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The Campbell Centre for the **Study of Animal Welfare**

‘Urges’, ‘Needs’, ‘Preferences’, ‘Priorities’ Coming to Terms with the Welfare of Hens

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Goals

- Different concepts of animal welfare and the criteria and methodologies used to assess welfare
- Review history of terms and concepts used in relation to behavioural deprivation
- To propose a comprehensive set of criteria for evaluating the welfare implications of restricting specific behaviours
- To review what we know (and don't know) about those evaluation criteria for nesting and dust bathing

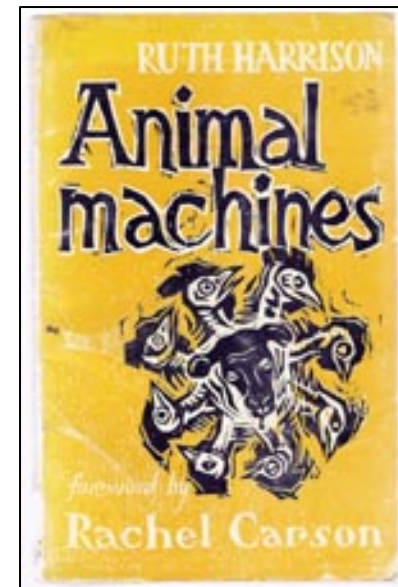


Why Animal Welfare?

- *Ruth Harrison's book published in 1964*

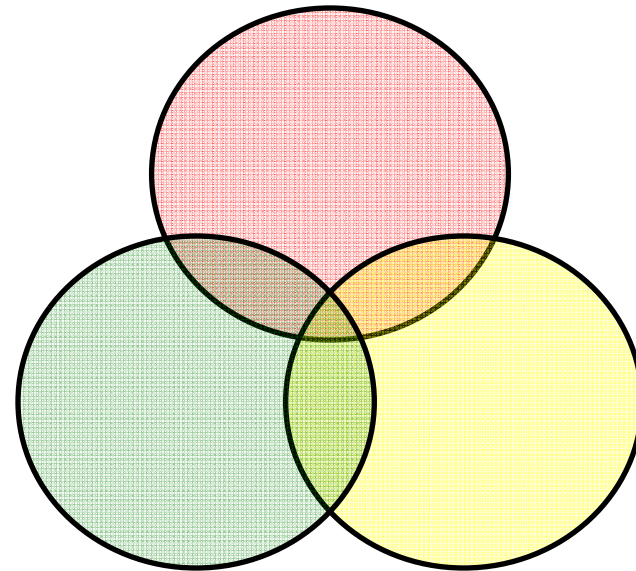
Resulted in the first formal inquiry on the welfare of farm animals

- Brambell report (UK, 1965)
- 'Birth' of animal welfare science



What Is Animal Welfare?

- *3 different approaches to defining the concept of animal welfare*
 - *Biological functioning*
 - *Affective states*
 - *Natural living*



Adapted from: Fraser, 2008

Provide the basis for criteria that are used to evaluate animal welfare



Biological Functioning

- *The concept that animal welfare has to do with being healthy, growing and reproducing well*
 - Based on the idea that if an animal is coping well with its environment, it will experience few physiological or behavioural disruptions



Biological Functioning

- Criteria used to assess welfare:
 - Health, Mortality
 - Physical Condition
 - Productivity
 - Physiological measures of stress
 - Sympathetic activation – epinephrine, norepinephrine, HR
 - HPA activation - corticosterone
 - Immune function



Affective States

- *The concept that animal welfare has to do with how an animal feels*
 - Based on affective (emotional) states such as pain, fear, frustration, pleasure or contentment
 - Animals have evolved affective states to motivate behaviour that promotes survival, growth and reproduction



Affective States

- Criteria used to assess welfare:
 - Primarily behaviour
 - Signs of pain, fear, frustration
 - Animal preferences and ‘behavioural demand’
 - Animals will ‘work’ to obtain something that they find rewarding and will avoid what they find unpleasant

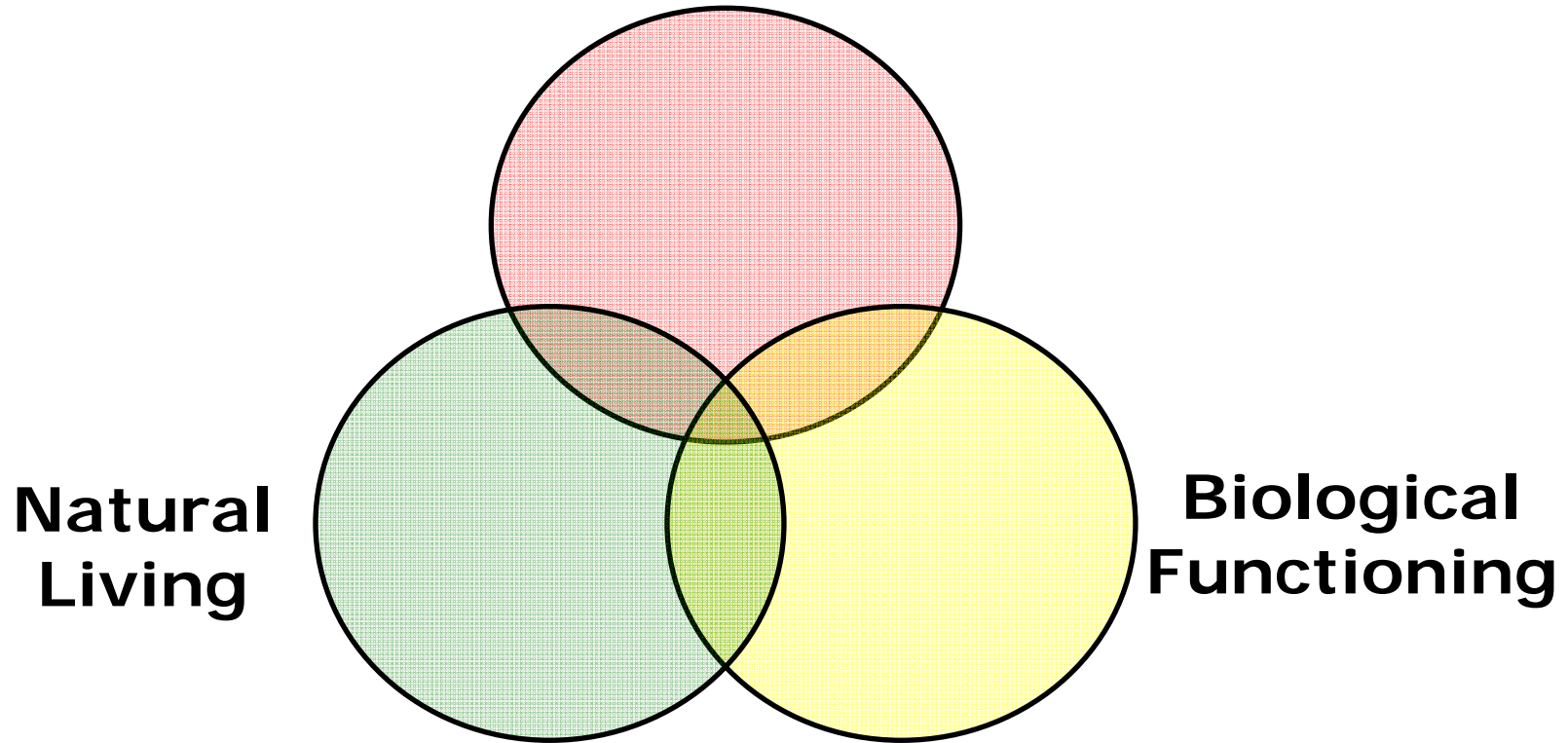


Natural Living

- *The concept that animal welfare has to do with being able to lead a relatively natural life and behave in ways that are consistent with the nature of the species*
 - Criteria for assessing welfare?
 - Not necessarily that animals have to be able to perform the full 'repertoire' of natural behaviour
 - But some types of behaviour may be important



Affective States



Often times there is some overlap among approaches and measures

Affective States and Stress Response

- Measures of affective state
 - Fear and pain
- Measures of biological function
 - Short term, acute stress response
 - Long term, chronic stress
 - Reduction in immune function
 - Reduction in productivity

How Do We Compare Welfare in Different Housing Systems?

Housing Systems for Laying Hens

Conventional cages



Source: OFAC Photo Library

Furnished Cages



Range of models and group sizes

- Nest box
- Perch
- Some models include dust bath or litter area for scratching



Source: LayWel Report

Single and multi-tiered barns



Source: Vencomatic.com

Outdoor and Free Range Systems



Source: LayWel Report

Covered veranda - access to outside covered area connected to the hen house
Free range - access to outside uncovered area that is covered with vegetation

Housing Systems for Laying Hens

– Cages

- Conventional cages
- Furnished cages (perch, nest box)
 - Small - up to ~15 hens
 - Medium - 15-30 hens
 - Large - > 15 hens up to ~ 60

– Non-cage systems

- Single-tiered non-cage barns
- Multi-tiered non-cage barns (aviaries)
- Outdoor and free range

Comparisons of Housing Systems

- Differ in a large number of features
- Different welfare criteria address different aspects of the housing systems
- Must account for differences in quality of stockmanship, genetics, management

The LayWel Project

<http://www.laywel.eu/>

- A 'traffic light' system for risk assessment



Probability of good or satisfactory welfare



Medium risk of poor welfare



High risk of poor welfare

Mortality, Injury, Disease

Table 7.7 Indicator / risk of poor welfare	Conventional cage	Furnished cage			Non-cage		Outdoor
		small	medium	large	single level	multi level	
Injury, disease and pain							
internal parasites	Green	Green	Green	Green	Red	Red	Red
external parasites (red mite etc)	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
use of prophylactic anthelmintics and coccidiostats	Green	Green	Green	Green	Yellow	Yellow	Yellow
osteoporosis/ low bone strength	Red	Yellow	Yellow	Yellow	Green	Green	Green
keel bone deformation	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
bone breaks during lay	Green	Yellow	Yellow	Yellow	Red	Red	Red
bone breaks at depopulation	Red	Red	Red	Red	Yellow	Yellow	Yellow
bumble foot	Green	Yellow	Yellow	Yellow	Red	Red	Red

Fear, Stress, Discomfort

Indicator / risk of poor welfare	Conventional cage	Furnished cage			Non-cage		Outdoor
		small	medium	large	single level	multi level	
Fear, stress & discomfort							
fearfulness	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
corticosterone (end of lay)	White	White	White	White	White	White	White
H:L ratio (end of lay)	White	White	White	White	White	White	White
crowding/suffocation	Green	Green	Green	Yellow	Red	Yellow	Yellow
feather pecking in beak trimmed flocks	Green	Green	White	White	Yellow	Yellow	Yellow
feather pecking in non-beak trimmed flocks	Red	Red	White	White	Red	Red	Yellow
feather loss	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
plumage soiling	Green	Green	Green	Green	Yellow	Yellow	Yellow
bumble foot	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
thermal discomfort	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
dust	Green	Yellow	Yellow	Yellow	Red	Red	Yellow
ammonia	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
dirty eggs (%)	Green	Yellow	Yellow	Yellow	Yellow	Yellow	Red

Behaviour

Indicator / risk of poor welfare	Conventional cage	Furnished cage			Non-cage		Outdoor
		small	medium	large	single level	multi level	
Behaviour							
nest box eggs at peak lay (%)	Red	Green	Green	Green	Green	Green	Yellow
hens on perch at night (%)	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
use of dustbath	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
foraging	Red	Yellow	Yellow	Yellow	Green	Green	Green
social	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow
behavioural restriction	Red	Yellow	Yellow	Yellow	Yellow	Yellow	Green
injurious pecking	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow	Yellow

From stress & discomfort

The LayWel Report

- “Conventional cages do not allow hens to fulfil behavioural priorities, preferences and needs for nesting, perching, foraging and dust bathing.”
- “We believe these disadvantages outweigh the advantages of reduced parasitism, good hygiene and simpler management.”

Behavioural Restriction

- Most contentious of welfare issues
- Four behaviours of concern
 - Nesting
 - Dust bathing
 - Perching
 - Foraging
- Concept of 'behavioural needs'



Instinctive Urges

Brambell Committee (1965)

- *“Whilst accepting the need for much restriction, we must draw the line at conditions which completely suppress all or nearly all **the natural, instinctive urges** and behaviour patterns characteristic of... the ancestral wild species and which have been little if at all bred out in the process of domestication”*



Behavioural Needs?

- “The idea of ‘behavioural needs’ crept into the scientific literature (and even into some codes and legislation)”
 - “essential behavioural needs” (Fölsch, 1980)
 - “an environment to satisfy behavioural needs” (Wegner, 1980)
 - “appropriate to their physiological and behavioural needs” (Anonymous 1983, Australian Code of Practice)

(Duncan, 1998)



Behavioural Needs

- Defined as specific activities or environmental resources that may be important to the animal and that when prevented, may lead to suffering (Dawkins, 1983; Hughes & Duncan, 1988; Jensen & Toates, 1993)



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Needs or Opportunities?

- Natural selection has favoured negative and positive emotions as separate processes to solve two different types of motivational problems
- ‘Need situations’ where immediate action is necessary for survival or reproduction are likely associated with some negative emotional state
- ‘Opportunity situations’ where the animal benefits from performing the behaviour but where there is little cost of not performing it are likely associated with some positive emotional state

(Fraser & Duncan, 1998; Pleasures, Pains and Animal Welfare)



Needs and Priorities

- More recently the term ‘behavioural needs’ refer to those ‘instinctive’ behaviours that are performed in the absence of an optimum environment or resource
 - Dust bathing, perching and foraging
- And ‘behavioral priorities’ as those that hens are prepared to work for
 - Nesting

(Cooper & Albentosa, 2003; Weeks & Nicol, 2006; LayWel Report, 2007)

40 Years After Brambell

- There is still some lack of consensus on how 'needs' are defined and how to provide evidence for them



Evaluating Behavioural Restriction

- **What factors motivate the behaviour?**
- Do hens have preferences for resources to perform the behaviour?
- Are hens willing to work to perform the behaviour?
- Are there signs of frustration when denied?
- Are there physiological responses to denying the behaviour?
- Are there other physical, health or fitness consequences of denying or accommodating the behaviour?



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Nesting

- Modern hen has retained 'urge' to nest
- Every time a hen lays an egg, it is preceded by searching, nest building and sitting on the nest
 - Caused by hormones released by ovulation
 - Evolved for reproductive success



Do Hens Have Preferences?

- Most hens prefer to lay in an enclosed nest box but there are strain and individual differences in use of nest boxes
- Nest box and floor layers are consistent in their choices

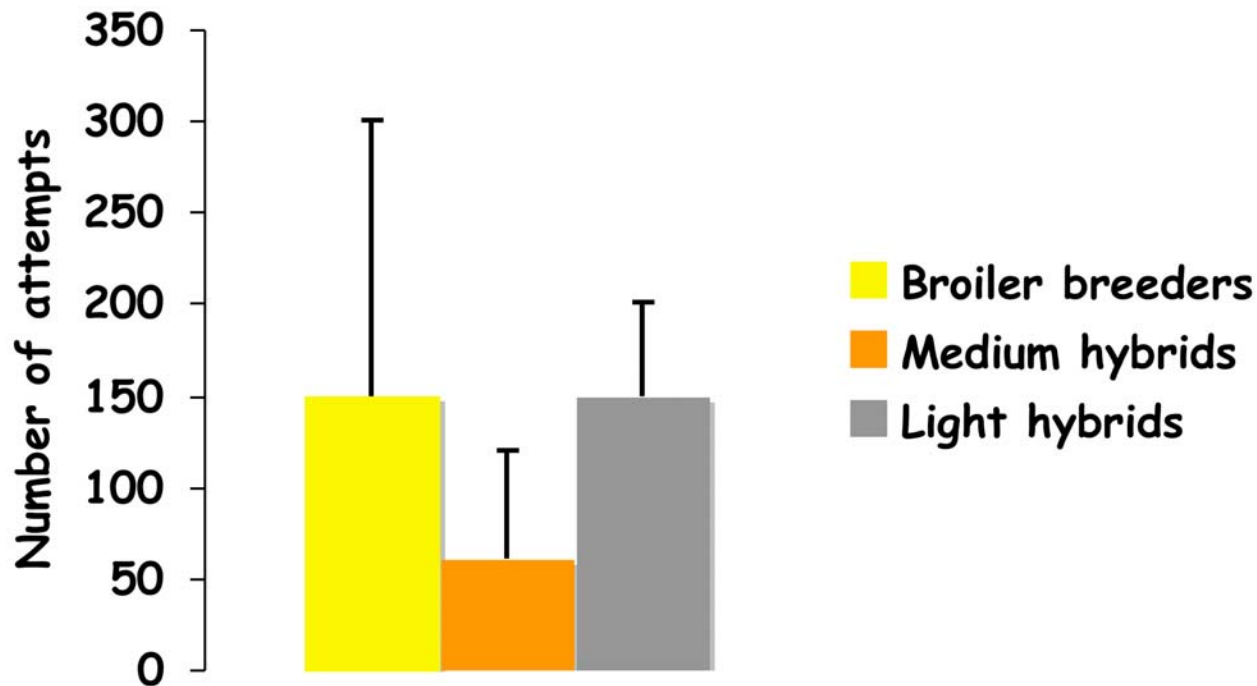
Are They Willing to Work for It?

- Most hens will perform a variety of ‘costly’ tasks to get to the nest box
(see Cooper & Albentosa, 2003)
 - Push through heavy doors
 - Squeeze through narrow gaps
 - Pass by a dominant hen
- Some hens will work to lay their eggs in an open tray (Kruschwitz et al 2008)



Are They Willing to Work for It?

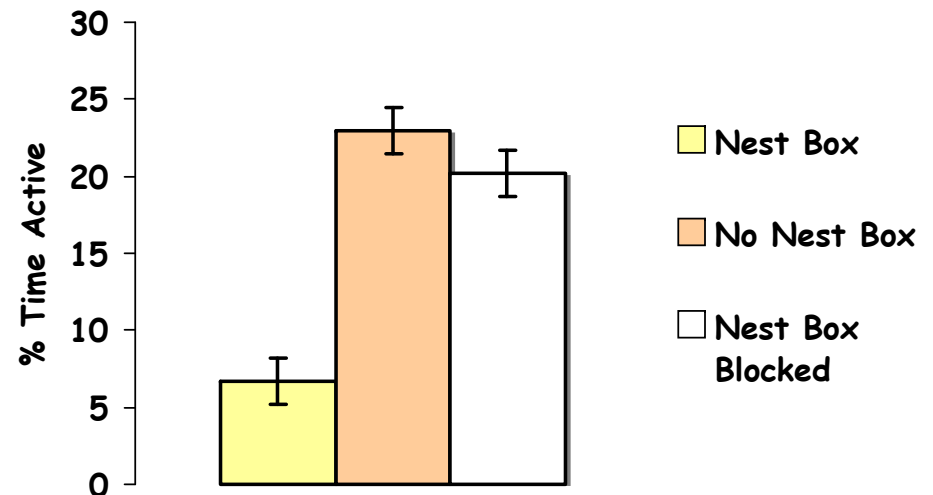
When the door was locked shut, hens were *very* persistent in their attempt to get through it to a nest



Follensbee, 1992

Are There Signs of Frustration?

- Hens without a nest box are more active, take longer to settle, and show ‘stereotypic pacing’ during the hour before egg laying



(Yue & Duncan, 2003)

Are There Physiological Responses?

- Surprisingly, few studies
- Most evidence is 'circumstantial'

Are There Physiological Responses?

- Nesting - delayed oviposition
 - Environmental stressors can cause a delay in oviposition due to epinephrine dependent retention of the egg in the shell gland (Reynard & Savory, 1997)
 - Disrupted nesting when hens are sitting in the nest delays oviposition (Friere et al, 1997; Cooper & Appleby, 2003)
 - Young hens **with nest boxes** laid their eggs slightly earlier in the day than hens **without nest boxes** but there was no difference after 30 weeks of age (Cronin and Barnett, 2008)

Are There Physiological Responses?

- Nesting - extra-cuticular calcium
 - An indirect measure of delayed oviposition
 - Walker & Hughes (1998) found more 'dusty eggs' when in hens with open nest area compared to enclosed nest box
 - Yue & Duncan (2003) found no differences in extra-cuticular calcium between hens with or without a nest box



Are There Physiological Responses?

- Nesting - HPA response (corticosterone)
 - No differences between furnished and conventional cages on adrenal responsiveness (Guesdon et al, 2004; Barnett et al, 2005)
 - Cronin et al (2008) found higher plasma corticosterone in hens with nest boxes early in lay, a transient increase in albumin corticosterone when nest boxes were blocked and no long term differences for hens with or without nestboxes

Are There Other Physical, Health or Fitness Consequences?

- Nesting

- No effects of presence or absence of a nest box on health or physical integrity of the hen that we know of
- Yue & Duncan (2003) found no effects of nest box on bone breaking strength

Dustbathing

– Internal

- Performed every 2-3 days, follows a diurnal rhythm
- After a period of deprivation hens will dust bath more quickly and for a longer period of time suggesting internal 'build-up' (see Cooper and Albentosa, 2003)

– External

- Sight of a dusty substrate, temperature, light and the sight/sounds of other hens dustbathing (Petherick et al, 1995; Duncan et al 1998)



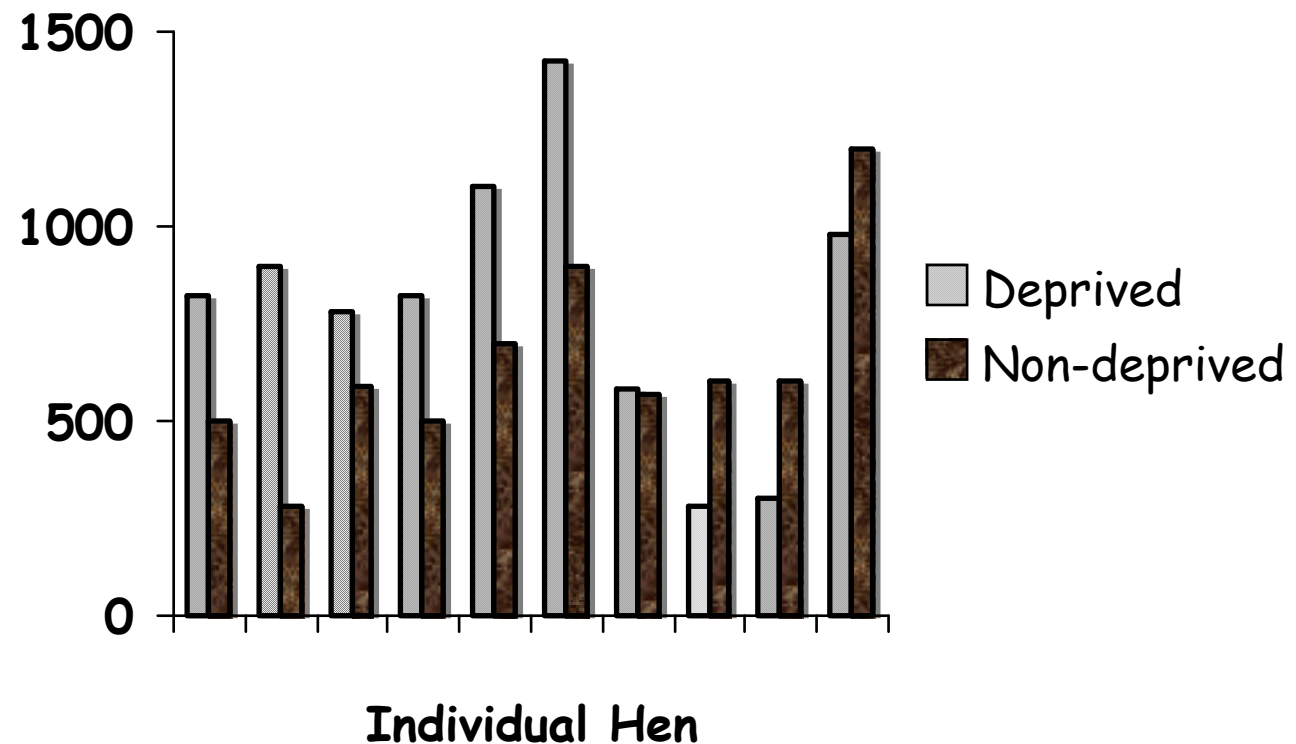
Do Hens Have Preferences?

- Hens do have preferences for different substrates
- Peat moss > sand > wood shavings (see Olsson and Keeling, 2005)



Are They Willing to Work for It?

- Hens may or may not work for a dust bath
- They *tend* to work harder after deprivation but... *not that hard* (Widowski and Duncan, 2000)



Are There Signs of Frustration?

- Dust bathing
 - Few signs of frustration reported in the literature
 - When thwarted from a dust bath hens did ↑↑ ‘gakel’ calls but **did not** ↑↑ escape attempts, alarm cackles, pacing, or displacement preening (Zimmerman et al 2000)
 - Hens ‘sham’ dust bathe on wire in the absence of substrate but they also ‘sham’ dust bathe on wire when substrate is available (Lindberg & Nicol, 1997)

Are There Physiological Responses?

- Dustbathing

- Even fewer studies
- Hens who had been living on litter for 3 years and then moved to cages had elevated corticosterone for several weeks (Vestergaard et al, 1997)
- No differences in plasma corticosterone or measures of immune response in hens housed in furnished cages either with or without a dust bath (Barnett et al, 2005)

Are There Other Physical, Health or Fitness Consequences?

- Dust bathing
 - Significantly higher concentrations of lipids on feathers when hens do not have access to dust bath (Sandilands et al 2004)
 - Providing litter or dusty substrates can result in poor air quality (Rodenberg et al, 2005)

Summary

- There are scientific criteria that can be used to address welfare implications of behavioural restriction
- Studies on motivation can provide compelling evidence that the performance of some behaviours may be important to the hen



Summary

- Additional evidence on the consequences of behavioural restriction with regard to stress physiology and health would provide a more comprehensive assessment of the impact of restricting some behaviours on welfare
- This may especially important when provision of resources may result in 'trade-offs' for other aspects of the hen's welfare



Acknowledgements

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