Factors affecting peak hatchability

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Achieving good hatchability is a prerequisite for the economic production of broiler chicks. Procuring good early and peak hatches is important as this coincides with the period of highest egg production and any reduction in hatchability at this time will have significant negative consequences for profitability.

Therefore, when Aviagen became aware of soft information from the field indicating variability in early and peak hatchability across Europe, an investigation to explore the possible causes for this was initiated.

The issue

In 2005 and 2006 soft information from the field showed some variability in early and peak hatchability across Europe. Hatchability was depressed, with no apparent recovery with age.

This depression in hatch was usually accompanied by other symptoms such as poor egg shell quality and the yolk membrane abnormalities, shown in the photographs.

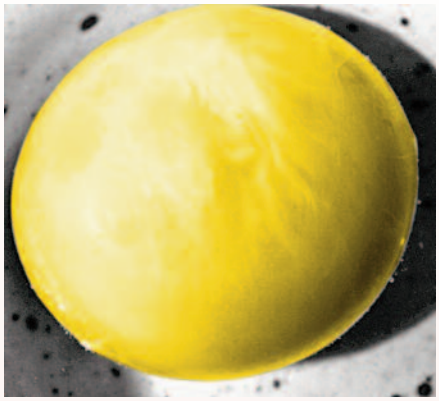
Hatchability deteriorated with egg storage faster than usual, giving elevated levels of candling clears. However, true fertility of fresh eggs was excellent and egg production remained normal. All breeds within Europe were affected, but there were no reports of any issues from other world regions.

European field survey

In early 2007 Aviagen surveyed breeder health, feeding and management in several European countries in an attempt to understand the reasons for this variability in early and peak hatch. Information was collected from 31 Ross 308 flocks across 15 companies from customers in the UK, Scandinavia, Holland, Germany and the Czech Republic.

The scope of this multidisciplinary survey was large. From each flock 150 eggs were collected and analysed for egg quality traits as it seemed likely that the shell and membrane abnormalities were related to the depressed hatchability.

Feed samples were supplied and feeds were analysed for nutritional content and



Folding in inner vitelline membrane.

presence of feed contaminants. Blood samples and swabs were taken to look for the presence of any diseases which might affect egg quality and hatch. Management inputs, including body weights at strategic ages, feeding levels and age of photo-stimulation were surveyed.

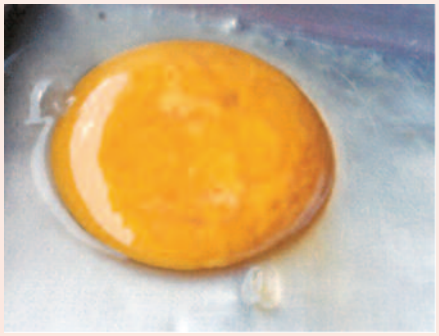
Each company provided eggs from their best and worst hatching flock between 35 and 45 weeks of age. This provided information on three distinct groups of flocks varying in peak hatchability as shown in Fig. 1.

The range of hatchability for the best flocks was 88-89%, for the middle flocks 88-87% and for the worst flocks 84-86%.

Egg quality

Some 150 eggs per flock were tested for shell colour and thickness, albumen quality, inclusions and yolk mottling. The data

Mottling of egg yolks.



showed small differences in egg quality between the three groups, but no specific link between poor hatching flocks and the egg quality parameters recorded was established.

However, the level of mottling was found to be significantly lower in the best hatching group.

Flock management

The rearing bodyweights of all groups were close to the recommended Ross 308 parent stock performance objectives 2007 (Fig. 2). However, the best hatching group received slightly higher feed allowances in rear.

A higher feed allowance in rear permits good weight gain and allows better feed distribution and a longer feed clear up time, giving a more even, less stressed flock of birds with a higher intake of micronutrients.

Achieving the correct weight gain between 15 and 23 weeks of age is critical for reproductive development. Failure to achieve appropriate weight gains during this time will affect growth and ovarian development reducing potential reproductive performance and uniformity of sexual maturity.

The best hatching group was shown to have the highest weight gain between 15 and 20 weeks of age.

By achieving good weight gains during this period (not below 675g) development of the reproductive system (and sexual maturity) in the best hatching group would have been optimised and variation in sexual maturity minimised.

Management during the pre-peak period of 20-30 weeks of age should support growth, egg production and egg weight. If appropriate weight gains are not achieved at this time, egg production and potentially hatchability will be affected.

Between 20 and 30 weeks of age the best hatching flocks were consistently close to or above the Ross 308 recommended bodyweight profile, while the bodyweights of the middle and worst hatching groups were consistently below the recommended target.

This data confirms the benefit of keeping bodyweights on or close to target.

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Allowing bodyweights to exceed target excessively can be negative for breeder performance leading to a reduction in egg production and hatchability.

Photo-stimulation

The timing of photo-stimulation did not differ between the best and worst hatching flocks with both groups being stimulated at 21 weeks of age. However, the best hatching flocks were close to target weight at photo-stimulation, while the worst hatching flocks were under weight at photo-stimulation.

This highlights the negative impact that being under weight at photo-stimulation can have on subsequent flock performance and hatchability. Achieving an appropriate weight at photo-stimulation is important to ensure that birds have achieved properly synchronised sexual maturity and optimal reproductive performance.

The middle hatching flocks were shown to be photo-stimulated at 20 weeks, indicting the negative impacting of light stimulating before 21 weeks of age on hatchability.

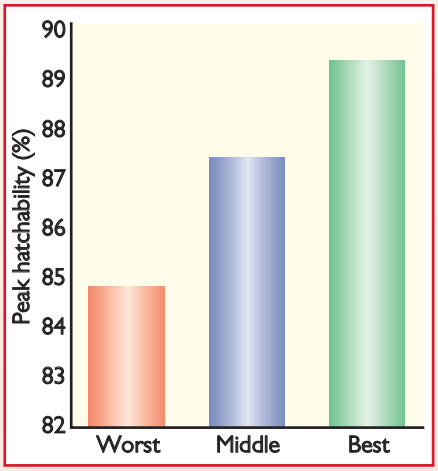
Feed analysis

Breeder feed samples were analysed for protein, energy, a range of minerals and deoxynivalenol (DON) mycotoxin. Egg yolks were tested for nicarbazine residues. There was no evidence from this survey that DON mycotoxin or nicarbazine contamination were damaging hatchability.

Dietary protein levels were adequate for all groups and did not seem to be an issue for hatchability.

Analysed dietary energy levels were low (10.9MJ) for all groups (recommended level of dietary energy in the breeder feed is 11.7MJ, Ross 308 parent nutrition specification, June 2007), however the best hatching group received diets which had a higher fat content (as measured by analysed crude fat content).

Fig. 1. Differences in average peak hatchability of flocks contributing to the European hatchability survey.



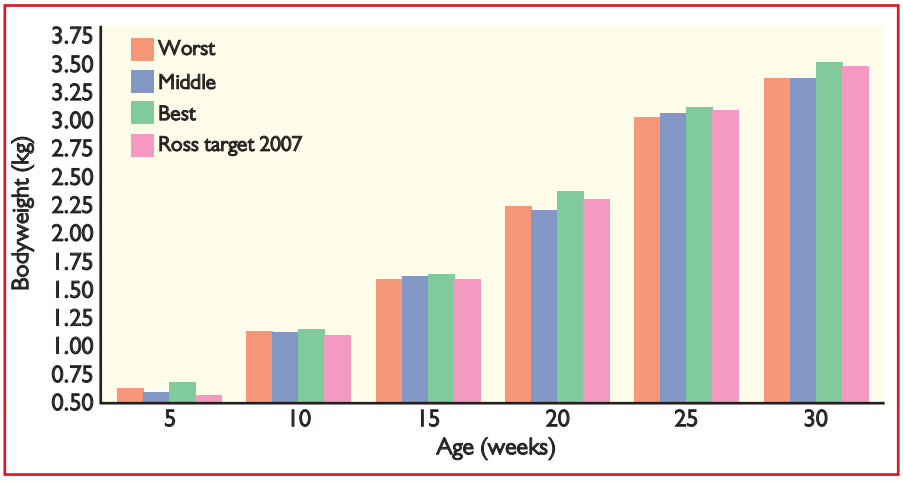


Fig 2. Differences in bodyweight between the best, middle and worst hatching flocks.

All flocks received high feed allowances in lay (peak feed averaged 172g/bird/day), However, with dietary energy levels of 10.9MJ/kg this constitutes an energy intake of 448kcals at peak which is 4% below recommended levels. The best hatching flocks achieved target weight gain pre-peak (from 25-30 weeks of age). It seems likely that the ability of these flocks to achieve target weight gain was related to higher fat content in the diet of these flocks.

This response to dietary fat may have been due to better energy availability in the diets or in the poorer hatching flocks where a reduced dietary fat content was fed, fat levels may simply not have been high enough to provide sufficient lipid for yolk synthesis.

There were also differences between the groups in terms of dietary calcium levels, with the best hatching flocks receiving a diet with a higher calcium level and hence having a higher calcium intake than the poorer hatching flocks. Dietary phosphorous levels were, however, found to be similar between the groups.

Calcium levels in the diet are important for shell quality and hatchability; however data on shell thickness showed only a small non-significant increase in thickness in the best hatching flocks.

Aviagen recommends a calcium level of 3% in the breeder diet and an available phosphorous level of 0.35%, higher levels of phosphorous are known to reduce egg shell quality. Other minerals were present in adequate amounts with minimal differences in diets fed to the different groups.

Summary

A field survey was initiated to investigate the possible causes of variation in early and peak hatchability in Europe. The size of this multi-disciplinary survey was huge with data on flock egg quality, health status, feed and management being collected from 31 Ross 308 flocks from five different countries.

Surveys of this size and scale are not often completed, in this respect the data set that was collected during this process is unique.

The main conclusions highlighted by this survey were:

- The importance of management and feeding (feed amounts and availability of nutrients such as energy) around the time of sexual maturity and the impact that this can have on egg quality and hatchability.
- The critical importance of achieving appropriate bodyweights and good flock uniformity at the time of photo-stimulation, to ensure flock production and hatchability are maximised. ■