Can we predict beef flavour?

"Key Customer Day" - 20 April 2018

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Can we predict beef flavour?

Consumer aspirations

Marker compounds

How can we use them?

Consumer aspirations?

Henchion et al., Meat Science, 2016

Quality attributes

- Search / Experience / Credence

Ranking 22 attributes from15 papers

1.	Origin	C
2.	Price	S
3.	Labels, brands, certification	S
4.	Visible fat	S
5.	Flavour	E
6.	Animal welfare	C
7.	Production system	C
8.	Freshness, shelf-life	E
9.	Natural, organic	C
10.	Tenderness	E
11.	Health, nutrition	C
12.	Meat colour	S

Prediction of overall acceptability of beef by tenderness and flavour

Grilled sirloin
German, Spanish and British consumers

Regression coefficients ($P < 0.001$)

Consumer Country	Tenderness coefficient	Flavour coefficient	R^2
German	0.50	0.50	0.99
Spanish	0.40	0.59	0.99
British	0.40	0.59	0.99

Oliver et al., Meat Science 2006

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So what can we do about beef flavour?

- Beef flavour = taste + aroma
- Many taste compounds and aroma compounds
- Most important ones are very difficult to analyse
- Consumer panels are effective but expensive in time and meat

?!

What we need are marker compounds!

(Compounds that are related to flavour but easy to measure)

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Identification of marker compounds for beef flavour

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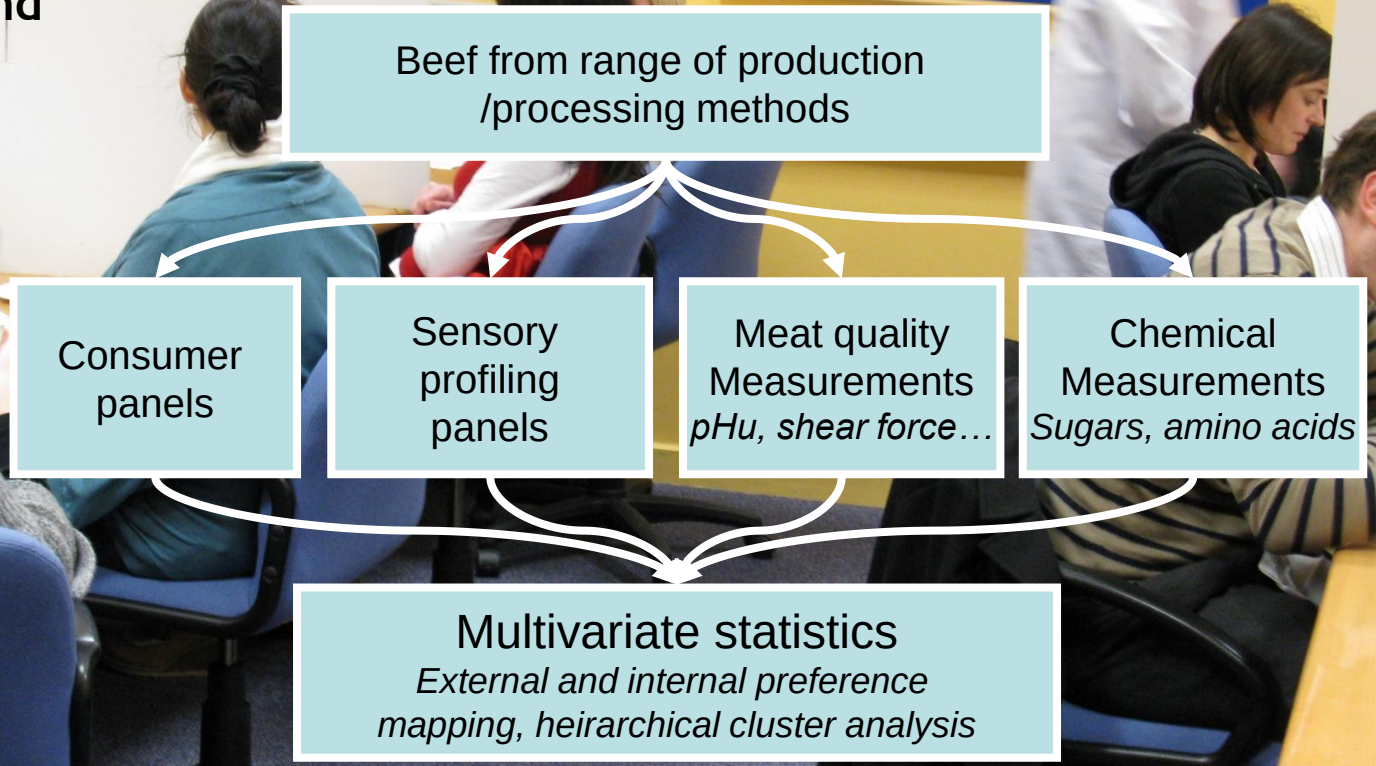
Understanding consumers
preference mapping

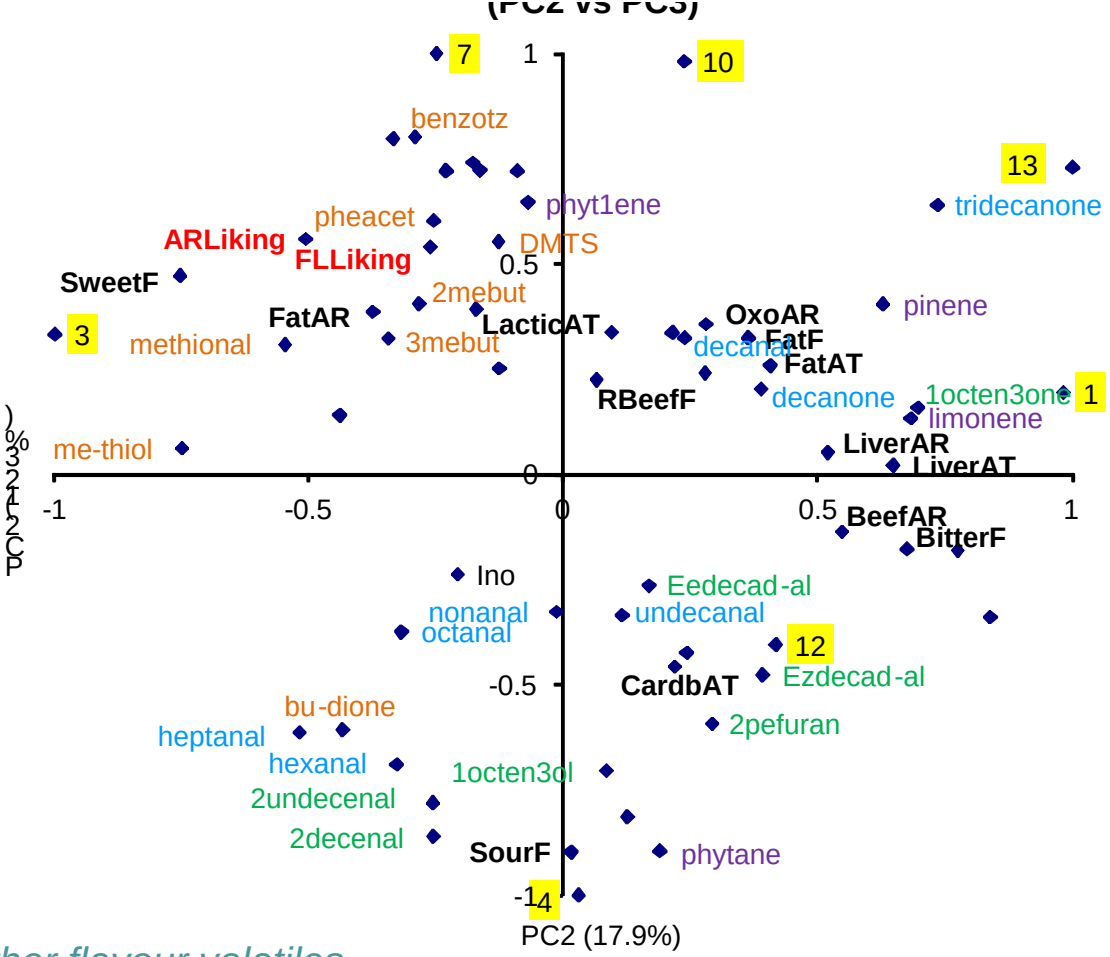
Funding from Dunbia and InvestNI



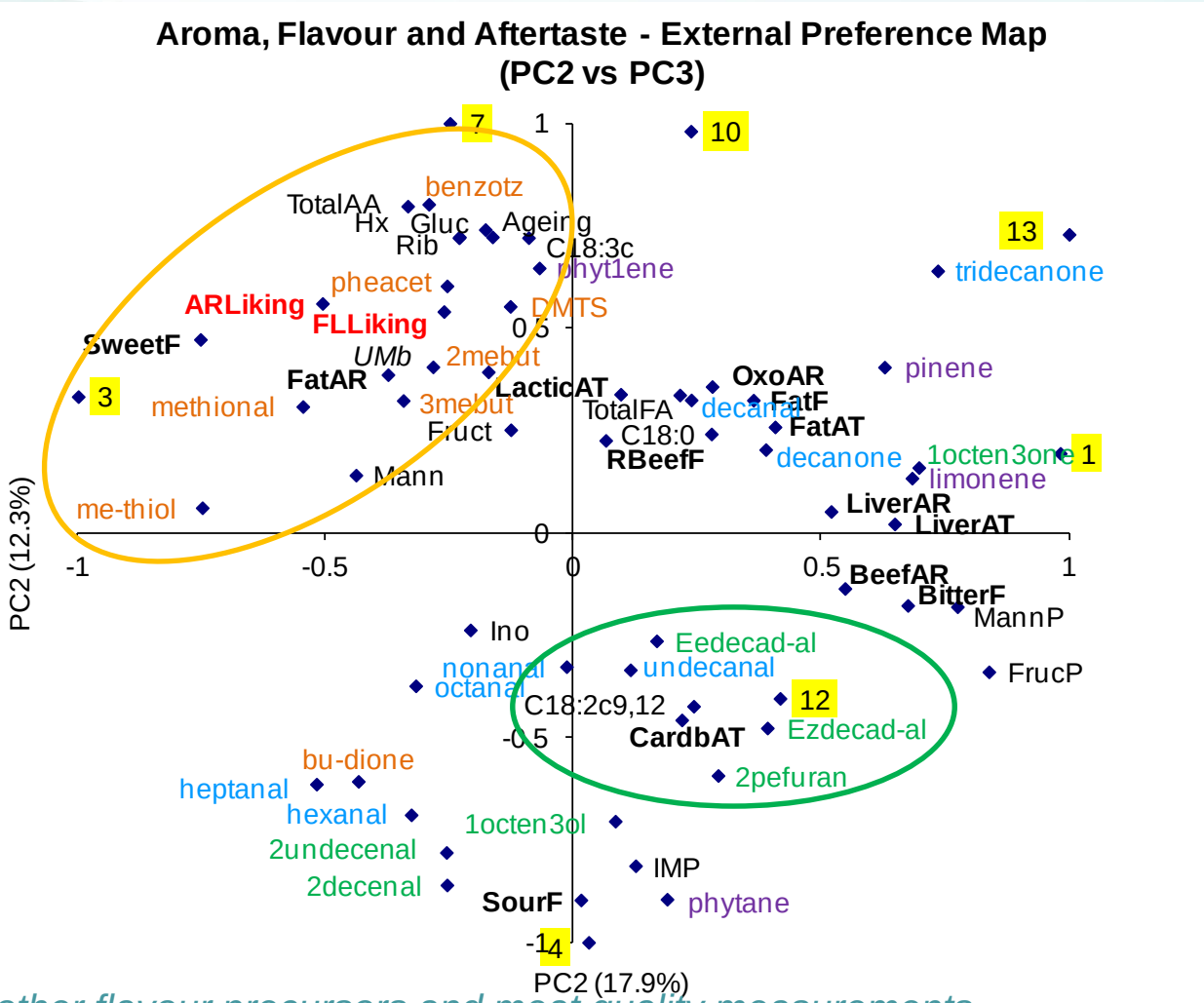
Farmer et al., ICOMST 2010

- A lot of information on all attributes
- Focus on selected data ...
- Flavour, odour and aftertaste only

Using flavour and aroma terms only - adding classes of volatiles



With other flavour volatiles



With other flavour precursors and meat quality measurements

Confirmed by independent data

- Texas Tech University and AFBI (funded by MLA, Birkenwood)
- Same volatile compounds linked to consumer liking.

Jerrad Legako et al, Meat Science 2015

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Marker compounds?

Consumer liking is linked to:

- tenderness, juiciness, sweet flavour attributes
- “Maillard” odour compounds
- Sugars and amino acids in raw meat

Possible “Marker compounds” for flavour liking

Rational explanation for beef flavour!

>> Opportunity to manage flavour!

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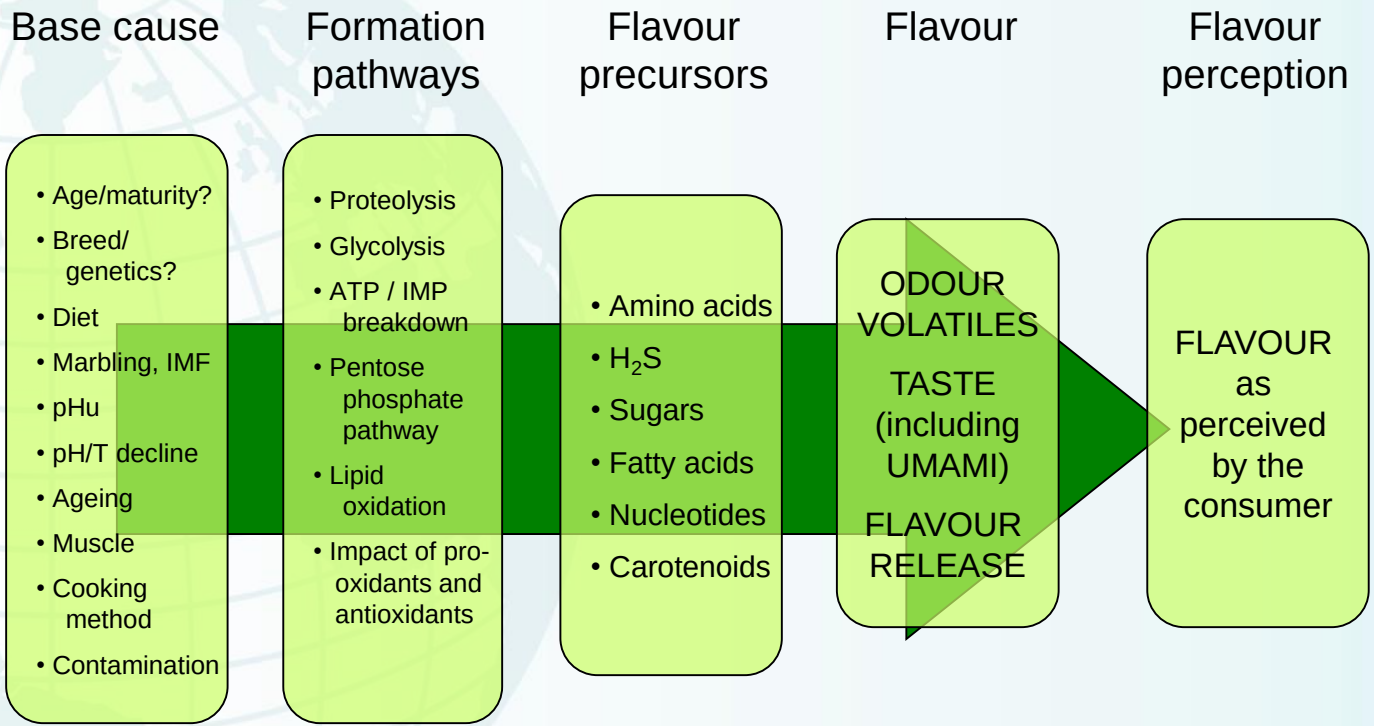

Base cause
Formation pathways
Flavour precursors
Flavour
Flavour perception
• Age/maturity?
• Breed/ genetics?
• Diet
• Marbling, IMF
• pHu
• pH/T decline
• Ageing
• Muscle
• Cooking method
• Contamination
• Proteolysis
• Glycolysis
• ATP / IMP breakdown
• Pentose phosphate pathway
• Lipid oxidation
• Impact of pro-oxidants and antioxidants
• Amino acids
• H_2S
• Sugars
• Fatty acids
• Nucleotides
• Carotenoids
ODOUR VOLATILES
TASTE (including UMAMI)
FLAVOUR RELEASE
FLAVOUR as perceived by the consumer

How can we use marker compounds?

Effect of muscle, ageing, packaging and cooking method on marker volatiles for beef flavour

Research funded by:

Meat and Livestock Australia

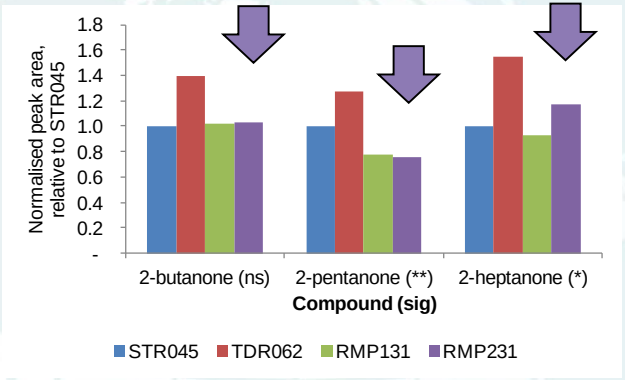
Teys

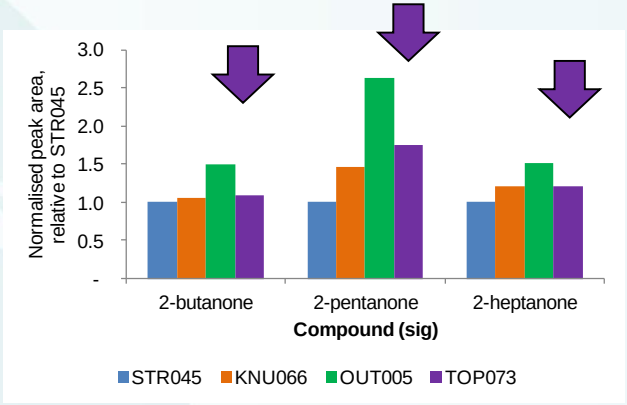
Birkenwood

Aim: To understand why differences in flavour occur, so that flavour can be managed to create added value

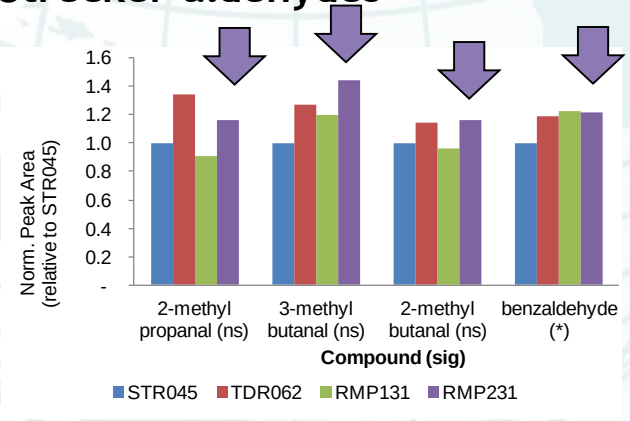
Example 1: Effect of muscle

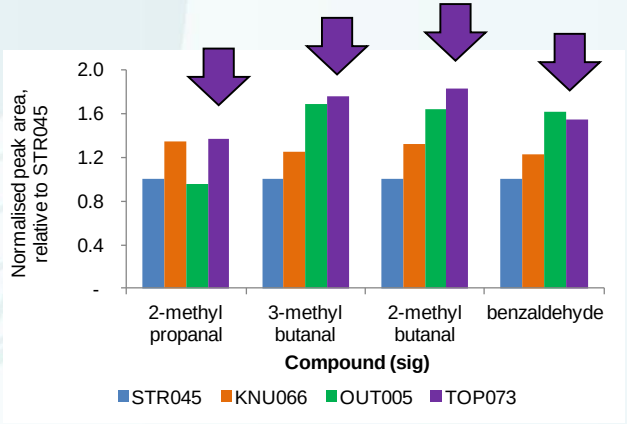
Ketones





Strecker aldehydes





- Quantities relative to STR045 = 1
- Some significant effects of muscle

BUT

- Consistent trends within groups
- E.g. TOP073 and RMP231 are high in Strecker aldehydes but not in ketones

Effect of muscle

Different muscles give a different balance of flavour compounds

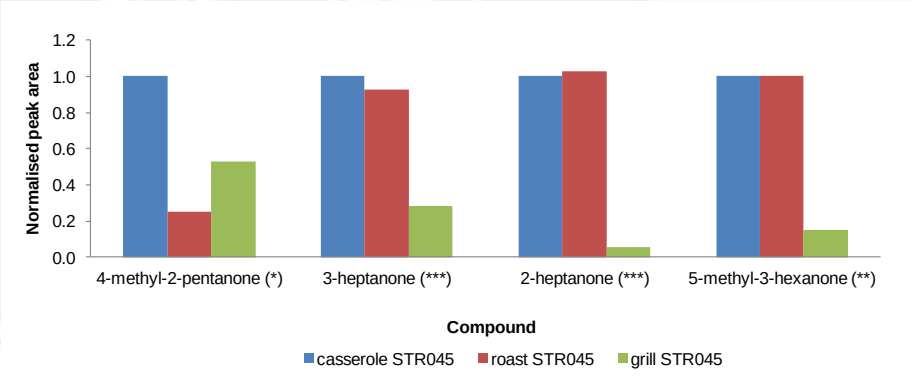
Is this due to a lack of certain precursors?

How could we use this?

E.g. add precursors in a marinade or sauce to enhance flavour formation

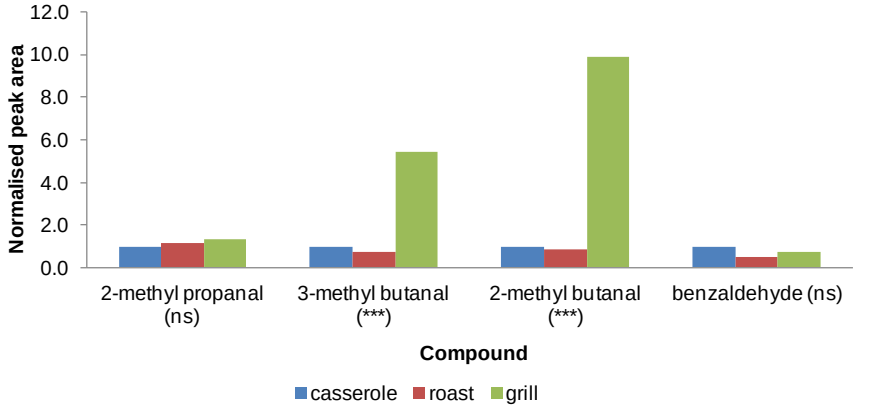
Example 2: Effect of cooking method

Ketones

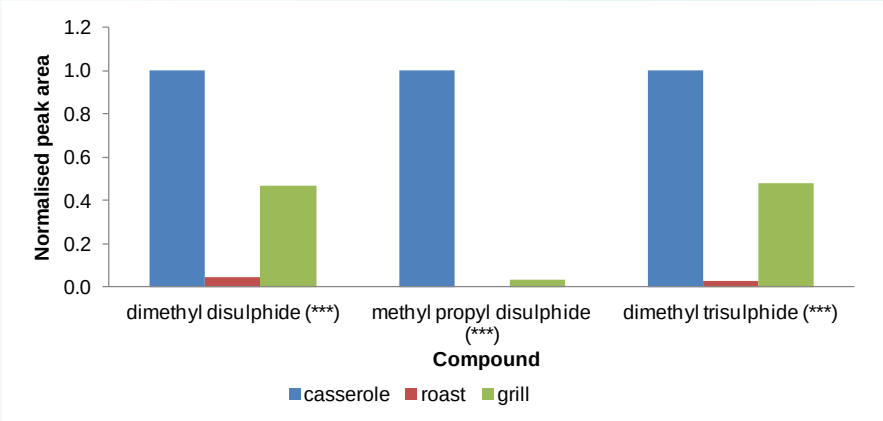


- Quantities relative to STR045 = 1
- Many sig effects of cooking method
- Large changes to balance of volatile compounds

Strecker aldehydes



Sulphur compounds



Effect of cooking method

Different cooking methods cause large changes to balance of flavour compounds

How could we use this?

Recommend different cooking methods to optimise flavour in particular muscles

Next steps

- Flavour precursor analysis to determine if they explain changes in volatile compounds
  - may suggest which precursors need to be increased when using less favoured cuts.
- Further samples and treatments
  - Statistical analyses to determine the relationship between the flavour volatiles and flavour liking.

Conclusions

- Marker compounds for flavour have been identified
- Differences due to muscle, packaging, ageing, cooking method
- Ongoing work on beef and also chicken
- Opportunities for adding value by improving flavour of specific muscles/treatments

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