

INFLUENCE OF LITTER ON FOOTPAD DERMATITIS AND BODY WEIGHT IN BROILERS

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Abstract

Footpad dermatitis (FPD) is a relatively widespread problem in Europe and constitutes a welfare issue. FPD affect the plantar regions of the feet. In this study the influence of four type of litter (whole wheat straw, wood shavings, rice hulls and mixture of all three in the same proportion) on body weight and FPD was determined. A total of 1260 as-hatched broiler chickens (Ross 308) were randomly allocated in 12 pens of 5.0 m x 1.4 m. The body weights were recorded and calculated weekly for all birds from day 1 till 42 days. FPD occurred at as early as 7 days. Both foos were examined and scored for the incidence and development of FPD on a scale from 0 (no lesion) to 2 (very severe lesions). The body weights at 42 day were 2290.04 grams for birds reared on whole wheat straw, 2371.78 grams for birds reared on wood shavings, 2304.07 grams for broilers reared on rice hulls and 2321.85 grams for birds reared on mixture. FPD scores at 42 days were 7 (wood shavings), 24 (rice hulls), 78 (mixture) and 150 (hole wheat straw) exceeding the value of 50 points considered by the EU proposal 221 “Laying down minimum rules for the protection of chickens kept for meat production” as threshold. The incidences of FPD were 8% (wood shavings), 22% (rice hulls), 52% (mixture) and 80% (whole wheat straw). The litter had no significant effect on mortality. Mortality rate was lower than 1%+0.06% multiplied by 42 days (Council Directive 2007/43/EC). The results obtained in this study lead to the conclusion that litter type influences in a great extent the FPD score and body weights of broiler chickens at slaughter. ($P < 0.05$).

Key words: Broilers, footpad dermatitis, litter, body weight

FPD is a type of contact dermatitis (Greene et al., 1985) affecting the plantar regions of the feet. The Scientific Committee on Animal Health and Animal Welfare of the European Commission (SCAHAW, 2000) has published a report on the status of the rearing conditions of broilers with particular focus on the factors linked to animal welfare. FPD is considered to be an indicator of animal welfare because the disease likely affects the health of the birds and inflicts suffering (Dawkins et al. 2004; Martrenchar et al. 2002; Thomas et al., 2004). In an early stage, discoloration of the skin is seen. Hyperkeratosis and necrosis of the epidermis can be seen histological. In severe cases, the erosions develop into ulcerations with inflammatory reactions of the subcutaneous tissue (Greene et al., 1985). Often, the lesions become infected by a variety of bacteria and fungi, especially *Staphylococcus spp.* and *Escherichia coli* (Hester 1994). The lesions may heal (Greene et al. 1985). Several experiments have shown that the incidence and severity of FPD is related to multiple factors such as: litter material (Grimes et al. 2002), litter moisture (Martland 1985), litter deep (Ekstrand et al. 1997), litter

amendments (Nagaraj et al. 2007), stoking density (Sørensen et al. 2000), seasonal effect (Ekstrand and Carpenter, 1998), nutritional deficiencies (Murillo and Jensen 1976; Mayne 2005; Kenny et al. 2010). It has been shown that bedding material can account for up to 4 percent of a broiler's diet, also because birds are reared on floors covered with litter, the quality and type are important in the prevalence of FPD. Bedding material is very important for poultry industry.

In this experiment we have investigated the influence of four type of litter on the performance and the incidence of footpad dermatitis in broiler chickens on farm and at slaughter house.

MATERIAL AND METHOD

The experiment was carried out at the National Research & Development Institute for Animal Biology and Nutrition (INCDBNA) in Balotesti, Romania. All experimental procedures used in this experiment were approved by the Animal Care Committee of the INCDBNA, Balotesti. A total of 1260 day-old broiler chickens (Ross 308) were studied here. The chickens were randomly placed in 12 pens of 5.0 m x 1.4 m. (105 chickens each).

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The four type of litter material used in the experiment were: whole wheat straw, wood shavings, rice hulls and a mixture of all three in the same proportion. The deep of litter was 10 cm in all 12 pens.

Control parameters, such as temperature, humidity, light, ventilation and vaccination, were the same for all groups. Feed and water were provided *ad libitum*. In cases where mortalities were observed, the numbers and weights of such mortalities were recorded accurately to make necessary corrections in calculating feed intake and feed conversion ratio.

During the experiment the body weight were recorded weekly for all birds for day 1 till 42 days. Also both feet were examined for FPD from 7 days to slaughter. Footpad lesions were assessing according to the Swedish system, which is generally accepted FPD scoring system used in Europe. The footpad lesions were assigned to one of 3 classes: score 0 - no lesion (no lesions or very small and superficial lesions, slight discolouration on a limited area, mild hyperkeratosis, old scars, *fig.1*), score 1 – mild lesion (substantial discolouration of the footpad, superficial lesions, dark papillae, *fig. 2*) and score 2 – severe lesion (ulcers or scabs of significant size, signs haemorrhages of severely swollen footpad, *fig. 3*).

To classify FPD lesion has been used a photo guide to broiler foot health classification developed by Wageningen UR.

The footpad score was calculated as follows:

FPD score = $[100 * (0 * \text{the total number of footpad with score 0} + 0.5 * \text{the total number of footpad with score 1} + 2 * \text{the total number of footpad with score 2}) / (\text{total number of footpad scored})]$

Incidence of FPD % = $(\text{total number with score 1} + \text{total number with score 2}) / (\text{total number of footpad scored})$.

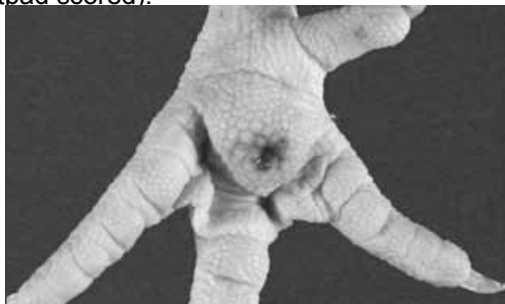


Figure 1 FPD score 0

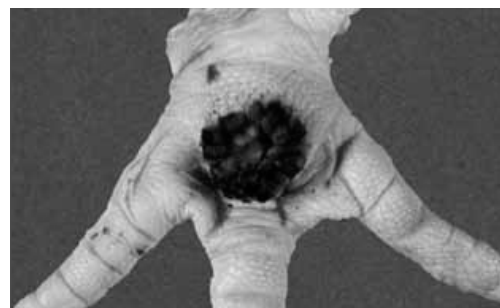


Figure 2 FPD score 1

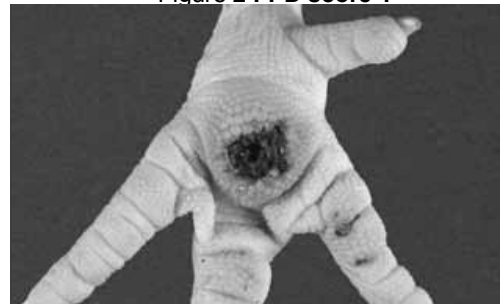


Figure 3 FPD score 2

Statistical analysis

All data were analysed by the General Linear Models (GLM) procedure using the SPSS software version 17 (SPSS Inc, Chicago IL, USA). One-way analysis of variance (ANOVA) with the post hoc Tukey's multiple comparison tests was used to evaluate statistical significance of differences among the control and experimental groups. Four treatments were arranged in 3 replications in a randomized complete block design. The results are given as means \pm standard deviation and $P < 0.05$ was considered as statistically significant difference. Replication was considered as the experiment unit for determined performance.

RESULTS AND DISCUSSION

The body weights obtained in the experiments are presented in Table 1. By age 28 days body weights were not significantly influenced by the type of litter. At 35 day the body weights were higher at broilers reared on wood shavings, comparative with birds reared on rice hulls and whole wheat straw. At 42 day, the higher body weight was for the birds reared on wood shavings, followed by birds reared on mixture, rice hulls and whole wheat straw ($P < 0.05$).

Table 1

Evolution of body weights (g) during the experimental period

Day of age	Mixture	Rice Hulls	Whole Wheat Straw	Wood shavings	P – Value
1	42.96 \pm 3.17	43.20 \pm 3.16	42.80 \pm 3.26	43.17 \pm 3.30	0.399
7	169.22 \pm 20.89	163.10 \pm 21.72	169.96 \pm 23.24	166.38 \pm 21.49	0.136
14	413.76 \pm 50.99	411.95 \pm 51.58	414.94 \pm 54.62	412.52 \pm 48.77	0.888
21	784.89 \pm 96.43	778.85 \pm 90.75	788.15 \pm 95.76	781.04 \pm 86.96	0.591
28	1261.38 \pm 164.58	1261.98 \pm 154.41	1260.46 \pm 162.13	1257.47 \pm 139.14	0.981
35	1782.13 \pm 208.28 ^{a,b}	1769.24 \pm 205.49 ^b	1757.76 \pm 189.93 ^b	1815.32 \pm 220.74 ^a	0,028
42	2321.85 \pm 253.96 ^a	2304.08 \pm 281.83 ^a	2290.04 \pm 278.51 ^b	2371.78 \pm 285.61 ^a	0,052

^{a,b} Means in the same row with different superscripts are significantly different ($P < 0.05$)

Table 2 presents the results of the experimental treatments on the average weight gain, feed intake, feed conversion ratio and mortality of the broilers. During the total period no significant difference between the experimental groups had been seen ($P>0.05$) for total weight

gain, feed intake, feed conversion ratio ($P>0.05$). Also the type of litter had no significant effect on mortality. Mortality rate was lower than $1\%+0.06\%$ multiplied by 42 days (Commission of the European Communities/ European Council, 2007).

Table 2

Weight gain (g), feed intake (g/bird), feed conversion ratio (g/g) and mortality (%) in broilers reared on different litter materials

Day of age	Mixture	Rice Hulls	Whole Wheat Straw	Wood shavings	P – Value
Total weight gain	2278.89±430.88	2284.97±398.29	2223.17±443.04	2328.61±418.74	0.123
Total feed intake	4126.11±333.79	4212.75±339.70	4080.37±350.17	4202.61±331.01	0.908
Total feed conversion ratio	1.81±0.20	1.85±0.24	1.86±0.22	1.81±0.23	0.774
Mortality	1.90±0.36	1.82±0.34	1.98±0.35	1.80±0.44	0.178

Means in each row with the same or no letter do not significantly differ ($P>0.05$)

Footpad dermatitis was observed in all fourth types of litter material. We observed that FPD occurred at as early as 7 days of age and the lesions became more severe according to age. Examples of foot pad lesions are presented in figure 4, 5 and 6.



Figure 4 FPD score 1 at 7 days



Figure 5 FPD score 1 at 28 days



Figure 6 FPD score 2 at slaughter

FPD scores calculated during the experiment are presented in figure 8. At 42 days FPD score were 7 (wood shavings), 24 (rice hulls), 78 (mixture) and 150 (hole wheat straw) exceeding the value of 50 points considered by the EU proposal as threshold. The incidences of FPD were 8% (wood shavings), 22% (rice hulls), 52% (mixture) and 80% (whole wheat straw) (fig. 8).

CONCLUSION

The results obtained in this study lead to the conclusion that litter type influences in a great extent the FPD score and body weights of broiler chickens at slaughter ($P<0.05$).

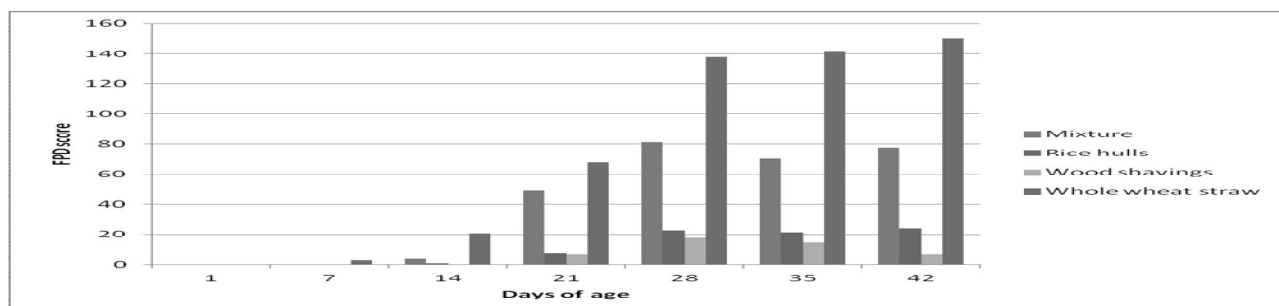


Figure 7 FPD score during the period 7 – 42 days

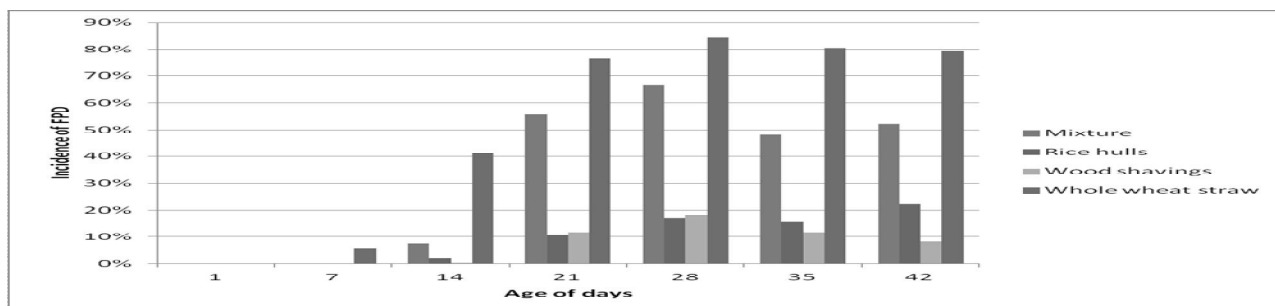


Figure 8 FPD incidence during the period 7 – 42 days

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