

**AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
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TITLE: Selenium fertilized forage as an organic selenium supplement for dairy cattle: Impact on health and milk quality

RESEARCH LEADER: Killefer/Bionaz

COOPERATORS:

SUMMARY: This study seeks to investigate the use of selenium fertilized alfalfa hay as an organic selenium source for dairy cattle. A group of 6 primiparous dairy cows were fed with 1 kg DM/100 Kg BW of alfalfa hay containing 3.26 ppm of Se (as DM) while a control group was fed with the same amount of alfalfa containing 0.4 ppm of Se (non-fertilized alfalfa hay). The cows receiving the alfalfa hay enriched with Se produced 2 kg/d more milk compared to control and had 1.7-fold increase of Se in the milk and 2-fold increase of Se in whole blood. No differences on animal health were detected.

OBJECTIVES: Determine the effect of feeding hay from Se-fertilized fields on whole blood and milk Se levels and glutathione peroxidase (Se dependent enzyme) activity of dairy cattle compared to unsupplemented cattle

PROCEDURES: We used 12 primiparous cows (6 Holsteins and 6 Jerseys) fed ad libitum with a TMR based on grass silage (0.14 mg Se/kg DM). Cows were homogeneously divided in two groups to be supplemented from 40 days prior parturition to 2 weeks post-partum with alfalfa hay in reason of 1 kg/100 kg of BW mixed with the TMR. TRT group was supplemented with alfalfa enriched with Se (3.2 mg/kg DM) and the CTR group received alfalfa with low Se (0.4 mg/kg DM). Heifers were monitored daily for health status, dry matter intake, activity, and milk yield and weekly for body weight and body condition score. Carrageenan skin test was performed throughout the experiment. Whole blood was used to determine Se and other trace minerals by ICP-MS. White blood cells count and blood hematocrit were assessed. Phagocytosis and leukocytes differential were measured by flow cytometer. Milk yield and components were measured at each milking using Afimilk system and samples were collected to assess milk composition by DHIA lab. Level of Se, Zn, Cu, and Co were measured in milk by ICP-MS. Health issues were recorded. Data were analyzed by GLIMMIX of SAS with the fixed effect of treatment, breed, time and their interactions and cows as random effect.

SIGNIFICANT ACCOMPLISHMENTS: After 4 weeks into the trial, Se concentration in whole blood increased 2-fold ($P < 0.0001$) in TRT vs. CTR (210 vs. 106 ng/mL) that results in higher ($P < 0.01$) Se in milk (42 vs. 25 ng/mL). Milk yield was higher in TRT vs. CTR (20.2 vs. 18.2 kg/d, $P < 0.05$). No other differences were detected. Our results point out that providing dairy heifers with a relative low amount of Se-enriched hay is an effective way to increase Se in blood and

milk. Se supplementation improved milk yield but had not effect on the function of the immune system in primiparous cows during the transition period. Glutathione peroxidase in milk has not been assessed yet, but we plan to perform it in the near future.

BENEFITS & IMPACT: Our data indicated that it is possible to increase the Se in whole blood and milk by feeding a relatively low amount of alfalfa hay enriched with Se by fertilization. Higher Se in cows increased milk yield.

ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM: Agriculture Research Foundation for the project titled “Effect of Selenium-enriched hay fed to dairy cows during the dry period on the immunity of calves” and USDA Animal Health and Disease proposal# ORE00174 titled “Liver activity and mammary macrophages in transition dairy cows fed selenium-enriched hay” both with Dr. Gerd Bobe as collaborator.

FUTURE FUNDING POSSIBILITIES:

Foundational USDA AFRI NIFA