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EVALUATION OF SPRAY-DRIED WHEAT GLUTEN AS A COMPONENT OF CALF STARTERS

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Summary

Holstein calves (n =52) were on experiment from birth to 10 wk of age. Control calves were fed starters containing soybean meal as the protein supplement. The other calves were fed starters in which part of the soybean meal was replaced by spray-dried wheat gluten. Bull calves fed starters containing wheat gluten consumed more starter during the third and fourth week and gained more weight during the third week than control calves, but overall differences in weight gain or feed intake were not significant, nor was there a significant carryover effect when all calves were fed the same diet.

(Key Words: Calves, Calf Starters, Wheat Gluten, Protein.)

Introduction

In recent research at Kansas State University, nursery pigs showed a significant improvement in performance when spray-dried wheat gluten (SDWG) was included at 6-8% of their diet. Also, a carryover effect occurred, i.e. pigs that had been fed SDWG performed better than control pigs when both groups were fed a common diet.

The objectives of this study were to evaluate the effect of partial replacement of soybean meal by SDWG in starters for preweaned dairy calves and to determine if postweaned calves showed a carryover effect.

Procedures

Holstein calves (n =62) were blocked by date of birth and sex, and calves from each block were randomly assigned to control or treatment groups. All calves were fed colostrum or transition milk for 3 days after birth, then milk at 8% of birth weight until weaning. The calves were housed in individual hutches bedded with straw. Water was always available, except during freezing weather when it was available for at least 1 hour twice daily. The calves were weaned when they consumed at least 1.5 lb starter on 3 consecutive days, provided they were healthy, at least 4 weeks of age, and had gained at least 10 pounds since birth.

Calves assigned to the control group were fed the control diet until they were 7 weeks of age; calves in the treatment group were fed a diet containing wheat gluten to 7 weeks of age. From then until the end of the experiment at 10 wk of age, all calves were fed the common starter. The compositions of the starters are shown in Table 1. Starter was always available and was fed in small amounts at first to ensure freshness. Additions and removal of starter were measured to allow determination of consumption. Periodic samples of the starters were collected and composite for analysis.

Body weights of the calves were measured weekly, and heights at withers were measured at the beginning, at 7 wk of age, and at the end of the experiment.

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Results and Discussion

Four of the calves assigned to the experiment died and six were removed because of sickness. Neither of these problems was a result of the experimental treatments. Weight gains and feed intake are shown by weeks in Table 2. Male calves fed starters containing wheat gluten consumed more feed during weeks 3 and 4 and gained more weight during week 3 than calves fed starters without wheat gluten. However, overall differences were not significant. Average daily gains for weeks 1-5, when most calves were consuming milk and starter, and for weeks 8-10, when calves were consuming only starter, and for the entire period are shown in Table 3. Treatment caused no differences in any of these measurements. Differences in height at withers were not significant.

Feed efficiencies, expressed as weight gain per unit feed, for weeks 8-10 were .37 for male calves not fed wheat gluten and .38 for male calves fed wheat gluten (SE .01). Corresponding values for female calves were .34 for calves not fed wheat gluten and .35 those fed wheat gluten (SE .02). Neither of these differences was significant.

Potentially, a particular protein can be more valuable than one it replaces by providing an improved amino acid balance, by having a different rumen escape potential, by increasing palatability, by having less antinutritional factors, or for other reasons. Amino acid composition of a protein that is degraded in the rumen is less important, because the amino acids are, to a large extent, synthesized into bacterial protein. For this reason, amino acid composition of protein fed to ruminants is less important than that of protein fed to nonruminants, and this may be an explanation for the difference in response between pigs and calves. Because milk provides a very good source of protein that bypasses the rumen, quality of protein in dry feed is less important before weaning.

More research is needed to determine if there is an advantage of feeding wheat gluten to weaned calves. To maximize the potential for benefit from an improved animo acid balance using wheat gluten, the amount of wheat gluten protein escaping rumen degradation and the amino acid composition of the specific fraction escaping rumen degradation should be determined. Also, the increased feed consumption by bull calves fed wheat protein, which was significant in weeks 3 and 4, should be explored more fully. Dry feed consumption is very important in the young calf, because dry feed is responsible for rumen development. Wheat gluten has a desirable effect as a pellet binder, which is important because calf starters are often pelleted and pellet quality is often a problem.

Table 1. Ingredient and Chemical Composition of Calf Starters

Item	Diets[1]		
	Control	Treatment	Common
Ingredient	%		
Alfalfa pellets	9.6	9.6	9.6
Corn, rolled	50.0	50.0	45.6
Oats	19.8	19.8	19.8
Molasses, liquid	5.2	5.2	5.2
Supplement	15.4	15.4	19.8
	Composition of Supplement		
Ingredient	%		
Corn	3.4	26.0	…
Soybean meal	79.9	27.3	85.8
Limestone	6.7	6.7	5.1
Salt, trace mineral	1.7	1.7	1.4
Deccox®[2]	5.7	5.7	76.0
Cellulose	.9	…	…
Wheat gluten	…	30.0	…
Dicalcium phosphate	…	.9	…
Vitamins A, D, and E[3]	1.7	1.7	1.7
Chemical analysis of diets, %			
DM	86.8	86.8	86.6
CP[4]	15.8	15.7	17.7
ADF[4]	9.3	8.6	9.6
NDF[4]	15.2	15.5	14.8

[1]As-fed basis.
[2]Provided 30 mg of decoquinate per lb finished diet.
[3]Provided 1000 IU vitamin A, 140 IU vitamin D, 32 IU vitamin E per lb finished diet.
[4]DM basis.

Table 2. Weekly Feed Intake and Weight Gain

Item Diets	Week 1	2	3	4	5	6	7	8	9	10	Overall
Feed Intake											
Male Calves	lb										
Control diet	0.8	1.7	4.6[a]	13.2[a]	24.8	32.8	36.3	43.2	48.7	52.9	259.1
Treatment diet	1.2	3.6	7.7[b]	15.9[b]	26.0	33.3	38.6	44.4	49.8	53.9	274.4
SE	.2	.4	.8	1.8	1.8	2.0	1.7	1.8	2.2	2.4	11.3
Female Calves											
Control diet	1.0	2.1	5.3	11.0	20.2	29.2	35.6	40.9	44.0	49.7	239.0
Treatment diet	1.0	3.0	6.1	12.6	19.0	27.4	33.1	40.6	46.2	51.3	245.0
SE	.3	.4	1.2	2.2	3.4	2.8	2.5	2.3	2.3	2.1	16.0
Weight Gain											
Male Calves											
Control diet	0.8	5.2	7.9[c]	12.7	12.2	15.2	14.2	17.2	19.2	17.2	121.7
Treatment diet	1.9	6.8	11.2[d]	9.6	10.9	16.5	14.2	17.8	20.2	18.5	127.5
SE	.9	.9	1.2	1.8	1.6	1.7	1.2	1.4	1.8	2.1	5.5
Female Calves											
Control diet	0.8	4.8	6.8	10.7	13.1	14.4	13.6	14.9	14.8	16.7	110.4
Treatment diet	0.8	4.6	8.5	10.4	10.8	13.0	13.6	17.1	17.4	13.8	110.0
SE	1.0	1.2	1.5	1.6	1.6	1.8	2.0	1.4	1.5	1.6	8.1

[a,b]Means within the same column, within response, with different letters differ ($P<0.05$)
[c,d]Means within the same column, within response, with different letters differ ($P<0.10$)

Table 3. Average Weight Gains during Certain Periods

Group	Average daily gains, lb Weeks 1-5	Weeks 8-10	Overall
Male Calves			
Control	1.11	2.55	1.74
Treatment	1.15	2.70	1.82
SE	.14	.08	.12
Female Calves			
Control	1.03	2.21	1.58
Treatment	1.00	2.30	1.57
SE	.11	.08	.16