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RED KITE
VETERINARY CONSULTANTS

Recognition and assessment of pain, suffering and distress

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LO: 2.9 & 5.5

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What does ASPA say?

- ASPA controls procedures performed on animals which may cause pain suffering distress or lasting harm.
- ASPA requires that all possible steps are taken to reduce the harms caused to animals.
 - Implementation of 3Rs mandatory
 - PPL specifies how adverse effects should be controlled
 - If severity limit is exceeded, Home Office must be informed
 - Animals in severe pain **MUST** be killed

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What does ASPA say?

- Project licence protocols are assigned one of four severity categories:
 - Mild
 - Moderate
 - Severe
 - Non-recovery
- Must be able to judge how severe a procedure is
- PPLh must notify Home Office if these limits have been exceeded

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Prospective
Severity
(in PPL)

Actual Severity
(Reported
retrospectively)

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Prospective Severity

- Defined in the PPL
- When a project licence application is submitted, the **likely** severity of the series of regulated procedures in each protocol is classified into one of 4 categories:
 - Mild
 - Moderate
 - Severe
 - Non-recovery
- This classification is confirmed in the granted project licence.

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Severity Category

- The severity category of the protocol is determined by the maximum degree of pain, suffering, distress or lasting harm expected to be experienced by a **single animal** during the course of the procedure.
- The severity category is based on the most severe effects that an animal is likely to suffer after applying all the appropriate refinement techniques.

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Severity categories

- 1) Mild
- Procedures on animals as a result of which the animals are likely to experience short-term mild pain, suffering or distress, and no significant impairment of well-being or general condition.



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Severity categories

- 2) Moderate
- Procedures which cause short-term moderate pain, suffering or distress, or long-lasting mild pain, suffering or distress, and procedures that may cause moderate impairment of well-being or general condition.
- Includes most surgical techniques.



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Severity categories

- 3) Severe
- Procedures which are likely to cause severe pain, suffering or distress, long-lasting moderate pain, suffering or distress and severe impairment of well-being or general condition.



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Severity Categories

- 4) Non-recovery
- Procedures that are performed entirely under general anaesthesia or decerebration from which the animal will not recover consciousness.



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Actual Severity

At the end of a series of regulated procedures, the **PPL holder or a suitably qualified deputy**, must classify the **actual severity** of the series of procedures carried out, using the observations taken from the animals during day-to-day monitoring. These may be classified as:

- Mild
- Moderate
- Severe
- Non-recovery
- Sub-threshold

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Sub-threshold

- If an animal(s) has experienced actual severity which is below the lower threshold for regulation.
- i.e. The level of pain, suffering, distress or lasting harm equivalent to, or higher than, that caused by the introduction of a hypodermic needle in accordance with good veterinary practice.

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Cumulative severity

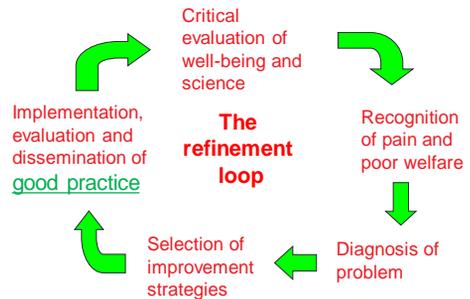
- In some cases, it is necessary to make a judgment as to the **total lifetime severity** an animal may have experienced
- This will be needed if an animal is to be re-used, or rehomed.
- This judgment may need to include consideration of harm caused by the procedures and other problems such as illness, injury, or contingent suffering due to transport, restrictive housing etc.

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Implementation of ongoing refinement



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The Status Quo



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What is good welfare?

- Need to understand what can lead to poor welfare
- Five welfare needs of the AWA2006
 - the need for a suitable environment
 - the need for a suitable diet
 - the need to be able to exhibit normal behaviour patterns
 - the need to be housed with, or apart from, other animals
 - the need to be protected from pain, suffering, injury and disease.
- If these are met, welfare is probably not compromised.
- Scientific procedures can impact negatively on all these.

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How can research impact on the five welfare needs?

- | | |
|---|---|
| • Suitable environment | • Metal cages, grid floors |
| • Suitable diet | • Food/fluid regulation paradigms |
| • Normal behaviour patterns | • Single housing, restricted space, little or no enrichment |
| • Housed with, or apart from, other animals | |
| • Pain, suffering, injury and disease | • Surgery, chronic implants, handling methods, procedures |

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What adverse effects may be caused?

- **PSD & LH**
- **Pain**
- **Suffering**
- **Distress**
- **Lasting harm**
- Terms often used interchangeably, although describes different physiological states

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What is stress?

- Induced alteration in biological equilibrium caused by internal or external factors, physiological or psychological
- Behavioural and physiological mechanisms then activated to counter the perturbation and return to normality
- Physiological stress – mild, animal unconscious of it
- Eustress (beneficial or 'good' stress, i.e. deadlines to get you focused)
- Overstress – starts to be detrimental

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What is distress?

- Aversive, negative state in which coping and adaptation processes in response to stressors fail to return an organism to physiological and/or psychological homeostasis
- Can result in maladaptive behaviours, or an aversive state that results from maladaptation or inability to adapt to stressors
- An animal cannot escape from or adapt to the internal or external stressors or conditions that it is experiencing, and this results in negative effects on its well-being

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When does stress become distress?

- Depends on several factors:
 - the type, duration and intensity of stress
 - capacity of an animal to respond
 - species
- Inherent in the transition from stress to distress is the impact on animal welfare
- Animal may deteriorate while it is successfully coping with a stressor
- At some unknown moment, the animal switches from coping with the maladaptive state, then rapidly deteriorates into a sick or debilitated animal

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What is pain?

- Unpleasant sensory and emotional experience associated with actual or potential tissue damage
- Normal/protective
 - Intended to prevent further tissue damage following injury
 - Learned avoidance and modification of behaviour
- Non-protective/maladaptive
 - Pain persists after the initiating cause has been removed
 - Peripheral and central sensitisation
 - Pain experienced is out of proportion to the injury

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What is suffering

- A negative avoidable state derived from adverse physical, physiological and psychological circumstances in accordance with the cognitive ability of the species and the life experiences of the individual.
 - Conscious endurance of pain and distress
 - Includes pain, distress, malaise, boredom, frustration, grief?
- Direct suffering
 - From the procedure
- Contingent suffering
 - From other aspects: transport, housing, injury etc

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Responses to PSD and LH

- Biological and behavioural responses
- Physiological/biochemical
 - HR, BP, hormonal, immunological
- Behavioural
 - Automatic
 - Population – animals communicate with each other
- These changes can be monitored to identify when animals are experiencing distress

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Intervention points

- Monitoring without intervention does NOTHING
- We must constantly strive to minimise any harms caused
- Must plan to intervene if suffering is identified

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End Points

- Ideally, predetermined intervention points (end points) should be defined:
 - Scientific end point – when all required data has been collected.
 - Error end point – experiment has gone wrong and data cannot be collected.
 - Humane end point – animal has reached predetermined limit of acceptable suffering.
- How do you know?

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How do we assess welfare?

- Before you can recognise abnormal, you must know what is normal, e.g.
 - for the species
 - for the physiological state of the animal
 - for the individual
- Contrast "normal" with what you normally see

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Welfare assessment

- Subjective assessments
 - Does it look OK?
- Objective assessments
 - Try to make some kind of measurement, using parameters associated with well being
 - Assign score with the aid of descriptors – normal or abnormal, degree of abnormality

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Welfare assessment

- Reliable welfare assessment systems allow semi-quantitative assessments of pain and distress
- Systems have to be easy to use, consistent, specific and sensitive
- Select parameters indicative of well being
- Assign score with the aid of descriptors – normal or abnormal, degree of abnormality

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Scoring systems - benefits

- Scoring systems encourage regular close observation of the animal
- If animal is deteriorating, then corrective action can be taken in a timely manner
- NB if analgesics are given, remember to re-score the animal **after** treatment to ensure that they have worked and the animal has improved

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Scoring systems - limitations

- Inter-observer variation
 - Different interpretation of same signs
 - Needs proactive approach to develop consistency
- Lack of sensitivity
 - 'General' score sheets will not be sensitive enough to pick up specific effects, specific systems needed for each model
 - Effectiveness requires detailed species knowledge
 - Need to know the normal/baseline state

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Distress scoring 1

- Morton and Griffiths (1985) (Veterinary Record 116, 431-36)
- Parameters:
 - Appearance
 - Food and water intake
 - Clinical signs
 - Natural behaviour
 - Provoked behaviour

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Development of scoring systems

- The example given is a general system and is not sensitive in all situations
- It must be developed to fit the model
- Pilot studies are important
- Modify the system as the experiment progresses, to include more specific parameters

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Scoring systems – limitations ctd

- Time consuming
 - Can be impractical to use on large scale
- Little evidence of how some parameters relate to pain
 - Changes could be due to other non-pain related causes
 - Changes in measure may not parallel change in pain
 - Measurement may be retrospective
- Use of behavioural indices improves effectiveness of welfare assessment

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| ANIMAL IDENTIFICATION | SCORE | DATE/TIME |
|--|-------|-----------|
| APPEARANCE – Normal | 0 | |
| - General lack of grooming | 1 | |
| - Coat staring, ocular/nasal discharge | 2 | |
| - Piloerection, hunched up | 3 | |
| FOOD AND WATER INTAKE – Normal | 0 | |
| - Uncertain, body weight ↓ <5% | 1 | |
| - ↓ intake, body weight ↓ 10-15% | 2 | |
| - No food or water intake | 3 | |
| CLINICAL SIGNS – Normal T, cardiac and resp. rates | 0 | |
| - Slight changes | 1 | |
| - T ± 1°C, C/R rates ↓ 30% | 2 | |
| - T ± 2°C, C/R rates 50% or very ↓ | 3 | |
| NATURAL BEHAVIOUR – Normal | 0 | |
| - Minor changes | 1 | |
| - Less mobile and alert, isolated | 2 | |
| - Vocalisation, self mutilation, restless or very still | 3 | |
| PROVOKED BEHAVIOUR – Normal | 0 | |
| - minor depression or exaggerated response | 1 | |
| - moderate changes in expected behaviour | 2 | |
| - Reacts violently, or very weak/comatose | 3 | |
| SCORE ADJUSTMENT - If 3 scored more than once, score extra point for each 3 | 2-5 | |
| TOTAL | 0-20 | |

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Distress scoring 2: Pain assessment in the rat

- Rats were scored post laparotomy for specific pain related behaviours: twitching, back arching, and falling.
- Quantifying these behaviours allows for reasonably reliable assessment of pain and response to analgesics in this model
- J Roughan and P Flecknell, University of Newcastle
- <http://www.digires.co.uk/>

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Distress scoring 3: Mouse Grimace Scale

- Facial expression is used to measure pain in children
- Recent research shows mice show pain through facial expression
- Langford, D.J., Bailey, A.L., Chanda, M.L., Clarke, S.E., Drummond, T.E., Echols, S., Glick, S., Ingrao, J., Klassen-Ross, T., LaCroix-Fralish, M.L., Matsumiya, L., Sorge, R.E., Sotocinal, S.G., Tabaka, J.M., Wong, D., van den Maagdenberg, A.M.J.M., Ferrari, M.D., Craig, K.D., and Mogil, J.S. Coding of facial expressions of pain in the laboratory mouse. *Nature Methods*, 7:447-449, 2010.

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Nose Bulge



0

1

2

44

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Ear Position



0

1

2

46

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Mouse Grimace Scale

Orbital Tightening



0

1

2

43

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Cheek Bulge



0

1

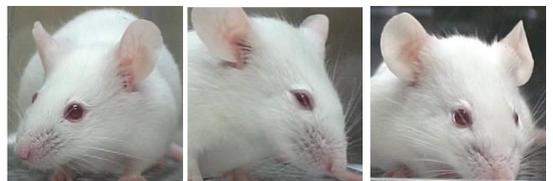
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Whisker Change



0

1

2

47

LO: 5.3

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Pain faces in other animals

- Rat grimace scale
 - Sotocinal et al. Molecular Pain 2011, 7:55
 - <http://www.molecularpain.com/content/7/1/55>
- Rabbit grimace scale
 - Keating et al 2012. Evaluation of EMLA Cream for Preventing Pain during Tattooing of Rabbits: Changes in Physiological, Behavioural and Facial Expression Responses.
 - PLoS ONE 7(9):e44437.doi:10.1371/journal.pone.0044437
- Lamb Grimace scale
 - Guesgen M. J., Beausoleil N. J., Leach M., Minot E. O., Stewart M. and Stafford K. J. (2016). Coding and quantification of a facial expression for pain in lambs. Behavioural Processes, 132:49-56

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- Bloom T and Friedman H (2013). Classifying dogs' (Canis familiaris) facial expressions from photographs. Behavioural Processes 96, pp 1-10

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Normal vs abnormal!

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LO: 7.7

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LO: 7.7

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LO: 7.7 54



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LO: 7.7 60



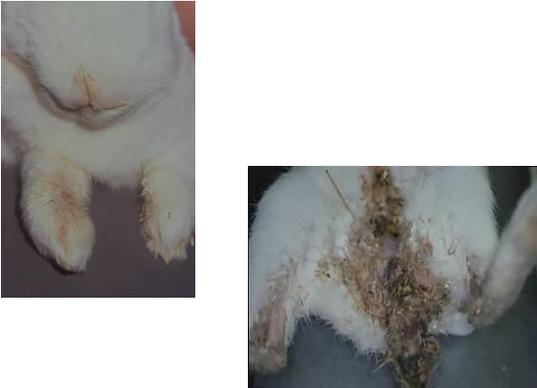
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LO: 7.7 62



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LO: 7.7 63



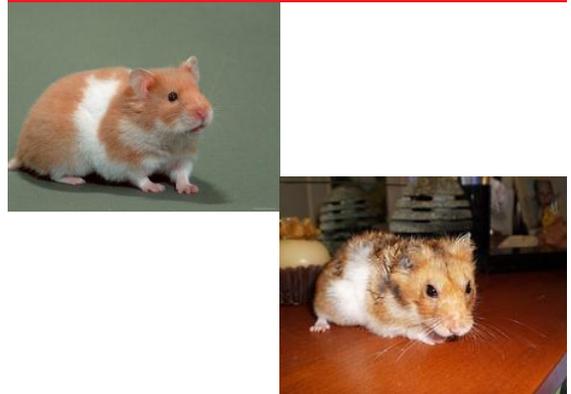
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LO: 7.7 65



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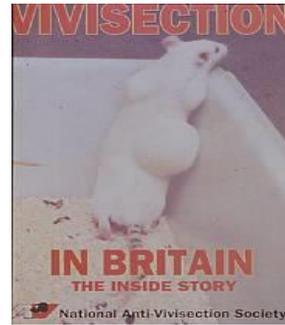
LO 7.7

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Summary

- Understand the species
- Know the individual
- Observe carefully: appearance, behaviour, physiology
- Keep monitoring – keep records
- Take ACTION to REFINE procedures

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