EFFECTS OF FEEDING DIETHYLSTILBESTROL ON THE
DEVELOPMENT AND REPRODUCTIVE PERFORMANCE
OF DAIRY CATTLE

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SUMMARY

The effects of continuous feeding of diethylstilbestrol (DES) on the development and reproductive performance of dairy cattle were determined.

Heifers fed DES starting at four months of age made more rapid weight gains (P < 0.05) to 15 months of age than controls; however, the difference between groups diminished thereafter. Differences in mammary gland development and height of tailhead were small and temporary in nature. DES feeding had no effect on the ability of the heifers to conceive and produce a normal calf.

There was some indication that reproduction was impaired in a few cows fed 15 mg DES daily starting 30 days postpartum; however, the results with mature cows were inconclusive.

As a result of the widespread use of diethylstilbestrol (DES) in rations for fattening beef cattle, interest has developed concerning the possible effects of feeding DES to dairy cattle of different ages.

Krawczyk and Olson (3) reported that feeding heifers 10 mg of DES daily starting at four to 14 months of age increased weight gains and wither height during a 210-day period. On the other hand, Fosgate and Hedge (2) reported that feeding 10 mg of DES daily increased the rate of gain of heifers over a 58-day period in one trial, but not in another. Rumery and Ward (5) found no significant increase in weight gain or wither height from feeding heifers DES at the rate of 10 mg daily for 351 days. Voelker (7) observed no increase in the growth of dairy calves resulting from feeding 2 or 3 mg of DES daily from four to 116 days of age.

Mammary gland development has been reported by several workers (3-5) to be similar in DES-fed and control heifers. In contrast, Voelker (8) reported that heifers implanted with 15 mg DES monthly for four successive months developed asymmetrical udders.

Krawczyk and Olson (3) observed DES-treated and control heifers to have essentially the same number of estrous cycles, differing only slightly in length. Reuber (4) observed no effect from DES on the frequency and duration of estrus in yearling beef heifers; however, in another trial involving heifers started at seven months of age, those fed DES had over twice as many heat periods as did untreated controls. No significant difference in the number of services required for conception has been observed (3-5) between heifers fed DES and controls. Similarly, Wrenn and Sykes (9) and Browning et al. (1) reported that feeding DES at levels from 5-15 mg daily for varying periods of time had no adverse effect on reproduction in dairy cows.

Previous work on feeding DES to dairy heifers involved animals of varying ages or sizes (3, 5) and relatively short experimental periods (2, 3, 5, 7). Therefore, this study was conducted to determine the effects of continuous feeding of DES on the development and reproductive performance of dairy heifers from four months of age to parturition. In addition, further information was obtained concerning the effect of DES feeding on reproduction in lactating dairy cows.

EXPERIMENTAL PROCEDURE

Two trials were conducted using Holstein cattle from a brucellosis-free herd, in which the calves were vaccinated for brucellosis at seven months of age.

In the first trial, 20 heifer calves were paired on the basis of date of birth and started on experiment at four months of age. One member of each pair was individually fed DES in the grain at the rate of 5, 10, and 15 mg per day from four to six, six to 12, and 12 months of age to calving, respectively. Mammary gland development was evaluated by monthly measurements of teat length to 15 months of age.

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and udder width and length to eight months of age, using the procedure described by Swett et al. (6). Body weight and height of tailhead were recorded at monthly intervals to 18 months of age. The height of tailhead was determined as the distance from pinbone to pinbone in a vertical plane over the tailhead.

Observations were made for estrus and inclination of heifers not in estrus to mount other animals at approximately 8-hr intervals. All heifers were bred artificially starting with the first estrous period after 15 months of age.

In a second trial, 20 cows were paired on the basis of freshening date. Beginning at 30 days postpartum one member of each pair was fed 15 mg of DES daily until the end of the subsequent gestation, except for cows not conceiving during a five-month breeding period. All cows were bred artificially at each estrous period starting at 60 days postpartum, and DES feeding was discontinued for cows not pregnant by seven months postpartum. In cases where pregnancy did not ensue after a four-month period without DES feeding, the cows were slaughtered to ascertain the cause of infertility.

RESULTS AND DISCUSSION

About ten days after the start of the experiment, edema of the vulva and perineum was noted in the heifers fed stilbestrol. This condition, also previously noted by other workers (1, 3) did not persist, but recurred at irregular intervals throughout the experiment. The average increase in height of tailhead was slightly greater in the heifers fed DES than in controls. However, the difference between groups, although statistically significant (P < 0.01), was not great enough to be detected visually and was considered to be of no practical importance.

Only slight differences were found between the two groups in width and length of udder during the period from four to eight months of age, and there was no noticeable difference between the two groups in appearance of the udders at parturition. The apparent edema of the udder and increased teat length observed during the early part of the experiment (Figure 1) was temporary in nature and evidently of little significance. Moreover, the relatively small, yet statistically significant (P < 0.01), difference between groups in teat length disappeared at about 12 months of age, coinciding with the onset of puberty (Figure 2). Thus, it appeared that DES feeding had no permanent effect on udder development of dairy heifers, which is in agreement with results obtained by other workers under similar experimental conditions (3-5).

The average weight gain of the heifers to 15 months of age was significantly greater (P < 0.05) for the DES-fed group than for controls (Table 1). However, the difference between groups diminished during the next three months, possibly because of a change in hormone balance brought about by pregnancy in most of the heifers at this period.

Although the heifers fed DES attained puberty 35 days earlier on the average than those in the control group, the difference between groups was not statistically significant (P > 0.10). Likewise, the number and length of estrous cycles were not sufficiently different for the two groups to indicate any marked change in ovarian function of the DES-fed heifers. The most noticeable difference between the two groups was the increased aggressiveness of the heifers fed DES, as evidenced by the number of attempts made by animals not showing clinical signs of estrus to mount other heifers (Table 1).

Fig. 1. Comparison of control heifer (left) with heifer fed 5 mg DES daily for 6 wk (right).

Fig. 2. Average teat length of heifers from 4 to 15 months of age.
TABLE 1
Growth and reproductive performance of heifers

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Stilbestrol</th>
<th>Control</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight gain (lb)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4-15 months</td>
<td>529</td>
<td>471</td>
</tr>
<tr>
<td>4-18 months</td>
<td>650</td>
<td>620</td>
</tr>
<tr>
<td>Age at puberty (days)</td>
<td>360</td>
<td>395</td>
</tr>
<tr>
<td>Number of estrous cycles prior to first breeding at 15 months of age</td>
<td>4.8</td>
<td>3.4</td>
</tr>
<tr>
<td>Length of estrous cycles prior to first breeding (days)</td>
<td>21.6</td>
<td>25.9</td>
</tr>
<tr>
<td>Aggressiveness rating a, b</td>
<td>17.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Services per conception</td>
<td>1.5</td>
<td>1.9</td>
</tr>
</tbody>
</table>

a Difference between groups statistically significant (P < 0.05).
b Average number of times heifers not in heat were observed to mount others from 12 to 15 months of age.

There was essentially no difference between groups of heifers as to their ability to conceive and produce a normal calf. The greater number of services required per conception for the control group was largely attributable to one animal which required an unusually large number of services. In each group, seven of the ten animals conceived at first service. The sex of the calves was apparently not affected by DES feeding. There were seven heifers and four bulls produced by the DES group, as compared to eight heifers and two bulls in the control group. Thus, continuous feeding of DES had no significantly adverse effects on either the development or reproductive performance of the heifers from four months of age to parturition.

Less consistent results were obtained with mature cows fed 15 mg DES daily from 30 days postpartum to the end of the subsequent gestation. Some cows fed DES conceived readily and calved normally. On the other hand, two cows in the DES group were slaughtered because of failure to conceive following several services during DES feeding and also during a subsequent period when the DES was withdrawn. The specific cause of infertility in these cows was not evident on gross and microscopic examination of the genitalia; however, factors other than DES feeding may have contributed to the condition as both of these cows had placental dystocia following the previous calving. Additional work with a larger number of cows would be needed to critically evaluate the effects on reproductive performance of continuous DES feeding at the rate of 15 mg daily for ten months or longer.

ACKNOWLEDGMENT

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REFERENCES

(7) VOELKER, H. H. Stilbestrol—How Does It Affect Young Dairy Calves? South Dakota Farm and Home Research, 8: 3. 1957.