Effect of agronomic selenium biofortified alfalfa hay on selenium status and glutathione peroxidase activity in transition dairy cows and their calves

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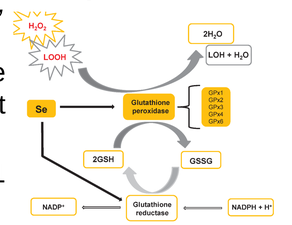
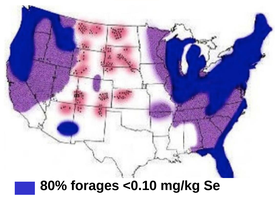
Background

- Early postpartum high-producing cows → metabolic stress, oxidative stress, and immune suppression *(Abuelo et al., 2015).*
- Se supplementation → ⇧ glutathione peroxidase (**GPx**) activity → ⇧ antioxidant capacity and immune system.
- Oregon → low Se in forages (<0.1 mg/kg) → cows in OR deficient.
- Inorganic Se toxic → supplementation in cattle ≤0.3 mg/kg (ppm) DM; ≤3 mg Se/head
- Organic Se (yeast or biofortified forages) non-toxic → Efficacy Se biofortification proven in beef cows fed 2.5% BW of alfalfa *(Wallace et al., 2017)* and 25% of alfalfa/timothy silage in dairy cows *(Seboussi et al., 2016).*
- High producing dairy cows → specialized ration, diversified composition of forages and a relatively high proportion of concentrates → balanced ration compared to beef cows.

Ellwanger et al. 2016





National Research Council, 1983

Objectives & Hypothesis

Objectives:

Effect of feeding 1 kg/100 kg of BW of Se-biofortified alfalfa to pregnant dairy cows and early post-partum on:

- Se level in whole blood, liver, milk, and colostrum in Jerseys and Holsteins primiparous cows and blood in their calves
- transfer of Se from cows into their calves
- antioxidant status in cows and calves (i.e., GPx activity)

Hypothesis:

Supplementation of dairy cows with a relatively low amount of agronomic Se biofortified hay during the dry period and early post-partum is an effective means to improve Se status in cows and their calves and improve their antioxidant status.

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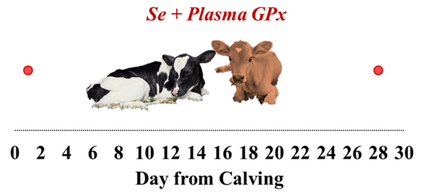
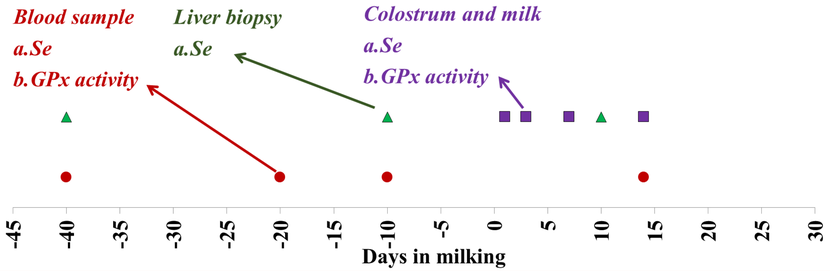
Experimental design

n =9 – Control
(4 Holstein+ 5 Jersey)

n =9 –Selenium
(4 Holstein+ 5 Jersey)





Materials and methods

- Primiparous cows received 1 kg DM/100 kg BW :
  - ❑ TRT = Alfalfa containing 3.2 mg Se/kg DM
  - ❑ CTR = Alfalfa containing 0.4 mg Se/kg DM
  - ❑ TMR→ Corn Silage, grass silage, grass hay
  - ❑ Calan gate→ individual DMI
- Cayman glutathione peroxidase kit→ GPx activity
- Se→ ICP-MS at W.M. Keck Collaboratory for Plasma Spectrometry (OSU)

Results

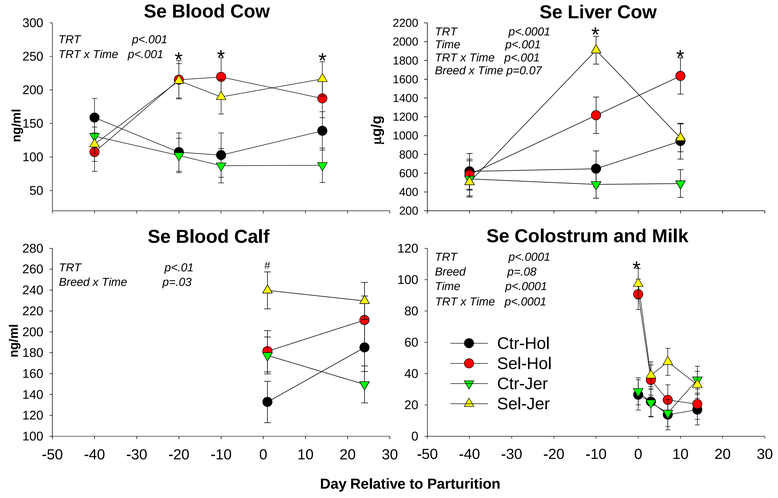


Figure 1. TRT= treatment effect, T=Time, TRT×T=treatment × time effect, Breed= breed effect. **Denotes difference between treatments (P<0.05) when TRT x Time P<0.05. #Denotes difference between treatments (P<0.05) when Breed x Time P<0.05*

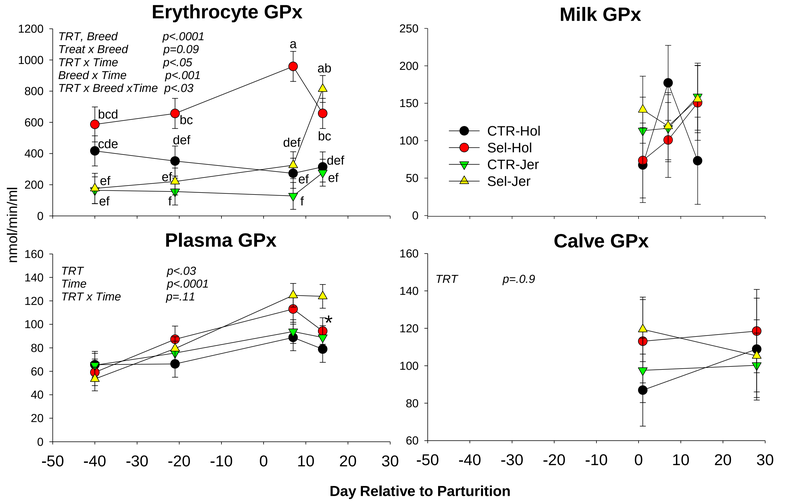


Figure 2. TRT= treatment effect, T=Time, TRT×T=treatment × time effect, Breed= breed effect. *Letters denote differences between treatments (P<0.05) when TRT x Breed x Time P<0.05.* **Denotes difference between treatments (P<0.05) when TRT x Time P<0.05*

Conclusions/Implications

- Feeding with 1 kg/100 kg of BW of Se biofortified hay→ efficient way to improve Se status in blood, liver, and colostrum samples in cows→ improved antioxidant activity of blood → improve the Se status in calves early post-birth
- Milk enrichment of Se only during first week post-partum and not effect on GPx activity
- Some difference in the response between Jersey and Holstein
- Se biofortified hay → efficacious strategy for dairy farmers to improve Se and antioxidant status in cows.

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