



## Infectious Bronchitis in Parent Stock

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### SUMMARY

#### Who Should Read This Article

This article is mainly targeted at veterinarians and production managers.

#### What is this Article About

IBV is increasingly being seen as a cause of poor peak production, egg quality and hatchability. It has a significant impact on the economic performance of a flock. Providing adequate protection against IBV is therefore a vital part of parent stock management. This article provides information on the key aspects involved in providing protection against infection from IBV.

#### Symptoms of IBV

Physical bird symptoms include respiratory gasping, coughing, sneezing, tracheal rales and nasal discharge. Generally, birds appear depressed and have reduced feed intake.

In adult breeders the clinical signs are often accompanied by a loss in production after peak. This loss can be as much as 40% but it is generally between 10 and 15%. Increasingly no peak in production is seen, rather a flat plateau in production.

Birds infected in the rearing period can look physically well but can have an incomplete or absent oviduct.

Mortality varies and is mainly caused by secondary bacterial infections.

Eggs can be smaller and paler in color and may be soft shelled or misshapen with increased calcareous deposits. Internal albumin quality is poor.

#### Risks of Infection

- IBV is highly infectious.
- Transmission is via direct and indirect contact between poultry and poultry premises (people, vehicles, etc.).
- The risk of IBV is increased in farms not cleaned out properly or disinfected or where built-up litter is used.
- Multi-age sites pose a high risk of transmission and infection with IBV.

#### Protection

A high biosecurity standard, with the controlled movement of equipment and personnel as well as proper cleaning and disinfection of housing is necessary to protect against IBV.

An adequate vaccination program and the appropriate administration of the vaccine are also essential. Establishing the correct vaccination program is difficult and serology is important to identify the presence of any variants. In order for vaccination to be effective it is important that:

- Vaccine storage and transport are correct.
- Vaccine application is correct and that a uniform uptake is achieved.
- Vaccine response is monitored.

#### Treatment

There is no treatment for IBV, but treatment with antibiotics to prevent secondary bacterial infections is appropriate.

### **TAKE HOME POINT**

A high biosecurity standard is required with correctly delivered early vaccination between the first and second week of the bird's life. These are critical for helping prevent any future production issues.

## **Introduction**

Infectious bronchitis virus (IBV) is an acute, highly contagious disease which can have a significant effect on egg production and egg quality. Increasingly IBV is being seen in the field as a cause of poor peak production, egg quality and hatchability. The occurrence of IBV can have a considerable impact on the economic performance of a flock. It is therefore important that procedures are put in place to ensure flocks are adequately protected against infection from the IB virus.

This article provides information on how to recognize if the disease is present in a flock and the procedures that need to be put in place to provide adequate protection against the occurrence of IBV.

## **Background**

Infectious bronchitis was first diagnosed in the United States in 1930 and now occurs worldwide. Numerous different serotypes have been identified since the originally identified Massachusetts type in 1950.

IBV is a highly contagious respiratory disease characterized by upper respiratory signs, such as tracheal rales, coughing and sneezing. It can be part of a mixed infection causing airsacculitis and may affect egg production and egg quality.

## **Transmission**

The IB virus is not vertically transmitted, but transmission via surface contamination of the egg with feces is possible. Infectious bronchitis can replicate in tissues of the respiratory tract, intestinal tract, kidneys and oviduct. The virus is periodically shed in nasal excretions and feces for up to 20 weeks after clinical recovery from the infection. Once exposed to poultry the virus spreads rapidly in a flock. The incubation period is 18-36 hours, depending on the infectious dose and the route of infection. All birds in a flock will become infected, but mortality is dependant on:

- the serotype of the virus.
- age of the birds.
- immune status (maternal, active or influence of immunosuppressive diseases).
- environmental stress e.g. ammonia levels.
- other respiratory viruses and bacterial infections.

The highly infectious nature of the virus combined with the long shedding period and the possibility of carrier birds means a high biosecurity standard is essential if infection with IBV is to be avoided. The risk of flock to flock transmission via contamination of personnel and/or equipment is high. To prevent this strict control of the movement of people, vehicles and equipment is required between poultry sites. Proper biosecurity and hygiene control on a multi-age site is very difficult.

Most serotypes of IBV are inactivated after 90 minutes at 45°C. During the colder winter months survival can be up to 50-60 days, and in fecal material it can stay alive for up to 100 days. The virus is sensitive to commonly used disinfectants, but for disinfectants to be effective all organic material, especially feces, should be removed from the houses during clean out. Disinfectants should be used at the suppliers recommended dose rate.

## **Clinical Signs**

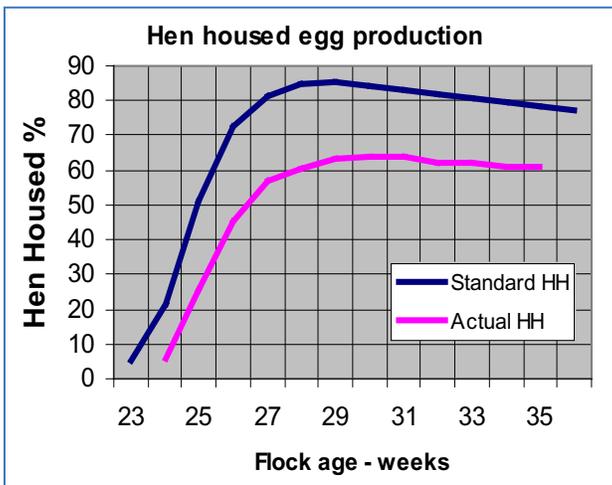
Respiratory signs, like gasping, coughing, sneezing, tracheal rales and nasal discharge are commonly found. Wet eyes with swollen sinuses may also be seen. Birds appear depressed, and feed consumption is reduced. Mortality is mainly caused by secondary bacterial infections. Duration of the disease could be up to 10 days, but may last longer if a severe bacterial infection is present. Breeders infected during the rearing period with a serotype affecting the kidneys may recover from the respiratory symptoms but tend to develop ruffled dirty feathers with frequent flushing and consequential wet litter due to the increased water intake.

In adult breeders the clinical respiratory signs are often accompanied by a decline in egg production.

Commonly there are two scenarios seen:

1. The classical egg production curve with a drop in egg production after peak. This decline may be as much as 40%, but in general a drop of 10-15% is seen.
2. No clearly defined peak in egg production is seen; rather a flat plateau in production occurs after 40-60% production. This type of decline in egg production is increasingly being seen in the field (Figure 1).

**Figure 1:** Example of egg production curve in a flock infected with IBV showing no peak and a plateau in production after 60%.



Generally egg production will slowly increase within eight weeks, but normal production is rarely achieved.

Together with these production problems, a change in external and internal egg quality is also frequently observed. When a flock is infected with IBV eggs are typically smaller in size and pale to the point of some being completely white. Eggs may also be soft shelled, misshapen or have calcareous deposits (Figure 2).

**Figure 2:** Examples of egg defects caused by IBV infection



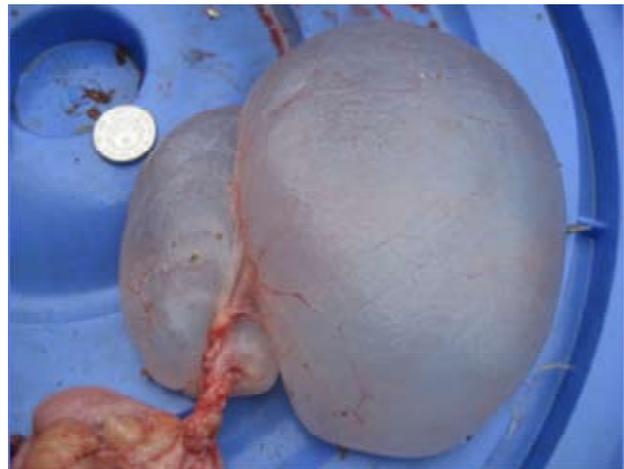
*The egg on the left has calcareous deposits and the egg on the right has a soft shell.*

Internally the albumin of the egg may become thin and watery with no clear distinction between the thick and thin albumin.

### False Layers

Recently in Europe, Asia and the Middle East there have been concerns over the early infection of young female parent stock with infectious bronchitis, causing permanent destruction of the oviduct. Birds that were otherwise healthy with good body weights and CV's did not reach peak production. Post mortem examination revealed an incomplete or absent oviduct or the presence of a thin walled cystic oviduct (Figure 3). Birds showing these symptoms are commonly referred to as 'false layers', as they visit the nests on a regular basis and cannot be differentiated from normal layers from their physical appearance.

**Figure 3:** A thin walled cystic oviduct



In a large number of these 'false layers' a new variant of IBV was detected; early infection with this variant has been seen to result in a failure of the oviduct to develop, despite the other characteristics of sexual maturity occurring normally (Figure 4). The GD – Animal Health Service in Deventer, Netherlands, has typed this IBV variant as D388. This strain has been confirmed as being identical to the QX-like variant, which was typed and described in China in 2004.

**Figure 4:** Examples of no oviduct development as a result of early infection with IBV



## Protection

A high biosecurity standard which controls the movement of personnel and equipment, and preferably an all-in all-out system with proper cleaning and disinfection of the houses is necessary if protection against IBV is to be maximized. Vaccination offers further protection against the disease. Vaccines for IBV can be both live and inactivated. Live vaccines replicate in the respiratory tract stimulating local and systemic immunity. Inactivated vaccines help to stimulate uniform and persistent titers.

Inactivated IBV vaccines do not stimulate local, cell-mediated immunity as effectively as vaccines containing live virus. Inactivated or killed vaccines are administered by injection of individual birds and are used in breeders around 18 weeks of age. For an inactivated vaccine to be effective, the birds need to be primed with a live vaccine at least five weeks before administration of the inactivated vaccine.

In order for vaccination against IBV to be effective the following are important:

- Appropriate storage and transport of vaccine. Monitor the storage conditions, keep the vaccine refrigerated, prevent direct sunlight and administer before expiry date.
- Application and uniform intake. Use proper and clean equipment for spray vaccination. Use clean water and cleaned waterlines before water vaccination; always adhere to the recommendations of the pharmaceutical company.

### Non-specific and Specific Immunity

For protection against an IBV challenge both non-specific and specific immunity is required.

The non-specific immune system includes body temperature, micro-flora of the intestine and cilia (hairs) and mucus in the respiratory tract. Mucus secretions trap the virus particles, which are then transported out of the body via cilia. The effectiveness of the non-specific immune system will be reduced if other factors such as brooding, ventilation and nutrition are not optimal; minimizing stress and practicing proper brooding management are very important. Poor nutrition leads to deficiencies in non-specific and specific immune systems; viruses (and other organisms) are able to penetrate the protective coverings like the intestine and at the same time the development of immunity is reduced, so the antibody response is insufficient. It is therefore important that feed of good physical quality, containing good quality proteins and vitamins, is provided.

Specific immunity is both passive and active. Passive immunity consists of maternally derived antibodies which will give the chick systemic protection for a limited period of time, and will reduce the vaccine reaction after vaccination with a live virus. Maximum concentrations of circulating maternal antibody occur in the young chicks at one to three days of age, as the yolk sac is absorbed, and is usually depleted at 18-24 days of age.

Because maternally derived antibodies only give a systemic protection for a short time, it is recommended to give a live vaccination in the hatchery or as soon as the birds arrive on farm via coarse spray or eye drop. This will establish local protection by blocking receptor cells in the upper respiratory tract, produce antibodies locally and will be the first defense against an early challenge.

### Vaccination Programs

With all the different IBV strains that exist around the world, establishing the correct vaccination program is difficult, however antibodies produced to one variant often show (part) cross protection to other variants. Where prevalent strains in an area have been identified, designing a vaccine program using commercially available vaccine is often possible.

No combination of IBV vaccine strains provides full protection against all the different IB challenges, although there are combinations which broaden the coverage. The vaccine program should include the use of two different IBV vaccines. In general it's not recommended to vaccinate with multiple live IBV serotypes at one time, as this can lead to the development of poor immunity and excessive vaccine reaction, but depending on the challenge it is sometimes necessary. For example a classical strain, like H120 or a Massachutes-strain at day 0 may be used in combination with a variant strain, like 4/91 or 793B at 10-14 days of age.

The combination of a classical with a variant strain will increase protection against a broader range of serotypes and will give better protection against QX/388 strain. This will help prevent 'false layers', where early protection is very important. Recent research has also shown that protection against 'false layers' was achieved when the Arkansas strain was used in combination with a classical strain.

It is preferable not to use other live respiratory vaccines within two weeks of live IBV vaccine administration. Respiratory viruses compete for the same receptor sites on the upper respiratory mucosa and the antibody response will be affected.

It may be able to administer a Newcastle Disease vaccine in combination with an IBV vaccine; this is recommended in areas with high challenges. The recommendations of the pharmaceutical companies should always be followed.

### **Treatment**

In cases of IBV challenge, antibiotics will have no effect on the IB virus itself. However, as IB virus causes a deficiency in non-specific immunity and increases the risk of a secondary bacterial infection, mainly *E. coli*. The use of a broad spectrum antibiotic for the prevention of a secondary bacterial infection is appropriate. Use smaller spectrum antibiotics to treat infections after culture and sensitivity of the bacteria involved has been established.

### **Monitoring**

Monitoring of vaccine response should be part of the vaccine program. Blood for ELISA testing should be collected on a regular basis to monitor the mean titer response and the coefficient of variation (CV%). The mean titer measures the immune response of the flock giving information about the antibody response of a flock after vaccination. The CV % gives an indication on variability of the mean titer response of a flock. The lower the CV%, the more uniform the distribution of the titers and the better the application of the vaccine. From an application with a live IBV vaccine the CV% should be less than 50%.

Remember that these titer values may vary according to type of bird, age, vaccine type and vaccination program and that every company should establish their own baselines for mean titer and CV%.

The use of blue dyes with water vaccination is recommended to monitor vaccine intake after water vaccination by tongue stain scoring. It also acts to stabilize the water and will reduce chlorine and sometimes heavy metals. Auditing of the entire vaccination process should be done on a regular basis.

### **Conclusions**

The presence of IBV within a flock can have a considerable impact on the economic performance of the current and subsequent flocks. It is essential that adequate biosecurity (of personnel and equipment) and appropriate vaccination programs are in place if infection with IBV is to be avoided. Some key management focus points for doing this are given below.

### **Key Management Focus Points**

- Infectious bronchitis virus (IBV) is caused by a corona virus that is easily spread within and between flocks. This virus is very hardy and survives well in the environment.
- IBV is not known to be a risk to human health.
- IBV affects birds of all ages and incidence occurs worldwide.
- IBV is highly infectious and only a few virus particles can start an infection.
- Transmission is via direct and indirect contact between poultry and poultry premises. People, vehicles and equipment can spread the virus.
- Placing chicks on farms not cleaned and disinfected properly or on built up litter increases risk of an IBV challenge.
- Multi-age premises pose a very high risk of transmission and infection of IBV.
- The development of a strong immune system in the young chick is vital to IBV protection. Early body-weight gains with good uniformity need to be achieved.
- Diets must be of good quality and contain the recommended levels of protein and vitamins to ensure proper development of the immune system.
- High biosecurity standards are very important to prevent immunosuppressive diseases such as Chicken Anemia Virus (CAV), Infectious Bursal Disease (IBD), Reo Virus and mycotoxins, which may increase the severity of IBV infections.
- Other respiratory challenges must be properly controlled as well, such as Turkey Rhinotracheitis (TRT), Avian Influenza (AI), Newcastle Disease (ND) and Infectious Laryngotracheitis (ILT).
- Many vaccinations are done in the first weeks of life and must be achieved with minimum stress levels to the chicks. In the hatchery the route of vaccination is very important, as is the accuracy of vaccination.
- Multiple vaccinations with different strains are needed for proper protection.
- Vaccination must follow standard operating procedures, which incorporate proper vaccination techniques to prevent trauma and secondary bacterial infections.
- Monitoring the presence of IBV strains in the field is helpful in determining strains to incorporate into a vaccination program.
- Select vaccine strains that will be most effective against the field strains present in a region.