

Mimeographed Circular M-271

October, 1955

A Preliminary Report of Studies on
Chlorinated Naphthalene Toxicity in Sheep

By W. E. Brock, D. V. M.



Experiment Station

Agricultural Experiment Station
DIVISION OF AGRICULTURE
Oklahoma A. & M. College
Stillwater

A Preliminary Report of Studies on
Chlorinated Naphthalene Toxicity in Sheep

By W. E. Brock, D. V. M.
Veterinary Research

Little experimental work has been done to determine whether the highly chlorinated naphthalene compounds are toxic to sheep and, if they are, the nature of the symptoms and lesions in sheep. Olafson and McEntee (1) fed two sheep the same feed that produced hyperkeratosis in cattle. They found that the sheep required, on a per weight basis, approximately ten times more of the contaminated feed to produce illness than did cattle. This indicates that sheep are much more resistant to chlorinated naphthalene poisoning than are cattle. They state (McEntee and Olafson (2)) that there was fluid in the body cavities and squamous metaplasia of the uterus and cervix; but they do not mention the symptoms and lesions most commonly associated with bovine hyperkeratosis such as lachrymation, salivation, thickening of the skin and loss of hair, ulceration of the oral mucosa, and a marked decrease in plasma vitamin A.

Large quantities of pelleted feeds are fed to sheep in Oklahoma. Contamination of pelleted feed with certain types of grease containing the highly chlorinated naphthalenes during the pelleting process has been incriminated as a cause of bovine hyperkeratosis. This experiment was initiated to determine if commercially pelleted feed would produce symptoms of bovine hyperkeratosis in sheep, and to determine the toxicity of chlorinated naphthalene for sheep and the symptoms and lesions produced by such toxicity. This report concerns the first objective: Does commercially pelleted feed produce symptoms of bovine hyperkeratosis in sheep?

Method

Fifteen ewes were divided at random into three lots of five animals each. The sheep were weighed at the time they were divided into lots and at approximately monthly intervals through the duration of the experiment.

The ewes were placed, by lot, in separate indoor pens. Wheat straw was used as bedding. Water was provided in a separate tub in each pen. The concentrate feed and hay were fed in a rack with a trough under the rack.

The ewes were fed 1/4 pound of cottonseed concentrate per ewe per day for 39 days, the concentrate then being increased to 1/2 pound per ewe per day for 44 days. A poor quality alfalfa hay was fed the ewes at the rate of 3 pounds per ewe per day.

The concentrate feed was obtained from two plants of the Chickasha Cotton Oil Company. The ewes in Lot 1 were fed cottonseed pellets from the Anadarko plant; Lot 2 ewes were fed cottonseed meal from the Chickasha plant; Lot 3 ewes were fed cottonseed pellets from the Chickasha plant.

Each ewe was examined at weekly intervals for symptoms of disease, particularly lesions in the mouth, nostrils and eyes that might be associated with vitamin A deficiency or bovine hyperkeratosis. Samples of blood for vitamin A analysis of the plasma were taken from each sheep before she was placed on feed and at 5- to 15-day intervals during the experiment.

Results and Discussion

As shown in Table I, random allotment resulted in placing the two heaviest of the 15 ewes in Lot 2. This chance factor caused Lot 2 to have a significantly higher initial weight, and this lot continued to be heavier than the other two lots throughout the experiment. This is evidence that there was no measurable effect on weight in the ewes due to the three different concentrate feeds, since no lot gained or lost weight more rapidly than the other lots.

Additional evidence that the feed had no measurable effect on weight is found in the weights within each lot. There was no significant change in the weight of the ewes in each lot from the initial weight taken at the time the animals were placed on the feed to the last weight taken 83 days later. If any of the feeds had had a deleterious effect on the weight of the sheep, evidence of this effect should have become apparent during the time the sheep were eating that feed.

As shown in Table II, vitamin A values of the plasma within Lots 1 and 2 showed a significant increase, but there was no significant change in the vitamin A values within Lot 3. The vitamin A values of the plasma did not show any significant change between the three lots. The increased vitamin A values in lots 1 and 2 can be attributed to the alfalfa hay fed during the experiment. The initial values of Lots 1 and 2 were somewhat low, so that the vitamin A in the alfalfa hay increased the vitamin A content of the plasma in these lots to more nearly that found in Lot 3. However, since the initial vitamin A content of the plasma of Lot 3 was more nearly normal, there was no significant change among the sheep of that lot. Therefore the feeds given these three lots of sheep during this experiment had little effect on the vitamin A content of their plasma except to increase the vitamin A content in those cases where it was initially lower.

No symptoms or lesions of vitamin A deficiency or bovine hyperkeratosis were found on clinical examination of the sheep in Lots 1, 2, and 3 during this experiment.

TABLE I. --Weight of Ewes During Experiment.

Lot	Sheep No.	Weight (pounds)		
		0 day	42nd day	83rd day
1	1	101	94	92
	2	97	96	89
	3	109	104	103
	4	91	89	82
	5	92	85	78
2	6	102	96	94
	7	90	97	93
	8	136	134	132
	9	103	102	100
	10	134	134	135
3	11	102	104	101
	12	102	97	100
	13	95	98	98
	14	93	93	94
	15	87	86	87

TABLE II. --Vitamin A Content of Plasma.

Lot	Sheep No.	Vitamin A (gamma/100 ml.)							
		0 day	5th day	10th day	20th day	25th day	40th day	55th day	70th day
1	1	23.9	27.9	40.7	27.9	31.0	30.0	36.3	35.8
	2	31.2	28.4	34.1	18.9	31.0	27.9	30.0	33.1
	3	32.6	33.1	33.6	20.3	34.1	33.1	33.6	34.7
	4	23.9	21.4	28.4	18.9	28.9	23.9	26.4	28.4
	5	27.9	27.9	32.6	17.9	30.0	23.4	28.9	28.4
2	6	28.9	25.8	28.9	21.9	31.0	31.0	31.0	31.0
	7	30.5	37.9	45.1	32.0	39.5	36.8	42.3	41.7
	8	16.0	32.6	32.6	25.8	32.0	27.9	32.6	25.8
	9	36.3	26.4	38.4	21.4	36.3	29.4	36.3	32.0
	10	32.0	29.4	34.1	27.4	34.7	32.0	35.2	42.9
3	11	26.8	26.8	28.4	22.3	29.4	24.4	24.4	35.2
	12	36.8	34.7	39.5	30.5	42.3	28.9	37.4	37.4
	13	33.6	33.1	37.9	23.4	31.5	25.8	33.6	39.5
	14	37.9	28.9	35.7	31.0	34.1	33.6	39.5	44.0
	15	37.4	41.7	50.3	34.1	40.1	36.3	42.9	41.2

Summary

Fifteen ewes were randomly divided into three lots of five ewes to each lot. Lot 1 was fed cottonseed pellets from the Anadarko plant of the Chickasha Cotton Oil Company. Lot 2 was fed cottonseed meal from the Chickasha plant, and Lot 3 was fed cottonseed pellets from this same plant.

Lot 2 had an initially higher mean weight than Lots 1 and 3. There was no significant change in weight of the sheep during the experiment.

There was a significant increase in vitamin A plasma levels in Lots 1 and 2. Comparison of the vitamin A value of the plasma of all the sheep showed no significant change.

No clinical symptoms or lesions of vitamin A deficiency or of bovine hyperkeratosis found in these sheep during the experiment. These results indicate that the feed given these sheep had no deleterious effects on weight, vitamin A levels of the plasma, or general health.

Literature Cited

1. Olafson, P., and McEntee, K.: "The Experimental Production of Hyperkeratosis (X-Disease) by Feeding a Processed Concentrate." Cornell Vet. 41:107-109. 1951.
2. McEntee, K., and Olafson, P.: "Reproductive Tract Pathology in Hyperkeratosis of Cattle and Sheep." Fertil. & Steril. 4:128-136. 1953.