Use of the Animal Welfare Assessment Grid to assess the life time experience of animals and cumulative severity of procedures

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Cumulative what?

• Welfare?
• Severity?
• Suffering?
• Does it matter to the animal what you call it?
• Perceptions.....it matters to people what you call it...
• EU Directive 2010/63: “Severity category shall take into account: Nature of p,s,d&lh...and its intensity, the duration, frequency and multiplicity of techniques... and ...cumulative suffering within a procedure”
• Russell & Burch: “direct and contingent suffering”
What is cumulative suffering =

Direct suffering (procedural detail on the licence), clinical conditions

+ 

Contingent suffering (housing, husbandry, transport)

X 

Duration
Life time experience
Disease and injury
Cumulative suffering: lab animal, pet animal, farm animal or wild animal*

• Animal’s perception of welfare, not affected by its reason for life or the cause of its suffering
• Is it acceptable for animals to suffer in the name of scientific progress?
• If so, how much and for how long?
• Function of the ethical review process and the Regulatory Bodies
• Success of this depends on the prevailing institutional culture and regulatory authority
• Need consistency between institutions and member states

*Wolfensohn & Honess 2007 Animal Welfare 16 supplement 1, 117-123
Cumulative suffering

Function of ethical review: Needed for harm:benefit judgement

• Prospective, on-going and retrospective
• How can you estimate it?
• Who should estimate it?
• When should you estimate it?
• Need an objective measurement
• Can cumulative suffering be justified?
Ethical review balances benefit vs harms

• Justification
• 3Rs
  – Replacement
  – Reduction
  – Refinement

**HOW** we do animal research – affects the level of cumulative suffering
Is this enrichment?
Severity classification

- Severity intensity
- Duration of each component?
- Is it getting better – or worse?
- What is the overall quality of life?

![Severity Limit: MODERATE]

- Training
- MRI
- Surgery 1
- Fight trauma
- Surgery 2
Illustration of cumulative severity

Event 1: Training
Event 2: MRI scanning
Event 3: Surgery
Event 4: Fight injury
Event 5: Second surgery

TIME

CUMULATIVE WELFARE SCORE

MODERATE SEVERITY LIMIT

SEVERITY CLASSIFICATION?

Illustration of cumulative severity
Assessing cumulative suffering

Animal Welfare Assessment Grid (AWAG)

ATLA (2010) 38 205-212
Welfare: The five domains

- Nutrition
- Environment
- Health
- Behaviour
- Mental state

AWAG Parameters:

- Physical
- Psychological
- Environment
- Procedural

Duration? Single moments in time?
Validation: retrospective use of the AWAG using data on TB vaccine studies*

- Four studies, retrospective data
- Different vaccine regime
- Different challenge
- Different housing
- Different species
- Different end points
- Effect on quality of life?
- Quantitative assessment of cumulative suffering

Vaccine efficacy studies against primary infection in macaque challenge model

- Rhesus and cynomolgus species used
- 3 efficacy studies performed in the macaque TB aerosol challenge model
- 1 efficacy assessment performed in the ‘BCG’ challenge model
- All included BCG ID vaccinated and not vaccinated groups

<table>
<thead>
<tr>
<th>Study</th>
<th>Species</th>
<th>Vaccine</th>
<th>Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rhesus</td>
<td>BCG ID in BSL 2</td>
<td>Mtb 50 CFU BSL3 52 weeks</td>
</tr>
<tr>
<td>2</td>
<td>Cynomolgus</td>
<td>BCG ID in BSL 2</td>
<td>Mtb 75 CFU BSL3 26 weeks</td>
</tr>
<tr>
<td>3</td>
<td>Rhesus</td>
<td>BCG ID in breeding unit</td>
<td>Mtb 75 CFU BSL3 16 weeks</td>
</tr>
<tr>
<td>4</td>
<td>Rhesus</td>
<td>BCG ID in BSL 2</td>
<td>BCG BSL2 2 weeks</td>
</tr>
</tbody>
</table>

Study designs

Week 0 21 23 37 47 73
1. **General condition (weight-loss, condition score etc)**  
   Weight loss of zero up to 1.9% score 2, from 2-3.9% score 3, from 4-5.9% score 4, from 6-9.9% score 5, from 10-14.9% score 6, from 15-19.9% score 7, from 20-24.9% score 8, over 25% score 10

2. **Clinical assessment**
   eg cough, diarrhoea, ascites, tachypnoea, dyspnoea, vomiting, temperature

3. **Activity level, mobility**

4. **Presence of injury**

5. **Not eating/drinking**
   Food/water intake less than 40% for 3 days score 6, food/water intake below 40% for 7 days or anorexic for 3 days score 9.
Behavioural/Psychological: Scoring factors

1. Stereotypy, self-harming, unusual grooming
   Take into account the frequency and time spent in the abnormal behaviour, not just the extent of physical damage to the animal

2. Response to catching event
   What method is used? How long does it take?

3. Hierarchy upset/dispute, aggression/bullying
   Take into account extent and duration

4. Use of enrichment

5. Aversion to ‘normal’ events
   Such as staff interaction, cage cleaning etc. Is the animal well trained and habituated or stressed and frightened or aggressive?
**Environmental: Scoring Factors**

1. **Housing**
   
   Free range type environment score 1. Consider the space provision, lighting, ventilation, weather exposure, animal friendly materials, noise. Adjust to take account of the species and size of the animals.

2. **Group size**
   
   Singles score 10, pairs score 6, small groups (3 to 5) score 4, medium size groups (6 to 8) score 3, breeding groups score 1.

3. **Provision of 3D enrichment**
   
   Consider the ability to climb, jump, hide, establish and maintain social hierarchy without aggression and fighting.

4. **Provision of manipulable enrichment**
   
   Consider forage material, food provision and the variety of what is offered.

5. **Contingent events**
   
   Consider if the animal has been moved, on-going building works etc.
Procedural (experimental/clinical): Scoring Factors

1. **Restraint**
   1 2 3 4 5 6 7 8 9 10
   Is positive reinforcement training used or is the animal aggressive and frightened? What method is used?

2. **Sedation**
   1 2 3 4 5 6 7 8 9 10
   Consider duration, quality of induction and recovery, effect on food intake and behaviour.

3. **Effect of intervention**
   1 2 3 4 5 6 7 8 9 10
   To what extent has it impacted on the animal’s welfare? What has been the overall effect on the animal’s welfare of the procedure carried out, even if done for the animal’s benefit in the longer term.

4. **Change in daily routine**
   1 2 3 4 5 6 7 8 9 10
   Consider such things as withholding enrichment or food, restricting access to usual living area.
Calculation of cumulative effects on welfare

The scores for each factor were entered into a spreadsheet that automatically calculated the average score for each of the four parameters, produced an AWAG at each time point, calculated its area and plotted that area across the animal’s life time.
AWAG to illustrate temporal component
CWAS: Life time experience, individual animals - S36 Study 3 unvaccinated
Animal S36: Study 3 unvaccinated

WAG: S36 day 801

WAG: S36 day 1084
Use of the AWAG to compare studies and demonstrate effect of refinement

- Survival study vs fixed end point study, duration of end point
- Housing – whole study in CL3 vs pre-challenge in breeding facility building
- Species difference and import vs home bred
- Different challenge dose M.Tb
- Different study design (M.Tb vs BCG challenge)
- Degree of severity across whole study
  - Vaccinated and unvaccinated groups in each study
Refinement of environment
The outcome of using the welfare assessment grid

• Allows objective feedback on changes affecting animal welfare and objective evaluation of the animal’s quality of life and cumulative suffering

• Enables drilling down to the separate components of welfare: Physical, Psychological, Environmental, Procedural

• Visual representation of welfare which may be easily understood and allows communication about animal welfare between care staff, research staff, ethical review committee members, regulators, funders and the public
Why is welfare measured?

• If welfare is identified as sub-optimal → find the cause → identify a solution
• The outcome of measurement should be action to improve welfare
• Do nothing – justify why not – experimental constraints?
• On going refinements can be targeted at specific elements
• Then keep monitoring to demonstrate Improvements in welfare
The Animal Welfare Assessment Grid:
AWAG software
free to download from
**Previous assessment date:** 18-11-2015

**Previous assessment scores:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Average</th>
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<tbody>
<tr>
<td>Environmental</td>
<td>1.80</td>
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<tr>
<td>Physical</td>
<td>1.80</td>
</tr>
<tr>
<td>Procedural</td>
<td>2.80</td>
</tr>
<tr>
<td>Psychological</td>
<td>2.50</td>
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</table>

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Score</th>
<th>Ignore</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stereotypy, self-harming, unusual grooming</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Response to catching event</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Hierarchy upset/ dispute, aggression/ bullying</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Alopecia score</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Use of enrichment</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Aversion to normal events</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

*Comment for parameter: Psychological*

Average score for parameter: Psychological is 2.50
Animal number: a100
Assessment date: Sat 21 Nov 2015
Assessment reason: TB Screen
Cumulative welfare assessment score: 28.98
Average parameter score: 3.83

**Psychological (Factors for assessment on Sat 21 Nov 2015)**

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Factor score</th>
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</thead>
<tbody>
<tr>
<td>Alopecia score</td>
<td>5</td>
</tr>
<tr>
<td>Aversion to normal events</td>
<td>2</td>
</tr>
<tr>
<td>Hierarchy upset/ dispute, aggression/ bullying</td>
<td>2</td>
</tr>
<tr>
<td>Response to catching event</td>
<td>6</td>
</tr>
<tr>
<td>Stereotypy, self-harming, unusual grooming</td>
<td>3</td>
</tr>
<tr>
<td>Use of enrichment</td>
<td>3</td>
</tr>
</tbody>
</table>

**Environmental (Factors for assessment on Sat 21 Nov 2015)**

<table>
<thead>
<tr>
<th>Factor name</th>
<th>Factor score</th>
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</thead>
<tbody>
<tr>
<td>Contingent events</td>
<td>4</td>
</tr>
<tr>
<td>Group size</td>
<td>4</td>
</tr>
<tr>
<td>Housing</td>
<td>6</td>
</tr>
<tr>
<td>Provision of 3D enrichment</td>
<td>4</td>
</tr>
<tr>
<td>Provision of manipulable enrichment</td>
<td>4</td>
</tr>
</tbody>
</table>
The refinement loop

Implementation, evaluation and dissemination of good practice

Critical evaluation of well-being and science

Recognition of pain and poor welfare

Diagnosis of problem

Selection of improvement strategies

(Lloyd, Foden & Wolfensohn 2008 Laboratory Animals 42 284-293)
Wider applications

- Use of the system in other veterinary sectors to evaluate life time experience
  - Marwell Zoo
  - Animal rescue centres

To facilitate decision making and improve welfare
Acknowledgements

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