# IMMEDIATE AND LONG TERM EFFECTS OF POST MATING LAPAROTOMY ON THE LAMBING PERFORMANCE OF MERINO EWES

I. N. CUTTEN*

*Summary*

Ovulation was measured at one of six equal intervals ranging from 3 to 9 days, to 38 to 44 days after oestrus. The experimental flock comprised 1½-year old (maiden) and 3½-year old South Australian strong wool Merino ewes of which 92 and 138 respectively were examined by laparotomy.

Laparotomy increased the number of dry ewes (combined ages) by 14.9 per cent ($P<0.001$) in the year of operation but there was no difference at the following lambing one year later.

In the 3½-year old ewes, laparotomy had a significant ($P<0.05$) effect when performed one, two, or three weeks after service but not when performed four, five, or six weeks after service. No effect of time of laparotomy was demonstrated in the 1½-year old ewes, with all times approaching the 5 per cent significance level.

There was a smaller percentage loss of ova from twin ovulating ewes than from single ovulating ewes but this effect was not significant.

Laparotomy tended to result in an all or none loss of ova in two ovulating ewes.

## I. INTRODUCTION

Laparotmy could be used to determine ovulation rate in the investigation of ovine infertility problems on private properties by a technical service. It is, therefore, important to have an estimate of the losses in reproduction which the technique may cause.

There have been reports (Lamond 1963; Packham and Triffitt 1966) of laparotomy shortly before or after ovulation resulting in a reduced number of lambs born and an increased number of dry ewes. There have been no reports on the long term effect of laparotomy on the lambing performance of the ewe.

This paper reports an experiment investigating the effect of laparotomy, at six times relative to service, on the lambing performance in the year of operation and in the following year. Interactions with age of ewe are examined and the reproductive wastage is discussed.

* Turretfield Research Centre, Rosedale, South Australia.

## II. MATERIALS AND METHOD

### *(a) Animals*

The experiment was conducted at Turretfield Research Centre, Rosedale, 60 km north of Adelaide, South Australia. The flock, of South Australian strong wool Merino ewes, comprised three hundred 3½-year old ewes born in April 1964 (1964 ewes) and two hundred and forty 1½-year old ewes, born in April 1966 (1966 ewes).

At the beginning of mating on January 2, 1968, the average liveweights of the 1964 and 1966 ewes were 50.4 and 49.1 kg respectively. Ewes in both groups lost, on average, -about 1 kg during the mating period, which ended on February 13, 1968. The 14 rams joined were fitted with Sire Sine harnesses and crayons (Radford, Watson and Wood 1960) for the detection of oestrous ewes.

Each week, ewes marked with crayons during each of the previous seven 24 h periods were randomised, within age, into two groups. Ewes in one group (operated) were randomised, again within age, into six subgroups and these were scheduled for laparotomy at 3-9, 10-16, 17-23, 24-30, 31-37 or 38-44 days after oestrus. These groups are hereafter referred to as being 1, 2, 3, 4, 5 and 6 weeks after service. Ewes in the other group (control) were similarly randomised into six groups. Thus, within each age, there were six operated groups and six control groups. Except for laparotomy, control ewes were treated in exactly the same manner as operated ewes.

In 1968, the ewes were lambed in a drift system and observations of ewe and lamb identity were made twice daily. These observations included identifying each lamb to a particular ewe, and thus the numbers of dry ewes, ewes bearing single lambs and ewes bearing twin lambs were determined.

In 1969, the ewes were mated for six weeks beginning on January 3, and: lambing performance was recorded in a similar manner to that of 1968 except that the ewes lambed in a single paddock and were not drifted.

### *(b) Treatment*

Each week, ewes scheduled for laparotmy, together with their controls, were transported by truck to the shearing shed where the belly wool of all animals was shorn off.

A laparotomy cradle (Lammond and Urquhart 1961) was used to restrain the ewe during laparotomy. An area surrounding the site of incision was clipped with small animal clippers and swabbed with a solution of Savlon® (casualty work strength). A local anaesthetic of Xylocaine® (2 per cent with Adrenaline 1: 80,000) was administered.

A longitudinal incision 4 to 6 cm in length was made 3 to 6 cm anterior to the mammary gland and 2 to 4 cm lateral to the mid-line. The reproductive tract was exteriorised and the number of functional *corpora lutea* noted. Each functional ***corpus luteum*** observed was assumed to indicate the release of one ovum. The tract was returned to the abdominal cavity and the incision was closed using two single sutures of gut for the peritoneum and connective tissue and three Michel clips for the skin.

The ewes, including the controls, remained in the shed until the following morning when they were walked back to the paddock.

### *(c) Analysis*

In 1968, only those ewes which, were detected in oestrus during the first four weeks of mating and which lambed to their first recorded service were classified as having lambed. All other ewes detected in oestrus in the first four weeks were classified as dry ewes. In 1969 on the other hand, all ewes were included in the analysis.

All data were examined using Chi-square analyses.

## III. RESULTS

### *(a) Dry ewes*

The total number of ewes and the number of dry ewes in each of the two age groups of ewes for both 1968 and 1969 are shown in Table 1. Laparotomy significantly increased the number of dry ewes in the year of operation by 12.2 per cent ($P<0.05$) and 18.5 per cent ($P<0.01$) for the 1964 and 1966 ewes respectively. In 1969, there was no carry-over effect of the laparotomy performed in 1968.

In 1968, when the six times of laparotomy were analysed (Table 2), it was found that for 1966 operated ewes all groups were homogeneous, whereas for 1964 ewes they were not homogeneous ($P<0.05$). Data for control ewes of both ages were homogeneous. Thus it was possible to compare, within age, individual times of laparotomy with the total of the six control groups.

There was an interaction between age of ewe and time of laparotomy, with 1966 ewes being affected equally (P approaching 0.05) at all times up to six weeks after service, but 1964 ewes being affected only in the first three weeks.

TABLE 1

*Incidence of dry ewes among 1964 and 1966 ewes in the year of laparotomy (1968) and in the following year*

| Year of lambing. | | Year of birth of ewes. | | | | | |
|---|---|---|---|---|---|---|---|
| | | 1964 | | 1966 | | 1964 & 1966 | |
| | | Operate | Control | Operate | Control | Operate | Control |
| 1968 | Total ewes | 138 | 150 | 92 | 119 | 230 | 269 |
| | Dry ewes | 61 | 48 | 41 | 31 | 102 | 79 |
| | % dry ewes | 44.2 | 32.0 | 44.6 | 26.1 | 44.3 | 29.4 |
| | $\chi^2$ — 1 d. f. | 4.55* | | 7.91** | | 12.04*** | |
| 1969 | Total ewes | 124 | 145 | 86 | 111 | 210 | 256 |
| | Dry ewes | 33 | 32 | 8 | 14 | 41 | 46 |
| | % dry ewes | 26.6 | 22.0 | 9.3 | 12.7 | 19.5 | 18.0 |
| | $\chi^2$ — 1 d.f. | 0.75 N.S. | | 0.48 N.S. | | 0.18 N.S. | |

1964 operate versus 1966 operate (1968) $\chi^2$ — 1 d. f. = 0.003 N.S.
1964 control versus 1966 control (1968) $\chi^2$ — 1 d. f. = 1.13 N.S.
* $P<0.05$
** $P<0.01$
*** $P<0.001$
N.S. Not significant.

TABLE 2

*The effect of week of laparotomy on the incidence of dry ewes in 1968*

| Year of birth of ewes. | | Week of laparotomy | | | | | | $\chi^2$ | d.f. |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | | |
| 1964 Operated. | Total ewes | 26 | 27 | 22 | 20 | 20 | 23 | $\chi^2$ | d.f. |
| | Dry ewes | 15 | 14 | 13 | 5 | 9 | 5 | | |
| | % dry ewes | 57.7 | 51.9 | 59.1 | 25.0 | 45.0 | 21.7 | 12.24* | 5 |
| | $\chi^2$ — 1 d. f.† | 6.37* | 3.96* | 6.15* | 0.19[a] | 1.73[a] | 0.66[a] | | |
| 1964 Control. | Total ewes | 25 | 24 | 23 | 25 | 28 | 25 | | |
| | Dry ewes | 9 | 10 | 6 | 9 | 9 | 5 | | |
| | % dry ewes | 36.0 | 41.7 | 26.1 | 36.0 | 32.1 | 20.0 | 3.42[a] | 5 |
| 1966 Operated | Total ewes | 18 | 15 | 16 | 13 | 15 | 15 | | |
| | Dry ewes | 8 | 7 | 6 | 6 | 7 | 7 | | |
| | %dry ewes | 44.4 | 46.7 | 37.5 | 46.2 | 46.7 | 46.7 | 0.41[a] | 5 |
| | $\chi^2$ — 1 d. f.‡ | 3.26[a] | 3.58[a] | 1.40[a] | 3.16[a] | 3.58[a] | 3.58[a] | | |
| 1966 Control. | Total ewes | 19 | 20 | 19 | 20 | 18 | 23 | | |
| | Dry ewes | 7 | 4 | 5 | 7 | 2 | 6 | | |
| | % dry ewes | 36.8 | 20.0 | 26.3 | 35.0 | 11.1 | 26.1 | 4.55[a] | 5 |

† each week of laparotomy compared to the total 1964 control.
‡ each week of laparotomy compared to the total 1966 control.
* $P<0.05$
[a] Not significant.

### *(b) Losses of ova*

Within the 1964 ewes, it was possible to compare the number of twin and single births from twin ovulating ewes for weeks 1 to 3, during which there was an effect of laparotomy on the incidence of dry ewes, and weeks 4 to 6, when there was no effect. In these ewes, there was a significant interaction ($\chi^2 - 2$ d.f. $= 7.8$; $P < 0.05$) between the loss of ova and week of laparotomy (weeks 1 to 3 versus weeks 4 to 6) (Table 3). This observation indicates that those ewes which suffered a loss lost both ova rather than one only. If they had lost only one of the two ova, then the incidence of dry ewes would have been expected to have been of the same order in both groups 1 to 3 and 4 to 6, while the incidence of single births would have been expected to be greater in weeks 1 to 3 than in weeks 4 to 6.

From Table 3, it is possible to calculate the loss of ova from all laparotomy groups combined, for 1964 twin ovulating ewes, as 47.3 per cent. Similarly, there was a 48.4 per cent loss of ova from 1964 single ovulating ewes. Among 1966 ewes, 34.1 per cent and 47.5 per cent of ova were lost from twin and single ovulating ewes respectively.

### *(c) Lambs born*

In 1969, the 1964 and 1966 operated ewes gave birth to 2.7 per cent and; 10.8 per cent more lambs per ewe mated than did the control ewes but neither difference was significant.

## IV. DISCUSSION

The increase in dry ewes as a result of laparotomy is similar to that reported by Lamond (1963). His suggestion that there was a smaller effect at 14-15 days than at 4-5 days after service was not supported by the findings reported in this paper. Here, the decline in the incidence of dry ewes in the 3½-year old ewes did not occur until later than three weeks after service, and there was no decrease in the 1½-year old ewes during the six weeks examined.

The reproductive tracts of ewes with large (old) embryos were more difficult, physically, to exteriorise than were the tracts of ewes with smaller embryos. Also, in general, 1½-year old ewes were more difficult than 3½-year old ewes because of the greater firmness in the suspension of their reproductive tract. These physical differences may account for part, at least, of the difference in response between the 1964 and 1966 ewes.

TABLE 3

*The effect of week of laparotomy on the loss of ova from 1964 ewes having twin ovulations in 1968*

| | Number of ova lost. | Week of laparotomy. 1-3 | 4-6 |
|---|---|---|---|
| | Nil | 4 | 10 |
| | One | 6 | 5 |
| | Two | 10 | 2 |
| Total ewes with twin ovulations | | 20 | 17 |

A carry-over effect of laparotomy, for at least one oestrus cycle, has been reported (Packham and Triffitt 1966). These workers reported a 27 per cent decrease in the number of lambs born following laparotomy during the oestrous cycle preceding the beginning of a six weeks mating period. In this present experiment, there was no significant difference in the number of lambs born per ewe mated between operated and control ewes at their lambing some 18 months after laparotomy.

There are reports (Edey 1966; Quinlivan *et al.* 1966; Dolling and Nicolson 1967; Killeen 1967) of there being proportionally greater losses of ova from twin ovulating ewes than from single ovulating ewes. This occurred under both non-stressed nutritional conditions (Dolling and Nicolson 1967; Quinlivan *et al.* 1966) and under nutritional stress in the other two cases. In this experiment, however, there was no difference between the losses of single and twin ova; if anything, there was a trend towards a greater loss in single ova in the 1966 ewes in 1968.

The optimum time for laparotomy depends primarily on two factors; firstly, the physical problems of examining ewes with enlarged uterine horns if laparotomy is delayed more than five weeks after service; and secondly, the likelihood of smaller losses, in some ewes at least, if laparotomy is delayed until three weeks after service. On these grounds, it seems that ovulation rate might best be determined in a flock by operating 22 to 35 days after service. Thus, three operating days at fortnightly intervals would be required for a six week mating period. If further observations should show that for maiden ewes the incidence of dry ewes is reduced by performing laparotomy later than six weeks after service, then one would have to weigh this advantage against the disadvantage of enlarged uterine horns.

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