

Iodine in the Nutrition of Sheep.

Final Report.

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INTRODUCTION.

ALTHOUGH it is universally recognized that Iodine is an essential element in nutrition, several workers have recently hesitated to advocate a general supplementation of iodine in the rations of live stock. It may well be argued that the continued administration of iodine may prove harmful to various internal organs. Malan *et al* (1935) drew attention to the increasing list of investigators who have become less enthusiastic about iodine, and some of whom have even sounded a warning in regard to the indiscriminate use of iodine in stock licks.

The work carried out at this Institute since 1932 [Malan *et al* (1932) and Malan *et al* (1935)] has not shown that the regular supplementation of small doses of potassium iodide proved beneficial to sheep. In fact, several of the ewes that received iodine aborted, or gave birth to clinically abnormal lambs. As abnormalities in regard to reproduction proved to be aggravated in the earlier work, it was concluded that the low vitamin A content of rations might have exerted an undesirable influence. It was, therefore, decided that further work should be done with the view of obtaining more conclusive evidence relative to the regular supplementation of iodine to sheep.

DESCRIPTION OF EXPERIMENT.

Twenty 4-tooth merino ewes were selected for this experiment. These were divided into two conformationally uniform groups. All the sheep received the same basal ration, which from past experience has proved to be slightly above maintenance requirements for sheep weighing about 70 pounds, when kept under similar conditions. The ration consisted of: 300 gms. crushed yellow maize, 50 gms. blood meal, 50 gms. veld hay and 50 gms. greenfeed.

The sheep were fed in individual pens and managed according to the description given by Malan *et al* (1935). A stock solution of KI was prepared, consisting of 20 gms. of KI per 5,000 c.c. of water, and the sheep dosed daily as follows:-

Group I—Controls—received 12 c.c. of water.

Group II—received 12 c.c. of solution containing 40 gms. KI.

In order to equalize handling and treatment in all sheep, Group I was dosed daily with 12 c.c. of pure water. The period of iodine supplementation was a relatively short one as may be seen in Fig. 1. Four months after supplementation was commenced, the sheep were shorn and were then put to the rams. In view of the researches done by Roux (1936), which showed that merino sheep come into oestrus more regularly from December to February, the rams were left with the ewes for a period of three months.

RESULTS.

(a) *Feed Consumption.*

As a rule all the feed was eaten and weighing back of any feed which remained unconsumed only became necessary in such cases as were off feed for short periods. It may, therefore, be taken that the full ration was consumed throughout the period. The greenfeed was included in order to ensure an adequate supply of vitamin A, and consisted of such material as was available at the time, e.g. green oats, barley or maize stalks and leaves.

(b) *Weights.*

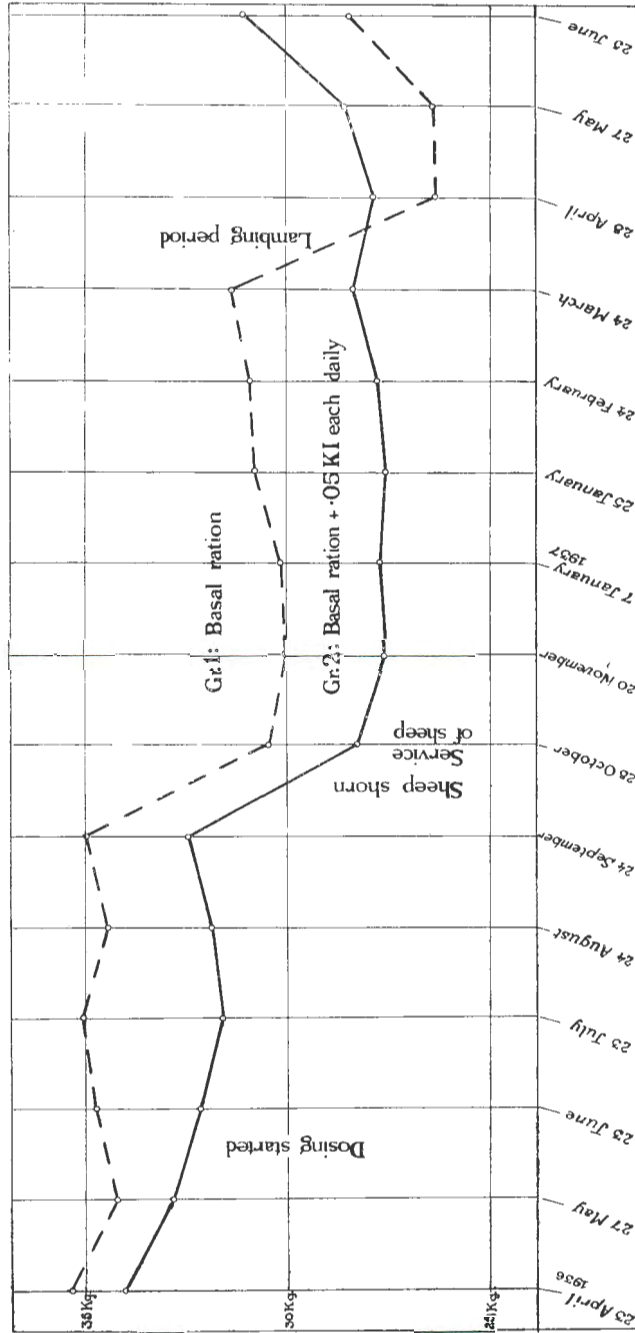
The sheep were weighed monthly and the record of the weights are given in Figure 1.

It will be noticed from the graph that the group which received KI weighed on an average 1.3 Kg. less than the control group at the commencement of the experiment. The difference in average weight between groups 1 and 2 gradually increased as the experiment progressed. Just before shearing all the sheep, this difference was 2.4 Kg. and the last weight recorded before the commencement of lambing indicates a difference of 3.0 Kg. in favour of the control group. A careful study of the curve shows that the widening gap may be attributed to a definite lag in average weight gain of the group that received the iodine supplement.

A far more severe drop in weight is registered in the case of the control group shortly after lambing than occurred in group 2. For an explanation the lambing chart, Table 1, should be consulted.

From the data given in Table 1 it will be seen that seven lambs were born in Group 1 as compared with five lambs in Group 2. Two lambs were lost in Group 1, the first on the day of birth due to a wrong presentation and the other two days after it had been born because the ewe refused to allow the lamb to drink. Five lambs were, therefore, reared in the control group.

FIG. 1.—*Monthly Weights of Sheep.*



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TABLE I.

Number of Ewe.	Date Served by Ram.	Date of Birth of Lamb.	Sex of Lamb.	Weight of Lamb at Birth.	Gestation Period.	Cause of Death of Lamb.	Date of Death of Lamb.	Cause of Death of Ewe.	Date of Death of Ewe.	Remarks.
<i>Group 1.</i>										
40325	6/11/36.....	5/4/37	Ewe	7 lb.	150 days	---	---	---	---	---
40304	5/1/37 and during December	---	---	---	---	---	---	---	---	---
40344	16/11/36.....	18/4/37	Ram	6 lb.	147 days	---	---	---	---	---
40281	21/11/36.....	18/4/37	Ram	5½ lb.	151 days	Ewe refused to take it	20/4/37	---	---	Not Pregnant.
40309	---	---	---	---	---	---	---	---	---	---
40291	6/11/36.....	7/4/37	Ewe	8 lb.	153 days	---	---	Peritonitis	3/11/36	Before Service.
40294	9/11/36.....	12/4/37	Ram	8½ lb.	154 days	---	---	---	---	---
40271	During December	2/5/37	Ram	7-3 lb.	?	---	---	---	---	---
40279	28/10/36.....	---	---	---	---	---	---	Enteritis and Suspected Heartwater	8/5/37	Not Pregnant.
40337	19/11/36.....	17/4/37	?	?	151 days	Wrong Presentation	17/4/37	Dystokia	17/4/37	---
<i>Group 2.</i>										
40326	22/1/37.....	24/6/37	Ewe	6 lb.	154 days	---	---	---	---	---
40319	---	---	---	---	---	---	---	---	---	---
40350	---	---	---	---	---	---	---	---	---	---
40341	---	---	---	---	---	---	---	---	---	---
40278	?	8/4/37	Ewe	3½ lb.	?	Deformed	8/4/37	---	---	---
40331	16/11/36.....	23/4/37	Ram	8½ lb.	159 days	Abortion Full Time	23/4/37	---	---	---
36467	28/10/36.....	26/3/37	Ram	5½ lb.	150 days	Abortion	26/3/37	After Effects of Abortion	12/4/37	---
40318	25/10/36.....	---	---	---	---	---	---	---	---	---
40312	---	---	---	---	---	---	---	---	---	---
40306	22/1/37.....	24/6/37	Ewe	4½ lb.	154 days	---	---	Pneumonia	1/8/36	Not Pregnant. Before Service.

Out of the five pregnancies in the group that received potassium iodide, there were two abortions and one deformed lamb was born that lived for a few hours only. In consequence only two lambs were reared in group 2.

In each group one ewe died early in the experiment so that this equalized conditions, especially as these ewes had not been served. Notwithstanding the length of the period that the rams were allowed to run with the ewes, conception apparently did not take place in the case of two ewes in Group 1 and four ewes in Group 2.

When all the factors in regard to the lambing are taken into consideration, it may be readily appreciated why the average group weight in Group 1 dropped below that of Group 2 during and after lambing. In spite of the loss in weight and the larger number of lambs that were being suckled in Group 1, this group showed a remarkable weight recovery during the last month of the experiment.

At the conclusion of the experiment one ewe in each group was submitted for a complete pathological examination by Dr. A. D. Thomas, Pathologist. Perhaps the most noticeable feature in the report received in regard to this examination refers to the skin and wool:—

Skin.—Control—Normal.

Sheep that received KI.—The hair follicles appeared closer together and deeper than in the control. There was evidence of a diffuse inflammatory process with occasional isolated eczematous crusts on the surface. It seemed as if there was greater activity of all epithelial cells: e.g. The sweat glands were thick-walled.

Wool.—Control—There was a recent break, otherwise the thickness was fairly uniform.

In the sheep that received KI the thickness varied somewhat. Eczematous crusts and mild inflammation of the skin was present.

The thyroids, which were examined in both ewes and lambs, showed cell changes but not the usual characteristic enlargements. No definite information could, therefore, be gained by the pathological examination of the thyroids.

DISCUSSION.

A consideration of all the data collected considerably strengthens the conclusions arrived at in past work at this Institute. Figure I and Table I clearly show that the daily administration of 0.05 gms. of potassium iodide did not benefit significantly a group of ten merino sheep. Although the weight curve as well as lambing chart suggest that potassium iodide supplementation had a detrimental effect, the results are not so marked as was the case when other deficiency factors, e.g., vitamin A or phosphorus, were also present as shown in the past work. There is little doubt therefore, that iodine supplementation is not warranted and that its

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deleterious effects are aggravated in the presence of other nutrient insufficiencies. The work of Williams *et al* (1938) drew attention to the occurrence of a condition among lambs where there was thyroid enlargement, nervous symptoms and as found by Malan *et al* (1932) these lambs lived only for a few days. The most acute deficiency in both instances probably was vitamin A. The supply of green succulence may not be adequate, consequently the intake of vitamin A would be low for pregnant ewes during the late winter months. During these months natural grazing may be lacking in quantity and in nutrients such as phosphorus and protein. Iodine supplementation in such circumstances will prove more harmful than when rations adequate in all nutrients are fed. The relatively short gestation period of the ewe may fall almost entirely within the interval of grazing deficiency or drought. The result not infrequently is the occurrence of a condition in lambs which appears to have a bearing on an iodine deficiency but which may be entirely unassociated with it. Goitrous conditions, as a result of an iodine deficiency, are however very rarely if at all seen among farm animals in this country. It is hoped that more light will be cast on this question when the present experimental work on poor nutritional conditions in relation to the production of disease has been concluded.

SUMMARY.

1. Two groups of 10 merino ewes were fed the same adequate basal ration with the exception that one group received an addition of 0.05 gms. each daily of potassium iodide.

2. A slight depression of weight and greater irregularity in regard to the reproduction was shown by the group that received the iodine supplement. The detrimental effects, however, were not as marked as recorded in previous work where other deficiencies, especially vitamin A, undoubtedly exercised an aggravating influence on reproductive abnormalities.

3. The indiscriminate use of iodine supplements for sheep is not recommended.

LITERATURE.

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