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summary of research on diethylstilbestrol

FOR GROWING AND FATTENING BEEF CATTLE



ANIMAL HUSBANDRY DEPARTMENT
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SUMMARY AND RECOMMENDATIONS ON THE USE OF STILBESTROL

1. Stilbestrol, either implanted or oral, has generally resulted in increased rates of gain and improved feed efficiency when used in wintering rations, on pasture, and in fattening rations for steers. (See table 1 for amount of response.)
2. Feeding stilbestrol to steers does not appear to significantly effect carcass grade but implanting stilbestrol has reduced carcass grade slightly (an average of about $\frac{1}{8}$ of a federal grade in 63 trials summarized with various levels of stilbestrol).
3. In direct comparisons between feeding stilbestrol and implanting at 24- or 36-milligram levels, there has been a slight advantage in rate of gain and feed efficiency in favor of implanting but a slight advantage in carcass grade ($\frac{1}{15}$ of a federal grade) in favor of feeding the stilbestrol (see table 3). All differences between the two methods in these comparisons are so small they are of little if any practical significance.
4. Feeding or implanting stilbestrol to heifers appears to give a similar but sometimes smaller response as with steers in the few trials reported (see table 2.) However, undesirable side effects are more frequently reported with heifers than with steers, especially when implanting with 36 milligrams or more of stilbestrol. Until more information becomes available, it appears that feeding stilbestrol to heifers would be better than implanting.
5. The present recommended level for feeding stilbestrol for both steers and heifers is 10 milligrams per head daily.
6. The present recommended level for implanting steers is 36 milligrams per head for dry lot feeding and 24 milligrams per head for pasturing. Twenty-four milligrams appears adequate for weaned calves.
7. In view of possible undesirable side effects with heifers, if implanting the level probably should not exceed 24 milligrams. Heifers intended for breeding should not receive stilbestrol.
8. The growth response to stilbestrol implants appears to drop off after 120-140 days. Cattle to be fed much in excess of 150 days need to be reimplanted or fed stilbestrol after about 120 days for maximum gains.
9. The use of stilbestrol in one phase of the feeding program does not appear to affect the performance with or without stilbestrol in subsequent phases.
10. The above summary and recommendations are based on the results of present experimental work. Some of the recommendations on the use of stilbestrol may need to be changed as more information becomes available.

Summary of Research on Diethylstilbestrol For Growing and Fattening Beef Cattle

D. V. RADABAUGH and L. B. EMBRY¹

Numerous experiments on the response of growing and fattening cattle to stilbestrol have been reported in recent years. There has been a response to stilbestrol in most of these experiments, though to varying degrees. Many of the reports have been of a preliminary nature and in several instances have covered only one trial. A review of such experiments individually does not present a clear and concise picture of the effects of stilbestrol treatment. Therefore, results of most of the reported experiments have been reviewed and are summarized in the tables in this pamphlet.

Four rather distinct phases of cattle feeding have been investigated. These are wintering without much fattening, pasturing alone, pasturing with additional feeding, and dry-lot fattening. These feeding phases are summarized separately.

Stilbestrol for Steers

A summary of the trials where stilbestrol was used with steers is presented in table 1.

Wintering. Steers on wintering rations in nine trials, which were fed stilbestrol orally, gained 7.14% faster than similar steers that did not receive stilbestrol. In six of the trials where feed requirements were reported, the treated steers showed an average of 5.3% decrease in feed requirements per 100 pounds of gain. The response to oral stilbestrol was quite variable in the experi-

ments when steers were fed wintering rations. More experiments are needed to accurately evaluate the response of steers to oral stilbestrol when fed wintering rations.

Steers on wintering rations, when implanted with stilbestrol, showed a favorable and consistent response to stilbestrol in rate of gain in all of the reported experiments. In the ten trials summarized, the average increase in daily gains over the control steers was 25.6%. In only two of the trials included in the table were the feed requirements per 100 pounds of gain reported, and the average of these two trials shows a 7.0% decrease in feed required per 100 pounds of gain when steers were implanted.

Implants greater than 36 milligrams of stilbestrol in wintering steers showed no consistent advantage in rate of gain over the 36-milligram implants in the results of the experiments. However, undesirable side effects such as high tail heads, depressed loins, and mammary development have been more pronounced at levels over 36 milligrams. It can, therefore, be concluded that 36-milligram implants should probably be high enough with wintering rations. Not enough experiments were reported using lower levels to properly evaluate them. Although there are no direct comparisons made here, stilbestrol-

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implanted steers had a greater increase in average daily gain over control steers than did steers fed stilbestrol in wintering rations.

Pasture Only. Steers on pasture fed stilbestrol orally gained an average of 8.1% faster than similar control steers in seven trials. In one of the trials, the gain was reduced 3.4%, and in another trial there was no difference between the control and treated steers. The increase in average daily gain due to stilbestrol treatment was from 15 to 20% in three of the trials.

Results when the steers were fed 5 milligrams of stilbestrol daily indicate that the level of stilbestrol was too low. In most cases, better results were obtained where 10 milligrams of stilbestrol was fed daily. From the results summarized, it appears that the feeding of 10 milligrams of stilbestrol daily to steers on pasture will result in a significant increase in rate of gain.

Thirty-five trials were summarized where steers on pasture were implanted with stilbestrol. The in-

crease in average daily gain due to stilbestrol implants was 17.6%. Many different levels of implants are reported in this summary, varying from 12 to 120 milligrams. The results indicate 24 milligrams is an effective level of stilbestrol for steers on pasture. Although there are no direct comparisons made here, steers implanted with stilbestrol showed more increase in average daily gain over the control steers than steers fed stilbestrol orally.

Feeding on Pasture. Steers fed concentrates on pasture and fed stilbestrol orally gained 6.6% faster than similar steers not receiving stilbestrol in 13 trials. Feed efficiency was improved an average of 2.1% in seven of the trials. The results of the trials summarized showed a considerable amount of variation in the response of steers to stilbestrol added to concentrates fed on pasture. However, the average results show some response to the feeding of stilbestrol.

Twenty-five trials showed that stilbestrol-implanted steers fed con-

Table 1. Summary of Use of Stilbestrol in Steers

Rations and Stilbestrol Treatment	No. of Trials	Av. Days on Trial	Total No. of Treated Animals	Average Daily Gains			% Increase in Feed Efficiency	Carcass Grades*	
				Control lbs.	Treated lbs.	Increase %		Control	Treated
Wintering Rations									
Oral	9	117	313	1.40	1.50	7.1	5.3	---	---
Implant	10	130	212	1.25	1.57	25.6	7.0	---	---
Pasture Only									
Oral	7	129	103	1.35	1.46	8.1	---	---	---
Implant	35	122	600	1.59	1.87	17.6	---	---	---
Feeding on Pasture									
Oral	13	123	137	2.28	2.43	6.6	2.1	---	---
Implant	25	123	276	2.26	2.65	17.3	8.1	---	---
Fattening Rations									
Oral	92	124	1357	2.30	2.63	14.3	9.7	6.6	6.5
Implant	63	144	919	2.19	2.50	14.2	10.3	6.6	6.1

*Carcass grade score based on Low Prime, 10; High choice, 9; Average Choice, 8; Low Choice, 7; High Good, 6; and Average Good, 5.

concentrates on pasture gained 17.3% faster than nonimplanted steers. In 11 of the trials where feed efficiency was reported, stilbestrol-implanted steers showed an 8.1% reduction in feed required per 100 pounds of gain. Many levels of implants were used in the experiments reported in this summary. There was no "best" level clearly indicated. The gains obtained from the higher implant levels (45 to 60 milligrams) were unusually high in these experiments in comparison to steers on pasture without grain and on dry-lot fattening rations. Because of the increased likelihood of undesirable side effects with the higher implant levels, it would appear that implants of 30 to 36 milligrams of stilbestrol in steers fed grain on pasture would be a satisfactory amount.

Dry-lot Fattening. Steers on fattening rations fed stilbestrol orally gained an average of 14.3% faster in 92 trials than similar control steers. A total of 1,357 treated animals were reported in the stilbestrol-treated lots. In 82 of the trials, where feed requirements per 100 pounds of gain were reported, the average increase in feed efficiency in the stilbestrol-treated steers was 9.8%. Fifty-six of the trials reported the federal carcass grades. The average carcass score for the treated steers was 6.5, while the average carcass score for the control steers was 6.6. This difference of 0.1 of $\frac{1}{10}$ of a federal grade is small and insignificant.

Ten milligrams of stilbestrol were used in most of the experiments. From the results summarized, it was shown that adding 10 milligrams of stilbestrol daily to rations of fattening steers will increase the rate of gain an average

of about 14% and decrease the feed requirement per 100 pounds of gain about 10%. Occasionally stilbestrol feeding has been reported to lower carcass grade slightly, but this is not usually the case, especially when stilbestrol-treated cattle are fed the same length of time as the nontreated cattle. This means that stilbestrol-treated cattle should go to market at heavier weights, which is a factor that should be taken into consideration. The increase in gain and feed efficiency would usually more than offset any reduction in carcass grade, if there is any.

Stilbestrol-implanted steers on fattening rations gained an average of 14.2% faster than similar nonimplanted steers in 63 trials. Feed requirements per 100 pounds of gain were reduced an average of 10.3% in the implanted steers in 38 of the trials where feed requirements were reported. In 35 of the trials where carcass grades were reported, stilbestrol implants reduced the carcass grade an average of $\frac{1}{10}$ of a federal grade. This difference is small and would be difficult to measure in individual trials with small numbers. It is partly influenced by some experiments where high levels of stilbestrol were used.

Many different levels of implants were used in the experiments reported in this summary. Sixty-milligram levels and above appeared to show the most effective response in rate of gain, but most of the experiments where the high-level implants were used were the earlier trials. Often undesirable side effects such as depressed loins, elevated tail heads, mammary development, and lower carcass grades were noted in the steers implanted

with high levels of stilbestrol. Where direct comparisons were made between levels of implants, the 36-milligram level gave just as good results in gain as higher levels and produced less of the undesirable side effects. In view of these facts, the 36-milligram implants of stilbestrol appear to be the best recommendation for fattening steers. Generally no serious undesirable side effects were noted in these experiments where 36-milligram implants were used. The above results show that stilbestrol implants will increase rate of gain about 14%, increase feed efficiency 10%, and reduce carcass grade slightly in some experiments (an average of about $\frac{1}{2}$ of a federal grade in the trials reviewed).

Stilbestrol for Heifers

The possibility of stilbestrol treatment of heifers being raised for slaughter has been of interest to cattlemen and researchers ever since stilbestrol treatment has shown its advantages for steers. Undesirable side effects have occurred in heifers treated with stilbestrol that are not shown in steers.

There have been reports of prolapse of the uterus and rectum, elevated tail head, depressed loin, and

excessive mammary development in heifers treated with stilbestrol, especially at implant levels 36 milligrams and above. Some research has been conducted to determine the effects of stilbestrol for heifers. Table 2 shows a summary of trials.

Wintering. Nine trials are summarized where heifers fed wintering rations were implanted with stilbestrol at various levels. The average increase in daily gain of the implanted heifers was 6.3%. This response is not as great as shown for steers in table 1.

Pasture. Six trials where stilbestrol was implanted in heifers on pasture show an average increase in daily gains of 26.9%. The response shown here is greater than that shown for steers in table 1. However, there have been only a few trials conducted.

Dry-lot Fattening. Ten trials were reported where stilbestrol was fed in the rations of fattening heifers. An average increase of 13.0% in rate of gain was obtained from feeding stilbestrol to fattening heifers. From the summary of the results, it appears that feeding stilbestrol to fattening heifers has generally increased the average daily gain about the same as for steers. However, it must be considered that undesirable

Table 2. Response of Heifers to Stilbestrol

Type of Ration	Number of Trials	Av. Days on Trial	Total Number of Treated Animals	Average Daily Gains		
				Control lbs.	Treated lbs.	Percent Increase
Wintering						
Implant	9	122	164	0.63	0.67	6.3
Pasture						
Implant	6	116	81	0.93	1.18	26.9
Fattening						
Oral	10	132	104	1.92	2.17	13.0
Implant	18	130	288	1.88	2.06	9.6

side effects are more likely to occur in heifers than in steers.

A summary of 18 trials where stilbestrol was implanted in heifers on fattening rations shows the implanted heifers gained 9.6% faster than the control heifers. Occasionally serious, undesirable side effects were noted in the treated heifers, especially where a high level of implant was used. Quite often, it was shown that stilbestrol implants lowered the carcass grade of heifers. From the summary of results, it appears that stilbestrol implants will increase the average daily gain of heifers on fattening rations. The response has not been as great as with steers in the limited number of tests.

Stilbestrol Oral-Implant Comparisons

Two types of stilbestrol administration—oral and implant—have been effectively used in beef cattle feeding. Several experiments have been conducted to study the effects of the two methods of stilbestrol administration. The results have not been consistent in all of the trials conducted.

A summary of six trials (table 3), where stilbestrol fed orally at 10 milligrams daily was compared to 24-milligram stilbestrol implants, shows that the average daily gains

for the implanted steers was greater than for the oral-stilbestrol steers. Five of the trials reported feed requirements per 100 pounds of gain, and the average of these trials shows that feed requirement was 4.7% less for the implanted steers than for the steers fed stilbestrol. The results indicate that stilbestrol - implanted steers showed more response in gains and feed efficiency than steers fed stilbestrol orally. There was very little difference reported between implant and oral stilbestrol treatments in undesirable side effects.

A summary of 15 trials (table 3), where 10 milligrams of stilbestrol fed orally was compared to 36-milligram stilbestrol implants in fattening steers, shows that the average daily gains for the implanted steers was greater than for the orally-treated steers. Feed requirements per 100 pounds of gain were slightly less for the implanted than for the orally-treated cattle. When comparing carcass grades of the two treatments in ten trials where carcass grades were reported, the stilbestrol implanted steers graded 0.2 of $\frac{1}{2}$ of a grade less than the oral-treated steers. The results of the experiments summarized show that more response in gains was obtained from 36-milligram stilbestrol implants than from oral stilbestrol with fattening steers.

Table 3. Summary of Comparison of 10 mg. Oral Stilbestrol Daily and Stilbestrol Implants in Steers

Level of Implant mg.	Number of Trials	Av. Days on Trial	Total Number of Animals	Oral Stilbestrol		Stilbestrol Implant		
				Average Daily Gain	Carcass Grade*	Average Daily Gain	Carcass Grade*	Percent Saving in Feed Over Oral Stilbestrol
24	6	126	149	2.47	---	2.58	---	4.7
36	15	151	361	2.55	6.4	2.63	6.2	1.1

*Carcass grade score based on Low Prime, 10; High Choice, 9; Average Choice, 8; Low Choice, 7; High Good, 6; Average Good, 5, and Low Good, 4.

There was a small advantage in feed efficiency for the implanted steers. The difference shown in carcass grades is small.

Frequency of Implanting

Work at the South Dakota Agricultural Experiment Station and at some of the other experiment stations indicates that the growth response to stilbestrol implants begins to drop off after 120-140 days as compared to the response to stilbestrol orally. We have found some pellet residue in the ear as many as 180 days after implanting, but the amount was very small.

When cattle were slaughtered and the pellet residue recovered between 66 and 120 days after implanting, the calculated time for absorption of one-half of the original amount of stilbestrol was from 66 to 87 days. This would indicate that the dosage received by the cattle is likely to be greatly reduced after four months.

The period of time which stilbestrol implants will be effective does not appear to be lengthened by increasing the level of stilbestrol implants. In some work at the South Dakota Agricultural Experiment Station, the rate of absorption per unit of weight of the pellets increased as the level of implants was increased from 24 to 60 milligrams. Thus, it appears important that the minimum effective levels of implants not be exceeded.

Since the growth response to stilbestrol implants may drop off after 120-140 days, cattle that are to be fed for periods much over 150 days should be reimplanted or fed stilbestrol after about 120 days to obtain maximum gains. In some work cattle receiving implants for the second time responded just as well in rate

of gain in the feed lot and graded as good as cattle implanted for the first time. Cattle implanted three times graded slightly lower. More work is needed to properly evaluate the effect on carcass grade of implanting several times during a feeding program.

Effect of Stilbestrol on Subsequent Performance

Work at the South Dakota Agricultural Experiment Station has shown that steer calves fed stilbestrol or implanted during the wintering period gained fully as well the following summer on pasture as calves which did not receive stilbestrol during the wintering period, when neither group received stilbestrol during the pasture season. This same relationship also existed when steers were implanted at the beginning of the pasture season but not when put in dry lot for fattening.

Steers implanted for the first time when going to pasture gained more than those which received stilbestrol during the wintering period. There appeared to be little if any advantage for using stilbestrol with wintering rations for gains of about three-fourths pound daily when followed by implanting before going to pasture.

Our own work and work at other stations has shown that stilbestrol implants on pasture do not appear to reduce the response to stilbestrol during the fattening phase. More total gain is obtained when stilbestrol is used in both pasture and fattening phases. However, if stilbestrol is used in only one phase of the feeding program, it should be used during the fattening phase because of the greater rate and total gain made during this period.