INFLUENCE OF CREEP FEEDING AND POST-WEANING DIETHYLSTILBESTROL IMPLANTATION ON POST-WEANING WEIGHT GAIN AND CARCASS COMPOSITION OF BEEF BULLS 1, 2

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DIETHYLSTILBESTROL (DES) had been shown to improve rate of gain and feed efficiency of heifers and steers and has produced contradictory results when fed to or implanted in bulls. Preweeding implantation of bull calves with DES has been shown to reduce preweaning gains by Pilkington et al. (1959) and to have no significant effect on preweaning gains by Hunsley, Vetter and Burroughs (1967a). Post-weaning implantation of young bulls with DES has been shown to produce no effect on weight gains by Koger et al. (1960), Wipf et al. (1964) and Martin, Albright and Stob (1965); to slightly increase weight gains by Bailey, Probert and Bohman (1966), Cmarik (1966) and Hunsley et al. (1967b); and to produce a significant increase in weight gains by Klosterman et al. (1955).

Reported effects of preweaning creep feed on post-weaning performance traits also vary. Black and Trowbridge (1930) reported that creep-fed calves maintained their weight advantage for 84 days post-weaning and had less weight increase than non-creep calves thereafter. Non-creep calves were more profitable than creep-fed calves when fed for 200 days post-weaning by Johnson and Fenn (1943) and when fed to choice grade by Nelson et al. (1955). Hunsley et al. (1967a), using both bull and steer calves, reported no significant difference between creep-fed and non-creep calves with regard to either post-weaning daily gain or carcass traits, except that creep-fed calves produced significantly (P≤.05) heavier carcasses per day of age.

The objectives of this research were to determine the effect of diethystilbestrol (DES) on post-weaning weight gain and carcass merit of bulls and to determine the effect of preweaning creep vs. non-creep feeding on post-weaning weight gain and carcass characteristics of bulls.

Experimental Procedure

Preweeding Management. For 2 yr., the cow herd was divided, prior to calving, so that one-half of the calves (male and female) received a creep ration for 140 days prior to weaning while the remaining one-half of the calves received no creep feed. The creep ration was coarse ground and consisted of one part oats and two parts shelled corn. All cattle had free access to salt and minerals. All calves remained with their dams from birth to weaning and grazed bluegrass-legume pastures from May to time of weaning. Calves were born in February, March and April and weaned in early November when the average age was 240 days. Both years were characterized by adequate moisture to produce excellent pastures. Creep consumptions of 0.48 and 1.03 kg. per day per calf were observed in the first and second years, respectively.

Trial 1. Fifty Angus bull calves were divided equally between creep and non-creep treatments prior to weaning. Initial weights were 202 and 197 kg., respectively, for creep and non-creep bulls. One-half of each group was implanted with 36 mg. DES both at weaning (240 days of age) and again at 84 days post-weaning. At 154 days post-weaning, one-half of the twice implanted bulls and one-half of the non-implanted bulls were implanted with 36 mg. DES.

All bulls received the same daily ration consisting of corn silage (9.1 kg. during the first 8 weeks, 7.9 kg. for the second 8 weeks and 6.8 kg. from the 17th week until slaughter), 0.9 kg. of a 32% protein concentrate, ground ear corn and minerals free choice. Daily consumption of ear corn was 4.3 kg. per bull.

All bulls were weighed individually every 28 days. Thickness of external fat, rib-eye area, % kidney fat, marbling score and yield of wholesale cuts were determined at slaughter.
Dressing percent was calculated as a ratio of chilled carcass weight (48 hr. after slaughter) to shrunk liveweight (24 hr. off feed and water).

The 9–10–11th rib section from the left side of each carcass was physically separated into muscle, fat and bone. The separable muscle consisted of the muscle plus any adhering fat which could not be easily removed. The separable muscle was thoroughly ground and mixed prior to collection of a sample which was analyzed for protein, ether extractable constituents and moisture.

The testes of each young bull were obtained at slaughter, weighed and prepared for histological study. The diameters of 10 seminiferous tubules were measured for each bull.

The feeding period was divided into two phases consisting of the first 154 days and the last 56 days.

**Trial 2.** Thirty-three bull calves from the creep preweaning treatment and 27 bulls from the non-creep preweaning treatment were divided equally into three treatment groups. The treatments were: non-implanted control, one 72-mg. DES implant at weaning and one 72-mg. implant at weaning, plus a 72-mg. implant at 84 days post-weaning.

Traits measured were the same as in trial 1 except for testes weight and seminiferous tubule diameter. The feeding regime was the same as that used in trial 1. Daily consumption of ear corn averaged 4.2 kg. per bull. Initial weights of creep and non-creep calves were 205 and 195 kg., respectively.

Data were analyzed by analysis of variance of equally weighted cell means. The appropriate error sum of squares was derived by multiplying the harmonic mean of subclass numbers by the within cell variance.

**Results and Discussion**

**Preweaning Treatment.** Preweaning treatment had no significant effect on post-weaning daily gain in trial 1. At the end of the entire feeding period, creep-fed bulls had gained at an average rate of 1.04 kg., while the non-creep bulls gained at the rate of 1.06 kg. per day. In trial 2, preweaning treatment also had no significant effect on post-weaning daily gain. Creep-fed bulls gained 1.16 kg. per day, while non-creep bulls gained 1.10 kg. per day.

Results of these trials agree closely with results reported by Hunsley et al. (1967a) with bulls and steers showing no evidence of compensatory gains by non-creep calves following weaning. Black and Trowbridge (1930), Johnson and Fenn (1943) and Nelson et al. (1955) reported evidence of compensatory gain by non-creep steers and heifers following weaning.

As shown in table 1, creep feed had significant effects on a small number of carcass traits. Non-creep bulls in trial 1 had a significantly higher (P≤.01) percent protein in muscle of the 9–10–11th rib. In trial 2, creep-fed bulls had higher (P≤.05) marbling scores, higher (P≤.05) percent kidney fat and less (P≤.05) rib-eye area. Considering the mean differences for all traits it would appear that carcasses from creep-fed bulls were very slightly fatter than those from non-creep bulls. Hunsley et al. (1967a) observed no significant effect of creep feed on carcass traits other than weight of carcass per day of age.

**TABLE 1. MEANS OF CARCASS TRAITS OF CREEP-FED AND NON-CREEP BULLS**

<table>
<thead>
<tr>
<th>Trait</th>
<th>Trial 1</th>
<th></th>
<th>Trial 2</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Creep</td>
<td>Non-creep</td>
<td>Creep</td>
<td>Non-creep</td>
</tr>
<tr>
<td>Dressing %</td>
<td>61.6</td>
<td>61.7</td>
<td>60.8</td>
<td>61.3</td>
</tr>
<tr>
<td>Carcass grade*</td>
<td>8.3</td>
<td>8.0</td>
<td>8.8</td>
<td>8.7</td>
</tr>
<tr>
<td>Marbling score b</td>
<td>5.1</td>
<td>4.6</td>
<td>4.3*</td>
<td>3.6</td>
</tr>
<tr>
<td>Fat cover, cm.</td>
<td>1.2</td>
<td>1.1</td>
<td>1.3</td>
<td>1.2</td>
</tr>
<tr>
<td>Rib-eye area, cm.</td>
<td>76.8</td>
<td>76.4</td>
<td>66.4</td>
<td>71.0*</td>
</tr>
<tr>
<td>Kidney fat, %</td>
<td>2.9</td>
<td>2.7</td>
<td>3.0*</td>
<td>2.7</td>
</tr>
<tr>
<td>% ether extract in muscle of 9–10–11th rib</td>
<td>11.5</td>
<td>11.8</td>
<td>14.9</td>
<td>14.2</td>
</tr>
<tr>
<td>% moisture in muscle of 9–10–11th rib</td>
<td>64.6</td>
<td>65.2**</td>
<td>63.4</td>
<td>64.0</td>
</tr>
<tr>
<td>% protein in muscle of 9–10–11th rib</td>
<td>18.4</td>
<td>19.1**</td>
<td>18.9</td>
<td>18.5</td>
</tr>
<tr>
<td>% muscle in 9–10–11th rib section</td>
<td>56.4</td>
<td>57.6</td>
<td>56.0</td>
<td>58.6</td>
</tr>
<tr>
<td>% fat in 9–10–11th rib section</td>
<td>25.5</td>
<td>25.1</td>
<td>26.5</td>
<td>24.5</td>
</tr>
<tr>
<td>% bone in 9–10–11th rib section</td>
<td>18.0</td>
<td>16.8</td>
<td>16.1</td>
<td>16.7</td>
</tr>
</tbody>
</table>

* Scale of 1–15; 7 = low good, 8 = average good, 9 = high good.
* Scale of 1–10; 3 represents small, 6 represents slightly abundant.
* P≤.05.
** P≤.01.
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TABLE 2. MEANS OF POST-WEANING DAILY GAINS (KG.) OF IMPLANTED AND NON-IMPLANTED BULLS IN TRIAL 1

<table>
<thead>
<tr>
<th>Time period</th>
<th>Initial implant at 0 and 84 da.</th>
<th>No implant at 0 and 84 da.</th>
<th>Initial implant control</th>
<th>Secondary implant control</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 28 da.</td>
<td>1.29</td>
<td>1.12</td>
<td>0.17*</td>
<td></td>
</tr>
<tr>
<td>0 to 56 da.</td>
<td>1.23</td>
<td>1.12</td>
<td>0.13**</td>
<td></td>
</tr>
<tr>
<td>0 to 84 da.</td>
<td>1.22</td>
<td>1.12</td>
<td>0.10*</td>
<td></td>
</tr>
<tr>
<td>0 to 112 da.</td>
<td>1.18</td>
<td>1.12</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>0 to 140 da.</td>
<td>1.12</td>
<td>1.09</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>0 to 154 da.</td>
<td>1.09</td>
<td>1.07</td>
<td>0.02</td>
<td></td>
</tr>
<tr>
<td>85 to 154 da.</td>
<td>0.94</td>
<td>1.00</td>
<td>0.06</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 182 da.</td>
<td>1.07</td>
<td>1.10</td>
<td>1.04</td>
</tr>
<tr>
<td>0 to 210 da.</td>
<td>1.05</td>
<td>1.08</td>
<td>1.04</td>
</tr>
<tr>
<td>155 to 182 da.</td>
<td>0.89</td>
<td>1.15</td>
<td>1.23</td>
</tr>
<tr>
<td>155 to 210 da.</td>
<td>0.90</td>
<td>1.10</td>
<td>1.16</td>
</tr>
</tbody>
</table>

* Contrast of bulls receiving 36 mg. at weaning and at 84 days with those not implanted either time. 
** Contrast of bulls receiving 36 mg. at 154 days with those which did not receive 36 mg. at 154 days.
Interaction between primary implant and secondary implant significant (P≤.01).

Weight Gain. In trial 1, bulls receiving the initial DES implant of 36 mg. gained at a significantly (P≤.01) faster rate (table 2) than non-implanted bulls during the first 84 days of the feeding trial. Subsequent to 84 days post-weaning, the non-implanted bulls gained at a faster rate than the implanted bulls (table 2).

Table 2 also shows the effect of reimplantation on daily gain. Though differences between accumulative gains were not statistically significant, those bulls which received an implant at weaning exhibited a depressed rate of gain following implantation at 154 days, while those which had not received the initial implant gained faster following the 154-day post-weaning implantation. The initial implant x secondary implant interaction for average daily gain the first 28 days following secondary implantation at 154 days was highly significant (P≤.01). Those bulls receiving the 36-mg. initial implants (weaning and 84 days) and a secondary implant of the same amount at 154 days gained 0.89 kg. per day, while those receiving only the secondary implant gained 1.23 kg. daily. Those receiving only the initial implants gained 1.14 kg. daily, while those receiving no DES gained 1.09 kg. daily. Hence, the lowest gain was made by bulls receiving both implants, while the greatest gain was made by bulls receiving only the secondary implant. The effects of DES implantation on daily gain in trial 2 are shown in figure 1.
There were no significant differences among average daily gains of the three groups of bulls during any period of the trial.

In trial 2 where 72-mg. implants were used, the implanted bull calves did not gain faster than non-implants in the first 84 days, did not gain at a slower rate after 84 days, and did not appear to respond negatively to reimplantation. This apparent contradiction between the results of trials 1 and 2 may be explained by results obtained by Cmarik (1966) indicating that dosage exceeding 48 mg. reduced rate of gain. Casas and Raun (1964) also investigated the effect of dosage on rate of gain and found that higher implant levels (72 and 96 mg.) significantly (P<=.01) lower percent protein in muscle of the 9–10–11th rib section and a significantly (P=.01) higher percent kidney fat. Data in table 3 indicate that bulls which did not receive the initial implants tended to be more lean than those which were implanted initially. Similarly, those bulls which did not receive the secondary implantation tended to be more lean than those which were reimplanted.

The data from trial 2, shown in table 4, indicate that bulls which did not receive DES had leaner carcasses than those which were implanted. Also, those bulls which received only one implant had leaner carcasses than those produced greater gains than either 12 or 48 mg. implants on older animals. Klosterman et al. (1955) used 84-mg. implant levels of DES to significantly increase the daily gain of young bulls. Effects of year and implantation level are completely confounded in the data reported here. Effects of dosage level remain undefined. These data, along with the reports of Koger et al. (1960), Wipf et al. (1964), Martin et al. (1965), Bailey et al. (1966), Cmarik (1966) and Hunsley et al. (1967b), would indicate that the effects of DES on post-weaning daily gain of young bulls are negligible from a practical point of view.

**Carcass Traits.** Effects of DES on carcass traits in trial 1 are shown in table 3. Early implantation had no significant effect on any of the carcass traits examined. Those bulls receiving the late implantation showed a significant (P=.01) lower percent protein in muscle of the 9–10–11th rib section and a significantly (P=.01) higher percent kidney fat. Data in table 3 indicate that bulls which did not receive the initial implants tended to be more lean than those which were implanted initially. Similarly, those bulls which did not receive the secondary implantation tended to be more lean than those which were reimplanted.

The data from trial 2, shown in table 4, indicate that bulls which did not receive DES had leaner carcasses than those which were implanted. Also, those bulls which received only one implant had leaner carcasses than those which received two implants. A greater number of differences (table 4) were found to be significant in trial 2 than in trial 1.

Cahill et al. (1956), Wipf et al. (1964), Martin et al. (1965), Bailey et al. (1966), Cmarik (1966) and Hunsley et al. (1967b) reported effects of DES similar to those reported here on carcass composition, while Koger et al. (1960) reported no effect of DES on carcass composition. Considering all evidence, DES implanted bulls can be expected to produce slightly fatter and higher grading carcasses than non-implanted bulls.

**Testes Histology.** Bulls receiving the late implantation in trial 1 produced testes which weighed significantly (P=.01) less than testes from bulls which did not receive this treatment (table 5). Seminiferous tubule diameter was not affected by DES implantation. At least

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**TABLE 3. MEANS OF CARCASS TRAITS OF IMPLANTED AND NON-IMPLANTED BULLS IN TRIAL 1**

<table>
<thead>
<tr>
<th>Traits</th>
<th>Implanted initially</th>
<th>Initial controls</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Implant 154 days</td>
<td>No implant 154 days</td>
<td>Implant 154 days</td>
</tr>
<tr>
<td>Dressing %</td>
<td>61.8</td>
<td>61.8</td>
<td>61.4</td>
</tr>
<tr>
<td>Carcass gradec</td>
<td>8.7</td>
<td>7.8</td>
<td>7.8</td>
</tr>
<tr>
<td>Marbling scored</td>
<td>5.2</td>
<td>4.6</td>
<td>5.1</td>
</tr>
<tr>
<td>Fat cover, cm.</td>
<td>1.2</td>
<td>1.1</td>
<td>1.2</td>
</tr>
<tr>
<td>Rib-eye area, cm. e</td>
<td>75.5</td>
<td>74.8</td>
<td>76.1</td>
</tr>
<tr>
<td>Kidney fat, %</td>
<td>3.2</td>
<td>2.6</td>
<td>3.0</td>
</tr>
<tr>
<td>% ether extract in muscle of 9–10–11th rib</td>
<td>12.8</td>
<td>12.2</td>
<td>10.8</td>
</tr>
<tr>
<td>% moisture in muscle of 9–10–11th rib</td>
<td>64.3</td>
<td>64.7</td>
<td>65.1</td>
</tr>
<tr>
<td>% protein in muscle of 9–10–11th rib</td>
<td>18.8</td>
<td>19.1</td>
<td>18.2</td>
</tr>
<tr>
<td>% muscle in 9–10–11th rib section</td>
<td>54.9</td>
<td>57.5</td>
<td>56.3</td>
</tr>
<tr>
<td>% fat in 9–10–11th rib section</td>
<td>27.4</td>
<td>24.9</td>
<td>26.1</td>
</tr>
<tr>
<td>% bone in 9–10–11th rib section</td>
<td>17.1</td>
<td>16.9</td>
<td>17.7</td>
</tr>
</tbody>
</table>

*Contrast of bulls receiving 36 mg. at weaning and at 84 days with those not implanted either time.

b Contrast of bulls receiving 36 mg. at 154 days with those which did not receive 36 mg. at 154 days.

c Scale of 1-15; 7=low good, 8=average good, 9=high good.

d Scale of 1-10; 3 represents small, 6 represents slightly abundant.

**P=.01.**
WEIGHT GAIN AND CARCASS COMPOSITION OF BEEF BULLS

TABLE 4. MEANS OF CARCASS TRAITS OF IMPLANTED AND NON-IMPLANTED BULLS IN TRIAL 2

<table>
<thead>
<tr>
<th>Trait</th>
<th>No implants</th>
<th>1 implant</th>
<th>2 implants</th>
<th>No implant—average of two implanted groups</th>
<th>One implant—two implants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dressing %</td>
<td>60.8</td>
<td>61.5</td>
<td>60.8</td>
<td>-.4</td>
<td>0.7</td>
</tr>
<tr>
<td>Carcass grade a</td>
<td>8.7</td>
<td>8.5</td>
<td>9.0</td>
<td>-.1</td>
<td>-.5</td>
</tr>
<tr>
<td>Marbling score b</td>
<td>4.1</td>
<td>3.9</td>
<td>3.8</td>
<td>.03</td>
<td>0.1</td>
</tr>
<tr>
<td>Fat cover, cm.</td>
<td>1.2</td>
<td>1.1</td>
<td>1.4</td>
<td>-.1</td>
<td>-.3</td>
</tr>
<tr>
<td>Rib-eye area, cm.2</td>
<td>69.7</td>
<td>71.6</td>
<td>65.8</td>
<td>1.0</td>
<td>5.8*</td>
</tr>
<tr>
<td>Kidney fat, %</td>
<td>3.1</td>
<td>2.7</td>
<td>2.7</td>
<td>.04**</td>
<td>0.0</td>
</tr>
<tr>
<td>% ether extract in muscle of 9–10–11th rib</td>
<td>15.1</td>
<td>14.0</td>
<td>14.4</td>
<td>.09</td>
<td>-.4</td>
</tr>
<tr>
<td>% moisture in muscle of 9–10–11th rib</td>
<td>63.4</td>
<td>64.1</td>
<td>63.6</td>
<td>-.4</td>
<td>.05</td>
</tr>
<tr>
<td>% protein in muscle of 9–10–11th rib</td>
<td>18.4</td>
<td>18.7</td>
<td>18.4</td>
<td>-.2</td>
<td>.3</td>
</tr>
<tr>
<td>% muscle in 9–10–11th rib section</td>
<td>60.1</td>
<td>57.9</td>
<td>54.4</td>
<td>3.9**</td>
<td>3.5*</td>
</tr>
<tr>
<td>% fat in 9–10–11th rib section</td>
<td>23.3</td>
<td>24.9</td>
<td>27.8</td>
<td>-3.1**</td>
<td>-2.9*</td>
</tr>
<tr>
<td>% bone in 9–10–11th rib section</td>
<td>17.0</td>
<td>16.1</td>
<td>16.2</td>
<td>.8</td>
<td>-.1</td>
</tr>
</tbody>
</table>

a Scale of 1–15; 7=low good, 8=average good, 9=high good.

b Scale of 1–10; 3 represents small, 6 represents slightly abundant.

Considering all carcass traits, there was a tendency toward the non-creep controls producing leaner carcasses than were produced by non-implant controls, creep-fed controls or creep-fed implants. With young bulls, the slight increases in fatness of carcasses associated with preweaning creep feed and post-weaning DES implantation were not additive.

Summary

Two trials were conducted utilizing 110 Angus bull calves to study effects of pre-weaning creep feed and post-weaning diethylstilbestrol (DES) implantation on post-weaning daily gain, carcass traits and testes histology.

Preweaning creep feed produced no significant (P≤.05) effects on post-weaning gain in either trial. Non-creep bull calves did not compensate for a slightly lower rate of gain prior to weaning. There was a very slight tendency for creep-fed bull calves to produce fatter carcasses than non-creep bull calves.

Post-weaning DES implantation produced

three of these implanted bulls were later used in the breeding herd. A satisfactory conception rate (better than 60% conception on first service) from natural service was observed with each bull. This indicates that any impairment of reproductive capacity was only temporary. Similar effects of DES on testicular weight have been reported by Cmarik (1966) and Hunsley et al. (1967b).

Interactions. Preweaning treatment (creep and no creep) interaction with DES implantation (implant and no implant) was found to be a significant (P≤.01) source of variation for a very few carcass traits. In trial 1, non-creep controls averaged 20.0% protein in separable muscle, while the remaining treatment combinations ranged from 17.9 to 18.9% protein. In trial 2, non-creep controls averaged 63.4% separable muscle in the 9–10–11th rib, while the remaining treatment combinations ranged from 55.6 to 56.1% separable muscle. There were no significant (P≤.05) interactions of preweaning treatment with DES implantation with regard to weight gain traits or reproductive tissue traits.

TABLE 5. MEANS OF TESTES TRAITS OF IMPLANTED AND NON-IMPLANTED BULLS IN TRIAL 1

<table>
<thead>
<tr>
<th>Trait</th>
<th>Implanted initially</th>
<th>Initial controls</th>
<th>Differences</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Implant 154 days</td>
<td>No implant 154 days</td>
<td>Initial implant control *</td>
</tr>
<tr>
<td>Tubule diameter, microns</td>
<td>156.9</td>
<td>157.7</td>
<td>0.4</td>
</tr>
<tr>
<td>Testes weight, grams</td>
<td>414.2</td>
<td>459.0</td>
<td>396.4</td>
</tr>
</tbody>
</table>

* Contrast of bulls receiving 36 mg. at weaning and at 84 days with those receiving no implant at either time.

b Contrast of bulls receiving 36 mg. at 154 days with those receiving no implant at 154 days.

** P≤.01.
a short-term (84-day) response in daily gain in trial 1 where the implantation rate was 36 mg. DES and no response in trial 2 where a 72-mg. implantation rate was used. In trial 1, reimplantation had a detrimental effect on daily gain while no effect of reimplantation was observed in trial 2. DES implanted bulls tended to produce fatter carcasses than bulls which were not implanted. Time of implantation and total dosage of DES appeared to be implicated in the magnitude of effects on carcass composition. DES implantation caused a reduction in testes weights but had no permanent effect on reproductive capacity. Effects of preweaning creep feed and post-weaning DES implantation on carcass composition were not completely additive.

Literature Cited


