

Reproductive performance of reindeer fed all-grain and hay-grain rations

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Abstract: Reproductive performance of grain-fed reindeer (*Rangifer tarandus*) was evaluated over a 2-year period. Groups of pregnant reindeer were fed one of three rations, (1) 100% whole-grain barley, (2) 98.9% whole-grain barley and 1.2% mineral and trace element supplement, and (3) 70% whole-grain barley and 30% finely-chopped bluegrass hay. Reindeer fed unsupplemented whole-barley failed to produce a single live calf. The addition of mineral and trace element supplement to the ration did not result in any significant improvement in reproductive performance. Eighty-five percent of the reindeer consuming unsupplemented and supplemented all-barley rations became pregnant; however, 76% of the pregnancies resulted in stillborn calves. One-hundred percent of the cows maintained on the grain/hay ration produced live calves. We speculate that reproductive failure in reindeer cows maintained on all-grain rations is most likely a result of a diet induced dysfunction in maternal rumen and/or carbohydrate metabolism rather than a micro-nutrient deficiency. More research is needed to determine which metabolic pathways are affected.

Keywords: all-grain rations, reindeer, dystocia, stillborn.

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Rangifer, Special Issue No. 1, 1986: 39 - 41

Introduction

Reindeer (*Rangifer tarandus* spp.) herders in Alaska have always relied upon tundra rangeland as the only feed resource for their animals. Because of this dependency, feed availability and herd performance has often been affected by range quality, snow conditions and current competitive range-use by caribou (*Rangifer tarandus granti*). Alternate feeds could be invaluable to herders when used as a supplement to tundra rangeland. In addition, alternate feeds could also be utilized during emergencies caused by prolonged adverse weather or depletion of local grazing resources.

Experiments have been conducted to determine the feasibility of using Alaskan-grown livestock feeds as a supplement to tundra range and also as an alternative to grazing (Blanchard *et al.*, 1983). Due to the fact that cereal grain is the most available livestock feed in Alaska, initial studies focused on performance of reindeer fed all-grain rations (Blanchard, 1983). Initial trials showed that reindeer fed all-grain rations

maintained considerable body finish throughout the winter months (Blanchard and Luick, 1980). However, preliminary findings also indicated that reindeer cows fed all-grain rations throughout gestation experienced a high incidence of reproductive failure (Blanchard *et al.*, 1983; Blanchard *et al.*, 1984).

The purposes of the feeding trials reported in this paper were to determine the extent of reproductive failure in grain-fed reindeer and to speculate on the role of nutrient imbalance or nutrient deficiency in reproductive failure.

Methods

Feeding trials were conducted during 1983 - 84 and 1984 - 85 using adult reindeer cows. Reindeer were placed on their respective rations 2 to 4 months prior to the fall rut and then maintained on these rations throughout gestation.

All-grain rations are typically low in several nutrients, including fiber and certain minerals and trace elements (National Academy of Sciences, 1971). In addition, unsupplemented

Table 1. Nutrient analysis (percent of dry-matter) of rations

Rations	NDF	ADF	Ca	P	K	Na
1984-WB ¹	26.9	10.4	0.08	0.42	0.74	0.04
1985-WB	40.9	8.5	0.13	0.36	0.57	0.06
1985-WB-MIN ²	36.0	8.0	0.44	0.34	0.30	0.18
1985-WB+HAY ³	50.6	17.3	0.22	0.32	0.83	0.06

¹ 100% whole-grain barley.

² 98.8% whole-grain barley, 0.55% limestone, 0.65% vitamin and mineral supplement.

³ 70% whole-grain barley and 30% bluegrass hay.

all-barley rations (Table 1) have a relative imbalance of calcium to phosphorus (0.2:1.0) and sodium to potassium (0.05:1.00). To determine the effect of the level of micro-nutrient intake on reproductive performance, one grain-feeding group (1984-WB+MIN) was maintained during 1983 - 84 on an all-whole-grain barley ration supplemented with a mineral and trace element block (*ad libitum*). The other 1983 - 84 group (1984-WB) served as a control and was maintained on an unsupplemented all-whole-grain barley ration.

During 1984 - 85, three feed groups were established. One group (1985-WB) served as a control and received an unsupplemented all-whole-grain barley ration (a repeat of 1983 - 84 control). During the 1983 - 84 trial, *ad libitum* mineral and trace element intake of the 1984-WB+MIN group was very low and therefore did not significantly increase micro-nutrient intake or change the low Ca:P and Na:K ratios significantly from that of the unsupplemented all-barley ration. A feed group (1985-WB+MIN) was created during the 1984 - 85

trial to again test the effects of mineral and trace element supplementation on the reproductive performance of reindeer fed all-barley rations. To assure sufficient intake, supplement was mixed directly with the grain producing a ration of 98.8% whole-grain barley, 0.65% limestone flour and 0.55% mineral and trace element supplement. This ration contained a Ca:P ratio of 1.3:1.0 and a Na:K ratio of 0.6:1.0.

A third feed group was established during the 1984 - 85 trial to determine the effect of adding a roughage source to all-barley rations. This group (1985-WB+HAY) was offered a ration (*ad libitum*) of 70% whole-grain barley and 30% finely-chopped bluegrass hay. This ration was not supplemented with micro-nutrients. The Ca:P ratio of 0.70 to 1.00 and Na:K ratio of 0.07 to 1.00 were considerably lower than that of the supplemented all-barley ration (1985-WB+MIN).

Results

Reindeer fed unsupplemented all-whole-grain barley rations failed to produce a single live calf

Table 2. The reproductive performance of reindeer fed all-grain and grain/hay rations.

Feed group ¹	N ²	Number pregnant cows	Number of calves produced			Mean birth weight (kg)	
			Live at birth	Live at 48 h	Stillborn	Live	Still
1984-WB	6	6/6 ³	0/6	0/6	6/6		8.3
1984-WB+MIN	7	6/7	1/6	0/6	5/6	4.8	5.8
1985-WB	3	2/3	0/2	0/2	2/2		2.3
1985-WB+MIN	4	3/3	2/3	1/3	1/3	4.1	2.7
1985-WB+HAY	4	4/4	4/4	4/4	0/4	6.6	

¹ WB=100% whole-grain barley (1984 & 1985); WB+MIN=100% whole grain barley plus mineral lick (1983 - 84) and 98.8% whole grain barley, 0.65% limestone flour, and 0.55% vitamin and mineral supplement (1984 - 85); and WB+HAY=70% whole grain barley and 30% choppel bluegrass hay.

² Number of reindeer in group sampled.

³ 6/6=(number in this category) compared to (total number in this sample).

(Table 2). Reindeer consuming supplemented all-barley rations experienced only a slight improvement in reproductive success. The 1984-WB+MIN group produced one live calf that died within 48 hours of birth after failing to stand and nurse. Similar results were observed in the 1985-WB+MIN group where one calf died within 48 hours of birth and another weak and frail calf with a birthweight of only 2.3 kg lived for 7 days.

During the 1983 - 84 trial, 70% of the cows produced stillborn calves, of which all were malpresented at parturition. In all cases, malpresentation resulted in severe dystocia, and ultimately caused the death of two cows. During the 1984 - 85 trial, 33% of the stillborn calves were malpresented. All reindeer in the 1985-WB+HAY group produced live calves, which averaged 6.6 kg at birth.

Conclusions

The low absolute levels and relative imbalance of several micro-nutrients in barley may in part contribute to reproductive failure in reindeer cows fed all-barley rations. However, results from the present feeding trials indicate that factors other than micro-nutrient status alone are contributing to reproductive failure, since supplemented rations resulted in only a slight improvement in reproductive success. In addition, micro-nutrient status of reindeer consuming a 70% barley/30% chopped hay rations was not substantially improved over that of reindeer consuming an unsupplemented all-barley ration, yet, consuming the grain/hay ration resulted in high reproductive success.

Replacement of 30% of the grain (by weight) with hay increased neutral detergent fiber by 25% and doubled the acid detergent fiber content of the ration (all barley vs. barley/hay). This increase in fiber may have resulted in significant changes in rumen function, volatile fatty acid production, maternal carbohydrate metabolism and/or partitioning of nutrients between maternal and fetal tissues. More research is needed to determine the specific metabolic effects that occur when grain rations are fed to reindeer.

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