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EFFECTS OF A BACTERIAL COMPOUND ON LITTER TO REDUCE FOOTPAD LESIONS IN BROILERS

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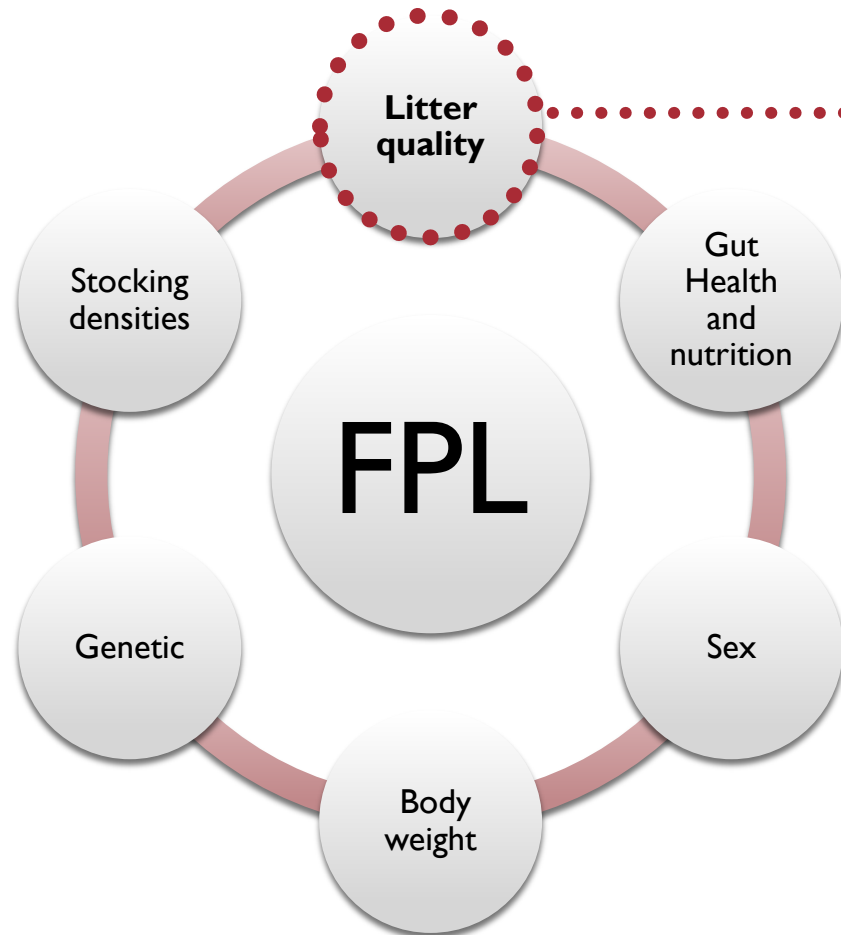
FOOTPAD LESIONS (FPL)

Condition characterized by inflammation and necrosis, ranging from superficial to deep on the plantar surface in growing broilers

- Affection of animal welfare
- Cause of unsteady walk and pain
- Risk factor: one of the main entry points for pathogenic microorganisms
- Reduce weight gain due to pain-induced-decreased feed intake



FACTORS ASSOCIATED WITH ONSET OF FOOTPAD LESIONS



Influence dust levels, air humidity and ammonia levels

Positive correlations between litter quality, moisture, and incidence of footpad dermatitis

Main features of interest: litter materials and water-holding capacity

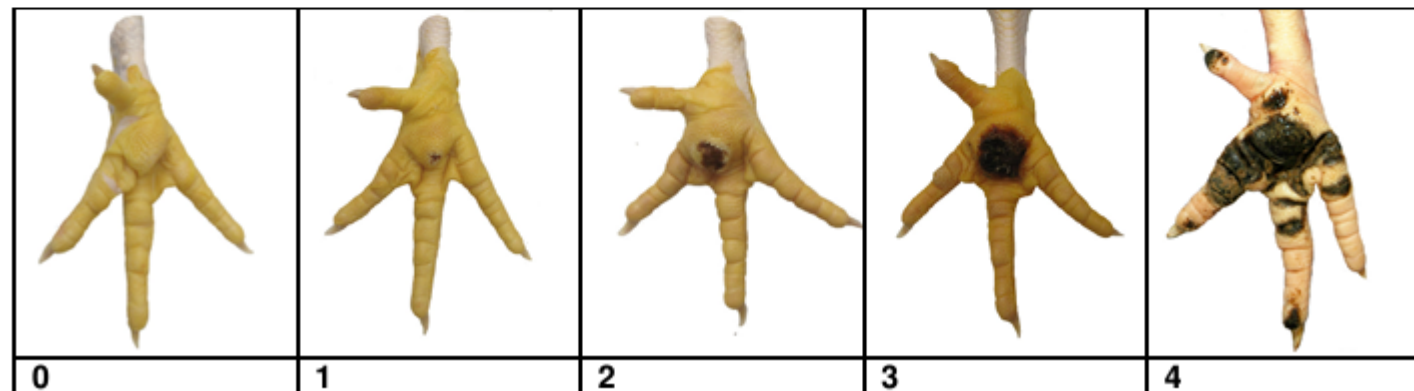
FOOTPAD LESIONS VISUAL SCALES

Foot, hock and breast burns lesions are considered as indicators of housing condition and general welfare in birds



Traditionally, visual scales are used to evaluate footpad lesions in broilers

<i>Title</i>	Foot pad dermatitis
<i>Scope</i>	Animal-based measure: Broiler chicken
<i>Sample size</i>	Sample size according to § 5.1A.5
<i>Method description</i>	Foot pad dermatitis is a contact dermatitis found on the skin of the foot, most commonly on the central pad, but sometimes also on the toes. The skin is turned dark by contact with litter and consequently deep skin lesions can result. The scoring scale allows an assessment of the severity of these lesions (see photographic reference). Assess the presence of hock burns with regard to the severity scale, scoring categories 0/1/2/3/4 as photographic illustration. Assess the number of animals in each scoring category and combine the categories for classification.
<i>Classification</i>	Individual level: a – No evidence of foot pad dermatitis (score '0') b – Minimal evidence of foot pad dermatitis (score '1' and '2') c – Evidence of foot pad dermatitis (score '3' and '4')



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Welfare Quality® - Assessment Protocol for Poultry

AIM OF THE TRIAL

FPL - MEASUREMENT

FPL - HISTOLOGICAL
EVALUATION

LITTER -
MICROBIOLOGICAL
CHARACTERIZATION



MATERIALS AND METHODS

89,200 Ross 308 chickens (39 ± 3 g) were housed in two sheds (C, control; T, treated) at the same environmental conditions

Chickens were weighed at day 0 and then weekly, using an electronic scale

Females were housed in the first part of each shed, males in the second and third part

A bacterial bedding conditioner was applied in T (EazyBed Pro, Lallemand, France)

1. Pre-treatment

(30g/m²) was carried out on the floor before placing the straw litter

2. Treatment

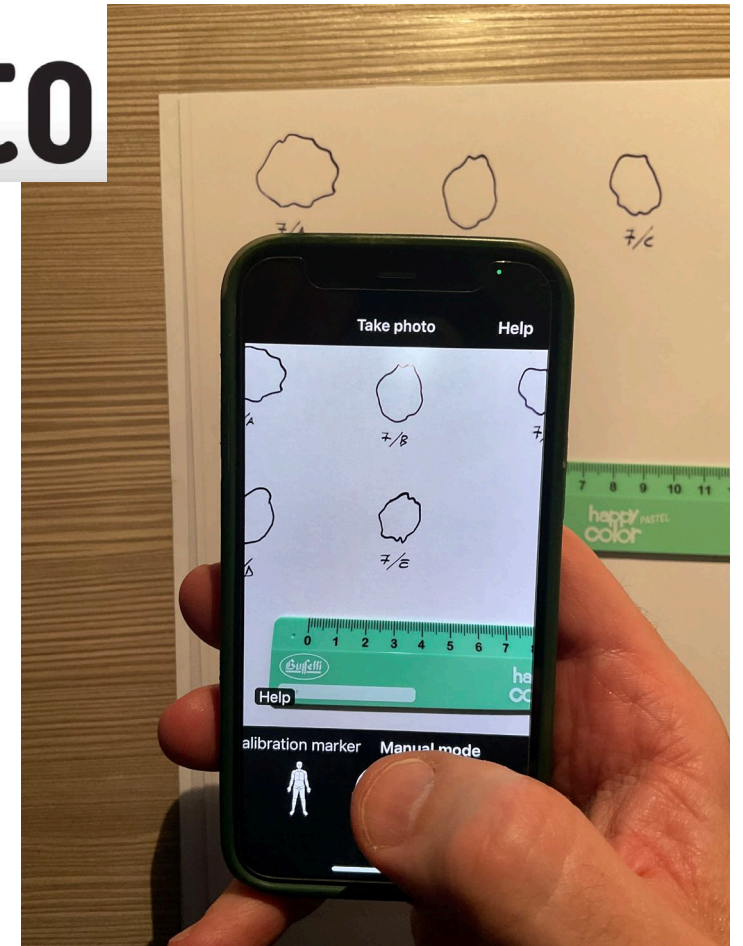
from week 1 to the end of the cycle (43d), the conditioner was applied weekly on the litter (90g/m²)



MATERIALS AND METHODS: FPL MISUREMENT



- On day 20 and the day before capture (35 and 42d), 30 birds in each part of the shed were randomly selected and, from both pads, the perimeter shape of each lesion was recorded, using transparent sheets
- A smartphone App for non-contact wound measurement (imitoMeasure) was used, to make the measurement of the area of footpad lesion objective
- Shape measurements were obtained in cm^2



ImitoMeasure App for mobile digital smart devices (Imito AG, Zürich, Switzerland, version 3.0.1)



MALDI-TOF MS
(Bruker Daltonics, Germany)

MATERIALS AND METHODS: MICROBIOLOGICAL ANALYSIS OF THE LITTER

For bacteriological and mycological culture, litter was sampled at different depths, pooling 9 samples/part, at the same timepoints (d 20, d 35, d 42)



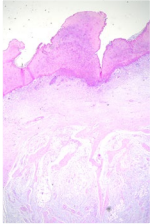


MATERIALS AND METHODS: SAMPLING

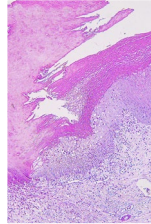
- ❑ At slaughtering, 12 legs for each group were randomly selected for histological examination
- ❑ Each pad was histologically analyzed using a scoring system, indicating the severity of lesion

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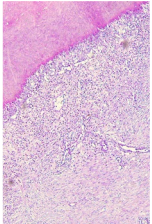
MATERIALS AND METHODS: HISTOLOGICAL SCORES



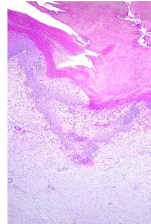
KERATINIZATON (0-5)



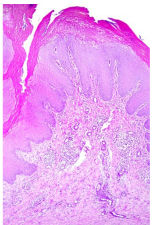
EPIDERMIS (0-5)



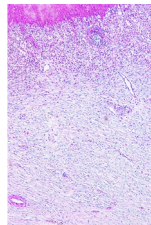
INFLAMMATION (0-5)



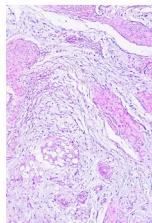
Eosinophils, Macrophages,
and Lympho-plasmacytes
(0-5)



NEOANGIOGENESIS(0-3)



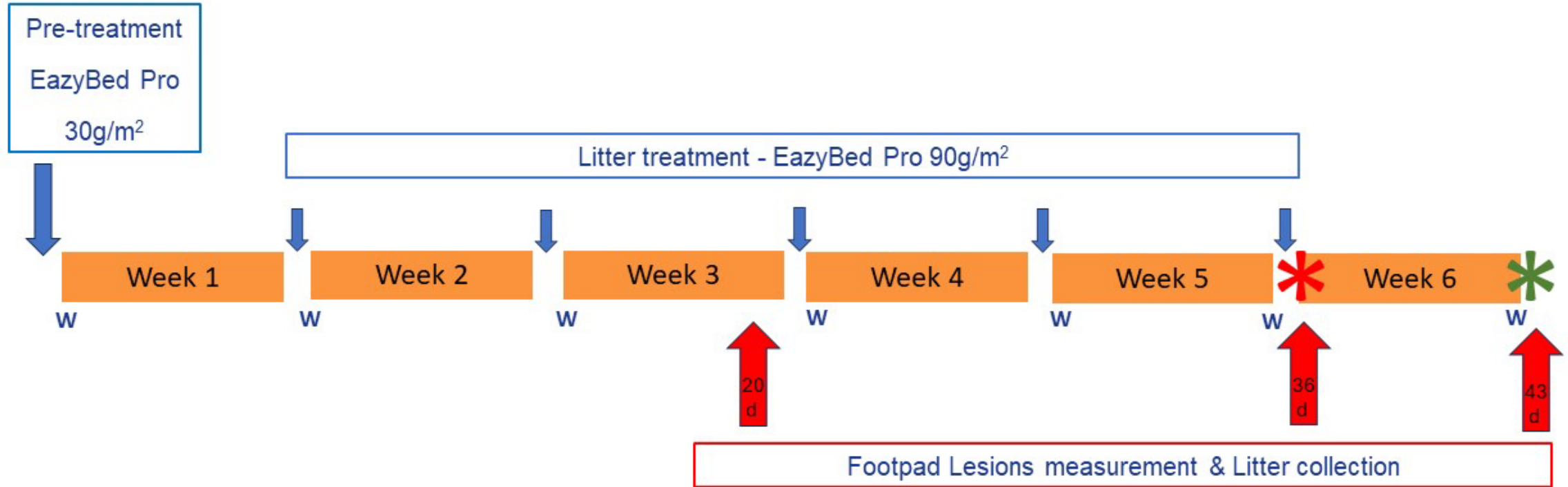
DERMAL INVOLVMENT
(0-5)



HYPODERMAL
INVOLVMENT (0-3)

ALL THE SINGLE
HISTOLOGICAL SCORES
WERE SUM UP TO OBTAIN
A TOTAL FINAL SCORE

MATERIALS AND METHODS: TIMELINE



W Weighing

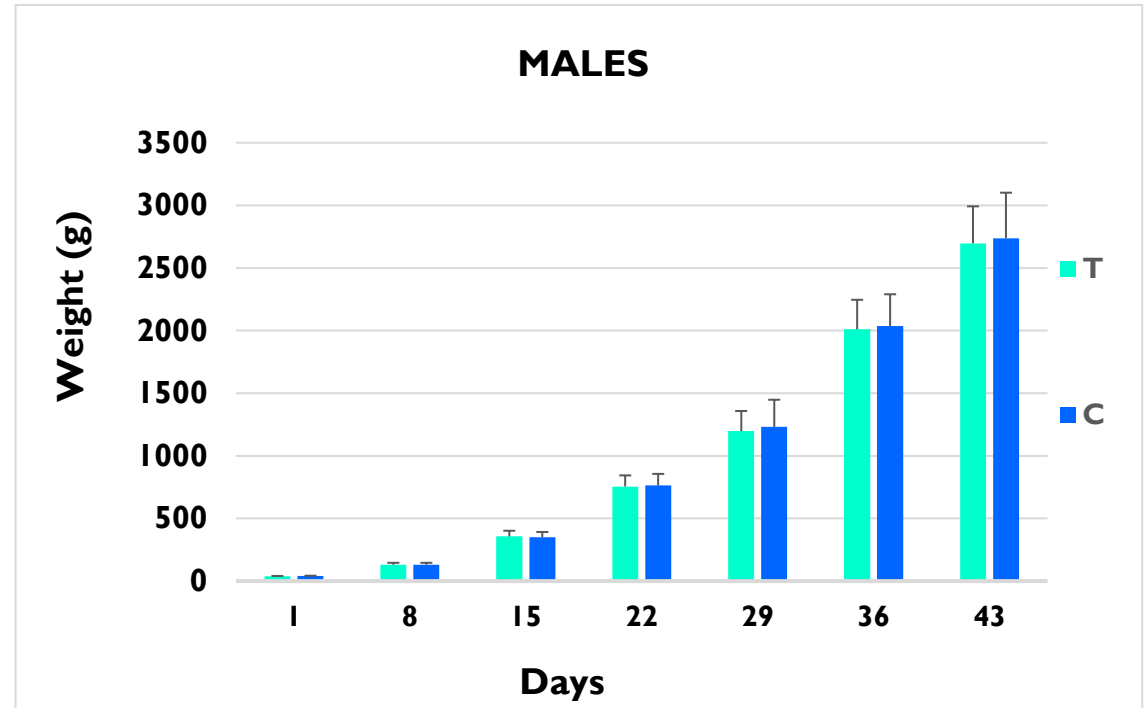
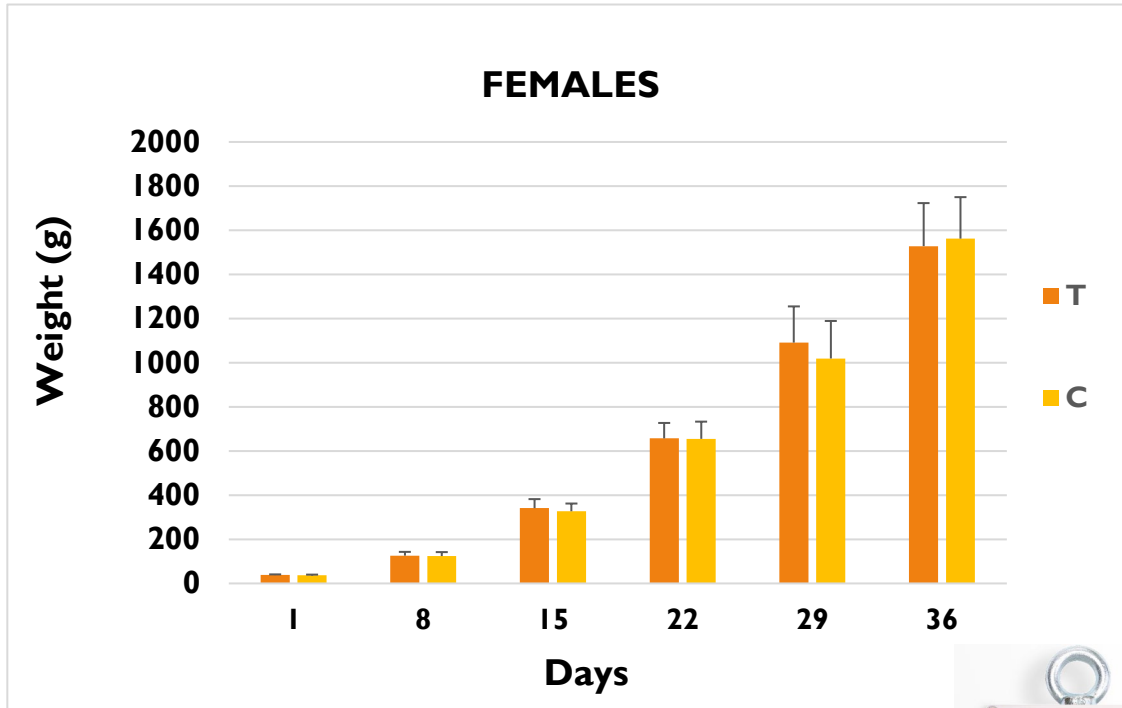
* Females slaughtering

* Males slaughtering

MATERIALS AND METHODS: STATISTIC

- ✓ Ordinal and cardinal variables were analysed by Mann-Whitney test or Student t-test, respectively
- ✓ In relation to the variables, median (minimum-maximum), and mean $\pm$ standard deviation, were considered

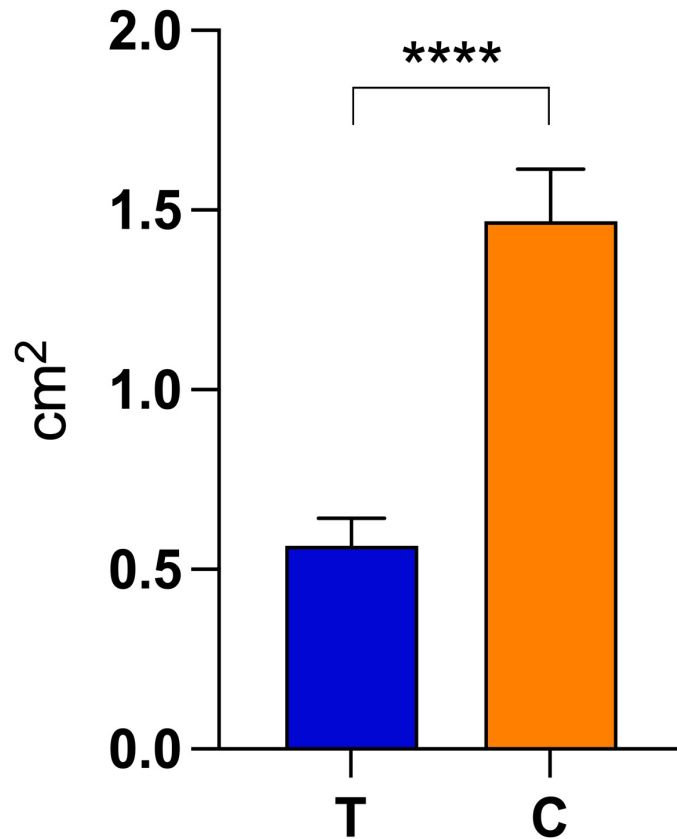
RESULTS: FINAL MEAN BODY WEIGHT



Females were slaughtered at 36d, males utilized the whole space until 43d, reaching the expected weights for the strain, without significant differences between groups

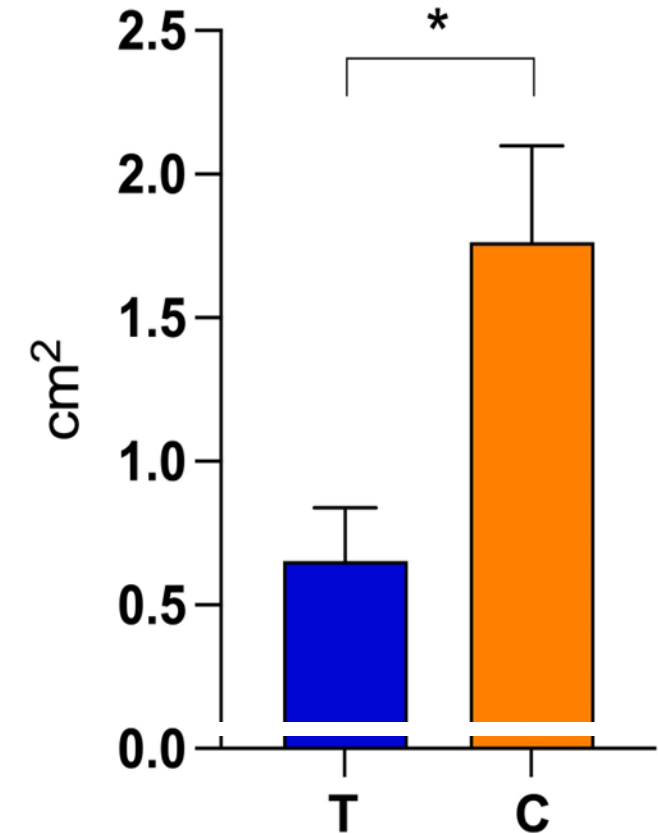


RESULTS: TOTAL FPL MISUREMENT



In T, lesions were significantly smaller than in C at **36 days**, in both males and females ($p < 0.0001$)

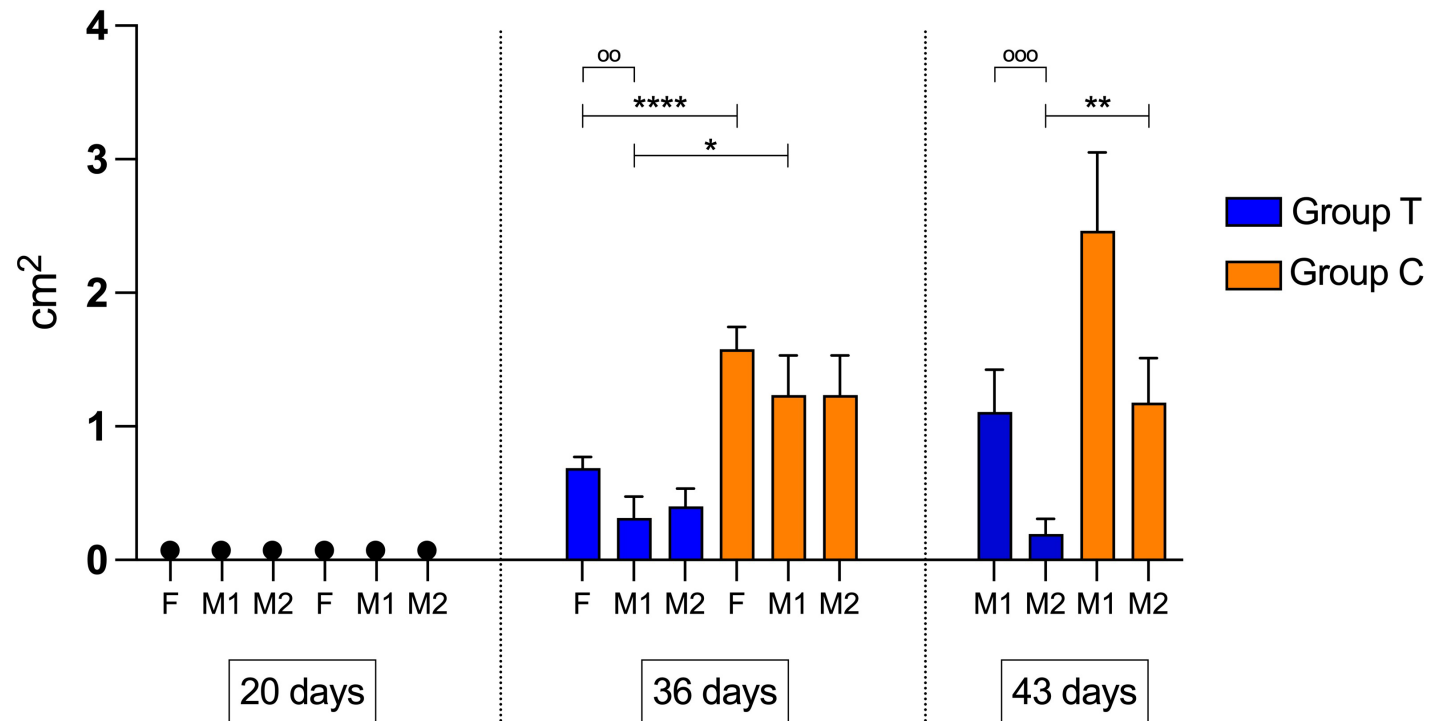
The application of ImitoMeasure allowed to obtain reliable results on footpad lesions



In T, lesions in males were significantly smaller than in C at **42 days** ($p = 0.049$)

No FPLs have been detected at **20 days**

RESULTS: FPL MISUREMENT IN EACH PART OF THE SHED



Also considering the three parts of each shed, lesions were significant smaller in T group

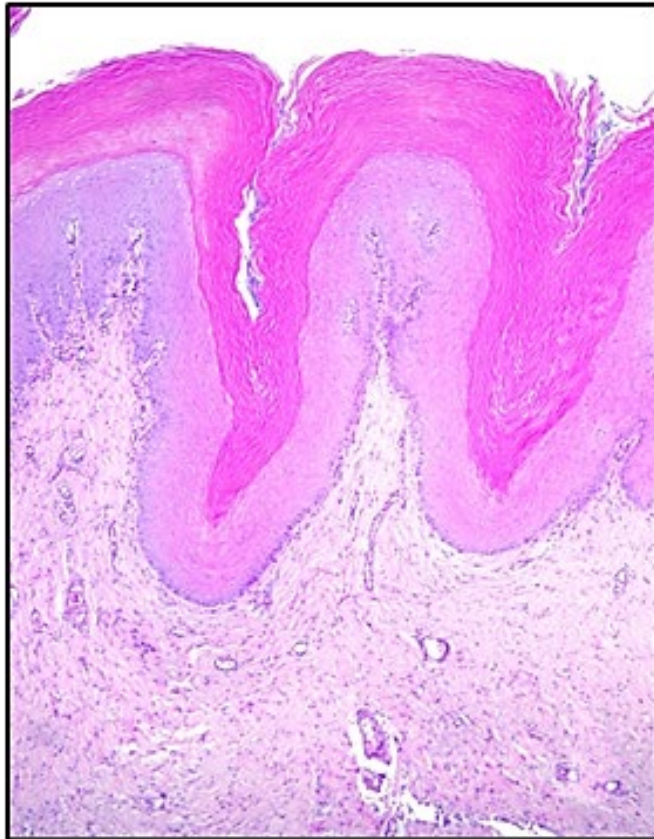
Asterisks indicate significant differences between groups. Circles indicate significant differences within each group
P-values, *: $P < 0.05$; **/°: $P < 0.01$; °°: $P < 0.001$; ****: $P < 0.0001$

RESULTS: LITTER MICROBIOLOGY

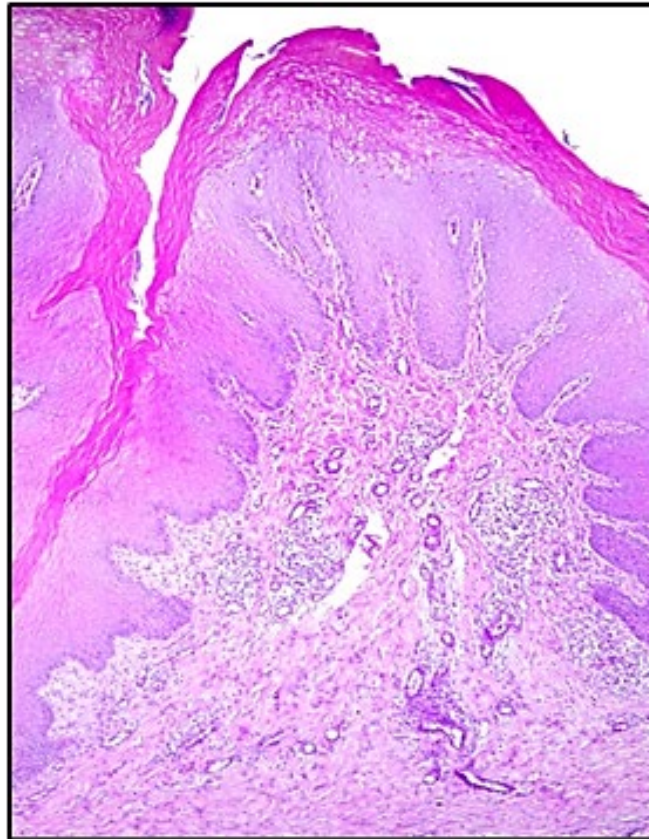
In litter collected in T, there was a significant reduction in Gram-negative bacteria ($p=0.0015$) and *Staphylococcus* spp. ($p = 0.0386$) counts, particularly notable in the second part of the shed ($p=0.0098$, $p=0.0131$ respectively)

RESULTS: HISTOLOGICAL ANALYSIS

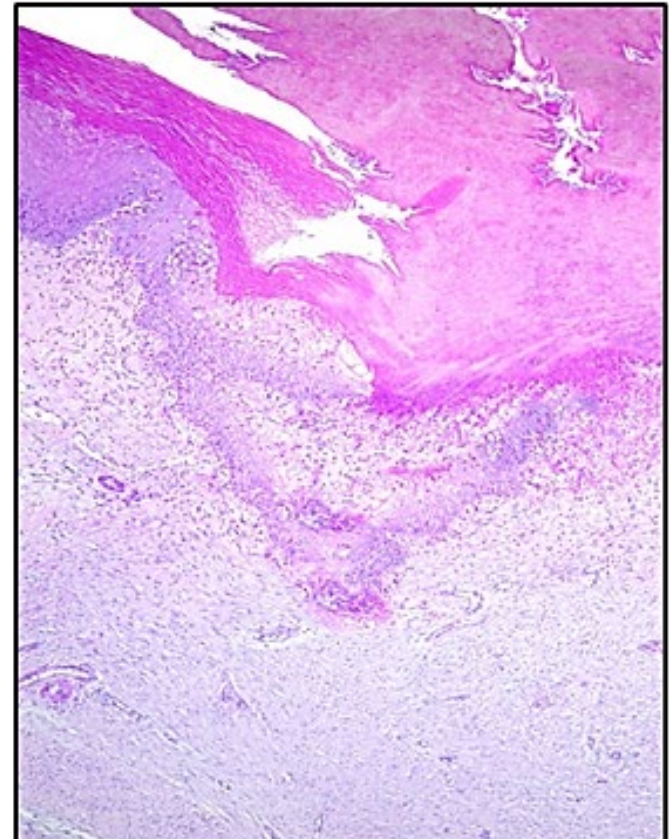
Total histological score: significantly lower in T than in C (18 vs 28.5; $p=0.0002$), especially in males (19.5 vs 30; $p<0.0001$)



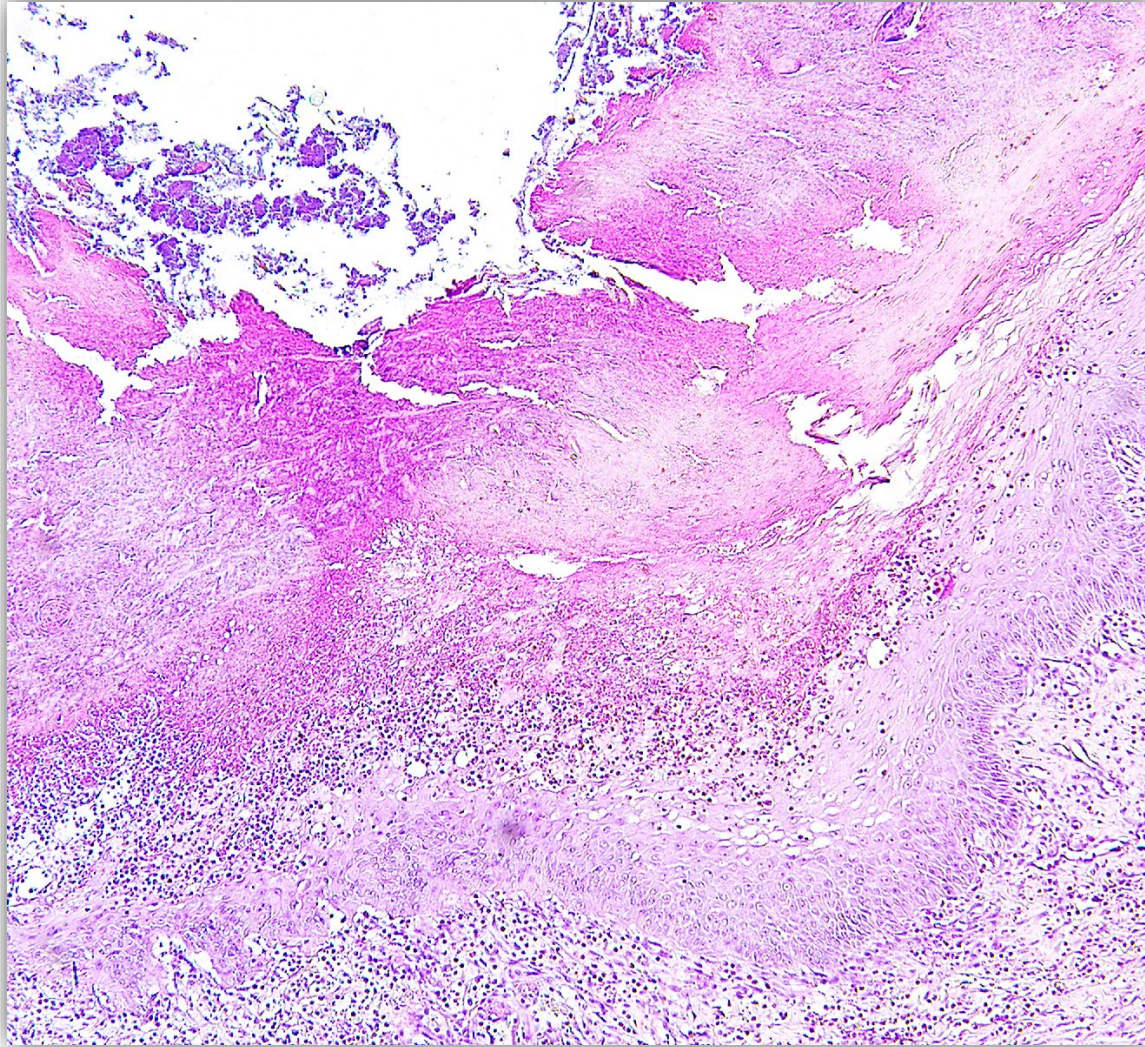
LOW SCORE – MILD FPL



MEDIUM SCORE – MODERATE FPL



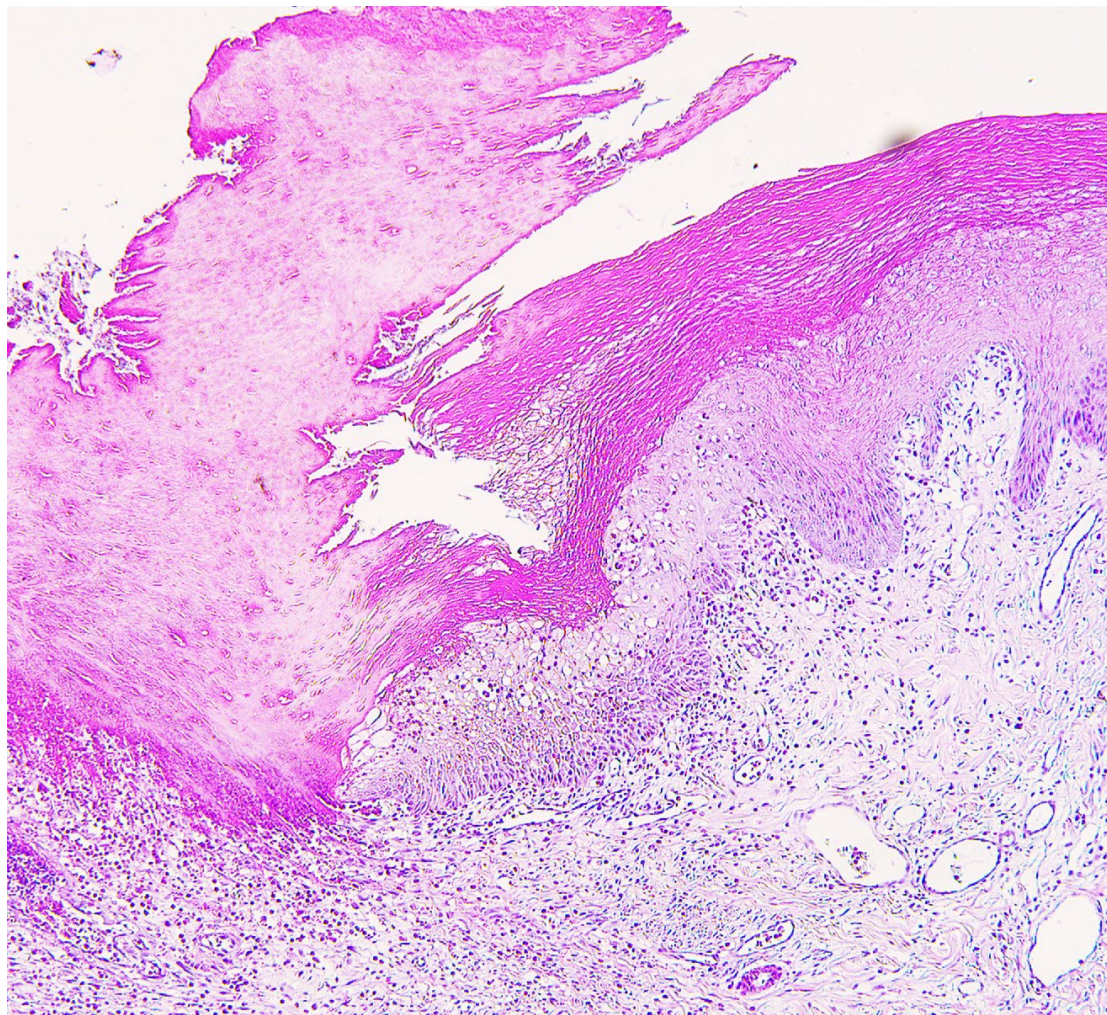
HIG SCORE- SEVERE FPL



HISTOLOGY - RESULTS

Both in **females** and **males**,
treatment significantly
reduce:

- **Inflammation**
(2 vs 4; $p < 0.0001$)
- **Heterophiles**
(3 vs 3; $p = 0.251$).
- **Leukocytes**
[macrophages (2 vs 3;
 $p = 0.016$) and lympho-
plasmacytes (1 vs 2;
 $p = 0.021$)]



HISTOLOGY - RESULTS

Only in **males** of group T were significantly reduced:

- **Keratinization**
(3 vs 4; $p=0.018$)
- **Epidermal layer structure**
(2.5 vs 5; $p=0.012$)
- **Dermal involvement of the lesions**
(2 vs 5; $p=0.0004$),
- **Hypodermal involvement**
(1 vs 2.5; $p=0.004$)
- **Neoangiogenesis**
(2 vs 3; $p=0.027$),

CONCLUSIONS

- The use of the *ImitoMeasure Application* facilitated objective measurement of the lesion
- Histological evaluations supported the use of the tested product to improve litter quality



**THE USE OF THE BACTERIAL COMPOUND APPLIED
ON THE LITTER POSITIVELY EFFECTS WIDTH AND
SEVERITY OF FOOTPAD LESIONS IN BROILERS**





*THANK YOU FOR YOUR
ATTENTION*

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