EFFECTS OF IODINE SUPPLEMENTATION OF EWES ON SURVIVAL AND GROWTH OF LAMBS

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SUMMARY

Ewes were injected intramuscularly with 1 ml iodised oil at mating or during the first two months of pregnancy to determine if marginal iodine deficiency contributed to the high mortality of newborn lambs in Victoria. Iodine treatment markedly increased milk iodine concentration of ewes. In nine of ten trials conducted in 1979 and 1980 at Ararat, Hamilton, Langi Kal Kal, Ruffy, Rutherglen and Trawalla, iodine supplementation of ewes had no effect on lamb survival, growth of lambs to weaning, and ewe wool production. At Trawalla in 1979 goitrous lambs were born to control ewes, and there was a marked difference in lamb survival between control and treated groups in one of two trials. In one of three years at Hamilton milk iodine concentrations of control ewes less than 80 µg/l indicated a marginal iodine deficiency and their newborn lambs had lower serum thyroxine concentrations than lambs of treated ewes, but there were no significant differences in birthweights and survival of newborn lambs between the groups. The trials indicated that iodine deficiency was not a major factor limiting the survival of newborn lambs and that widespread iodine supplementation of ewes would not produce any major shifts in productivity.

INTRODUCTION

Adequate iodine intake by pregnant ewes is essential to enable their lambs to produce sufficient thyroid hormones for development and growth, and survival after birth. Extreme iodine deficiency which causes goitre in newborn lambs is easily recognised, but it is possible that the importance of iodine deficiency can be overlooked in outbreaks of high mortality in lambs where there are only small changes in thyroid size (King 1976). In Victoria, sporadic outbreaks of goitre in lambs, kids, calves and foals have occurred in the high rainfall areas (Caple *et al.* 1980), which were once noted for endemic goitre in humans (Kelly and Sneddon 1960). High mortality of newborn lambs continues to be a major problem in Victoria, but little attention has been given to the role of iodine deficiency in this loss in sheep production.

Recently, interest has been directed to the possibility of sub-clinical iodine deficiency, hypothyroidism, and production losses in sheep (Ellis 1980). This interest has been heightened by the finding of low plasma thyroxine concentrations in grazing sheep (Wallace *et* aZ.1978; Andrewartha et *al.* 1980), and the observation that iodine supplementation to ewes during late pregnancy and early lactation had increased lamb birth weight, survival and growth rate in trials conducted in Queensland (Knights et aZ.1979). This study was undertaken to determine if iodine deficiency was involved in the high neonatal mortality of newborn lambs on properties in Victoria and whether iodine supplementation resulted in any improvements in lamb and ewe productivity.

MATERIALS AND METHODS

Iodine supplementation trials were conducted during 1979 and 1980 at the Pastoral Research Institute, Hamilton, the Rutherglen Research Institute, and on properties at Ruffy, Trawalla, Langi Kal Kal and Ararat. Lambs had been born with goitre on the property at Ruffy in 1978 (Andrewartha et *al.* 1980), and high

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mortality of lambs born in late winter and spring occurred in most years on the properties at Trawalla and Ararat, and occasionally at Hamilton (McLaughlin 1968). The breeds of ewes in the trials included fine and medium wool Merinos, Romney, Perendale and Border Leicester X Merino. Lambings occurred between May and October.

In ten trials, ewes of a similar age were allocated to a control or treated group. Treated ewes were given an intramuscular injection of 1 ml iodised oil ('Lipiodol', May & Baker) at mating or during the first two months of pregnancy. The ewes were inspected daily, lamb deaths were recorded, and dead lambs were examined where possible. At Hamilton and Rutherglen, newborn lambs were weighed and identified. The lambs were re-weighed when they were weaned at an average age of 12 weeks. Ewe greasy fleece weights were recorded at Hamilton at shearing. In 1980, the ewes treated in 1979 at Hamilton were given an additional dose of 1 ml iodised oil.

Blood samples were collected from ewes and newborn lambs for assay for serum thyroxine concentrations by radioimmunoassay (Andrewartha et aZ.1980). Milk samples from ewes were ashed under alkaline conditions and assayed for iodine by a ceric-arsenic reduction method (J.K.Azuolas, unpublished).

RESULTS

Trials at Hamilton There were no significant differences in the lambing performance of control and iodine-treated ewes. In 1979, 95% of ewes mated lambed and 11% of ewes had twins. The lamb mortality in both groups was similar in 1979 and 1980 (Table 1).

TABLE 1 Mortality (%) of newborn lambs at Hamilton

Year		Treated group %	(n)	Control group %	(n)
1979	Singles	27.8	(165)	17.2	(163)
	Twins	42.1	(48)	56.3	(38)
	Overall	31.0		26.0	
1980	Singles	26.6	(160)	25.2	(318)
	Twins	37.5	(34)	37.7	(36)
	Overall	28.4		26.4	

n = number of lambs sampled

There were no significant differences between the mean birth weights of lambs of treated ewes (singles 4.05 kg., twins 3.29 kg) and control ewes (singles 4.07kg, twins 3.30 kg). Control and treated groups grazed together, and the weaning weights of the lambs (treated singles 22.6 kg, treated twins 17.4 kg; control singles 22.7 kg, control twins 19.5 kg) indicated that iodine supplementation of ewes had no effect on the growth of the lambs. There was no effect on the wool production of the ewes; mean greasy fleece weights of control and treated ewes in 1979 were 3.37 kg and 3.32 kg respectively.

Ewes treated with iodine had higher milk iodine concentrations. In October 1980 the mean (± SE) milk iodine concentration of ten treated ewes was 389 ± 36 µg/l and of 12 control ewes was 79 ± 9 µg/l. In 1981 the ewes were not treated, but milk samples were collected from treated and control ewes lambing in autumn and spring. In June 1981 the mean milk iodine concentration of 19 treated ewes was 356 ± 32 µg/l and 8 control ewes was 169 ± 15 µg/l. In September, the milk

iodine concentrations of 7 treated ewes was 229 ± 30 µg/l and 8 control ewes was 157 ± 39 µg/l.

Newborn lambs of treated ewes had significantly higher serum thyroxine concentrations than lambs of control ewes in 1980 ($p<0.01$ Students 't' test), but not in 1979 or 1981 (Table 2). There were no significant differences between the serum thyroxine concentrations of treated or control ewes sampled at various times during the three-year period. The mean serum thyroxine of ewes ranged from 31 µg/l in March to 55 µg/l in July.

TABLE 2 Serum thyroxine concentrations (µg/l) in newborn lambs

Year	Treated group		(n)	Control group		(n)
	Mean	SE		Mean	SE	
1979	83.9	3.0	(41)	82.0	3.4	(54)
1980	94.3	5.2	(22)	77.7	3.3	(23)
1981	102.2	9.7		103.2	9.2	(9)

n = number of lambs sampled

Trials at Rutherglen Trials were conducted on 200 maiden Border Leicester X Merino ewes lambing in May-June 1979, and another on 200 aged crossbred ewes lambing in August 1980. There was no difference between control and treated groups in lamb birthweight and survival in 1979, and the growth rates of lambs to weaning at 12 weeks were similar averaging 214g/day for the flock. In 1980, there were no differences in survival of lambs born to control and treated ewes. The mean milk iodine concentration in samples collected in November 1980 from 15 treated ewes was 470 ± 34 µg/l and from 13 control ewes was 180 ± 10 µg/l.

Trials at other locations At Trawalla, treated pregnant ewes had higher mean serum thyroxine (54.3 ± 1.1 µg/l) than control ewes (45.1 ± 0.8 µg/l) when sampled one month before lambing ($p<0.01$). The thyroid glands of some dead lambs in the control groups were enlarged (thyroid to body weight ratio >0.4 g/kg). Mortality of lambs born to control and treated three-year-old Merino ewes were 40% and 20% respectively, and in four-year-old ewes was 32% in the control group and 35% in the treated group.

In four trials conducted at Ararat, Ruffy and Langi Kal Kal the lamb mortality ranged from 6% to 30%, and there were no significant differences between treated and control groups or signs of goitre in dead lambs.

The overall mortality of 2667 lambs born to 2623 control ewes in the ten trials was 23.2% and of 2304 lambs born to 2254 treated ewes was 21.4%. Examinations of 374 dead lambs showed that 50% had walked and metabolised most of their perirenal brown fat, but had not sucked any milk; 25% of dead lambs were stillborn or had died from dystocia, and 15% had died without metabolising any brown fat.

DISCUSSION

The iodised oil treatment was very effective in increasing the milk iodine concentrations of treated ewes. Milk iodine concentrations should be greater than 80 µg/l if the ewes have adequate intake (Mason 1976). Ewes treated with iodised oil at one mating had higher milk iodine concentration than untreated ewes during the next two lactations over an eighteen-month period. Measurements of milk iodine

concentrations indicated there was considerable variation in the iodine intake of ewes between seasons and between years, and milk iodine levels in ewes lambing in autumn were generally higher than in ewes lambingin spring. The iodine nutrition of unsupplemented ewes at Hamilton was apparently marginal during 1980 as indicated by their low milk iodine concentrations (Mason 1976). The serum thyroxine concentrations of these ewes were not significantly different from treated ewes, but those in newborn lambs of ewes treated with iodine were higher than lambs of control ewes. Nearly all control lambs examined had thyroxine levels greater than 50 µg/l; responses of newborn lanibs to hypothermia are not markedly affected unless serum thyroxine levels are less than 50 µg/l (Caple and Nugent 1982).

Treatment of ewes with iodised oil had no marked effect on the survival of newborn lambs. On one property where dead lambs of untreated ewes had enlarged thyroid glands, there was a marked difference between the mortality of lambs in one trial on three-year-old ewes, but not in another on four-year-old ewes. It appeared that factors other than iodine deficiency were involved in lamb deaths on this property since lamb mortalities in the treated groups were 20% and 35% respectively.

The iodine treatment of ewes had no significant effects on the growth rates of lambs to weaning, or on the wool growth of the ewes. The results of these trials differ from those conducted by Knights et *al.* (1979)in Queensland where increased birthweight, survival and growth rates were recorded in lambs when ewes and lambs were supplemented with potassium iodide.

It would appear that iodine deficiency is not a major factor involved in the high mortality of lambs born in winter and spring in Victoria. In years when seasonal conditions result in decreased iodine intake by pregnant ewes it could be important on individual properties, but it is unlikely that any improvements in the productivity of sheep would result from widespread supplementation of sheep with iodine.

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