The Detection of Dysbacteriosi s — Iain Mortimer, M.R.C.V.S.

“Biography”

Senior Veterinary Advisor, Elanco Animal Health
U.K. And Ireland

Iain qualified as a veterinarian from Melbourne University in 1989, and after a short period in General practice, moved to Ireland where he spent 3 years working as a specialist production animal veterinarian. In 1997 he joined Elanco Animal Health as a veterinary adviser, supporting Elanco’s Pig and Poultry team in the UK and Ireland.
The Detection of Dysbacteriosis

“Iain Mortimer, Elanco Animal Health

Introduction

Increasingly, wet litter has been reported as a problem of the intensive broiler industry.

Many environmental, management and bird factors contribute to litter quality. Recently, wet litter has been directly linked to a poorly described digestive condition of poultry known as ‘dysbacteriosis’.

Enterome based analytical methods have demonstrate that birds affected by this condition have an increase in the size and change in the composition of the normal duodenal bacterial flora (Panneman 2000). It is hypothesised that this change in the microbial flora leads to malabsorption and a deterioration in litter quality due to a higher moisture content in the droppings of affected birds.

Well-managed litter will have some absorptive capacity, consequently the moisture content of affected birds is likely to be abnormally high for a period of time before litter quality deteriorates visibly. For that reason, a means of monitoring the moisture content of the birds’ droppings, on a daily basis, would be helpful in the early diagnosis of dysbacteriosis and in the differentiation of this disease from management associated problems.

The Litter Box – materials and methods

The litter box is a simple device designed to allow the moisture content of bird droppings to be measured. The droppings of birds, perched on top of the box, pass through the grid on the top and fall onto absorptive paper below. A moisture ring then spreads out from this dropping, the extent of which would be directly proportional to the moisture content of the dropping. (See Figures D-1 and D-2 on next page).
If droppings are classified as ‘wet’ or ‘dry’, according to the extent of the moisture ring, (> 0.5cm ‘wet; < 0.5cm ‘dry’) then the proportion of wet dropping over a given time period can be assessed on a daily basis. The greater the proportion of wet droppings, the greater the likelihood of the birds having dysbacteriosis and subsequently, the litter becoming wet. The litter box can be used thus as a diagnostic tool:

- If the proportion of wet droppings is below a lower cut off mark, then the birds are unaffected and the litter will not become wet.

- If the proportion of wet droppings is above an upper cut off mark, then the birds are affected and the litter will become wet.

- If the proportion of wet droppings is between the two cut off marks, the test is inconclusive.
Computer programmes are available to determine these cut off marks and ensure that the number of false positives and false negatives are acceptably low.

**Results**

The diagnostic ability of the litter box was assessed over 150 farms in the UK. Upper and lower cut off marks were determined, with their corresponding positive and negative predictive values.

For the purposes of this assessment, each farm was given a score, rounded to the nearest first decimal point, equal to the highest proportion of wet droppings over two consecutive days. Farms were classified as ‘affected’ (litter assessed as wet by the farm manager for two or more consecutive days) or ‘unaffected’. Farm managers were given specific guidelines on how to assess the litter quality. For each score, the number of affected and unaffected farms was recorded. Results are shown in Figure D-3.

![Figure D-3](image)

This information was analysed using Win Episcope2.0® software (See Figures D-4 & D-5).
A lower cut off of 0.2 gave a 95% negative predictive value and an upper cut off of 0.5 gave a 100% positive predictive value.

Figure D-4.

Figure D-5.
Discussion and conclusions

The following guidelines were then recommended for use with the litter box:

1. Calculate the proportion of wet droppings, daily, over a two to three hour period.

2. If the value of the litter box score is less than 20%, wet litter should not be a problem.

3. If the litter box score rises above 20%, for two or more consecutive days, then the farm is at risk of wet litter due to dysbacteriosis.

4. If the litter box score rises above 50%, for two or more days, then the litter is highly likely to become wet and immediate action is required.

Conclusion

The presence of a qualitatively and/or quantitatively abnormal flora in the small intestine (dysbacteriosis) can cause a diarrhoea, malabsorption and wet droppings. This in turn leads to wet litter.

Current knowledge shows that litterboxes can be used as an indication of increased likelihood of wet litter occurring during a crop and can confirm wet droppings as the causal factor.

References


The Detection of Dysbacteriosis

“Slide Presentation”

Iain Mortimer, Elanco Animal Health

Figure D-1.

Figure D-2.

Figure D-3.

Figure D-4.
The Detection of Dysbacteriosis, The Elanco Global Enteritis Symposium

“Slide Presentation”, D-10

July 9-11, 2002
Figure D-11.

Determining the cut off marks
- Over 150 farms in the UK took part in the assessment
- A protocol for measuring the moisture ring and assessing the litter quality was written
- All farm managers were visited to ensure interpretation of the protocol was the same

Figure D-12.

Protocol
- Place box daily from day 10 to day 35
  - Do not place near drinker lines, the door or other areas of condensation
- Record % wet droppings daily
  - Do not record cerel droppings
  - Ignore all droppings that lie too close together to allow them to be distinguished
- Assess litter quality and record daily
  - Guide on recording sheet
- Affer depopulation form is classified as affected or unaffected
  - If the farm had wet litter >= 2 days then affected otherwise unaffected

Figure D-13.

Determining the cut off marks
Results entered into database

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<th>Farm</th>
<th>Score</th>
<th>Affected</th>
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<tbody>
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</tr>
<tr>
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<td>0.5</td>
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</tr>
<tr>
<td>3</td>
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</tr>
<tr>
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</tr>
<tr>
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<td>0.2</td>
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</tr>
<tr>
<td>6</td>
<td>0.5</td>
<td>Yes</td>
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</tbody>
</table>

Figure D-14.

Determining the cut off marks
Score: Number of unaffected and affected farms for each score

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<th>Number of Affected</th>
<th>Number of Unaffected</th>
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<tr>
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</tr>
</tbody>
</table>

Figure D-15.

Upper Cut Off

Figure D-16.

Lower Cut Off
The Detection of Dysbacteriosis

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**Figure D-17.**

**Results**

- <20%, negative predictive value 98%
  - If percentage of wet droppings < 20% at least 98% certain that the birds do not have dysbacteriosis
- >50% for 2 consecutive, positive predictive value 100%
  - If percentage wet droppings >50% for 2 or more consecutive, 100% certain that wet litter will develop
- If between 20% and 50% for 2 consecutive days, then it is inconclusive

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**Figure D-18.**

**Accuracy**

- <20%, negative predictive value 98%
  - If percentage of wet droppings < 20% at least 98% certain that the birds do not have dysbacteriosis
- >50% for 2 consecutive, positive predictive value 100%
  - If percentage wet droppings >50% for 2 or more consecutive, 100% certain that wet litter will develop
- If between 20% and 50% for 2 consecutive days, then it is inconclusive

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**Figure D-19.**

**Inconclusive results**

- There is large band of inconclusive results
  - Small sample size
  - Misclassifications
  - Farm to farm variation in litter management
  - Seasonal variation
  - Cut off marks can be fine tuned at farm or company level

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**Figure D-20.**

**Reliability in the field**

- 5 companies are using the litter box
  - Results so far are consistent with recommendations
  - A number of farm managers have been able to fine tune the cut off marks to reduce the number of inconclusive results

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**Figure D-21.**

**Reliability in the field**

- 5 companies are using the litter box
  - Results so far are consistent with recommendations
  - A number of farm managers have been able to fine tune the cut off marks to reduce the number of inconclusive results

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**Figure D-22.**

**Conclusions**

- The litter box is a user friendly system for visualising the level of moisture in bird droppings
  - When used as directed can predict the likelihood of wet litter developing
    - Recommended cut off marks of 20% and 50% are accurate and reliable in the field
    - The amount of inconclusive results can be reduced by adjusting cut off marks to individual farm or company conditions

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