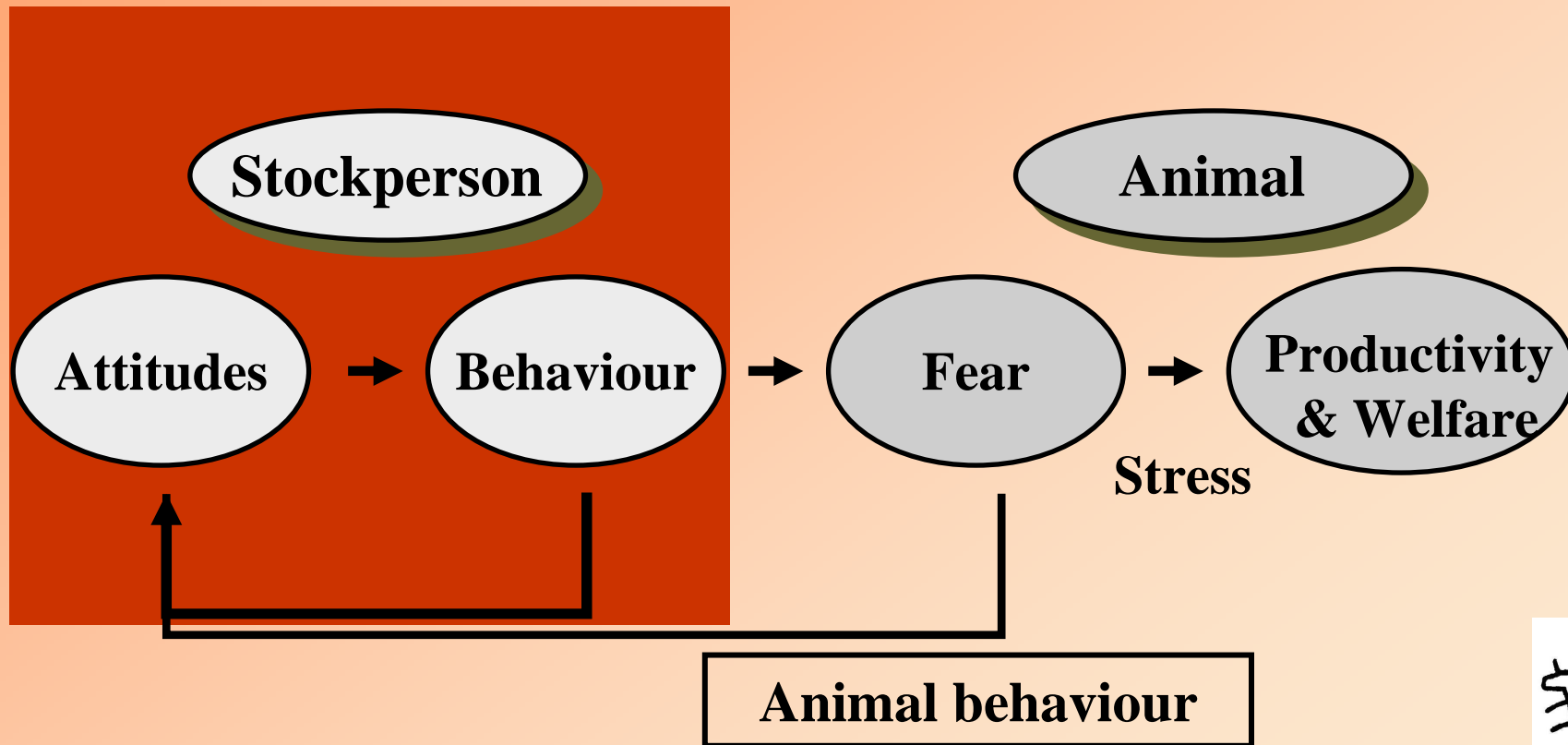


Our research

Our research has focused on the **fear response** of farm animals to humans, one dimension of the animal's 'perception' of humans.

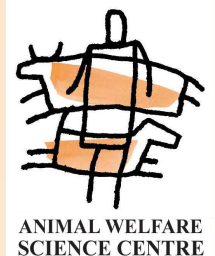


A model of human-animal interactions in the livestock industries



Fear

- Is a powerful emotional state
- Is a normal, adaptive response, developed to protect the individual from injury
- It normally gives rise to defensive behaviour or escape and activation of the autonomic nervous system and the neuroendocrine system.



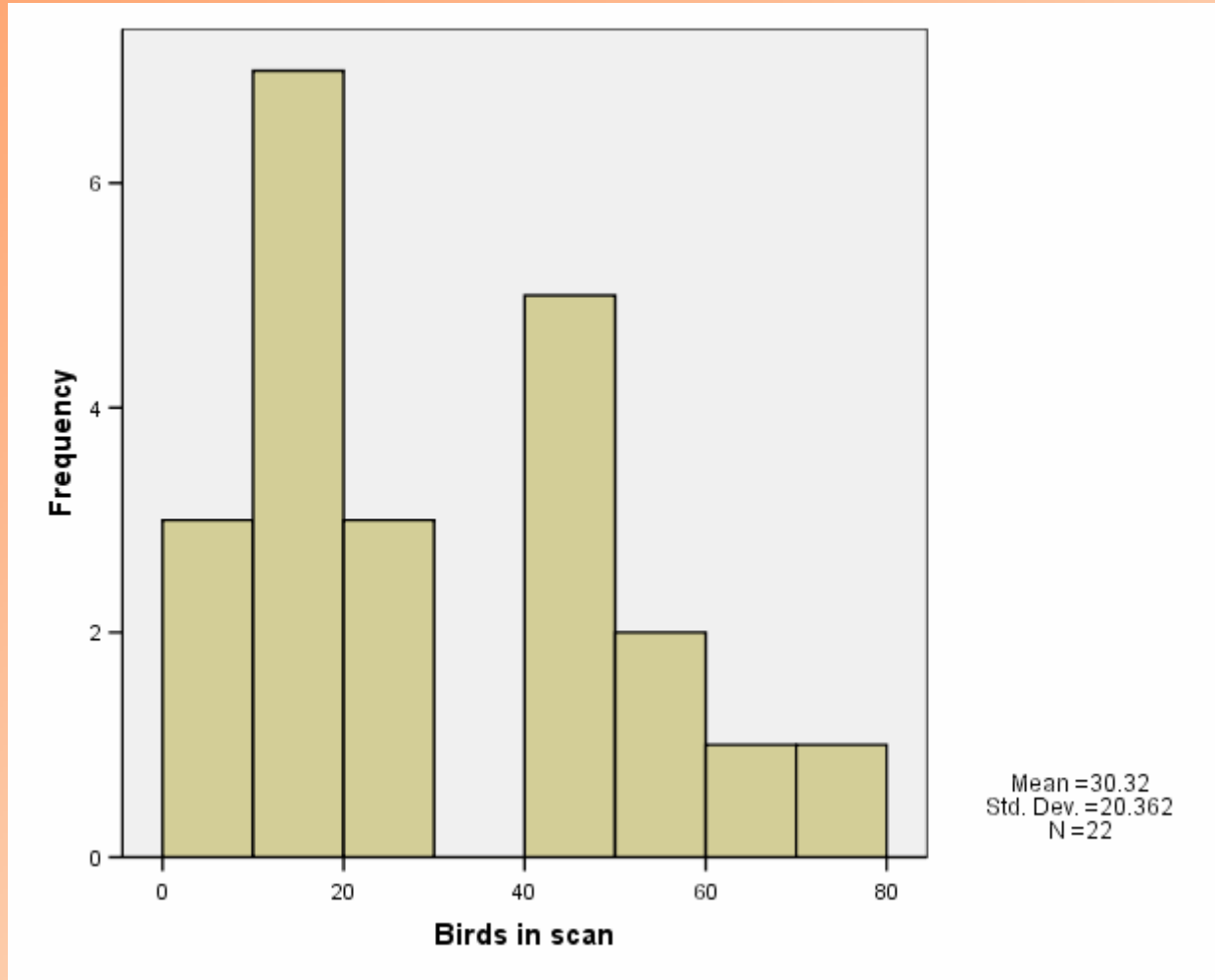
Fear

- Fear of humans can be assessed on the basis of the behavioural response of the animal to an experimenter in a standard test.
- For example,
 - avoidance response to an approaching experimenter, or
 - approach behaviour to a stationary experimenter.

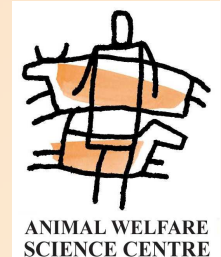


Distribution in fear responses in broiler chickens

Variable - number of birds within 0.5m of experimenter per observational scan

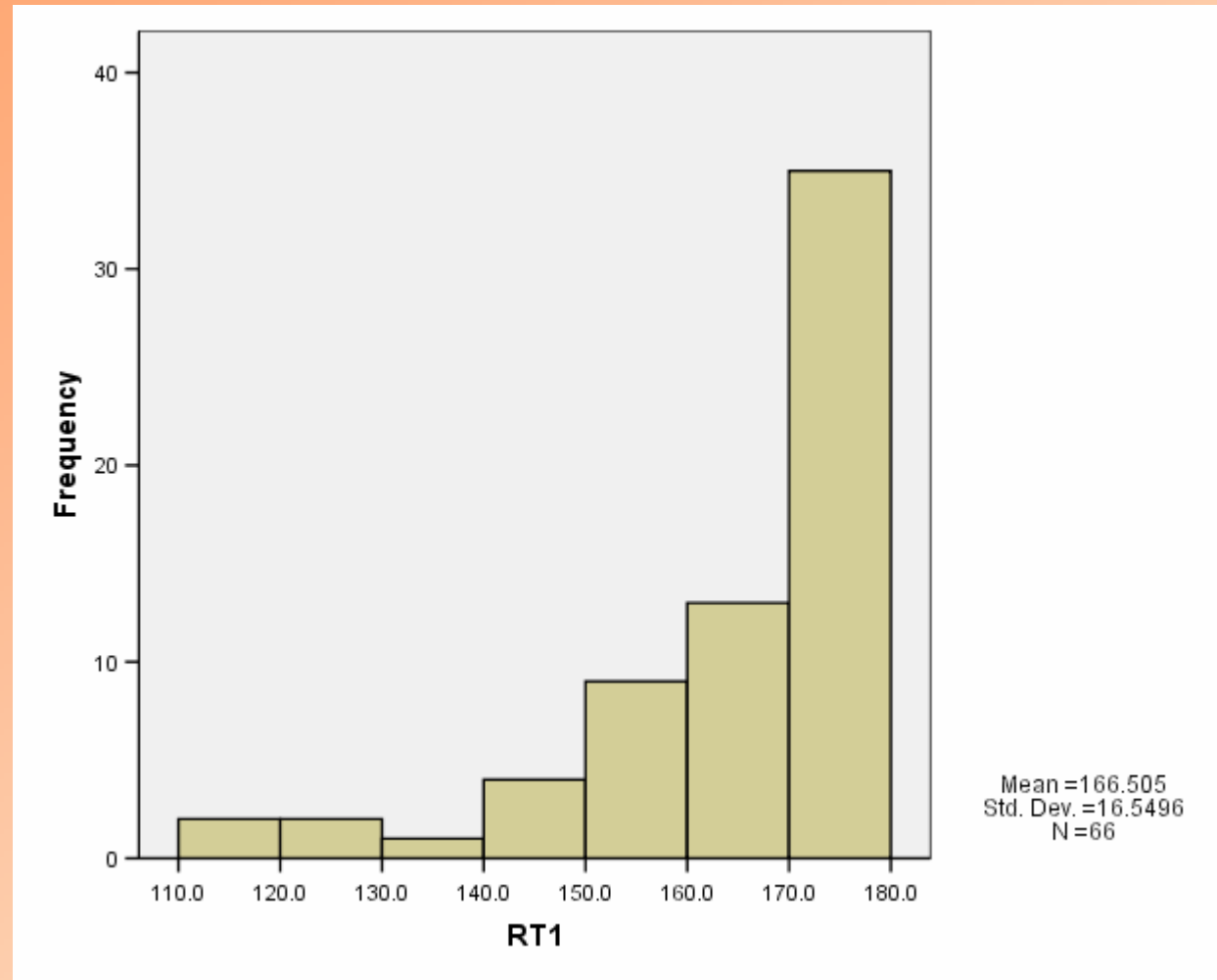


(From Hemsworth & Coleman, 1998)



Distribution in fear responses in dairy cows

Variable - time to closely approach human (s)

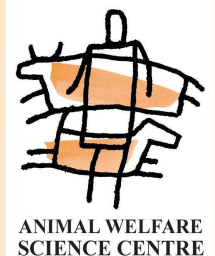


(From Hemsworth *et al.*, 2000).

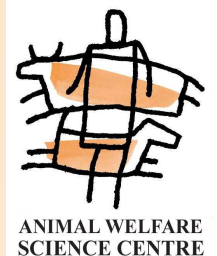
Evidence of this model of the human-animal relationship in agriculture

This presentation will consider the following:

1. Animal fear and productivity relationships
2. Stockperson behaviour and animal fear relationships
3. Stockperson attitude and behaviour relationships
4. Opportunities to improve human-animal relationships.



1. Animal fear – productivity relationships



Animal fear – productivity relationships

- Consistent negative relationships, based on farm averages, between **fear of human and productivity** found in studies in the dairy, pig and poultry industries.

Correlations between fear of humans and animal productivity

Fear & Productivity

Pigs

| | |
|--------------------------------|--------|
| Hemsworth <i>et al</i> (1981b) | -0.51* |
| Hemsworth <i>et al</i> (1989) | -0.55* |
| Hemsworth <i>et al</i> (1994c) | -0.01 |

Dairy cows

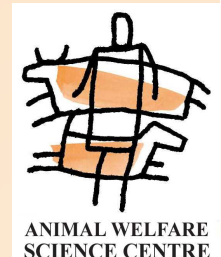
| | |
|-------------------------------|--------|
| Breuer <i>et al</i> (2000) | -0.46* |
| Hemsworth <i>et al</i> (2000) | -0.27 |

Meat chickens

| | |
|--------------------------------|---------|
| Hemsworth <i>et al</i> (1994a) | -0.57** |
| Cransberg (1996) | -0.10 |
| Hemsworth <i>et al</i> (1996) | -0.39 |

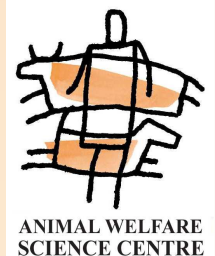
Laying hens

| | |
|-----------------------------|---------|
| Barnett <i>et al</i> (1992) | -0.58** |
|-----------------------------|---------|



Handling and productivity

- Handling studies, particularly on pigs, have consistently shown that handling treatments that elicit high levels of fear adversely affect animal productivity.
- A number of these handling studies implicate stress in the deleterious effects of aversive handling on animal productivity.



Handling and productivity of pigs

| Experiment | -ve handling | P value |
|---------------------------------------|--------------|---------|
| <i>Hemsworth et al. (1981)</i> | | |
| Growth rate | ⇓ | 0.05 |
| <i>Gonyou et al. (1986)</i> | | |
| Growth rate | ⇓ | 0.05 |
| <i>Hemsworth et al. (1986)</i> | | |
| Pregnancy rate | ⇓ | 0.05 |
| <i>Hemsworth et al. (1987)</i> | | |
| Growth rate | ⇓ | 0.05 |
| <i>Hemsworth & Barnett (1991)</i> | | |
| Growth rate | ⇓ | NS |
| <i>Hemsworth et al. (1996)</i> | | |
| Growth rate | ⇓ | 0.05 |

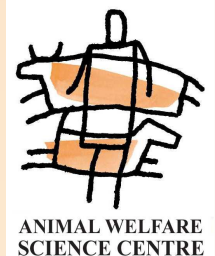
Handling and the productivity & stress physiology of dairy cows

| Variables | Handling | |
|---------------------|-------------------|-------------------|
| | -ve | +ve |
| Milk yield (kg/day) | 16.7 ^a | 18.0 ^b |
| Flight distance (m) | 4.74 ^b | 1.96 ^a |
| Lameness (%) | 48% ^b | 6% ^a |

From Breuer (2000)

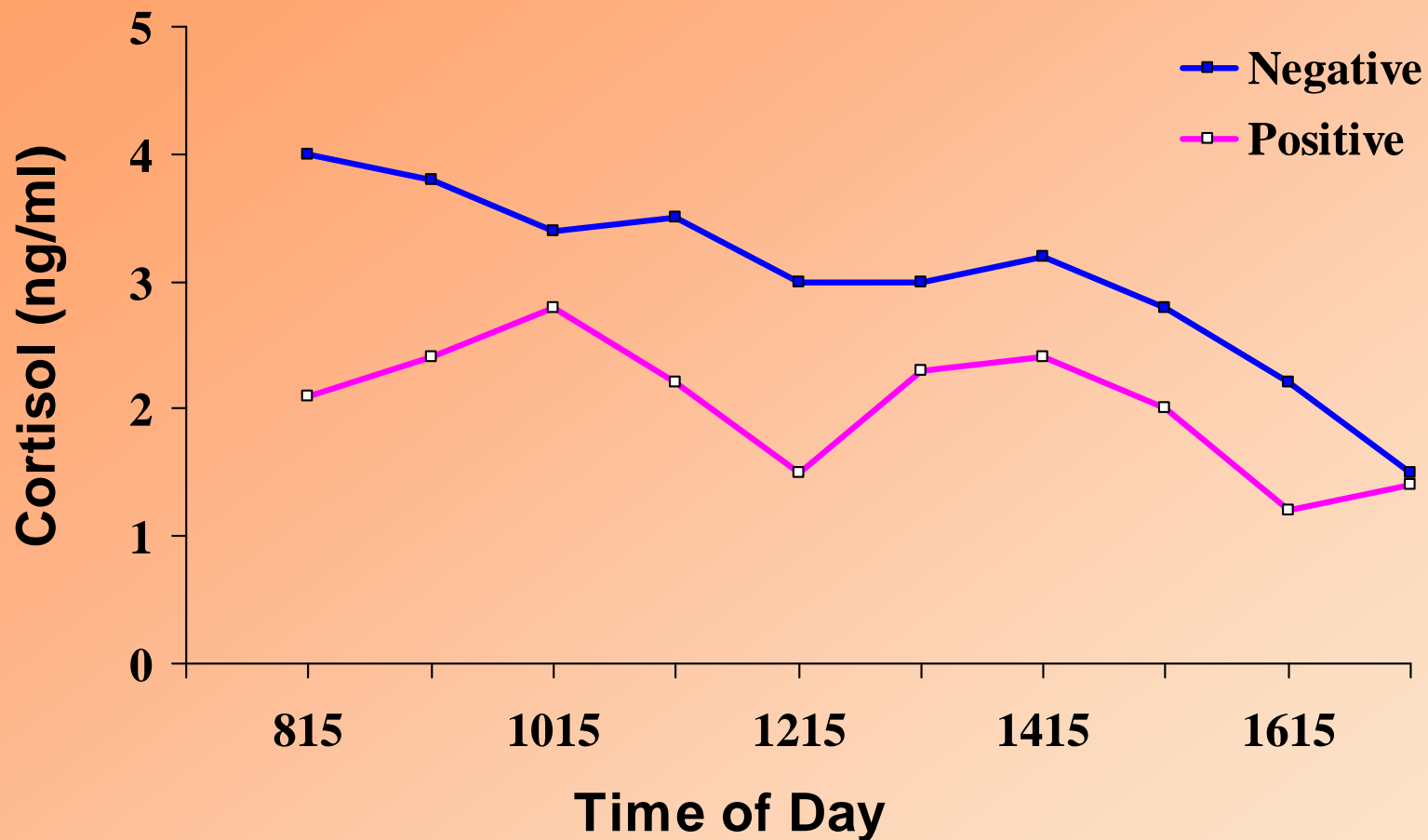
Animal fear & stress

- High levels of fear of humans can induce chronic stress
- This is likely to be the mechanism whereby fear reduces animal productivity.

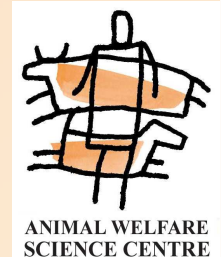


Handling and stress physiology of pigs

| Experiment | -ve handling | P value |
|---------------------------------------|---------------------|----------------|
| <i>Hemsworth et al. (1981)</i> | | |
| Basal cortisol | ↑ | 0.05 |
| <i>Gonyou et al. (1986)</i> | | |
| Adrenal glands | ↑ | 0.05 |
| <i>Hemsworth et al. (1986)</i> | | |
| Basal cortisol | ↑ | 0.05 |
| <i>Hemsworth et al. (1987)</i> | | |
| Basal cortisol | ↑ | 0.01 |
| <i>Hemsworth & Barnett (1991)</i> | | |
| Basal cortisol | ↑ | NS |
| <i>Hemsworth et al. (1996)</i> | | |
| Adrenal glands | ↑ | 0.01 |



Basal plasma cortisol (free) concentrations of gilts handled positively or negatively (Hemsworth *et al.*, 1981)



Handling, growth & stress physiology of growing pigs

| Variables | Handling Treatment | | | |
|------------------------------------|--------------------|------------------|-------------------|------------------|
| | +ve | Control | Inconsistent | -ve |
| Time to interact with human (s) | 10 ^a | 92 ^b | 175 ^c | 160 ^c |
| Growth rate (g/day) | 455 ^b | 458 ^b | 420 ^{ab} | 404 ^b |
| Basal cortisol (ng/ml) | 1.6 ^x | 1.7 ^x | 2.6 ^y | 2.5 ^y |

From Hemsworth et al. (1987)

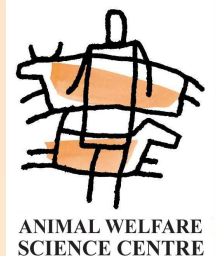
Handling, productivity, fear & stress physiology of laying hens

| Variables | Handling treatments | |
|--|---------------------|-------------------|
| | Minimal | Additional |
| Times in front of cage (mean/bird) | 1.22 ^y | 2.12 ^x |
| Hen-day egg production (%) | 83.1 ^b | 89.4 ^a |
| Corticosterone concentration (nmol/l) | 11.7 ^b | 7.9 ^a |

From Barnett et al. (1994)

Animal fear, stress & health

- While there has been little research conducted on animal health, a limited number of studies indicate the potential impact of human-animal relationships on animal health.
- Furthermore, stress elicited by fear has implications for animal health because of the close relationship between stress and illness (Moberg, 2000).



Handling, growth & health of chickens

| Social environment | FCE | Antibody response* | |
|--------------------|--------------------|--------------------|------------------|
| | | HA line | LA line |
| Socialized | 0.320 ^b | 8.4 ^c | 4.9 ^a |
| Ignored | 0.261 ^a | 7.7 ^b | 5.0 ^a |
| Hassled | 0.278 ^a | 7.0 ^a | 5.5 ^a |

From Gross and Siegel (1981)

FCE – weight gain/feed consumed

air sac lesions

* antibody response to sheep RBC

Handling, growth & health of chickens

| Socialized at 1-8 wks | FCE | Response to <i>E coli</i> Lesions [#] | Deaths | Antibody titres* |
|--------------------------|--------------------|---|-----------------|---------------------|
| No | 0.240 ^a | 60 ^b | 31 ^b | 5.4 ^a |
| Yes | 0.298 ^b | 44 ^a | 6 ^a | 7.0 ^b |

From Gross and Siegel (1981)

FCE – weight gain/feed consumed

[#]air sac lesions in response to *E coli* challenge

* antibody response to canine RBC

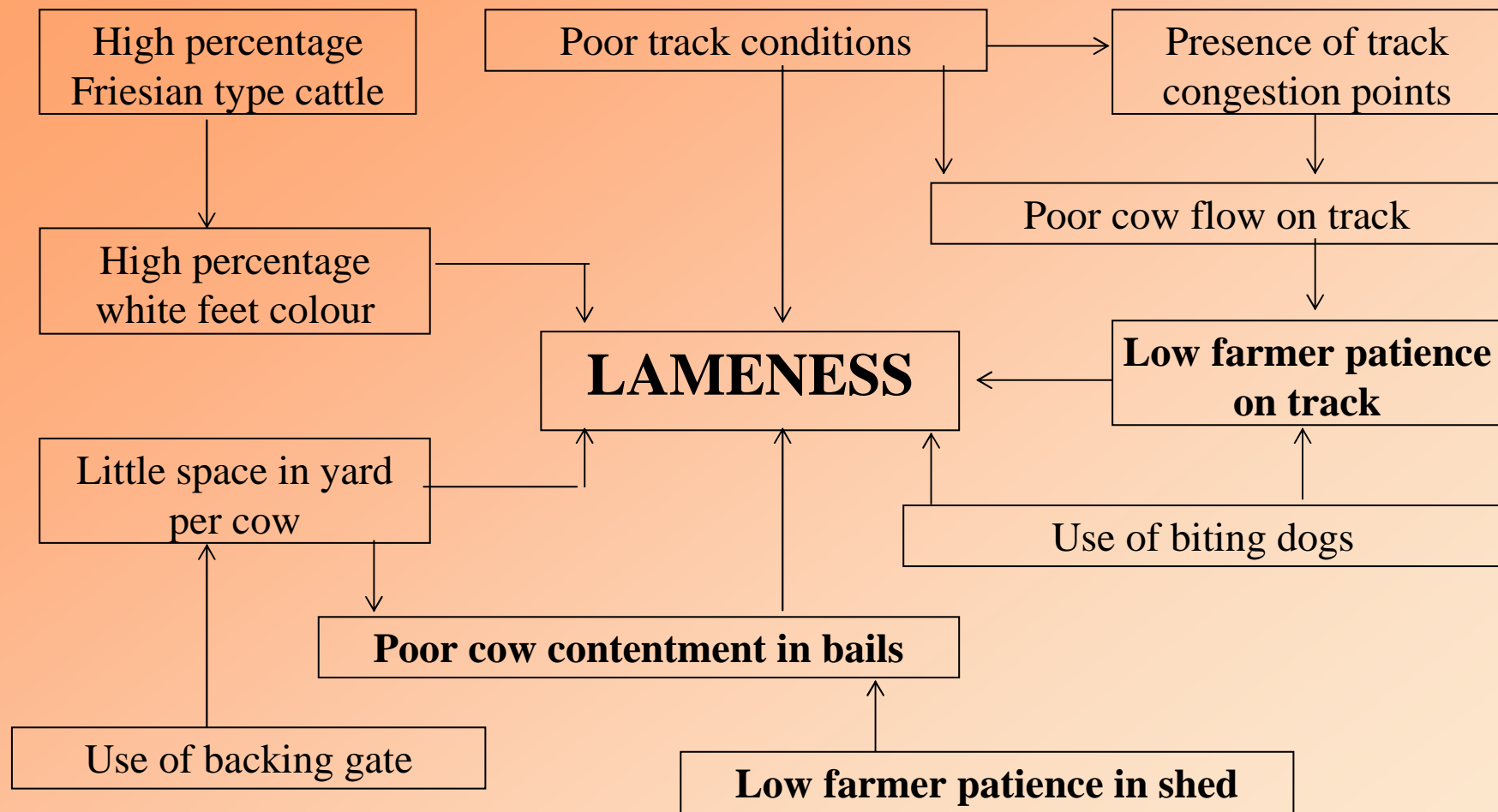
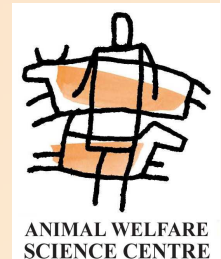


Fig. Management factors and lameness (Chesterton *et al.*, 1989).



Handling and the productivity & stress physiology of dairy cows

| Variables | Handling | |
|---------------------|-------------------|-------------------|
| | -ve | +ve |
| Flight distance (m) | 4.74 ^b | 1.96 ^a |
| Milk yield (kg/day) | 16.7 ^a | 18.0 ^b |
| Lameness (%) | 48% ^b | 6% ^a |

From Breuer (2000)

Handling, productivity & meat quality of veal calves

| Variables | Handling | | P value |
|---|--------------------|--------------------|---------|
| | Control | +ve | |
| Growth rate (kg/day) | 1.21 | 1.19 | 0.50 |
| Calves with ulcers (%) | 36.4 ^b | 0.0 ^a | 0.05 |
| Glycogenic potential ($\mu\text{mol/g}$) | 154.1 ^a | 172.6 ^c | 0.03 |

From Lensink *et al.* (2000)

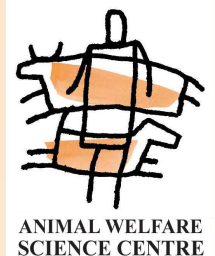
Handling, behaviour & stress physiology of calves

| Variables | Stockperson Behaviour | | P value |
|----------------------|-----------------------|--------------------|---------|
| | +ve | -ve | |
| Incidents at: | | | |
| - unloading | 0.60 | 0.67 | 0.60 |
| - lairage | 0.79 ^a | 1.15 ^b | 0.007 |
| Heart rate (bpm) at: | | | |
| - unloading | 185.6 ^a | 193.0 ^b | 0.03 |
| - lairage (+ 5 min) | 147.8 ^a | 149.2 ^b | 0.63 |

From Lensink *et al.* (2001a)

Animal fear, stress & health

- In a study of the relationships between stockperson characteristics and the behaviour, health and productivity of veal calves, Lensink *et al.* (2001b) found that the behaviour of the stockperson was an important predictor of calf mortality.

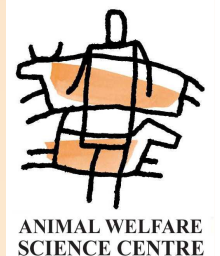


Fear, activation of the HPA axis and animal fitness:

The chronic activation of the HPA axis comes at a physiological cost such as:

- decreased metabolic efficiency (catabolic effects of ACTH and corticosteroids – eg gluconeogenesis),
- reduced reproductive performance,
- impaired immunity and
- morbidity and mortality.

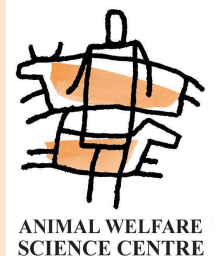
2. Stockperson behaviour- animal fear relationships



Studying stockperson behaviour

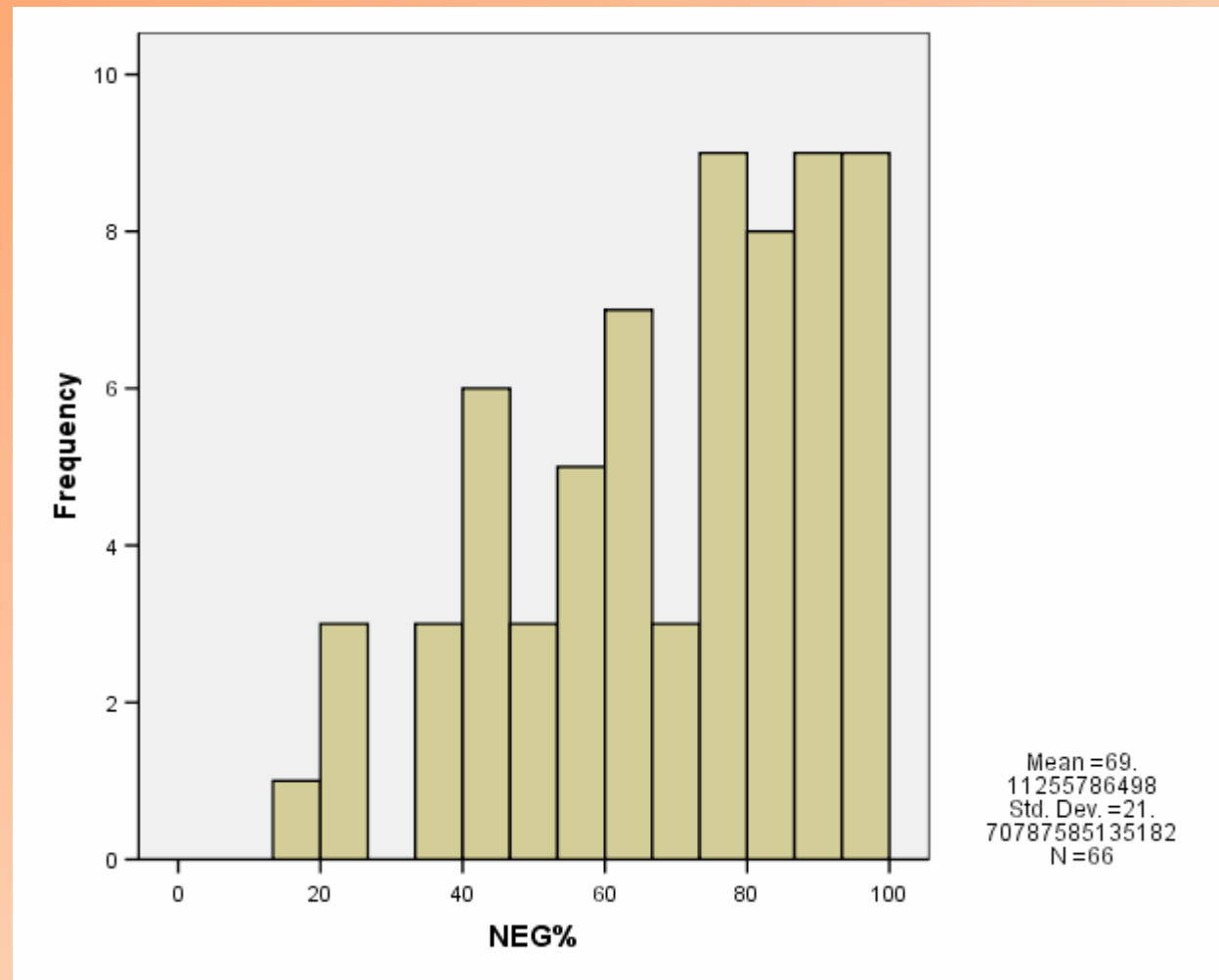
Measure frequency of behaviour

- **-ve behaviour** - slaps, hits, shouting, fast speed of movement, unexpected movement, etc.
- **+ve behaviour** - pats, talking, hand resting on back of animal, slow and deliberate movement, etc.



Distribution in stockperson behaviour

Variable is negative behaviour used in handling cows



(From Hemsworth *et al.*, 2000).

Correlations between stockperson behaviour & fear of humans

-ve Behaviour & Fear

Pigs

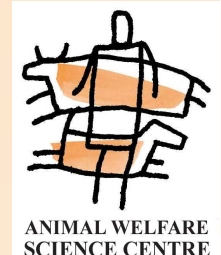
| | |
|------------------------|-------|
| Hemsworth et al (1989) | 0.45* |
| Hemsworth et al (1994) | 0.01 |
| Coleman et al (2000) | 0.40* |

Dairy cows

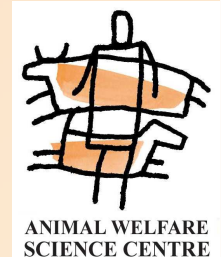
| | |
|-------------------------|--------|
| Breuer et al (2000) | 0.31 |
| Hemsworth et al (2000) | 0.32** |
| Waiblinger et al (2002) | 0.40** |

Meat chickens

| | |
|------------------------|-------|
| Cransberg (1996) | 0.43* |
| Hemsworth et al (1996) | 0.32 |



3. Stockperson attitude – behaviour relationships



Demographic variables
Personality traits
Attitudes towards targets



Beliefs that behaviour leads to outcomes
Evaluation of outcomes



Attitude towards the behaviour



Intention



Behaviour

Studying stockperson attitudes

Measure attitudes

- Attitude questionnaires were used to obtain information on the **behavioural beliefs** of stockpeople about interacting with their farm animals.

Correlations between stockperson attitudes & behaviour

+ve Beliefs about Effort & -ve Behaviour

Pig industry

| | |
|-------------------------|--------|
| Hemsworth et al (1989) | -0.47* |
| Hemsworth et al (1994c) | -0.12 |
| Coleman et al (1996) | -0.10 |

Dairy industry

| | |
|---------------------------|---------|
| Breuer et al (2000) | -0.50** |
| Hemsworth et al (2000) | -0.36* |
| Waiblinger et al. (2002)# | -0.50** |

Correlations between stockperson attitudes & behaviour

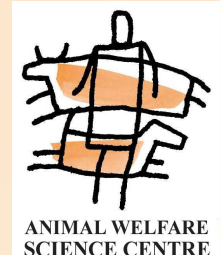
+ve Beliefs about Petting & -ve Behaviour

Pig industry

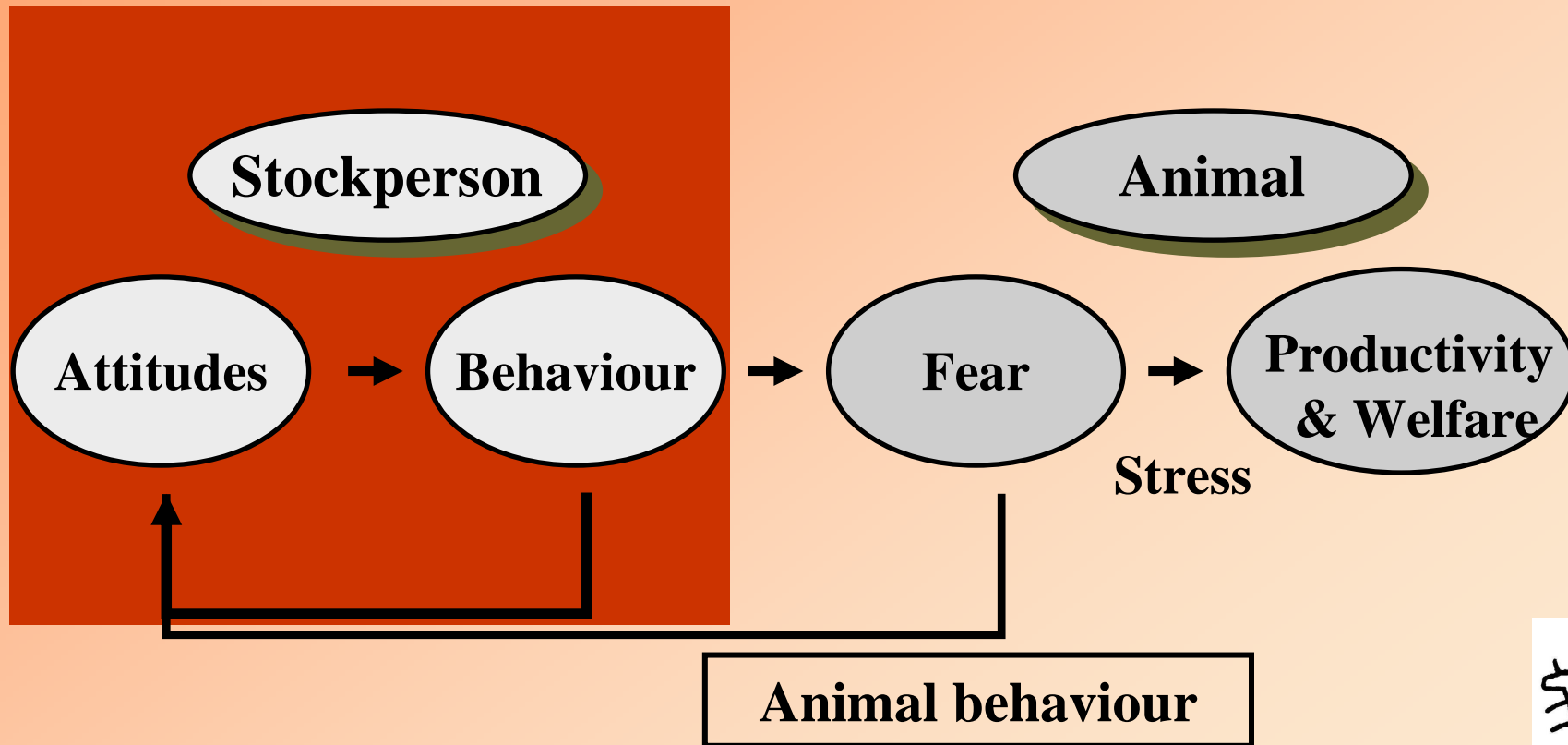
| | |
|-------------------------|---------|
| Hemsworth et al (1989) | -0.61** |
| Hemsworth et al (1994c) | -0.55** |
| Coleman et al (1996) | -0.20 |

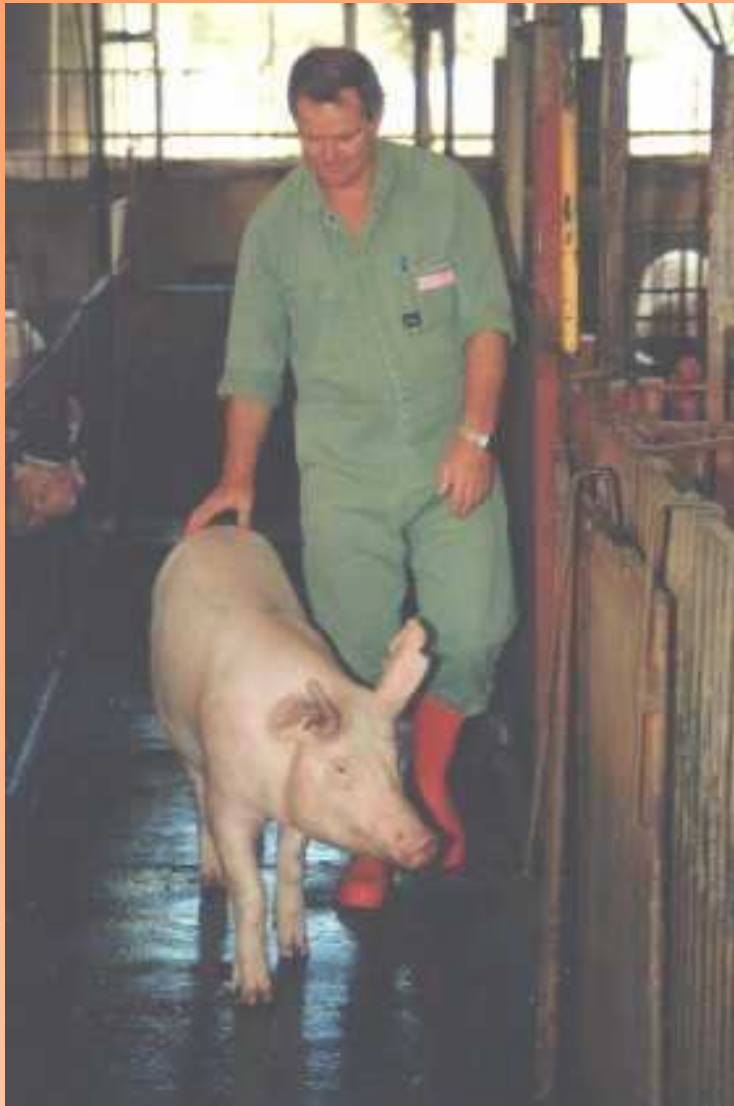
Dairy industry

| | |
|--------------------------|---------|
| Breuer et al (2000) | -0.50** |
| Hemsworth et al (2000) | -0.47** |
| Waiblinger et al. (2002) | -0.35 |



A model of human-animal interactions in the livestock industries

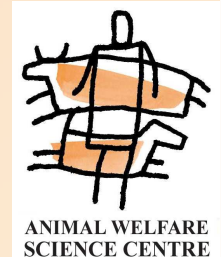




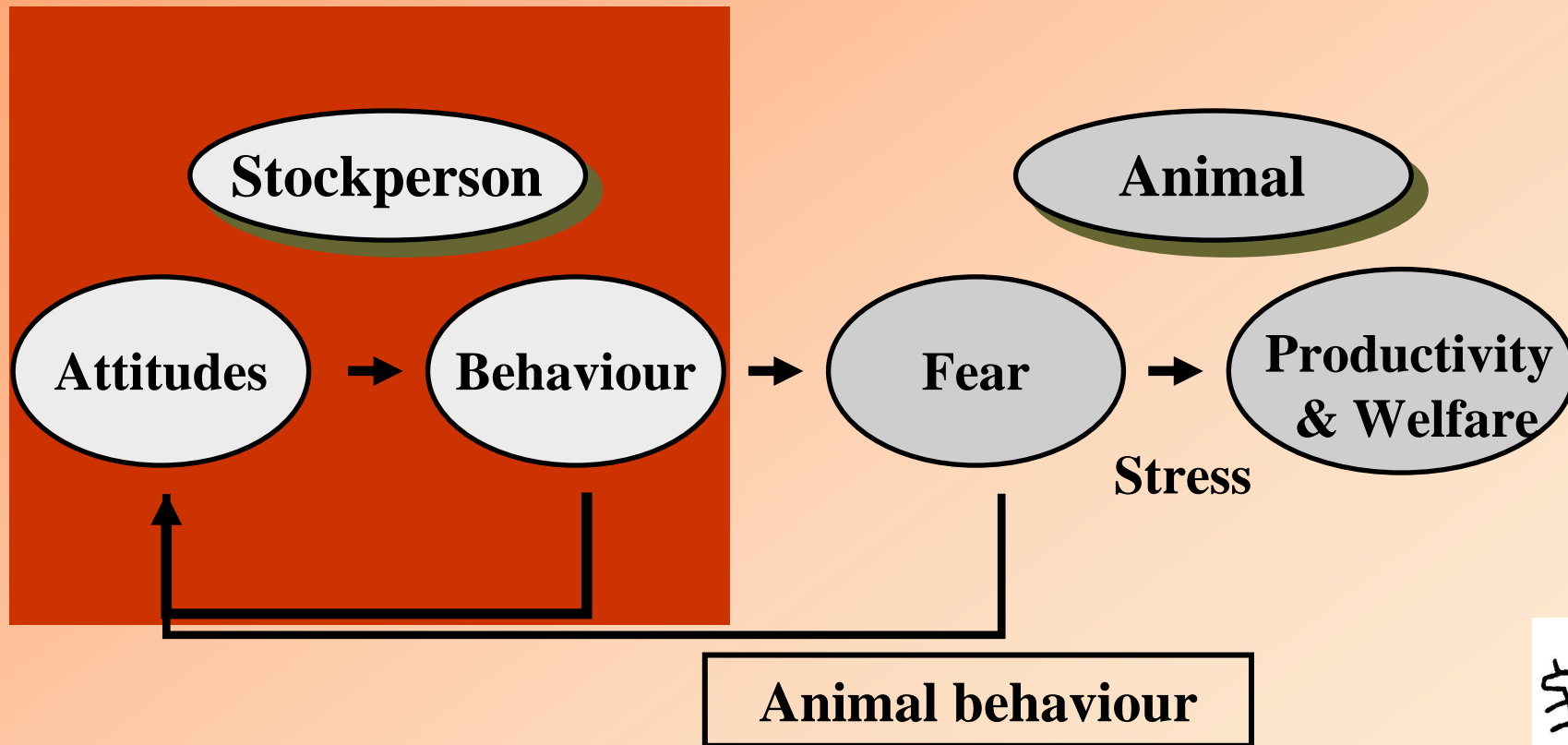
Conclusion

- **Understanding stockperson behaviour and the key attitudes** underpinning these, appears to be the key to manipulating these human-animal interactions to improve animal welfare, health and productivity.
- Some of these attitudes and behaviours in commercial situations may not be intuitively obvious.

4. Opportunities to improve human-animal relationships



A model of human-animal interactions in the livestock industries



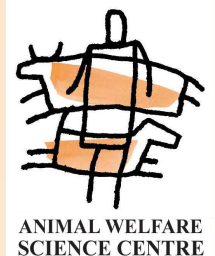
Opportunities to improve human-animal interactions

The sequential relationships between stockperson attitude and behaviour and animal fear, welfare and productivity demonstrate the opportunities to improve animal welfare and productivity through appropriate:

- **training stockpeople**
- **selection of stockpeople.**

Cognitive-behavioural training

- To change the behaviour of stockpeople towards farm animals ultimately requires:
 - targeting the **beliefs** that underlie the behaviour,
 - targeting the **behaviour** in question, and
- then maintaining these changed beliefs and behaviour.



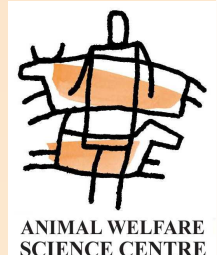
Intervention studies – establishing causality and validating training in the livestock industries

Two treatments imposed:

- **Intervention** - cognitive-behavioural intervention procedure, targeting key stockperson attitudes and behaviour
- **Control** - no intervention was attempted.

Measurements

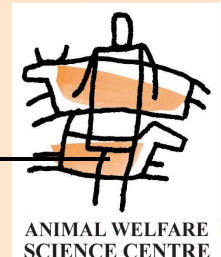
- **Stockperson attitudes** - behavioural beliefs about handling animals.
- **Stockperson behaviours** - number and percentage of negative tactile behaviours.
- **Fear of humans** - behavioural response to humans.
- **Animal productivity.**



Analysis of Covariance

| Variables | Treatments | | LSD (P=0.05) |
|-------------------------------|-------------------|-------------------|-----------------|
| | Control | Interv. | |
| Stockperson attitude | | | |
| "Petting" subscale | 19.6 ^b | 23.6 ^a | 3.37 |
| "Effort" subscale | 38.2 ^b | 42.1 ^a | 4.07 |
| Stockperson behaviour | | | |
| -ve behaviour (%) | 77.1 ^y | 47.3 ^x | 13.97 |
| Forceful -ve behaviour (%) | 12.2 ^y | 2.4 ^x | 7.47 |

From Hemsworth et al. (2002)



Analysis of Covariance

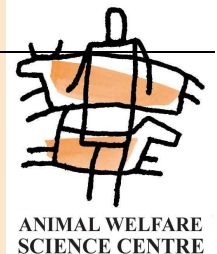
| Variables | Treatments | | LSD (P=0.05) |
|----------------------|-------------------|------------------|-------------------------|
| | Control | Interv. | |
| Cow behaviour | | | |
| Flight distance (m) | 4.5 ^b | 4.2 ^a | 0.33 |

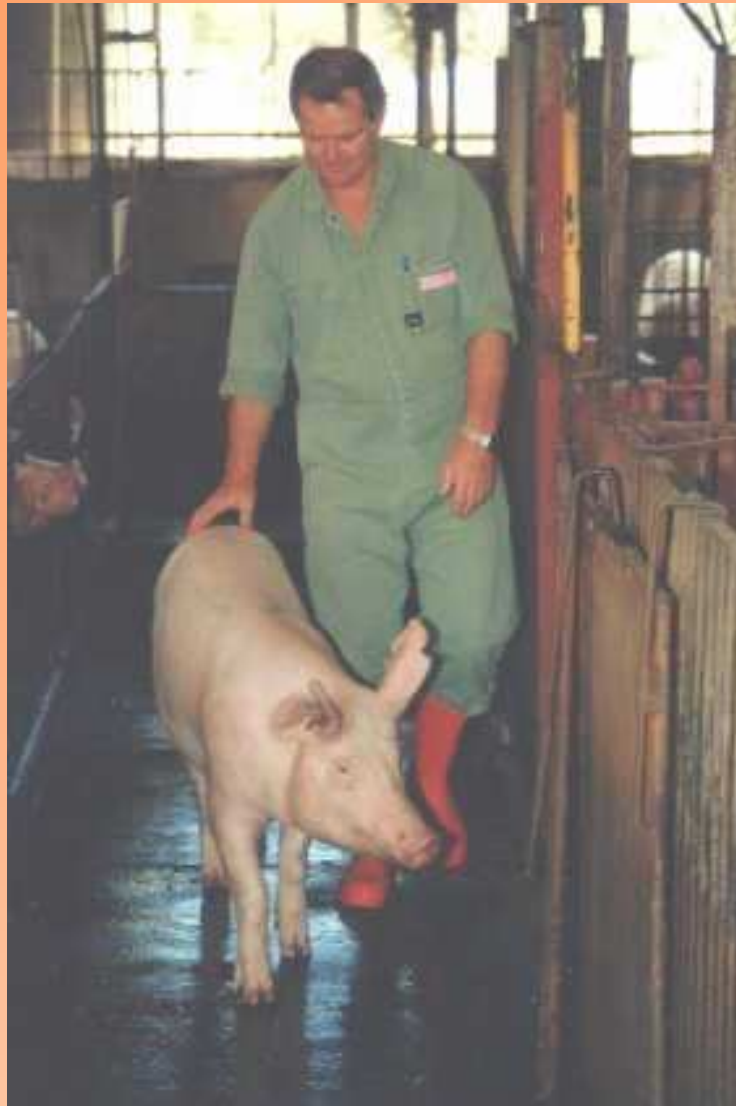
From Hemsworth et al. (2002)

Analysis of Covariance

| Variable | Means | | P value |
|------------------------|---------|---------|---------|
| | Control | Interv. | |
| Milk yield (l/cow/mo) | 551 | 580 | 0.02 |
| Protein (kg/cow/mo) | 17.7 | 18.5 | 0.03 |
| Fat (kg/cow/mo) | 22.8 | 23.8 | 0.04 |
| Milk cell count (,000) | 241 | 224 | 0.38 |

Hemsworth et al. (2002)





Conclusion

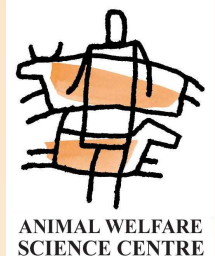
- **Understanding stockperson behaviour and the key attitudes** underpinning these, may provide opportunities to improve human-animal interactions.
- Indeed, research has shown that targeting these key attitudes and behaviour may improve animal welfare, health and productivity in those situations in which animal fear imposes severe limits.

Training programs available

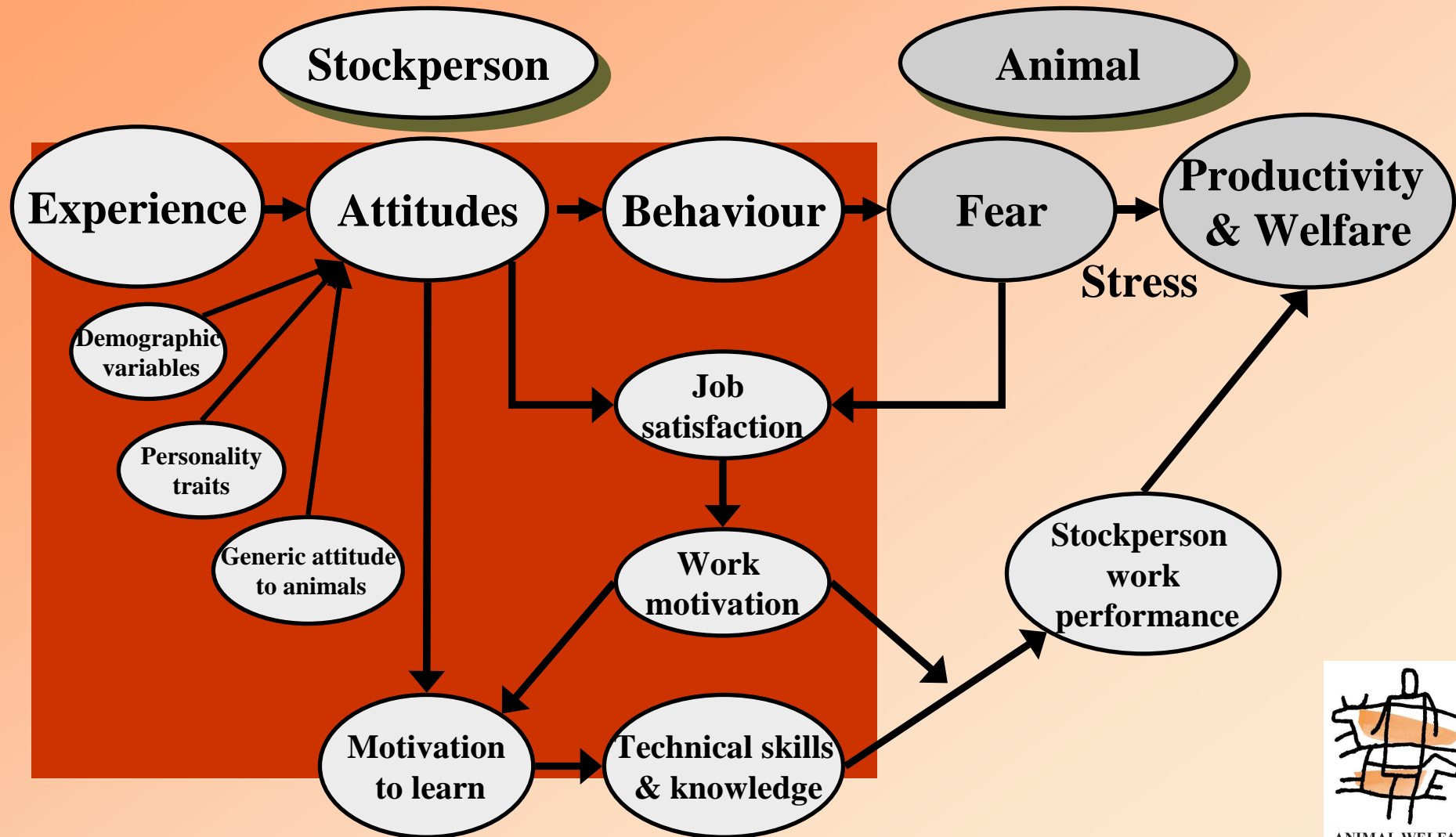
- Pig stockpeople
- Dairy stockpeople
- Pig stockpeople at abattoirs

- Transport drivers
- Sheep and cattle stockpeople at abattoirs

- EU 6th Framework Sub-project 3 “Minimising Handling Stress”: Prototype training packages for cattle, pigs & laying hens.



A model of human-animal interactions in the livestock industries



Thank you!

