Aviagen™ Brief

Testes Development and Fertility

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The correct testes development is critical for achieving and maintaining fertility levels within a flock. This article aims to describe the progress of testes development over time and is based on work carried out within Aviagen facilities in response to field enquiries.

Introduction

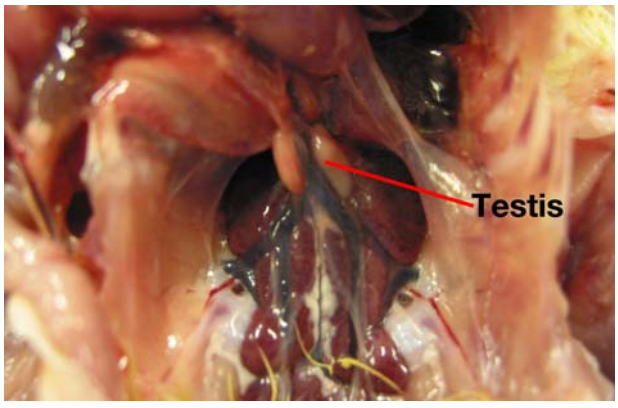
Testes size is highly correlated with fertility, poor fertility often being associated with small testes. It is therefore vital to ensure that management does not inhibit the development of the testes at any stage. If male management is to promote the growth of good, healthy testes, an understanding of the critical periods of testicular development is needed. This article gives an overview of the development of the testes during the male's life.

Testes development timetable

2 - 15 weeks

Between 2 and 12 weeks of age testes development occurs mainly at the cellular level. During this period of time the physical growth of the testes is small but vital multiplication of the sertoli cells which determine the fertility potential of the male occurs. During the first 10 weeks after hatching the weight of the testes increases by a small amount (from a few mg to 60-100 mg), but the number of sertoli cells increases from 1 to 100 million. The sertoli cells provide support and nourishment for the developing sperm and the ability of the testes to produce sperm is closely linked to the number of sertoli cells present in the testes. If sperm production in the mature male is to be maximized it is vital that multiplication of the sertoli cells is allowed to proceed normally.

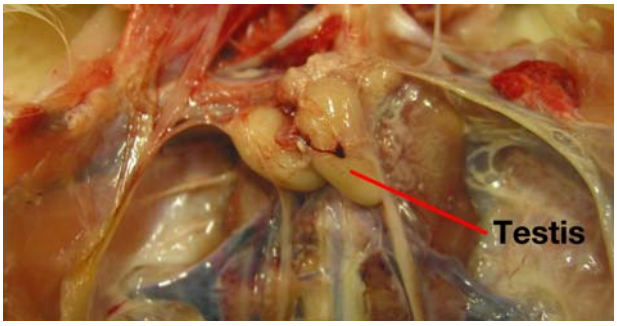
Figure 1: Testes weight at 15 weeks -typically .02 oz (0.5 g)



16 - 24 weeks

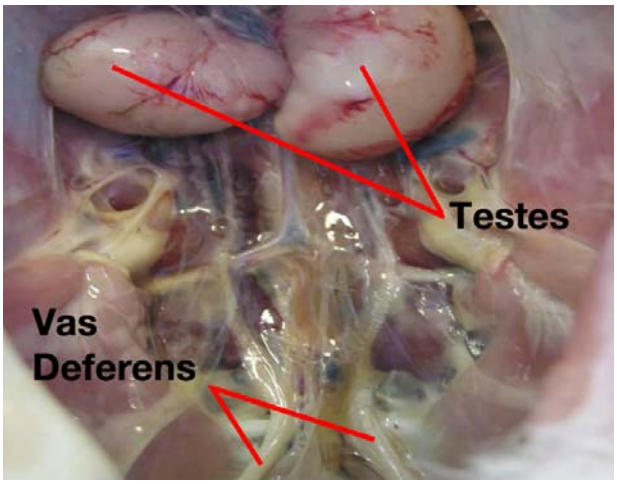
After 15 weeks of age the physical growth of the testes is accelerated. At 20 weeks of age, prior to any light stimulation and under a constant rearing day length of 8 hours the weight range of the testes is typically .02-.07 oz (0.5-2g) (see Figure 2).

Figure 2: Testes at 20 weeks of age



Further significant growth of the testes occurs in the first three weeks after light stimulation. Light stimulation commences sexual maturity by stimulating the secretion of the hormones that initiate the production of sperm, hence the dramatic increase in testes size. At 23 weeks the testes are typically in the weight range of .42-.78 oz (12-22 g) (**Figure 3**). The vas deferens, the ducts that carry sperm from the testes during ejaculation, are also developing at this time (**Figure 3**).

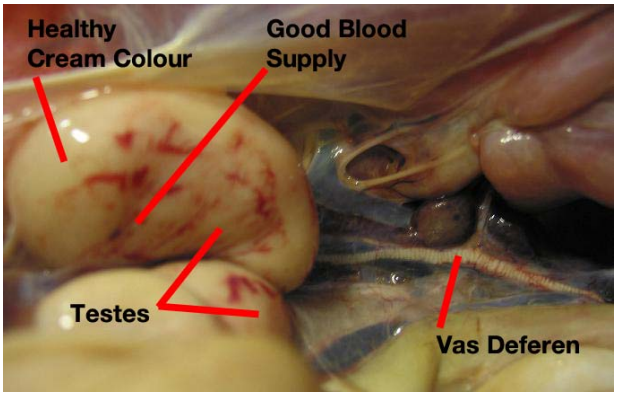
Figure 3: Testes at 23 weeks of age



25 - 30 weeks

Peak testes weight and semen production occurs around 28 to 30 weeks of age. Figure 4 shows the testes of a good mature male at 35 weeks of age. Testes weight was 1.52 oz (43 g) and the good development of vas deferens (a pearly white color), the good blood vessel supply to the testes and their healthy cream color should be noted.

Figure 4: Testes of a good mature male at 35 weeks

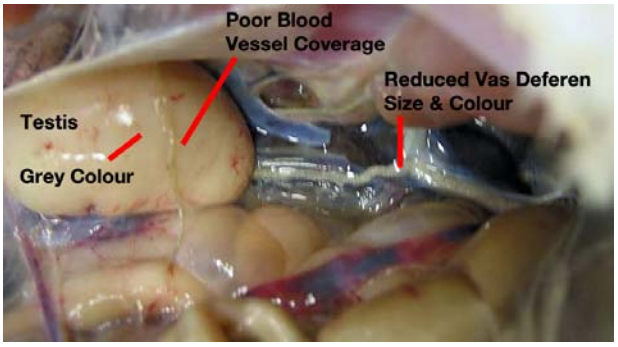


Beyond 35 weeks of age

After 30-35 weeks of age there is a natural reduction in testes weight and sperm production, and a decline in fertility. However, male management at this time can significantly affect the rate at which this decline occurs. It is critical that male bodyweight and condition are maintained after peak if the rate of decline in fertility is to be minimized.

Figure 5 shows the typical regression of the testes. Note the poor blood vessel coverage, grey color of the testes and the reduced vas deferens color and size.

Figure 5: Regressing Testes



When it goes wrong - male regression

In field conditions males are commonly over fleshed (overweight) or under fleshed (underweight). This is largely due to inadequate separate sex feeding techniques and poor flock management. The majority of problems can be related to the period from mating up (23 weeks) until physical maturity at around 30 weeks and commonly lead to poor testes development and fertility. The underfeeding of males post-peak is a frequent problem which will have a damaging effect on male condition, regression of testes and fertility. Periods of overfeeding followed by underfeeding will have a negative effect on the physiological development of the male which will not be apparent during a physical assessment of male condition.

The data below were taken from a flock at 35 weeks with different physical fleshing conditions. Male 1 was a poorly fleshed bird, male 2 was selected as a good working male and male 3 was considered over-fleshed (**see Figure 6**). The corresponding bodyweights for the 3 males are given in the table below with the corresponding testes weight (**see Figure 7**).

Table 1: Body and testes weights of a (1) poorly fleshed, (2) good working and (3) over-fleshed male.

	Male 1	Male 2	Male 3
Bodyweight	7.1 lb 3200 g	10.7 lb 4850 g	11.8 lb 5350 g
Testes weight	.95 oz 27 g	1.5 oz 43 g	1.0 oz 29 g

Figure 6: Picture showing the different fleshing of 35 week old males illustrating the effect of male weight and condition on testes size.

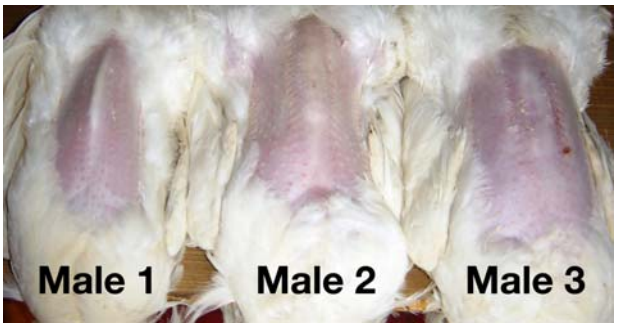
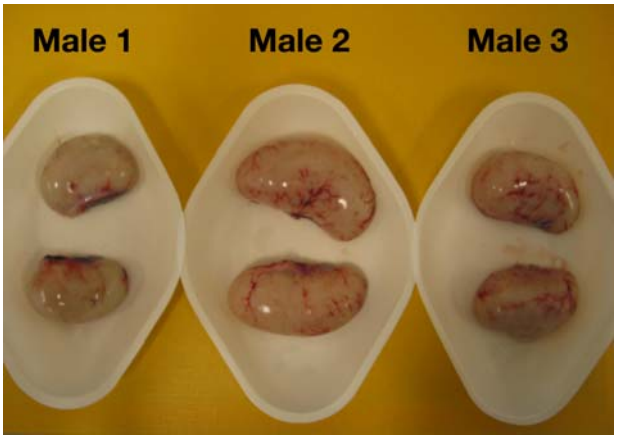


Figure 7: The testes associated with the differently fleshed males in Figure 6.



The results demonstrate the importance of physical condition (fleshing) on testes weight. The two extremes of the population (males 1 [under-fleshed] and 3 [over-fleshed]) having sub-optimal testes development. As testes size is closely linked to sperm production and fertility these males would be expected to have poorer fertility.

Conclusion

There is a clear link between bodyweight, testes weight and fertility and it is therefore essential that good male management is achieved if the development of the testes is not to be inhibited. Although it is generally true that large males have large testes, in modern broiler breeders, male bodyweight alone is not the definitive solution to achieving optimum fertility. Indeed, as has been shown, heavy over-fleshed males often have sub-optimal testes development.

Good, fertile hatching eggs are obtained from flocks which have a proactive management approach using the following tools:

- Fleshing
- Feed volumes (see Ross Parent Stock Performance Objectives, 2007). Observation at feeding time; separate sex feeding (stealing from females) and feed distribution
- Bodyweights (see Ross Parent Stock Performance Objectives, 2007)
- Mating ratio's (see Ross Breeder Management Guide, 2002)
- Uniformity of the male population (see Ross Breeder Management Guide, 2002)
- Vent size, moisture and color
- Face color.

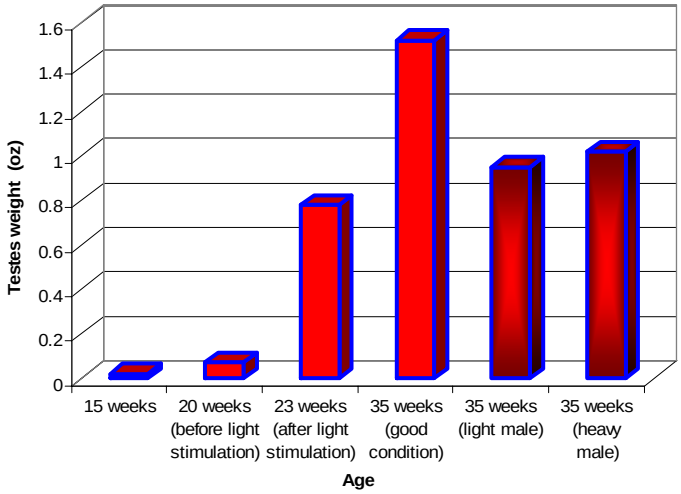
Male management for optimal testes development and fertility starts from a young age and continues throughout the male's life. Management pre-light stimulation is important for supporting the cellular development of the testes. During this time although the physical growth of the testes is small, vital multiplication of the cells that support sperm production occurs.

After light stimulation the physical development of the testes is significant as the birds become sexually mature and sperm production is initiated. Appropriate male management is critical at this time if fertility is to be maximized. Peak testes weight/development and semen production occurs between 28 and 30 weeks of age. After peak, testes size and fertility naturally decrease, but the rate of this decline will be influenced by management. Maintenance of male condition and bodyweight post-peak is critical if the decline in fertility in older males is to be minimized.

Key Stages of Testes Development

- Between 2 and 15 weeks of age testes development occurs mainly at the cellular level and physical development is small.
- After 15 weeks of age the physical growth of the testes is accelerated.
- Further significant growth of the testes occurs in the first 3 weeks after the first light stimulation.
- Testes weight peaks around 28-30 weeks.
- Beyond 35 weeks there a natural decline in testes size and fertility occurs. The rate of this decline will be accelerated if management is poor.

Figure 8: Development of testes over time



Comments/Notes

1. Weights of testes used are in ounces per pair (grams per pair).
2. The difference between the left and right testes was less than .07 ounces (2 grams) during the trial.
3. For more information on male management refer to the Ross Parent Stock Performance Objectives (June 2007) and the Ross Breeder Management Guide (2002).

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