

Effect of Estrus Activity when Evaluating Feed Efficiency in Heifers

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Summary and Implications

Estrus activity in virgin heifers tends to affect the outcome in measurements observed during performance and feed utilization tests. Prior to any testing it is prudent to identify those females that have shown estrus activity consistently and those which have not, then evaluate animals for feed efficiency grouped by stage of sexual maturity.

Introduction

Feed efficiency measurements taken on individual heifers or bulls for the purpose of selection of replacement breeding stock tend to be taken when these animals are 200 to 400 days of age. During this time frame, many of these animals undergo puberty and the subsequent changes advancing sexual maturity initiates; however they do not all mature at the same rate. These changes tend to affect carcass characteristics due to the anabolic nature of the hormones associated with this stage of life, but also there are behavior changes that could have some effect on feed use. Estrus activity of heifers in the feedyard is discouraged and the use of additives such as melengestrol acetate (MGA) which suppresses estrus activity tends to improve feed conversion and weight gain in large pen studies. With this in mind along with the fact that puberty onset is variable within a weaning contemporary group, there was some concern that evaluation of feed efficiency may be

confounded by the onset of puberty and estrus activity when evaluating heifers.

Material and Methods

Angus and Sim-Angus virgin heifers from six weaning contemporary groups, from five different seedstock producers totaling 169 head were individually monitored in terms of feed intake and estrus activity at the Werner Beef Center at Diagonal Iowa during the late fall through early spring. These animals were approximately 230 to 380 days of age while on test with a test period of 70 days after an acclimation period of about one week. A Feed Intake Monitoring System (FIMS) capable of collecting individual feed intakes was used to record daily feed intakes and estrus activity was observed visually with the aid of heat detection tail head patches. Standing "heats" were recorded while on test, but no previous knowledge of estrus activity was available. The ration fed was balanced using the BRaNDS software containing approximately 0.54 Mcal/lb of NEg targeting two pounds of daily gain. The ration was composed of corn silage, corn distillers grain, grass hay, dry corn and a vitamin mineral supplement. Cattle were weighed two consecutive days going on and coming off test. A carcass ultrasound was performed during the trial to measure 12th rib fat depth. Residual gain, residual feed intake and adjusted feed to gain (following Beef Improvement Federation guidelines) were calculated when the trial data was collected and compiled. A quasi index was also calculated labeled "TonIndex" which follows the format of Equation 1 below. This index takes the market value of beef produced by a ton of ration dry matter consumed by the animal and subtracts the cost of producing this beef. A mixed model procedure was done using SAS on the data collected.

Equation 1. TonIndex

$$[(rDM / AdjF:G) \times MV] - \$160 - [(rDM / AdjF:G)/ADG] \times YC$$

rDM=1 ton of Ration Dry Matter = \$160

AdjF:G=Adjusted Feed to Gain conversion outlined by Beef Improvement Federation Guidelines

YC=Daily yardage charge = \$0.40 per head per day

MV=Market Value of beef produced = \$1.30 per pound

Results

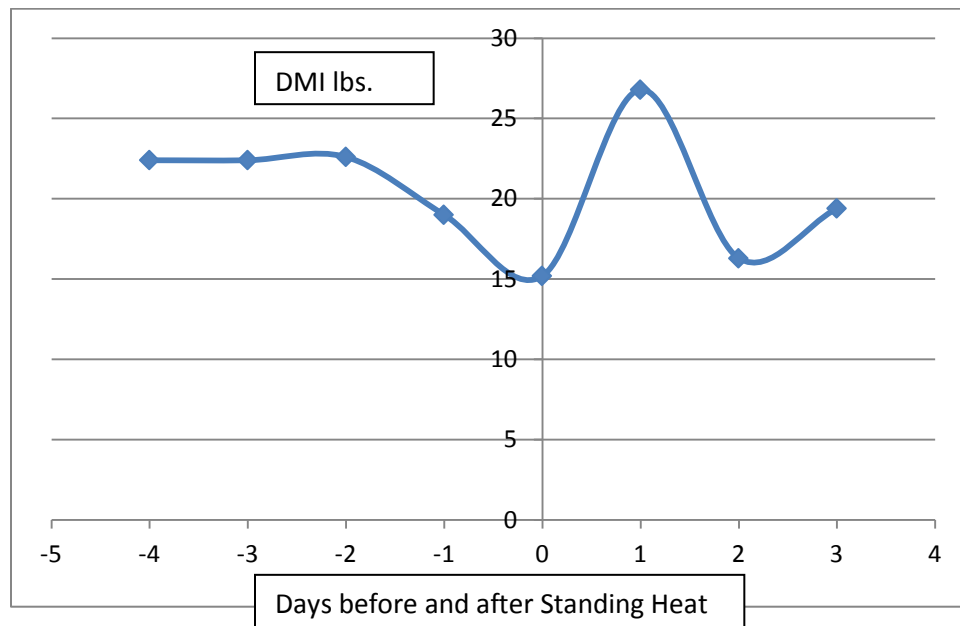
This trial used heifers that were not all at the same stage of sexual maturity. Of those tested, 57% showed estrus activity during the trial and 16% showed multiple cycles. Dry matter intake during the estrous cycle is affected. Figure 1 displays the pattern of this DMI change observed in the heifers from this trial with time “0” being the visible time of standing heat. The effect is seen in a DMI surge followed by suppression then a recovery in DMI with compensation and finally a leveling off. The DMI disturbance pattern shown in Figure 1 is consistent in shape across all the animals observed in this trial. However, the magnitude of peaks and valleys along with the matchup of these peaks and valleys with exhibited standing heat varies slightly.

Table 1 provides the results when comparing pubertal to nonpubertal heifers. Puberty has been confirmed by a standing heat during the trial. Those not showing a standing heat were considered nonpubertal. Comparing those that showed estrus and those that did not, some hint of a difference in feed efficiency was detected numerically, but statistically the evidence was lacking to make a confirmation. Daily gain was however significantly different and in favor of those animals confirmed as pubertal. Many of the measures recorded seemed to be very close to showing significance if a significant T test is considered to be equal or less than a value of 0.05. Since many of these observations are quite close to being significant, it would be interesting and probably worthwhile to further investigate this pubertal- nonpubertal effect in better documented contemporary groupings and scoring the reproductive tracts of the heifers when placed on trial.

Taking this issue a step further, Table 2 provides results when the number of displayed estrus cycles is documented. This breakdown may provide more questions than answers. The expression of one cycle in many cases was a detriment towards feed efficiency while those not cycling or those showing multiple cycles were similar in conversion performance. The 70 day trial should have allowed at least two estrous cycles to be expressed so we can speculate that these individuals may have shown their first cycle or were anestrus and began to cycle again or quit cycling due to some health issue. These scenarios may impact our result, but at this time it is only speculation. If the impact of a first cycle does lead to the observed results, however, it seems prudent to reconsider how and when heifers are to be evaluated for feed efficiency and it may be appropriate to test only those animals that have expressed estrus prior to testing, or to artificially inhibit estrus while on test.

The final point that may be raised from the introduction is that it was noted that the expression of estrus was considered a detriment in feedyard performance. This did seem to be the case with animals showing only one cycle during the trial, but in this trial we observed that animals showing multiple cycles tended to have an improved performance and in general seemed to be more robust if starting weight is any indication of prior health. The surge in estrogen should have an anabolic effect and lead to an apparent improvement in feed utilization; therefore this observed result seems reasonable. In a feedlot situation where a larger pen population exists, the potential riding activity also increases combined with a ration higher in grain that could potentially bring on subclinical acidosis when eating patterns are disrupted the effect of an estrous cycle would potentially have the less favorable outcome.

Figure 1. Dry Matter Intake Pattern Exhibited during Estrous Cycle



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Table 1. The Effect of Confirmed Puberty on Feed Efficiency Measures

means	Head	AvgStWt	ADG	DMI	TonIndex	RG	RFI	AdjF:G
Pubertal	97	689	2.66	21.5	137.85	0.05	0.21	8.38
NonPubertal	72	672	2.39	19.9	113.92	-0.04	-0.27	9.38
Prob. >T		.38	.02	.07	.06	.07	.24	.06

Table 2. The Effect of Estrus on Feed Efficiency Measures

means	Head	AvgStWt	ADG	DMI	TonIndex	RG	RFI	AdjF:G
No Estrus	72	672 ^a	2.39 ^a	19.9 ^a	113.92 ^a	0.05 ^a	-0.27 ^{ab}	9.38 ^a
1 Estrus	70	688 ^a	2.58 ^{ab}	21.4 ^a	132.54 ^{ab}	-0.08 ^b	0.55 ^b	8.59 ^{ab}
>1Estrus	27	691 ^a	2.88 ^b	21.8 ^a	151.95 ^b	0.07 ^a	-0.70 ^a	7.82 ^b

Measures with same coefficient are similar statistically based on F at 0.05 level

Acknowledgements

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