THE RELATIONSHIP OF BODY COMPOSITION AND FEED INTAKE OF BEEF STEERS

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Story in Brief

Feed intake usually declines from a relatively constant plateau as fed cattle near slaughter weight. To investigate how this decline is related to body fat, a dynamic computer growth model was used to simulate body composition of a large group of feedlot steers for which periodic feed intake and body weight gain data were available. Feed intake decreased at lower body weights for animals put on feed at lower initial weights. However, the observed decline in intake occurred within a relatively narrow range of empty body fat (32 ± 1%) in steers regardless of initial feedlot weight. This suggests that body fat stores exert feedback control to reduce feed intake.

(Key Words: Growth Model, Empty Body Fat, Body Weight)

Introduction

So that most cattle will grade choice or above, a decline in dry matter intake is often observed as cattle near finished weight. Reduced feed intake is of concern to cattle feeders because it reduces rate of gain and efficiency. The mechanism responsible for this decline in intake is not known, although the lipostatic or "set point" theory of intake regulation suggests that animals regulate their energy intake to maintain a certain body composition. Alternatively, the ability of the rumen or intestines to expand after a meal may be limited by the presence of intraabdominal fat (McDonald et al., 1981). The objective of this research was to determine whether the decline in intake which occurs late in the feeding period of beef steers was directly related to body composition (empty body fat).

Materials and Methods

Feedlot data used in this study have been summarized in previous research (Thornton et al., 1985). From that data set, records representing 444 pens of commercial feedlot steers, primarily British and British crossbreds were used (Table 1). For analysis, pens were grouped into five classes based on initial feedlot weight. Observation of dry matter intake and body weight at 14 day intervals were used. Pens of steers with less than three observations or pens with no initial observations before thirty days on feed were excluded from the data set. A dynamic computer growth model (Oltjen, 1986) was used to simulate mean empty body fat for the average animal in each pen. Model inputs included starting feedlot weight, condition score, frame size, sex, time on feed, energy concentration of the ration, an implant factor and feed intake. An iterative computer program adjusted the energy concentration of the ration so that predicted final weight of the steers was within one pound

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Table 1. **Description of beef steers** by **initial weight classes.**

Weight Class:	502		616		709		801		921	
Item	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Pens	20		116		233		69		6	
Days on Feed	103	17	108	32	96	26	91	20	88	7
Weight (lb):										
Initial	502	17	616	27	709	29	801	28	921	47
Final	768	62	946	105	1003	88	1080	77	1200	54
Daily gain (lb/day)	2.54	.22	3.02	.30	3.04	.26	3.03	.33	3.13	.30

of observed weight. Adjustments were needed because pen feed intakes were greater than predicted from published equations (Thornton et al., 1985). Regression analysis was used to relate feed intake with days on feed, body weight and empty body fat.

Results and Discussion

Mean dry matter intakes as smoothed by the model for the various initial weight classes are plotted against days on feed in figure 1. In general, feed intake increased to a plateau which was higher for steers with heavier starting weights. Plateaus began at 63, 48, 45, 44, and 47 days for the 502, 616, 709, 801 and 921 weight groups, respectively. Note that the lightest weight steers (502 lb) reached a plateau much later than other groups. After the initial plateau, intake remained relatively constant until late in the feeding period at which time intake declines were noted for all groups except the 502 lb group. Feed intake declined with fewer days on feed for steers with heavier initial weights. To adjust for these weight differences, intakes are also plotted against body weight (Figure 2). Steers with lighter starting weights tended to reach intake plateaus at lighter weights. The decline in feed intake also occurred at lighter weights for steers with lighter initial weights.

The relationship between empty body fat calculated from the model of Oltjen (1986) and feed intake is shown in figure 3. Intakes for all groups except the 502 lb group declined within a narrow range of

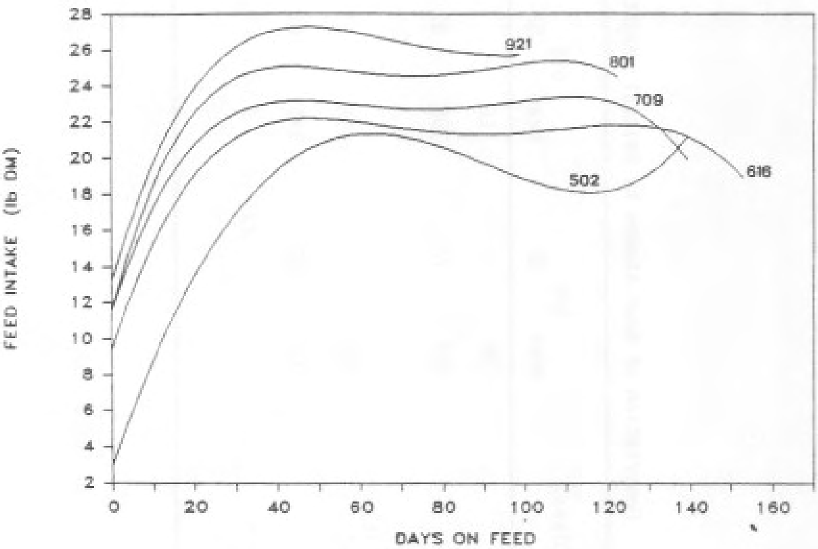

Figure 1. Relationship between feed intake and days on feed for different initial weight classes.

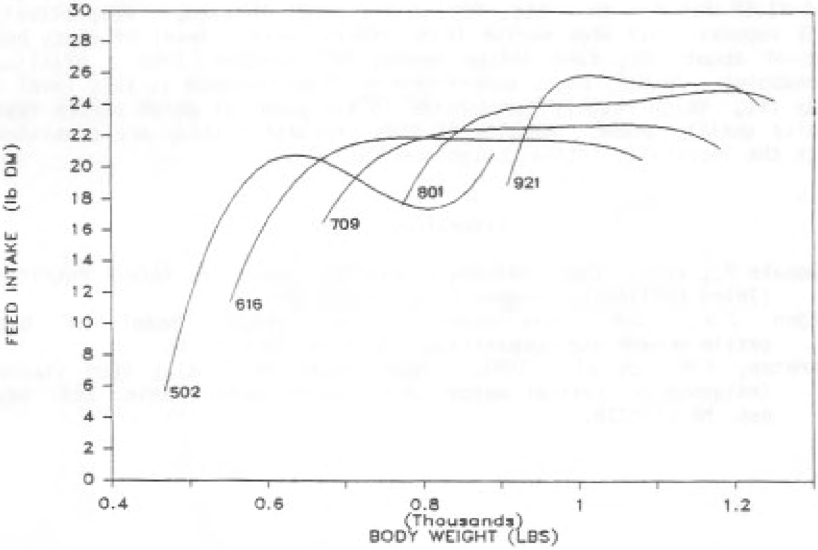

Figure 2. Relationship between feed intake and body weight for different initial weight classes.

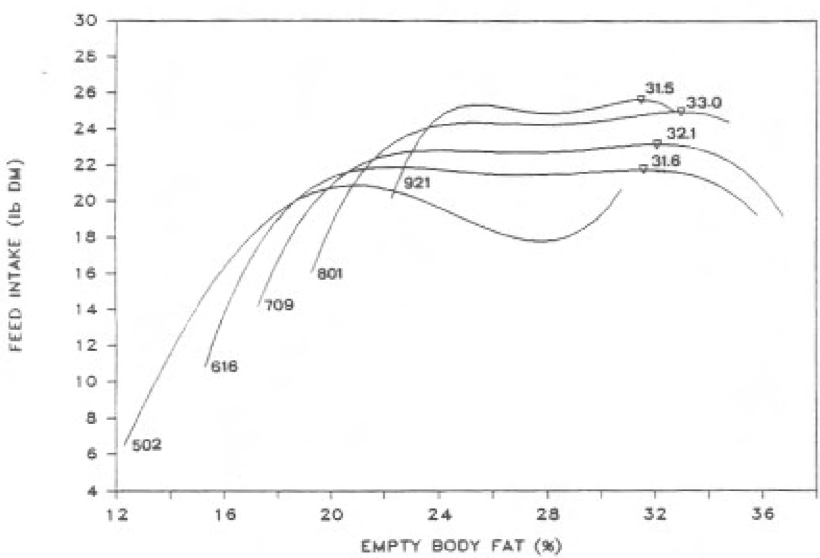

Figure 3. Relationship between feed intake and predicted empty body fat for different initial weights classes. Empty body fat at feed intake decline given by ∇.

predicted body composition. Intake declines began at 31.6, 32.1, 33.0 and 31.5% fat for the 616, 709, 801 and 921 lb groups, respectively. This suggests that when medium frame steers reach a level of empty body fat of about 32%, feed intake begins to decrease. From a practical standpoint, feeders might expect decreased performance at this level of body fat, which roughly corresponds to the point at which steers reach choice quality grade. Results of this simulation study are consistent with the lipostatic intake control mechanism.

Literature Cited

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