

# The importance of **VITAMIN A** in ruminants



## The functions of Vitamin A – Role in health, immunity, and reproduction

Vitamin A is a fat-soluble vitamin that play an important role in the body of the ruminant. Vitamin A is necessary for support of growth, reproduction, and maintenance of body systems and epithelial cells of mammals. Vitamin A deficiency causes loss of vision, defects in bone growth, defects in reproduction, and defects in growth and differentiation of epithelial tissues, resulting in cornification and keratinization.<sup>1,2,5</sup> Keratinization of tissues result in loss of function and makes the tissues more susceptible to infection. The gastro-intestinal-, genital-, reproductive-, respiratory-, and urinary tracts may be affected. **Diarrhoea and pneumonia are typical secondary effects of vitamin A deficiency.**<sup>1</sup>

Vitamin A is required for normal disease resistance which is related to the maintenance of mucous membranes. **Vitamin A deficiency may therefore lead to an increased occurrence in eye infections.** Vitamin A deficiency causes a reduced immune response by affecting the production of antibodies.<sup>1</sup>

Vitamin A is important for reproduction. A deficiency will lead to failure of sperm production (spermatogenesis) in male animals and reduced conception, early embryonic death, or resorption of the fetus in female animals.<sup>1,2,4</sup> A deficiency of Vitamin A may also lead to a higher incidence of retained fetal membranes, the birth of dead, weak or blind calves.<sup>2</sup> In dairy cows, the economic benefits to proper vitamin supplementation include increased milk production, improved



reproduction, reduced prevalence of mastitis, reduced occurrence of milk fever, and fewer reproductive disorders.<sup>5</sup>

## Where is Vitamin A obtained from?

Carotenoids like beta-carotene, also called provitamin A are precursors for vitamin A in the body.<sup>1,3</sup> Carotenoids are synthesized by plants and algae and are involved in photosynthetic processes.<sup>3</sup> Carotenoids is therefore obtained from green forages that is grazed by ruminants. Carotenoids is converted to retinol (vitamin A) in the intestines, the liver and other organs.<sup>1,2,3</sup> It is absorbed in the small intestine and stored in the liver and fat tissues from where it is mobilized.<sup>1,2,3</sup>

Grass concentrations of B-carotene vary according to vegetation stage and decrease during drying and preservation.<sup>3</sup> Diets containing stored roughages such as wheat straw and corn silage are low in beta-carotene.<sup>1,3</sup>

**Deficiencies of Vitamin A therefore occur during the dry season, when high amounts of stored roughages like grass bales, wheat straw and silage is fed**

## Supplementing Vitamin A

The requirement of vitamin A will depend on the deficiency of the animal, the diet and the animals' production stage. Vitamin A can be supplemented through the diet by inclusion into supplementary feed, through oral solutions or injectable solutions. **The administration of injectable vitamin A is a direct way to supplement an accurate dosage of Vitamin A.** The supplementation of vitamin A is advised before and after the dry season, when a diet of stored roughages like grass bales, wheat straw or silage is fed and before periods of stress like breeding, calving or lambing and weaning.



### References:

1. FRYE, T.M., WILLIAMS, S.N. & GRAHAM, T.W. 1991. Vitamin deficiencies in cattle. Veterinary Clinics of North America: Food Animal Practice, Vol. 7(1).
2. HURLEY, W.L. & DOANE, R.M. 1989. Recent Developments in the Roles of Vitamins and Minerals in Reproduction. Journal of Dairy Science, 72:784-804
3. NOZIERE, P., GRAULET, B., LUCAS, MARTIN, B., GROLIER, P. & DOREAU, M. 2006. Carotenoids for ruminants: From forages to dairy products. Animal Feed Science and Technology 131, 418-450
4. OZIS-ALTINCEKIC, S.O., KOYUNCU, M. & DURU, S. 2022. Effects of flushing and various doses of -Carotene and vitamin E applications on the reproductive performance of ewes. South African Journal of Animal Science 2022, 52 (1).
5. WEISS, W.P. 1998. Requirements for Fat Soluble Vitamins for Dairy Cows: A Review. Journal of Dairy Science, 81:2493-2501