

The impact of crude fibre concentrate on footpad dermatitis in broilers

by Manfred Pietsch,
J. Rettenmaier & Söhne GmbH &
Co KG, Holzmühle 1, 73494
Rosenberg, Germany.

Footpad dermatitis is a common problem in poultry. Severe cases of footpad dermatitis have a negative impact on animal welfare as well as on the commercial result of broiler units.

The quality of the litter is unquestionably a major impact factor on the development of footpad dermatitis.

A combination of wet litter and unspecified chemical factors in the litter are thought to be the major cause of the footpad dermatitis. Beside disease, animal bedding and the housing management, the feed has a major impact on the litter quality.

Feed additives have been established to address wet litter problems (NSP-enzymes). Another approach is the use of a crude fibre concentrate. There is evidence that fibrillated insoluble lignocellulose has a positive effect on the litter quality and on the performance of the birds, respectively.

Footpad dermatitis

Footpad dermatitis, also known as plantar pododermatitis is a condition characterised by lesions of the ventral footpads of poultry. It is a type of a contact dermatitis affecting the plantar regions of the feet. The lesions can develop in less than a week.

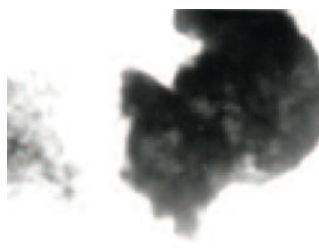
These lesions cause the birds serious pain and therefore the pododermatitis is an animal welfare issue.

Apart from animal welfare issues the contact dermatitis has a negative impact on the commercial results of the poultry industry. It has been shown that broilers with severe footpad dermatitis have a reduced weight gain.

Additionally, there are observations that footpad dermatitis is often associated with breast blisters and hock burns. Finally, the lesions can be a gateway for bacteria which spread via blood and cause joint



The HPC fibrillated insoluble crude fibre concentrate Arbocel (left) compared to wheat bran (right) at 50x magnification.



lesions and other serious health related problems.

In some Asian countries the intended use of the feet is for human consumption. Feet with serious lesions will not be consumed.

Wet litter

The so called 'wet litter syndrome' in poultry causes significant commercial damage. According to Butchers & Miles (2009) litter quality is one of the key factors in poultry production.

If litter quality is not kept at an acceptable level, very high bacterial loads and unsanitary growing conditions may result in odours (including ammonia), insect problems, soiled feathers, footpad lesions and breast blisters.

In a well managed broiler house, litter moisture normally averages between 25-35%.

In northern European countries wet litter is often prevalent in winter, as very low outside temperatures and necessity to heat make sufficient ventilation virtually impossible, while maintaining an ideal indoor temperature for the broilers. In some Middle East countries, as well as in South East Asia, wet litter issues can be observed throughout the whole year, due to the high air humidity.

Feeding strategies

Feed related causes of wet litter are well summarised by Butcher and Mills (2011).

Diarrhoea can be caused by

dietary components and/or infectious agents. A well established approach to control the infectious agents is the use of acids via feed/water or the use of antibiotics, in countries where they are still approved feed additives.

High intake of the minerals potassium, sodium, magnesium, sulphate or chloride can lead to excessive water consumption and wet droppings. When wet litter problems occur, feed levels of sodium and chloride (salt) should be determined. It is possible that a feed mixing error has occurred, resulting in excess salt in the diet. The water should be checked periodically for quality and mineral concentrations, especially for sulphate and magnesium.

Dietary fat of poor quality or rancid fat can lead to wet faecal droppings. Likewise, using feed ingredients such as wheat, barley, rye or cassava often results in excessively wet droppings. In this case it is

recommendable to use a commercially available enzyme preparation.

It is well established that high levels of mycotoxins in the feed can irritate the digestive tract.

Additionally, marked pathological changes in the kidney might occur resulting in higher water excretion.

Feed mills are well aware of this and control the feed for several mycotoxins before use. If the mycotoxins exceed a certain level the raw material is refused. In order to ensure a proper feed quality, mycotoxin binders are regularly included in the feed formulation.

Crude fibre concentrates

Crude fibre concentrates (CFC) describe products with a crude fibre content of at least 60%. The high fibre content is achieved by concentration processes of physical or thermo-mechanical nature. CFC are usually based on a lignocellulosic or a cellulosic fibre.

The CFC Arbocel has a very high water binding capacity. The product binds the water in the upper part of the intestine and releases the water in the lower part of the intestine by osmotic pressure.

Therefore the water is available for reabsorption and will not appear in the litter. Additionally, insoluble fibres speed up the transit period of the digesta in the small intestine. Thus, harmful bacteria cannot

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	Control	Arbocel
Birds	37,900	37,900
Trial start	17th January 2013	
Trial end	21st February 2013	
Trial duration (days)	33	33
FCR (g/g)	1.673	1.665

Table 1. Trial design.

Table 2. Broiler weight at different stages of the fattening period.

Day	Control	Arbocel	Statistics
0	41.0	40.2	ns
10	316	336	0.000
21	958	1017	0.000
33	1884	1992	0.003

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colonise and produce endotoxins, which often cause a release of water into the lumen.

The insoluble HPC fibrillated CFC Arbocel has been intensively investigated in the last couple of years. Professor Farran from the American University of Beirut demonstrates in several broiler trials that the use of 0.8% Arbocel in the feed reduces the litter humidity about 10%. This result has been confirmed in layers at the La Trobe University in Australia.

The occurrence of footpad dermatitis was not recorded in the trials mentioned above.

In order to show the direct impact of Arbocel on footpad dermatitis, a study at the University of Applied Science in Osnabrück was conducted. This trial evaluated the effects of 0.8% Arbocel in a commercial broiler diet on performance, footpad dermatitis and the litter humidity. Two independent replicates with about 76,000 birds each were evaluated.

The design of the first replicate is shown in Table 1.

Table 2 shows the weight of the birds. Arbocel caused a significant improvement in weight gain after 10, 21 and 33 days of trial duration. This higher weight gain confirms earlier observations of the University of Applied Science in Bingen, Germany.

Day	Control	Arbocel
0	92.9	92.9
10	72.7	78.9
21	61.8	68.6
33	61.3	60.3

Table 3. Litter dry matter (litter based on spelt hulls).

The American University of Beirut conducted digestibility trials including Arbocel. They observed an improvement of the protein and essential amino acid digestibility by 5-7% due to the use of Arbocel. This might explain the improved performance observed in the Osnabrück trial.

Tables 3 and 4 show the litter humidity and the scoring of footpad lesions. Until day 21 there was clearly reduced litter humidity in the Arbocel group. At the end of the trial the litter humidity was similar. However, the footpad scoring shows a significant improvement concerning the footpad lesions at the end of the trial at day 33.

This observation may lead to the conclusion that the litter humidity during the first 21 days of the fattening period is the most relevant to avoid serious footpad lesions.

During this period it is therefore obligatory to control the litter humidity via feed (starter and grower feed). The use of insoluble CFC is highly recommended in this period.

This trial was repeated in the same barns, with cross over design in order to avoid influence of the housing units. By doing so the researchers made sure that the effects are archived by the dietary treatment and not by the barn.

The second replicate with the

same number of birds was conducted from 1st March-4th April 2013.

The observations from the first trial were confirmed. Arbocel caused significantly better performance, lower litter humidity until day 21 and an improved situation concerning the footpad lesions.

Summary and conclusion

Footpad dermatitis (pododermatitis) is a serious problem in poultry. It negatively affects animal welfare, as well as the economic output in broiler units. Wet litter is one of the main causes for the development of footpad dermatitis.

It is important to control the wet litter by well established management tools like ventilation. On the other hand, feed quality and formulation (salt level, mycotoxins) can help control wet litter as well.

New trial results from the University of Applied Science in Osnabrück confirm that the HPC fibrillated insoluble crude fibre concentrate Arbocel is a good tool to control litter humidity as well as development of the footpad dermatitis. The results show that the control of litter humidity is especially important during the first 21 days to control the development of footpad dermatitis. ■

Table 4. Footpad lesions according to Mayne (2007): 0 = no footpad lesions; 7 = more as 50% of the foot with necrotic tissue.

Day	Left foot			Right foot		
	Control	Arbocel	Statistics	Control	Arbocel	Statistics
10	0.6	0.5	ns	0.4	0.4	ns
21	2.5	1.8	ns	2.7	1.7	0.039
33	3.7	2.7	0.006	3.9	2.6	0.006