



## Indicators at slaughter to assess broiler welfare on farm

### Introduction

Some Animal Based Indicators (ABIs) collected at slaughter can provide retrospective information on the welfare of broilers on farm.

These ABIs are commonly referred to as “iceberg indicators” (EFSA, 2023), since they are related to more than one welfare consequence.

EFSA (2023) proposes the following ABIs for monitoring at slaughter the welfare of broilers on-farm: ‘total mortality’, ‘carcass condemnations’, ‘wounds’ and ‘footpad dermatitis’.

### Total mortality

**Definition:** Total number of dead chicken in the flock during rearing on farm. Calculation of **mortality rate** is used (EFSA, 2023).

The total mortality in a flock is measured by the **Cumulative Daily Mortality Rate (CDMR)** that is the sum of all **daily mortality rates (DMR)** up until the last day on farm.

The DMR is the number of broilers which have died in the farm on the same day (including the birds culled), divided by the number of birds present on that day, multiplied by 100.

#### Daily mortality rate % (DMR)=

$$\frac{\text{Number of birds culled and found dead each day}}{\text{Number of birds in the house at the start of each day}} \times 100$$

**Timing of assessment:** DMR is calculated each day from the beginning of rearing. CDMR is calculated on farm and then transmitted with the flock to the slaughterhouse at the end of production.

**Interpretation:** High flock mortality represents a severe welfare concern and can be caused by an outbreak of disease or problems with the environment in the building.

Other factors, affecting total mortality on farm, are chick mortality in the first week and the culling policy of the farmer: culling of birds, whatever the reason, is a way to minimise suffering of sick, injured or runt animals.

### Carcass condemnation

**Definition:** Carcasses or parts of the carcass that are unfit for consumption, and therefore rejected, described as rate of rejected carcasses out of a total slaughtered.

The condemnation rate (CR%) is obtained by calculating the proportion of condemned carcasses on the total number of animals slaughtered in a batch.

#### Condemnation rate% (CR)=

$$\frac{\text{Total n° of condemnation}}{\text{Total n° of slaughtered broilers}} \times 100$$

**Timing of assessment:** Post-mortem, on the slaughterhouse line.

**Interpretation:** Post-mortem carcass inspection results help to identify possible poor welfare conditions on farm.

High rates of carcass condemnation can be used as a proxy of poor welfare, assuming that severe lesions or poor body conditions have caused negative affective states such as pain.

As condemnation assessment addresses only the cases that are relevant to food safety, low levels of carcass condemnation might not necessarily reflect good welfare on farm (EFSA, 2023).

Some reasons for condemnation, undoubtedly associated with impaired welfare, are: hematomas (fig.1), breast blisters (fig.2), bruises (fig.3,4), ascites, dermatitis and emaciation (Ellerbroek, 2019).



Figure 1. Hematoma on the pectoral muscle (IRTA ©)



Figure 2. Breast blister (IZSLER ©)

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## Wounds

**Definition:** Soft tissue damage with or without rupture of the skin. Wounds ranging from minor superficial punctiform spots to scratches or large open wounds that go deeper than the skin (*Welfare Quality Network, 2019*). It also includes bruises.

**Timing of assessment:** Post – mortem, on the slaughterhouse line, after defeathering.

A method to carry out wound checks, in order to determine time of occurrence, severity and frequency, should be based on post-mortem visual assessment of defeathered broilers to assess bruises (i.e., extent, site of bruising, colour, appearance and severity, or a combination) and skin lesions (i.e., occurrence and severity) on the slaughterhouse line (*EURCAW – Poultry – SFA, 2020*).

### Interpretation:

**Bruises** (fig.3, fig.4) are produced by blood extravasation and accumulation in the subcutaneous and muscular tissue and can occur only when a broiler is alive, as a consequence of trauma. The potential causes of bruises are excessively high stocking density in the poultry farm and rough handling during catching and crating (*Kittelsen et al., 2018*).

**Scratches** are caused by the claws of broilers as a result from bird to bird contact due to aggressive interactions, panic movement/excitation or due to huddling when seeking thermal comfort (*Vieira et al., 2012*). The prevalence of scratches on farm is positively correlated to the stocking density (*Eljadil et al., 1996; Villarroel et al., 2018*), but also to abrupt temperature changes, fasting and water deprivation (*EURCAW – Poultry – SFA, 2020*).

**Large open wounds** are skin lesions that go deeper than the skin and could be a consequences of the scratch with open integument, skin rupture due to a trauma or pecking injury.


## Method for assessment

In bruise assessment, several factors could be taken into consideration:

- Only bruises larger than 2 cm (*EURCAW – Poultry – SFA, 2020*);
- The site of bruising (e.g., wing, breast, leg): wing and leg bruises become lighter with the time, breast bruises become darker (*Northcutt et al., 2000*);

 Bruise severity (*EURCAW – Poultry – SFA, 2020*):

- Grade 1:** the damaged area involves only subcutaneous tissues
- Grade 2:** the lesion affects subcutaneous and muscular tissue
- Grade 3:** the bruise is severe and includes bone fracture or dislocation

 Approximate time of occurrence, based on its colour (“recent” if reddish, “not recent” if yellowish, see table 1).

Estimate age of contusion	Colours of the bruise
From 2 minutes	Red
From 12 hours	Dark red / Purple
From 24 hours	Light Purple
36 hours	Light green / Purple
48 hours	Yellow – green – purple
72 hours	Yellow - green
96 hours	Light yellow
120 hours	Normal

Table 1. Colour of bruises in relation to time since the injury was inflicted (adapted from Gregory, 1992). \*Highlighted are the colours of the bruise that refer to the ones most likely to be caused at the farm level.

**Bruises from light purple to yellow are most likely to be caused at the farm level (*EURCAW – Poultry – SFA, 2020*)**

Intense dark red to purple colour: Bruises less than 12 h old (caused during catching and transportation, *Gregory et al., 1992*).

Bright red colour: Bruises caused at the slaughterhouse during shackling (*Bremmer and Johnston, 1996*).



Figure 3. 12h wing bruise (IRTA ©)



Figure 4. 48h wing bruise (Sacrificio humanitario de aves ©)

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Other wounds are counted when there is more than one scratch on the carcass (fig.5) or open wounds larger than 2 cm with a rupture of the skin and deep cut (fig.6).



Figure 5. More than one scratch (IZSLER ©)



Figure 6. Large open back wound (IZSLER ©)

This section describes a method to calculate the percentage of birds with wounds on the slaughter line, also determining which wounds probably occurred on farm:

- Select a good view position to count the total wounds after defeathering of broilers, at a position where the wings, thighs, back and legs of the bird are clearly visible.
- Assess and record if the bird has more than one **scratch** (fig 5) or large open wounds  $\geq 2$  cm (record only the presence or absence of wounds per bird, even if multiple wounds are seen on the same bird).
- Score and record **bruises** only larger than 2 cm, taking care to mark the severity and colour to estimate dating (record only the presence or absence of wounds per bird, even if multiple are seen on the same carcass).
- Assess at least 200 birds per count.
- **Wounds %** =  $\frac{\text{n}^\circ \text{ of animals scored with wounds}}{\text{n}^\circ \text{ of animals assessed}} \times 100$
- Do at least two counts, one at beginning and one at the end of the flock.

- The estimation of how many birds are experiencing wounds occurred on farm is done:
  - For bruises – Considering the colour recorded (table 1), paying attention to those from light purple to yellow (24 – 96 h).
  - For scratches and open wounds - Avoiding fresh red ones (related to transport phase) and considering only the old ones.

## Foot Pad Dermatitis (FPD)

**Definition:** Footpad dermatitis (FPD) is a contact dermatitis that can lead to ulcerative lesions on the plantar surface of footpads in poultry.

**Timing of assessment:** Post – mortem, after collection of the feet.

**Interpretation:** FDP represents one of the main concerns of the broiler chicken sector, because of its impact on both production and animal welfare (EURCAW – Poultry – SFA, 2022).

Birds with severe FDP lesions experience pain, show impaired locomotory behaviour, may show reduced feed intake and weight loss, due to difficulties to reach feeders and drinkers and can be more susceptible to infections with *Staphylococcus aureus* and other microorganisms (EURCAW – Poultry – SFA, 2022).

Footpad health correlates directly to litter quality on farm, in particular wetness.

**Description:** The scoring systems most widely used in Europe are based on a 3-point scale system consisting in an adaptation of the Swedish scoring system (Lotta Berg, 1998).

**0 → No lesion** or very small superficial lesions or healed skin with slight discoloration on limited area of the footpad, enlargement of scales, erythema, mild hyperkeratosis

**1 → Mild lesion.** characterized by hypertrophic and hyperkeratotic scales covered by a yellowish to brownish exudate (poorly adherent crust) with substantial discolouration of the footpad

**2 → Severe lesion.** Depressed lesion, loss of substance, crater (ulceration), with dark (brown or black) thick adherent crust, signs of haemorrhages or severely swollen footpad



Score 0



Score 1



Score 2

Figure 7. FPD score (IZSLER ©)



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## Foot Pad Dermatitis (FPD)

FPD score =  $100\% \left[ \frac{(0 \times \text{the total number of feet with score 0}) + (0.5 \times \text{the total number of feet with score 1}) + (2 \times \text{the total number of feet with score 2})}{\text{Total number of scored feet}} \right]$

Total number of scored feet

*Welfare Quality Assessment protocol for poultry © (2009)*

At the slaughter plant, 200 feet per broiler flock (only the left or the right, to avoid scoring two feet of the same bird), severed from the carcasses, are collected and assessed using the above scoring system. An overall score is then assigned to the flock ranging from 0 (all feet score 0) to 200 (all feet score 2). Feet can also be assessed on the line, although the high shackle line speed makes it often difficult.

Action shall be taken on farm, based on the result assessed at slaughter, according to a defined threshold level. For example in Sweden and Denmark the threshold value for FPD score of a flock has been set at 80 (EURCAW – Poultry - SFA, 2022).

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