Effects of feeding a vitamin and mineral supplement and (or) an energy supplement on the abundance of SLC7A5 transporter in beef heifer placentomes at d 83 of gestation

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Background and Objective

A study was conducted in which 35 crossbred Angus heifers (BW = 359.5 ± 7.1 kg) were randomly assigned to one of four treatments (n = 8 or 9/group) in a 2 × 2 factorial arrangement with main effects of vitamin and mineral (**NoVTM** or **VTM**) and energy (**NoNRG** or **NRG**) supplements. The VTM treatment was initiated 71 to 148 d before artificial insemination (**AI**) to target 113 g•head^{-1}•d^{-1}of a commercial mineral and vitamin product (Purina® Wind & Rain Storm All-Season 7.5 Complete, Land O'Lakes, Inc., Arden Hills, MN). The NRG treatment was initiated at AI and consisted of a blend of cracked corn and Purina® Accuration Range Supplement 33, with target gains of 0.79 kg/d for NRG and 0.28 kg/d for NoNRG heifers. Heifers were ovariohysterectomized at d 83 of gestation.

Preliminary data (Menezes et al., 2020 – abstract #218) show an increase in neutral amino acids (**AA**) concentration in allantoic fluid from VTM heifers, suggesting effects on the mechanisms of AA uptake and balance between the maternal circulation and fetal fluid compartments.

Therefore, objective was to evaluate effects of VTM and (or) NRG supplements on the abundance of the neutral AA transporter SLC7A5 in heifer placentomes at d 83 of gestation.

Materials and Methods

Placentome cross sections (5 µm) were mounted onto glass slides, deparaffinized, and stained for SLC7A5. Fluorescent images of tissue areas including fetal membranes, caruncles, endometrial epithelium, superficial glands, deep glands, and myometrium were obtained with the Zeiss Axioimager M2 microscope using MosaiX module of Zeiss AxioVision software (Carl Zeiss Microscopy, LLC; 1 Zeiss Dr., Thornwood, NY). MosaiX images were analyzed using ImagePro Premiere software (Media Cybernetics, Silver Spring, MD, USA) for relative intensity of fluorescence within the areas of interest as an indicator of transporter abundance.

Results

Table 1 Abundance of the neutral amino acid transporter SLC7A5 in placentome from heifers at d 83 of gestation as influenced by vitamin and mineral (VTM) and (or) energy (NRG) supplementation.

	NoVTM		VTM			P-values		
Item	NoNRG	NRG	NoNRG	NRG	SEM	VTM	NRG	VTM × NRG
Fetal Membranes	33.9	41.9	36.0	28.8	6.4	0.38	0.95	0.22
Caruncles	27.9	24.7	23.2	28.8	5.5	0.07	0.12	0.33
End. Epithelium	30.3	40.0	27.3	21.9	5.3	0.05	0.67	0.15
Superficial Glands	36.9	42.7	30.2	25.5	3.9	<0.01	0.89	0.17
Deep Glands	34.9^{ab}	42.5^{a}	29.9^{bc}	20.5^{c}	4.4	<0.01	0.82	0.05
Myometrium	22.9	21.9	25.1	18.9	5.3	0.92	0.48	0.61

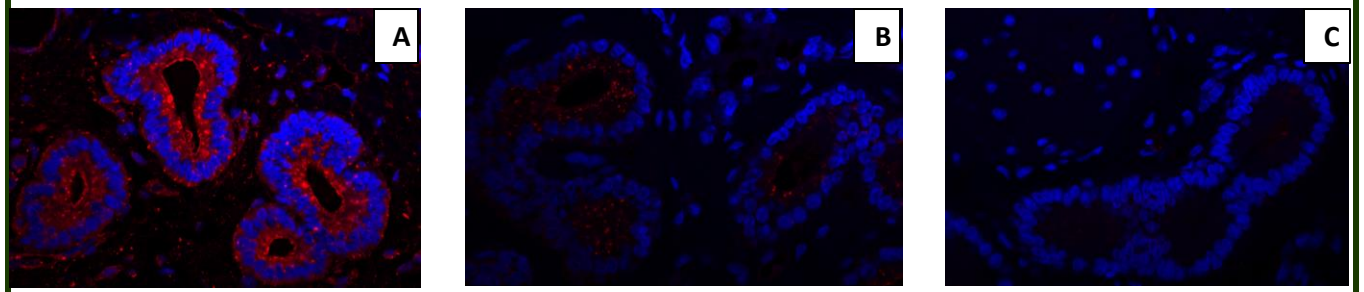

Figure 1 Abundance of SLC7A5 in deep glands of NoVTM-NRG (A), VTM-NoNRG (B), and VTM-NRG (C) heifers

Conclusion

We hypothesize that transporter efficiency may be reduced in NoVTM heifers, with greater transporter abundance being a mechanism of compensation to supply AA to the fetus. Together, these data help to further elucidate mechanisms of AA uptake and balance between the maternal and fetal compartments.

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