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**A Directed Search for QTL Affecting  
Carcass Composition Traits in Texel Sheep**

**A thesis presented in partial fulfillment  
of the requirements for the degree of  
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at**

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**Patricia Lea Johnson**

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## ***Abstract***

In New Zealand moves towards lean-meat yield- and meat quality-based payment of lamb carcasses, which more accurately reflect consumer preferences, mean that breeders and producers will need to change their selection objectives and management practices to maximise returns. This thesis investigates approaches to achieving increased meat yields, while not detrimentally affecting meat quality.

The main objective was to search for Quantitative Trait Loci (QTL) affecting carcass composition traits in Texel sheep, in the region of Growth Differentiation Factor 8 (GDF8) on ovine chromosome 2. Dissection and meat quality data for legs and loins were collected for 90 Texel-cross progeny from each of six Texel or Texel-cross sires. All animals were genotyped for seven markers around GDF8. A QTL which increased leg muscle by 5-8% and decreased leg fat by 10-15% was identified for four of the six sires in the region of markers BM81124 and BULGE20. The two sires for which no QTL was detected, were homozygous and therefore uninformative at these markers. The QTL did not negatively affect meat quality. There was only limited evidence for a QTL affecting loin composition traits.

Candidate genes to explain the QTL effect, in addition to GDF8, were sought, based on the conserved synteny between the ovine and human genomes, but none were identified. A number of genes in the region are poorly documented, and new genes are still being mapped to the region so a candidate gene could yet emerge.

The progeny data set when analysed for sex differences, revealed that, relative to ewe lambs, meat from the ram lambs had 10% higher Warner-Bratzler shear values, was less red, and for *M. longissimus*, had 28% more samples that exceeded the "high pH" threshold of 5.8. These negative meat quality aspects for ram lambs need further investigation to determine their commercial importance.

Future research on the putative QTL for leg and loin composition should assess its effects on other parts of the carcass, and its effect in lambs homozygous for the QTL. Additionally its position needs to be more closely defined, and ideally the specific gene or genes involved identified, before industry implementation is carried out.

**Dedicated to my father Tom Johnson,  
who inspired me to become an animal scientist.  
I know you would be so proud of this work.**



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## Contents

<b>Abstract.....</b>	<b>i</b>
<b>Acknowledgements .....</b>	<b>v</b>
<b>Chapter 1 Introduction.....</b>	<b>1</b>
<b>Chapter 2 Literature Review.....</b>	<b>5</b>
2.1 <i>Introduction.....</i>	<i>6</i>
2.2 <i>The New Zealand Sheep Industry.....</i>	<i>6</i>
2.2.1    Numbers .....	6
2.2.2    Industry Structure .....	6
2.2.3    Lamb Meat .....	7
2.3 <i>The Texel breed as an Option for Prime Lamb Production .....</i>	<i>10</i>
2.3.1    History.....	11
2.3.2    Establishment of the Texel outside the Netherlands.....	12
2.3.3    Comparison with Other Breeds .....	13
2.4 <i>Gender of Choice for Prime Lamb Production.....</i>	<i>33</i>
2.4.1    Possible Reasons for Differences Between Gender Groups .....	34
2.4.2    Comparison of the Composition Characteristics and Meat Quality Between Gender Groups of Lambs .....	34
2.5 <i>Development of Quantitative Trait Loci Technology.....</i>	<i>45</i>
2.5.1    Development of DNA Markers .....	45
2.5.2    Development of Linkage Maps .....	47
2.5.3    Experimental Designs for QTL searches .....	49
2.5.4    Analysis of Data From Experiments Designed to Search for QTL.....	51
2.5.5    Marker Assisted Selection (MAS).....	53
2.6 <i>Quantitative Trait Loci Affecting Growth, Composition and Meat Quality             Characteristics for Sheep and Cattle .....</i>	<i>53</i>
2.6.1    Cattle.....	53
2.6.2    Sheep.....	58



2.7	<i>Conclusions</i> .....	63
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### **Chapter 3 A comparison of the Carcass and Meat Quality of Ram and Ewe Lambs**

.....		67
3.1	<i>Introduction</i> .....	68
3.2	<i>Materials and Methods</i> .....	69
3.2.1	Ethical Approval .....	69
3.2.2	Animals .....	69
3.2.3	Slaughter Procedure.....	69
3.2.4	Dissection Procedure.....	72
3.2.5	Preparation of Meat Samples for Quality Analysis .....	72
3.2.6	Meat Quality Analysis .....	72
3.2.7	Muscularity and Muscle to Bone Ratios .....	75
3.2.8	Statistical Analysis.....	75
3.3	<i>Results</i> .....	76
3.3.1	Carcass Composition Traits.....	76
3.3.2	Leg Composition Traits.....	77
3.3.3	Leg Characteristics.....	78
3.3.4	Meat Quality .....	78
3.4	<i>Discussion</i> .....	82
3.4.1	Dressing-Out Percentage.....	83
3.4.2	Carcass Conformation Traits.....	83
3.4.3	<i>M. longissimus</i> Traits.....	83
3.4.4	Fat Traits .....	84
3.4.5	Cut Distribution .....	84
3.4.6	Muscle Traits .....	85
3.4.7	Bone Traits .....	86
3.4.8	Leg Characteristics.....	87
3.4.9	Meat Quality .....	87
3.5	<i>Conclusions</i> .....	89

<b>Chapter 4 The Search for QTL Affecting Traits Contributing to Lamb Value....</b>	<b>91</b>
4.1 Introduction.....	92
4.2 Materials and Methods.....	96
4.2.1 Ethical Approval.....	96
4.2.2 Trial Design.....	96
4.2.3 Animals.....	96
4.2.4 Measurements Made.....	98
4.2.5 Dissection of Legs and Loins.....	99
4.2.6 Genotyping.....	101
4.2.7 Genotype Testing.....	103
4.2.8 Map Distances.....	104
4.2.9 Pedigree.....	105
4.2.10 Single Peak QTL Analysis.....	105
4.2.11 Information Content.....	111
4.2.12 Multi-trait Analysis.....	112
4.2.13 Two-Peak Analysis.....	112
4.2.14 Sex-QTL Interaction Analysis.....	113
4.2.15 Linkage Disequilibrium Analysis.....	113
4.2.16 Analysis of Data.....	114
4.3 Results.....	115
4.3.1 Pedigrees.....	115
4.3.2 Inherited Phases and Haplotypes.....	117
4.3.3 Information Content.....	118
4.3.4 Allele Frequencies.....	119
4.3.5 Results of QTL Analysis.....	123
4.3.6 Single Trait Analysis.....	123
4.3.7 Multi-Trait Analysis.....	143
4.3.8 Two-Peak Analysis.....	149
4.3.9 Age at Slaughter as a Covariate.....	150
4.3.10 Linkage Disequilibrium Analysis.....	150
4.3.11 Sex-QTL Interaction Analysis.....	151
4.4 Summary.....	152

4.5	<i>Discussion</i> .....	154
4.5.1	Trial Design .....	154
4.5.2	Pedigree of Sires .....	155
4.5.3	Informativeness of Sires.....	155
4.5.4	Single Trait Analysis of Growth Rates .....	156
4.5.5	Single Trait Analysis of Dressing-Out Percentage.....	156
4.5.6	Single Trait Analysis of Linear Measurements .....	157
4.5.7	Single Trait Analysis of Whole Leg Measurement .....	157
4.5.8	Single Trait Analysis of Muscle Measurements.....	158
4.5.9	Single Trait Analysis of Fat Measurements .....	163
4.5.10	Single Trait Analysis of Meat Quality Traits .....	166
4.5.11	Combined Trait Analysis .....	168
4.5.12	Two-peak Analysis .....	170
4.5.13	Sex-QTL Interaction Analysis.....	171
4.5.14	Linkage Disequilibrium Analysis .....	173
4.5.15	Haplotype .....	174
4.6	<i>Conclusions</i> .....	175
<b>Chapter 5 Candidate Genes for a QTL for Increased Muscling.....</b>		<b>177</b>
5.1	<i>Introduction</i> .....	178
5.2	<i>Likely Attributes of the Candidate Gene</i> .....	179
5.3	<i>Conserved Regions of DNA for Ovine Chromosome 2</i> .....	180
5.4	<i>Major Genes Involved in Muscle and Fat Pathways</i> .....	181
5.4.1	Hormones .....	183
5.4.2	Muscle Regulatory Factors.....	185
5.5	<i>Genes Known to Have a Direct Effect on Increasing Skeletal Muscle Mass and Decreasing Fat Mass</i> .....	186
5.5.1	Search Words.....	187
5.5.2	Documented Genes Affecting Skeletal Muscle.....	187
5.5.3	Documented Genes Affecting Fat Development.....	188
5.6	<i>Lexical Analysis</i> .....	189
5.6.1	Sourcing Gene List .....	190

5.6.2	Word Lists.....	190
5.6.3	Key Words.....	191
5.6.4	Concordance.....	192
5.7	<i>Tissue Expression</i> .....	195
5.7.1	Example of Tissue Expression Profile.....	195
5.7.2	Candidate Gene Expression in Skeletal Muscle.....	196
5.8	<i>Follow up of Candidate Genes</i> .....	198
5.9	<i>Assessment of the Relative Merits of Various Methods for Searching for Candidate Genes</i> .....	200
5.10	<i>Conclusions</i> .....	201
5.11	<i>Epilogue</i> .....	202
<b>Chapter 6 General Discussion .....</b>		<b>205</b>
6.1	<i>Choice of Breed</i> .....	206
6.2	<i>Gender Differences</i> .....	207
6.3	<i>Search for a QTL</i> .....	209
6.4	<i>Identification of Candidate Genes</i> .....	211
6.5	<i>Overall</i> .....	212
<b>Chapter 7 References.....</b>		<b>213</b>
<b>Chapter 8.....</b>		<b>Appendicies</b>
.....		<b>235</b>
8.1	<i>DNA Procedures</i> .....	236
8.1.1	DNA Extraction Technique.....	236
8.1.2	DNA Amplification Reagents.....	236
8.1.3	Gel used for Electrophoresis.....	237
8.1.4	Alternative Protocol for Marker TGLA10.....	237
8.2	<i>Models Fitted for QTL Analysis</i> .....	238
8.2.1	Definition of Fixed Effects and Covariates.....	238
8.2.2	Models Fitted.....	238

8.3	<i>Pedigree Diagrams</i> .....	239
8.4	<i>Sire 1190/00 Non-Significant Single Trait QTL Results</i> .....	241
8.5	<i>Sire 1170/00 Non-Significant Single Trait QTL Results</i> .....	243
8.6	<i>Sire 150/96 Non-Significant Single Trait QTL Results</i> .....	245
8.7	<i>Sire 15/98 Non-Significant Single Trait QTL Results</i> .....	248
8.8	<i>Sire 122/99 Non-Significant Single Trait QTL Results</i> .....	250
8.9	<i>Sire 429/98 Non-Significant Single Trait QTL Results</i> .....	252
8.10	<i>Sire 535/98 Non-Significant Single Trait QTL Results</i> .....	254
8.11	<i>Weighting Factors for Multi-Trait Analysis</i> .....	257
8.11.1	Leg Muscle Traits .....	257
8.11.2	Leg fat weight traits .....	257
8.11.3	Loin Muscle Traits.....	257
8.11.4	Loin Fat Traits .....	257
8.12	<i>Linkage Disequilibrium Non-Significant Results</i> .....	258
8.12.1	Tanbar Flock.....	258
8.12.2	Skye Flock .....	259
8.12.3	Woodlands Flock .....	260
8.13	<i>Sex Interaction Analysis Non-Significant Results</i> .....	262
8.13.1	Sire 1199/00.....	262
8.13.2	Sire 1170/00.....	263
8.13.3	Sire 150/96 .....	264
8.13.4	Sire 15/98 .....	266
8.13.5	Sire 429/98 .....	267
8.13.6	Sire 535/98 .....	268
8.14	<i>Mutations Identified Through (OMIM) as Impacting on Muscle or Fat</i> .....	270
8.14.1	Muscle Mutations .....	270
8.14.2	Fat Mutations.....	272
8.15	<i>Details of Genes Identified within Region of Interest on Human Chromosome</i> <i>2</i> .....	273
8.16	<i>Details of New Genes Mapped to Region of Interest</i> .....	280

## List of Tables

### Chapter 2

Table 2.1 Abbreviations used throughout the review .....	14
Table 2.2 A summary of breed comparisons for Average Daily Gain .....	15
Table 2.3 A summary of breed comparisons for dressing-out percentage.....	17
Table 2.4 A summary of breed comparisons for <i>M. longissimus</i> characteristics .....	19
Table 2.5 A summary of breed comparisons for linear measurements.....	21
Table 2.6 A summary of breed comparisons for conformation assessments .....	22
Table 2.7 A summary of breed comparisons for cut distribution .....	24
Table 2.8 A summary of breed comparisons for lean-meat yield .....	26
Table 2.9 A summary of breed comparisons for fat traits.....	28
Table 2.10 A summary of breed comparisons for muscle to bone ratio .....	31
Table 2.11 A summary of breed comparisons for meat quality traits.....	32
Table 2.12 A summary of breed comparisons for meat quality .....	33
Table 2.13 A summary of gender comparisons for dressing-out percentage.....	35
Table 2.14 A summary of gender comparisons for <i>M. longissimus</i> characteristics .....	36
Table 2.15 A summary of gender comparisons for linear measurements.....	37
Table 2.16 A summary of gender comparisons for carcass conformation.....	38
Table 2.17 Summary of sex comparison studies for carcass cut distribution .....	39
Table 2.18 A summary of gender comparisons for lean-meat yield.....	40
Table 2.19 A summary of gender comparisons for fat traits.....	41
Table 2.20 A summary of gender comparisons muscle to bone ratio .....	42
Table 2.21 A summary of gender comparisons for meat quality traits.....	43
Table 2.22 A summary of gender comparisons for meat quality traits.....	44

### Chapter 3

Table 3.1 Details of the number of lambs per different sub-class.....	70
Table 3.2 Abbreviations and description of measurements made .....	71
Table 3.3 Least-squares means for lamb carcass characteristics.....	77
Table 3.4 Least squares means for lamb leg traits.....	77
Table 3.5 Least-squares means for weight-adjusted lamb leg muscles .....	78
Table 3.6 Least-squares means for weight-adjusted leg characteristics .....	78
Table 3.7 Least-squares means for meat quality characteristics .....	79

Table 3.8 Least-squares means for lamb meat quality characteristics.....	80
Table 3.9 Difference between <i>M. semimembranosus</i> and <i>M. longissimus</i> .....	80
Table 3.10 Simple linear correlations between selected composition characteristics and meat quality traits .....	81

## Chapter 4

Table 4.1 Values used to estimate the number of progeny required.....	97
Table 4.2 Details of properties and animals used .....	98
Table 4.3 Number of lambs born per sire.....	98
Table 4.4 Abbreviations and descriptions of carcass and meat quality measurements made .....	100
Table 4.5 Details of the primers used .....	101
Table 4.6 A-Z Scoring for markers used in the Texel QTL trial. ....	103
Table 4.7 The position of markers on ovine chromosome 2.....	105
Table 4.8 An example of phase determination in a sire and one of his progeny.....	106
Table 4.9 Conditional probability formulas for half-sib family design .....	108
Table 4.10 An example of converting distances to recombination fractions .....	108
Table 4.11 Examples of estimating conditional probability.....	108
Table 4.12 Phase inherited for markers in region of interest .....	117
Table 4.13 Sire haplotypes for markers in region of interest .....	118
Table 4.14 Sire-inherited allele frequencies (%) for markers .....	120
Table 4.15 Dam-inherited allele frequencies (%) for markers .....	121
Table 4.16 Descriptions of the column headings used in tables.....	123
Table 4.17 Details of peaks for sire 1199/00 – leg muscle weight traits .....	124
Table 4.18 Details of peaks for sire 1199/00 – other muscle related traits .....	124
Table 4.19 Details of peaks for sire 1199/00 – leg fat weight traits .....	126
Table 4.20 Details of peaks for sire 1199/00 – loin fat traits .....	127
Table 4.21 Details of peaks for sire 1170/00 – ultrasound muscle traits .....	128
Table 4.22 Details of peaks for sire 1170/00 – leg muscle weight traits .....	130
Table 4.23 Details of peaks for sire 1170/00 – other muscle related traits .....	130
Table 4.24 Details of peaks for sire 1170/00 – leg fat weight traits .....	131
Table 4.25 Details of peaks for sire 15/98 – ultrasound muscle traits .....	133
Table 4.26 Details of peaks for sire 15/98 – leg muscle weight traits .....	134
Table 4.27 Details of peaks for sire 15/98 – other muscle related traits .....	134

Table 4.28 Details of peaks for sire 15/98 – leg fat weight traits.....	136
Table 4.29 Details of peaks for sire 429/98 – leg muscle traits .....	138
Table 4.30 Details of peaks for sire 429/98 – other muscle related traits .....	138
Table 4.31 Details of peaks for sire 429/98 – leg fat traits .....	140
Table 4.32 Details of peaks for sire 429/98 – <i>M. semimembranosus</i> and <i>M. longissimus</i> meat quality traits .....	141
Table 4.33 Details of QTL peaks for half-sib Texel cross population - muscle in leg (as determined by multi-trait analysis).....	143
Table 4.34 Details of QTL peaks for half-sib Texel cross population - muscle traits in loin (as determined by multi-trait analysis) .....	144
Table 4.35 Details of QTL peaks for half-sib Texel cross population - fat percentage in leg .....	145
Table 4.36 Details of QTL peaks for half-sib Texel cross population - fat traits in loin (as determined by multi-trait analysis) .....	146
Table 4.37 Details of QTL peaks for half-sib Texel cross population - combined leg (as determined by multi-trait analysis).....	147
Table 4.38 Details of two peak QTL analysis for half-sib Texel cross population.....	150
Table 4.39 Details of QTL results where adjustment for linkage disequilibrium.....	151
Table 4.40 Details of QTL peaks for half-sib Texel cross population analysed by fitting a QTL by sex interaction.....	151
Table 4.41 A summary of the number of significant QTL detected.....	153
Table 4.42 Summary of results by trait group, showing the likely position of QTL....	153
Table 4.43 Summary of results by trait group, showing the size of QTL.....	154

## Chapter 5

Table 5.1 Human chromosomal locations of major hormones and their receptors involved in the growth pathway. ....	185
Table 5.2 Human chromosomal locations of the muscle regulation factors involved in the growth pathway.....	186
Table 5.3 Details on candidate genes identified as having documented mutations which result in changes to skeletal muscle.....	187
Table 5.4 Details on candidate genes identified as having documented mutations which decrease fat accumulation .....	188
Table 5.5 Results from KeyWor for genes with an “search” word as a keyword.....	192



Table 5.6 Examples from the concordance study of genes in the region of interest. .	193
Table 5.7 Details on candidate genes identified through lexical analysis.....	194
Table 5.8 Details of candidate genes identified through tissue expression profiles .....	197

## Chapter 8

Table 8.1 Covariates and fixed effects fitted for different trait groups. ....	238
Table 8.2 Details of peaks for sire 1199/00 – liveweight traits.....	241
Table 8.3 Details of peaks for sire 1199/00 – ultrasound muscle traits .....	241
Table 8.4 Details of peaks for sire 1199/00 – ultrasound fat traits.....	241
Table 8.5 Details of peaks for sire 1199/00 – dressing-out percentage .....	241
Table 8.6 Details of peaks for sire 1199/00 – carcass linear traits .....	241
Table 8.7 Details of peaks for sire 1199/00 – loin muscle traits .....	242
Table 8.8 Details of peaks for sire 1199/00 - leg bonetraits.....	242
Table 8.9 Details of peaks for sire 1199/00 – meat quality traits.....	242
Table 8.10 Details of peaks for sire 1170/00 – liveweight traits.....	243
Table 8.11 Details of peaks for sire 1170/00 – ultrasound fat traits.....	243
Table 8.12 Details of peaks for sire 1170/00 – dressing-out percentage .....	243
Table 8.13 Details of peaks for sire 1170/00 – carcass linear traits .....	243
Table 8.14 Details of peaks for sire 1170/00 – loin muscle traits .....	243
Table 8.15 Details of peaks for sire 1170/00 – loin fat traits .....	244
Table 8.16 Details of peaks for sire 1170/00 - leg bonetraits.....	244
Table 8.17 Details of peaks for sire 1170/00 – meat quality traits .....	244
Table 8.18 Details of peaks for sire 150/96 – liveweight traits.....	245
Table 8.19 Details of peaks for sire 150/96 – ultrasound muscle traits .....	245
Table 8.20 Details of peaks for sire 150/96 – ultrasound fat traits.....	245
Table 8.21 Details of peaks for sire 150/96 – dressing-out percentage .....	245
Table 8.22 Details of peaks for sire 150/96 – carcass linear traits .....	245
Table 8.23 Details of peaks for sire 150/96 – leg muscle weight traits .....	246
Table 8.24 Details of peaks for sire 150/96 – other muscle related traits.....	246
Table 8.25 Details of peaks for sire 150/96 – leg fat weight traits.....	246
Table 8.26 Details of peaks for sire 150/96 – loin muscle traits .....	246
Table 8.27 Details of peaks for sire 150/96 – loin fat traits .....	246
Table 8.28 Details of peaks for sire 150/96 - leg bonetraits.....	247
Table 8.29 Details of peaks for sire 150/96 – meat quality traits.....	247

Table 8.30 Details of peaks for sire 15/98– liveweight traits.....	248
Table 8.31 Details of peaks for sire 15/98– ultrasound fat traits.....	248
Table 8.32 Details of peaks for sire 15/98– dressing-out percentage.....	248
Table 8.33 Details of peaks for sire 15/98– carcass linear traits .....	248
Table 8.34 Details of peaks for sire 15/98– loin muscle traits.....	248
Table 8.35 Details of peaks for sire 15/98– loin fat traits.....	249
Table 8.36 Details of peaks for sire 15/98- leg bone traits .....	249
Table 8.37 Details of peaks for sire 15/98– meat quality traits.....	249
Table 8.38 Details of peaks for sire 122/99 – liveweight traits.....	250
Table 8.39 Details of peaks for sire 122/99 – ultrasound muscle traits.....	250
Table 8.40 Details of peaks for sire 122/99 – ultrasound fat traits.....	250
Table 8.41 Details of peaks for sire 122/99 – dressing-out percentage.....	250
Table 8.42 Details of peaks for sire 122/99 – carcass linear traits .....	250
Table 8.43 Details of peaks for sire 122/99 – loin muscle traits .....	251
Table 8.44 Details of peaks for sire 122/99 – loin fat traits.....	251
Table 8.45 Details of peaks for sire 429/98 – liveweight traits.....	252
Table 8.46 Details of peaks for sire 429/98 – ultrasound muscle traits.....	252
Table 8.47 Details of peaks for sire 429/98 – ultrasound fat traits.....	252
Table 8.48 Details of peaks for sire 429/98 – dressing-out percentage .....	252
Table 8.49 Details of peaks for sire 429/98 – carcass linear traits .....	252
Table 8.50 Details of peaks for sire 429/98 – loin muscle traits .....	253
Table 8.51 Details of peaks for sire 429/98 – loin fat traits.....	253
Table 8.52 Details of peaks for sire 429/98 – leg bone traits.....	253
Table 8.53 Details of peaks for sire 535/98 – liveweight traits.....	254
Table 8.54 Details of peaks for sire 535/98 – ultrasound muscle traits.....	254
Table 8.55 Details of peaks for sire 535/98 – ultrasound fat traits.....	254
Table 8.56 Details of peaks for sire 535/98 – dressing-out percentage.....	254
Table 8.57 Details of peaks for sire 535/98 – carcass linear traits .....	254
Table 8.58 Details of peaks for sire 535/98 – leg muscle weight traits.....	255
Table 8.59 Details of peaks for sire 535/98 – other muscle related traits.....	255
Table 8.60 Details of peaks for sire 535/98 – leg fat weight traits.....	255
Table 8.61 Details of peaks for sire 535/98 – loin muscle traits .....	255
Table 8.62 Details of peaks for sire 535/98 – loin fat traits.....	255
Table 8.63 Details of peaks for sire 535/98 – leg bone traits.....	256

Table 8.64 Details of peaks for sire 535/98 – meat quality traits .....	256
Table 8.65 Weighting Factors for Multi-Trait Analysis of Leg Muscle Traits .....	257
Table 8.66 Weighting Factors for Multi-Trait Analysis of Leg fat weight traits .....	257
Table 8.67 Weighting Factors for Multi-Trait Analysis of Loin Muscle Traits .....	257
Table 8.68 Weighting Factors for Multi-Trait Analysis of Loin Fat Traits .....	257
Table 8.69 Results where adjusting for linkage disequilibrium did not result in an increase in significance thresholds for the Tanbar Flock .....	258
Table 8.70 Results where adjusting for the effects of linkage disequilibrium did not result in an increase in significance thresholds for the Skye Flock .....	259
Table 8.71 Results where adjusting for the effects of linkage disequilibrium did not result in an increase in significance thresholds for the Woodlands Flock .	260
Table 8.72 Details of non-significant QTL-sex interaction results for sire 1199/00 ...	262
Table 8.73 Details of non-significant QTL-sex interaction results for sire 1170/00 ...	263
Table 8.74 Details of non-significant QTL-sex interaction results for sire 150/96 .....	264
Table 8.75 Details of non-significant QTL-sex interaction results for sire 15/98 .....	266
Table 8.76 Details of non-significant QTL-sex interaction results for sire 429/98 .....	267
Table 8.77 Details of non-significant QTL-sex interaction results for sire 535/98 .....	268
Table 8.78 Mutations identified in Online Mendelian Inheritance in Man as impacting on muscle, but not fitting the criteria of the candidate gene sought .....	270
Table 8.79 Mutations identified in Online Mendelian Inheritance in Man as impacting on fat, but not fitting the criteria of the candidate gene sought .....	272
Table 8.80 List of genes identified using USCS Genome Bioinformatics .....	273
Table 8.81 List of genes identified using USCS Genome Bioinformatics .....	276
Table 8.82 List of new genes identified using USCS Genome Bioinformatics .....	280
Table 8.83 List of genes identified using USCS Genome Bioinformatics .....	281

## List of Figures

### Chapter 2

- Figure 2.1 Average consumption per capita of rea meat in the United Kingdom..... 9  
 Figure 2.2 Experimental designs for QTL detection ..... 49

### Chapter 4

- Figure 4.1 An example of a QTL (allele Q) lying between markers M, and N ..... 107  
 Figure 4.2 An example of a regression of phenotype against genotype probability .... 109  
 Figure 4.3 Pedigree diagram for Sire 150/96. .... 116  
 Figure 4.4 Pedigree diagram for Sire 429/98. .... 116  
 Figure 4.5 Information content along the region of ovine chromosome two..... 119  
 Figure 4.6  $-\log_{10}\text{prob}$  curves for sire 1199/00 – weights of leg muscles..... 125  
 Figure 4.7  $-\log_{10}\text{prob}$  curves for sire 1199/00 – other muscle related traits..... 125  
 Figure 4.8  $-\log_{10}\text{prob}$  curves for sire 1199/00 - leg fat weight traits..... 127  
 Figure 4.9  $-\log_{10}\text{prob}$  curves for sire 1199/00 - loin fat traits..... 128  
 Figure 4.10  $-\log_{10}\text{prob}$  curves for sire 1170/00 – ultrasound muscle traits ..... 129  
 Figure 4.11  $-\log_{10}\text{prob}$  curves for sire 1170/00 – weights of leg muscles..... 130  
 Figure 4.12  $-\log_{10}\text{prob}$  curves for sire 1170/00 – other muscle related traits ..... 131  
 Figure 4.13  $-\log_{10}\text{prob}$  curves for sire 1170/00 - leg fat weight traits..... 132  
 Figure 4.14  $-\log_{10}\text{prob}$  curves for sire 15/98 – ultrasound traits..... 133  
 Figure 4.15  $-\log_{10}\text{prob}$  curves for sire 15/98 – weights of leg muscles ..... 135  
 Figure 4.16  $-\log_{10}\text{prob}$  curves for sire 15/98 – other muscle related traits..... 135  
 Figure 4.17  $-\log_{10}\text{prob}$  curves for sire 15/98 - leg fat weight traits ..... 136  
 Figure 4.18  $-\log_{10}\text{prob}$  curves for sire 429/98 – weights of leg muscles..... 139  
 Figure 4.19  $-\log_{10}\text{prob}$  curves for sire 429/98 – other muscle related traits..... 139  
 Figure 4.20  $-\log_{10}\text{prob}$  curves for sire 429/98 - leg fat weight traits..... 141  
 Figure 4.21  $-\log_{10}\text{prob}$  curves for sire 429/98 - quality traits..... 142  
 Figure 4.22  $-\log_{10}\text{prob}$  curves for sire 429/98 - quality traits ..... 142  
 Figure 4.23  $-\log_{10}\text{prob}$  curves for half-sib Texel cross population - muscle in leg (as determined by multivariate analysis)..... 144  
 Figure 4.24  $-\log_{10}\text{prob}$  curves for half-sib Texel cross population - muscle traits in loin (as determined by multivariate analysis) ..... 145  
 Figure 4.25  $-\log_{10}\text{prob}$  curves for half-sib Texel cross population - fat percentage in leg

(as determined by multivariate analysis).....	146
Figure 4.26 $-\log_{10}\text{prob}$ curves for half-sib Texel cross population - fat traits in loin (as determined by multivariate analysis).....	147
Figure 4.27 $-\log_{10}\text{prob}$ curves for half-sib Texel cross population - combined leg (as determined by multivariate analysis of weights).....	148
Figure 4.28 $-\log_{10}\text{prob}$ curves for half-sib Texel cross population – combined leg (as determined by multivariate analysis of percentages).....	148
Figure 4.29 $-\log_{10}\text{prob}$ curves for half-sib Texel cross population – combined leg (as determined by multivariate analysis across sires) .....	149
Figure 4.30 $-\log_{10}\text{prob}$ curves for sire 15/98 – sex interaction analysis for <i>M. longissimus</i> dimensions.....	152

## Chapter 5

Figure 5.1 Maps showing comparative area of ovine chromosome 2q, bovine chromosome 2 and human chromosome 2.....	182
Figure 5.2 Distribution of words in abstracts of 78 genes.....	191
Figure 5.3 Example of the enriched expression profile .....	196

## Chapter 8

Figure 8.1 Pedigree diagram for Sire 535/98 .....	239
Figure 8.2 Pedigree diagram for Sire 15/98. ....	239
Figure 8.3 Pedigree diagram for Sire 122/99. ....	240