Response of newborn calves to injectable vitamins A, D and E

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Introduction

- Calves are born deficient in fat-soluble vitamins and depend upon colostrum and milk to provide adequate vitamins E and A. Sun exposure is required for adequate systemic vitamin D production since vitamin D content of colostrum and milk is typically very low.
- In early spring, gestating beef cows consuming stored roughages that contain low levels of fat-soluble vitamins, typically supply lower levels of fat-soluble vitamins E and A in colostrum and milk compared to gestating cows grazing lush pasture (Hidiroglou et al., 1973). While mineral/vitamin supplements may contain vitamin A and vitamin D, levels of vitamin E are typically very low (0 to 220 I.U. vitamin E per kg mineral).
- Gestating dairy cows are typically supplemented with higher levels of fat-soluble vitamins pre-partum compared to beef cows, especially vitamin E.
- Newborn calves deficient in fat-soluble vitamins can exhibit weak-calf syndrome, muscle weakness and diarrhea after birth (Waldner, 2007; Radostits, 1991).
- Injecting fat-soluble vitamins at birth is a means to enhance fat-soluble vitamin status during the first few weeks after birth (Krueger, et al. 2014).
- Two experiments were conducted to measure effectiveness of VITAL E®-Newborn (Stuart Products, Inc.) on fat-soluble vitamin status in newborn beef and dairy calves.

One mL of VITAL E-Newborn contains
500 I.U vitamin E (d-alpha-tocopherol),
50,000 I.U. vitamin A (retinyl-palmitate), and
50,000 I.U. vitamin D (cholecalciferol).

Methods

In experiment 1, randomly selected spring-born Angus beef calves (n= 4) were not injected and others (n= 4) were injected S.Q. with 5 mL VITAL E-Newborn. Serum samples were obtained initially and days 1, 2, and 7 post-injection and analyzed for α-tocopherol, total vitamin A (retinol plus retinyl-palmitate), and 25-OH-D3.

In experiment 2, newborn Holstein dairy calves (n= 4) were not injected and others (n=7) were injected S.Q. with 5 mL VITAL E-Newborn. Serum samples were taken 62 h post-injection and analyzed for α-tocopherol, retinol and 25-OH-D3.

Serum was analyzed for Vitamin E and vitamin A by Veterinary Diagnostic Laboratory, Iowa State University, Ames, and for 25-OH-D3 by Heartland Assays, Ames, Iowa. Paired t-test was used to determine differences between treatments.

All treated calves were injected S.Q. with 5 mL VITAL E-Newborn to supply each calf:

2,500 I.U. vitamin E (d-α-tocopherol)
250,000 I.U. vitamin A (retinyl palmitate)
250,000 I.U. vitamin D (cholecalciferol)

Discussion

- Beef and dairy calves responded similarly to the injection.
- Increase in vitamin A status was mainly due to increase in retinyl palmitate levels. Retinol did not increase significantly.
- Vitamin D status continued to increase 7-days post-injection in beef calves.
- Vitamin E status was highest 24 hours post-injection in beef calves.

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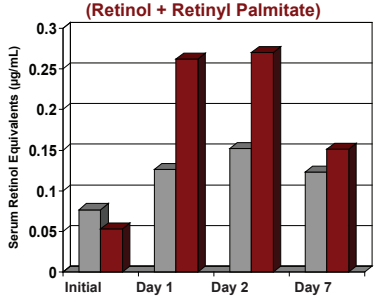
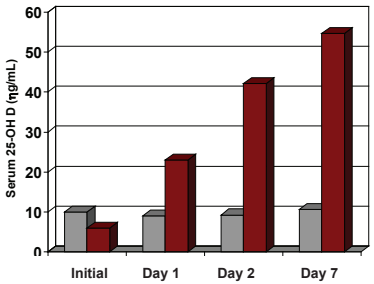
Results - Beef Calves

Serum Vitamin A Status-Beef Calves
(Retinol + Retinyl Palmitate)



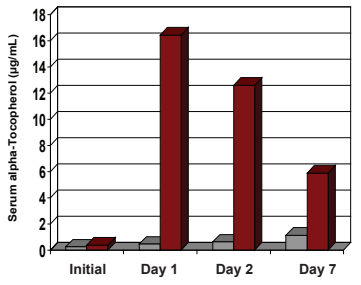
All post-injection sample days different from control (P<0.01)

Serum Vitamin D Status - Beef Calves



All post-injection sample days different from control (P<0.001)

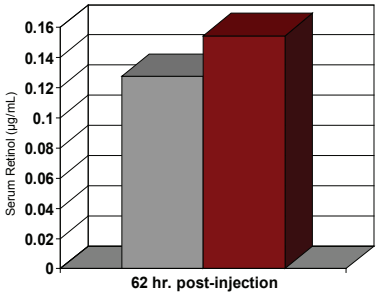
Serum Vitamin E Status - Beef Calves



All post-injection sample days different from control (P<0.001)

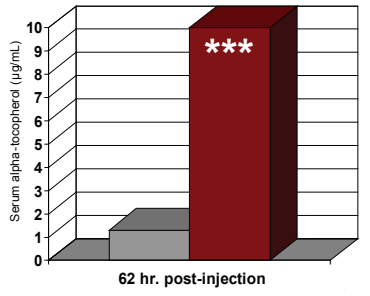
Results - Dairy Calves

Serum Retinol Status - Dairy Calves



Serum Vitamin D Status - Dairy Calves

Serum Vitamin E Status - Dairy Calves



Literature Cited

Hidiroglou, M. et al. 1973. Changes in plasma and milk tocopherol levels in beef cattle turned out to pasture. Anim. Production. 16: 179-183.

Krueger, L. et al. 2014. Effects of d-alpha-tocopherol and energy on growth and health of preruminant dairy calves. J. Dairy Sci. 97:3715-3727.

Radostits, O. et. al. 1991. Fatal non-responsive diarrhea in beef calves 6 to 8 weeks of age. Proc. Am. Assoc. Bovine. Prac. p 101-109.

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Conclusion

- Injecting newborn calves with a bioavailable source of fat-soluble vitamins is an excellent method to assure that newborn beef and dairy calves have adequate levels of these critically important vitamins after birth.

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