

**AGRICULTURAL RESEARCH FOUNDATION
FINAL REPORT
FUNDING CYCLE 2015 – 2017**

TITLE: Impacts of Stocking Density on Welfare and 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.

OBJECTIVES: Compare growth, welfare/stress-related responses, and puberty attainment 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 October 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 (**HD**; 150 ft²/heifer), or 2) low stocking density (**LD**; 10,000 ft²/heifer). Treatments were designed to represent average stocking densities observed in commercial Oregon cow-calf systems. Heifers in the LD group were maintained on 3 pastures (10 heifers/pasture) with no forage available for grazing from weaning (day 0; October 2015) until their first breeding season (day 182; April 2016). Heifers in the HD group were maintained on 3 drylots (10 heifers/drylot) during the same period. Heifers from both treatments

received the same diet during the experiment (day 0 to 182), which consisted of meadow foxtail hay and supplemental alfalfa hay.

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. Heifer body weight was recorded while blood samples were collected weekly (Wednesdays) to determine onset of puberty using progesterone concentrations. Hair from the tail switch was collected during the experiment and analyzed for cortisol concentrations to evaluate chronic stress responses.

SIGNIFICANT ACCOMPLISHMENTS:

Heifers from LD had more steps/week compared with HD (Table 1). No treatment effects were detected for heifer growth (Table 1).

Table 1. Heifer activity and growth parameters

| Item | LD | HD | P = |
|---|--------|-------|--------|
| <i>Activity</i> | | | |
| Steps/week ² | 19,709 | 3,148 | < 0.01 |
| <i>Growth parameters</i> | | | |
| Initial body weight on day 0 (lbs) | 464 | 466 | 0.82 |
| Final body weight on day 182 (lbs) | 783 | 787 | 0.84 |
| Daily body weight gain (lbs/day) ³ | 1.71 | 1.73 | 0.82 |

Hair cortisol concentrations were greater in HD compared with LD heifers beginning on day 98 (Figure 1). Heifers from HD experienced delayed puberty attainment and had less proportion of pubertal heifers on day 182 compared with LD (Figure 2).

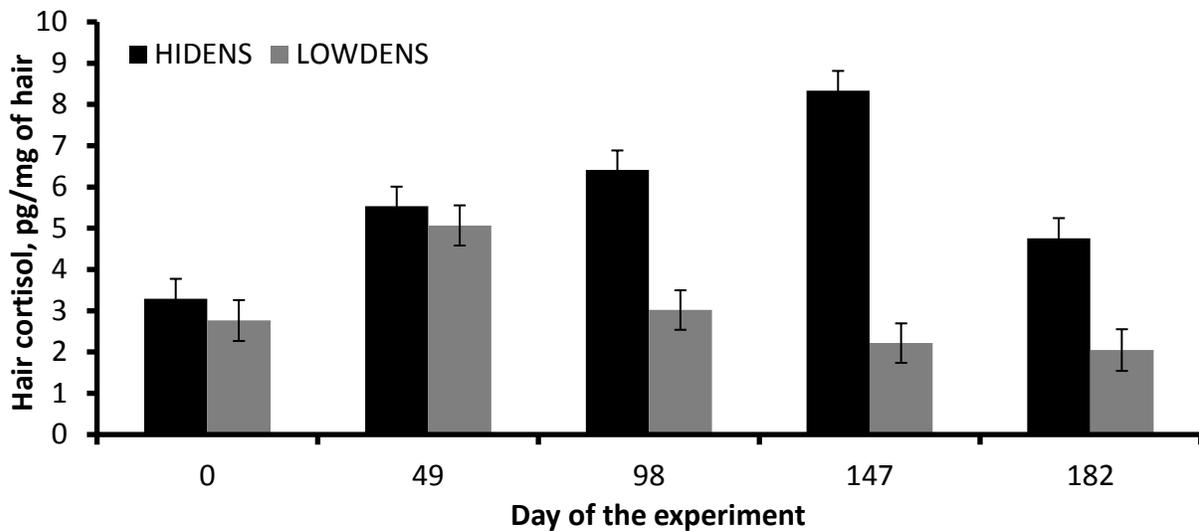


Figure 1. Hair cortisol concentrations results

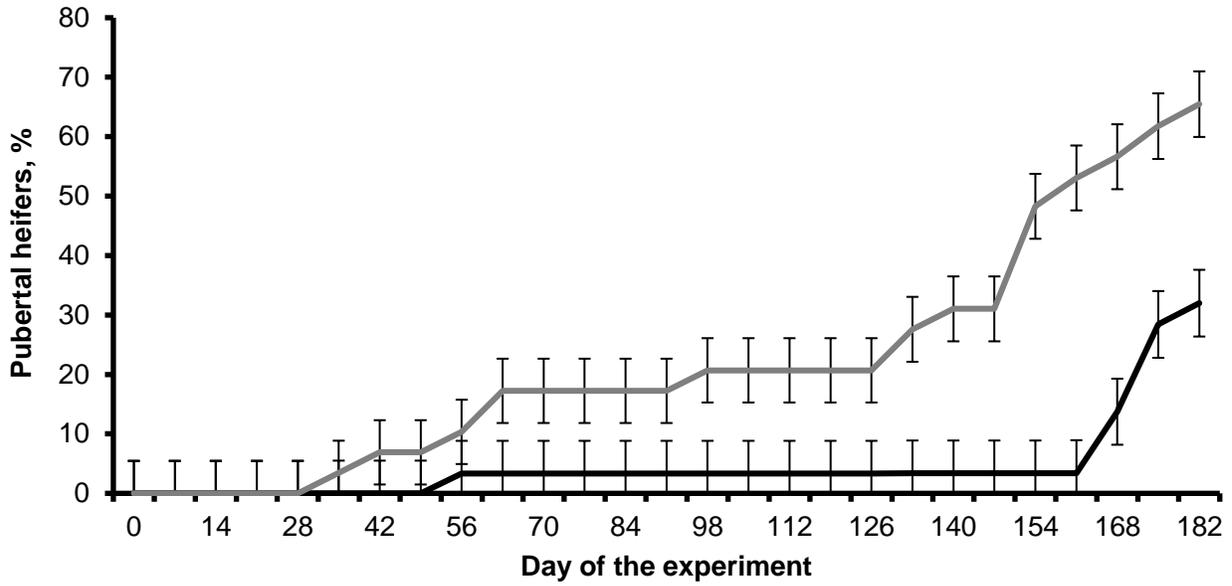


Figure 2. Puberty attainment results

BENEFITS & IMPACT: Rearing replacement beef heifers in drylots with high stocking density impacted stress-related and physiological responses, and delayed puberty attainment compared with rearing heifers in pastures with low stocking density. Moreover, these outcomes were independent of heifer nutritional status and growth rate, but were associated with reduced physical activity and increased chronic stress caused by high stocking density. Therefore, stocking density should be considered in heifer development programs to optimize reproductive and overall efficiency of cow-calf operations.

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