

A Review . . .

Spaying and Hormones in Heifer Feeding

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Castration of bulls for meat production has been practiced for hundreds of years. Spaying of heifers has been a rather sporadic practice. A recent surge of interest in this practice has prompted this review.

One of the early studies was conducted by Wilson and Curtis (1894) when they compared two-year-old spayed heifers, open heifers and steers in the feedlot. The steers outgained both groups of heifers, but the results were confounded because more than half of the spayed and "open" heifers were with calf. Later, the same workers repeated the treatments with younger animals (7 months initially). There was no difference in the rate of gain between spayed and open heifers, and the steers outgained both heifer groups. The steers and spayed heifers required about a pound more dry matter per pound of gain than did the open heifers.

Table 1. Steers vs. Heifers (Gramlich & Thalman)

	Steers	Heifers	
		open	spayed
Age			
2-year-olds (175 day feeding)			
Initial wt., lbs.	792	721	
Avg. daily gain, lbs.	2.12	1.99	
TDN/day, lbs.	17.1	16.7	
TDN/lb. gain, lbs.	8.08	8.38	
Age			
Yearlings (175 day feeding)			
Initial wt., lbs.	635	570	589
Avg. daily gain, lbs.	2.10	2.15	1.89
TDN/day, lbs.	15.3	15.0	14.5
TDN/lb. gain, lbs.	6.90	6.60	7.68
Age			
Calves (175 day feeding)			
Initial wt., lbs.	382	390	386
Avg. daily gain, lbs.	2.07	1.92	1.66
TDN/day, lbs.	11.3	11.3	11.2
TDN/lb. gain, lbs.	5.45	5.95	6.73

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A quarter-century later, Gramlich and Thalman (1930) investigated the spaying of heifers in more detail. A brief summary of their three trials is given in Table 1. Feeds fed were corn and alfalfa hay. These were converted to TDN (corn = 80, hay = 50) for comparisons.

In general, for these three experiments, the steers outgained the heifers and were more efficient in conversion of feed to meat.

A few years later, California workers (Hart, Guilbert and Cole, 1940) compared bred, open and spayed heifers in the feedlot. Table 2 gives pertinent data for the two experiments. Same conversions were made for feed to TDN for easy comparisons.

Table 2. Heifers - Bred, Open and Spayed (Hart, ET AL., 1940)

	Heifers		
	bred	open	spayed
Age			
2-year-olds (175 day feeding)			
Initial wt., lbs.	573	569	554
Avg. daily gain, lbs.	1.85	1.77	1.86
TDN/day, lbs.	12.1	11.9	12.2
TDN/lb., gain lbs.	6.52	6.72	6.63
Age			
Yearlings (175 day feeding)			
Initial wt., lbs.	538	540	531
Avg. daily gain, lbs.	2.12	1.99	1.79
TDN/day, lbs.	13.1	13.4	12.7
TDN/lb., gain lbs.	6.18	6.74	7.11

In summarizing both the Nebraska and the California data, it appears that spaying is of doubtful value and bred heifers tend to gain faster and be more efficient than either open or spayed heifers.

A few years later, Dinusson *et al.*, 1950, in investigating diethylstilbestrol (DES) as a possible implant for heifers, used spayed heifers as a nega-

Table 3. Open vs. Spayed vs. Stilbestrol Heifers

	open	spayed	open+DES
(140 days on feed)			
Initial wt., lbs.	560	494	511
Avg. daily gain, lbs.	2.07	1.91	2.32
Feed/day, lbs.			
concentrates	9.57	10.57	10.27
roughage	6.45	6.46	6.98
Feed/lb. gain, lbs.			
concentrates	4.63	5.53	4.42
roughage	3.12	3.38	3.01
(185 days on feed)			
Initial wt., lbs.	504	497	506
Avg. daily gain, lbs.	1.72	1.54	2.00
Feed/day, lbs.			
concentrates	11.81	11.20	12.46
roughage	7.28	7.09	7.38
Feed/lb. gain, lbs.			
concentrates	6.88	7.28	6.23
roughage	4.24	4.60	3.69

tive control in the comparisons. These experiments are abstracted in Table 3.

In these summaries it can be seen that spaying was of questionable value because the heifers gained less, were less efficient and were harder to keep on feed than were the open or DES-implanted heifers.

In 1955 and 1956, the Dickinson Branch Station (6th and 7th Annual Research Roundup Reports) reported on trials with spayed heifers; a summary is given in Table 4.

In these trials, the spayed heifers tended to eat more feed than the open heifers and were less efficient in energy conversion. The steers outgained both heifer groups and were more efficient. In a later report (9th Annual Research Roundup), bred and open heifers were compared. In the 182-day feeding period, the bred heifers gained 2.03

lbs. per day compared to 1.87 lbs. for the open heifers. The bred heifers were also more efficient.

In their Ninth Annual Beef Cattle Report (1965), South Dakota workers Whetzal, Embry and Dye reported on comparisons of steers and heifers treated with different implants. Six lots of calves were allotted by sex and weight with equal numbers from each producer. One lot in each sex group was implanted with DES (24 mg for heifers and steers first implant, 155 days later 24 mg reimplant for heifers and 36 mg reimplant for steers), Synovex (200 mg progesterone and 20 mg testosterone propionate and 20 mg of estradiol benzoate for heifers). These were reimplanted after 155 days. The open heifers and steers received no treatment. Results are briefly summarized in Table 5. The results are especially interesting because heifers of similar breeding from same herds were compared. One half of each lot was fed for 250 days. The other half was fed for 290 days. Feed intake and feed efficiency are summarized here on a total dry matter (DM) basis.

To quote from author's summary:

"During the growing period (99 days) when corn silage was full fed, the steers gained 18 per cent faster and required 8.2 per cent less feed (dry basis) per hundred pounds of gain than did heifers. For the 250-day feeding period, daily gains for both sexes were increased by each of the hormonal compounds used with an increase from stilbestrol and Synovex for steers amounting to 15.7 per cent and 11.7 per cent, respectively, compared to 8.0 per cent and 4.0 per cent for heifers . . ." "Overall daily gains and response of heifers and steers to the different treatments were not changed appreciably by feeding 40 days longer."

In a second experiment, the same South Dakota researchers initiated another trial comparing heifers and steers (Tenth Annual Beef Day, 1966). After 65 days on trial, one lot of calves of each sex was implanted with same treatments as in the

Table 4. Effect of Spaying of Heifers — Dickinson Exp. Sta. 6th, 7th and 8th Research Roundup

	steers	Heifers		
		open	spayed	
Initial weight, lbs.	596	548	547	
Average daily gain, lbs.	1.78	1.66	1.46	
Days on feed (finishing)	162	162	162	
	steers	open	spayed (3 mos.)	spayed (1 yr.)
Initial weight, lbs.	342	332	335	
Average daily gain, lbs.	1.72	1.49	1.49	
Days on feed (wintering)	182	182	182	
Initial weight, lbs.	655	609	607	597
Average daily gain, lbs.	2.01	1.92	1.82	1.91
Days on feed (finishing)	114	114	114	114

Table 5. Sex and Treatments in Feedlot.

Treatment	Heifers			Steers		
	DES	Synovex	open	DES	Synovex	none
Days	99	99	99	99	99	99
Initial weight, lbs.	479	476	477	528	532	527
Average daily gain, lbs.	1.60	1.75	1.66	2.08	2.03	1.79
Average daily feed, (D.M.) lbs.	15.0	14.6	14.6	15.7	16.1	15.7
Feed/lb. gain, (D.M.) lbs.	9.34	8.38	8.78	7.54	7.91	8.73
Performance of 1/2 lots after 250 days						
Final weight, lbs.	943	956	916	1068	1055	994
Average daily gain, lbs.	1.95	2.03	1.88	2.28	2.20	1.97
Feed/lb. gain, (D.M.) lbs.	9.39	8.75	9.07	8.29	8.78	9.27
Performance of 1/2 lots after 290 days						
Final weight, lbs.	1021	1020	982	1166	1144	1080
Average daily gain, lbs.	1.98	1.98	1.84	2.30	2.22	2.01
Feed/lb. gain, (D.M.) lbs.	9.41	9.15	9.41	8.38	8.88	9.19

previous trial. The implanted cattle were reimplanted after 134 days as reported for the previous experiment. The first phase of 170 days used high-roughage rations. The second phase included more concentrates and the cattle were marketed after 316 days for the steers and 317 days for the heifers. A brief summary is presented in Table 6.

From the researchers' summary, "The results of this experiment show a greater rate of gain for steers over heifers, which amounted to 12.0, 13.0 and 5.6 per cent, respectively, when implanted with Synovex, DES (heifers spayed) or not implanted (heifers not spayed). The advantage in favor of steers was slightly greater when feeding a high energy ration. Steers consumed more feed than heifers, but made more efficient gains when both were implanted with Synovex or diethylstilbestrol, 6.3 per cent and 6.2 per cent. Control steers and control non-spayed heifers differed very little in feed efficiency.

Spayed heifers implanted with Synovex-H or DES gained 7.9 per cent and 4 per cent faster than the non-spayed controls. However, there were only small improvements in feed efficiency. The implanted heifers had lower carcass grades and

yields, resulting in no economic advantage for the treatments in this experiment.

Steers implanted with Synovex-S or DES gained 14.4 per cent and 11.2 per cent faster with 7.0 per cent and 6.3 per cent improvement in feed efficiency over non-implanted steers." A third experiment conducted by L. J. Nygaard and L. B. Embry (Tenth Annual Beef Day Report, 1966) used heifers which were wintered either at the Range Field Station at Cottonwood, or at the Central substation at Highmore. Implant treatments were 24 mg of diethylstilbestrol (DES), Synovex-H or none. There were six lots with half the heifers spayed. The heifers were spayed at the Highmore Station following allotment. Spaying was delayed about 6 weeks at the Cottonwood Station due to weather conditions. The heifers were reimplanted after 89 days on the finishing trial with the same dosage as initially.

The trial was in two phases, a wintering phase (125 days at Cottonwood, 118 days at Highmore). The finishing phase (average 192 days) followed the wintering phase. Table 7 summarizes the pertinent results.

In the wintering phase, no data were available for feed efficiency since the heifers were fed to-

Table 6. Sex and Treatments in Feedlot.

Treatment	Heifers			Steers		
	Spayed DES	Spayed Synovex	open	DES	Synovex	none
Initial weight, lbs.	424	423	423	446	446	446
Average daily gain, lbs.	1.64	1.71	1.57	1.81	1.91	1.62
Feed/lb. gain, (air dry basis)	11.79	11.54	12.32	11.18	10.71	12.42
Days	147	147	147	147	147	147
Final weight, lbs.	1011	1032	987	1109	1125	1044
Average daily gain, lbs.	2.10	2.17	2.02	2.43	2.42	2.20
Feed/lb. gain, (air dry basis)	10.45	10.63	10.39	9.78	10.08	10.03

Table 7. Effect of Spaying and Implants on Heifers.

Treatment	Spayed			Non-Spayed		
	Control	DES	Synovex-H	Control	DES	Synovex-H
Initial weight, lbs.	381	381	381	381	382	381
Average daily gain, lbs.	0.93	1.15	1.14	1.04	1.22	1.23
Final weight, lbs.	852	973	953	920	976	978
Average daily gain, lbs.	1.86	2.35	2.25	2.15	2.34	2.30
Feed/lb. gain (air dried lbs.)	9.25	7.99	8.21	9.48	8.36	8.35

gether. The major points can best be presented by quoting Nygaard and Embry's summary:

"Spaying heifers following weaning reduced rate of gain and increased feed requirements when not implanted with diethylstilbestrol or Synovex-H.

"Implanting non-spayed heifers with 24 mg of DES following weaning and again during drylot finishing increased rate of gain by 8.8 per cent over non-implanted controls, but had only a very slight effect on feed efficiency.

"Heifers spayed and implanted performed about equally with non-spayed and implanted heifers.

"Similar results were obtained with DES and Synovex-H. Considerable trouble was encountered from vaginal prolapse with both DES and Synovex-H implants and with spayed and non-spayed heifers. In view of this and the small effects on feed efficiency and carcass value, the economic value of the implant treatments appears questionable for heifers when administered after weaning and again during drylot finishing as in this experiment."

In a brief review, Bellows *et al.*, (Miles City Field Day Reports, 1976) summarized 11 studies on spaying. The daily gain of intact heifers was 1.89 lbs. vs. 1.72 lb. per day for spayed heifers, a reduction of 9.9 per cent. In 10 of the 11 studies, spayed heifers required 8.5 per cent more feed per 100 pounds of gain. Bellows also referred to a University of Wyoming study in 1960 (not included in this review) in which spayed heifers gained 1.28 lbs. per day vs. 1.47 lbs. for intact heifers in a 120-day summer grazing period, a 14.8 per cent reduction in gain.

Bellows also cited a trial, data given to him by Mr. Roger Moul, county agent at Buffalo, South Dakota, where 420 lb. spayed heifers in a 116-day pasture trial gained 1.66 pounds a day, compared with 1.77 pounds for spayed heifers which had been implanted with 12 mg of DES.

From this brief review of existing data the following points can be summarized:

1. Steers usually gain about 10 per cent faster than heifers with a similar increase in feed efficiency.
2. Spayed heifers usually gain less than intact, open heifers.
3. Bred heifers generally gain faster than spayed or open heifers and are more efficient.
4. Implants increase gains of spayed heifers and in the South Dakota work almost as much as with intact, open heifers.
5. Older heifers, more than one year of age, seem to be affected less from spaying than heifer calves.

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