AGRICULTURAL RESEARCH FOUNDATION  
INTERIM REPORT  
FUNDING CYCLE 2015 – 2017

TITLE: Impacts of Stocking Density on Welfare & Productivity of Replacement Beef Heifers

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COOPERATORS: None

SUMMARY: Stocking density is one example of management that may impact welfare and reproductive efficiency of beef females in Oregon cows-calf systems. In spring-calving herds, replacement heifers are weaned late in the fall and exposed to their first breeding season the following spring/summer. Therefore, these heifers are often developed in drylot systems during the winter/early spring to facilitate management and supply of feed and water. However, data from our research station indicates that in years when heifers are developed in drylots (stocking density of 150 ft²/heifer), they have greater growth rate (1.65 vs. 1.25 lbs/day) but reduced puberty attainment (15% vs. 50% of pubertal heifers by the beginning of their first breeding season) compared to years when heifers are maintained on a pasture (stocking density of 10,000 ft²/heifer). It is important to know that heifers are maintained on pastures previously harvested for hay and with no forage available for grazing. Hence, nutritional management of heifers developed in drylot or pasture during the winter/early spring in our research station is similar across years. These outcomes suggest that developing beef heifers in confined areas is detrimental to their reproductive development and future performance, although research with heifers concurrently reared in different stocking densities is warranted. Given that rearing cattle in confined areas is known to stimulate stress reactions, while acute and chronic stress directly impairs reproductive function in beef cattle, we hypothesized that elevated stocking density (less area available per animal) impairs reproductive development and welfare of beef heifers.

Supporting our hypothesis, research from Montana reported that heifers developed on drylot (120 ft²/heifer) gained more weight but had increased heart rate and rested less (indicators of increased stress) compared with contemporary heifers reared on native range (80,000 ft²/heifer), corroborating that rearing heifers in confined spaces is indeed detrimental to their welfare.

OBJECTIVES: Compare growth, behavior, welfare/stress-related responses, and reproductive performance of beef heifers reared on high-stocking density (drylot; 150 ft²/heifer) or low-stocking density (pasture; 10,000 ft²/heifer) from weaning until their first breeding season, and receiving the same nutritional and general management

PROCEDURES: Sixty Angus × Hereford heifer calves were weaned in September 2015 (day 0) and assigned to this experiment. Heifers were stratified by age and weaning body weight and randomly allocated to: 1) high-stocking density (150 ft²/heifer), or 2) low stocking density (10,000 ft²/heifer). Treatments were designed to represent average stocking densities observed in commercial Oregon cow-calf systems. Heifers in the low-stocking density group are being
maintained on 3 pastures (10 heifers/pasture) with no forage available for grazing from weaning (day 0; September 2015) until the end of their first breeding season (day 300; May 2016). Heifers in the high-stocking density group are being maintained on 3 drylots (10 heifers/drylot) during the same period. Heifers from both treatments are receiving the same diet during the experiment (day 0 to 300), which consists of meadow foxtail hay and supplemental alfalfa hay.

Heifer body weight is being recorded while blood samples are being collected weekly (Wednesdays) to determine onset of puberty using progesterone concentrations. These blood samples will also be analyzed for concentrations of hormones and metabolites associated with nutrient metabolism/growth (such as glucose, insulin, and somatomedin), as well as stress and welfare responses (cortisol, inflammatory proteins, serotonin, and endorphin). Moreover, all heifers were fitted with a pedometer (Omron HJ-321 Tri-Axis Pedometer) on day 0 to assess daily distance traveled by each heifer during the experiment.

From day 241 to 300, each treatment group will be exposed to 2 mature Angus bulls (1:15 bull:heifer ratio), and bulls will be rotated weekly between treatments to account for potential bull effects and prevent stocking density effects on bull performance. Heifer pregnancy status will be verified by detecting a fetus with transrectal ultrasonography 30 d after the end of the experiment. Date of conception will be estimated retrospectively by subtracting gestation length (285 d) from the calving date.

**SIGNIFICANT ACCOMPLISHMENTS TO DATE:** This experiment is currently being conducted at the EOARC Burns. As expected, heifers in the high-stocking density group are gaining more weight and walking less during the day compared with low-stocking density cohorts. This research will be completed in May 2016, and is serving as M.Sc. thesis of Kelsey Schubach (Animal and Rangeland Sciences).

**ADDITIONAL FUNDING RECEIVED DURING PROJECT TERM:** None

**FUTURE FUNDING POSSIBILITIES:** Depending on the outcomes, this research may have implication on animal welfare, health, and reproduction, and serve as preliminary data for larger funding opportunities including USDA-NIFA (AFRI Foundational Program).