EFFECTS OF DIETARY ARSANILIC ACID ON THE GROWTH AND WELL-BEING OF YOUNG DAIRY CALVES

E. E. BARTLEY, F. W. ATKESON, H. C. FRYER, AND F. C. FOUNTAIN

Department of Dairy Husbandry and Statistical Laboratory
Kansas Agricultural Experiment Station, Manhattan

Certain organic arsenicals have been reported to be effective in stimulating the growth of chickens, turkeys, and swine (1, 4, 6, 9). Frost (4) presumes that "one action of the phenylarsonic acids is similar to that of antibiotics—in some way altering bacterial metabolism in the tract to favor improved nutrition of the animal."

The effects of feeding arsenicals to dairy calves were determined by Graf and Holdaway (5), who fed p-aminophenylarsonic acid at three levels, 60, 120, and 240 g., incorporated in each ton of milk replacement or calf starter. They reported a lower incidence of scours and more rapid gains during the first 4 weeks after birth. The calves fed levels of 60 or 120 g. per ton of feed made slightly greater gains than those fed the 240-g. level. Owen et al. (8) reported greater weight gains for calves fed 3-nitro-4-hydroxyphenyl arsonic acid at the rate of 57 p.p.m. of total dry matter in ration than for controls or for calves fed terramycin. However, calves fed the arsonic acid made gains that were similar to gains made by calves fed bacitracin and less than gains made by calves fed terramycin. Dewey (3) supplemented the diets of calves between 5 and 90 days of age with 20 mg. of sodium arsanilate daily per 100 lb. body weight. No difference in growth rate was observed between the supplemented and control calves. Also, supplementation of the diet of 4-month-old calves on pasture with 40 mg. of sodium arsanilate daily per 100 lb. body weight did not produce any increase in growth rate. However, with five 4-month-old calves that had been retarded in growth for reasons other than lack of feed, significant increases in growth rate resulted when the calves were supplemented with 15 mg. of sodium arsanilate daily per 100 lb. body weight.

The experiment reported herein was undertaken to provide additional information on the feeding of arsenicals to calves.

EXPERIMENTAL PROCEDURE

Eighteen female calves (four Ayrshires, six Holsteins, and eight Jerseys) were paired by breed and age. From birth to 23 weeks of age, 50 mg. of p-aminophenylarsonic acid (arsanilic acid) was given once daily by capsule to one member selected at random from each pair; the other calf of each pair serving as the control. All calves received their mothers' colostrum the first 3 days.

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2 Through the courtesy of D. V. Frost, Abbott Laboratories, North Chicago, Ill.
TABLE 1

Effect of arsanilic acid on the weights of calves at 4-week intervals

<table>
<thead>
<tr>
<th>Supplement</th>
<th>No. of calves</th>
<th>Weight in per cent of birth weight at:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>4 wk.</td>
</tr>
<tr>
<td>Arsanilic acid a</td>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>None (Control)</td>
<td>9</td>
<td>9</td>
</tr>
</tbody>
</table>

* 50 mg. daily by capsule.

Beginning with the fourth day they were fed whole milk at approximately 10% of body weight daily for the next 4 weeks. After the fourth week, the rate of milk feeding was gradually reduced until a total of 350 lb. had been consumed. The calves usually were weaned from milk between 6 and 8 weeks of age. Alfalfa hay and a calf starter were fed ad libitum beginning at 1 week of age. At the 17th week of age, the calves were changed from the starter to a calf grower. Consumption of starter and grower was limited to 5 lb. for Holsteins and Ayrshires and 4 lb. for Jerseys. The calves were weighed at weekly intervals. Details on the composition of the feeds and on the method of feeding and management were described in a previous paper (2).

RESULTS

The effect of arsanilic acid on growth is shown in Table 1. The calves varied in size owing to differences in breed, sex, and birth weight. Therefore, all weight data were converted to a comparable basis by converting the weekly body weights of each calf into a percentage of original birth weight, the original birth weight being considered 100 for each calf regardless of size. The growth data in Table 1 are presented by 4-week intervals to save space. There were no statistically significant differences in size between control calves and those fed arsanilic acid at any time during the 23-week period of study. This conclusion is based on 23 t-tests applied to weekly differences between the size of calves fed arsanilic acid and their paired controls.

The feed intakes were studied from birth to 16 weeks, inclusive, as this period was considered to be of sufficient duration to evaluate the effect of arsanilic acid on feed consumption. An analysis of variance was made of the body weight gain and feed efficiency for this period (Table 2). The differences between control calves and those fed arsanilic acid were small and not statistically significant.

TABLE 2

Effect of arsanilic acid on body weight gain and efficiency of gain of calves from birth to 16 weeks of age a

<table>
<thead>
<tr>
<th>Supplement</th>
<th>No. of calves</th>
<th>Birth weight (lb.)</th>
<th>Gain in wt. (lb.)</th>
<th>TDN/lb gain b</th>
<th>Digestible protein/lb gain b</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arsanilic acid</td>
<td>9</td>
<td>76</td>
<td>119</td>
<td>2.91</td>
<td>0.66</td>
</tr>
<tr>
<td>None (Control)</td>
<td>9</td>
<td>73</td>
<td>114</td>
<td>3.04</td>
<td>0.69</td>
</tr>
</tbody>
</table>

a None of these differences was statistically significant.

b Calculated from Morrison's (7) tables.

c 50 mg. daily by capsule.
EFFECTS OF ARSENICALS ON CALVES

Study of the effects of the experimental treatments on calf health showed that the nine control calves had a total of 16 digestive and respiratory infections, five slight, two medium, and nine severe. The nine calves receiving arsanilic acid had 15 infections, five slight, one medium, and nine severe. Thus, there was no apparent difference between control calves and those fed arsanilic acid in incidence of disease. Also, there was no apparent difference in physical condition between the two groups of calves. In the environment of this experiment, neither beneficial nor deleterious effects resulted from feeding 50 mg. of arsanilic acid daily per calf.

SUMMARY

This experiment was initiated to study the effects of arsanilic acid on the growth and well-being of young dairy calves. Eighteen calves were divided into two groups, balanced for age and breed. Calves in one group received 50 mg. of arsanilic acid daily per calf, and those in the control group received no arsanilic acid. All calves were started on experiment at birth and continued until 23 weeks of age.

There was no statistically significant difference between the two groups in regard to rate of weight gain or feed efficiency. Also, there was no apparent difference between the two groups in incidence of disease or in physical appearance.

REFERENCES