

Male  
Management  
Supplement

CobbMV™ *Male*

breeder



ONE FAMILY.  
ONE PURPOSE.

# Cobb MV Male Management Supplement

## Introduction

Cobb's commitment to genetic improvement of our family of products continues to increase the performance potential in all areas of broiler and broiler breeder production. However, to attain both genetic potential and consistent flock production, it is important to have a good management program in place. Cobb broiler breeder success worldwide provides considerable experience with the breed in a wide range of situations including hot and cold climates, controlled environment and open housing. This Male Management supplement will help you build a management program.

Successful management must not only meet the basic needs of the stock but must also be finely tuned to fully benefit from the breed's potential. Some of the guidelines may need to be adapted locally according to your own experience or infrastructure. Cobb's regional technical service and world tech teams can help with adapting recommendations for your operation.

This Cobb MV Male Management supplement highlights critical factors that are most likely to influence flock performance. Our technical information includes Cobb Management guides for grandparent stock, parent stock, hatchery, broiler, vaccination procedures, technical bulletins and a full range of performance charts. Our recommendations are based on current scientific knowledge and practical field experience from around the world. You should be aware of local legislation, which may influence the management practice you choose to adopt.

Please use the Cobb MV Male Management supplement as a reference and supplement to your own flock management skills. Apply your knowledge and judgment to obtain consistently good results with the Cobb family of products.

# Cobb MV Male Management Supplement

## Male Management

The key to obtaining good fertility from today's broiler breeders is to develop feeding and management programs that allow for correct development of the male's reproductive system while controlling the growth rate and capacity to deposit breast muscle.

The male growth profile is the single most important factor that correlates with flock fertility. Males should be weighed at least weekly from one to 30 weeks of age and at least every other week thereafter. Handle males by both legs during weighing and vaccinations.

Tracking growth and production records that include the body weight curve, feeding program, weekly uniformity, percentage male ratio and all other management aspects can be very instrumental in fine tuning performance. Ask your Cobb technical service representative for our Excel spreadsheet that makes tracking easy and efficient.

## Rearing

A good start in rearing is essential for weight uniformity as well as promoting good organ and skeletal development. Each of these factors correlates with male fertility potential. It is important for males to achieve the standard body weight targets.

For best results, **males should be reared separately from females** until housing between 21-22 weeks of age. In brown out or dark out houses, sufficient light intensity and duration must be provided to ensure the proper feed amount is consumed during the brooding period.

Adequate housing, feed and water equipment is paramount to obtaining flock fertility. The recommended male stocking density is between 3.6 - 4.3 males/m<sup>2</sup> (2.5 - 3.0 ft<sup>2</sup> per male). In addition to floor space, sufficient feeder space is important to allow all males to eat simultaneously. Rapid, even feed distribution is essential for producing high quality males. The following feed space guideline is provided based on various types of feeding systems available:

- Trough - 6 - 7" (15-18 cm)
- Round pan - 8 - 10 birds/pan
- Oval pan - 10 - 12 birds/pan

A balanced starter ration containing 18- 19 % crude protein (CP) will allow the male to attain a body weight (BW) of 150-160 g (0.33 - 0.35 lb) at 7 days of age. It is not necessary to use a pre-starter diet with high levels of CP (21 % and higher).

# Cobb MV Male Management Supplement

## Body Weight Management & Uniformity

Males should never lose weight at any age. Research conducted on male reproductive physiology shows that sperm production potential is established at an early age. Males subjected to undue stress, often accompanied by a weight stall or decline, may lose reproductive potential in the first 15 weeks of life.

Body weight development during the first 8 weeks largely determines frame size later in life. Heavier males tend to develop the largest frame size making it imperative that male weights be kept close to standard from 4-16 weeks of age. One way to accomplish this is to separate the heaviest males at 3-4 weeks of age by grading and controlling the body weight during the growing period. This can be followed by a repeat grading at 8 weeks of age by handling all males and removing poor quality males with visual defects including crooked and bent toes, spinal abnormalities and eye and beak abnormalities. Flocks with poor uniformity at 15-16 weeks can be graded on breast conformation and/or wing resistance with the least developed males placed in a separate pen and given supplemental feed to help improve sexual development and conformation uniformity. The goal is to have 95% of the males properly conditioned by 20 weeks of age.

Maintaining flock uniformity is of utmost importance in managing today's high yielding males. This includes uniformity of body weight, frame size and carcass conformation or fleshing. In slatted hen houses, uniform males maintained close to the Cobb standard weight express fewer leg defects leading to better mobility, a higher mating frequency and more completed matings.

## Transferring From Rearing To Production Houses

For best results, mate the average male population with the females. Heavy males with no visible defects (skeletal or leg problems) can be used for spike males while small, poorly conditioned males should be removed from the population. Culling poor quality males should be done on a regular basis and is essential to maximize fertility. Mate heavier groups of males with heavier females, and light males with light females. It is important to ensure proper sexual synchronization between males and females and a proper body weight differential. This greatly enhances hen receptivity and mating efficiency.

Ensure positive growth occurs the first 4 weeks after light stimulation when testes undergo rapid development. 75% of testes development occurs the first 2-3 weeks after photo stimulation. Monitor weights weekly and adjust feed accordingly. It is a good management practice to observe males and females eating for several days after housing. If males are observed *stealing* feed from the female feeder, it may be necessary to hold the male feed rate constant for several weeks and increase the female feed amount to compensate for the feed males are consuming. One suggestion is to give 50% of the male feed in the male feeder, and the remaining 50% in the female feeder.

In slatted houses, males must quickly identify and access water lines to ensure body condition does not regress at any time after housing with females.

# Cobb MV Male Management Supplement

Overfeeding after transfer may result in larger, over-fleshed males requiring additional energy for body weight maintenance. If the male BW increases too rapidly after housing, an alternative is to reduce the feed amount (not more than 5 g (1.1 lbs/100) at a time) to closer meet the male nutritional requirement. Act immediately so males do not increase body weight too fast. Handling males frequently and scoring breast fleshing during this time period is the best way to evaluate males and help guide the feeding program.

## Sexual Synchronization With Females

It is important to ensure proper sexual synchronization between males and females. This is largely influenced by the body weight differential between the sexes. A properly synchronized flock will have high hen receptivity and a high mating efficiency. A guide to determining the correct male ratio should take the following criteria into consideration:

- 1) Weight differential between males and females at transfer.
- 2) Body composition, frame size and maturity development between males and females at transfer.
- 3) Genetics - there are differences in maturation rates, temperament and activity levels between male breeds and strains.



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Maintaining control of male weight from transfer to flock depletion is an essential component of maximizing male fertility. Generally, the body weight differential target between males and females at housing should be in a range of 15-20% depending on the Cobb female strain being used. By 30 weeks of age, when sexual activity is at peak, the weight difference can be as little as 12-15%, again depending on female strain. This differential gives more leeway to manage the BW growth of the males for good fertility persistency. Review the table below for more information.

## Percent Difference Tables

Age Weeks	Bodyweight Cobb500 FF Female g (lb)	Bodyweight Cobb MV Male g (lb)	% Bodyweight Difference
20	2150 (4.74)	2765 (6.09)	28.6
22	2575 (5.67)	3050 (6.72)	18.4
25	3000 (6.61)	3600 (7.93)	20.0
30	3440 (7.58)	4020 (8.85)	16.9
40	3640 (8.02)	4270 (9.41)	17.3
50	3795 (8.36)	4495 (9.90)	18.4
60	3900 (8.59)	4720 (10.40)	21.0

Age Weeks	Bodyweight Cobb500 SF Female g (lb)	Bodyweight Cobb MV Male g (lb)	% Bodyweight Difference
20	2250 (4.96)	2765 (6.09)	22.9
22	2675 (5.89)	3050 (6.72)	14.0
25	3105 (6.84)	3600 (7.93)	15.9
30	3570 (7.86)	4020 (8.85)	12.6
40	3770 (8.30)	4270 (9.41)	13.3
50	3915 (8.62)	4495 (9.90)	14.8
60	4015 (8.84)	4720 (10.40)	17.6



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The following management techniques can be considered if male maturity lags behind females at transfer to the production facility:

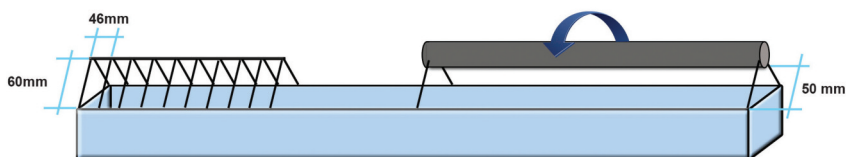
- Maintain 10 lux (1 footcandle) light intensity during rearing. Insufficient light intensity during rearing may delay maturity onset.
- Increase the weekly bodyweight gain between 18-21 weeks.
- House and photostimulate males one week earlier than females to train them to the male feeder and accelerate maturation.

## Male Management During Production

One challenge for the farm manager and the feeding system selected is to distribute a measured amount of feed per male as quickly and uniformly as possible to keep all males with uniform growth and activity level.

It is highly recommended to use Separate Sex Feeding (SSF) in production. True SSF implies that males should not have access to the female feed and vice versa. A normal set up would include a male exclusion system placed on the female feeder (grill, roller bar, plank or wooden board) and a line of pans, trough or tube feeders for the males. The exclusion grill should create both a vertical (60 mm) and horizontal (46 mm) restriction (See Female Track Feeder on the following page). In systems with a plank or roller bar restriction, the vertical restriction should be 50 mm. This type of system can serve a dual purpose in countries where animal wellbeing mandates necessitate a minimal area for bird perching.

**Different exclusion methods on a female track feeder.  
A grill on the left and a roller bar on the right.**



It is equally important to keep the female from eating from the male feeder. Keep the male feeder at a height that makes the males stretch slightly to eat and prevents females from reaching. The entire male feeder should be stable and not allowed to swing. The height needs to be frequently adjusted by observing feeding behavior at least once a week up to 30 weeks of age.

Male dubbing is no longer a recommended practice. A complete comb, or one partially dubbed helps restrict the males earlier in production. Full exclusion does not start until the combs are completely developed between 26-27 weeks of age.

# Cobb MV Male Management Supplement



*Productive males have uniform red colored combs, wattles and eye rings. Beaks should be rounded with no sharp edges that may cause damage to females or other males.*

*Regressing or poorly conditioned males exhibit a loss of color around the eyes. Management intervention to recover these males includes separating from the flock and providing additional feed for several days.*

*Males that have lost all color in the comb and wattles should be culled.*

**Training is key to the success of Sex Separate Feeding.** Males need to quickly identify and use their specific feeders. The best option is to have the same type of male feeder in rearing and production. In houses where pan feeders are used during rearing, training may also include use of a mini slat under a drinker line to help train males to jump. This can be particularly helpful when males will be housed to slatted hen houses.

After 30 weeks, feed allocations should be modified according to weight trends. Ideally, small feed increases should be provided to maintain a slight weight increase throughout the production period and ensure all males are receiving sufficient nutrition to sustain activity level and interest in females. Use of a separate male ration can be beneficial in allowing a higher feed volume while still controlling male bodyweight during production.

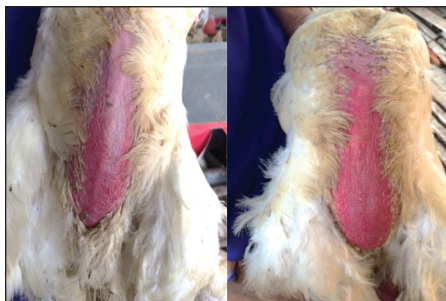
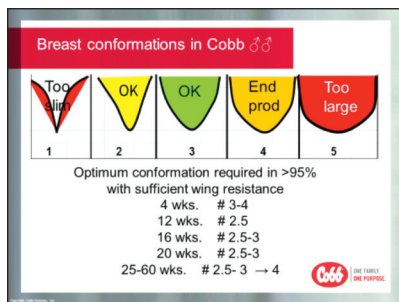
The Cobb MV male weight standard is designed to keep the male light early in production with a consistent positive growth of about 20 - 25 g (0.04 - 0.06 lb) per week from 30 weeks to depletion. Please refer to the weight standards charts for details.

The male feeder should be on a winch system so that it can be raised and refilled daily to prepare for the following day's feeding. It's essential to ensure that all pans are being used and receive the same feed quantity to allow all males equal and simultaneous feed access each feed day. Under normal circumstances, the female feeder is usually started first to move females to their feeder before the male feeder is lowered.

In addition to weight control, male conformation and fleshing should be monitored to help gauge male condition. Breast fleshing should be frequently palpated by hand with the objective of maintaining a "V" shape for as long as possible. Fleshing should cover the tip of the keel, however the keel should still feel prominent.



# Cobb MV Male Management Supplement



*A breast conformation score between a 2 and 3 is ideal at peak production while a small % of males will move to a 4 toward the end of the production period. The picture on the left is a 3 and on the right is a 4. Observe that both males have a red breast color indicating a high level of libido and sexual activity.*



*Both pictures above illustrate how to evaluate male fleshing in rearing and production. The male is palpated on the lower, middle and upper part of the breast. Males with prominent keels are usually scored a 2, while males with fleshing that reaches and covers the keel on both sides is usually scored a 3. The vast majority of males in the flock should score a 3 on fleshing.*

Unproductive males should be removed from the flock as they are detected. Depending on labor availability, male condition and house design, a male selection based on body weight has resulted in better male uniformity and enhanced fertility. Best results have been achieved when selections are done at 25, 35, 45 and 55 weeks. This management technique may be most beneficial in countries where spiking is not an option.

# Cobb MV Male Management Supplement

## Body Weights For Cobb MV Males

Age		Bodyweight	
days	weeks	grams	pounds
7	1	150	0.33
14	2	340	0.75
21	3	525	1.16
28	4	690	1.52
35	5	830	1.83
42	6	960	2.11
49	7	1090	2.40
56	8	1220	2.69
63	9	1345	2.96
70	10	1470	3.24
77	11	1595	3.51
84	12	1720	3.79
91	13	1845	4.06
98	14	1970	4.34
105	15	2095	4.61
112	16	2225	4.90
119	17	2355	5.19
126	18	2490	5.48
133	19	2625	5.78
140	20	2765	6.09
147	21	2905	6.40
154	22	3050	6.72
161	23	3340	7.36
168	24	3470	7.64
175	25	3600	7.93
182	26	3690	8.13
189	27	3770	8.30
196	28	3860	8.50
203	29	3950	8.70
210	30	4020	8.85
217	31	4060	8.94
224	32	4090	9.01
231	33	4110	9.05

Please refer to the Cobb Breeder Management Guide for general flock management recommendations, as well as guidelines concerning post peak feeding.

Weights correspond to the weekly anniversary date.

Weights for weeks 2 through 22 are off-feed weights. From 23 weeks onward, (or when the change is made to everyday feeding), birds can be weighed after a minimum of two hours has passed from the time of complete clean-up of the day's ration.

# Cobb MV Male Management Supplement

## Body Weights For Cobb MV Males

Age		Bodyweight	
days	weeks	grams	pounds
238	34	4130	9.10
245	35	4155	9.15
252	36	4175	9.20
259	37	4200	9.25
266	38	4220	9.30
273	39	4245	9.35
280	40	4270	9.41
287	41	4290	9.45
294	42	4315	9.50
301	43	4335	9.55
308	44	4360	9.60
315	45	4380	9.65
322	46	4405	9.70
329	47	4430	9.76
336	48	4450	9.80
343	49	4470	9.85
350	50	4495	9.90
357	51	4515	9.94
364	52	4540	10.00
371	53	4565	10.06
378	54	4585	10.10
385	55	4610	10.15
392	56	4630	10.20
399	57	4655	10.25
406	58	4675	10.30
413	59	4700	10.35
420	60	4720	10.40
427	61	4745	10.45
434	62	4765	10.50
441	63	4790	10.55
448	64	4810	10.59
455	65	4835	10.65

Please refer to the Cobb Breeder Management Guide for general flock management recommendations, as well as guidelines concerning post peak feeding.

Weights correspond to the weekly anniversary date.

Weights for weeks 2 through 22 are off-feed weights. From 23 weeks onward, (or when the change is made to everyday feeding), birds can be weighed after a minimum of two hours has passed from the time of complete clean-up of the day's ration.

# Cobb MV Male Management Supplement

## Cobb MV Male

The Cobb MV male provides a unique balance between breeder and broiler performance characteristics. On the breeder side, this male expresses excellent feed conversion, liveability and fertility to the flock while also conveying improved feed conversion, liveability and meat yield to the broiler progeny.

## Management Highlights

- Provide weekly feed increases to achieve the weekly weight goal.
- Due to enhanced feed efficiency, use caution to not overfeed at any age especially after moving to the production house.
- Sexual synchronization with females is crucial for optimum hen house performance (fertility/ hatchability).
- If male maturity lags behind females, males can be moved to the production house several days prior to females to help transition to the new environment and access the male feeder. If males and females are synchronized, they can be moved at the same time.
- The Cobb MV male has a smaller comb size when compared to other males. This may necessitate a lower feed amount at housing due to a greater ability to steal feed from the female feeder. A way to prevent this is by using the same type of male feeder in rearing and production so that males are trained to recognize their feeder. Meeting the nutritional needs is essential to maintaining a high level of mating activity.
- Weigh and handle males frequently post housing to closely monitor fleshing and body conformation.
- Overweight males at housing generally tend to mature more quickly post photo stimulation. In this situation, poor sexual synchronization can lead to slating of hens, male and female mortality and a higher incidence of floor and slat eggs. Overdeveloped males can be mated with the females at a later date or utilized for spike males.
- Use of a male feed ration can help control weekly weight gain.

## Male Ratio

The single most important factor in determining the correct ratio is male quality at housing.

Considerations in determining the correct male to female ratio:

- **Male condition**
  - The target male ratio in slatted hen houses is between 8.0- 9.0%. In 100% deep litter houses, the ratio can be increased to 9.0-10%. The male ratio can be adjusted according to the sexual maturity of the males and females and the availability of housing to hold extra males for spiking.
- **Female strain**
  - If the male has matured more quickly than the female, then fewer males are needed especially when mated with the Cobb700. Excessive male weight and advanced male maturity could result in slating of young hens.
- **Spiking program/type of housing**

## Spiking

Spiking is the addition of young broiler breeder males into an older flock to compensate for the decline in fertility that usually occurs after 45 weeks of age. This decline can be due to a decrease in mating interest (natural post 35 -40 weeks of age), a reduction in sperm quality (natural post 55 weeks), lower mating efficiency (poor management leading to males in poor physical condition such as weight or leg and feet disorders, etc.), and excessive male mortality resulting in a reduced male to female ratio.

### Types of spiking programs:

- Extra males are moved to a separate house/farm at transfer and held until moved to a number of older flocks. Alternatively, the males are moved to another flock and held in a pen until used to spike that flock.
- Designated spike male houses are used specifically for raising extra males from day-old to be used to supply spike males to 38 - 40 week old hen flocks. When using a separate spike male rearing farm, the number of males placed with pullets at day-old can be reduced to 10 -11 %.



# Cobb MV Male Management Supplement

## Important criteria:

- Spiking with the Cobb MV male in slatted production houses should occur when the male ratio goes down to ~7.0 % (spike back to 9.0 %).
- In production houses without slats, house 9.5 - 10 % males at transfer and let the ratio come down to 7.5 % before spiking is done, with the ratio going back up to 9.0 %.
- Spike with a minimum of 20 % additional males to an existing flock for best results. Spiking with an insufficient number of males is generally ineffective due to primary male dominance resulting in mortality.
- Spike males should be of good quality and free of physical defects. Males must be at least 25 weeks of age with a minimum weight of 4.1 kg (9 lb) and be sexually mature. The bodyweight differential between spike males and primary males should be as similar as possible to ensure a high success rate.
- Regularly cull poor primary males. This practice helps identify more accurately the remaining male ratio. Spike males are then added to increase the ratio to original levels.
- At housing, when an early spiking is assured, it may be possible to start with fewer males (7 - 8 % at 21 - 22 weeks of age) and to add extra males as needed over time to increase to 9 - 10%. This will improve female receptivity and mixing.
- A slight feed increase just after spiking (2 -3 g/bird/day, or 0.45 - 0.65 lb/100) could be beneficial since spiking significantly increases male's mating activity.
- Flock data has repeatedly shown that having a spiking program in place prior to a fertility drop produces the best results. Many times, historical flock data can help guide when a flock should be spiked. The best results come when the hen flock is spiked between 35 and 40 weeks of age and can be done as a normal scheduled management procedure. Spiking once in the life of the flock is normally enough. Flocks spiked twice on an 8 to 10 week interval also show good results. Spiking is usually not economical beyond 55 weeks of age.
- One of the biggest risks with a spiking program is the possibility of introducing unwanted disease or parasites into the spiked flock. Males should come from a single source flock. The source flock should be serologically tested 5 to 7 days before moving. Any positive or suspect results should put the move on hold.

# Cobb MV Male Management Supplement

## Intra-Spiking

Intra-spiking simply means exchanging 25 - 30% of original males between houses from the same farm, without importing any young males, to create a similar stimulus to mating activity as the one created by spiking.

Intra-spiking produces better results when done earlier in life (<45 weeks) and two Intra-spiking's, done at 40 and 48 weeks of age, can produce even better results.

Intra-spiking is inexpensive, easy-to-practice and, most importantly, rarely presents a biosecurity risk.

## Summary

The key to achieving excellent fertility starts with rearing a uniform flock of healthy males. Having males properly prepared in terms of weight and fleshing prior to photo stimulation will help ensure they are ready to adjust to the new environment in the hen house. A successful transition to the hen house, with controlled weekly weight gains and timely, even feed distribution and meeting their daily nutritional requirements will help ensure males are healthy and viable throughout the production cycle. Please refer to the ***Cobb Breeder Management Guide*** for additional detailed information on male management.

## Recommended digestible amino acid levels based on amino acid/lysine ratios

<b>Phase Age (days) (weeks)</b>	<b>Starter 0-28 0-4</b>	<b>Grower/Pre-Breeder 29-154 5-22</b>	<b>Breeder 155+ 23+</b>	<b>Male* 155+ 23+</b>
Lysine	100	100	100	100
Methionine	44	45	47	50
M + C	75	85	86	90
Tryptophan	22	25	25	29
Threonine	70	83	75	93
Arginine	105	100	90	100
Valine	67	75	80	75
Isoleucine	70	83	76	83
Leucine	118	130	112	120
Histidine	32	33	34	35
Phenylalanine	65	65	66	65
P + T	115	120	120	120

\* The recommendations for males 155+ days of age can be used if feeding a separate male feed in production is desired. Cobb males will perform well using a normal hen diet throughout their life, thus avoiding the need to formulate a diet specific for males in production.



# Cobb MV Male Management Supplement

## Recommended nutrient levels (% per 1000 kcal/kg metabolizable energy)

Phase Age (days) (weeks)	Units	Starter 0-28 0-4		Grower 29-126 5-18		Pre-Breeder** 127-154 19-22		Breeder 1 155-280 23-40		Breeder 2 281+ 41+		Male* 155+ 23+	
		Dig.	Total	Dig.	Total	Dig.	Total	Dig.	Total	Dig.	Total	Dig.	Total
Crude Protein	%	6.630		5.600		5.590		5.590		5.240		4.717	
Calcium	%	0.358		0.383		0.524		1.048		1.119		0.326	
Av. Phosphorus	%	0.160		0.156		0.157		0.157		0.139		0.163	
Sodium	%	0.067		0.075		0.066		0.066		0.066		0.069	
Chloride	%	0.067		0.075		0.066		0.066		0.066		0.069	
Potassium	%	0.215		0.232		0.227		0.227		0.209		0.218	
Linoleic Acid	%	0.436		0.430		0.419		0.454		0.349		-	
Amino Acid		Dig.	Total	Dig.	Total	Dig.	Total	Dig.	Total	Dig.	Total	Dig.	Total
Lysine	%	0.322	0.359	0.190	0.230	0.220	0.260	0.230	0.262	0.225	0.255	0.152	0.175
Methionine	%	0.142	0.158	0.086	0.104	0.099	0.117	0.108	0.123	0.106	0.120	0.076	0.088
M + C	%	0.242	0.269	0.162	0.196	0.187	0.221	0.198	0.225	0.194	0.219	0.137	0.158
Tryptophan	%	0.071	0.079	0.048	0.058	0.055	0.065	0.058	0.066	0.056	0.064	0.044	0.051
Threonine	%	0.225	0.251	0.158	0.191	0.183	0.216	0.173	0.199	0.169	0.194	0.141	0.165
Arginine	%	0.338	0.377	0.190	0.230	0.220	0.260	0.207	0.236	0.203	0.230	0.152	0.175
Valine	%	0.216	0.241	0.143	0.173	0.165	0.195	0.184	0.210	0.180	0.204	0.114	0.131
Isoleucine	%	0.225	0.251	0.158	0.191	0.183	0.216	0.175	0.199	0.171	0.194	0.126	0.145
Leucine	%	0.380	0.424	0.247	0.299	0.286	0.338	0.258	0.293	0.252	0.286	0.182	0.210
Histidine	%	0.103	0.115	0.063	0.076	0.073	0.086	0.078	0.089	0.077	0.087	0.053	0.061
Phenylalanine	%	0.209	0.233	0.124	0.150	0.143	0.169	0.152	0.173	0.149	0.168	0.099	0.114
P + T	%	0.370	0.413	0.228	0.276	0.264	0.312	0.276	0.314	0.270	0.306	0.182	0.210

**Example:** To calculate starter crude protein, assuming a 2860 kcal/kg metabolizable energy diet is  $2.860 \times 6.630 = 18.96$  % crude protein.

**\*\*** The use of a pre-breeder is optional but recommended for those flocks that are underweight or below desired body composition prior to light stimulation. \* The recommendations for males 155+ days of age can be used if feeding a separate male feed in production is desired. Cobb males will perform well using a normal hen diet throughout their life, thus avoiding the need to formulate a diet specific for males in production.

# Cobb MV Male Management Supplement

## Recommended supplementary levels of vitamins and trace elements per metric ton basis

Phase Age (days) (weeks)	Unit	Starter 0-28 0-4	Grower 29-126 5-18	Pre-Breeder/ Breeder 127+ 19+
Vit. A (Maize Diets)	MIU	10	10	12
Vit. A (Wheat Diets)	MIU	11	11	13
Vit. D3	MIU	3	3	3
Vit. E	KIU	75-80	45-50	50-100
Vit. K	g	3	3	6
Thiamine	g	2	2	2.5-3.5
Riboflavin	g	5-8	5-7	10-16
Pantothenic Acid	g	8-12	8-10	25
Niacin	g	20-40	20-35	40
Pyridoxine	g	3	3	6
Folic Acid	g	1.5	1	4
Vit. B12	mg	25	20	35-40
Biotin (Maize Diets)	mg	250	250	300
Biotin (Wheat Diets)	mg	300	300	375
Vit. C	g	25	25	50
Choline	g	300-350	200-300	250-450
Manganese	g	100	100	120
Zinc	g	100	120	110
Iron	g	20-50	20-50	40-55
Copper	g	10-15	10-15	10-15
Iodine	g	1.5	0.5	2
Selenium	g	0.3	0.3	0.3

MIU = million international units; KIU = thousand international units; g = grams; mg = milligrams. Supplementary levels of vitamins and trace elements should always be reviewed to ensure total levels do not exceed those set in local legislation.



