Evaluating environmental enrichment for pigs

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Needs for good welfare
(1) The Five Freedoms

- Freedom from hunger & thirst
- Freedom from pain, injury & disease
- Freedom to express most normal behaviour
- Freedom from thermal & physical discomfort
- Freedom from fear & distress
EC Directive (2001/93/EC)

“...pigs must have permanent access to a sufficient quantity of material to enable proper investigation and manipulation activities .......

- How can we decide what meets the requirements of pigs?
Approaches to assessing enrichment

- **Resource measures (inputs)**
  - The type of enrichment object/substrate
  - The properties of enrichment

- **Animal-based measures (outcomes)**
  - Measures of adequate enrichment
  - Measures of inadequate enrichment
Defining adequacy by type of enrichment

- EU Directive
  “….such as straw, hay, wood, sawdust, mushroom compost, peat or a mixture of such”

- Expert Opinion (Bracke et al., 2007)
  9 experts gave 0-10 score to a list of enrichment items
## The type of enrichment

<table>
<thead>
<tr>
<th>Score (0-10 scale)</th>
<th>Materials</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>Mirror, radio, concrete block</td>
</tr>
<tr>
<td>&lt;2</td>
<td>Chain, ball, mineral block, minimal straw</td>
</tr>
<tr>
<td>&lt;3</td>
<td>Chain+wood, rope, Bite-rite, operant feeder</td>
</tr>
<tr>
<td>&lt;4</td>
<td>Box with shredded paper, sawdust, chopped straw</td>
</tr>
<tr>
<td>&lt;5</td>
<td>Branches, earth box, sawdust on floor</td>
</tr>
<tr>
<td>&lt;6</td>
<td>Straw basket, daily straw pellets, peat, food-ball</td>
</tr>
<tr>
<td>&lt;7</td>
<td>Wood bark layer, loose compost, straw rack</td>
</tr>
<tr>
<td>&lt;8</td>
<td>Daily soil, fodder beet, maize silage</td>
</tr>
<tr>
<td>&gt;8</td>
<td>Mixed straw+fodder beet, loose straw bale, straw+scattered concentrate</td>
</tr>
</tbody>
</table>
An alternative approach: properties not objects – asking the pig

73 diverse objects
% of 24h in object interaction
day 1 & day 5

(van de Weerd et al, 2003)
Habituation to objects

Weaned pigs
Growing pigs

Day 1
Day 5

% time occupied with toy

(van de Weerd et al, 2003)
Winners

1. Lavender straw with peanuts in a trough
2. Carrots hanging on a string
3. Coconut halves hanging on a string
4. Long straw in a trough

9. Sisal hanging rope

Losers = chains, bricks, planks, mirrors

But what characterises winners?
Important Characteristics

**DAY 1**
- Odorous
- Deformable
- Chewable
- Not Rootable
- Not attached

**DAY 5**
- Ingestible
- Destructible
- Contained (in box)
- Not Rootable (hanging)

(van de Weerd et al, 2003)
Importance of novelty (and additivity)

Hanging rope or wood block on floor
- separately or together
- changed weekly or continuous (rope renewed after 2 weeks)

Trickett et al (2009)
Independence of objects (additivity)

Guy et al., (2013)
The important properties of enrichment
(36 experts: Bracke et al, 2006)

<table>
<thead>
<tr>
<th>% citing</th>
<th>Properties</th>
</tr>
</thead>
<tbody>
<tr>
<td>39</td>
<td>Provides occupation</td>
</tr>
<tr>
<td>39</td>
<td>Rootable / digable</td>
</tr>
<tr>
<td>31</td>
<td>Manipulable with mouth</td>
</tr>
<tr>
<td>28</td>
<td>Chewable</td>
</tr>
<tr>
<td>22</td>
<td>Variable and unpredictable</td>
</tr>
</tbody>
</table>
OUTCOME EVALUATION

- Which outcome measures are relevant?
  - Animal-enrichment interaction
  - Activity – play
  - Harmful social behaviour – tail, ear biting
  - Aggression
  - Pig directed behaviour – chewing, massaging
  - Pen directed behaviour
  - Fearfulness – novelty, humans
  - Production – feed intake growth, efficiency
  - Hygiene and health
Outcomes of environmental enrichment

More pens show tail biting in a slatted building than matched building with straw bedding (33% v 8%, P<0.001) (Scott et al., 2005)

Pigs in slatted pens spend more time chewing other pigs and pen fittings (P<0.001)
How do outcomes map to materials  
(Bracke et al, 2006)

<table>
<thead>
<tr>
<th>Material</th>
<th>+</th>
<th>-</th>
<th>0</th>
<th>+/-</th>
<th>Weighted Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metal (chains)</td>
<td>6</td>
<td>4</td>
<td>8</td>
<td>1.5</td>
<td>0.3</td>
</tr>
<tr>
<td>Mineral blocks</td>
<td>3</td>
<td>1</td>
<td>3</td>
<td>3.0</td>
<td>0.5</td>
</tr>
<tr>
<td>Rubber / plastic (hoses, belts)</td>
<td>19</td>
<td>4</td>
<td>9</td>
<td>4.7</td>
<td>0.7</td>
</tr>
<tr>
<td>Rope / cloth</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>6.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Wood (beams, blocks, branches)</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>7.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Straw (loose, rack, basket)</td>
<td>28</td>
<td>3</td>
<td>8</td>
<td>9.3</td>
<td>1.1</td>
</tr>
<tr>
<td>Roughage (beet, hay, silage)</td>
<td>10</td>
<td>1</td>
<td>5</td>
<td>10.0</td>
<td>0.8</td>
</tr>
<tr>
<td>Mixtures (compound enrichment)</td>
<td>28</td>
<td>2</td>
<td>4</td>
<td>14.0</td>
<td>1.3</td>
</tr>
<tr>
<td>Substrates (compost, earth, sawdust)</td>
<td>17</td>
<td>1</td>
<td>7</td>
<td>17.0</td>
<td>1.0</td>
</tr>
</tbody>
</table>

54 experiments, 200 statistically significant welfare outcomes
Modelling enrichment value

(Bracke, 2008)
ICEBERG Indicators

Simple and quick measures to summarise enrichment adequacy in daily practice?
Pig oral behaviour index

Simple scan measure unaffected by time of day or level of activity (Mullan et al., 2009)
BPEX Enrichment use score

- Looking at sitting or standing pigs only
- Ignore pigs eating or drinking
- Proportion of active pigs occupied (orally) with objects provided for enrichment / All active pigs
BPEX Real Welfare Project

82 finishing units assessed by farm vet at 3 quarterly visits

Mean score: 0.37
Lower quartile: 0.25
Median: 0.37
Upper quartile: 0.49
95th percentile: 0.62

Measure now rolled out in most UK farms as part of Red Tractor farm assurance
Is this score a useful enrichment measure?

15 UK farms, 5 pens, 100 pigs/farm

(Mullan et al., 2011)
Is this score a useful enrichment measure?

- 63 farms, 170 visits, 981 pen evaluations

- In straw pens, the score was a significant predictor of tail lesions. A higher proportion of active pigs manipulating other pigs significantly predicted a higher probability of tail lesions.

- For non-straw pens, the proportion of pigs occupied with the pen floor or fittings was a significant factor in risk of tail lesions, as was a higher proportion of active pigs manipulating other pigs.

(Taylor et al., unpublished)
POSITIVE WELFARE?

Good Welfare

Quality of a Life

A good life

A life worth living

A life not worth living

Poor Welfare

Balance of good and poor welfare

Needs and wants met

Policy intention

Good substantially outweighs poor welfare

All vital needs, all mental needs and most wants

Clearly beyond minimum legal standard

Good outweighs poor welfare

All vital needs, most mental needs and many wants

Minimum legal standard

Poor to bad welfare

Vital needs only, few, if any, wants

Avoidance of unwarranted suffering

Farm Animal Welfare Council, 2009
Does good enrichment generate “positive welfare”? (Mullan et al., 2011)

15 UK farms, 5 pens, 100 pigs/farm
Cognitive bias test

3 stimuli:

- Positive (glockenspiel then apple) = approach
- Negative (clicker then shaken plastic) = do not approach
- Ambiguous (squeaky toy then nothing) ? response

The Hatch (pigs either do or do not approach this depending on the stimulus)
Pigs placed behind the line between stimuli (30 second wait)

(Douglas et al., 2012)
Housing

Prolonged environment (4 weeks training)
New environment (7 days)
Return to original environment (7 days)

Group 1
Enriched

Group 2
Barren

Testing Days:
Day -1 Day 1 Day 6

Day 1 Day 6
Results

Group 1 (enriched first) - Probability of response

(Douglas et al., 2012)
Conclusions

- Enrichment is a complex concept
- Legislation on “type” (object/material) ignores other important aspects
- Outcome measures should be applied – but evaluation should be more than just absence of injurious behaviour
- Measures to define “positive welfare” value of enrichment need further development