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Reviews

Poultry diseases – their control and effects on nutritional requirements

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Poultry disease and its control require effective co-operation and communication between the poultry producer, their veterinary surgeon and other professional scientists and experts. The most effective way to ensure health and welfare requires a three-way dialogue between all the interested parties. This paper sets out to discuss ways in which poultry veterinarians approach disease diagnosis, treatment and control, together with the important role liaison with nutritionists can have in resolving problems and ensuring optimal flock performance.

Keywords: disease; nutrition; treatment; performance

Veterinary advice – and beyond

In terms of the relationship between the poultry producer and his veterinary surgeon, the veterinary advice provided covers a number of areas. Historically this has been focussed on general advice regarding the diagnosis and treatment of disease with the supply of necessary medications and recommendations on any future preventive medicine strategy. Increasingly, in an era of farm assurance, this relationship has extended to advice on biosecurity, HACCP and food safety. The veterinarian also has a core role in offering advice on maintaining acceptable standards of animal welfare. Increasingly, this extends beyond just providing the ***needs*** of poultry flocks in terms of welfare inputs to consideration of the birds ***wants*** or preferences aimed at enhancing welfare, as demonstrated by meeting aspirational goals which may be assessed more by monitoring welfare outcomes. To ensure the most effective performance of modern poultry flocks, this also requires advice on management and nutrition and the ways in which this may affect bird health.

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Poultry disease control

Poultry disease is never simple and, in some cases, is becoming increasingly complicated. A variety of bacterial, viral, fungal and parasitic challenges and combined infections can influence bird performance. The effects of these diseases can be significantly affected by other inputs, notably feed and water quality, nutritional supply (quality, quantity and specification), as well as significant management, stockmanship and environmental effects. It is now unusual to see a simple disease requiring diagnosis and straightforward preventative treatment, with most conditions being multi-factorial where the individual components must be evaluated and the disease syndrome managed.

As a result, the predominant elements of modern disease control involve a general approach to biosecurity, use of vaccination, targeted medication use and the implementation of effective stockmanship to ensure effective environmental control.

Biosecurity may be defined as *'a set of management practices which, when followed, collectively reduce the potential for the introduction and spread of disease causing organisms onto, and between, sites'*. The most important aspects of such a definition is to appreciate that biosecurity is never one simple solution but a set of practices and that these practices must be followed and practiced rather than becoming just a theoretical wish list. There must also be a realistic appreciation that biosecurity measures are likely only to reduce the potential of introduction and spread of organisms rather than their total elimination.

Biosecurity aims to control these disease challenges in some, or all, of the following ways:

- To keep lethal, highly contagious diseases out of premises (*e.g. Avian influenza*, *Newcastle disease*, *Gumboro disease*).
- To reduce challenge by endemic disease causing mortality and reduced productivity (*e.g. E. coli*, *coccidiosis* etc).
- To reduce or eliminate background immunosuppressive agents which leave birds more susceptible to other diseases (*e.g. Gumboro*, *Chick Anaemia virus* and *Mareks disease*).
- To reduce contamination with agents of public health significance (*e.g. Salmonella* and *Campylobacter*).

Biosecurity means different things to different people and some organisations will set a very detailed programme based on HACCP principles operating at many different levels within their integrated company. However, at the individual farm level, biosecurity does not need to be prohibitively complex and may involve simple procedures such as the use of foot dips, protective clothing, limiting visitors and vehicle access and effective cleansing and disinfection.

Effective disease diagnosis

In establishing an effective biosecurity programme, it is important to know and appreciate the involvement and significance of different infectious challenges. In this regard, accurate and effective veterinary diagnosis is essential. There is a wide and increasing range of methods employed in the diagnostic process to help evaluate the relative roles and significance of different infectious agents that may be present in an affected flock or region.

These include:

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- Local knowledge of the site, the company farms or the regional incidence of disease.
- Establishing the specific clinical picture on a farm through effective stockmanship as the first stage in identifying an issue (*e.g.* reduced water or feed intake, general morbidity or specific clinical signs), triggering prompt veterinary attention.
- Post mortem examination.
- Serology (blood testing) – routine monitoring or in relation to a specific clinical incident.
- Bacteriology.
- Parasitology.
- Virus detection or other diagnostic tests.

Serological examinations have been used for many years in poultry disease diagnosis. They can be done to confirm freedom from a range of infectious agents, to assess the response to vaccination or confirm exposure to clinical challenges. However, their usefulness has often been over-emphasised. It must be appreciated that blood sampling is only a snapshot in time and that antibodies may take a while to appear. Sadly, results are usually over-interpreted, with producers expecting a definitive answer to each test. The biological variation in bird response, the interference of vaccinal titres and the time lag between infection and sero-conversion can all make interpretation difficult or subject to many caveats.

The most promising development of recent years has been the introduction of PCR (Polymerase Chain Reaction) and other rapid detection and typing techniques that can enable real time identification of the involvement of specific pathogens. Such techniques are by their nature more expensive to perform but increasingly commercial reagents are available and knowing exactly which agents are present in affected birds in ailing flocks can be powerful diagnostic and epidemiological tools. It is this latter area where the agent involved can be typed which is particularly useful in diagnosing specific strain involvement. This can be essential in devising tailor made vaccination programmes for commercial flocks, but in the case of notifiable diseases, such as Avian influenza and Newcastle Disease, can aid researchers in identifying the source and type of infection involved. This can influence and guide control strategies.

Control options – medication and vaccination

Another important element of the disease control triangle is the use of medication. Birds, like other animals and humans, can become sick and there are effective medications which can be used. However, as in many areas of production, this puts additional requirements on farmers and their supervising veterinary surgeons to ensure the responsible use of such medicines to safeguard the health and welfare of the birds being treated as well as the consumer. Responsible use guidelines involve some or all of the following (further information is available at www.ruma.org.uk):

- Medicine use should complement rather than replace good management, environmental control and effective biosecurity.
- Use flock health planning to get the most out of any treatments and disease prevention programme.
- Mix, use and store all medicines as directed by your veterinary surgeon.
- Always follow dosing instructions and complete the course of treatment as directed.
- Record all medicine usage.

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- Ensure that all meat and egg withdrawals are strictly observed.

The next area to consider is vaccination. Vaccination may be used as follows:

- Prevention of disease that can cause death, reduced performance, reduced egg production or increased seconds.
- To act as a "primer" for other vaccines given later.
- To produce protective maternal antibody in progeny (broilers or layers).
- To protect birds against infection or contamination by bugs of human health significance (*e.g.* Salmonella).

Vaccination aims to protect different organs or body systems, most specifically the respiratory tract, the reproductive tract, the intestinal tract and the immune system.

The philosophy is of **optimal protection** such that the use of medication in conjunction with vaccination as part of a structured and managed programme is to produce a balance between the birds, the pathogens challenging them and the environment in which the birds are expected to grow.

Veterinary health and welfare planning

An important part of effective health and welfare protection is the use of veterinary health and welfare plans. There is some concern that these can be over-elaborated or can simply become another checklist that needs to be written – and then ignored! However, the art is to ensure that these are workable and practical, in essence, requiring only a sharp pencil, a sheet of paper and an open mind. A producer can simply draw a schematic representation of their poultry site or organisation, and then consider all the possible routes of introduction of pathogens. Considering each aspect in detail, individually and in combination, will allow critical control points to be identified and hence the control processes that need to be in place.

Contribution of feed and nutrition

Nutritionists are an important aspect of the effective dialogue between the poultry producer and their veterinary surgeon.

Nutrition can have a potent effect on poultry health and the ability of birds to respond or defend themselves against infection.

Griffiths *et al.* (1985) established that 7 day old broilers given access to food for only 30 minutes daily for 7 days showed significant atrophy of the thymus and bursa compared with *ad libitum* fed birds (*Table 1*).

Table 1 Effect of feeding strategy on immune tissue weight (Griffiths *et al.*, 1985).

Tissue	Restricted fed	*Ad libitum* fed
Thymus weight (g)	0.45 (+/- 0.08)	1.32 (+/- 0.31)
Bursa weight (g)	0.26 (+/- 0.08)	0.74 (+/- 0.11)

The lesions induced were similar to those observed in birds affected by Runting and Stunting Syndrome. Such significant effects on the immune system are certain to have an influence on the bird's ability to resist and react to a range of disease challenges.

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In relating this to specific disease conditions, there are a number of useful examples. Let us first examine enteric disease in turkeys. The severe stunting and mortality issues associated with PEMS (Poult Enteritis Mortality Syndrome) virus appear to be due to a combination of a number of viruses, some bacteria, environmental effects and feed absorption and nutrition. Wet litter conditions in turkeys in general are also multi-factorial but feed factors such as interruption, physical quality, digestibility, protein source, carbohydrate source and mycotoxins can be significant triggers or influencing factors, alongside infectious agents, drinker management and ventilation control.

In broilers, dysbacteriosis is a complex syndrome and, again, feed consumption, composition and structure are thought to be significant in the full expression of the condition.

In free range layers Brachyspira infection is a new and confusing disease. The syndrome is often associated with reports of the presence of watery, pasty brown faeces and the Brachyspira organism can be found readily in the caecum and droppings of affected flocks. This clinical picture can be associated with reduced egg production, in both layers and breeders, around peak production. It has also been associated with poor body weights, increased mortality and reduced appetite. During veterinary investigations it is frequently difficult to unravel which factor came first or then needs correcting. It has been suggested that there is primary intestinal disease leading to poor body weight, unevenness and poor egg production. However, it is possible that the loss of intestinal integrity is primarily associated with nutritional and management factors leading to poor feed intake at peak production allowing infections such as Brachyspira to become established.

The need for cooperation

As a result of this clear multi-factorial picture, the suggested approach is equally multi-factorial! It is important for the producer to regularly monitor records of performance, and for the veterinarian to undertake post mortem examinations to check disease input, and advise medication where appropriate to establish gut function. Regular check weighing of healthy flocks will help to monitor progress and may act as a first line indicator of problems. Based on these examinations and monitoring of the results, management factors and dietary control to help address weight loss, unevenness and maintenance of egg size can be contemplated. It is these latter aspects where the veterinarian will depend on effective cooperation with nutritionists to ensure that any feed manipulation is appropriate for the birds. Manipulating feed composition to promote improved intake and increased bodyweight must be balanced against egg mass produced and egg weight targets.

Conclusions

Effective cooperation between producers, their vets and nutritionists cannot be over-emphasised. The complexity of disease challenges and the ways in which the birds react to them under different management systems and feeding regimes has never been more difficult to manage. If differing expertise can be harnessed then the birds can be expected to achieve their full potential in terms of their health, welfare and productive efficiency. This requires all involved to take an active interest in their own areas of expertise, but rather than doing this in isolation all should work together to ensure synergy in the advice given.

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References

GRIFFITHS, G.L., SINGH, U.M., HOPKINS, D. and WILCOX, G.E. (1985) Nutritional stress as a cause of thymic atrophy in broiler chickens. *Avian Diseases* **29**: 103-106.

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