EVENT REPORT

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The use of animal-based measures at slaughter for assessing the welfare of broiler chicken on farm: scientific NCPs Network exercise

European Food Safety Authority

Abstract

The Network of the National Contact Points for scientific support under Art 20 of Council Regulation (EC) 1099/2009 on the protection of the animals at the time of killing (scientific NCPs Network) includes nationally appointed representatives of Members States, including EFTA Countries. At the annual scientific NCPs Network meeting held in October 2021, an exercise was set up to collect information from Network members on the use of animal-based measures (ABMs) at slaughter to assess welfare in the farms of broiler chickens. In preparation for the meeting, the participants were asked to submit an online questionnaire to collect information on the use of such ABMs in the various European countries. Among the information, the ease of use, and the relationship of the ABMs with one or more welfare consequences were collected. During the meeting, the exercise continued with discussion and further elaboration of the information submitted. Meeting participants were asked to express their opinion by voting on the reliability of post-mortem ABMs to on-farm welfare conditions, on feasibility of assessing the ABMs at slaughter, and on which ABMs to prioritize. The exercise was held for the assessment of ABMs during *ante-mortem* and *post-mortem* inspections and, as a result of this exercise, informative lists of the most promising ABMs to be used at slaughterhouses to monitor the welfare of broiler chickens in the farm were produced.

Key words: broiler chickens, animal-based measures, slaughter, welfare assessment, on-farm welfare, *ante-mortem* and *post-mortem* inspections.

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1. Introduction

The new Farm to Fork (F2F) strategy was published on 20 May 2020 (https://ec.europa.eu/food/sites/food/files/safety/docs/f2f_action-plan_2020_strategy-info_en.pdf) and includes a new comprehensive approach to increase European food sustainability.

In the framework of its F2F strategy, the EC has started a comprehensive evaluation of the animal welfare legislation and requested to EFSA a comprehensive and updated assessment of the scientific knowledge on welfare aspects of i) pigs, ii) calves, iii) laying hens, iv) broiler chickens and v) animal transportation.

Against this background, the EC requested EFSA to review the available scientific publications and possibly other sources to provide a sound scientific basis for future legislative proposals.

EFSA is requested to: i) describe, based on existing literature and reports, the current husbandry systems and practices of keeping the animals ii) describe the relevant welfare consequences iii) define qualitative or quantitative measures to assess the welfare consequences (animal-based measures) iv) identify the hazards leading to these welfare consequences v) provide recommendations to prevent, mitigate or correct the welfare consequences (resource and management-based measures).

In addition, the EC has identified practical difficulties or insufficient information in ensuring the welfare of the animals in certain specific scenarios. For these specific scenarios, EFSA should propose detailed qualitative (yes/no question) or quantitative (minimum/maximum) animal-based measures (ABMs) and preventive and corrective measures.

In the F2F mandates, a specific scenario relates to the need for EFSA to define ABMs collected and assessed in slaughterhouses to monitor the level of animal welfare on farms.

With specific reference to the protection of broiler chickens, EFSA is requested to collect evidence on the use of ABMs collected in slaughterhouses to monitor the level of welfare on broilers farms[1].

EFSA is therefore developing the relevant sections of the scientific opinions on the protection of domestic fowl related to the production of meat (broiler chickens), including a list of *ante-mortem* and *post-mortem* ABMs (such as footpad dermatitis) that could be used at slaughter to assess the welfare of broiler chickens on farm.

The scientific NCPs Network is composed by the EU MS (including EFTA Countries) National Contact Points that provide scientific support under Art 20 of Reg. (EC) 1099/2009 on the protection of the animals at the time of killing (scientific NCPs). At the annual Network meeting held in October 2021 an exercise was held to collect information from Network members on the use of ABMs at slaughter to assess farm welfare in broiler chickens.

2. Methodology

2.1. Questionnaire on the use of ABMs at slaughter to assess welfare of broiler chickens on farm

In preparation for the meeting held in 2021, scientific NCPs Network members were requested to complete an online questionnaire to collect information from their countries. The questionnaire was composed by two sections:

- Section on *ante-mortem* inspection of broiler chickens. It included an open field to be compiled with free text (see Annex A, Part A), giving the possibility to each respondent to list relevant ABMs (if any), together with their descriptions.
- Section on *post-mortem* inspection of broiler chickens, reporting an initial list of potentially relevant ABMs, together with their descriptions, produced by the EFSA experts on the basis of

[1] https://open.efsa.europa.eu/questions/EFSA-Q-2020-00479

existing literature (Welfare Quality®, 2009; EFSA AHAW Panel, 2012) (see Annex A, Part B). *Post-mortem* ABMs are listed in Table 1.

Table 1: List of ABMs for *post-mortem* assessment produced by the EFSA's WG experts. Descriptions of ABMs are reported in Annex A, Part B.

Broiler chickens
1. Wounds
2. Plumage damage
3. Footpad dermatitis
4. Hock burn
5. Breast blister
6. Bruise
7. Cellulitis
8. Emaciation
9. Ascites
10. Indicators used for carcase condemnation (e.g. septicaemia, hepatitis, pericarditis, abscess, arthritis)
11. Red or inflamed skin

A list of welfare consequences on farm, and their descriptions, was also produced by the EFSA experts and proposed in the questionnaire to investigate the association between ABMs assessed at slaughter and the welfare consequences on farm. The list of welfare consequences is reported in Annex B.

The aim of the questionnaire was to collect data on broiler chickens.

In the section of the questionnaire on *post-mortem* inspection (Annex A, Part B), Network members were requested to:

A. Indicate which of the listed ABMs are currently used in the slaughterhouses in the country as indicators of on-farm animal welfare;

B. Indicate which scoring systems are in place to assess these ABMs;

C. Provide an estimation of the ease of use of these ABMs (easy-medium-difficult);

D. Identify the association between the ABMs and welfare consequences on farm.

2.2. Exercise during the meeting

2.2.1. Open discussion

The questionnaires were discussed during the scientific NCPs Network meeting, held on 05-06 October 2021, where the exercise was continued to further discuss and to extend the information submitted by Network members. The main objectives were, for each ABM:

- to gather information on which ABMs are assessed in broiler chickens at slaughter.
- to gather information on whether Network members have any database (e.g electronic recording) of the ABMs;
- to discuss the aim of monitoring the ABMs at the slaughterhouse (i.e. if an ABM was already recorded with the specific purpose of assessing animal welfare, and/or for other purposes);

- to know Network members' opinion on future development, i.e. if in their country the monitoring system is likely to be implemented
- to discuss possible scoring systems
- to define the feasibility (indicated as ease of use in the questionnaire) of an ABM in a monitoring process implemented at the slaughterhouse.
- to collect information on the association between the ABM and the broiler welfare consequences on farm.

In addition, for the specific case of footpad dermatitis information were collected on the sample size and on the actions that need to be put in place at farm level on the basis of the results of official controls at the slaughterhouse .

2.2.2. Poll

In the context of a possible set up of a EU standardised monitoring system in the future, participants were invited to score four specific questions on ABMs in *post-mortem*. Microsoft Forms (Microsoft ©) was the tool used to issue real-time polls and collect the answers. Each participant could submit the poll only once, and the submission was anonymous.

The questions of the poll were:

1. Do you think this ABM collected in *post-mortem* inspection at the slaughterhouse can provide information on the level of animal welfare on farm (worthiness of use)?
2. If we want to use this ABM for the purpose of assessing the welfare on farm, how do you consider it in the future? Do you think the assessment of this ABM is feasible with visual observation, feasible automatically by videos, both or impossible?
3. Do you think the level of feasibility for visual observation of the following ABMs at slaughter is feasible, moderate feasible or difficult?
4. If only a limited number of ABMs at slaughter are possible to be scored in practice, which are the most important ones to prioritise? Do you think this ABM is essential, desirable or not important?

Polling results were visualised, further analysed, and commented in the plenary discussion. After the poll, the results were shown to the participants and a discussion was carried out to comment or explain the results.

3. Results of the assessment – Broiler chickens

Seventeen questionnaires were submitted, and the data were discussed at the meeting to get a common understanding of the information provided. This gave the opportunity to two Network members to add information on the use of ABMs in their countries.

According to the information submitted through the questionnaire, in the case of broiler chickens, all EU Member States reported the use of ABMs at slaughter as indicators of on-farm welfare. From the discussion at the scientific NCPs Network meeting, it emerged that the entry into force of Council Directive 2007/43/EC[2] was the main driver for reaching this achievement. From the time when the Directive entered into force, the level of data on the assessment of ABMs at slaughter to identify possible indications of poor welfare conditions of broiler chickens on farm has increased a lot both in quality and quantity. Among ABMs, footpad dermatitis (FPD) resulted the most widely used one for assessing the welfare of broiler chickens on farm. Data on this ABM are mainly recorded following *ad-hoc* protocols.

When discussing the other ABMs that are used in *ante-* and/or *post- mortem* inspections of broiler chickens, it was explained that, currently, several are assessed at slaughter also for animal welfare purpose, besides food safety and food quality purposes. For these measures some welfare assessment

[2] Council Directive 2007/43/EC of 28 June 2007 laying down minimum rules for the protection of chickens kept for meat production (Text with EEA relevance)

systems are already in place in some countries as well as a structured collection of the data (e.g. in the case of hock burn). Meeting participants also clarified that this assessment is usually performed at flock level. A dynamic situation was described: different scoring methods of assessment are already developed or under development in the different countries. The outcomes of this assessment are communicated to the farmers according to specific thresholds (when defined) or in case of high severity. In general terms, the best means for improving the situation is acting on the stocking density on farm.

The main outcomes of the entire exercise are reported in the following sections.

3.1. ABMs assessed *ante-mortem* at slaughter

From the questionnaire, 15 countries out of the 19 respondents assess ABMs in *ante-mortem* inspection of broiler chickens at slaughter. The ABMs used, together with some relevant information, were reported in the open field of the questionnaire (Annex A, Part A). These ABMs were both health- and behavioural-related: cleanliness, general health conditions, dead on arrival (DOA), total mortality, abnormal behaviours. Several countries reported the assessment of these ABMs in *ante-mortem* inspection and further details were discussed at the meeting:

- **Cleanliness.** Eleven countries reported on the assessment of the level of birds' cleanliness in *ante-mortem*. The presence of very dirty or wet birds is assessed by visual inspection when uncrated and shackled. In most of the countries this ABM is assessed for food safety reasons and, in some cases, recorded in central databases. However, there are countries were broiler chickens' cleanliness is collected also with the aim of monitoring on-farm welfare (e.g. Sweden). Most of the countries do not have specific scoring methods to assess birds' cleanliness, however, exceptions were reported (e.g. Austria).
- **General health conditions.** In *ante-mortem* inspection, an overall health condition of the animals (including e.g. appearance, body condition, quality of plumage, visible mucous membranes, skin surface and legs) is assessed by visual observation. This is mainly carried out for food safety reasons. However, in some cases, this indicator is also used to assess animal welfare on-farm. Scoring methods are in place, however network members did not report any specific threshold. In most cases, general animal welfare-related signs assessed at the slaughterhouse, although only the list of diseases for condemnation are usually recorded and communicated to the farm.
- **DOA** is assessed in several countries. At the meeting it was discussed the peculiarity of this indicator: although DOA is assessed in *ante-mortem* inspection, it intrinsically implies that birds are already dead. In general, dead-on-arrival is assessed at shackling, as a part of the meat assessment protocols. It can be calculated by individual counting or from an estimation of the dead animals on the basis of their weight on arrival. Scoring methods and central databases exist Different thresholds exist among countries, and generally, when the values above, a notification is sent to the producers. A follow-up to the farm and centralised systems for data collection are in place.
- **Total mortality.** European countries record several parameters in relation to total mortality: daily mortality, cumulative daily mortality (recorded on-farm) and DOA. Mortality on- farm is communicated in most of the cases to the slaughterhouse. At slaughterhouse, high total mortality is notified to the farm, leading, in some countries, to farm inspection or to the obligation to decrease the stoking density. Different threshold levels and several protocols exist among countries to assess this ABM.
- **Abnormal behaviours.** In some countries, abnormal behaviours, including moribund animals are assessed in *ante-mortem*. The assessment of this ABMs can be really, difficult before uncrating birds; however, some simple indicators such as panting heavily (heat stress) can be monitored. No specific scoring methods were reported for this ABM, which assessment is mainly subjective and not always in place.

3.2. ABMs assessed *post-mortem* at slaughter

As previously explained (section 2.1), eleven ABMs were originally proposed in the online questionnaire. The number of countries assessing these ABMs is reported in Figure 1.

As shown in Figure 1, all the ABMs listed in the questionnaire were used during *post-mortem* inspection of broiler chickens. Footpad dermatitis (FPD) was the ABM most used from the responding countries whereas plumage was the less used.

During the discussion at the meeting, Network members shared information on the assessment of FPD, and, specifically, in relation to sample size, scoring methods in use and consequences that occur at farm level following the results of official controls at the slaughterhouse.

Most common sample sizes for visual assessment consist in 100 birds/flock or 100 legs/flock (in some countries legs are randomly sampled, while in other countries legs are sampled from the same side in all animals). Differently, if the assessment is automatized (using videos), all animals of the flock can be inspected. Data on FPD assessment are usually recorded in electronic databases. In some countries, not all batches are examined, but only a sample. Few countries replied that the assessment of FPD is not in such a level of development and that a specific scoring method is lacking.

In few countries the total count of the affected animals is the method used. Much countries reported the use of a more complex scoring methods, ranging from skin discoloration or very small superficial lesions to ulceration or severely swollen footpad dermatitis.

All the countries that are recording FPD routinely have defined a threshold. Values of FPD over this threshold will lead to some consequence for the farm of origin. These consequences vary among countries, e.g:

- Notification to the farmer. This can be followed by no further obligation, obligation to reduce the stocking density, or obligation to investigate the cause at the farm and to produce written evidence of the procedure to fix the issues. Notification to the farmer can also be followed by pecuniary penalty,
- Official inspection at the farm
- Exclusion of the flock from high-quality labelling schemes.

Moreover, in some country farmers can apply to have economic support for a reduction in FPD.

In addition to the ABMs proposed in the questionnaire, three countries reported also the use of plumage condition, high dehydration and cannibalism in *post-mortem* inspection. These additional ABMs were reviewed in plenary discussion and it was agreed that they were already covered by the proposed ABMs.

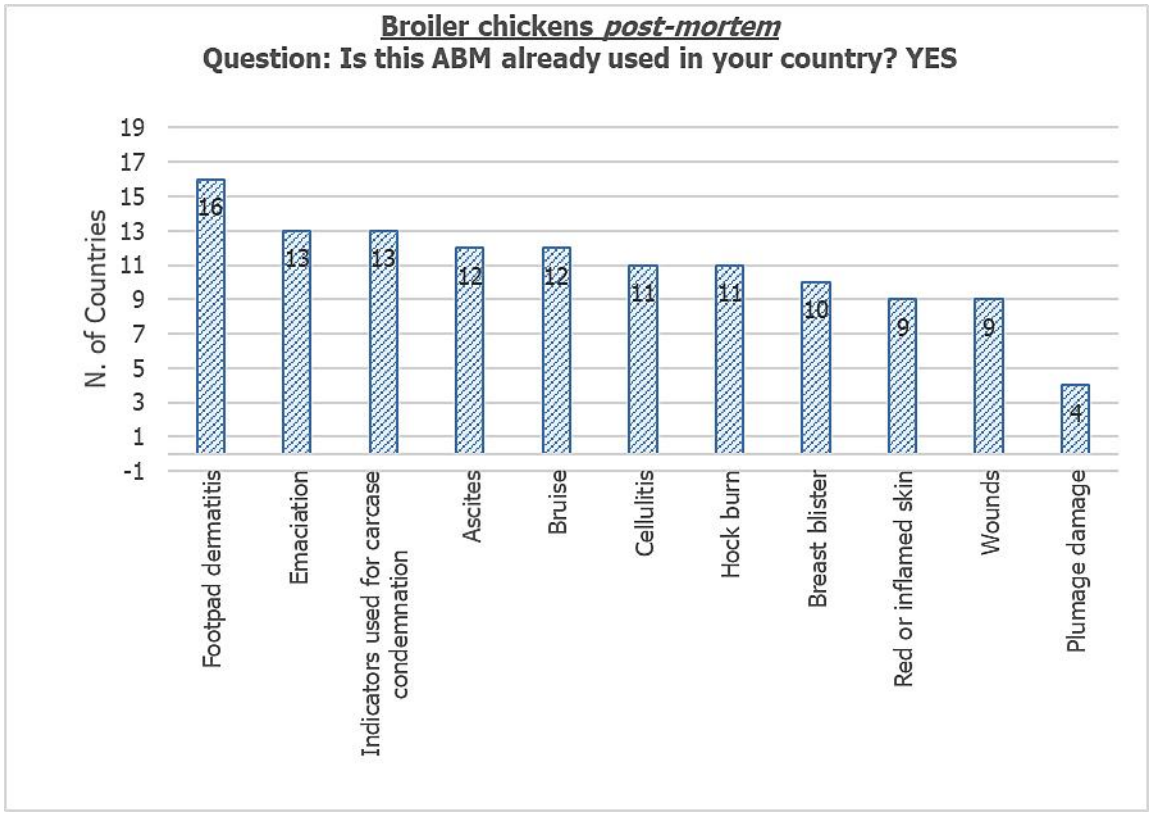

Figure 1: ABMs assessed in *post-mortem* inspection in broiler chickens in the different countries. The y-axis indicates the number of responding countries (on a total of 19 respondents) reporting the use of each ABM. The ABMs proposed by the EFSA experts are visualized in the x-axis.

3.2.1. Assessment of ABMs at slaughter in *post-mortem* inspection by Competent Authorities or Food Business Operators

Network members were requested to indicate whether the assessment of the ABMs post-mortem is performed by the Competent Authorities (CAs) in the framework of the official controls or by the Food Business Operators (FBOs) in relation to e.g. internal quality controls or voluntary private schemes, or for both of them. The results of this question showed that ABM assessment was heterogeneous among countries. Overall, all the ABMs were mainly recorded by CAs (see Figure 2).

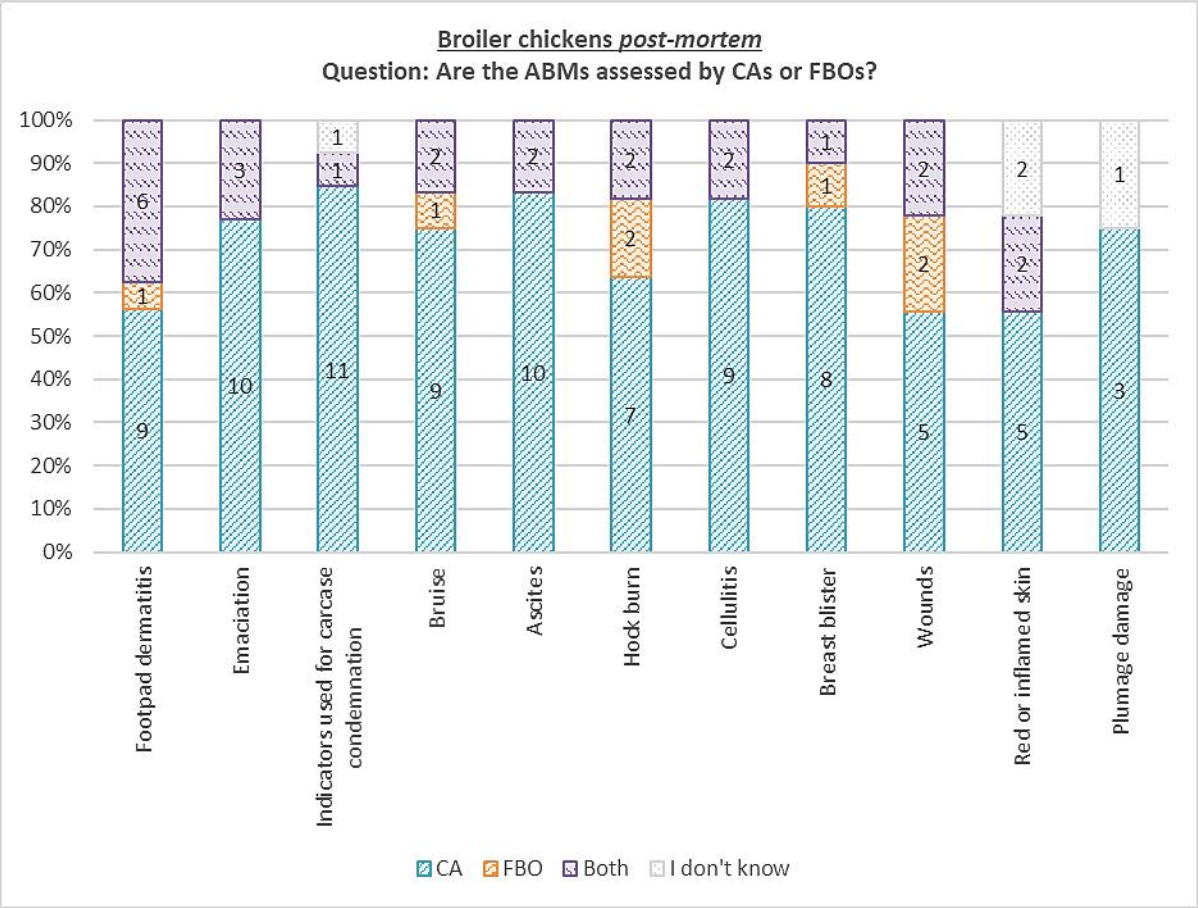

Figure 2: Proportion of countries where ABMs are used in *post-mortem* inspection of broiler chickens by Competent Authorities (CAs), Food Business Operators (FBOs) or for both of them. The histograms report the number of respondents.

3.2.2. Association between ABMs assessed in *post-mortem* inspection and welfare consequences on farm

The possible association between ABMs and on-farm welfare consequences was investigated by analysing the replies to a specific section of the questionnaire (see section 3.2.2.1) and through an on-site poll (see section 3.2.2.2) at the meeting.

3.2.2.1. Identification of welfare consequence associated with ABMs assessed *post-mortem*

The results showed that the respondents associated each ABM monitored at slaughter with one or more than one on-farm welfare consequences. In particular, the assessment at slaughter of red or inflamed skin and indicators used for carcase condemnation was associated with 24 different on-farm welfare consequences, similarly emaciation (23 welfare consequences), wounds and plumage damage (21), whereas cellulitis, footpad dermatitis and bruise were associated with 16 welfare consequences, hock burn and breast blister with 13, and ascites with 10. The list of welfare consequences occurring on farm that were associated with post-mortem ABMs by the respondents is reported in Annex C.

All the welfare consequences pertinent to birds that were listed in the questionnaire were associated with at least one *post-mortem* ABM at slaughter.

3.2.2.2. ABMs collected in *post-mortem* inspection at the slaughterhouse to provide information on the level of animal welfare on farm

At the meeting, participants were asked to express their opinion, through the poll, on the worthiness of each ABM to be used for an evaluation of on-farm welfare conditions. From the results of the poll, all the ABMs were considered informative on the level of animal welfare on farm (see Figure 3).

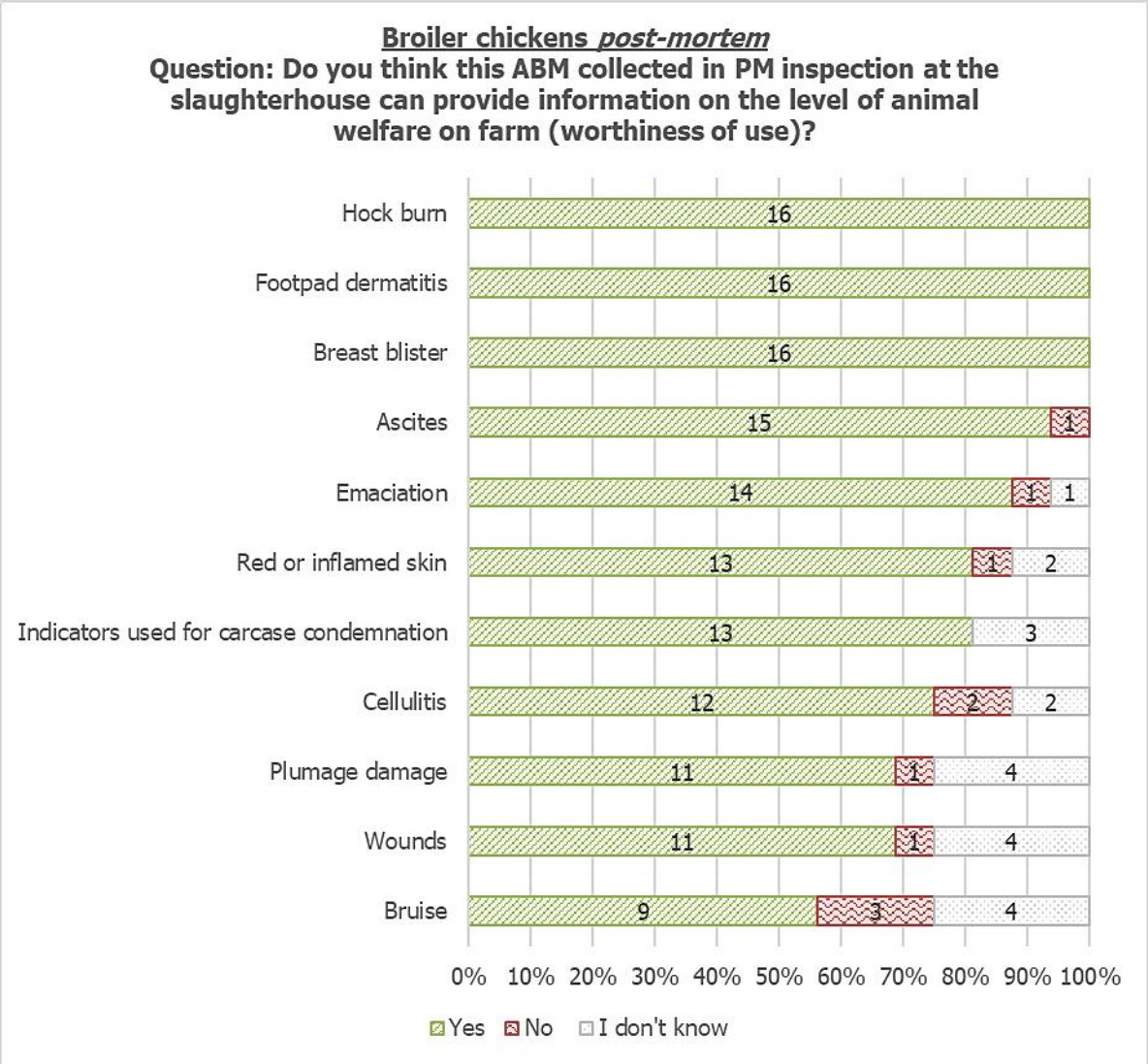

Figure 3: Results from the poll on the worthiness of each post-mortem ABM to be used for an evaluation of on-farm welfare conditions. The histograms report the number of respondents, out of the 16 Network members that responded to this question.

3.2.3. Scoring methods in *post-mortem* assessment

Details on the scoring method used to assess the ABMs used in *post-mortem* inspection were requested in the questionnaire.

Results showed that for most ABMs respondents used a simple assessment method based on presence/absence of the ABM (referred as 'yes/no scoring'), e.g. in the case of indicators used for carcass condemnation, emaciation, ascites, and bruise. Footpad dermatitis and hock burn resulted the AMBs scored using a more detailed scoring method by much of respondents (see also section 3.2). To visually represent the outcomes of this exercise, these detailed scoring systems were then grouped under one single category called 'other scoring methods' (see Figure 4).

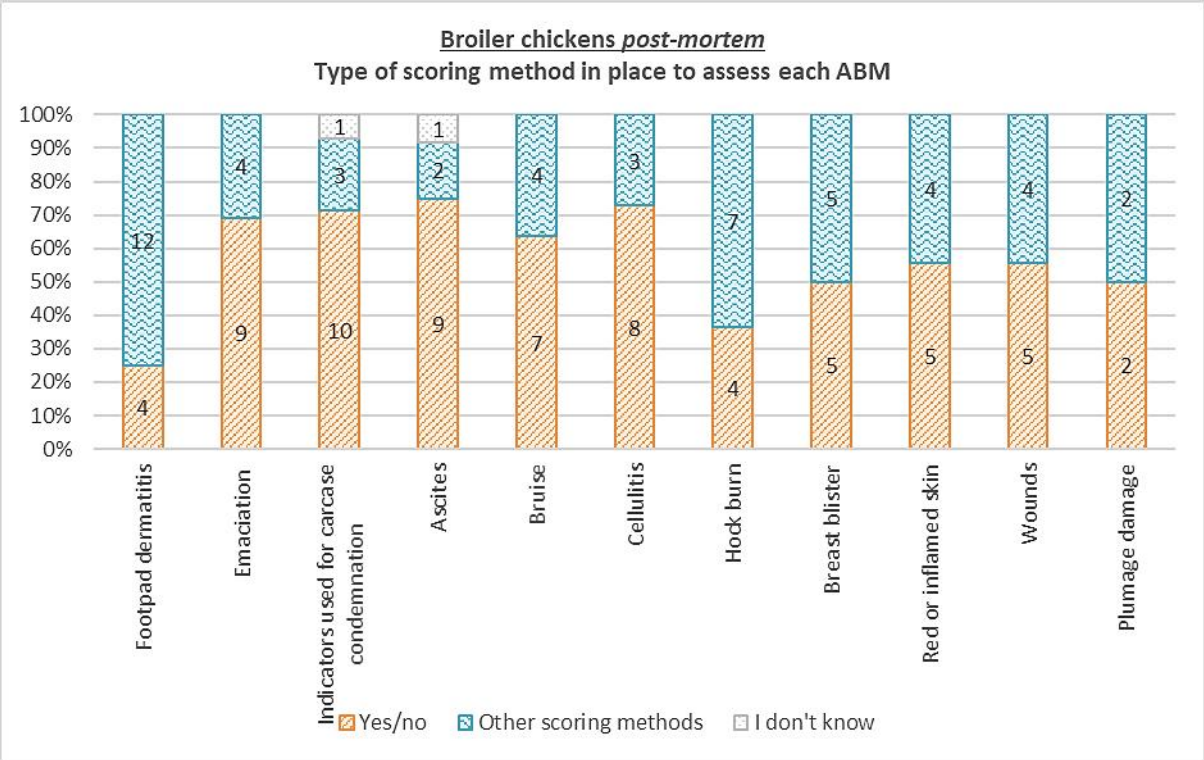

Figure 4: ABMs and scoring methods: results from the questionnaire on the type of scoring method used for assessing each ABM. The histograms report the number of respondents.

3.2.4. Feasibility of ABMs assessed post-mortem

As a feedback from the online questionnaire, information on the ease of use of each ABM was also gathered. The assessment of all ABMs was in general reported as easy-medium level of difficulty apart from emaciation, hock burn and plumage damage that were considered easy to be assessed by most of respondents.

During the discussion at the meeting a question was polled to get Network members' opinion on the method of assessment and the level of automatization that could be developed in the future for the purpose of assessing the welfare on the farm. Network members were asked to indicate in the poll if the assessment of each ABM could be feasible only by visual observation, automatically by using videos, feasible in both cases or generally impossible (Figure 5). The results demonstrated that all respondents considered all ABMs feasible to be assessed (none was voted as 'impossible'). There is a general tendency to consider the assessment of these ABMs mainly feasible with visual observation. This is particularly evident in the case of ascites, where respondents were very consistent. Hock burn, breast blister and footpad dermatitis, were instead considered feasible to be assessed both by visual observation and by automatic videos.

Network members discussed in detail the results of the poll and highlighted some criticalities on the development of automated-video assessments for certain ABMs. This is the case, for example, of emaciation and cellulitis which are unlikely to be assessed by video as it is generally difficult to observe skin discolouration thought a video. On the contrary, in some countries assessments by video automations have been already developed for e.g. FPD. Other video systems are being developed in some countries for the assessment of hook burn, keel bone fractures and skin bruise.

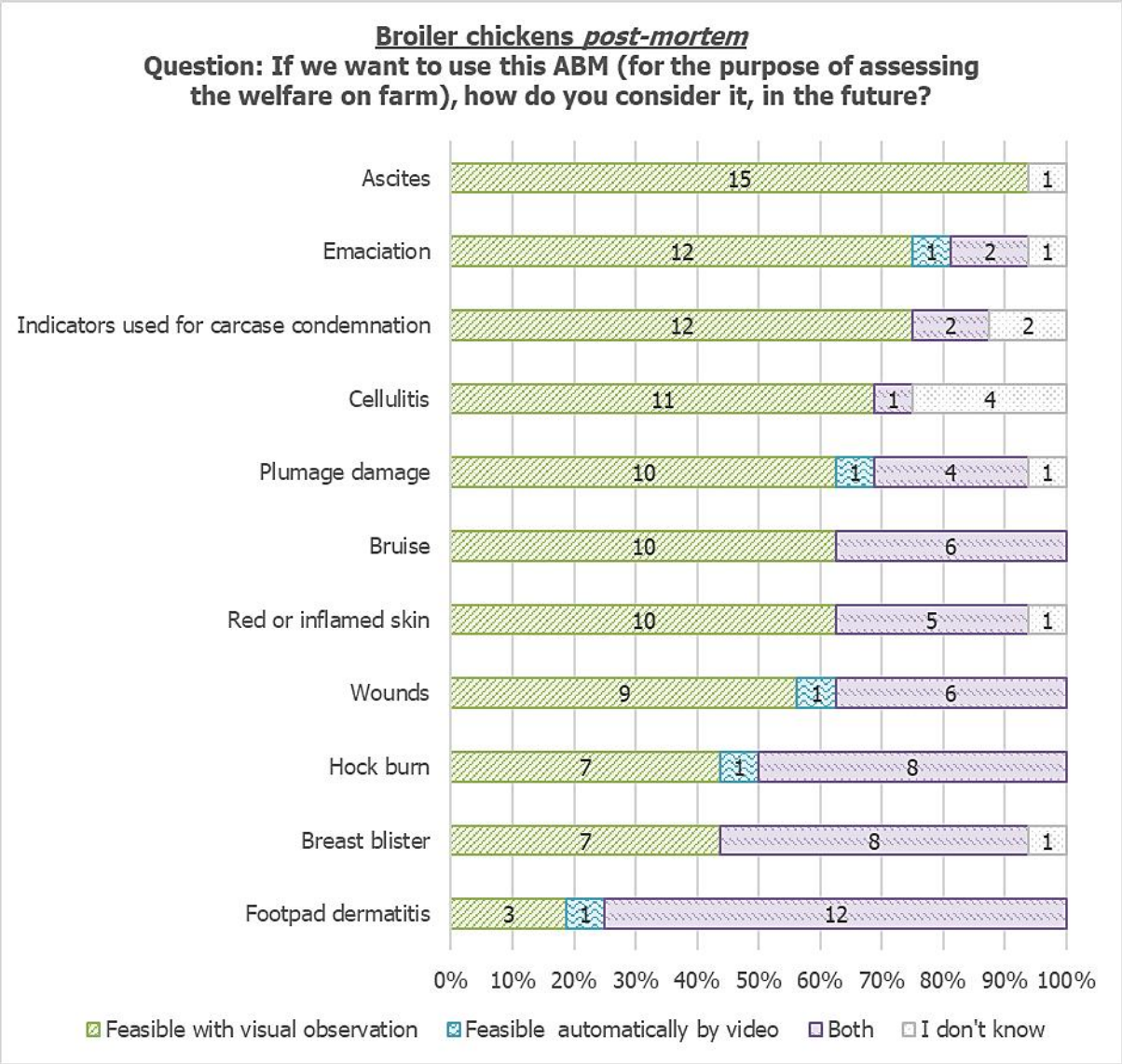

Figure 5: Results of the poll on the feasibility of ABMs. The histograms report the number of respondents.

Subsequently, meeting participants were also asked to express their opinion on the level of feasibility for visual inspection of each ABM by classifying them in three categories: feasible, moderate feasible or difficult. As visualised in Figure 6, all respondents considered visual inspection of footpad dermatitis to be feasible. More than 50% of the respondents considered it feasible also for other ABMs: hock burn, emaciation, breast blister, indicators used for carcass condemnation, plumage damage. Whereas, red or inflames skin, ascites, wounds, cellulitis, bruise were considered of moderate feasibility, (see Figure 6).

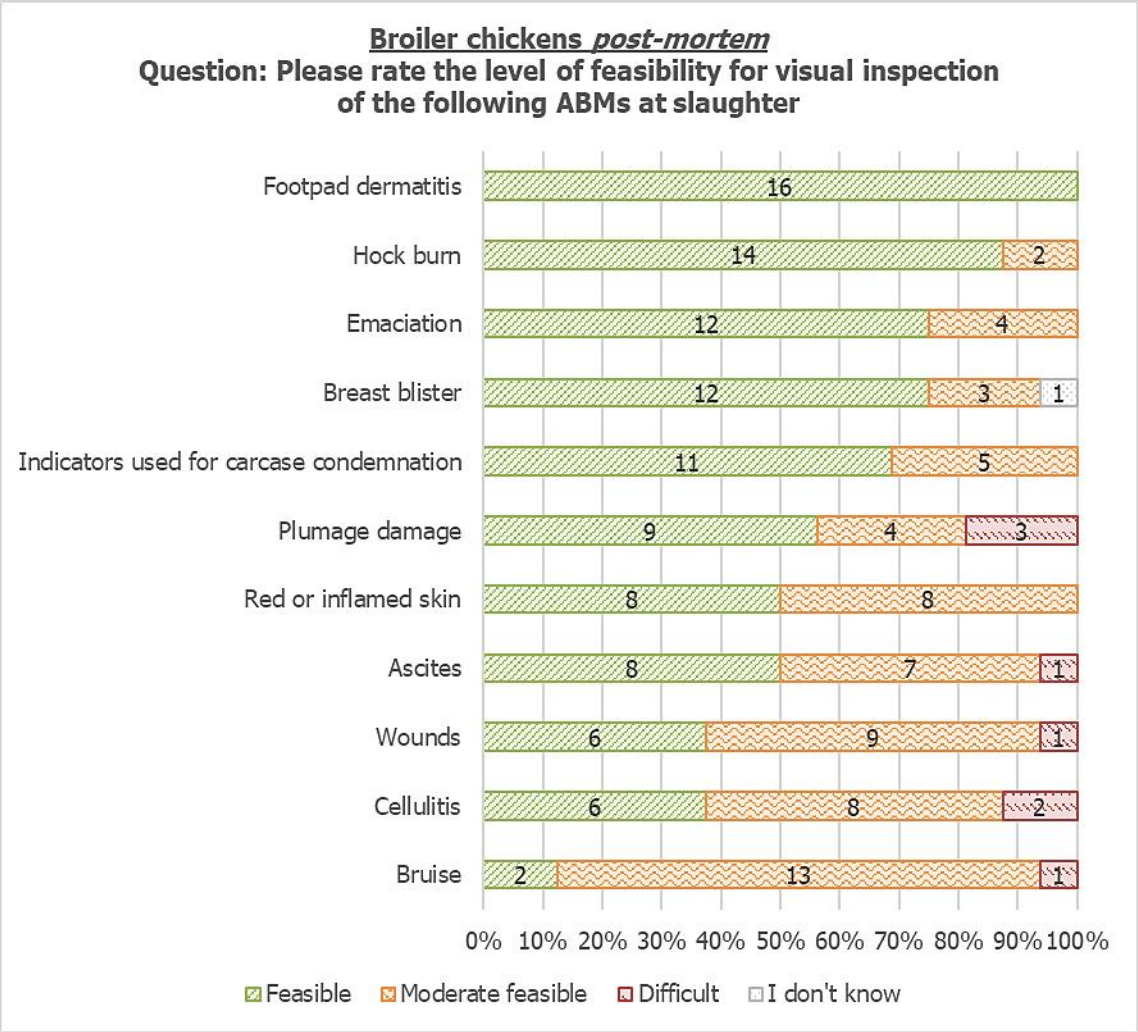

Figure 6: Results of the poll on the level of feasibility for visual inspection of ABMs. The histograms report the number of respondents

3.2.5. Prioritization of ABMs *post-mortem*

Network members were asked to prioritize the ABMs, i.e. to classify them as essential, desirable, or not important for future welfare monitoring scheme (Figure 7). From this exercise, it resulted that all the respondents to the poll considered footpad dermatitis essential to be prioritised for assessing the welfare of broiler chickens on-farm. In addition, more than 50% of the respondents also voted emaciation and hock burn as essential ABMs.

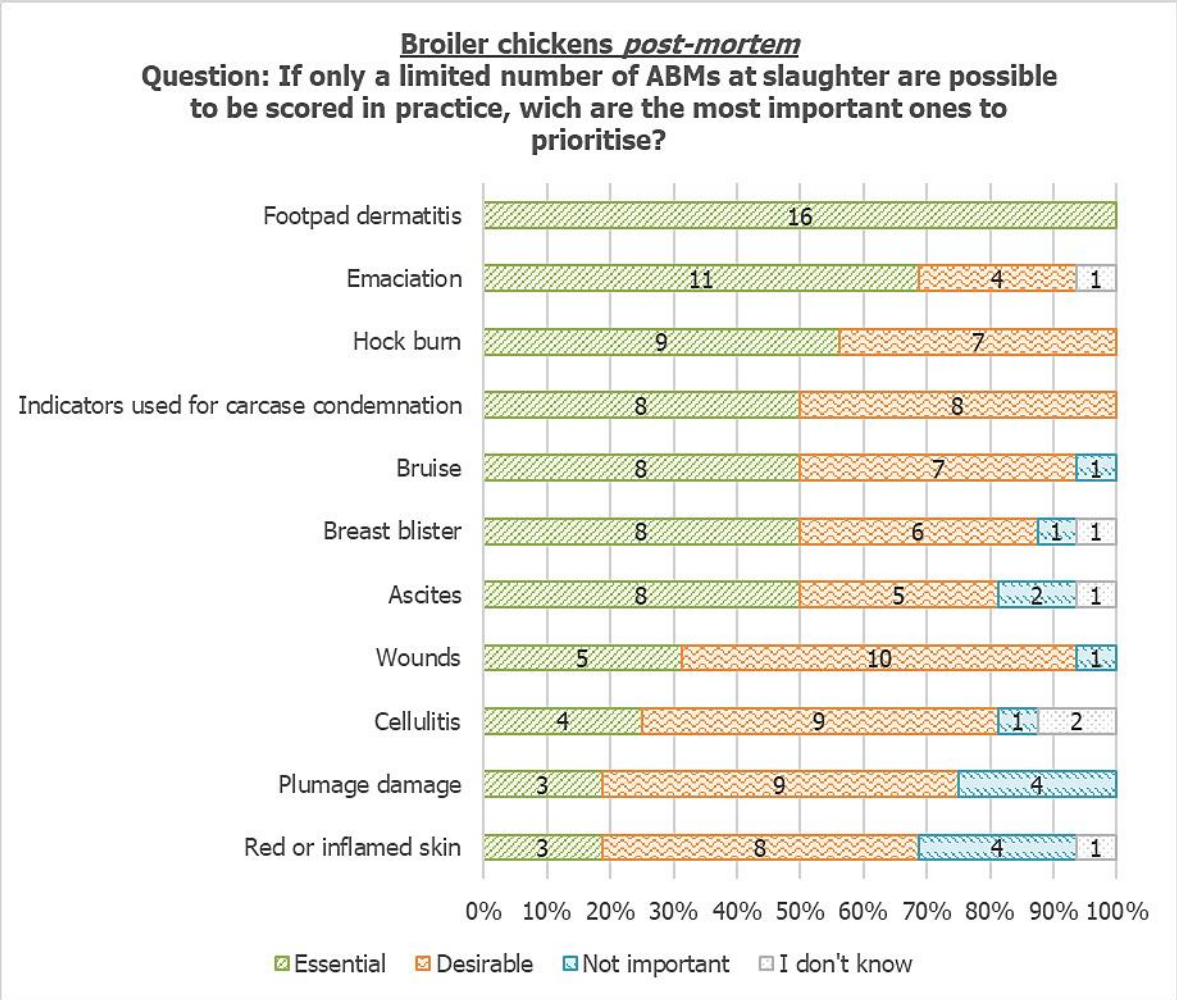

Figure 7: Results of exercise on prioritization of the ABMs. The histograms report the number respondents.

4. Conclusions

To address the F2F mandates, EFSA is assessing a list of *ante-mortem* and *post-mortem* ABMs at slaughter to monitor animal welfare on farm. The members of the Network of the EU MS (including EFTA Countries) National Contact Points for scientific support under Art 20 of Reg. (EC) 1099/2009 on the protection of the animals at the time of killing (scientific NCPs) shared their practical knowledge on the use of these ABMs in an exercise performed during the Network meeting held on 05-06 October 2021.

Network members consider that the ABMs proposed by EFSA are (almost without exception) strongly related to welfare consequences on farm. This supports their inclusion in the EFSA scientific opinion on the "Protection of broiler chickens" that will be delivered by EFSA in 2022. Among an initial list of ABMs discussed at the meeting, those that are considered essential for a welfare assessment at slaughter were prioritised (see section 3.1 for *ante-mortem* and Figure 7 for *post-mortem*). However, the methods applied for scoring ABMs are considerably different between countries. The information obtained in this report will be considered in the scientific opinion.

5. References

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Annex A – Questionnaire inspection of broiler chickens

Please indicate the country you represent **Name and affiliation:**							
PART A. *ANTE-MORTEM* INSPECTION please indicate if you collect ABMs at slaughter in ante-mortem to assess the welfare on farm, and provide relevant info (which ABMs, which scoring systems etc…): e;g panting animals, DoA,….							
PART B. *POST-MORTEM* INSPECTION							
ABM	**DESCRIPTION**	**IS THIS ABM ALREADY USED IN YOUR COUNTRY?**	**IF SO, WHICH SCORING SYSTEM DO YOU USE?** Please specify which scoring system is in place in your country and how is it scored; specify if this scoring is used under official or voluntary controls			**EASINESS OF USE**	**CORRESPONDING WELFARE CONSEQUENCE ON FARM** (see Annex 3)
		Please answer (Yes/No) and specify if it relates to official controls (CA) or private voluntary schemes (FBO)	**Scoring method 1 -** **Total count of the affected animals**	**Scoring method 2 -** **other scoring method** (please detail it) **More sophisticated way for scoring the ABMs** - e.g. scoring scales based on the **severity (please detail it)**	**Scoring method 3 -** **other scoring method** (please detail it)	**Please estimate if the use of this ABM is:** **easy-medium-difficult**	**In your view, what welfare problem on farm does this ABM indicate?** e. g Footpad dermatitis due to restriction of movement
ABM 1- Wounds	Tissue damage with rupture of the skin or not (scratches. Injury, open abscess,…). Wounds that are not yet completely healed.						
ABM 2 - Plumage damage	Damaged feathers or feather loss						

ABM 3 – Footpad dermatitis	Footpad dermatitis is a type of contact dermatitis affecting the foot and toe pads. Contact dermatitis is inflammatory states in the subcutaneous tissue leading hyperkeratosis, necrosis or ulcerations						
ABM 4 - Hock burn	Hock burns are a type of contact dermatitis affecting the caudal back of the hock joint.						
ABM 5 - Breast blister	A breast blister (or keel cyst) is an enlargement of the sternal bursa						
ABM 6 - Bruise	Bruising is a superficial injury that occurs after trauma, it results from a hematoma and is often without rupture of the skin						
ABM 7 - Cellulitis	Discoloration and thickening of the skin and inflammation of the subcutaneous tissues.						
ABM 8 - Emaciation	Extreme weight loss and unnatural thinness due to lack of fat and muscle throughout the body.						
ABM 9 - Ascites	Ascites is an accumulation of tissue fluid in the lungs, air sacs and abdomen						
ABM 10 - Indicators used for carcase condemnation (e.g. septicaemia, hepatitis, pericarditis, abscess, arthritis)	Carcasses (i.e. number of animals or weight of the carcases condemned) that are unfit for use as food						
ABM 11- Red or inflamed skin	Sign of skin inflammation due to primary bacterial infections and/or parasitic agent infestation e.g. red mite infestation. Skin can be red, hot and/or swollen						
OTHER ABMs							

Annex B – Overall list of welfare consequences (preliminary list drafted by EFSA Experts)

Welfare consequence	Description
Restriction of movement	The animal experiences stress and/or negative affective states such as pain, fear, discomfort and/or frustration due to the fact that it is unable to move freely, or is unable to walk comfortably (e.g. due to overcrowding, unsuitable floors, gates, barriers).
Resting problems	The animal experiences stress and/or negative affective states such as discomfort, and/or frustration due to the inability to lie/rest comfortably or sleep. (e.g. due to hard flooring, inability to perch or vibration during transport). This may eventually lead to fatigue.
Group stress	The animal experiences stress and/or negative affective states such as pain, fear and/or frustration resulting from a high incidence of aggressive and other types of negative social interactions, often due to hierarchy formation and competition for resources or mates.
Sensorial under and/or overstimulation	The animal experiences stress and/or negative affective states such as fear, discomfort due to visual, auditory or olfactory under/overstimulation by the physical environment.
Handling stress	The animal experiences stress and/or negative affective states such as pain and/or fear resulting from human or mechanical handling (e.g. sorting and vaccination of newly hatched chicks, loading/unloading, catching and crating of animals to be transported, inversion).
Isolation stress	The animal experiences stress and/or negative affective states such as frustration and/or fear resulting from the absence of or from limited social contact with conspecifics.
Separation stress	The animal experiences stress and/or negative affective states such as fear and/or frustration resulting from separation from conspecifics.
Inability to perform comfort behaviour	The animal experiences stress and/or negative affective states such as discomfort and/or frustration resulting from the thwarting of the motivation to maintain the function and integrity of the integument (e.g. cannot keep clean, scratch, dust bathe).
Inability to perform sexual behaviour	The animal experiences stress and/or negative affective states such as frustration resulting from the thwarting of the motivation to engage in sexual activities.
Inability to avoid unwanted sexual behaviour	The animal experiences stress and/or negative affective states such as pain and/or fear resulting from inability to avoid forced mating.
Inability to perform exploratory or foraging behaviour	The animal experiences stress and/or negative affective states such as frustration and/or boredom resulting from the thwarting of the motivation to investigate the environment or to seek for food (i.e. extrinsically and intrinsically motivated exploration).
Inability to express maternal behaviour	The animal experiences stress and/or negative affective states such as frustration resulting from the thwarting of the motivation to care for offspring, including during the pre-partum/pre-laying phase.
Inability to perform sucking behaviour	The animal experiences stress and/or negative affective states such as frustration resulting from the thwarting of the motivation to suck from an udder.
Inability to chew and/or ruminate	The animal experiences stress and/or negative affective states such as frustration resulting from the thwarting of the motivation to ingest sufficient amounts of fibrous feed or the inhibition of rumination.

Welfare consequence	Description
Inability to perform play behaviour	The animal experiences stress and/or negative affective states such as frustration resulting from the thwarting of the motivation to engage in social/locomotory or object play.
Predation stress	The animal experiences stress and/or negative affective states such as fear and/or pain resulting from being attacked or perceiving a high predation risk
Prolonged hunger	The animal experiences craving or urgent need for food or a specific nutrient, accompanied by a negative affective state, and eventually leading to a weakened condition as metabolic requirements are not met
Prolonged thirst	The animal experiences craving or urgent need for water, accompanied by an uneasy sensation (a negative affective state), and eventually leading to dehydration as metabolic requirements are not met.
Heat stress	The animal experiences stress and/or negative affective states such as discomfort and/or distress due to the difficulty to maintain body temperature in the thermoneutral zone when exposed to high effective temperature.
Cold stress	The animal experiences stress and/or negative affective states such as discomfort and/or distress due to the difficulty to maintain body temperature in the thermoneutral zone when exposed to low effective temperature.
Locomotory disorders (including lameness)	The animal experiences negative affective states such as pain, discomfort and/or due to impaired locomotion induced by e.g. bone, joint, skin or muscle damage.
Soft tissue lesions and integument damage	The animal experiences negative affective states such as pain, discomfort and/or distress due to physical damage to the integument or underlying tissues, e.g. multiple scratches, open or scabbed wounds, bruises, ulcers, abscesses and feather or hair loss. This welfare consequence may result from negative social interactions such as aggression, tail-biting or feather pecking, from handling or from damaging environmental features, or from mutilation practices (e.g. beak trimming, de-toeing, de-horning, tail docking).
Bone lesions (incl. fractures and dislocations)	The animal experiences negative affective states such as pain, discomfort and/or distress due to fractures or dislocations of the bones (excluding those fractures leading to locomotory disorders).
Skin disorders (other than soft tissue lesions and integument damage)	The animal experiences negative affective states such as pain, discomfort and/or distress due to e.g. infections (e.g. dermatophytosis/ringworm, pseudomonosis, staphylococcosis, viral diseases), ectoparasites (e.g. mange or red mites), inflammation of the skin or sunburn.
Respiratory disorders	The animal experiences negative affective states such as discomfort, pain, air hunger and/or distress due to impaired function or lesion of the lungs or airways.
Eye disorders	The animal experiences negative affective states such as discomfort, pain and/or distress due irritation or lesion or lack of function of at least one eye.
Gastro-enteric disorders	The animal experiences negative affective states such as inappetence, discomfort, pain and/or distress due to impaired function or lesion of the gastro-intestinal tract resulting from for example nutritional deficiency, infectious, parasitic, or toxigenic agents.
Reproductive disorders	The animal experiences negative affective states such as pain and/or discomfort due to a disorder of the reproductive system resulting from physical injury or infection (including dystocia and metritis).
Mastitis	The animal experiences negative affective states such as pain and/or discomfort due to the inflammation of at least one of the mammary glands.
Metabolic disorders	The animal experiences negative affective states such as inappetence, weakness, fatigue, discomfort, pain and/or distress due to disturbed metabolism (e.g. acidosis and ketosis), deficiencies in several nutrients (e.g. anaemia) or induced by ectoparasites affecting metabolism (anaemia due to red mites) or poisoning

Welfare consequence	Description
Muscle disorders	The animal experiences negative affective states such as discomfort and/or pain due to a disorder or lack of function of the muscles (e.g. myopathy in broilers).
Umbilical disorders and hernias	The animal experiences negative affective states such as discomfort and/or pain due to inflammation of the navel or any type of hernias

Annex C – Animal-based measures assessed *post-mortem* and related on-farm welfare consequences in broiler chickens

ABM observed at slaughter	On-farm related welfare consequences
Red or inflamed skin	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Sensorial under and/or overstimulation Resting problems Inability to perform exploratory or foraging behaviour Muscle disorders Respiratory disorders Eye disorders Handling stress Inability to perform play behaviour Predation stress Prolonged hunger Prolonged thirst Reproductive disorders Inability to avoid unwanted sexual behaviour
Indicators used for carcase condemnation (e.g. septicaemia, hepatitis, pericarditis, abscess, arthritis)	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Sensorial under and/or overstimulation Resting problems Inability to perform exploratory or foraging behaviour Muscle disorders Respiratory disorders Eye disorders Handling stress Inability to perform play behaviour Predation stress Prolonged hunger Prolonged thirst Reproductive disorders Umbilical disorders and hernias
Emaciation	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage

ABM observed at slaughter	On-farm related welfare consequences
	Cold stress Sensorial under and/or overstimulation Resting problems Muscle disorders Respiratory disorders Eye disorders Handling stress Predation stress Prolonged hunger Prolonged thirst Reproductive disorders Isolation stress Separation stress
Wounds	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Sensorial under and/or overstimulation Resting problems Inability to perform exploratory or foraging behaviour Muscle disorders Respiratory disorders Eye disorders Handling stress Inability to perform play behaviour Predation stress Inability to avoid unwanted sexual behaviour
Plumage damage	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Sensorial under and/or overstimulation Resting problems Inability to perform exploratory or foraging behaviour Muscle disorders Respiratory disorders Eye disorders Inability to perform play behaviour Predation stress Isolation stress Inability to perform sexual behaviour
Cellulitis	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness)

ABM observed at slaughter	On-farm related welfare consequences
	Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Sensorial under and/or overstimulation Inability to perform exploratory or foraging behaviour Muscle disorders Respiratory disorders Eye disorders Handling stress
Footpad dermatitis	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Sensorial under and/or overstimulation Resting problems Inability to perform exploratory or foraging behaviour Prolonged hunger Prolonged thirst
Bruise	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Inability to perform comfort behaviour Locomotory disorders (including lameness) Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Cold stress Resting problems Prolonged hunger Handling stress Predation stress Inability to avoid unwanted sexual behaviour
Hock burn	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Sensorial under and/or overstimulation Resting problems Inability to perform exploratory or foraging behaviour
Breast blister	Group stress Heat stress Restriction of movement Bone lesions (incl. fractures and dislocations) Gastro-enteric disorders

ABM observed at slaughter	On-farm related welfare consequences
	Inability to perform comfort behaviour Locomotory disorders (including lameness) Metabolic disorders Skin disorder (other than soft tissue lesions and integument damage) Soft tissue lesions and integument damage Sensorial under and/or overstimulation Resting problems Prolonged hunger
Ascites	Group stress Heat stress Restriction of movement Gastro-enteric disorders Metabolic disorders Cold stress Respiratory disorders Prolonged hunger Reproductive disorders Umbilical disorders and hernias