On-farm welfare assessment in dairy cattle

Improving animal welfare: a practical approach
Budapest, September 26th-27th, 2011

Christoph Winckler [christoph.winckler@boku.ac.at]
Towards a European animal welfare assessment standard

- Inform consumers about the welfare status of the animals from which they buy products
- Give advisory feedback to the farmers
Steps toward welfare improvement

Welfare Assessment

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Not lame</td>
</tr>
<tr>
<td>2</td>
<td>Lame</td>
</tr>
<tr>
<td>3</td>
<td>Severely lame</td>
</tr>
</tbody>
</table>

Timing of steps and weight-bearing equal on all four feet.

Irregular foot fall – uneven temporal rhythm between hoof-beats, weight not borne for equal time on each of the four feet. This creates a definite limp and the affected limb is immediately obvious. A favoured limb will move more quickly than the lame limb.

Steps toward welfare improvement
Outcome-based vs. resource-based

Influencing factors = indirect parameters

Housing

Management, human-animal relationship

Genetics, ...

WELLFARE?

Output = direct parameters

Health, injuries

Behaviour

Physiology
Outcome-based vs. resource-based

Influencing factors = indirect parameters

- Housing
- Genetics, ...

WELFARE?

Output = direct parameters

- Health, injuries
- Physiology

Easy to assess
But validity?

Validity high
Time consuming
Knowledge

Options for animal welfare labelling and the establishment of a European Network of Reference Centres for the protection and welfare of animals

... could lead to a system based not on production method, but on animal-based outcomes to classify animal welfare which could be useful to provide consumers with transparent and reliable information.
Output measures often widely accepted

To develop on-farm welfare assessment systems that

- focus on **animal-based** measures (i.e. output measures),
- are **scientifically sound**, and
- are **feasible**.
4 principles, 12 criteria

- Good human-animal relationship
- Expressing social behaviour
- Expressing other behaviours
- Good feeding
- Absence of prolonged hunger
- Absence of prolonged thirst
- Appropriate behaviour
- Thermal comfort
- Good housing
- Comfort around resting
- Ease of movement
- Good health
- Absence of pain induced by management procedures
- Absence of disease
- Absence of injuries
- Positive emotional state
- Absence of injuries
## 6.1 Collection of data for dairy cows on farm

<table>
<thead>
<tr>
<th>Welfare Criteria</th>
<th>Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Good feeding</strong></td>
<td></td>
</tr>
<tr>
<td>1 Absence of prolonged hunger</td>
<td>Body condition score</td>
</tr>
<tr>
<td>2 Absence of prolonged thirst</td>
<td>Water provision, cleanliness of water points, water flow, functioning of water points</td>
</tr>
<tr>
<td><strong>Good housing</strong></td>
<td></td>
</tr>
<tr>
<td>3 Comfort around resting</td>
<td>Time needed to lie down, animals colliding with housing equipment during lying down, animals lying partly or completely outside the lying area, cleanliness of udders, cleanliness of flank, upper legs, cleanliness of lower legs</td>
</tr>
<tr>
<td>4 Thermal comfort</td>
<td>As yet, no measure is developed</td>
</tr>
<tr>
<td>5 Ease of movement</td>
<td>Presence of tethering, access to outdoor loafing area or pasture</td>
</tr>
<tr>
<td><strong>Good health</strong></td>
<td></td>
</tr>
<tr>
<td>6 Absence of injuries</td>
<td>Lameness (loose housed animals), lameness (tied animals), integument alterations</td>
</tr>
<tr>
<td>7 Absence of disease</td>
<td>Coughing, nasal discharge, ocular discharge, hampered respiration, diarrhoea, vulvar discharge, milk somatic cell count, mortality, dystocia, downer cows</td>
</tr>
<tr>
<td>8 Absence of pain induced by management procedures</td>
<td>Disbudding/dehorning, tail docking</td>
</tr>
<tr>
<td><strong>Appropriate behaviour</strong></td>
<td></td>
</tr>
<tr>
<td>9 Expression of social behaviours</td>
<td>Agonistic behaviours</td>
</tr>
<tr>
<td>10 Expression of other behaviours</td>
<td>Access to pasture</td>
</tr>
<tr>
<td>11 Good human-animal relationship</td>
<td>Avoidance distance</td>
</tr>
<tr>
<td>12 Positive emotional state</td>
<td>Qualitative behaviour assessment</td>
</tr>
</tbody>
</table>
4 steps during the farm visit

1. Behaviour observations/behavioural tests
2. Health: clinical scoring, health records
3. Resources checklist
4. Management questionnaire
4 principles, 12 criteria

Behaviour observations/behavioural tests

- Good feeding
- Good housing
- Good health
- Comfort around resting

Expressing social behaviour
Expressing other behaviours
Good human-animal relationship
Positive emotional state
<table>
<thead>
<tr>
<th>Dairy</th>
<th>Lying down movement</th>
<th>Duration of movement (in seconds)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Collision with housing equipment during the movement</td>
</tr>
<tr>
<td>Lying position</td>
<td>Lying partly/completely outside lying area (cubicles)</td>
<td></td>
</tr>
</tbody>
</table>
Comfort around resting

Time needed to lie down

Definition

Time recording of a lying down sequence starts when one carpal joint of the animal is bent and lowered (before touching the ground). …
… The whole lying down movement ends when the hind quarter of the animal has fallen down and the animal has pulled the front leg out from underneath the body.

Hind quarter fallen down
Front leg under body

Front leg pulled out

Comfort around resting
Time needed to ly down

stop time recording
During lying down the cow hits against housing equipment with any part of the body (usually hind quarter or side). The collision is obviously seen or heard.
Expression of social behaviours

Agonistic behaviours

AGO = head butt + displacement + chasing + fighting + chasing-up

Dairy cattle in tie stalls:
AGO = head butt + displacement + chasing-up

Frequency recording of behaviours using continuous behaviour sampling in segments of the barn/pen

- 2 h net observation time
- up to 12 segments/pens
Definition Head butt

Interaction involving **physical contact** where the actor is butting, hitting, thrusting, striking or pushing the receiver with forehead, horns or horn base with a **forceful movement**; The receiver does **not** give up its **present position**.
Definition displacement (DP)

**Loose housed dairy cattle**

Interaction involving **physical contact** where the actor is **butting, hitting, thrusting, striking, pushing or “penetrating”** *(see next slide)* the receiver with forehead, horns, horn base or any other part of the body with a **forceful movement** and as a result the receiver does **give up its present position** *(walks away for at least half an animal-length or stepping aside for at least one animal-width)*.

**Special case:** “chain reaction” or “domino effect” at feeding rack: If after a displacement neighbouring animals also leave their feeding places but physical contact as described above is not involved, this reaction is not recorded as displacement.
Definition Fighting

Only recorded in loose housed dairy cattle

Two contestants vigorously pushing their heads (foreheads, horn bases and/or horns) against each other while stemming their feet into the ground in sawbuck position and both exerting force against each other.

Other agonistic interactions (head butt, displacement, chasing) are not recorded additionally as long as they are part of the fighting sequence.

A new bout is recorded if the same animals start fighting after 10 seconds or more or if the fighting partner changes.
Definition Chasing-up

The actor uses forceful physical contact (e.g. butting, pushing, shoving) against a lying animal which makes the receiver rise.

It is not relevant where the receiver has been lying (whether in defined resting area, cubicle or in walking/feeding alley or other activity areas).
Expression of social behaviours

Agonistic behaviours
Good human-animal relationship

Avoidance distance

- Avoidance distance at the feed gate
- At individual level
- Sample of cows/pens (~50% of the animals)
**Good human-animal relationship**

**Avoidance distance**

<table>
<thead>
<tr>
<th>Individual level:</th>
<th>Distance in cm (200-0 cm, with a resolution of 10 cm)</th>
</tr>
</thead>
</table>

**Classification**

<table>
<thead>
<tr>
<th>Herd level:</th>
<th>Percentage of animals that can be touched</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Percentage of animals that can be approached closer than 50 cm but not touched</td>
</tr>
<tr>
<td></td>
<td>Percentage of animals that can be approached as closely as 100 to 50 cm</td>
</tr>
<tr>
<td></td>
<td>Percentage of animals that cannot be approached as closely as 100 cm</td>
</tr>
</tbody>
</table>
Are animals content, relaxed, at ease, or in pain, distressed, bored ...

Can we perceive this?

Yes ... through animal’s ‘body language’

Requires a holistic perspective:

- integrative: *whole* animal
- dynamic: *how* animal behaves
- expressive: *style* of behaving

Requires knowing cattle well:
- correct interpretation
- avoiding anthropomorphism (pig-morphism, poultry-m.)
To observe animal as whole being = to see more than just ‘behaviour’

Not just ‘sitting’ ...

But an animal who sits in a certain way, with a certain expression ...
The terms used for dairy cow QBA assessment are:

- Active
- Relaxed
- Fearful
- Agitated
- Calm
- Content
- Indifferent
- Frustrated
- Friendly
- Bored
- Playful
- Positively occupied
- Lively
- Inquisitive
- Irritable
- Uneasy
- Sociable
- Apathetic
- Happy
- Distressed

Please observe the animals in the unit for 10-20 minutes, and then assess their behavioural expression ('body language') by scoring the following terms:

<table>
<thead>
<tr>
<th>Term</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relaxed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fearful</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Clinical scoring

- Absence of prolonged hunger
- Absence of disease
- Absence of injuries

Good feeding

Good housing

Appropriate behaviour

Good health
Absence of prolonged hunger  
*Body Condition Score*

- View the animal from behind and from the side
- Although the assessment will be carried out visually, it is helpful to feel palpate the animal during training
- Four areas under consideration
# Classification of dairy cows as too thin or too fat

<table>
<thead>
<tr>
<th>Body Region</th>
<th>Too thin</th>
<th>Too fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailhead</td>
<td>Cavity around tailhead</td>
<td>Tailhead cavity full and folds of fatty tissue present</td>
</tr>
<tr>
<td>Loin</td>
<td>Deep depression between backbone and hip bones (tuber coxae)</td>
<td>No depression between backbone and hip bones (tuber coxae)</td>
</tr>
<tr>
<td>Vertebrae</td>
<td>Ends of transverse processes sharp</td>
<td>Transverse processes not discernible</td>
</tr>
<tr>
<td>General</td>
<td>Tailhead, hip bones (tuber coxae), spine and ribs prominent</td>
<td>Outlines of fat patches visible under skin</td>
</tr>
</tbody>
</table>

**If 3 or more** criteria are present the animal is classified as “too thin” or “too fat”
## Classification of beef and dual purpose cows as too thin or too fat

<table>
<thead>
<tr>
<th>Body Region</th>
<th>Too thin</th>
<th>Too fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tailhead</td>
<td>Cavity around tailhead</td>
<td>Tailhead cavity full and folds of fatty tissue present</td>
</tr>
<tr>
<td>Loin</td>
<td>Visible depression between backbone and hip bones (<em>tuber coxae</em>)</td>
<td>Convex between backbone and hip bones (<em>tuber coxae</em>)</td>
</tr>
<tr>
<td>Vertebrae</td>
<td>Ends of transverse processes distinguishable</td>
<td>Transverse processes not discernible</td>
</tr>
<tr>
<td>General</td>
<td>Tailhead, hip bones (<em>tuber coxae</em>), spine and ribs visible</td>
<td>Outlines of fat patches visible under skin</td>
</tr>
</tbody>
</table>

If **3 or more** criteria are present the animal is classified as “too thin” or “too fat”
Very lean -
Deep tailhead cavity
Very lean -
Deep depression (concave shape) between backbone and hipbone (tuber coxae)
Very lean -

Ends of transverse processes of vertebrae sharp
Very lean -
Prominent bones
The dividing line!

Acceptable

Very lean!
Very fat

Tailhead cavity filled with fat

Convex shape between spine and tuber coxae
Areas to assess:

1. lower hind leg including the hock
2. hind quarter – upper hind leg, hind quarter and rear view excluding udder
3. udder including teats
“Plaques” are three-dimensional layers of dirt amounting to the size of the palm of a hand or if more than half of the area under consideration is covered with dirt.

<table>
<thead>
<tr>
<th>Region</th>
<th>Acceptable</th>
<th>Dirty</th>
</tr>
</thead>
<tbody>
<tr>
<td>lower hind legs (coronary band to hock)</td>
<td>little or no dirt</td>
<td>separate or continuous plaques of dirt above the coronary band (a)</td>
</tr>
<tr>
<td>hinder quarter (upper leg above the hock and rear view, excluding udder)</td>
<td>no dirt present</td>
<td>separate or continuous plaques of dirt (a)</td>
</tr>
<tr>
<td>udder</td>
<td>no dirt present</td>
<td>distinct plaques of dirt on udder (a) or any dirt on and around the teats</td>
</tr>
</tbody>
</table>
hind quarter – tail also included; hair tuft excluded
udder - including side view and teats

lower legs
minor splashes of dirt

plaques of dirt – are three-dimensional
udder dirty – plaques of dirt

hind quarter acceptable - only small splashes of dirt
hind quarter **dirty** – plaques of dirt

udder **dirty** – plaques of dirt

lower legs **dirty** – plaques of dirt
Absence of injuries

Lameness

Locomotion scoring

- Observe cows walking in single file on a level, smooth, hard surface, on which they would normally walk
- View cows walking voluntarily from behind and/or from an angle/the side
- Driving (e.g. by an assistant) may influence results
### Locomotion scoring

<table>
<thead>
<tr>
<th>Score</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – Not lame</td>
<td>Timing of steps and weight bearing are equal on all four feet (this includes tender footing and reduced joint flexion)</td>
</tr>
<tr>
<td>1 - Lame</td>
<td>Imperfect temporal rhythm creating a limp – irregular timing of steps (favoured limb will move more quickly than the lame limb)</td>
</tr>
<tr>
<td>2 – Severely lame</td>
<td>More than one limb affected, or strong reluctance to bear weight on one or more limbs or does not bear weight on one limb</td>
</tr>
</tbody>
</table>
2 categories of integument alterations:

1. hairless patches
2a. lesions
2b. swellings
1. Hairless patches

- area with hair loss
- skin not damaged
- extensive thinning of the coat due to parasites
- hyperkeratosis (callosity) possible
2. Lesions

- damaged skin either in form of a scab or a wound
- dermatitis due to ectoparasites
- completely or partly missing teats
- ear lesions due to torn off ear tags
3. Overt swellings

- obvious increase in circumference compared to sound state

no swelling
Criteria - skin alterations

- count all skin alterations $>2\text{cm}$
- if more than 20 alterations “21” is noted

- the maximum (“21”) is also noted, if the **total area affected** is equal to the area covered by a hand
Taking the measurement

- maximum distance to focal animal: 2 meters
- examination of only one side (skin + claw condition; random side selection!)
- view from behind, side and front
Body areas

- Hindquarter
- Neck/shoulder/back
- Tarsus (incl. hock)
- Flank/side/udder
- Carpus
Absence of disease

Signs of clinical disease in individual animals:

1. Nasal discharge
2. Ocular discharge
3. Hampered respiration
4. Diarrhoea
5. Vulvar discharge
Absence of disease

Information from records

Milk somatic cell count

<table>
<thead>
<tr>
<th>Title</th>
<th>Milk somatic cell count</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope</td>
<td>Animal-based measure: Dairy cows</td>
</tr>
<tr>
<td>Sample size</td>
<td>Sample size according to § 6.1.5</td>
</tr>
<tr>
<td>Method description</td>
<td>This measure applies to all dairy cows, and requires input from animal unit manager.</td>
</tr>
</tbody>
</table>

Milk somatic cell count data can be obtained from milk records. They are collected at individual cow level from a period of three months prior to the farm visit. Such data can also be collected in advance of the farm visit. Somatic cell counts greater than 400,000 are considered to indicate sub clinical inflammation.

Individual level:
0 – Somatic cell count below 400,000 within 3 months
2 – Somatic cell count of 400,000 or above within 3 months

Classification
Herd level:
Percentage cows with somatic cell count of 400,000 or above (i.e. score 2)
Information from records

Mortality
Incidence of dystocia
Incidence of downer cows

<table>
<thead>
<tr>
<th>Title</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scope</td>
<td>Animal-based measure: Dairy cows</td>
</tr>
<tr>
<td>Sample size</td>
<td>Animal unit</td>
</tr>
<tr>
<td>Method description</td>
<td>Mortality is defined as the ‘uncontrolled’ death of animals as well as cases of euthanasia and emergency slaughter. The animal unit manager is asked about the number of dairy animals which died on the farm, were euthanized due to disease or accidents or were emergency slaughtered during the last 12 months. Additionally the average number of dairy cows in the animal unit is asked. Farm records may also be used.</td>
</tr>
<tr>
<td>Classification</td>
<td>Herd level: Percentage of animals dead, euthanized and emergency slaughtered on the farm during the last 12 months</td>
</tr>
</tbody>
</table>
Sample size for measures in individual animals

Selecting dairy cows for assessment
For some of the measures, random sampling is required. This is indicated in the description of the measures. Check the current number of animals and determine the sample size according to Table 13.

<table>
<thead>
<tr>
<th>Herd size</th>
<th>Number of animals to score (suggestion A)</th>
<th>If A is not feasible</th>
</tr>
</thead>
<tbody>
<tr>
<td>30</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>40</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>50</td>
<td>33</td>
<td>30</td>
</tr>
<tr>
<td>60</td>
<td>37</td>
<td>32</td>
</tr>
<tr>
<td>70</td>
<td>41</td>
<td>35</td>
</tr>
<tr>
<td>80</td>
<td>44</td>
<td>37</td>
</tr>
<tr>
<td>90</td>
<td>47</td>
<td>39</td>
</tr>
<tr>
<td>100</td>
<td>49</td>
<td>40</td>
</tr>
<tr>
<td>110</td>
<td>52</td>
<td>42</td>
</tr>
<tr>
<td>120</td>
<td>54</td>
<td>43</td>
</tr>
<tr>
<td>130</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>140</td>
<td>57</td>
<td>46</td>
</tr>
<tr>
<td>150</td>
<td>59</td>
<td>47</td>
</tr>
<tr>
<td>160</td>
<td>60</td>
<td>48</td>
</tr>
<tr>
<td>170</td>
<td>62</td>
<td>48</td>
</tr>
<tr>
<td>180</td>
<td>63</td>
<td>49</td>
</tr>
<tr>
<td>190</td>
<td>64</td>
<td>50</td>
</tr>
<tr>
<td>200</td>
<td>65</td>
<td>51</td>
</tr>
</tbody>
</table>

Applies to:
- Body condition score
- Cleanliness
- Lameness scoring
- Integument alterations
- Clinical signs
<table>
<thead>
<tr>
<th>Dairy cows</th>
<th>Herd size</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>60</td>
</tr>
<tr>
<td><strong>Sample size</strong></td>
<td>37</td>
</tr>
<tr>
<td><strong>Avoidance distance (min)</strong></td>
<td>37</td>
</tr>
<tr>
<td><strong>QBA (min)</strong></td>
<td>25</td>
</tr>
<tr>
<td><strong>Behaviour (min)</strong></td>
<td>150</td>
</tr>
<tr>
<td><strong>Clinical scoring (min)</strong></td>
<td>111</td>
</tr>
<tr>
<td><strong>Resources (min)</strong></td>
<td>10</td>
</tr>
<tr>
<td><strong>Total duration (h)</strong></td>
<td>5:30</td>
</tr>
</tbody>
</table>
How long does it take?

Duration depends on:

- Farm/herd size
- Facilities (i.e. number of pens, accessibility...)
- Skills and experience of observer
- [Farmer]
Protocols work(ed) well

Schedule depends on farm routines, but some flexibility (e.g. interview)

Positive response by vast majority of farmers (both dairy and beef)

High level of interest in animal-based parameters!
Quick and easy data entry

→ Palm, tablet PC
Thank you for your attention