Amino Acid requirements for Mohair fibre growth

By Dr Mackie Hobson

Thursday, 1st November 2018

1. **NUTRITION**

Angora goats are the most efficient animals in producing fibre. The genotype determines the fibre producing capacity by the number density of the hair follicles.

Fibre production will compete with other tissue for nutrients and fibre growth will change as the nutrient supply changes.

The major limitations for fibre growth are

(1) The amount of amino acid (aa) available and

(2) the composition of the aa

A 40kg Angora goat will produce 79g of ruminal bacteria a day when Sulphur and Phosphorous do not limit bacterial growth. This amount of bacteria will meet all the aa requirements except those aa containing sulphur.

Amino acid imbalance and effect on fibre growth

An aa imbalance can be created by the addition of aa.

When excess aa is catabolised then all aa metabolism is increased and results in decreased feed intake and resulting decreased growth. Aa imbalance arises by adding 1 or 2 non limiting aa to a low protein diet.

Supplementation with the growth limiting aa enhances appetite.

The initial metabolic response to an aa imbalance is increased protein synthesis by the liver. This decreases the size of the pool of the limiting aa.

Increased aa is not stored but leads to an increased rate of aa metabolism. This results in the accentuation of the limiting aa.

Aa imbalance are thought to decrease keratin production

The effect of methionine on fibre growth

Keratin is rich in Cysteine and a little Methionine. 75% of methionine is converted to cysteine. Studies in demonstrated that supplementation with methionine stimulated mohair growth.

D-methionine can be converted to L-methionine so both promote fibre growth. Effect of methionine on fibre growth is dose related. However excess methionine may depress keratin supplementation due to increased aa metabolism.

Effect of Lysine on fibre growth

Lysine forms component of inner root sheath. Mohair diameter and clean yield was increased with methionine infusions but decreased by Lysine.Mohair length was however increased by the Lysine

An ideal ratio between methionine and lysine is required for optimal fibre growth

Reference/Extracts:

A review of Amino acid requirements for fibre growth of Sheep and angora goats

Qi, Lupton and Owens

Sheep and Goat research Journal 1994

Cobalt, Vit B12

By Mackie Hobson

Monday, 26th November 2018

1. **NUTRITION**

Cobalt (Co) deficiency in Angora goats is seldom seen largely due to the use of lucerne (good cobalt source) in many Angora goat production systems.

Cobalt is an essential constituent of vitamin B12. Vit B12 (cyanocobalamin) is manufactured in the rumen by the rumen microbes. If Co in diet is lower than 0.11ppm DM basis a deficiency will occur.

Deficiencies occur:

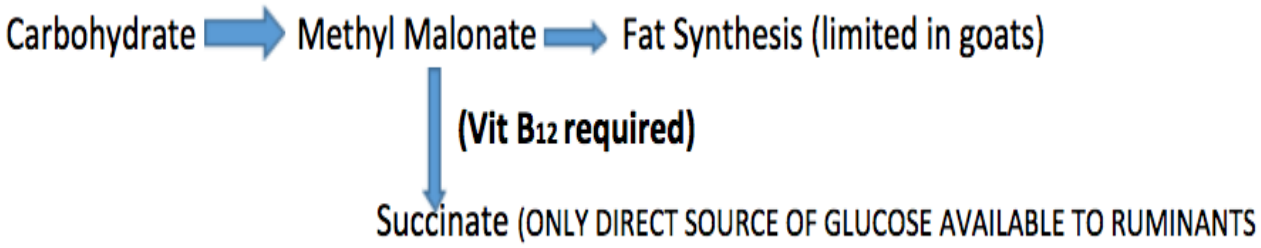
- In sandy soils in the Southern Cape and Humandorp.
- Grains and concentrate animal feeds are low in Co.
- Co deficiencies in the Graaff-Reinet/Murraysburg area

Legumes (Lucerne) are a good source of Co.

Vit B12 is stored in the liver. And can last 3-4 months.

Role of Vit B12

Propionate is produced in the rumen as the result of fermentation of carbohydrates which in turn is converted to methyl malonate. The critical step is the conversion of methyl malonate to succinate.



This can explain why Vit B12 injections to sick or goats with a poor functioning rumen often helps.

Deficiencies cause the rate of proprionate clearance from the blood to be poor which supresses the appetite. B12 injection stimulates the appetite overnight.

Vit B12 is also important for the production of **Methionine** which is essential for mohair growth. See Article on Methionine on the SAMGA website https://www.angoras.co.za/article/importance-of-methionine-in-angora-goats#260

Signs of Cobalt deficiency

Younger goats, especially weaned kids can be more susceptible to deficiencies.

- Reduced appetite (poorer growth)
- Reduced mohair growth
- Polioencephalomalacia (Thiamine deficiency) See article on the SAMGA website https://www.angoras.co.za/article/polioencephalomalacia-pem#217
- Fatty liver - See article of 'floppy kid syndrome' on the SAMGA website

https://www.angoras.co.za/article/floppy-kid-syndrome#257

Determining Vit B12 levels

- Liver samples

- Serum blood samples reflect cobalt intake when liver levels are low. The goats must not be starved before sampling

Treatment

Because a regular dietary intake of cobalt required oral dosing is not effective.

Mineralised anthelmintics contain about 2-3mg cobalt/10ml and are not a sufficient form of supplementation.

- Vit B12 injections will boosts for a least a month
- Feed Lucerne (Legume)

Ref: West, Bruere, Ridder (Vetlearn) Health , disease and Production

Copper Deficiency in Angora Goats

By Mackie Hobson

Monday, 26th November 2018

1. **NUTRITION**

COPPER DEFICIENCY IN ANGORA GOATS

An indicator of the mineral content of the karoo region would be the mineral content of tissues animals that consumed the plants of the area. Angora goats are mixed feeeders and both browse and graze. Springbok (intermediate mixed feeders) would have a similar vegetation nutritional intake to Angora goats.

Studies (J.B.J. van Ryssen and J.H. Hoon) have been conducted using Springbok in the karoo for checking copper (Cu), selenium (Se) and manganese (Mn). The tests showed springbok had high concentrations of hepatic copper and selenium in the Karoo region. These results corresponded well with soil characteristics indicative of the availability of mineral elements present. This study confirmed that in the Karoo region it is unlikely that Angora goats would suffer from a Cu or Se deficiencies, in agreement with the map published by Bath (1979) and supporting the Se map published by Van Ryssen (2001).

In one case on a farm between Middelburg and Richmond high soil pH was thought to have precipitated a deficiency in copper. A second case was diagnosed on leached shale/sandstone soils in the mountainous region between Graaff-Reinet and Pearston.

Normal blood Cu level is >0.80 ppm. Cu has a very narrow safety tolerance and risk. Dietary levels are ideal 5-15ppm. High levels of S ,Mo and Fe supress Cu absorption. CaCo3 and ZnSO4 also supress Cu absorption. Normal levels of Cu found in the liver 100-400 ppm with deficiencies when less than 25ppm.

Cu (Copper) is stored in the liver and new born kids have higher levels of Cu. Cu is important in bone, nerve production (hence ‘swayback’) hair production and the crimp formation.

Signs of deficiencies

- In animals with pigmented hair are the loss of colour which is not a factor in Angora goats. The formation of a ‘steely ’ fibre (wool/mohair) where the crimp is lost and the hair breaks easily.
- Deficiencies also reduce the effective immune system (decreased neutrophil production) and anaemia.
- Darcy dark-Class of 1994 (Edited by W.G.VanAlstine) diagnosed a Angora kid that was unable to stand and lay in sternal recumbency. The kids were on pasture being fed a concentrate diet. Caprine Arthritis-Encephalitis(CAE) and spinal abscesses, trauma and copper deficiency were the main differentials. Blood samples. Blood copper levels were 0.20 ppm. (Deficient is 0.04-0.40 ppm.) The cause of ataxia in this particular kid was presumed to be copper deficiency because of deficient blood copper levels and rapid response to adequate copper in the diet.

Treatment

Treatments that have been given

- Oral copper sulphate crystals dissolved in water (80mg) per day for 7 days. By the end of the treatment period, the kid's blood copper level was 1.06 ppm. (Darcy dark-Class of 1994 (Edited by W.G.Van Alstine)
- Injectable and oral supplement SEE SAMGA Website https://www.angoras.co.za/article/list-of-mineral-and-vitamin-supplements#171

Copper supplementation

Always ensure you have a Cu deficiency before you supplement Cu (check liver samples).

If Cu is deficient check Mo and S levels.

Excess copper can cause Enzooitic Icterus or 'Geelsiekte'. The fibre of sheep/game may turn an orange colour. **SEE COPPER TOXICITY** https://www.angoras.co.za/article/copper-toxicity-geelsiekte#214

Importance of METHIONINE in Angora goats

Tuesday, 6th February 2018

1. **NUTRITION**

The importance of specific nutrients affecting mohair production has not been established in Angora goats, apart from one study showing that mohair growth responded to parenteral supplementation with methionine.

What is methionine?

Methionine (Met) is an amino acid that is used in the biosynthesis of proteins. As an essential amino acid, methionine is not synthesized by Angora goats so they must ingest methionine or methionine-containing proteins. Together with cysteine, methionine is one of two sulfur-containing proteinogenic amino acids.

What is the role of methionine in mohair production?

The main function of methionine is to provide cysteine for mohair protein synthesis.

Where does the methionine come from?

Sulfur is an essential macro-element for ruminants and can only be obtained from feed. Most cystine in sheep and goats are absorbed from the gastro-intestinal tract, but the others are transformed by methionine.

What are some commercial products containing Methionine?

- Byboost Sheep & Goats (Bayer)
- Byboost Sheep & Goats+ Copper (Bayer)
- Complex +A&E for Sheep & Goats (Cipla/Ascendis)

Trials indicating the importance of Methionine (Met) in fibre production.

- Effects of zinc-methionine on performance of Angora goats. Supplementation of Zn-Met had positive effect on ADG and mohair growth. (Puchalaa,Sahlua, Davisa)
- Sulfur supplementation promotes the synthesis of ruminal microbial protein, as well as cellulose digestion, wool growth and improves wool quality (Reis & Schinckel, 1963; Bray & Hemsley, 1969; Qi et al.,1994a).
- Cashmere goat's dietary supplementation with ZnSO4 increases concentrations of total protein and methionine in plasma. These sulfur supplements can also increase the content of methionine, cysteine and sulfur in cashmere fibres. Furthermore, the supplements can accelerate cashmere growth with no significant effect on cashmere fineness (Yali Feng; Yu Sun; Hongwei Deng; Yuyan Cong)
- Sulfur accounts for 2.7% to 5.4% of wool, with finer fibres containing a higher amount of sulfur (Qi & Lupton, 1994 of ruminal microbial protein, as well as cellulose digestion, wool growth and improves wool quality (Reis & Schinckel, 1963; Bray & Hemsley, 1969; Qi et al.,1994a)

How much was added to diets in some of the trials?

- Supplementation of 1 g Zn-Met may have positive effect on ADG and mohair growth when diet contains about 20 ppm Zn. (Puchalaa, Sahlua, Davisa)
- Studies have shown that 0.23% was the optimal level of dietary sulfur in cashmere goats (Zhang & Cong, 2009; Cong et al., 2010).

- Supplemented with 0.63% $ZnSO_4.H_2O$ increased cashmere production. (Yali Feng; Yu Sun; Hongwei Deng; Yuyan Cong)

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References:

- Farzad Aabdollahzadeh, Arash Usefi. Preliminary Study on the factors Affecting growth and Properties of Mohair and Wool fibers. Bull. Env.Pharmacol. Life Sci., Vol 2 (12) November 2013: 117-121
- The nutritional control of the growth and properties of mohair and wool fibers: a comparative review. P J Reis and T Sahlu
- Effects of zinc-methionine on performance of Angora goats. RPuchalaaTSahluaJ.JDavisa
- Promotion of cashmere growth by sulfur supplements in cashmere goats1
- Yali Feng; Yu Sun; Hongwei Deng; Yuyan Cong ,Shenyang Agricultural University, Shenyang, China

Mineral and Vitamin supplementation effect on reproduction in Angora goats

Tuesday, 17th May 2016

Mineral and Vitamin supplementation effect on reproduction in Angora goats

There is no injection or dose of minerals and vitamins that can compensate for poor genetics and nutrition!

When walking into the co-op the Angora goat farmer may be faced with a minefield of mineral and vitamin products that may enhance reproduction. Are they needed?

A few examples:

To answer the question we need to look at trials of mineral and vitamin supplementation on Angora goats and their influence on reproduction.

What has been the effect on reproduction by supplementation of minerals and Vitamins in Angora goats in trials conducted?

1. A study by P.G.Marais was conducted under different environmental conditions. The trial with Merino and Dorper sheep, Boer goats and Angora goats and was repeated over four years. The stock was injected with a commercial **vitamin A** product 4 - 6 weeks prior to mating and again 4 - 6 weeks before lambing.

- It was evident that vitamin A supplementation had no effect on reproduction and production traits measured in this trial.

2. In trials by Grootfontein (Bacs, Snyman, Kilian) that supplementing **minerals and vitamins** every 6-8 weeks resulted in:

- Better density and motility of sperm
- No difference on teste traits or semen quality

3. Trials by mineral manufacturer (Multimin) to determine the effect on reproduction traits of Angora goats indicated that:
    - Pregnancy rates were improved by 0.7%
    - Kidding by 1.1%

- Weaning by 4.6 %

These results are significantly lower than found in Sheep. This may be due to the browsing nature of the goats. Browse plants usually have higher mineral concentrations than grass and so Angoras are generally less likely to have mineral deficiencies than sheep. Karroo bush also tends to remain green in non-drought years through the winter. Mineral deficiencies will become evident as goats become more intensively managed under commercial conditions.

4. Trials by J.H.Hoon were done where Angora goats were supplemented with Zn, Mn and Se in different areas in the karoo. From the results it would appear that:

- supplementation of Zn, Mn and Se by means of commercial product in had a positive effect on the reproduction of Angora ewes, although differences were relatively small at most localities.
- At some localities, however, no differences in production and reproduction traits could be observed and some of the results were even in favour of the control groups.
- From the mean blood Se values, it would appear that supplementation of goats specifically with Se, will not be of economic value to the producer.

It must be noted that Vit A levels will be determined by the veld condition and will be significantly lower in winter veld and in times of drought.

The only source of **Vit A and E** for the kid is via the colostrum as it does not cross the placenta and hence supplementation 4-6 weeks before kidding in times of drought or dry winter should be considered.

Most of a dose of Vit A is excreted within a week and the remainder stored in the liver. These liver reserves may last for 6 months in the Angora goat.

Are Mineral and Vitamin supplements required on Lucerne lands?

Mineral supplementation- Lucerne is high in Calcium and Sulpher which has a suppressive effect on **Selenium**, **Manganese** and **Zinc** levels.

- Supplementation of these minerals is generally advised 4-6 weeks before kidding or for any goats which graze lucerne for extended periods.
- Vitamin A is synthesized from carotene, which is present in green plants, so supplementation on lucern lands is not required (when just lucerne hay is fed then Vit A supplement is required)

Remember intake of pasture lucerne before mating can reduce ovulation rates by 20% by reducing the number of eggs shed per oestrus and reducing the proportion of eggs fertilised. The presence of leaf diseases, insect damage and severe moisture stress can all increase coumestans levels. Coumestan-induced infertility is generally considered as temporary. Ram semen appears not to be effected. Lucern hay has much lower levels of oestrogenic hormones and has not reportedly affected fertility.

The general advice is not to feed high risk Lucerne pasture to breeding Angora ewes in the 21 days prior to and during mating.

Remember many factors effect semen quality and quantity:

- Age
- Body weight and condition
- Testis size
- Season
- **Nutrition** (trial evidence)
- Sperm production, as well as total number of spermatozoa per ejaculate, can be improved diet by increasing energy and protein levels in the diet. Parker & Thwaites (1972), Braden et al. (1974), Foote (1978), Oldham et al. (1978), Alkass et al. (1982), Fernández et al. (2004) and Kheradmand et al. (2006)
- The proportion of live and dead spermatozoa is not affected by dietary treatment (Kheradmand et al., 2006).
- A protein deficiency will result in a reduced quality and sexual activity. (Okolski et al., 1971; Brown, 1994).
- A deficiency in protein could be responsible for depressed testicular growth and spermatogenesis of rams (Oldham et al., 1978)

Conclusion:

Good nutrition is critical. There are also however times when supplementation with minerals will make a significant difference to reproductive performance in Angora goats.

Mineral supplementation:

- Ewes and Rams prior to mating in times of dry veld and drought
- Ewes 4-6 weeks before kidding
- Rams and Ewes that have been grazing Lucerne

Vitamins A, E:

- Ewes and Rams before mating when the veld is dry or times of drought
- Ewes 4 weeks before kidding

No supplement can replace GOOD NUTRITION!

For those interested in the role of Minerals and Vitamins in reproduction

Zinc is essential in the production of many of the sex hormones, including testosterone and gonadotrophin releasing hormone It is also involved in ribonuclease activity and spermatozoa maturation during spermatogenesis and enhances sperm motility. Supplementation with zinc increases daily sperm production and reduces the proportion of abnormal spermatozoa.

Selenium (Se) and **Vitamin E** play a biological role as cell antioxidant by preventing damage by oxygen and various peroxides formed from fatty acids. In goats deficiencies can result in poor growth, lower reproduction rates due to reabsorption of fertilised eggs and suppression of sperm activity, early born, weak kids.

Vitamin A is involved during spermatogonia differentiation and spermatid adhesion regulation. An advanced deficiency of Vitamin A causes degeneration of the seminiferous tubules and testicular atrophy. Vitamin A and iodine deficiency impair the ram's libido.

Mn (Manganese) deficiencies are mainly characterised by delayed, very short and irregular oestrus, poor conception especially in young ewes, normally developed but still born kids,

Deficiency of **iodine**, **copper** and **manganese** levels in the diet can cause abortion and lowered reproductice performance.

Vitamin D is seldom considered deficient but Vit ADE could be supplemented in late pregnancy when the ewe loses large amounts of Ca and P to the foetus. Symptoms of a Vit D deficiency would be that of a Ca deficiency.

Vitamin E functions as an antioxidant in conjunction with selenium and marginal deficiencies can be significant. Effects of a combined vitamin E/ Selenium deficiency are well documented and include poor reproduction, poor growth and mortalities in kids. Deficiencies result in striated muscle damage in young animals (tongue affected and can't suckle), retained placentas. Vitamin E is therefore particularly important in areas with marginal or deficient levels of selenium. Stress situations are regarded as precipitating factors for Vit E deficiencies. Green feed has high levels of vitamin E so again may be deficient in winter veld.

Defficiencies are rare and consult your local veterinarian as he will know your area. Liver, blood and water samples can be taken as the best indicator of your animals' deficiencies. You need to check about 5 samples in a flock. It is worth checking samples in both winter and summer as this may differ on each farm

Minerals should not be over supplemented.

The range between safe and toxic levels is quite narrow for many of the minerals unlike vitamins which are easily excreted if in excess. Due to the complex interactions between minerals, excess consumption of one mineral may decrease absorption and/or utilisation of another. Caution should be observed particularly when the likely Copper status of the flock has not been established as Copper toxicity is not uncommon, although it is thought to be less of a problem in Angora goats as compared to sheep.

Common multi-mineral supplements available contain Manganese, Zinc, Selenium and Copper can be given at a low-end dose at 4-6 weeks before kidding where no specific mineral analysis has been done. However If there is any suspicion of undesired effects, this should be discontinued and analysis of tissue samples (or blood) carried out.

Dr Mackie Hobson

REFERENCE

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Grootfontein Agricultural Development Institute

Reproduction and trace minerals

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