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STUDIES ON EMBRYO TRANSPLANTATION PROCEDURES

USING BOORoola-MERINO X PERENDALE EWES

A thesis presented in partial fulfilment
of the requirements for the degree of
Master of Agricultural Science
at Massey University

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1987

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ABSTRACT

A study was carried out to develop an embryo transfer programme under farm conditions. For this embryos were collected from donor ewes 5-6 days after single-sire mating by rams of the same crossbreed as the ewes. Then the embryos were transplanted soon after collection or after they had been initially frozen and later on thawed before their transfer. To enable this study to be carried out, one hundred and sixty-one Booroola-Merino x Perendale ewes aged between 3 and 6 years and of 34-69 kg live weight were examined. These animals were classified as either carriers (F+) or non-carriers (++) of the fecundity gene on the basis of the number of ovulations recorded at laparoscopy carried out a few days after progestagen sponge treatment to induce oestrus synchronisation, and in a few cases on the basis of previous lambing data. The aims of the study therefore were also to identify ewe carriers or non-carriers of the fecundity gene, and to evaluate their ovulatory response to several doses of Pregnant Mare Serum Gonadotrophin (T1=0, T2=350, T3=700 and T4=1050 i.u. of PMSG) given during the embryo transfer programme.

On the basis of the criteria used to classify F+ and ++ ewes, 76 ewes were considered as carriers and 85 as non-carriers of the fecundity gene.

Immediately after progestagen synchronisation treatment the incidence of oestrus and the distribution of onset of oestrus was similar in both groups of ewes, and also following PMSG treatment given in the succeeding cycle.

Ovulation rate after the progestagen sponge treatment was significantly affected by genotype and age of the ewes, but it was not associated with the live weight of the ewes. The least-squares means for number of ovulations in F+ and ++ ewes and in 3 and 4-6 years old animals were 3.02, 1.73, 2.14 and 2.45 respectively. Higher sensitivity to PMSG treatment was observed from the right ovary than from the left ovary (3.40 v. 2.82 ovulations respectively).

No significant effect of dose of PMSG was found on the percentage of embryos recovered, the overall recovery rate being 66%. Of the ova or potential embryos recovered 78% had been fertilised and had developed to embryos. There were no significant differences between the 3 rams in the fertilisation rate in the ewes compared on a per ewe basis.

The reproductive performance of donor ewes which had been flushed, was considerably influenced by the efficiency of the embryo recovery procedures, since every embryo not recovered represents a potential pregnancy and such a situation sometimes is not desirable. In this study 30% of the ewes that were flushed, subsequently became pregnant and produce lambs as a result of one or more embryos not being recovered at surgery.

The number of ovulations after PMSG treatment was significantly affected by the dose-level of PMSG and the genotype, age and live weight of the ewes. F+ ewes recorded a significantly higher ovulation rate than ++ ewes. Their respective least-squares means were 3.61 and 2.31 corpora lutea. No significant difference was found between treatments 1 and 2 and between treatments 3 and 4. However, the response from the last two treatments was significantly higher than that from the first two treatments. Their respective least-squares means were 2.10, 2.01, 3.74 and 4.37 corpora lutea. Ewes 4-6 years old recorded a significantly higher number of ovulations than younger ewes (3 years old). Small significant effect of live weight was found on the ovulatory response of the ewes. Analysis within each genotype showed a similar trend in both genotypes, but small significant effect of weight was only detected in the ++ ewes.

The pregnancy rate that occurred after the transfer of two fresh embryos (86%) was significantly affected by the genotype of the recipient ewe (F+ ewes 75% v. ++ ewes 96%). The number of ovulations in the recipients and whether or not they had received PMSG before transfer had no effect on the incidence of pregnancy.

The pregnancy rate achieved after the transfer of frozen embryos (35%) was significantly influenced by the number of embryos transferred, but not by the ovulation rate in the recipient ewe or the time elapsing from flushing until freezing. Pregnancy rate was significantly higher after the transfer of 2 embryos compared to the transfer of single embryos (43% v. 0%), but only 8 transfers were made

in the later category.

On the basis of the number of ovulations, it can be concluded that ewe carriers of the fecundity gene recorded significantly higher ovulation rate after oestrus synchronisation and were more sensitive to PMSG stimulation than non-carrier ewes.

There was an encouraging pregnancy rate obtained with frozen embryos, even although the small number of transfers carried out limits conclusions that can be drawn. However, the eighty-six percent pregnancy rate achieved after the transfer of two fresh embryos per recipient, shows the feasibility of the embryo transfer programme under conditions where suitable recipients are available. Where recipients are limited then additional embryos might be frozen and stored until ready for transplantation.

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TABLE OF CONTENTS

Chapter	Page
ABSTRACT.....	ii
ACKNOWLEDGEMENTS.....	vi
TABLE OF CONTENTS.....	viii
LIST OF TABLES.....	xviii
LIST OF FIGURES.....	xxi
LIST OF APPENDICES.....	xxii

CHAPTER 1

INTRODUCTION.....	1
-------------------	---

CHAPTER 2

REVIEW OF LITERATURE.....	4
2.1. Identification of Ewes Carrying the High Fecundity Gene.....	4
2.2. Oestrus Synchronisation.....	7
2.3. Superovulation.....	8
2.4. Factors which Affect the Ovulatory Response to PMSG Treatment.....	9
2.4.1. Dose-level of gonadotrophin.....	10
2.4.2. Season.....	12
2.4.3. Day of injection.....	14
2.4.4. Age.....	15
2.4.5. Breed.....	15
2.4.6. Live weight.....	18

Chapter	Page
2.5. Service of Donor Ewes.....	19
2.6. Embryo Recovery from Donor Ewes.....	20
2.7. Embryo Searching and Evaluation.....	21
2.8. Embryo Transfer.....	25
2.9. Factors which Affect the Success of Embryo Transfer.....	26
2.9.1. Number of embryos transferred.....	26
2.9.2. Synchronisation.....	28
2.9.3. Site of transfer.....	31
2.10. Preservation of Embryos.....	32
2.10.1. Medium for freezing.....	32
2.10.2. Cryoprotectants.....	32
2.10.3. Addition of cryoprotectant.....	34
2.10.4. Containers for freezing embryos.....	34
2.10.5. Process of freezing.....	35
2.10.6. Seeding.....	37
2.10.7. Thawing process.....	37
2.10.8. Removal of cryoprotectant.....	38
2.10.9. Post-thaw embryo assessment.....	39
2.11. Factors Affecting Efficiency of Freezing Technique.....	40
2.11.1. Embryo quality.....	40
2.11.2. Time from collection to freezing.....	40

Chapter	Page
CHAPTER 3	
MATERIALS AND METHODS.....	42
3.1. Experimental Animals and their Management.....	42
3.2. Experimental Plan.....	43
3.2.1. Oestrus synchronisation.....	43
3.2.2. Laparoscopy.....	46
3.3. Embryo Transfer Procedure.....	46
3.3.1. PMSG treatment.....	46
3.3.2. Service of donor ewes.....	47
3.3.3. Embryo recovery from donor ewes.....	47
3.3.4. Embryo searching and evaluation.....	48
3.3.5. Transfer of fresh embryos.....	49
3.4. Preservation of Embryos.....	49
3.4.1. Solutions for embryo preservation.....	50
3.4.2. Addition of the cryoprotectant.....	50
3.4.3. Freezing procedure.....	51
3.4.4. Thawing.....	53
3.4.5. Removal of the cryoprotectant.....	54
3.4.6. Transfer of frozen embryos.....	54
3.5. Preparation of Material and Equipment.....	55
3.6. Analysis of Data.....	55

Chapter	Page
CHAPTER 4	
RESULTS.....	58
4.1. Ewes carrying the high fecundity gene.....	58
4.1.1. Distribution of ewe carriers (F+) and non-carriers (++) of the high fecundity gene.....	58
4.1.2. Distribution of ovulation rate.....	61
4.1.3. Factors affecting ovulation rate.....	61
4.1.3.1. <u>Genotype</u>	61
4.1.3.2. <u>Age</u>	61
4.1.3.3. <u>Live weight</u>	62
4.2. Incidence and Distribution of Oestrus After Hormonal Treatment.....	63
4.2.1. Efficiency of intravaginal dispositive.....	63
4.2.2. Incidence and time of onset of oestrus after progestagen sponge treatment.....	63
4.2.2.1. <u>Effect of genotype on the incidence of oestrus</u>	63

Chapter	Page
4.2.3. Incidence and distribution of oestrus after PMSG treatment.....	67
4.2.3.1. <u>Effect of genotype on the incidence of oestrus after PMSG treatment.....</u>	67
4.2.3.2. <u>Effect of dose of PMSG on the incidence of oestrus.....</u>	71
4.2.3.3. <u>Effect of day of PMSG injection on the incidence of oestrus.....</u>	73
4.3. Ovarian Response to PMSG Treatment, Embryo Recovery and Fertilisation Rate.....	74
4.3.1. Ovulatory response.....	74
4.3.2. Embryo recovery.....	75
4.3.2.1. <u>Efficiency of embryo recovery.....</u>	75
4.3.3. Fertilisation Rate.....	76
4.3.3.1. <u>Influence of ram on fertilisation rate.....</u>	76

Chapter	Page
4.4. Reproductive Performance of Donor	
Ewes After Embryo Recovery.....	78
4.4.1. Incidence of oestrus in donor	
ewes after embryo recovery.....	78
4.4.2. Effect of efficiency of embryo	
recovery on the incidence of	
oestrus after flushing.....	79
4.4.2.1. <u>Ewes not returning</u>	
<u>to oestrus</u>	79
4.4.2.2. <u>Ewes returning</u>	
<u>to oestrus</u>	80
4.4.3. Pregnancy rate in donor ewes.....	81
4.4.3.1. <u>Pregnancy rate of</u>	
<u>flushed ewes</u>	81
4.4.3.2. <u>Pregnancy rate of</u>	
<u>non flushed ewes</u>	81
4.4.4. Total reproductive rate.....	82

Chapter	Page
4.5. Factors Affecting the Ovulatory Response to PMSG Treatment.....	82
4.5.1. Analysis including both genotypes.....	83
4.5.1.1. <u>Effect of genotype</u>	83
4.5.1.2. <u>Effect of dose-level</u> <u>of PMSG</u>	83
4.5.1.3. <u>Effect of the interaction</u> <u>of genetic group by</u> <u>treatment on the</u> <u>ovulatory response</u>	84
4.5.1.4. <u>Effect of age on the</u> <u>ovulatory response</u> <u>after PMSG treatment</u>	87
4.5.1.5. <u>Effect of live weight on</u> <u>the ovulatory response</u> <u>to PMSG treatment</u>	87

Chapter	Page
4.5.2. Analysis within genotype.....	89
4.5.2.1. <u>Effect of age on the</u> <u>ovulatory response</u> <u>after PMSG treatment</u>	89
4.5.2.2. <u>Effect of PMSG treatment on</u> <u>the ovulatory response</u>	89
4.5.2.3. <u>Effect of the interaction</u> <u>of age by treatment on</u> <u>the ovulatory response</u>	90
4.5.2.4. <u>Effect of live weight on</u> <u>the ovulatory response</u> <u>to PMSG treatment</u>	90
4.6. Factors Affecting the Success of Fresh Embryo Transfer.....	93
4.6.1. Effect of genotype on pregnancy rate.....	93
4.6.2. Effect of ovulation rate on pregnancy rate.....	94
4.6.3. Effect of PMSG treatment on pregnancy rate.....	94
4.6.4. Embryo survival.....	95

Chapter	Page
4.7. Factors Affecting the Success of Frozen Embryo Transfer.....	96
4.7.1. Effect of number of embryos transferred on pregnancy rate.....	96
4.7.2. Effect of ovulation rate on pregnancy rate.....	97
4.7.3. Effect of time elapsing from flushing to freezing on pregnancy rate.....	98
4.7.4. Embryo survival.....	98
4.8. Observations After Freezing Procedure.....	100

CHAPTER 5

DISCUSSION.....	102
5.1. General Discussion of Results.....	102
5.2. Feasibility of Embryo Transfer and Storage of Embryos from Selected Sheep.....	121
5.2.1. Example 1.....	121
5.2.2. Example 2.....	123
5.2.3. Problems found through the experiment.....	129
5.2.4. Potential application of the programme at Massey.....	131
5.3. Areas Needing Further Research.....	132
5.4. Conclusions.....	134

Chapter

Page

CHAPTER 6

REFERENCES..... 136

APPENDICES..... 172

LIST OF TABLES

Table	Page
2.1. Number of F1 progeny of several Booroola-type sires, and the proportion with at least one record of ≥ 3 litter size/ovulation rate in 3-6 records.....	6
2.2. Mean and range ovulation rates in ewes treated with PMSG on day 12 of the cycle.....	11
2.3. Embryo development in sheep.....	22
3.1. Distribution of ewes among groups and oestrus synchronisation timetable.....	44
4.1. Distribution of ewe carriers (F+) and non-carriers (++) of the high fecundity gene by group.....	59
4.2. Ovulation rate in ewe carriers (F+) and non-carriers (++) of the high fecundity gene by group.....	60
4.3. Factors affecting ovulation rate after oestrus synchronisation: Analysis of variance.....	62
4.4. Effect of genotype of the ewe on the incidence of oestrus after sponge removal.....	64
4.5. Distribution of onset of oestrus after sponge removal.....	65

4.6.	Effect of genotype of the ewe on the incidence of oestrus after sponge treatment.....	67
4.7.	Effect of genotype of the ewe on the incidence of oestrus after PMSG treatment.....	68
4.8.	Distribution of onset of oestrus after PMSG treatment.....	69
4.9.	Incidence of oestrus after PMSG treatment in ewe carriers (F+) and non-carriers (++) of the high fecundity gene.....	71
4.10.	Effect of dose-level of PMSG on the incidence of oestrus.....	72
4.11.	Effect of day of PMSG injection on the incidence of oestrus.....	73
4.12.	Number of ovulations after PMSG treatment and their distribution between ovaries.....	74
4.13.	Efficiency of embryo recovery.....	76
4.14.	Effect of ram on fertilisation rate.....	77
4.15.	Activity of ewes after flushing.....	78
4.16.	Effect of embryo recovery on oestrus activity after flushing.....	79
4.17.	Influence of efficiency of embryo recovery on ewes returning to oestrus.....	80
4.18.	Factors affecting ovulation rate after PMSG treatment: Analysis of variance including both genotypes.....	88

4.19.	Least-squares means of ovulation rate in ewes classified as carriers (F+) or non-carriers (++) of the fecundity gene.....	84
4.20.	Factors affecting ovulation rate after PMSG treatment: Analysis of variance of data for F+ genotype ewes.....	91
4.21.	Factors affecting ovulation rate after PMSG treatment: Analysis of variance of data for ++ genotype ewes.....	92
4.22.	Effect of genotype of the ewe on pregnancy rate after the transfer of two fresh embryos.....	93
4.23.	Effect of ovulation rate on pregnancy rate after the transfer of two fresh embryos.....	94
4.24.	Effect of hormonal treatment on pregnancy rate after the transfer of two fresh embryos.....	95
4.25.	Effect of number of embryos transferred on embryo survival.....	96
4.26.	Effect of number of embryos transferred on pregnancy rate.....	97
4.27.	Effect of ovulation rate on pregnancy rate.....	98
4.28.	Effect of time elapsing from flushing until freezing on pregnancy rate.....	99
4.29.	Effect of number of embryos transferred on embryo survival.....	100

LIST OF FIGURES

Figure	Page
2.1. Ovulatory response to PMSG by animals selected for fecundity.....	17
2.2. Embryo freezing procedures used successfully.....	36
3.1. Experimental plan of an embryo transfer programme using BMxP ewes. Number in rectangles = No of ewes allocated.....	45
3.2. Freezing procedure used in the present experiment.....	52
4.1. Distribution of oestrus after sponge removal from ewes classified as carriers (F+) and non-carriers (++) of the fecundity gene.....	66
4.2. Distribution of oestrus after PMSG treatment in ewes classified as carriers (F+) and non-carriers (++) of the fecundity gene.....	70
4.3. Effect of dose of PMSG on ovulation rate.....	85
4.4. Effect of dose of PMSG on ovulation rate in ewes classified as carriers (F++) or non-carriers (++) of the fecundity gene.....	86
5.1. Sequence of events of an embryo transfer programme and results achieved.....	128

LIST OF APPENDICES

Appendix	Page
1. Bartlett's test for homogeneity of variance of ovulation rate data: Normal ovulation rate.....	172
2. Bartlett's test for homogeneity of variance of ovulation rate data: Ovulation rate after PMSG treatment in both genotypes.....	174
3. Bartlett's test for homogeneity of variance of ovulation rate data: Ovulation rate after PMSG treatment within genotype.....	177