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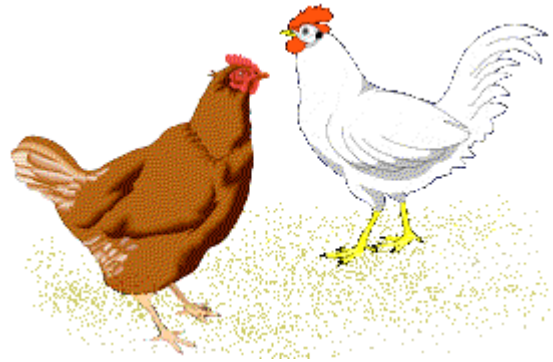
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1. Introduction

- 1 A poultry flock kept on well maintained litter is healthier and more profitable than one kept on poor quality litter. Diseases such as pododermatitis, hock burn and breast blisters are all a consequence of poor litter. In turkeys the so called "shaky leg syndrome" sometimes follows foot ulceration associated with poor litter quality. These disorders cause unnecessary suffering to the birds and can also result in downgrading of the end product at the slaughterhouse.
- 2 The requirement to keep litter in a well maintained state is enshrined in law (Welfare of Livestock Regulations 1994) and in the Defra Welfare Codes. Farmers who cause unnecessary pain or unnecessary distress to their birds by failing to maintain good quality litter may be prosecuted.
- 3 Many factors may give rise to poor litter quality and it is the purpose of this publication to help producers prevent the problem by providing an understanding of these factors.



2. Litter Associated Conditions

- 4 A typical example of burnt hocks in broilers.



- 5 When on poor litter broilers are susceptible to pododermatitis.



- 6 Turkeys can also suffer from pododermatitis.



- 7 Breast blemishes can be found on chickens.



3. Factors Effecting Litter Conditions

- 8 There are three factors that have particularly important effects on the litter condition.
- a) Litter Moisture
 - b) Greasy Capped Litter
 - c) Nitrogen in the litter

Litter Moisture

- 9 Litter moisture is the key to the burnt hock problem. It is unusual for there to be burnt hocks when the litter condition is friable and dry.
- 10 Litter moisture is affected by drinker design; air change rate; litter material and depth; stocking density; diet and flock health.
- 11 Wet litter causes degeneration of the outer scales on the hocks and feet (i.e. on the pressure points). As liveweight increases and mobility decreases the pressure becomes greater and contact with the litter more prolonged. Males are therefore more affected by wet litter than females.

Greasy Capped Litter

- 12 When there is too much fat in the feed or it is of poor quality, the fat content of the faeces increases. Consequently the litter also has a higher fat content which causes it to lose its friability more quickly. A cap forms and the pressure points on the bird's legs and breast are then vulnerable to damage.

Nitrogen in the Litter

- 13 Experimental evidence suggests that the worst burning tends to occur when the nitrogen content of the litter exceeds 5.5%. The quality and amount of protein in the feed should be examined if litter nitrogen levels are high. At these times, the moisture content of the litter is also often found to be high.

4. Control of Litter Condition

- 14 A number of issues can affect the condition of poultry litter. These include:
- Drinker Design and Management
 - Air Change Rate and House Environment
 - Litter Material and Depth
 - Stocking Density
 - Nutrition
 - Flock Health
 - Conclusions

Drinker Design and Management

- 15 Of all the factors that affect litter moisture, probably the most important is the design and management of the drinkers. This is not surprising when one considers that a poor drinker design will waste as much as 15,000 litres of water in a 20,000 bird broiler house over a 49 day growing period!



Welfare risks are increased by capped litter. Capping can be caused by the feed, drinkers, environment or disease

- 16 It is essential for drinkers to be at the optimum height for the birds. This too reduces wastage. A nipple or cup drinking system at the correct height can lead to up to a 7% reduction in litter moisture.



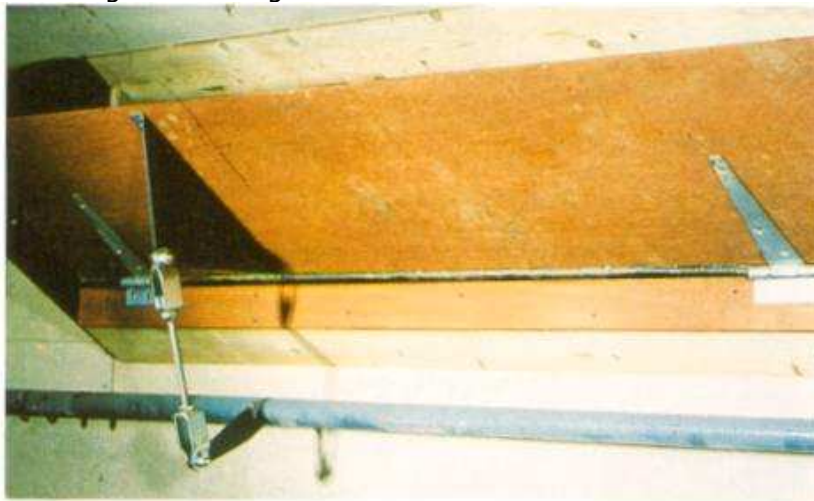
A ring of capped litter is often found under bell drinkers



Nipple drinkers can reduce litter moisture by up to 7%

Air Change Rate and House Environment

- 17 In poultry houses, three factors have to be considered together, because their control is interdependent. They are the environmental temperature, ventilation rate and humidity. Ideally their control should be interlinked.
- 18 The humidity of the poultry house environment is affected by the number and size of the birds and therefore by their respiratory output and also, of course, by the relative humidity of the air being drawn into the house by the ventilation system. When the relative humidity in the house exceeds 70%, the moisture content of the litter tends to increase, leading to poorer conditions. The aim should be to maintain a relative humidity level in the house of between 50 and 70% by supplying sufficient air and added heat when necessary.
- 19 The ventilation rate must always be maintained at a level sufficient to ensure that ammonia does not approach the threshold level of 25ppm. In cold weather this may necessitate increasing the heating levels within the house.



A typical automated eaves inlet

- 20 It is important to prevent cool moist air from falling to the litter. With the correct controls and inlet design this can be achieved. Tell tale soggy areas of litter can often be shown to be where the air has tumbled into the house from ridge inlets or down to the litter from wider than necessary eaves inlets.
- 21 Roofs and walls of poultry houses must be adequately insulated to prevent condensation. Insulation with a U value of $0.4\text{W/m}^2\text{C}$ or better is necessary. To prevent deterioration of the insulation, a vapour seal between the birds and the insulant is essential unless self sealed insulation is used. Likewise cool water pipes and tanks should be lagged and the dwarf walls should be insulated. Ideally the concrete floor of the house should have a waterproof membrane to prevent rising damp.

Litter Material and Depth

- 22 The most effective litter material for poultry is wood shavings. The most commonly used alternative is chopped straw. The action of chopping the straw makes it more absorbent. Recently introduced pelleted, dried and treated products are now available and these are used at a lesser depth than the usual 5cm of woodshavings or 5 - 10 cm of chopped straw. In general, neither the choice of material nor its depth has a consistent effect in preventing the problems associated with poor quality litter. With friable litter, increasing the depth can obviously improve the ratio of litter to faeces. Poultry litter that is friable has a temperature that increases to about 27C. This warmth is due to bacterial breakdown of the faeces. When it is capped and cold the litter material may need 'topping up' with fresh litter so that direct contact with the

wet cap can be avoided and the welfare of the birds enhanced. An extreme example of this occurs with ducks where frequent topping up is essential because of their very wet faeces.

Stocking density

- 23 A guide to maximum stocking densities is given in the Defra Welfare Codes. For table chickens this is 34kg/ m² and for adult laying birds not more than 7 birds / m².
- 24 Most of the water, fat and nitrogen found in the litter has been excreted from the birds as faeces. Therefore the higher the density the more of these factors the litter has to absorb. The rate of evaporation of moisture from the litter falls as stocking density increases, so particular attention must be paid to litter quality as the birds approach killing weight.



The risks of poor litter are increased by high stocking densities

Nutrition

- 25 Any dietary factor that makes the birds increase their water consumption is likely to lead to wetter litter and therefore higher risks to the birds' welfare.
- 26 The following factors should not exceed their optimum levels:-
- Sodium and chloride** - Use sodium bicarbonate as well as salt
 - Potassium** - Beware of molasses, manioc, excessive soya
 - Crude protein and amino acids** - As well as increasing the moisture content of the faeces, excess nitrogen is excreted. This increases the severity of burnt hocks. Poorly digested feed ingredients can lead to wetter litter, higher litter nitrogen and therefore an increased welfare risk. For this reason protein quality and the amino acid balance must be optimal. Enzymes such as B glucanase can aid the digestibility of cereals in the feed.



Both protein and fat quality can affect litter condition

- 27 Added fat is an essential ingredient in achieving adequate dietary energy levels for poultry meat production. The quality, composition and quantity of the fat has a direct effect on the level of the fat in the faeces. High faecal levels can lead to the litter capping at lower moisture levels. The fat blend must have optimal ratios of saturated and unsaturated fats. Saturated fats are less well digested especially early in life.

- 28 It is vital that those responsible for formulations realise that the effects of each of the possible nutritional anomalies are **additive**.

Flock Health

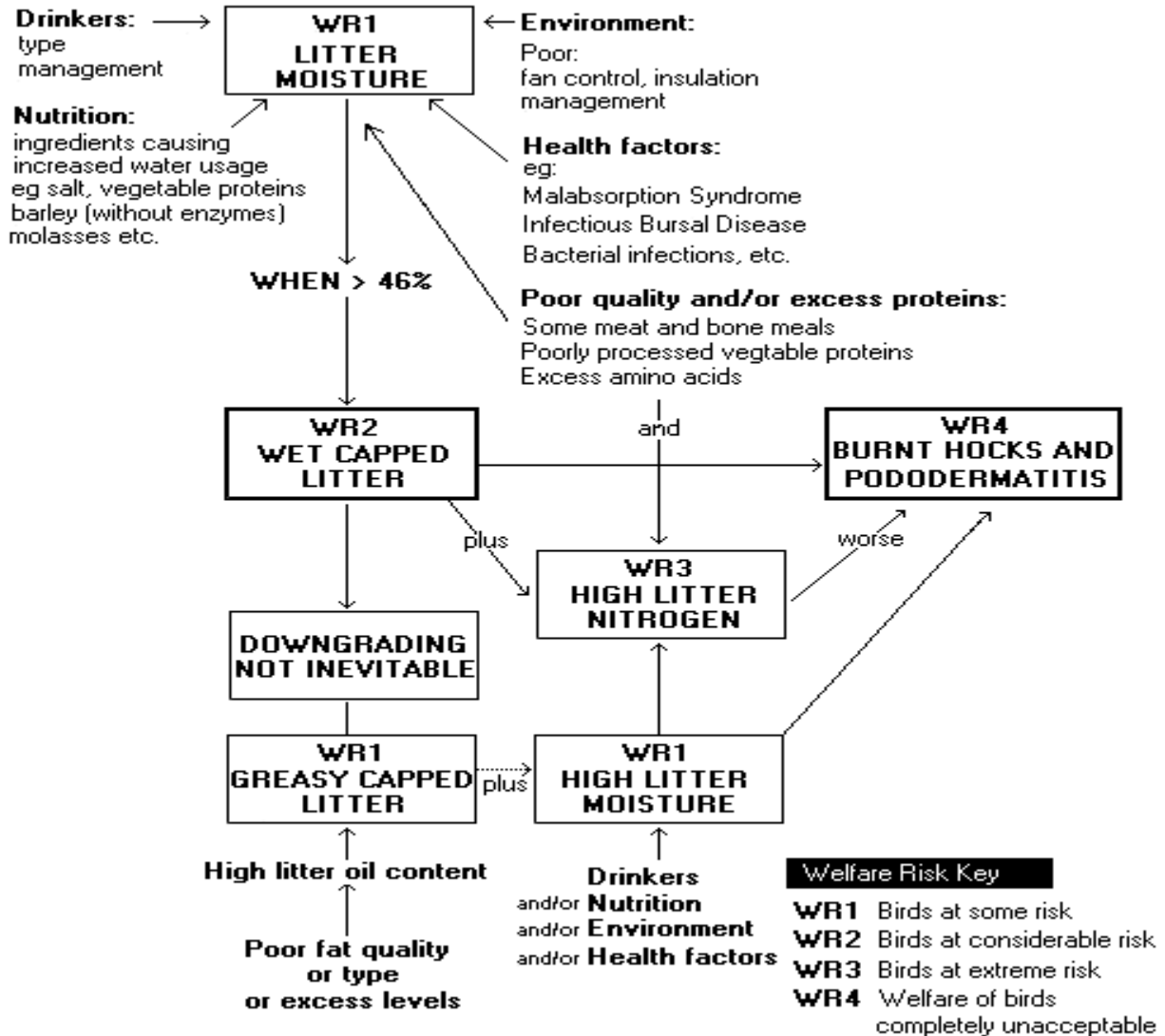
- 29 There are several infectious and non-infectious diseases and conditions that may increase the severity of hock burn, pododermatitis and breast blisters.
- 30 Any disease or skeletal abnormality that reduces the birds' mobility is likely to affect their welfare adversely, as they will have increased contact with the litter.
- 31 Enteritis and disorders such as the so-called malabsorption syndrome can result in an increased excretion of water in the faeces. Likewise, infectious bursal disease (Gumboro Disease) is well known to result in extremely wet and foul smelling litter almost overnight.
- 32 It is essential to seek and act upon veterinary advice if disease is suspected.
- 33 **Remember: not all hock burn or breast blisters are simply a result of poor litter quality. If birds spend excessive amounts of time squatting down due to leg problems or other diseases they will be more likely to suffer from these lesions regardless of litter condition.**

5. Conclusions

34

- Poor litter quality can be avoided.
- The welfare of poultry and litter condition are closely linked. Many factors affect the condition of poultry litter. Their detrimental effects are **additive**.
- **Water is the key word**. Any factors that increase litter moisture are likely to affect the birds' welfare adversely. A contact dermatitis such as hock burn and plantar pododermatitis are typical of conditions that are associated with wet litter.
- Drinkers that reduce water wastage should be used.
- Condensation should be eliminated by correct insulation of the building structure and water supply system.
- Adequate air change rates should be provided uniformly to all birds.
- Stocking density should not exceed the welfare code levels.
- Litter should be of adequate depth for dilution of the faeces. Wood shavings are the best litter but chopped or treated straw can be used, provided that the management of the litter is good.
- Both poor quality and excess protein levels in the feed increase litter moisture and its nitrogen content. This leads to an increase in the severity of the burnt hocks and pododermatitis.
- Dietary sodium, chloride and potassium affect water consumption and therefore litter moisture and condition. Their inclusion levels in the feed must be optimal.
- The maximum inclusion rates of dietary ingredients should reflect their individual and additive effects on the litter.
- Either poor quality fat or an excess of good quality fat will lead to higher oil levels in the litter which causes it to lose its friability and therefore to cap.
- Veterinary advice should be sought and acted upon whenever disease is suspected.

6. Poultry Welfare Litter Condition and Management



7. Further Information

If you would like any further information or advice relating to this code please contact DEFRA's Animal Welfare Division on 020 7904 6512.

DEFRA (Department of Environment, Food and Rural Affairs). Further copies of this publication are available from : Defra Publications, Admail 6000, London, SW1A 2XX, Tel: 0845 955 600.

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