Investigation into the impact of age and mixing with ewes on eating quality of rams

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Aims

• To identify the age at which sexual maturity affects the eating quality of rams.

• To determine whether the mixing of rams with ewe lambs affects the flavour of the ram lamb meat
Experimental: Rearing of Lambs

- Lambs were from the same farm, breed and fed on the same grass and supplementary diet.
- Born in late March- early April and weaned in early August.
- “Mixed” ram lambs were held with ewes while unmixed rams were segregated from females after weaning.
- Lambs were slaughtered to a defined schedule at the same meat plant over a five month timescale.
## Experimental design

<table>
<thead>
<tr>
<th>Sex</th>
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<tbody>
<tr>
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<td>RU</td>
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<td>Ewes</td>
<td>n/a</td>
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Consumer Panels

Consumer panels: 200 assessors scored “liking of appearance”, “aroma” and “overall liking” on both lean and fat however “liking of flavour” and “texture” on lean only.

Cooking Procedure: 2.5cm thick loin slices with fat attached cooked in a commercial fan oven to 74°C and rested for 2 minutes before serving.
Sensory Profiling

Seven experienced taste panellists, trained to assess the appearance, flavour, texture and aftertaste.

Training included specific training on “ram or mutton like” odours.

Assessors developed 61 attributes

For aroma these included such attributes as sheep pen, slurry, mothball, ram, sweaty and old aromas
Statistical Analysis

- REML analysis
- External preference mapping
- Internal preference mapping
## Comparison of mixed and unmixed rams

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Profiling results: Texture attributes influenced by age

Effect of age - texture

Mean sensory score

- Fatty AE **
- Compact AI *
- EasilyCut TK ***
- Tender TM ***
- Rubbery TM ***
- Chewy TM

Values:
- 6.50
- 7.75
- 8.50
- 9.75
- 10.75
Profiling results: - **Texture attributes influenced by age**

Effect of age - texture

![Graph showing the effect of age on texture attributes such as Fatty AE, Compact AI, EasilyCut TK, Tender TM, Rubbery TM, and Chewy TM with mean sensory scores ranging from 6.50 to 10.75. The graph indicates that texture attributes are influenced by age.]
Profiling results: Selected flavour attributes influenced by age

![Graph showing the effect of age on selected flavour-related attributes. The x-axis represents different flavors and attributes, while the y-axis shows mean sensory scores. The graph includes multiple bars for each age group (6.5 mo, 7.75 mo, 8.5 mo, 9.75 mo, 10.75 mo). The mean sensory scores vary for different attributes such as Rlamb AR*, Rlamb FL***, RoLamb AT***, IntLamb FL***, Sweet FL***, Sweet AT**, Musty AR*, Old FL**, and Int AT*. The graph highlights the changes in sensory scores across different age groups.]
Profiling results: Selected flavour attributes influenced by age

Mean sensory score

- Rlamb AR*
- Rlamb FL***
- RoLamb AT***
- IntLamb FL***
- Sweet FL***
- Sweet AT**
- Musty AR*
- Old FL**
- Int AT*

Effect of age - selected flavour-related attributes

- 6.5 mo
- 7.75 mo
- 8.5 mo
- 9.75 mo
- 10.75 mo
Consumer Results: Comparison of rams of different ages, mixed and unmixed, for overall liking

Overall liking, entire sample

Sex: ns, Age: **, Sex.Age: ns
## Comparison of unmixed rams with ewes

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<td></td>
<td>5.5</td>
<td>6.5</td>
<td>7.25</td>
<td>7.75</td>
<td>8.5</td>
<td>9.75</td>
<td>10.75</td>
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</table>
Comparison of ewes and rams (unmixed) at 5.5, 7.25/7.75, 10.75mo

Sex: ***, Age: *, Sex.Age: ns (0.052)
Initial Conclusions

• Lambs slaughtered at 7.75 months were significantly different and less acceptable.

• Overall liking for ewes compared with unmixed rams was significantly higher at 7.25/7.75 and 10.75 months.

• Multivariate statistical techniques such as external and internal preference mapping may further explain differences between sex, age and mixed/unmixed.
External preference map - Texture

PC1 (94.3%)  PC2 (2.5%)
External preference map - Texture

PC1 (94.3%) vs. PC2 (2.5%)

-1 -0.8 -0.6 -0.4 -0.2 0 0.2 0.4 0.6 0.8 1

RubberyTM, LumpyTM, ChewyTM, EasilyCutTK, MeltsTM, TenderTM
External preference map - Aroma, Flavour and Aftertaste
External preference map - Aroma, Flavour and Aftertaste

PC1 (59.1%)  PC2 (12.6%)

LikingAR  LikingFL

IntAR  BloodAR  GrassAR  BloodyFL

RamAR  MustyAR  SourAT

OilyAT  RM8.5  RU9.75

RU10.75  RM9.75  RM7.75

RU7.75  RU6.5  RM6.5

E10.75  E7.25  E5.5

SaltyFL  SweetFL  IntLambFL  OldFL

LambFL  RamAT  RoLamAT

AntiseptAR  SalatAT  -1 -0.5 0 0.5 1
External preference map - Aroma, Flavour and Aftertaste

PC1 (59.1%) - PC2 (12.6%)

LikingAR - LikingFL

IntAR, BloodAR, GrassAR, BloodyFL

RM9.75 - RM8.5 - RM7.75 - RM6.5 - RM5.5 - RM4.5 - RM3.5 - RM2.5 - RM1.5 - RM0.5 - RM-0.5 - RM-1

RU9.75 - RU8.5 - RU7.75 - RU6.5 - RU5.5 - RU4.5 - RU3.5 - RU2.5 - RU1.5 - RU0.5 - RU-0.5 - RU-1

E10.75 - E10.25 - E5.5 - E5.0 - E0.5 - E-0.5 - E-1

IntLambFL, OldFL, SweetFL, SaltyFL, LikingFL, LikingAR, SweetAR

RamAR, RamAT, OilyAT, SourAT, MustyAR, BloodyFL, RamAT, OilyAT, SourAT, MustyAR, BloodyFL

LikingAR ♦

LikingF L -1 -0.5 0 0.5 1

PC1 (59.1%) - PC2 (12.6%)
External preference map - Aroma, Flavour and Aftertaste
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External preference map - Aroma, Flavour and Aftertaste
Internal preference map - Flavour only
Internal preference map - Flavour only
Conclusions

• Lambs killed at 7.75 months was significantly less acceptable than the other kill dates.

• At both 7.75 and 10.75 months slaughter dates ewes more acceptable than unmixed rams.

• Ewe and young ram lamb were most liked, most tender and most roast lamb flavour.

• No evidence of effect of RU versus RM.

• Treatments grouped by kill date.

• Liking of texture and flavour grouped together with Overall liking
• Finally I would like to thank Dunbia and InvestNI for their support of this project.
### Descriptors of compounds or material used for training profiling panellists in specific attributes

<table>
<thead>
<tr>
<th>Descriptors</th>
<th>Compound or material used</th>
<th>Concentration in minced lamb (ng/g)</th>
<th>Attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sheep, woolly, animal,</td>
<td>ethyl octanoic acid</td>
<td>10-1000</td>
<td>Sheep pen aroma</td>
</tr>
<tr>
<td>Piggy, slurry</td>
<td>skatole</td>
<td>200-20000</td>
<td>Slurry aroma</td>
</tr>
<tr>
<td>Mothballs</td>
<td>indole</td>
<td>20000</td>
<td>Mothball aroma</td>
</tr>
<tr>
<td>Hospital, disinfectant</td>
<td>4-iso-propylphenol/ cresol</td>
<td>1000/10-1000</td>
<td>Antiseptic aroma</td>
</tr>
<tr>
<td>Muttony, strong sheepy</td>
<td>4-methyloctanoic acid</td>
<td>1000</td>
<td>Ram aroma *</td>
</tr>
<tr>
<td>Sweaty, body odour</td>
<td>4-methylbutanoic acid</td>
<td>1000</td>
<td>Sweaty aroma</td>
</tr>
<tr>
<td>Cheesy/ over ripe cheese</td>
<td>3-methylbutanoic acid</td>
<td>1000</td>
<td>Cheesy aroma</td>
</tr>
<tr>
<td>Liver/undercooked meat</td>
<td>4-methylnonanoic acid</td>
<td>5000</td>
<td>Liver flavour</td>
</tr>
<tr>
<td>Older lamb or sheep, boiled lamb, sheepskin</td>
<td>thiophenol</td>
<td>20</td>
<td>Old flavour</td>
</tr>
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</table>
### Statistical Model 2: Comparison of unmixed rams with ewes

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Internal preference map - flavour liking