Growth breeding value redistributes weight to the saddle region in lambs


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Objectives

• Lean meat yield (LMY %).
• Role of genetics.
• Modelling of carcase composition using CT data from the Information Nucleus Flock.
• Current selection methods are increasing muscle where we’d like.
Sheep CRC Information Nucleus Flock

Acknowledgements

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Jason Siddell
Lean meat yield %

- Neck Chop
- Chop
- Breast & Flap
- Eye of Loin
- Chump
- Tenderloin
- Shank
- Leg
- Hind quarter
- Rump
- Loin Chop
- Rack
- Shoulder
- Fore Shank
- Fore quarter
- Saddle
- Frencheded Cutlet
- Breast & Flap
Lean meat yield %
Australian Sheep Breeding Values - ASBVs

- PWWT – Post weaning weight
- PFAT – C site fat depth
- PEMD – Post weaning eye muscle depth

Industry Indices
- Carcase plus
- Carcase 2020
• PWWT ASBV selects for increased mature size
• At the same carcase weight will be ‘less mature’

Butterfield 1988
Hypothesis PWWT

Fat

Lean

Bone
Method
CT scanning
Converting image to tissue type
## Data

### Carcass composition by CT Scanning

<table>
<thead>
<tr>
<th>Birth Year</th>
<th>Site</th>
<th>Number of animals scanned</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>Kirby</td>
<td>246</td>
</tr>
<tr>
<td>2007</td>
<td>Katanning</td>
<td>181</td>
</tr>
<tr>
<td>2008</td>
<td>Kirby</td>
<td>398</td>
</tr>
<tr>
<td>2008</td>
<td>Katanning</td>
<td>120</td>
</tr>
<tr>
<td>2009</td>
<td>Hamilton</td>
<td>122</td>
</tr>
<tr>
<td>2009</td>
<td>Turretfield</td>
<td>151</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>1218</strong></td>
</tr>
</tbody>
</table>
Carcase composition: raw data
Carcass composition: raw data

\[ y = ax^b \]
Carcase composition: log data

\[ \log y = \log a + b \cdot \log x \]
Phenotypic Model

\[ \log y = \log a + b \cdot \log x \]

log CT lean wt

**Fixed effects**
- Flock-year
- BTRT
- Sex
- Sire type
- Kill group (Site-year)

**Covariates**
- Log CT carcase wt
- ASBVs
- Random
  - Sire
  - Dam*Drop
Phenotypic Model

\[ \log y = \log a + b \cdot \log x \]

- Fixed effects:
  - Flock-year
  - BTRT
  - Sex
  - Sire type
  - Kill group (Site-year)

- Covariates:
  - Log CT carcase wt
  - ASBVs
  - Random
  - Sire
  - Dam*Drop

Interpret differences as percentages
Whole carcase composition

\[ \log \text{CT Fat} = \log a + b \cdot \log \text{CT carcase wt} \]

\[ \log \text{CT Lean} = \log a + b \cdot \log \text{CT carcase wt} \]

\[ \log \text{CT Bone} = \log a + b \cdot \log \text{CT carcase wt} \]
Lean distribution

log Hind Qrt Lean = log a + b.log carcase lean

log Saddle Lean = log a + b.log carcase lean

log Fore Qrt Lean = log a + b.log carcase lean
Results
Whole carcase composition
Effect of PWWT ASBV on whole carcase composition

Fat

Lean

Bone

% diff in carcase fat weight

% diff in carcase lean weight

% diff in carcase bone weight

p<0.01

Kirby 07
Kirby 08
Hamilton 09
Turretfield 09
Katanning 07
Katanning 08

Kirby 07
Kirby 08
Hamilton 09
Turretfield 09
Katanning 07
Katanning 08
Effect of PWWT ASBV on whole carcase composition

% diff in carcase lean weight

% diff in carcase fat weight

% diff in carcase bone weight

-5 0 5 10 15 20

-5 0 5 10

-5 0 5

-5 0 5

Kirby 07
Kirby 08
Hamilton 09
Turretfield 09
Katanning 07
Katanning 08

p<0.01

p<0.01

p<0.01
Effect of PWWT ASBV on whole carcase composition

**Lean**

% diff in carcase lean weight

- PWWT
- ASBV

p < 0.01

**Fat**

% diff in carcase fat weight

- PWWT
- ASBV

p < 0.01

**Bone**

% diff in carcase bone weight

- PWWT
- ASBV

p < 0.01

Data sources:
- Kirby 07
- Kirby 08
- Hamilton 09
- Turretfield 09
- Katanning 07
- Katanning 08
Effect of PWWT ASBV on whole carcase composition

No net effect
Tissue distribution
Sire estimates for saddle lean using PWWT-ASBV

Sire estimates:
- Maternal
- Merino
- Terminal

P<0.01
Sire estimates for saddle lean using PWWT-ASBV

25 units

Sire estimates:
- Maternal
- Merino
- Terminal

P<0.01
Sire estimates for saddle lean using PWWT-ASBV

Sire estimates:
- Maternal
- Merino
- Terminal

25 units

7% P<0.01
PWWT-ASBV effect on saddle bone

10%
PWWT-ASBV effect on saddle bone

% diff in saddle bone wt vs PWWT - ASBV

Kirby 07
Kirby 08
Hamilton 09
Turretfield 09
Katanning 08

P < 0.01
PWWT-ASBV effect on saddle fat

% diff in saddle fat wt

P<0.01
PWWT-ASBV effect on saddle fat

% diff in saddle fat wt

P<0.01

Kirby 07
Kirby 08
Hamilton 09
Turretfield 09
Katanning 08
Effects of PWWT

Fat
variable
+2.0%

Lean
+7%

Bone
variable
+10%
Hypothesis PWWT

Fat

Lean

Bone
Hypothesis PWWT
Hypothesis PWWT

Fat  Lean  Bone

This is new!!
Lean redistribution effects........?

• Altered body dimensions?
• Fibre type shift? More fast-glycolytic fibres?
PWWT effect on ICDH activity

Sire estimates:

- Maternal
- Maternal
- Terminal

Isocitrate Dehydrogenase Activity (µmol/min/g tissue)

P<0.05
PWWT effect on myoglobin concentration

Sire estimates:
- Maternal
- Merino
- Terminal

P<0.05
Future directions

• Finalise CT data (2012)
• Economic analysis of current findings
• Mechanistic experiments to help explain lean redistribution
Conclusion

• PWWT delivered no net increase in LMY%.
• PWWT causes redistribution of all tissue types to the saddle region.
• PWWT will likely positively impact carcase value.