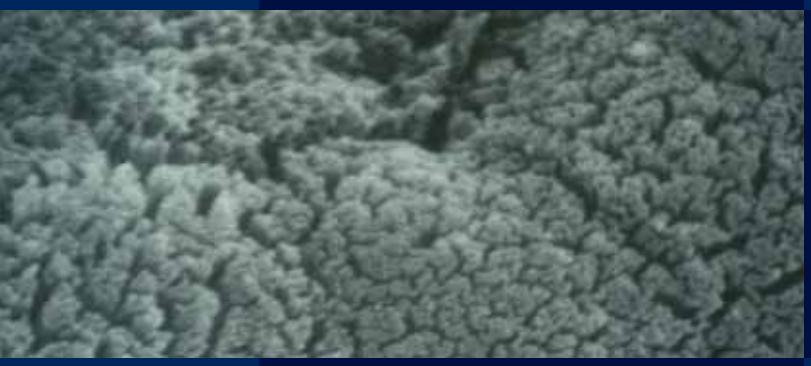

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Ross Tech

ENTERIC HEALTH IN BROILERS

ENTERIC HEALTH IN BROILERS

An important key to optimal broiler performance is maintaining a high standard of enteric health.

POOR ENTERIC HEALTH RESULTS IN SOME OR ALL OF THE FOLLOWING:

- Wet or poor litter
- Poor FCR
- Poor weight for age
- Poor uniformity of flock
- Increased water consumption
- Watery or sticky droppings
- Malabsorption resulting in runting and stunting
- Pododermatitis
- Secondary bacterial infections

COMMON CAUSES OF POOR ENTERIC HEALTH

MANAGEMENT

- Brooding conditions
- Water management
- Ventilation

DISEASE CHALLENGE

- Bacterial (Dysbacteriosis)
- Viral (Rota, Entero-like viruses, Reo)
- Coccidiosis

Nutrition

Normal Digestion and Absorption

Gut function and health in a flock is most easily assessed by examining droppings and litter. In the normal bird, faeces from the digestive tract are mixed with urine in the cloaca.

An individual dropping appears as a rounded brown mass with a characteristic white cap of uric acid. In a healthy bird, these are evacuated 12-16 times per day. The contents of the caecal tubes are quite different and appear as discrete masses of dark brown, glutinous material. Usually these are passed once or twice per day.

Chicken droppings can be variable in water content, depending on the birds' water intake. Thus if water intake is excessive, the usual consequence is wet litter.

Most enteric health problems lead to higher water consumption. Measuring and recording water consumption daily can be a very useful early indicator of the start of some enteric health problems. Enteritis often results in diarrhoea which is simply defined as a more frequent evacuation of watery faeces.

Litter Management

If the litter moisture content becomes elevated OR the surface of the litter is allowed to 'cap', birds will be exposed to a continual damp, slippery and sticky surface.

	GOOD LITTER	POOR LITTER
	Occupies at least 80% of the house	Found in more than 20% of the house
Moisture	25-35%	>45%
pH	<5 or >8	6-7
Physical characteristics	Friable, being worked.	Capped, sticky surface.

The litter in these house locations must be continually stirred, raked or replaced to prevent the problem from becoming worse. Temperature, humidity and ventilation must be continually monitored to ensure the moisture content of the litter is controlled and the litter remains friable. There must be adequate minimum ventilation rates throughout the house. These ventilation rates should prevent the air in the poultry house exceeding the dangerous levels of carbon dioxide and ammonia, (a product of water, from high humidity and urea from the birds excreta).

Maintain a relative humidity below 70% if poor litter conditions and disease are to be avoided.

Wet Litter

An epidemiological study of wet litter and its risk factors in UK broiler flocks has recently been completed by Liverpool Veterinary School (Hermans et al, in press*). The study was carried out by sending a questionnaire to over 850 broiler farm managers, of which 75% reported having wet litter at least once in 2001. They found the following:

- Wet litter was most common in the winter.
- Disease was considered an underlying cause in approximately 60% of cases and non-disease causes in approximately 40% of cases.
- Disease was attributed to: Non-specific enteritis, Coccidiosis, Viral infection or Dysbacteriosis.
- In those cases where disease was not a factor, the primary factors were related to ventilation issues, leaking drinkers, adverse weather or leaking roofs.

KEY FACTORS TO PROPER LITTER MANAGEMENT

- Litter Material - Wood shavings are better than straw.
- Pre-heating - helps remove floor condensation.
- A chick floor temperature of 29℃ (84℉) should be achieved.
- High standards of chick start -water, feed and correct environment.
- Good ventilation with no drafts (i.e. - doors, faulty fan shutters).
- Uniform light intensity to encourage even bird distribution.
- High standards of water management – measure daily consumption, measure and adjust flow rates to avoid leaking nipple drinkers.

Achieving Good Gut Health in the Young Chick

For a normal, fully functional gut that is resistant to disease challenges it is vital that good early growth and uniformity is achieved.

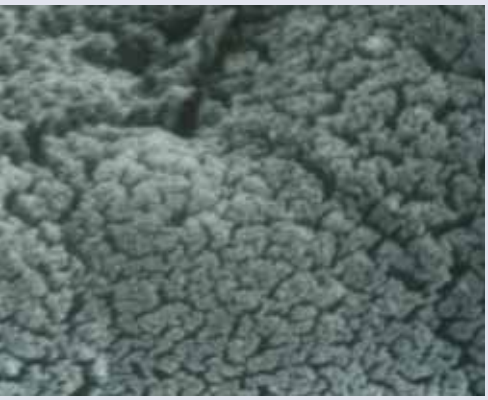

Figure 1 *- Brush Border Region Microvilli 48 hours post-hatch, fed chicks. There is a good even surface of villi – similar to a quality carpet. This is a fully functional absorptive surface which will resist enteric disease challenges.*

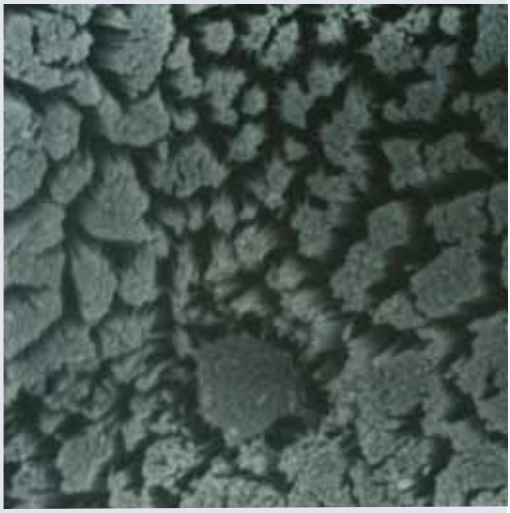

Figure 2 *- Brush Border Region Microvilli 48 hours post-hatch, unfed chicks. In those that have not been fed there is stunting and loss of the integrity of the villi. This is a poorly absorptive surface that is likely to result in increased susceptibility to infection and poor early growth.*

Figures 1 and 2, Uni et al, 1998**, show scanning electron micrographs of the small intestine of 4 hour old chicks that have and have not been fed.

What can be done to improve early gut health?

1) Ensure that there is good nutrition of parents. This helps ensure chick size is optimal and that high levels of maternal antibodies and essential nutrients are transferred in the yolk.

2) Spread of hatch should be minimal. 30 hours or better should be the target, Also excessive hatch temperatures 40℃ (104℉) may lead to abnormal intestinal development.

3) Brooding conditions are vital to chick start combined with good quality starter diets. For further detailed information on brooding see the Ross Broiler Management Manual. The onset of feeding and drinking in chicks will assist in gut development and transfer of yolk sac antibodies and nutrients to the chick.

4) Stress. Day old chicks are particularly susceptible to chilling. Chick holding conditions and transport conditions should be closely monitored, Spray vaccination will readily chill day old chicks therefore close attention should be paid to proper administration and droplet size.

5) Feed formulations, specifications and presentation should follow the advice in the Ross Broiler Management Manual. In young chicks poor quality fats and higher fibre vegetable protein sources should be avoided.

6) Early dehydration will hamper development and will severely compromise resistance to disease challenge. Water must be readily available.

Monitoring crop fill in recently placed chicks gives one of the best indications of the efficacy of the chick start. At 24 hours after placement at least 95% of chicks should have a crop the size of roughly a 10mm hemisphere, with contents the consistency of pea soup. **If the crop is empty or only contains water or only feed there is a serious problem.**

DISEASE RELATED CAUSES OF ENTERIC ILL HEALTH

Where disease is considered to be a likely factor in poor enteric health the advice of an appropriate veterinary surgeon should be sought.

Pododermatitis

Pododermatitis is a consequence of poor litter, Scoring footpads has been routine for all Danish broiler flocks since 2002. Over the last 5 years there have been substantial improvement in the footpad scores of Danish broilers and significant improvements in live weight to 38 days (average improvement 50g per year) and FCR. This improvement is attributed to focusing on litter quality.

Dysbacteriosis

Dysbacteriosis is a term first used in Northern Europe in the mid 90s, after the removal of antibiotic growth promoters, to indicate the presence of an abnormal balance of enteric bacteria. The condition is poorly defined but is associated with wet litter or litter going off and pale droppings with undigested feed between 20 and 30 days of age.

Figure 3 *- Orange mucus on droppings from a case of dysbacteriosis.*

Foamy caecal droppings, glistening or orangey droppings and big splashes of caecal droppings can usually be found. The litter often has a slippery surface. Birds may flick whole feed particles or pellets from feed pans and undigested feed may be seen in droppings and in the intestines.

There are also fluctuations in water intake, with an increase usually seen. The increased water content of the droppings can be used for diagnosis. Water can easily be squeezed out of the droppings whereas normal droppings can be rolled in the hand and they stay intact.

With dysbacteriosis, performance may be unaffected or there may be a decrease in feed intake with a check in growth. Feet problems are common. Farms that have problems of environmental control (for example no cups on nipple drinkers, straw bedding, less shavings or poor ventilation) are more prone to dysbacteriosis. Infectious Bronchitis and Coccidiosis are differential diagnoses; Infectious Bursal Disease may contribute to the problem.

Diagnosis is commonly confirmed by wet droppings returning to normal with administration of antibiotics. Birds remain susceptible for the entire grow out and immunity does not occur. Relapses will occur if the initiating factors are not removed. An alternative method for evaluation of dysbacteriosis is a litter box.

Litter box paper record

Figure 4 *- A litter box in use within a broiler house.*

Litter box - Droppings fall through on to paper and the size of the ring of water staining round the droppings can be measured. Alternatively it is feasible to directly measure the water content of the droppings.

Viral Enteritis in Broilers

Since 2003 there have been reports of broiler flocks in the UK, Europe and the USA with runting and stunting associated with malabsorption. These broilers present with a fairly typical clinical picture of a proportion of the flocks failing to grow and having signs of enteritis.

Figure 5 *- Viral Enteritis in the small intestines. A is normal, B and C show Viral Enteritis with watery contents and thin walls.*

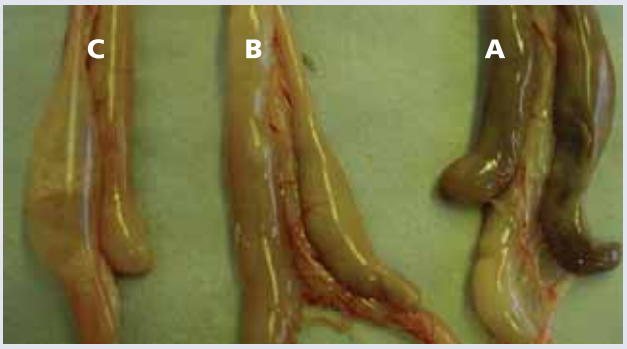

Figure 6 *- Viral Enteritis Caecae. A is normal, B and C show Viral Enteritis with gassy, watery contents and are from cases of viral enteritis.*

Possible Agents Associated with Viral Enteritis

Some recent cases have been investigated and found to be associated with Rota D and Entero-like Viruses (ELVs). Other viruses such as Reoviruses, Astrovirus, Small Round Viruses and Circoviruses have also been associated with viral enteritis.

Rota D

Rota D virus currently cannot be cultured, unlike Rota A which is easily cultured and frequently found in healthy broiler flocks. In the last 3 years broiler flocks in different parts of Europe that have shown clinical signs of viral enteritis have also been shown to be positive for Rota D, whereas other healthy broiler flocks in the same locality have been negative. A research project at the University of Jena put Rota D into healthy SPF broiler chicks and demonstrated similar clinical findings to those of clinical cases. When healthy 7 day old chickens were added to the experimental group, they all developed clinical signs, indicating chickens are not just susceptible at day old. All affected chicks were subsequently shown to be positive for Rota D. Although these experiments have suggested a link with Rota D, further work needs to be done to confirm these initial findings.

Entero-like Viruses (ELVs)

ELVs have been identified by the Veterinary Science Division, DARDNI, Stormont, Northern Ireland, in enteric contents samples from UK broilers, being associated with uneven growth and poor enteric health. Gut content from sick chicks was used to orally inoculate 1-day-old SPF chicks and resulted in significant growth retardation and feather abnormalities being observed at 2-3 weeks in the affected chicks ELVs were detected by Electro Microscopy at days 4, 6, 8, 10 and 15 days post infection.

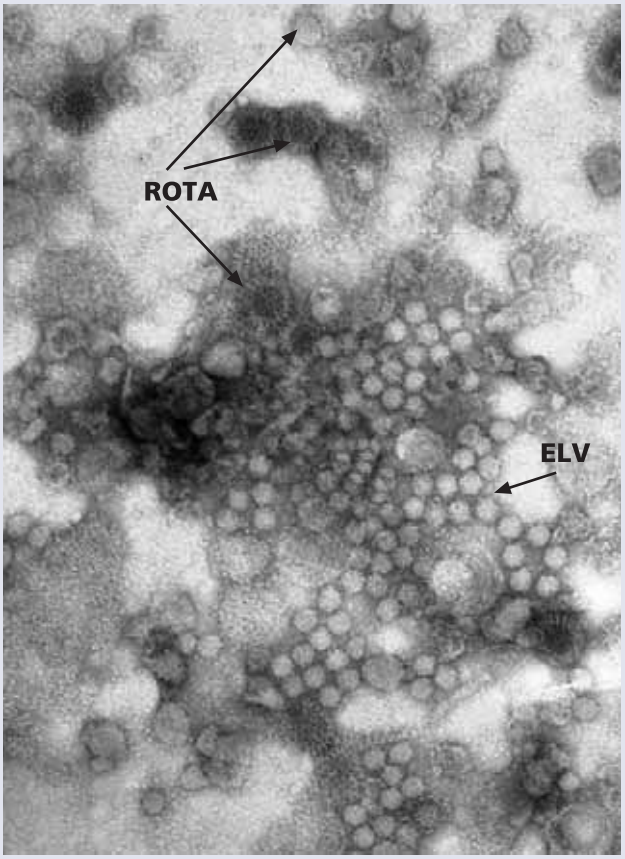

Figure 7 *- Rotavirus and Entero-like Virus (ELV) in broiler gut contents (courtesy of Professor B. Adair, Veterinary Science Division, DARDNI, Stormont, Northern Ireland).*

Control of Viral Enteritis

Clean out and disinfection between flocks must be sufficient to remove viruses. Most enteric viruses are very robust and difficult to destroy. The presence of faecal material increases their stability in the environment, and their resistance to disinfectants. Rota viruses are resistant to many disinfectants including quaternary ammonia, chlorhexidine, gluconate and povidone iodine solutions. Suitable anti-viral disinfectants include - formaldehyde, peroxide/peracetic acid and gluteraldehyde.

- Effective cleaning must be within the house and also the area surrounding the house.
- Cleaning should be inspected.
- Use of cleaning agents and disinfectant must follow a Standard Operating Procedure to ensure that it is done correctly.
- After effective cleaning a virucidal disinfectant should be used.
- Cleaning and disinfection must include water lines and feed equipment.
- Short turn round time must be avoided.

Biosecurity is paramount and people, clothing or equipment that may be carrying virus must not have contact with birds. It is advisable to consider every person that enters the farm. This includes people placing chicks and any service teams or production managers coming on to the farm to inspect, vaccinate or weigh chicks. All staff and visitors who will have contact with birds should enter the farm via a properly designed changing facility and have at minimum, a full change of clothes and footwear. Feed and other delivery drivers must not enter any poultry houses. At the entrance to every poultry house there should be a frequently replenished disinfectant footbath that is properly used by all people entering the house. Otherwise there should be an effective barrier and a change of footwear on entry to every house.

These biosecurity requirements are even more pertinent with the risks of Avian Influenza and the desire of the industry to control Campylobacter and Salmonella.

Coccidiosis

Coccidial challenge remains a common cause of under performance and wet litter. With clinical coccidiosis there may be blood on droppings and unlike some other enteric conditions the birds may appear dull or sick, and reluctant to eat or move. It is probable that the incidence of sub-clinical coccidiosis is often underestimated. Symptoms are a consequence of the damage done to the gut wall during the multiplication stages.

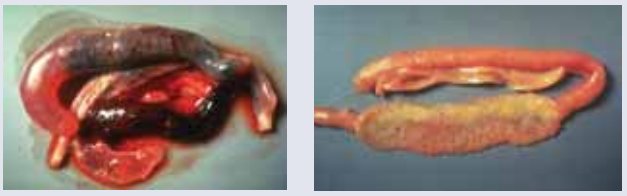

Figure 8 *- Eimeria tenella infection (left) and Eimeria acervulina infection (right).*

Coccidial infection is most commonly seen in broilers after 3 weeks of age. The rate of multiplication of oocysts is massive, and a very small number of oocysts can multiply to a potentially overwhelming challenge in 5-7 days. Immunity for individual birds takes a similar time to develop, but flock immunity takes 2-3 weeks. The infectious stage of the oocyst is very difficult to kill. Therefore cleaning, disinfection and biosecurity are not the answers to preventing coccidial disease, but can be important in reducing early challenge.

Coccidiosis Control

In broilers the principal coccidia species are *Eimeria acervulina, Eimeria maxima, Eimeria mitis* and *Eimeria tenella*. Immunity is species specific. Therefore vaccines have to contain all species to be effective. Vaccines contain a low and controlled number of oocysts which may be attenuated. Administration can be via the drinking water, sprayed on the feed or sprayed on chicks in the hatchery. It is vital that all chicks receive a low infective dose of all species. Flock immunity takes 2-3 oocyst cycles and should develop by 3 weeks of age.

Drugs are effective against all species, but resistance may be a problem. Drugs fall into two groupings: ionophores (e.g, Narasin) and synthetic chemicals (e.g. Nicarbazin - now withdrawn in many countries). In recent years, due to resistance to individual drugs, the use of mixtures has become more common (e.g. Narasin and Nicarbazin).

The strategic use of vaccines may be of value where there is a build-up of coccidial resistance to the available drugs.

To monitor the effectiveness of control there are two common methods: coccidial lesion scoring or measurement of faecal oocyst counts. Regular coccidiosis sensitivity testing can be useful in planning a control programme. For further advice it is recommended to consult your veterinary surgeon.

Nutrition

Excessive water consumption, which will lead to wet litter, can be due to a high intake of potassium, sodium, magnesium, sulphate or chloride and some mycotoxins. Soya products have the potential to be high in potassium, biscuit meal may contain high or variable salt and sodium and fishmeal may be high in salt, sodium or calcium. When a nutritional cause is suspected it is worth checking feed levels of sodium and chloride.

Depending on source the water should be checked for mineral concentrations, especially for sulphate and magnesium.

Other studies have indicated that inappropriate use of phytase in diets can increase the incidence and severity of wet litter. This may be due to the phytase releasing other minerals that result in shortened gut passage and increased water consumption.

There are some reports of the benefits of betaine in preventing enteric stress, especially as related to osmotic challenges. For broilers that exhibit flushing (mild diarrhoea), betaine may be helpful in alleviating the problem. A typical dosage is 2kg betaine per tonne feed. Where mycotoxins are present the use of mycotoxin prevention additives should be considered.

ACHIEVING BEST POSSIBLE ENTERIC HEALTH AND LITTER

- Review causes – management, nutrition or disease
- Review management of ventilation, insulation and prevention of draughts. Objective is a consistent environment throughout the house.
- Review chick start: Objective is all chicks with good crop fill at 24 hours.
- Review biosecurity: cleaning, disinfection and effective barriers on to farm. Nothing should enter the farm that has not been properly cleaned and disinfected.
- Review effectiveness of coccidiosis control programme.
- Use epidemiology and veterinary advice with any outbreaks to assist with identification of nutritional, disease and management causes.
- Use day to day stockman's assessment of flocks to identify onset of clinical signs of enteritis or wet litter and take rapid preventative action.

** P.G. Hermans, D. Fradkin BA; I.B. Muchnik and K.L. Morgan BA. (2006) Prevalence of wet litter and associated risk factors in broiler flocks in the UK. (Veterinary Record, in press).*
***Z. Uni, S. Ganot, D. Sklan (1998) Posthatch development of mucosal function in the broiler small intestine. (Poultry Science January; 77 (1): 75-82)*

This information comes to you from the Technical Team of Aviagen. Although it is considered to be the best information available at the present time, the effect of using it cannot be guaranteed as performance can be affected substantially by many factors including flock management, health status, climatic conditions, etc.

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