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Calf Note #36 – Vitamin E in colostrum

Introduction

Colostrum is an extremely important source of immunoglobulins for newborn calves. Much has been written about the importance of proper colostrum feeding and management to the health of the neonate.

Less well appreciated, however, is the role of colostrum as *a source of nutrients*. Colostrum is the first feed that a calf will consume. It contains large amounts of energy, proteins, vitamins, and minerals that are required by the calf for normal metabolic functions, growth, and establishment of the immune system. The importance of these nutrients should not be underestimated. As the first feed that a calf will consume, the nutrient content of colostrum will determine the nutrients available to the calf to establish adapt to the environment outside the cow. In addition, the management of the cow during the dry period may affect the nutrient quality of colostrum that is available to the calf.

An important example of this variability is vitamin E.

Vitamin E in colostrum

Vitamin E is an important component of maternal colostrum. Because α -tocopherol does not cross the placenta in appreciable amounts, the calf is born with very limited stores of vitamin E.

Instead, the calf is dependent upon colostrum intake to

obtain vitamin E after birth. Colostrum normally contains much more vitamin E than milk and is intended to be the first source of vitamin E for the calf. However, vitamin E content of colostrum is usually low unless the cow is provided supplemental dietary vitamin E (Figure 1).

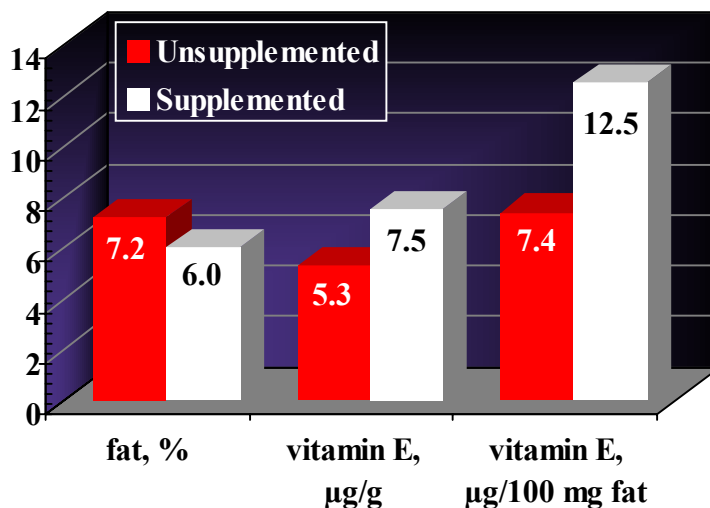


Figure 1. Composition of colostrum in dairy cows supplemented with 0 or 1,000 IU/d of vitamin E. From Weiss et al., 1990.

One method of increasing the vitamin E content of colostrum is by supplementing the dry cow diet with vitamin E. Hidiroglou et al. (1993) reported that supplementing diets of gilts with 22, 44, or 88 IU/kg of diet increased gilt plasma and milk α -tocopherol, but did not alter colostrum α -tocopherol.

Other work reported increased concentration of a-tocopherol in colostrum from cows supplemented with a-tocopherol (Weiss et al., 1990, 1992, 1994). Nemec et al. (1994) reported that supplemental vitamin E did not affect absorption of colostrum IgG in neonatal pigs but improved the development of cellular immunity. Most researchers recommend that dry cow diets should be supplemented with vitamin E to reduce the chances of periparturient diseases (retained placenta, metritis, ketosis, etc.). In addition to providing immunological support to the cow, this supplemental vitamin E is important to the calf - through colostrum.

Vitamin E supplementation of colostrum

If cows are not properly supplemented with vitamin E during the dry period, colostrum may contain inadequate amounts of the vitamin to support optimal development of the immune system. A trial was conducted (Quigley and Bernard, 1995) to determine if adding vitamin E to maternal colostrum would increase the amount of

vitamin E in blood of calves at 12 and 24 hours of age. Colostrum was collected from cows and had a mean vitamin E concentration of 2.9 µg/ml. Calves were fed 2 liters of colostrum in each of two feedings as soon as possible after birth and 12 hours later. To each

Item	Vitamin E, IU added to colostrum		
	0	100	1000
Serum a-tocopherol, µg/ml			
12 hours*	0.17	0.56	2.12
24 hours*	0.38	0.84	2.02
BW gain, g/d, 0-35 d	322	328	351
Scours scores, 0-35 d*	1.4	1.4	1.4
DM intake, g/d, 0-35 d	809	828	861

*Significant linear effect of added vitamin E ($P < 0.01$).

**Scours scored on scale of 1 = normal to 4 = severe scours.

feeding of colostrum, 0, 100, or 1000 IU of vitamin E was added. Serum a-tocopherol at 12 and 24 hours was linearly increased when calves were fed supplemental vitamin E. From the data in this study, it appears possible to maximize absorption of vitamin E in calves by adding 1000 IU to the first feeding of colostrum only - the second addition of vitamin E at 12 hours did not increase serum a-tocopherol in calves on this study. Thus, it appears that supplementing calves with vitamin E is a means for providing this important to the neonate.

In this relatively small study (45 calves), there was no effect on growth rates, intakes, or body weight gains of calves fed supplemental vitamin E. However, other researchers have reported that added vitamin E improves immune performance and helps reduce the incidence and severity of disease in young animals.

Conclusions

Colostrum is an important source of nutrients for young calves. Early feeding of an adequate quantity of high quality colostrum and/or colostrum supplement is critical to ensuring the health of calves. Dry cows should be supplemented with 1,000 IU per day of vitamin E supplementation to maximize colostrum a-tocopherol and minimize incidence of postpartum metabolic disease.

References

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