Understanding first week health issues to achieve optimal genetic potential

The modern broiler chick encounters a host of challenges once hatched. Overcoming these challenges are key to achieving full genetic potential. Understanding and optimising the health of the chick in the first seven days of life is fundamental in the goal of maximising productivity and subsequent profitability.

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Many factors impact on the viability and health status of the day old chick once it is placed on the growing farm. These relate to breeder health and management, hatchery management and chick transport, early nutrition as well as on farm management through the brooding period.

The article outlines the issues experienced in the first week of life and the causes, treatments and understanding of these issues to prevent future problems are discussed.

The main problems relate to either early mortality or failure to gain the adequate weight in the first seven days. The most common causes include:

- Non-starters/starve outs:
  - Dehydration and kidney damage with visceral and arthritic gout.
  - Birds failing to feed leading to anorexia, wasting and death.

- Bacterial infections:
  - Omphalitis.
  - Yolk sac infection.
  - Enterococcus septicaemia.
  - Pseudomonas septicaemia.
  - Salmonellosis (Salmonella pullorum, S. gallinarum, S. enteritidis, S. typhimurium).
  - Mycoplasmosis (Mycoplasma gallisepticum and M. synoviae).

- Fungal infections: Aspergillosis (fungal pneumonia).

- Viral infections:
  - Avian encephalomyelitis (epidemic tremor).
  - Chick anaemia virus (Blue Wing).
  - Enteric viruses.
  - Respiratory viral infection – Infectious Bronchitis Virus (IBV)/ Avian metapneumovirus (AMPV).

Non-starters or starve outs

'Non-starters' are birds that have failed to feed and drink once placed on farm. These birds are small, huddle and appear lethargic, they are often described as bumble bees.

On post mortem such chicks are in poor body condition, dehydrated with sunken dark skin covering the legs, internally they have urates around the heart, over the liver and in the joints. Kidneys are swollen with urates throughout the tubules and ureters. Crops are empty, gizzards bile stained and yolk sac reserves depleted. The causes of non-starters are multiple but they must be understood to avoid significant mortality, poor weights and poor uniformity.

There are some key aspects of management to avoid development of non starters:

- Check breeder health and viability.

- Ensure adequate breeder nutrition. It is key that the required nutrients enter the egg to optimise chick viability.

- Ensure that egg storage times and conditions are optimal and ideally do not exceed seven days.

- Ensure that the hatchery is set up correctly in respect of temperature, humidity and ventilation. It is crucial that the hatch window is monitored and managed to avoid early hatching chicks from becoming dehydrated and later hatching chicks from being lethargic and weak.

- Ensure that take off is carefully managed – handling, sexing, counting, vaccination. Temperature must be carefully managed to avoid chicks from becoming chilled or overheated. Chicks should be held in the hatchery for the minimum amount of time so that birds have access to feed and water as soon as possible.

- Chicks must be transported to the farms using appropriate vehicles with temperature monitoring and control, this could require additional heating or cooling depending on climate. Consideration must be given to ensuring optimal ventilation and temperature balance throughout the vehicle to avoid hot spots and cold spots.

- Once chicks arrive on farm they need to be quickly moved into the house from the vehicle to avoid exposure.

- The house chick set up is crucial. The houses should have been cleansed and disinfected and allowed to dry. Litter should have been placed to a minimum depth of 5cm (in litter based systems). Houses should be preheated to approximately 25°C at least 48 hours prior to planned chick placement, and houses further warmed to approximately 34°C for whole house heating systems 12 hours before placement to achieve floor temperatures of 30°C – NB this will vary depending on humidity levels.

  Floor temperatures in radiant spot brooding systems will range between 25-45°C.

  Humidity levels should be maintained between 40-60%RH – the use of misting systems is advised where this is not achieved in arid environments. Chick papers should be placed on litter systems to cover a surface area of approximately 20%. Feed should be placed on the chick papers at a rate of 50-70kg per 1000 chicks.

  Lighting levels should be around 20 lux throughout the house. Drinker lines should have been cleaned with a hydrogen peroxide based sanitiser in the turnaround. Lines will need to be primed with fresh water to flush out all sanitiser. It is advisable to flush the lines again and activate nipples before the chicks arrive to ensure birds have access to cold, clean, fresh water. The ventilation system should be set up to ensure that minimum ventilation requirement of birds are met avoiding draughts at bird level.

  Ventilation at this early stage of production is also key to avoiding respiratory and cardiovascular compromise which could result in ascites later in flock life. The use of laser thermometers, hygrometers, CO_2 meters (<2500ppm) are all key to monitoring and optimising environmental conditions on chick placement.

- Chicks should be placed on the feed papers and monitored for their activity and distribution throughout the house. Birds should spread evenly, and feed and drink almost immediately. Chicks should also be weighed on placement and average between 35-45g. Consider use of electrolytes.

- After 24 hours chicks should be screened for their crop fill. This should be approximately 95%. If less, then investigations should be initiated to check all the points highlighted above.

Bacterial infections

Bacterial infections can lead to high mortality in the first seven days, but also lead to significant culling throughout the growing period, and rejects at processing.

Thus it is important that any mortality above 0.3%, for more than two consecutive days, in the first seven days of life, is investigated by a veterinarian.

The most common bacterial manifestation in the first seven days of life is omphalitis (inflamed naval) and yolk sac infection. The most common bacterial isolates are Escherichia coli and Enterococcus.

Omphalitis occurs when the chicks' navels do not heal or are exposed to bacteria prior to healing. Yolk sac infection can be the result of ascending infection from the navel or due to bacteria in the egg.

These conditions may be treated with antibiotics should mortality levels remain excessive. This should be based on culture, identifying the bacteria and conducting antibiotic sensitivity testing.

It is important to establish the cause so corrective action can be

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implemented to prevent problems in future placements.

- High incidence of floor eggs in breeding flock. Check management to avoid floor eggs, check procedures for sanitising floor eggs if being set.

- Poor egg quality in breeders – deterioration in shell quality in older flocks.

- Poor egg handling, hygiene and storage, inadequate sanitising and fumigation.

- Poor hatchery hygiene leading to birds being exposed to high bacterial loading in hatchers. Ensure formalin use (where permitted) in hatchers, post transfer, prior to, and during early pipping.

- Incorrect hatchery parameters leading to protracted hatch window and poorly healed navels.

E. coli is often observed in cases of omphalitis and yolk sac infection but may also be associated with acute septicaemia – this can occur where high levels of E. coli circulate in hatchery at pipping.

Enterococcus can cause more specific symptoms:

- Enterococcus caecorum is associated with spinal abscess.

- Enterococcus durans with encephalitis.

- Enterococcus hirae with endocarditis and wryneck.

Pseudomonas septicaemia can lead to peracute losses within the first 24 hours.

Pseudomonas is commonly associated with vaccination contamination, either spray or injection, and thus hygiene within the hatchery and at vaccination is key in prevention.

Pseudomonas can also grow in drinker lines and thus birds could be exposed on placement so it is important to ensure a rigorous drinking water sanitation policy operates. Pseudomonas usually has a limited antibiotic sensitivity and thus licensed treatment options may be few.

Salmonellae are particularly problematic as they are usually vertically transmitted. This can result in significant dissemination in the hatchery and thus contamination can become widespread.

The poultry salmonellae – S. pullorum and S. gallinarum are now less common due to the elimination from the primary breeding stock but may occur from time to time.

High early mortality is likely and white diarrhoea may be observed.

Birds may present with septicaemia and polyserositis, nodules throughout the internal organs and caecal cores.

Selective cultures using selenite methods are key in identifying these bacteria.

Control depends on the country but in many countries these infections are notifiable with subsequent flock destruction.

The salmonellae of human health significance, namely Salmonella typhimurium and Salmonella enteritidis can also lead to significant mortality through acute septicaemia.

Selective cultural examinations using modified semi-solid rappaport vassiliadis is recommended. Staff working with potentially infected chicks should be warned of the zoonotic potential so that specific hygiene measure can be taken. Vaccination of breeding stock should be considered in high risk environments.

Mycoplasmosis may cause early losses through respiratory symptoms and birds may go on to develop chronic respiratory disease with E. coli involvement. This infection is usually vertically transmitted from parent stock.

Mycoplasma gallisepticum and Mycoplasma synoviae are the most common species identified. Birds with early respiratory symptoms, snicking, sneezing, tracheal rales, air sac lesions on post mortem, should be screened for mycoplasma. Use of serology in day old chicks is unreliable so molecular techniques such as PCR should be preferentially used, with culture required for confirmation.

Mycoplasma infections can be treated with antibiotics. Some mycoplasmas strains have become resistant to some antibiotics so combination therapies to achieve synergism can be required to prevent clinical disease. Treatment may be via the drinking water and feed.

Fungal infections

Aspergillosis (fungal pneumonia) is most commonly caused by birds inhaling Aspergillus fumigatus fungal spores following hatch.

This may occur in the hatchers when aspergillus spores may enter through a contaminated air handling system, through release of spores from contaminated hatching eggs, or through exposure on farm from mouldy litter or feed.

Birds present with gasping, and post mortem examination reveals white/grey plaques occluding the trachea or white 1-5mm nodules throughout the lung fields and air-sacs.

There is no treatment for affected chicks so they are culled, however the source of spores requires rapid investigation to avoid issues on other farms and in other houses.

Viral infections

Viral infections are less common in the first seven days because the incubation period of most horizontally transmitted viral infections means that clinical disease is often not observed.

However some viruses are vertically transmitted and pose specific challenge. The two of concern are avian encephalomyelitis (AE) and chick anaemia virus (CAV). Both infections can occur in chicks through vertical transmission following infection of breeding stock with either virus during lay. This can result in production of infected chicks for a period of approximately 6-10 weeks and many flocks become economically unviable, through high mortality, poor growth and uniformity.

AE manifests as lethargic chicks with a head tremor, whilst CAV results in severe immunosuppression, so birds become very susceptible to secondary bacterial infection.

Later in life 'blue wing' can be observed when a wet dermatitis occurs over the wings as a result of skin necrosis due to immunosuppression.

There are no treatments for either of these conditions and thus control centres around management in the breeding stock. AE and CAV should both be monitored in the breeding stock in rear.

Commercial vaccines are available for both infections and breeding stock should be vaccinated post six weeks of age. Flocks should then be monitored serologically using ELISA test prior to transfer to the laying farm.

Any flocks which have failed to fully seroconvert should be vaccinated again and checked for full seroconversion prior to the collection of hatching eggs.

Enteric viruses can be a significant problem in broiler growing, resulting in malabsorption, poor growth rates, poor food conversion and poor uniformity. Many of the enteric viruses are difficult to remove through disinfection programmes alone so ensuring optimal chick viability and early brooding management, as well as high standards of biosecurity are crucial.

Common viruses that may cause problems include reoviruses, rotaviruses, adenoviruses and entero-like viruses to name a few.

Reoviruses are of significant concern and thus it is important to identify which reoviruses are circulating on farms so that appropriate vaccines can be used in the breeding stock so that high levels of maternal antibodies are transferred to the day old chick to provide protection. Additional live reoviruses vaccine may be administered to chicks in some countries where local legislation allows. Control of enteric viruses is key, all in all out facilities should operate wherever possible, and disinfection programmes should centre around virucidal disinfectants such as gluteraldehydes, formaldehyde and peroxygen based disinfectants.

Avian metapneumovirus (AMPV) and infectious bronchitis virus (IBV) immunity is not conferred by material antibodies in the day old chick and thus the birds are susceptible to infection. In areas where these viruses are prevalent the implementation of a live day old vaccination should be considered. Choice of live vaccine is determined by the local circulating strains. In the case of AMPV this may be A or B, whilst IBV strains are more diverse.

Most programmes are designed using the protectotype theory where a classical Massachusetts strain and a variant IBV strain is co-administered in a single hatchery spray to confer local and cell mediated immunity against current and newly emerging strains. This strategy when combined with biosecurity is successful in control.

Symptoms include snicking, sneezing, tracheitis and, in more complex cases with secondary bacterial infection, also airsacculitis and septicaemia.

Conclusion

In conclusion there are many challenges to the day old chick in surviving the many changes that occur in its life in the transition from an embryo to being placed on a farm.

The factors that contribute to the ability of the day old chick to achieve optimal genetic potential are multiple and complex.

It is clear that the viability and health of the chick is influenced by the management, health and nutrition of the breeding stock, as well as the care of the hatching egg from point of lay through to hatch.

Once the day old chick hatches stress must be minimised from the take off period through to placement on the farm. Biosecurity and hygiene are key in reducing the risk of exposure of the breeding stock, hatching eggs and day old chicks to infection, whether these be fungal, bacterial or viral.

Management during transport and brooding is vital in ensuring early water and feed intake to achieve optimal chick starts.

Monitoring for infections, disease and key production indices are paramount in rapidly identifying problems, implementing correction actions but also ensuring continuous improvement throughout the integrated process. ■