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Pine Needle Abortion Among Cows Grazing Foothill Ranges

A Progress Report

L. D. Kamstra and C. Cogswell

The frequent occurrence of pine needle abortion in cattle grazing foothill ranges having tree stands of ponderosa pine (Pinus ponderosa) causes management problems for many ranchers in South Dakota, Wyoming, Colorado, Idaho, and California as well as many areas in Canada. Surveys (1973-75) covering eight counties in western South Dakota and eastern Wyoming indicate the area loss to be approximately 700 calves annually even with good management to prevent pregnant cows from consuming pine needles. Loss of the cow as well from infection of a retained placenta is not unusual. In 1975, for example, one rancher lost 38 calves from pine needle abortion and 12 of the cows thereafter from infection resulting from retained placentas. Investigations are in progress to isolate and identify the causative factor in pine needles. Ranchers assumed the factor to be present in needles only during late winter and early spring since this was the period when abortions were noted with cattle.

Materials and Methods

Since our first objective was to determine when the abortive factor was present in pine needles, collections of pine needles were made monthly throughout 1 year. The presence or absence of the abortive factor was determined by feeding freeze-dried water and acetone extracts to bred mice and examining fetal growth after 5, 6 and 7 days. Another group of mice was fed in a similar manner and allowed to complete the gestation period to determine how many young would be produced while being fed pine needle extracts. The needles were also analyzed for fiber, lignin, protein and in vitro digestibility.

Results and Discussion

Our laboratory analyses indicate the nutritive value of pine needles is comparable to low quality hay, having a fiber content of 28 to 35%, lignin 12 to 15% and digestibility varying between 30 to 42% depending on the time of collection. It would appear that pine needles are a highly fibrous, lignified material with low potential for animal utilization such that animals should have no special incentive to seek out pine needles as a feed source under normal conditions. The active abortive principle was found to be present in pine needles during all collections regardless of the season of the year.

Control mice fed only Purina Mouse Chow had a ( $P < .01$ ) greater number of viable embryos at 5 to 7 days post coitum than mice fed either the water or acetone fractions of pine needles (table 1).

If mice were fed pine needle extracts throughout the entire 21-day gestation period, very few live births occurred (table 2). It was also noted that, even when some live births did occur, the young were weak and often died within 3 days after birth.

If small animal studies can be applied to what might occur on the ranch, it would appear that the rancher's concern for potential calf losses from pine needle abortion is justified. Since the abortive factor has been found to be present in pine needles throughout the year, it might be expected that not only will abortion occur but also resorption of fetuses if cows consume needles early in pregnancy. As noted in the studies with mice, fetal absorption had begun within 5 days after the animals were bred. It might be predicted, therefore, that ranchers would observe abnormal numbers of barren cows if animals consumed needles throughout the year.

Table 1. Number of Viable Embryos at Five, Six or Seven Days Post Coitum

Days post coitum	Control	Treatment <sup>a</sup>		
		1 <sup>b</sup>	2 <sup>c</sup>	3 <sup>d</sup>
5	6	5	1	2
6	7	4	0	3
7	7	3	0	2

<sup>a</sup>Number of viable embryos is the average per bred female. Twelve mice were used to test extracts from needles collected at six different collection dates.

<sup>b</sup>Treatment 1 mice were fed the water extracts from an amount of pine needles equal to the weight of mouse chow.

<sup>c</sup>Treatment 2 mice were fed the water extracts in a ratio of 2:1 to mouse chow.

<sup>d</sup>Treatment 3 was similar to treatment 1 except the extraction solvent was acetone rather than water.

Table 2. Effect of Pine Needle Extracts on Pregnancy in Mice

Experiment number <sup>a</sup>	Control	Treatment <sup>b</sup>		
		1 <sup>c</sup>	2 <sup>d</sup>	3 <sup>e</sup>
Average number of live births per mouse				
1	8	3	0	0
2	8	3	0	0
3	8	0	0	4
4	8	1	1	0
5	8	3	0	0
6	8	0	0	0

<sup>a</sup>Experiments 1 to 6 utilized needles collected on November 30, January 5, January 21, February 28, March 23 and April 26, respectively.

<sup>b</sup>Two mice were used for each treatment at each collection date.

<sup>c</sup>Treatment 1 mice were fed the water extracts from an amount of pine needles equal to the weight of mouse chow.

<sup>d</sup>Treatment 2 mice were fed the water extracts in a ratio of 2:1 to mouse chow.

<sup>e</sup>Treatment 3 was similar to treatment 1 except the extraction solvent was acetone rather than water.