17th European Symposium on Poultry Nutrition looks at wet litter

The UK Branch of WPSA recently hosted the 17th European Symposium on Poultry Nutrition. One of the sections focused on nutrition and litter quality and we will now summarise its contents for you.

British poultry veterinarian, Stephen Lister, set the scene with his paper entitled Effects of Litter Moisture on Performance, Health and Welfare.

He started off by stating that good quality litter supplies comfortable bedding which holds and maintains moisture and works to neutralise unwanted microbial activity from faecal material, whist providing a source of warm and dry material under foot. Good litter also supplies a substrate which enables the birds to satisfy ethological needs such as dust bathing.

The EU Council Directive 2007/43/EC states that 'all chickens (kept for meat production) shall have permanent access to litter which is dry and friable on the surface' although similar requirements already appear in the domestic legislation of some EU countries.

These legislative requirements tend to focus on the moisture content and texture of the litter and place significance on its friability. Litter that breaks up easily allows moisture release and this moisture can subsequently be removed by the ventilation system. It also facilitates aerobic conditions which promote aerobic microbial activity that generate heat for bird comfort and this also facilitates moisture loss from the litter and encourages the breakdown of organic faecal material.

PARASITES
Coccidiosis
Hexamitiasis
Trichomoniasis
Cochlosoma
BACTERIA
Clostridial infection, for example necrotic enteritis
Dysbacteriosis – imbalance of gut micro-flora
Other anaerobes
Spirochaetes, for example Brachyspira Spp.
VIRAL
Gumboro disease
Infectious bronchitis (certain strains)
Astroviruses
Rotaviruses
Enteroviruses

Table 2. Infectious causes of wet litter.

It is generally accepted that good litter has a dry matter content of 65-75% and litter can considered to be 'wet' when its dry matter content is <45%. Wet litter can be influenced by drinker management and the presence of scour in a flock.

Capping or caking of litter tends to trap moisture and noxious gases and prevents the litter working. This can be accompanied by hock, footpad and breast 'burns'.

The causes of wet litter can broadly be divided into infectious and non-infectious causes and usually wet litter is a combination of a range of inter-related factors. For example, footpad dermatitis has been associated with a high stocking density but whether this is due to increased faecal output per m^2, less efficient ventilation rates at higher stocking levels or changes in bird activity or a combination of these can be debated. In reality, it is probably a complex interaction of all of these and other factors.

Drinker design and management are very important in maintaining good litter quality. Closed nipple drinker systems tend to lose less water and, therefore, have less of an adverse effect on litter quality. Irrespective of system, bad maintenance (excessive leakage) and poorly managed (wrong water pressure or set at wrong height) systems will cause wet litter.

At 20°C water consumption is considered to be double feed intake (1.7-2.0:1.0), whereas at 26°C this will rise to 2.5:1.0 and at 35°C this can rise to 5.0:1.0. Thus, the temptation to compromise on minimum ventilation to conserve gas usage is often a false economy and can lead to significant problems in maintaining adequate air exchange, water removal and, hence, litter quality.

Dietary effects can impact on litter quality and these are summarised in Table 1. There are numerous infectious causes of wet litter and these are summarised in Table 2. It should be noted that, following the EU ban on the use of antimicrobial digestive enhancers, gut homeostasis has deteriorated.

It has been shown that elevated humidity and ammonia levels can influence the incidence and severity of respiratory tract damage which, in turn, impacts on the respiratory disease picture and poorly working litter exposes birds to increased parasitic and viral challenges. Excessive feather soiling can result in public health concerns because of increased levels of campylobacter and salmonella on birds going to processing.

Litter quality impacts on skin integrity and this can be associated with an increase in subcutaneous infections. All of these impact on bird health, welfare and performance.

H. Enting and colleagues from Spain then considered the influence of minerals on litter moisture. They highlighted how minerals

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Table 1. Dietary effects associated with wet litter.

Physical	Grist size, dust content, consistency and feed interruptions
Heat treatment	This can adversely affect digestibility
Electroytes	(potassium, sodium and chloride) affecting ionic balance associated with feed formulation or specific ingredients, for example soya
Protein	Level, source, quality and digestibility
Fats	Digestibility and effect on faecal quality and output
Cereals	Effect depends on digestibility and their effect on gut microflora
Mycotoxins	A variety of mycotoxins have attributed a number of non-nutritive effects

Sodium (g per kg)		0.9	1.3	1.7	2.4
Excreta moisture content	Day 15	794	796	794	803
	Day 28	763	777	795	806
Litter score	Day 15	8.9	9.0	9.0	9.0
	Day 28	5.2	5.3	5.0	4.6

Table 3. Effect of dietary sodium levels on excreta moisture content and litter quality during the winter (Nutreco).

Sodium (g per kg)		1.1	1.5	1.8	2.0
Water:feed ratio		1.69	1.70	1.71	1.74
Litter score	Day 11	6.9	7.0	7.1	6.9
Litter score	Day 28	6.1	6.3	6.3	6.0

Table 4. Effect of sodium levels in grower and finisher feeds on water:feed ratio and litter quality of broiler chickens during the summer (Nutreco).

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that are required to maintain osmotic pressure, anion-cation balance and bone strength are directly related to water intake and urinary output and hence with litter quality.

Increasing dietary sodium level can increase litter moisture content and impair litter quality (Tables 3 and 4).

Effects of sodium on litter quality in these tables appear to be more pronounced during the winter than during the summer.

Increased potassium (Table 5) levels result in increased water:feed ratio, impaired litter quality and increased excreta and litter moisture. An increase of 1g potassium per kg feed in layer diets provides a larger increase in excreta moisture content than an increase of 1g sodium per kg feed (12.0 vs. 9.1g per kg respectively).

It would appear that phytase may have a sodium sparing effect, whereas this is not the case with potassium. So, there may be merit in assigning a sodium value to phytase when formulating feeds.

The effects of chloride on litter quality appear to be less clear than those of sodium and potassium.

Recently in the literature it has been mentioned that dolomite limestone with high levels of magnesium can cause wet litter. Work done by H. Enting and colleagues at Nutreco indicates that increased magnesium levels can cause an increase in the water:feed ratio and impair litter quality (Table 6).

Interestingly, the effects of calcium and phosphorus on excreta moisture seem to be different in laying and growing poultry and young birds seem to be able to tolerate high calcium levels less well than older birds. ■

Table 5. Effect of dietary potassium levels on water:feed ratio and litter quality of broilers (Nutreco).

Potassium (g per kg)		8.0	9.0	10.0	11.0
Water: feed ratio		1.44	1.61	1.70	1.74
Litter score	Day 11	9.3	9.4	8.7	8.9
Litter score	Day 28	5.8	5.5	4.5	3.7

Table 6. Effect of dietary magnesium levels on water:feed ratio and litter quality for broilers (Nutreco).

Magnesium (g per kg)		2.3	3.0	3.6	4.1
Water: feed ratio		1.80	1.80	1.89	1.96
Litter score	Day 11	6.9	6.8	6.7	6.4
Litter score	Day 28	6.8	6.4	4.7	4.5