

# Broiler chicken welfare indicators

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☐ Português

☒ English

## Page 1

Dear colleague,

This study, entitled “Animal-based welfare indicators: refinement and applicability in Brazilian broiler chicken production”, is registered in the Ethics Committee, Health Science Sector, Federal University of Paraná (CEP/SCS/UFPR), no. 1,377,497.

Before you start answering the questionnaire, you need to sign on the specific field to inform that you agree to participate in this study and that you read the Informed Consent sent to you by email.

It will take you about 20 minutes to answer the questions about bird cleanliness, carcass scratches and contact dermatitis on the breast and abdominal areas.

Thank you for participating this research.

Carla Forte Maiolino Molento and Ana Paula de Oliveira Souza  
Animal Welfare Laboratory  
Federal University of Paraná

**I read the consent term and I understand the purpose of this study, to which I agreed to participate. \***

☐ Yes (this answer will direct you to the questionnaire)

☐ No (this answer will finish your participation)

## Bird cleanliness

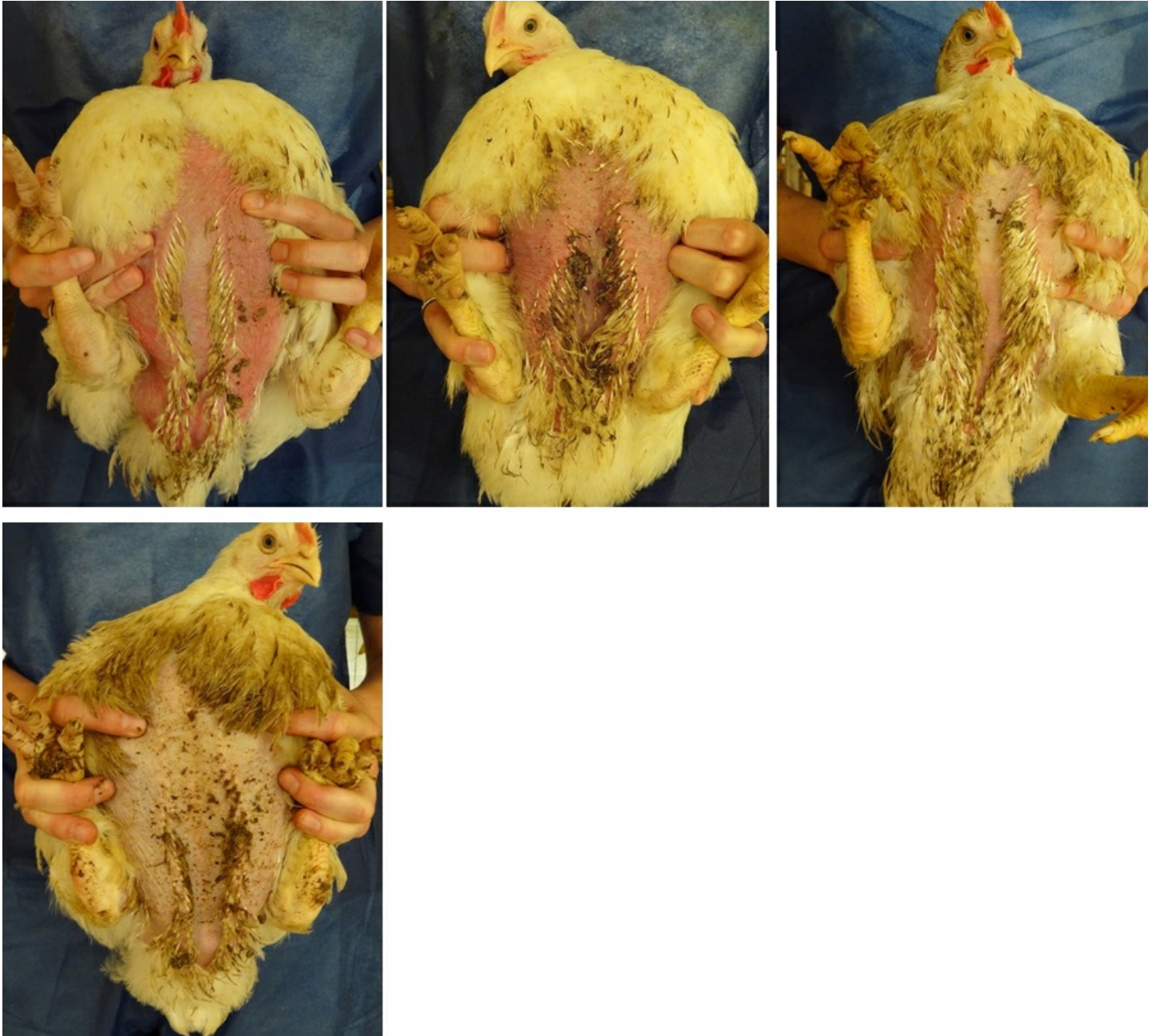
Birds use their feathers to keep warm, to protect themselves from moisture dirt and skin infections. If feathers become wet or soiled with litter, faeces or dirt, they may lose their protective properties and thus severe soiling may have significant effects on bird welfare (1).

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Please pay full regard to the different levels of bird cleanliness in the pictures below; an overview of the total range of variation in this indicator will be relevant for the subsequent assessment of each individual case presented.







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**Please, briefly justify your answer. You can use this field to add any comment.**

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**Relation between bird cleanliness and bird feathering condition**



Observe the figure:



**Based on the figure, choose an alternative: \***

- ☐ Poor feathering does not affect bird cleanliness assessment
- ☐ Poor feathering impacts on bird cleanliness assessment
- ☐ Other (specify)

**Please, briefly justify your answer. You can use this field to add any comment.**

### **Relation between bird cleanliness and bird feathering condition**

**If you answered that poor feathering impacts on bird cleanliness assessment, which would be the best option to assess birds condition? \***

- ☐ To propose a mathematical model that takes account general feathering. For example: Good feathering= score 0, poor feathering= score 1. Bird cleanliness: absence of soiling=score 0, low soiling= score 1, moderate soiling= score 2 and severe soiling= score 3. Final bird cleanliness score= [Feathering condition score + bird cleanliness score]. Thus, any poor feathering condition would increase severity of bird cleanliness score.
- ☐ To propose a mathematical model that takes account proportional body area with poor feathering. For example: Good feathering= score 0, poor feathering in 25% of ventral body area = score 0.25, poor feathering in 50% of ventral body area= score 0.50, poor feathering in 75% of ventral body area= score 0.75, poor feathering in more than 75% of ventral body area = score 1. Bird cleanliness: absence of soiling= score 0, low soiling= score 1, moderate soiling= score 2 and severe soiling= score 3. Final bird cleanliness score= [Feathering condition score + bird cleanliness score]. Thus, poor feathering would gradually increase severity of bird cleanliness score.
- ☐ When poor feathering is observed, the worst bird cleanliness score should be considered (for example, severe soiling).
- ☐ Other (specify)

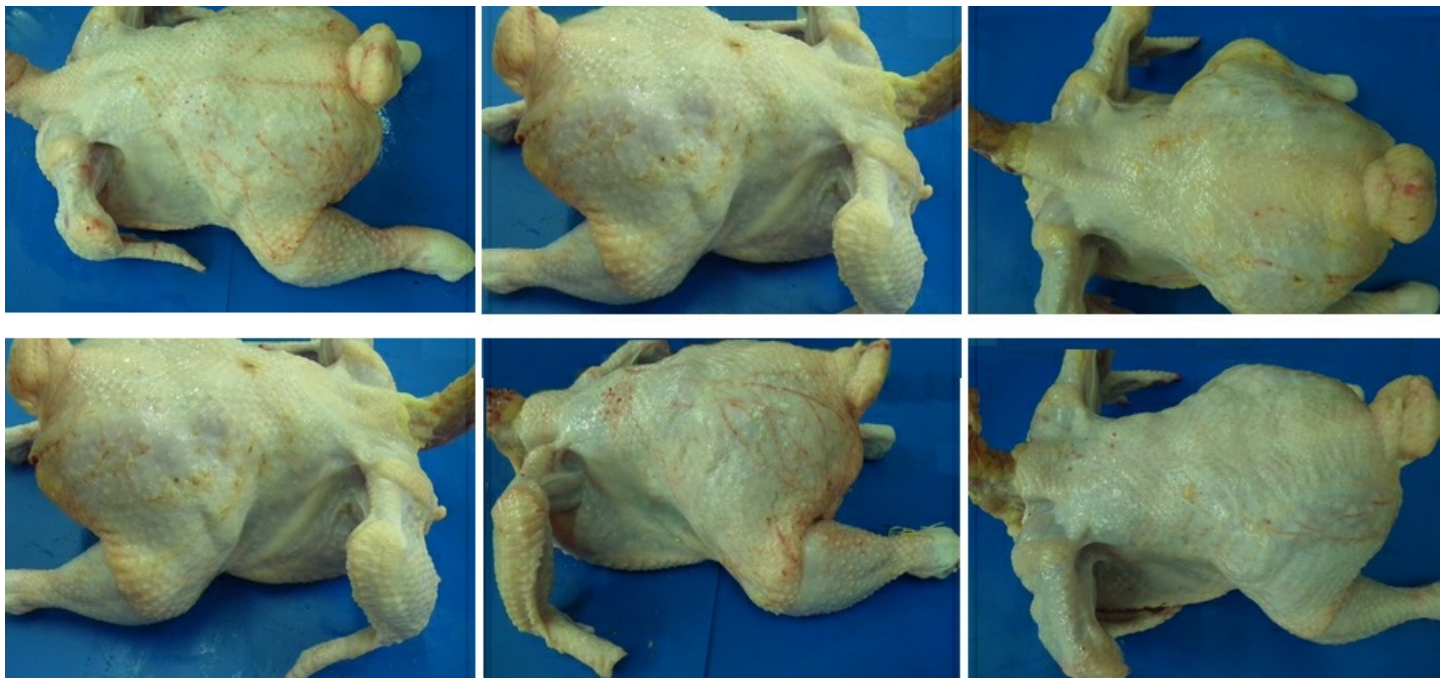
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## Carcass scratches

Scratching behaviour is affected primarily by stocking density, bird activity levels, bird handling, processing conditions and strain of bird. Therefore, scratches may be a reflection of substandard housing conditions, which suggests poor welfare (2).

(2) GOUVEIA, K. G.; MARTINS DA COSTA, P.; VAZ-PIRES, P. Welfare assessment of broilers through examination of haematomas, foot-pad dermatitis, scratches and breast blisters at processing. *Animal Welfare*, v. 18, p. 43–48, 2009.

**Please pay full regard to the different levels of carcass scratches in the pictures below; an overview of the total range of variation in this indicator will be relevant for the subsequent assessment of each individual case presented.**







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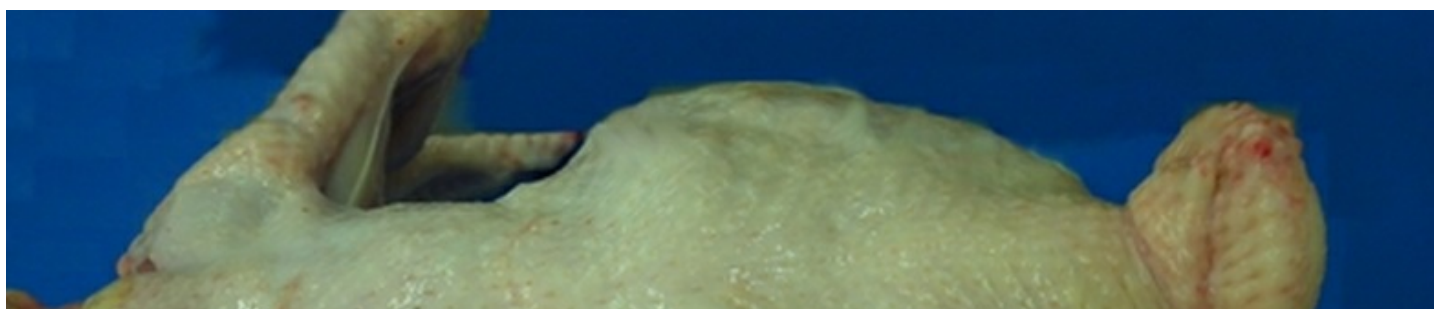
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## **Contact dermatitis on the breast and abdominal areas**

Contact dermatitis is an inflammatory skin condition caused by direct contact with an offending substance (3), resulting mainly in lesions of the plantar region of the bird's feet, on the hock or on the breast (4). Patches of erythema and papules represent primary lesions (3), and it is related to activity rates of birds and environmental factors, such as litter quality and humidity (5).

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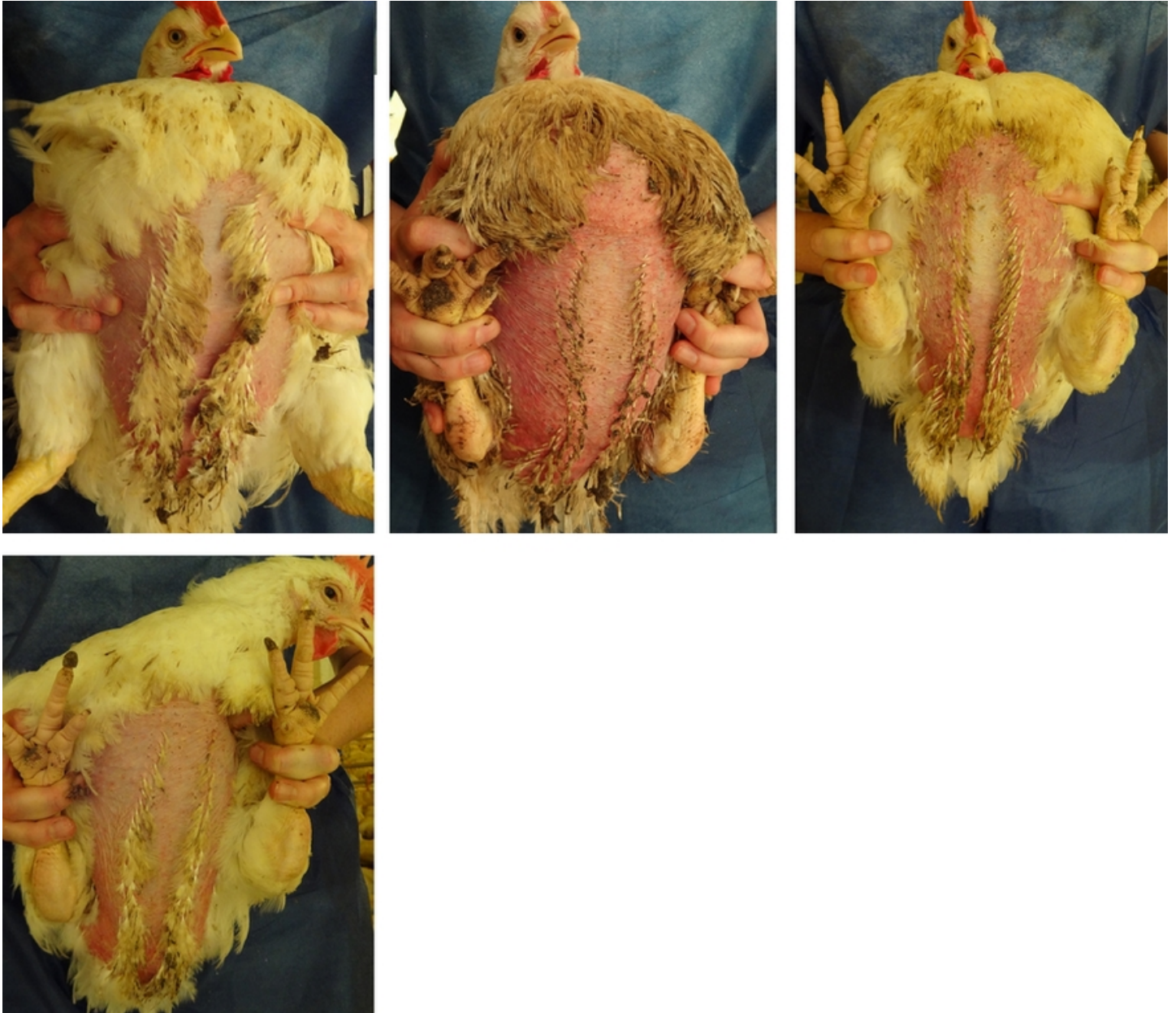
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**Note: Brown spots in the ventral area of birds are litter soiling.**

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**Considering contact dermatitis on the breast and abdominal areas, observe the figure:**



**Note: Brown spots in the ventral area of birds are litter soiling.**



**Considering contact dermatitis on the breast and abdominal areas, the figure represents: \***

- ☐ Absence of contact dermatitis
- ☐ Light contact dermatitis
- ☐ Moderate contact dermatitis
- ☐ Severe contact dermatitis
- ☐ Prefer not to answer this question
- ☐ Other (specify)

**Please, briefly justify your answer. You can use this field to add any comment.**

**Considering the scale below, mark the contact dermatitis score, being 0 absence of contact dermatitis and 100 most severe contact dermatitis**

0  100

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Contact dermatitis is an inflammatory skin condition caused by direct contact with an offending substance (3), resulting mainly in lesions of the plantar region of the bird's feet, on the hock or on the breast (4). Patches of erythema and papules represent primary lesions (3), and it is related to activity rates of birds and environmental factors, such as litter quality and humidity (5).

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☐ Other (specify)

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☐ Other (specify)

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0  100

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- ☐ Absence of contact dermatitis
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- ☐ Moderate contact dermatitis
- ☐ Severe contact dermatitis
- ☐ Prefer not to answer this question
- ☐ Other (specify)

**Please, briefly justify your answer. You can use this field to add any comment.**

**Considering the scale below, mark the contact dermatitis score, being 0 absence of contact dermatitis and 100 most severe contact dermatitis**

0  100

**Thank you for your participation!**

**As the Delphi is a consensus method, you may be requested to answer the questionnaire more than once, until we get the consensus within the participants.  
All results will be shared with participants through the publication of scientific paper and the PhD thesis.**

**You can leave any comment in the field below, if you wish.**

**Best regards!**

**Ana Paula de O. Souza**  
**[anapaulasouza@ufpr.br](mailto:anapaulasouza@ufpr.br) / [qualitebr@gmail.com](mailto:qualitebr@gmail.com)**  
**55 41 3350-57-88**

**Carla Forte Maiolino Molento**  
**[carlamolento@ufpr.br](mailto:carlamolento@ufpr.br) / [carlamolento@yahoo.com](mailto:carlamolento@yahoo.com)**  
**55 41 3350-5788**

You have completed the survey. Thank you very much for your participation.

You can now close the window.

## Broiler chicken welfare indicators (round 2)

Bitte wählen Sie eine Sprache aus. / Veuillez s'il vous plaît choisir une langue. / Please choose a language. / Selezionare una lingua. / Lütfen bir dil seçin. / Por favor, seleccione un idioma. / Por favor escolha um idioma. / Kies een taal. / Välj ett språk. / Vennligst velg et språk. / Vælg sprog. / Valitse kieli. / الرجاء اختيار لغتك.

☐ Português

☒ English

### Page 1

Dear colleague,

Thank you for participating in the first round of the project "Animal-based welfare indicators: refinement and applicability in Brazilian broiler chicken production".

In the first round, 83 respondents from South and North America, European Union and United Kingdom participated. Respondents were professionals from government and meat industry, animal welfare certification auditors, professors and researchers experienced in broiler chicken welfare and/or production.

Now you are invited to refine answers for the same indicators: bird cleanliness, carcass scratches and contact dermatitis on the breast and abdominal areas. We will also present some answers from the first round.

It will take you 10 minutes to complete the questionnaire.

We will be glad if you keep contributing to this research.

Thank you for your attention.

Carla Forte Maiolino Molento and Ana Paula de Oliveira Souza  
Animal Welfare Laboratory  
Federal University of Paraná

### Bird cleanliness

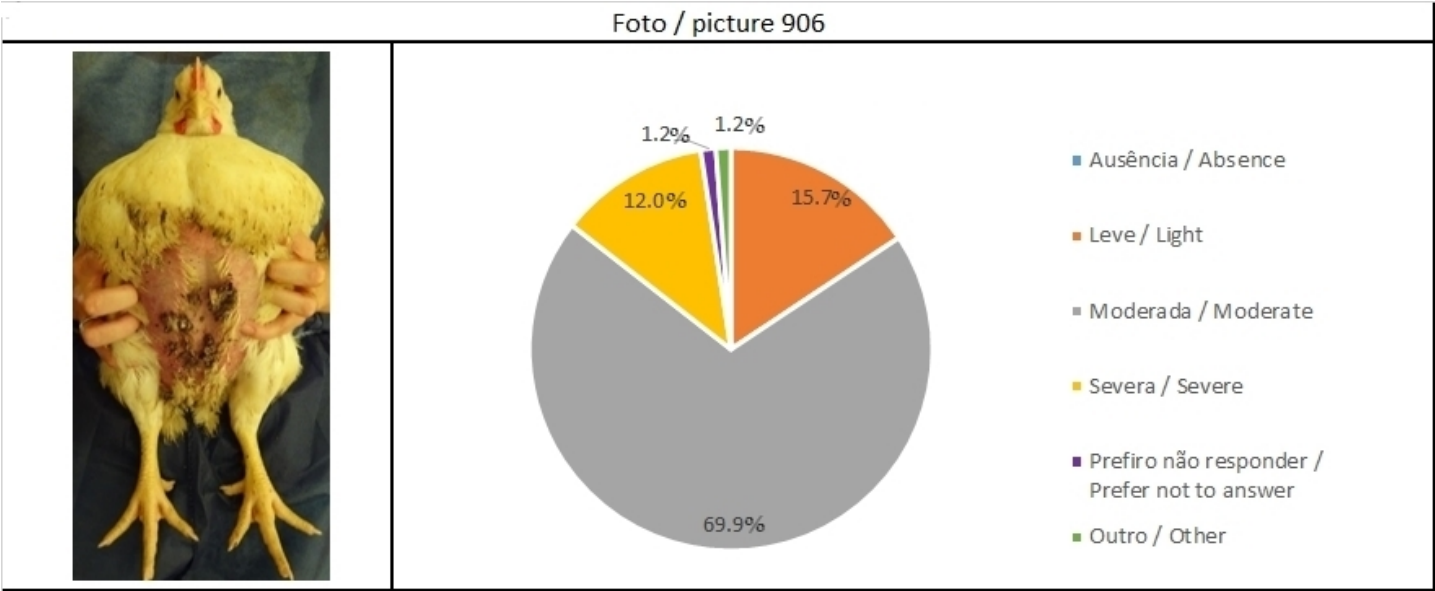
Consensus was achieved for 8 of 10 pictures in the first round. We collected information to describe the four scores proposed: absence of soiling, light, moderate and severe soiling.

Below there are two examples of pictures with consensus.

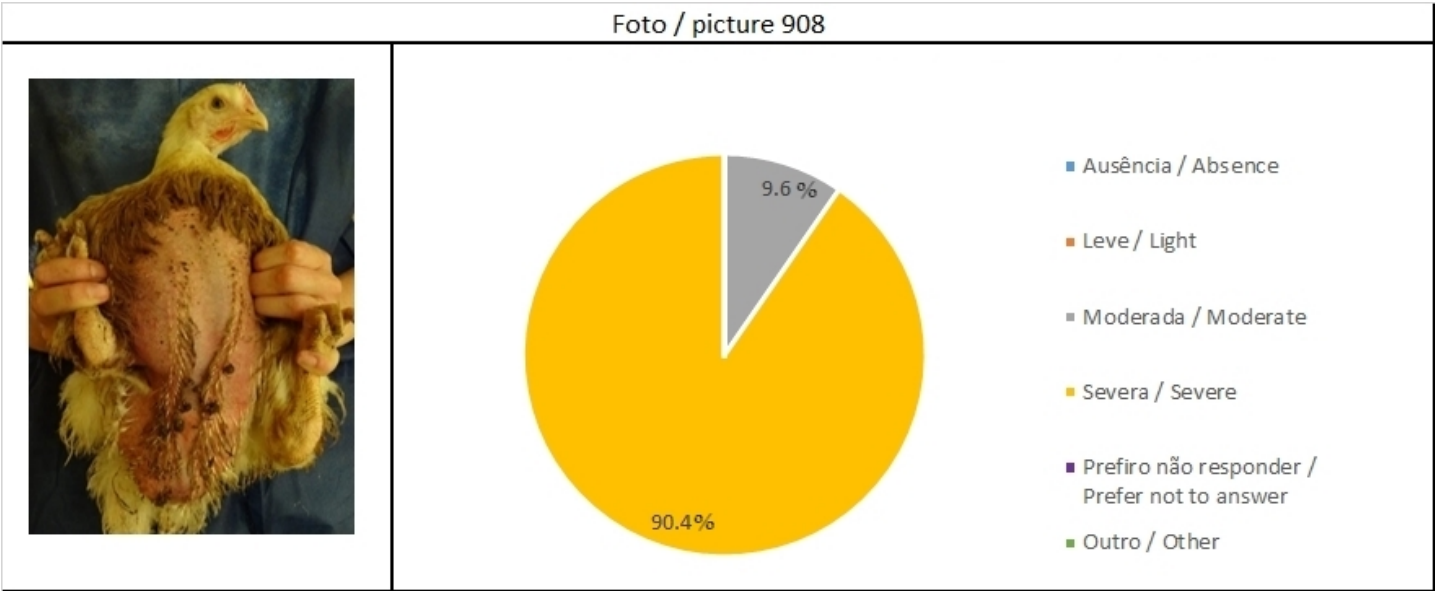
Note: all figures will be presented in Portuguese and English, simultaneously.



Moderate soiling

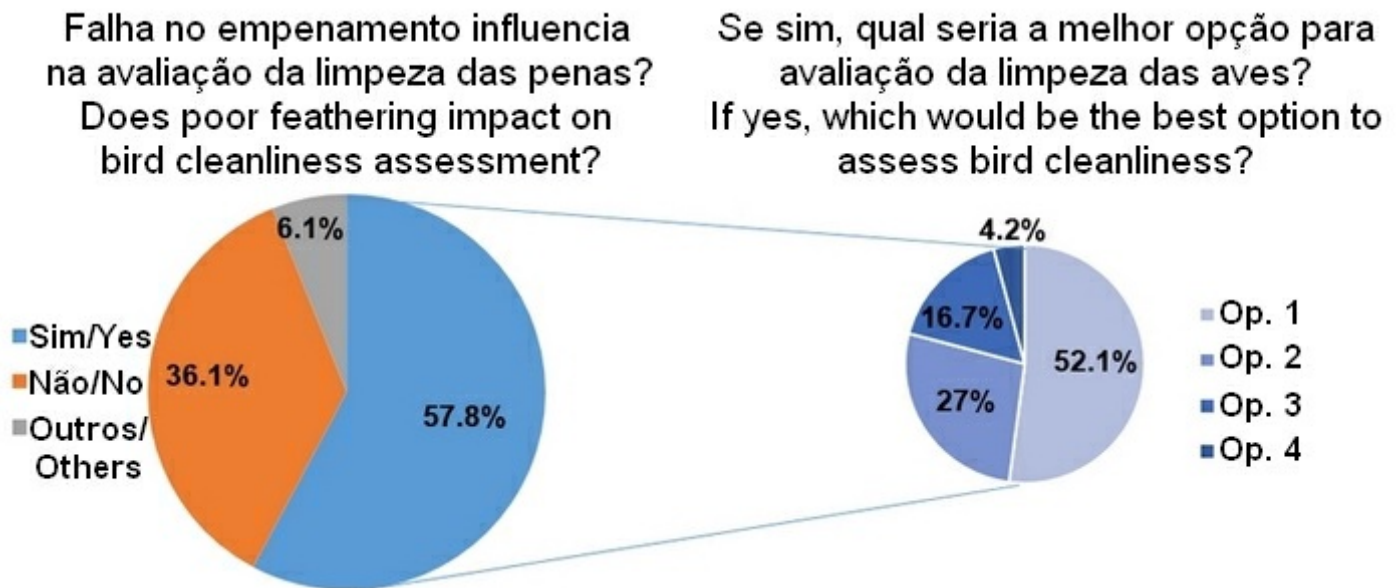


Severe soiling



**We did not reach consensus among respondents when we asked if poor feathering affects bird cleanliness assessment.**

**Below we present a summary of the answers about the influence of feathering on bird cleanliness assessment.**



Op. 1: To propose a mathematical model that takes into account proportional body area with poor feathering. For example: Good feathering= score 0, poor feathering in 25% of ventral body area = score 0.25, poor feathering in 50% of ventral body area= score 0.50, poor feathering in 75% of ventral body area= score 0.75, poor feathering in more than 75% of ventral body area = score 1. Bird cleanliness: absence of soiling= score 0, low soiling= score 1, moderate soiling= score 2 and severe soiling= score 3. Final bird cleanliness score= [Feathering condition score + bird cleanliness score]. Thus, poor feathering would gradually increase severity of bird cleanliness score.

Op. 2: To propose a mathematical model that takes into account general feathering. For example: Good feathering= score 0, poor feathering= score 1. Bird cleanliness: absence of soiling=score 0, low soiling= score 1, moderate soiling= score 2 and severe soiling= score 3. Final bird cleanliness score= [Feathering condition score + bird cleanliness score]. Thus, any poor feathering condition would increase severity of bird cleanliness score.

Op. 3: Others

Op.4: When poor feathering is observed, the worst bird cleanliness score should be considered (for example, severe soiling).

## Bird cleanliness

Please observe the following justification given by the respondents:

1. Respondents who considered poor feathering affected bird cleanliness assessment justified that dirt appears to adhere more to feathers than on skin, thus, lack of feathers prevents clumps from being retained.
2. Respondents who considered poor feathering did not affect bird cleanliness assessment justified that assessment was feasible even when birds were poor feathered.
3. Other respondents considered that poor feathering could be a consequence of soiling or poor litter quality; or that birds should only be scored for cleanliness if completely feathered or with sufficient feather cover.

**We ask you to think again about the influence of feathering on bird cleanliness score.**

**Does poor feathering affect bird cleanliness assessment? \***

☐ Yes

☐ No

**You can use this field to add any comment.**



## Relation between bird cleanliness and bird feathering condition

**If you answered that poor feathering impacts on bird cleanliness assessment, which would be the best option to assess birds condition? \***

- ☐ To propose a mathematical model that takes into account general feathering. For example: Good feathering= score 0, poor feathering= score 1. Bird cleanliness: absence of soiling=score 0, low soiling= score 1, moderate soiling= score 2 and severe soiling= score 3. Final bird cleanliness score= [Feathering condition score + bird cleanliness score]. Thus, any poor feathering condition would increase severity of bird cleanliness score.
- ☐ To propose a mathematical model that takes into account proportional body area with poor feathering. For example: Good feathering= score 0, poor feathering in 25% of ventral body area = score 0.25, poor feathering in 50% of ventral body area= score 0.50, poor feathering in 75% of ventral body area= score 0.75, poor feathering in more than 75% of ventral body area = score 1. Bird cleanliness: absence of soiling= score 0, low soiling= score 1, moderate soiling= score 2 and severe soiling= score 3. Final bird cleanliness score= [Feathering condition score + bird cleanliness score]. Thus, poor feathering would gradually increase severity of bird cleanliness score.
- ☐ When poor feathering is observed, the worst bird cleanliness score should be considered (for example, severe soiling).
- ☐ When poor feathering is observed, cleanliness assessment should not be done.
- ☐ Other:

## Carcass scratches

During the first round, consensus was achieved for 5 of 8 pictures. We collected information to describe the four proposed levels of carcass scratches: absence of scratches, light, moderate and severe scratches.

Below there are some examples of pictures with consensus.

Ausência / Absence: 98%



Leve / Light: 81%



Moderada / Moderate: 66%



Severa / Severe: 79%



Answers were based on the following items (1) quantity, (2) area affected, (3) depth (superficial or deep), (4) size (small or long) and (5) time (new or old scratch) . However, answers included general terms as ‘multiple scratches in one side’, ‘large area affected’ or ‘there are some deep scratches’.

Our objective in the second round is to quantify these items to establish a cut point between each level of carcass scratches. In order to achieve this purpose, we will present two questions divided into superficial and deep scratches.

## Carcass scratches with regard to size

**ATTENTION! This first question is only for superficial scratches. Questions about deep scratches will be presented subsequently.**

Important definitions:

- Small scratches: up to 3 cm (1.2 in)
- Long scratches: larger than 3 cm (1.2 in)
- Superficial scratches: light scratches, affecting the epidermis
- Deep scratches: affect the dermis, they may achieve muscle tissue

Please, consider the following scale to answer the question below: absence of scratches, light scratches, moderate scratches and severe scratches.

What do you consider acceptable for each one of the following scores?

### **Absence of scratches \***

Quantity of small superficial scratches (enter the number)

Quantity of long superficial scratches (enter the number)

### **Light scratches \***

Quantity of small superficial scratches (enter the number)

Quantity of long superficial scratches (enter the number)



**You can use this field to add any comment.**

**Moderate scratches \***

Quantity of small superficial scratches (enter the number)

Quantity of long superficial scratches (enter the number)

**You can use this field to add any comment.**

**Severe scratches \***

Quantity of small superficial scratches (enter the number)

Quantity of long superficial scratches (enter the number)

**You can use this field to add any comment.**

## Carcass scratches with regard to size

**ATTENTION!** This question is only for deep scratches.

Important definitions:

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- Deep scratches: affect the dermis, they may achieve muscle tissue

Please, consider the following scale to answer the question below: absence of scratches, light scratches, moderate scratches and severe scratches.

What do you consider acceptable for each one of the following scores?

### **Absence of scratches \***

Quantity of small deep scratches (enter the number)

Quantity of long deep scratches (enter the number)

**You can use this field to add any comment.**

### **Light scratches \***

Quantity of small deep scratches (enter the number)

Quantity of long deep scratches (enter the number)

**You can use this field to add any comment.**

**Moderate scratches \***

Quantity of small deep scratches (enter the number)

Quantity of long deep scratches (enter the number)

**You can use this field to add any comment.**

**Severe scratches \***

Quantity of small deep scratches (enter the number)

Quantity of long deep scratches (enter the number)

**You can use this field to add any comment.**



## Carcass scratches with regard to time

Old scratches: brown or yellow scratches, indicative of healing process

New scratches: pink or red scratches

**In the first round, some respondents considered recent scratches as more severe. Some did not consider old scratches as a welfare problem, and there were respondents concerned about the presence of simultaneous old and new scratches. In the latter case, old scratches could be related to multiple aversive events on farm during animal rearing.**

**Should old scratches be considered during carcass scratches assessment? \***

☐ Yes

☐ No

☐ Other:

**Please, justify your answer: \***

## Contact dermatitis on the breast and abdominal areas

Consensus was achieved for 2 of 10 pictures, being them the most extreme cases, absence and severe contact dermatitis, within the pictures presented to respondents.

Besides low level of consensus, answers sustained the idea that erythema presented by birds in some pictures was not a healthy condition of the skin. Only two respondents did not consider the pictures representative of contact dermatitis on the ventral and abdominal areas of broiler chickens.

Below you may find pictures with consensus.

Ausência / Absence: 76%



Severa / Severe: 83%



### Contact dermatitis on the breast and abdominal areas

In our recent studies using the Welfare Quality to assess broiler chicken welfare, we observed medium to high occurrence of footpad dermatitis and hock burn, but few or no breast lesion. Probably it is consequence of the scale, which includes only the presence or the absence of breast blister.

Contact dermatitis is caused by direct contact of skin with irritant or allergenic substances. By definition, dermatitis is an inflammatory reaction of the skin, and erythema is one of the signs. The usual progression of a skin disease involves primary lesions such as papules, pustules and vesicles. As the inflammatory changes progress, crusting develops.

In our study we considered the erythema of the skin to assess contact dermatitis on the breast and abdominal areas.

We analyzed answers given by respondents to each score of contact dermatitis. Below you may find the summary of the scale divided in three levels, being light and moderate contact dermatitis combined in one intermediate score:

Escore/Score	Descrição	Description
Ausência / Absence	- Pele sem lesão, inflamação ou eritema	- Skin without lesion, inflammation or erythema
Intermediário / Intermediate	- Eritema focal ou generalizado em tom rosa claro, ou - Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e tendendo ao vermelho.	- Light pink local- or generalized erythema, or  - Skin may present different degrees of erythema, from light pink to red.
Severo / Severe	- Grande área inflamada, apresentando-se muito avermelhada	- Large area inflamed, dark red color

## Contact dermatitis on the breast and abdominal areas

Observe the two scales below:

Escala 1 – Parte 1 / Scale 1 – Part 1

Escore/Score	Descrição	Description
Ausência / absence	- Pele sem lesão, inflamação ou eritema	- Skin without lesion, inflammation or erythema
Intermediário / Intermediate	- Eritema focal ou generalizado em tom rosa claro, ou - Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e vermelho (até 50% da região ventral).	- Light pink local- or generalized erythema, or  - Skin may present different degrees of erythema, from light pink to red (up to 50% of ventral body).
Severo / severe	- Grande área inflamada (mais de 50%), apresentando-se muito avermelhada	- Large area inflamed (more than 50%), dark red color

Escala 1 – Parte 2

Há crosta marrom ou bolha de peito? ( )Sim ( )Não

Scale 1 – Part 2

Is there brown spot or breast blister? ( )Yes ( )No

Escala 2 / Scale 2

Escore/Score	Descrição	Description
Ausência / absence	- Pele sem lesão, inflamação ou eritema perceptível	- Skin without lesion, inflammation or erythema
Leve / light	- Eritema focal ou generalizado em tom rosa claro, ou - Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e vermelho (até 25% da região ventral).	- Light pink local- or generalized erythema, or  - Skin may present different degrees of erythema, from light pink to red (up to 25% of ventral body area).
Moderado / Moderate	- Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e vermelho (de 25% a 50% da região ventral), ou  - Presença de crostas pequenas na cor marrom	- Skin may present different degrees of erythema, from light pink to red (from 25% to 50% of ventral body area), or  - Presence of small brown spots
Severo / Severe	- Grande área inflamada (mais de 50%), apresentando-se muito avermelhada, ou  - Grande crosta marrom ou bolha de peito	- Large area inflamed (more than 50%), dark red color, or  - Large brown spots or breast blister

Adaptado de / adapted from de Jong et al., 2014



**We ask you to think about all information presented on contact dermatitis. In your opinion, which scale is more appropriate? \***

☐ Scale 1

☐ Scale 2

☐ Other:

**Please, justify your answer. \***

## **Contact dermatitis on the breast and abdominal areas**

**When erythema and skin lesions (eg. brown spot, breast blister) are assessed together, do you think that erythema is underestimated in a contact dermatitis scale? \***

☐ Yes

☐ No

☐ Prefer not to answer

☐ Other:

**Please, justify your answer. \***

Thank you for your participation!

All results will be shared with participants through the publication of a scientific paper and the PhD thesis.

You can leave any comment in the field below, if you wish.

Best regards.

Ana Paula de O. Souza

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You have completed the survey. Thank you very much for your participation.

You can now close the window.

## Development and refinement of three animal-based broiler chicken welfare indicators

### Supplementary material

1. Contact dermatitis on the breast and abdominal areas: scales presented to Delphi respondents during the second round.

**Escala 1 – Parte 1 / Scale 1 – Part 1**

Escore/Score	Descrição	Description
Ausência / absence	- Pele sem lesão, inflamação ou eritema	- Skin without lesion, inflammation or erythema
Intermediário / Intermediate	- Eritema focal ou generalizado em tom rosa claro, ou - Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e vermelho (até 50% da região ventral).	- Light pink local- or generalized erythema, or - Skin may present different degrees of erythema, from light pink to red (up to 50% of ventral body).
Severo / severe	- Grande área inflamada (mais de 50%), apresentando-se muito avermelhada	- Large area inflamed (more than 50%), dark red color

**Escala 1 – Parte 2**

Há crosta marrom ou bolha de peito? ( )Sim ( )Não

**Scale 1 – Part 2**

Is there brown spot or breast blister? ( )Yes ( )No

**Escala 2 / Scale 2**

Escore/Score	Descrição	Description
Ausência / absence	- Pele sem lesão, inflamação ou eritema perceptível	- Skin without lesion, inflammation or erythema
Leve / light	- Eritema focal ou generalizado em tom rosa claro, ou - Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e vermelho (até 25% da região ventral).	- Light pink local- or generalized erythema, or - Skin may present different degrees of erythema, from light pink to red (up to 25% of ventral body area).
Moderado / Moderate	- Pele pode apresentar diferentes graus de eritema, variando entre rosa claro e vermelho (de 25% a 50% da região ventral), ou - Presença de crostas pequenas na cor marrom	- Skin may present different degrees of erythema, from light pink to red (from 25% to 50% of ventral body area), or - Presence of small brown spots
Severo / Severe	- Grande área inflamada (mais de 50%), apresentando-se muito avermelhada, ou - Grande crosta marrom ou bolha de peito	- Large area inflamed (more than 50%), dark red color, or - Large brown spots or breast blister

Adaptado de / adapted from de Jong et al., 2014

2. Relation between poor feathering and bird soiling: answers from Delphi respondents in two rounds.

Option to integrate bird soiling and poor feathering scores	First round	Second round
To propose a mathematical model for BS that considers general feathering	27.0% (13/48)	39.2% (20/51)
To propose a model that considers the proportion of body area presenting poor feathering)	52.1% (25/48)	31.4% (16/51)
To consider the worst BS score when poor feathering is observed)	4.2% (2/48)	3.9% (2/51)
When poor feathering is observed, cleanliness assessment should not be done	--	13.7% (7/51)
Other	16.7% (8/48)	11.7% (6/51)