THE VALUE OF VITAMIN B₁₂, DL-METHIONINE AND POTASSIUM-PENICILLIN IN MILK REPLACEMENT FORMULAS
FOR DAIRY CALVES¹,²

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The development of a milk replacement formula (6, 8) and the widespread use of it by dairymen has shown that calves can be raised successfully with small amounts of saleable whole milk. Significantly increased growth rates in calves, due to ration supplementation with an APF supplement have been reported (2), while other workers (4, 7) have not been able to demonstrate such increases.

The research presented in this report was undertaken in part to furnish additional data on the role of vitamin B₁₂ in calf nutrition. Increased growth rates reported in poultry rations supplemented with 0.3 per cent DL-methionine (1, 3) prompted its use, at the same level, in this work. The use of potassium-penicillin as a milk replacement supplement also was investigated in this trial.

EXPERIMENTAL PROCEDURE

The male Holstein calves used were obtained during the winter of 1951 from Pennsylvania state institutional herds. They were housed in individual solid-walled pens equipped with a water bowl, a salt block and a feeding box for the calf starter. To prevent positional effects, the calves were placed at random throughout the artificially lighted and ventilated stable, maintained at a temperature of 65°F. by steam heat controlled thermostatically. Three measures of growth (body weight, height at withers and chest circumference) were taken each week by the same person and at the same time of day. Daily observations were made of the condition of the feces of each calf. If scours persisted for 24 hr., an 8-g. dose of sulfathalidine was administered orally, followed by an additional 4-g. dose at each of the next two successive feedings.

Twenty-four calves were divided into four groups of six calves each, which were comparable on the basis of body weight, chest circumference and height at withers. All calves were placed on experiment before they were 5 days old.

Group I (control) was fed the following milk replacement formula: 50 lb. dried skimmilk, 10 lb. dried whey, 15 lb. distillers' dried corn solubles, 10 lb. soluble blood flour, 7 lb. dextrose, 5 lb. oat flour, 0.5 lb. vitamin A and D concentrate (4000 U.S.P. units and 500 U.S.P. units per gram) 0.5 lb. trace elements and 2 lb. dicalcium phosphate. Throughout the milk replacement feeding period the control replacement was supplemented as follows: Group II received 50 g. vitamin B₁₂ supplement (6 mg. vitamin B₁₂ per pound); group III received

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0.3 per cent DL-methionine; and group IV received 0.5 g. potassium-penicillin per 100 lb. milk replacement.

The milk replacements were dissolved in water at 100° F. and were fed from open pails placed in the concentrate box located 16 in. above the floor of the pen. The rate of feeding was: First through 4th day—dam’s milk; 5th through 7th day—2 lb. whole milk, 0.2 lb. milk replacement, 2 lb. water (twice daily); 8th through 10th day—1 lb. milk, 0.4 lb. milk replacement, 3 lb. water (twice daily); 11th through 21st day—0.5 lb. milk replacement and 5 lb. water (twice daily); 22nd through 35th day—0.6 lb. milk replacement and 6 lb. water (twice daily); 36th through 49th day—0.7 lb. milk replacement, 6 lb. water (twice daily); and 50th through 56th day—0.7 lb. milk replacement, 7 lb. water (once daily).

All groups of calves were fed *ad libitum* a good quality timothy-alfalfa hay during the trial. Calf starter was fed *ad libitum* until each calf, if possible, was able to consume the maximum of 6 lb. daily for the duration of the 12-wk. trial. The calf starter was prepared as follows: 416.5 lb. ground yellow corn meal, 300 lb. wheat bran, 400 lb. crimped whole oats, 100 lb. linseed oil meal, 300 lb. soybean oil meal (44 per cent protein), 150 lb. dehydrated alfalfa meal, 100 lb. cane molasses, 100 lb. dried skim milk, 100 lb. distillers’ dried corn solubles, 0.5 lb. irradiated yeast (4,000,000 U.S.P. units vitamin D per pound in dry meal form), 10 lb. dicalcium phosphate, 10 lb. ground limestone, 10 lb. iodized salt, and 3 lb. vitamin A feed (4,000,000 U.S.P. units per lb.).

**EXPERIMENTAL RESULTS**

The growth data for these trials are summarized in table 1. When all the growth data were treated statistically (5), no significant differences in growth rates were found at 9 and 12 wk. between the control group and the DL-methionine and vitamin B₁₂-supplemented groups. These negative findings with vitamin B₁₂ supplementations of milk replacements corroborate previous results obtained (7).

The supplementation of a milk replacement with potassium-penicillin resulted in a depression of growth rates. The mean daily gains of the control calves at 9 and 12 wk., respectively, were 0.94 and 1.17 lb. per day, while those for the penicillin-supplemented calves were 0.40 and 0.80 lb. per day. The differences between these rates of gain in weight were significant at the 1 per cent

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**TABLE 1**

Summary of growth data

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<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>I (Control)</td>
<td>6</td>
<td>0.94</td>
<td>0.05</td>
<td>0.07</td>
<td>1.17</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>II (Vit. B₁₂)</td>
<td>6</td>
<td>0.84</td>
<td>0.04</td>
<td>0.06</td>
<td>1.12</td>
<td>0.05</td>
<td>0.07</td>
</tr>
<tr>
<td>III (DL-methionine)</td>
<td>6</td>
<td>0.89</td>
<td>0.05</td>
<td>0.07</td>
<td>1.23</td>
<td>0.05</td>
<td>0.09</td>
</tr>
<tr>
<td>IV (Penicillin)</td>
<td>6</td>
<td>0.40</td>
<td>0.03</td>
<td>0.04</td>
<td>0.81</td>
<td>0.04</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*Expressed as mean daily gains.*
level at 9 wk. in a complete group analysis and significant at the 5 per cent level at 12 wk. in an analysis necessitating the use of estimated values. Estimated values were introduced into the data when two calves in the penicillin-supplemented group died of pneumonia at 9 and 10 wk. of age, respectively, at the time when the replacement feeding period had been terminated and subsistence on starter and hay had become necessary. It also was noted that the penicillin-supplemented group had a greater incidence of respiratory ills, as compared with the other calves on this trial.

All calves drank the milk replacement mixtures readily, but there was a large

**Table 2**

Summary of calf starter consumption (lb.)

<table>
<thead>
<tr>
<th>Group</th>
<th>Total starter for 6 calves</th>
<th>1st 8 wk.</th>
<th>Starter consumed per calf</th>
<th>9th &amp; 10th wk.</th>
<th>11th &amp; 12th wk.</th>
<th>Lb. starter/ lb. gain (12 wk.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I (Control)</td>
<td>1268.0</td>
<td>68.0</td>
<td>68.0</td>
<td>80.0</td>
<td>80.0</td>
<td>2.24</td>
</tr>
<tr>
<td>II (Vit. B₁₂)</td>
<td>1128.0</td>
<td>48.0</td>
<td>58.0</td>
<td>81.5</td>
<td>81.5</td>
<td>2.04</td>
</tr>
<tr>
<td>III (DL-methionine)</td>
<td>1295.5</td>
<td>56.7</td>
<td>65.9</td>
<td>93.0</td>
<td>93.0</td>
<td>2.07</td>
</tr>
<tr>
<td>IV (Penicillin)</td>
<td>613.0a</td>
<td>24.5</td>
<td>30.0</td>
<td>70.9b</td>
<td>70.9b</td>
<td>2.02</td>
</tr>
</tbody>
</table>

*Total for 6 calves.

Based on 4 surviving calves.

difference in the amount of starter consumed, as shown in table 2. The average starter consumption per calf for the control group was 211.3 lb., while that for the penicillin-supplemented group was 102.2 lb. Hence penicillin-fed calves consumed about one-half the amount of starter as did the control calves during the first 10 wk. of the trial. During the last 2 wk. of the trial, the four surviving calves, which had been fed a penicillin-supplemented milk replacement, ate considerably more starter, approaching that amount consumed by the controls over the same period. However, hay consumption among the penicillin-fed calves was not depressed.

**SUMMARY**

The addition of vitamin B₁₂ as well as DL-methionine to a milk replacement formula did not increase growth rates of young dairy calves. These negative findings with vitamin B₁₂ supplementation corroborate former work done at this station. A milk replacement containing potassium-penicillin significantly decreased the rate of gain in weight of dairy calves and lowered the amount of starter consumed by them.

**REFERENCES**


