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Effect of steroid immunisation in the performance of 3 breeds of sheep under hill country conditions

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ABSTRACT

The first two years' (1983, 1984) results of a trial to determine the effect of immunisation with Fecundin® on the reproductive performance of Romney, Coopworth and Perendale ewes under hill country conditions are reported. Immunisation increased ovulation rate by 40 to 60%, lambs born/ewe present at lambing by 19 to 26% and lambs present at weaning by 4 to 9%. The major reason that the increased potential lamb production of the immunised ewes was not realised in practice was the failure of the ewes that lambed to produce as many lambs as expected from their measured ovulation rate.

Immunisation tended to produce a larger increase in ovulation rate in Romneys than in Coopworth and Perendales and in older ewes than in younger.

Lambs of immunised ewes had lower birth weights and higher mortality rates within each birth rank than lambs from non immunised ewes.

INTRODUCTION

The use of steroid immunisation has been tested on many breeds and under a wide range of climatic and management conditions. However, the response in the 3 major breeds in New Zealand has not been evaluated in a common environment and no reports on the continual use of Fecundin® under hill country conditions have been published. This paper presents the first 2 years' results (1983 and 1984) of a trial to determine the effects of immunisation with Fecundin® on the reproductive performance of Romney, Coopworth and Perendale ewes under hill country conditions.

MATERIALS AND METHODS

On 3 February 1983, 180 to 200 2½- to 4½-year-old ewes of each breed were weighed and randomly allocated on a weight basis, within breed and age, to 2 groups. One group was immunised with Fecundin® 6 weeks and again 3 weeks before joining on 29 March. The other group was not immunised. In 1984 the original 4½-year-old ewes were culled from the flock. The rest of the ewes remained in their respective treatment groups with the immunised ewes receiving a booster injection of Fecundin® 3 weeks before joining on 27 March 1984. An additional 70 to 80, 2½-year-old ewes of each breed were weighed on 7 February and allocated on a weight basis within breed to the 2 groups. The 2½-year-old ewes in the immunised group were injected with Fecundin® 6 weeks and 3 weeks before joining. The ewes were weighed 2 to 3 days before joining each year and laparoscoped to determine their ovulation rate a month after the beginning of joining.

All ewes were grazed together throughout the year except over joining, when they were divided into breeds and joined with rams of their own breed. Ewes lambing and their lambs were individually identified. Birth weights, lamb survival to weaning (8 to 14 weeks of age) and weaning weights for both ewes and lambs were recorded. All ewes lambed together.

Response or changes due to immunisation are calculated as percentage unit differences and expressed as simple percentages throughout.

As this paper reports preliminary data from a long-term experiment, a complete statistical analysis has not been carried out.

RESULTS

Live Weight

Mean live weights of the immunised and non immunised ewes were similar at joining 1983 but by weaning 1983 the non immunised ewes were 0.7 kg heavier (Table 4). In 1984 this difference increased to 0.8 kg at joining and 1.1 kg at weaning.

Reproductive Performance

Over the years, immunisation with Fecundin® increased ovulation rates by 60 and 40% when compared with non immunised ewes (Table 4). This increase in potential lamb production was however reduced to a 26 and 19% increase in lambs born/ewes present at lambing (EPL) and a 9 and 4% increase in lambs present at weaning. The major loss of potential lambs from immunised ewes was the difference between the potential number of lambs born per ewe lambing (as indicated by the ovulation

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TABLE 4 Mean live weight (kg) and reproductive performance (%) of ewes immunised (I) or not immunised (NI) with Fecundin®.

	1983		1984	
	I	NI	I	NI
No. of ewes present at lambing (EPL)	252	273	307	294
Live weight - Joining	54.9	54.8	50.9	51.7
- Weaning	49.6	50.3	50.8	51.9
Ovulation rate of ewes ovulating	223	163	215	175
Barren ewes/EPL	11	6	11	11
Lambs born/ewe lambing	174	138	169	147
Lambs born/EPL	156	130	150	131
Lamb mortality	23	15	25	17
Lambs weaned/EPL	119	110	113	109

rate) and the actual number of lambs born per ewe lambing. This difference was 49 and 46% in immunised ewes and 25 and 28% in non immunised ewes. Mortality of lambs born to immunised ewes was 8% higher than for lambs born to non immunised ewes. In 1983 there was an increase in percent barren ewes after immunisation.

Immunisation tended to produce a larger increase in ovulation rate in Romney than in Coopworth and Perendale ewes (60% increase v 44 to 46% increase) and to increase the incidence of barrenness in Perendale ewes by 8%. (Table 5). The difference between the ovulation rate per ewe ovulating and the number of lambs born per ewe lambing tended to be smaller for immunised Perendale ewes than for the other breeds (37% decrease v 52 to 55% decrease). The net effect was a 20 to 25% increase in lambs born per EPL in the 3 breeds. The increased percentage of lambs born per EPL for the immunised ewes was offset by the 9% increase in lamb mortality for immunised Romney and Perendale ewes and 6% increase in lamb

mortality for Coopworth ewes. This meant that immunisation increased the percentage of lambs weaned per EPL by 3 to 4% for Romney and Perendale ewes and 10% for Coopworth ewes.

The increase in ovulation rate from immunisation tended to increase with the age of the ewes (41, 46 and 68% increase for 2½-, 3½- and 4½-year-old ewes) which was reflected in a smaller increase in lambs born per ewe lambing for the younger ewes (18, 33 and 39% increase for 2½-, 3½- and 4½-year-old ewes, respectively) (Table 5). The incidence of barrenness in the immunised ewes increased in the 2½- and 3½-year-old ewes and decreased in the 4½-year-old ewes. The net effect was an 8% increase in lambs born per EPL for immunised 2½-year-old ewes, a 25% increase for 3½-year-old and a 40% increase for 4½-year-old ewes. The increase in lamb mortality in the immunised ewes was similar for the 3 ages of ewes (7 to 9% increase). For lambs weaned there was a 2% net decrease for the immunised 2½-year-old ewes, a 7% increase for the 3½-year-old and a 17% increase for the 4½-year-old ewes.

Effects of Birth Rank on Lamb Mortality and Birth and Weaning Weights

The increased lamb mortality in the immunised ewes was not just attributable to an increase in the proportion of multiple-born lambs. The mortality of lambs born as singles and twins was 4.7% higher for the immunised than the non immunised ewes (Table 6). The immunised ewes tended to have lower birth weights for lambs born in each birth rank and this difference was still apparent at weaning for the single and twin-born lambs.

DISCUSSION

Immunisation of ewes with Fecundin® consistently increased ovulation rates in all breeds and ages of ewes. Only 10 to 15% of this higher potential lamb production was however realised in terms of lambs

TABLE 5 Effect of breed and age on the reproductive performance (%) of immunised (I) and non-immunised (NI) ewes.

	Breed						Age (years)					
	Romney		Coopworth		Perendale		2½		3½		4½	
	I	NI	I	NI	I	NI	I	NI	I	NI	I	NI
No. of ewes present at lambing (EPL)	171	180	177	188	174	193	221	229	174	186	140	146
Ovulation rate of ewes ovulating	218	158	229	184	210	164	208	167	222	176	232	164
Barren ewes/EPL	14	13	7	10	12	4	14	8	10	8	8	10
Lambs born/ewes lambing	163	136	177	155	173	137	161	143	175	142	182	143
Lambs born/EPL	140	119	165	140	152	132	139	131	157	132	168	128
Lamb mortality	28	19	23	17	22	13	22	15	25	16	25	16
Lambs weaned/EPL	101	97	127	117	118	115	108	110	118	111	125	108

TABLE 6 Mean birth weight, weaning weight (kg) and lamb mortality (%) for single-, twin- and triplet-born lambs from immunised (I) and non-immunised (NI) ewes.

	1983		1984	
	I	NI	I	NI
Lamb mortality				
Singles	16	12	19	12
Twins	22	17	23	17
Triplets	37	33	41	44
Birth weight				
Singles	4.7	5.0	4.4	4.6
Twins	3.8	3.9	3.8	3.7
Triplets	3.0	3.4	3.1	3.3
SED	0.1		0.1	
Weaning weight				
Single born	20.8	22.0	21.1	22.5
Twin born	17.3	18.0	17.4	18.4
Triplet born	16.3	13.8	16.5	17.9
SED	0.6		0.6	

weaned. This increase in the % lambs weaned varied with breed, age of ewe and year. These variable responses to immunisation in % lambs weaned associated with breed, age of ewe and year were attributable to variation in % ovulation rate, % barrenness, % lambs born per ewe lambing and % mortality of lambs.

The major reason that the increased potential lamb production of the immunised ewes was not realised was the failure of ewes that lambed to produce as many lambs as expected from their mean ovulation rates. This loss could be caused by 3 factors. Firstly, the ewes may have maintained their pregnancies but with a higher incidence of partial failure of multiple ovulations. Secondly, the ewes may not have conceived at the first mating and the ovulation rate at the return to service may have been lower than the ovulation recorded at laparoscopy. Thirdly, the barren ewes may have included a high proportion of ewes with high ovulation rates. The contribution of these 3 factors to the loss will become more apparent with the full analysis of the data at the end of the experiment.

The increased barrenness in the 2½-year-old ewes and Perendale ewes may be reduced if the interval between the last injection and joining was increased from 3 weeks to 4 weeks. Geldard (1984) found the incidence of barrenness was higher when the intervals between the last injection and joining was 1 to 2 weeks rather than 2 to 3 weeks.

Only a portion of the 8% increase in lamb mortality of the immunised ewes can be attributed to the higher incidence of the more susceptible multiple-born lambs (Dalton *et al.*, 1980). The increased mortality of lambs within birth ranks for the immunised ewes was a major factor contributing to the overall increased lamb mortality. This increased mortality could not be accounted for by the lambs' lower birth weight when comparisons were made using the relationship between lamb survival and birth weight found by Dalton *et al.* (1980) for these same flocks.

Lower birth weights within birth ranks of the lambs born to immunised ewes could be associated with their higher ovulation rate. Rhind *et al.* (1980) found that single and twin foetuses from ewes with high numbers of ovulations were 7% lighter than those from ewes with 1 or 2 ovulations. There was an associated 25% reduction in the number of cotyledons per foetus, which they suggest was a result of previous competition from embryos which did not survive.

The lower birth weight of the single and twin-born lambs for the immunised ewes increased up to weaning when there were differences of 0.7 to 1.2 kg in weaning weight. In addition, the live-weight penalty of the higher litter size of the immunised ewes carried through from one year to the next so that the immunised ewes were lighter than the non-immunised ewes.

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