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Relationship between flavour volatiles and eating quality of lamb

Janeen McKinnie-Hill, Terence Hagan, Aurelie Aubrey, Linda Farmer, and Frank Monahan

Department of Agriculture, Food and the Marine
An Roinn Talmhaíochta, Bia agus Mara

UCD DUBLIN University College Dublin Ireland's Global University

eagasc Agriculture and Food Development Authority

Relationship between flavour volatiles and eating quality of lamb

1. Background
2. Experimental design
3. Sensory profiling analysis
4. Analysis of odours
5. Conclusions

1. Background

What is the problem?

- Concern in Irish lamb meat industry about ram lambs vs castrated male lambs
- Perception that ram meat is of a lower quality
- Ram lambs favoured in production
- Medium length branched chain fatty acids (BCFAs), phenols or indoles may cause off-odour

AIM

To determine the cause of any off-flavours in ram meat

& see how it is affected by diet

2. Experimental design

Experimental design 1

Farm	Diet	BSxSBx		Suffx		
		Ram	Cast	Ram	Cast	
Outdoor	Fresh Grass	6	6	6	6	24
Outdoor	Stubble Turnip	6	6	6	6	24
Outdoor	Forage Rape	6	6	6	6	24
Indoor	Conc	6	6	6	6	24
Indoor	Clover silage	6	6	6	6	24
Indoor	Grass silage	6	6	6	6	24
		36	36	36	36	Total = 144

Total = 144 lambs

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3. Sensory Profiling analysis

Sensory Profiling analysis

- 8 trained panellists tasted a 25mm slice of loin
- Grilled to internal temp of 75^{o}C
- Every animal sampled
- Assessed sensory profiling attributes
- Data analysed using linear mixed model methodology using REML estimation

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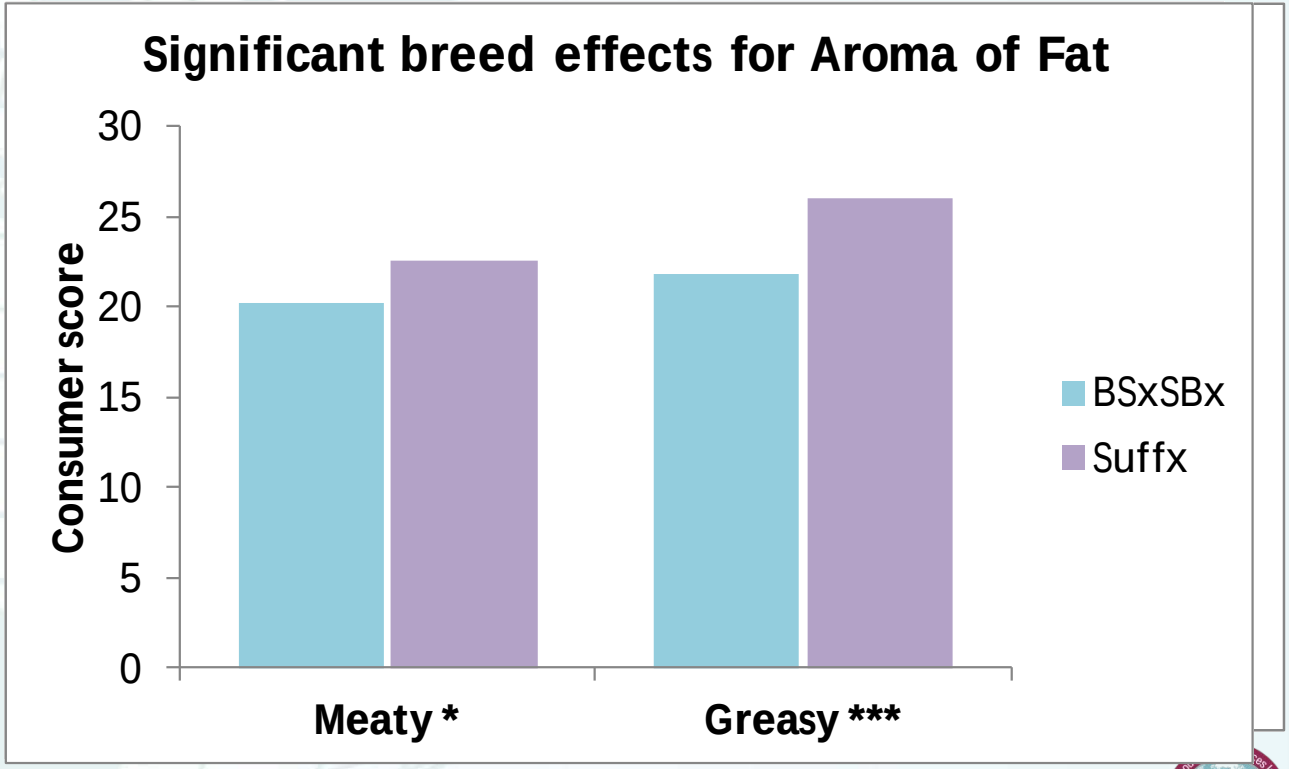
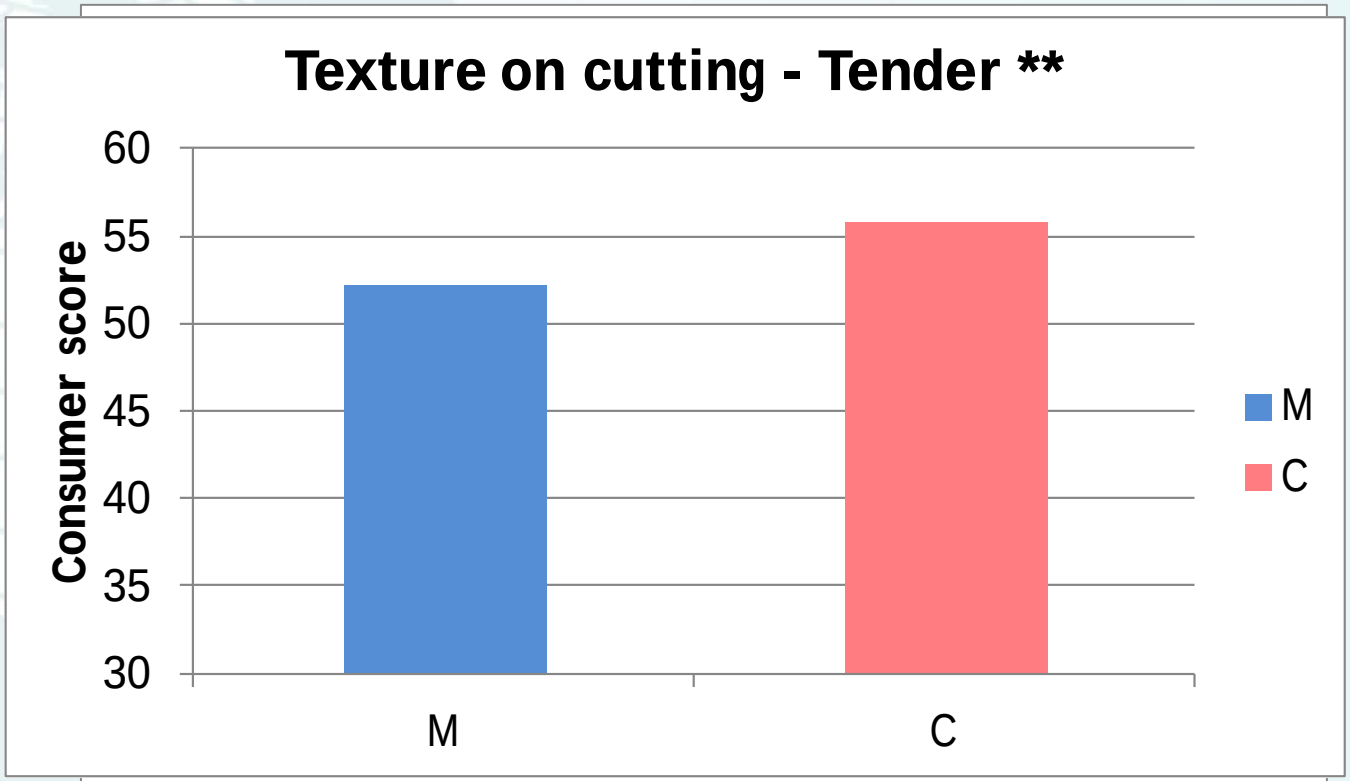
Sensory Profiling analysis – results for flavour related attributes



Diet.Sex.Breed Interaction
*

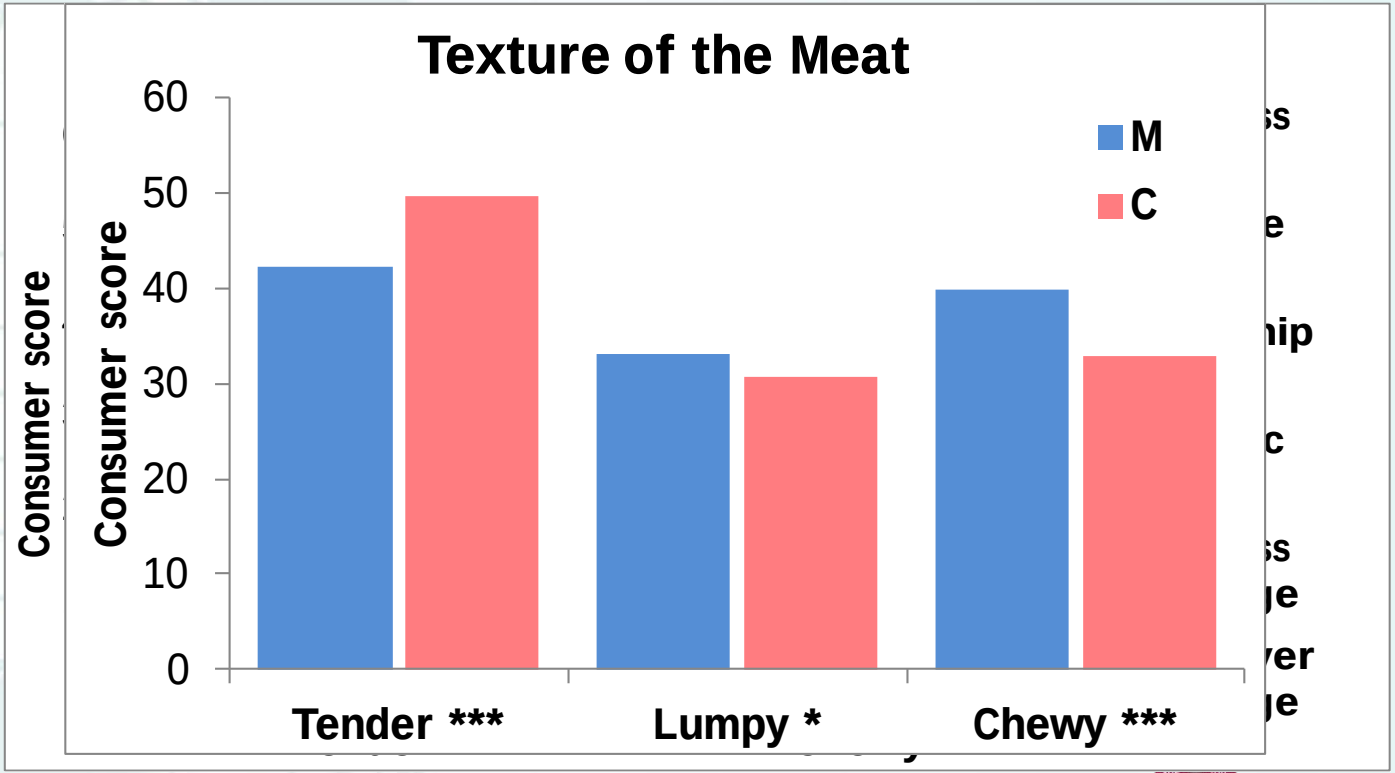
Definitions: ***Crackling*** = *Crisp, Roasted fat*; ***Meaty*** = *Beefy smell*; ***Greasy*** = *Fatty, oily, chip shop*; ***Fatty*** = *Greasy, fatty.*

Sensory Profiling analysis - results



***Definitions**: **Juicy** = Juices on surface & on plate, moist; **Tender** = Scale of tenderness; **Cooked** = Scale of degree of cooked appearance.*

Sensory Profiling analysis - results



Definitions: ***Tender*** = *Scale of tenderness*; ***Lumpy*** = *Forms balls on chewing*; ***Chewy*** = *Requires a lot of chewing, hard to swallow.*

4. Analysis of odours

GC-MS-O analysis

- Volatiles collected onto a Tenax trap
- 3 Assessors for each of 40 animals chosen

Grass Silage
Turnip
Concentrate
Grass

5 **Rams** +
5 **Castrates**
from each

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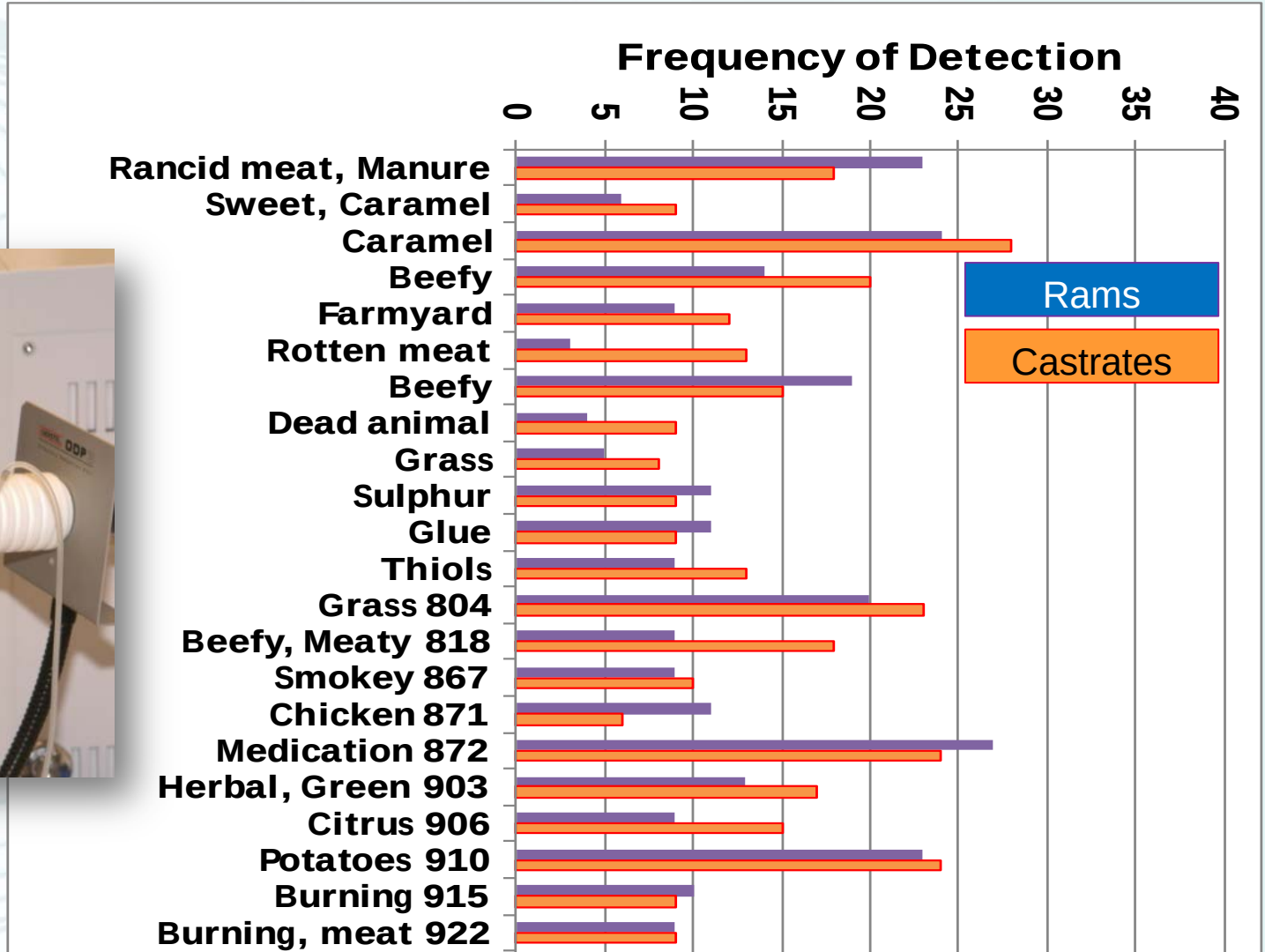
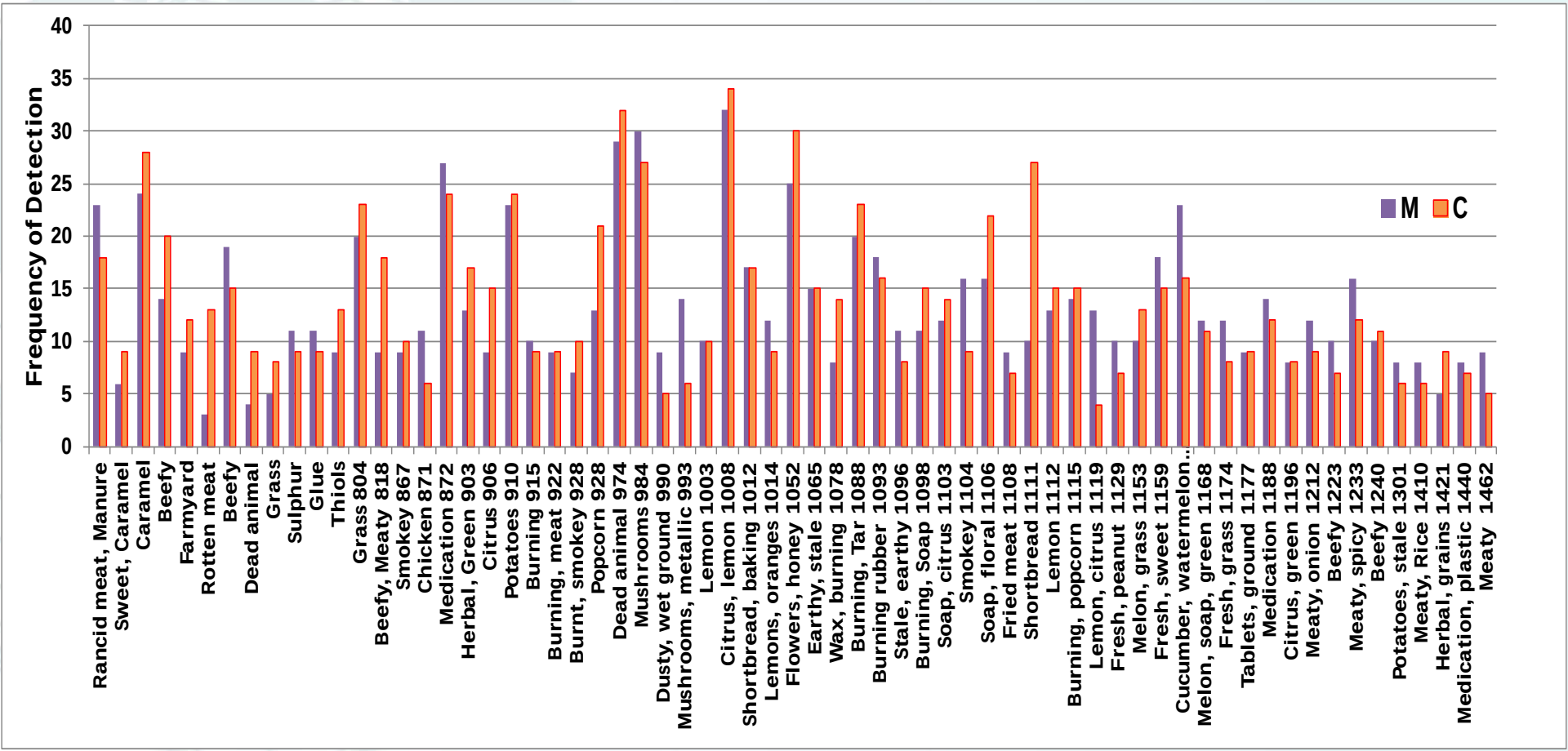
Results of GC-O



Main odours detected using GC-MS-O



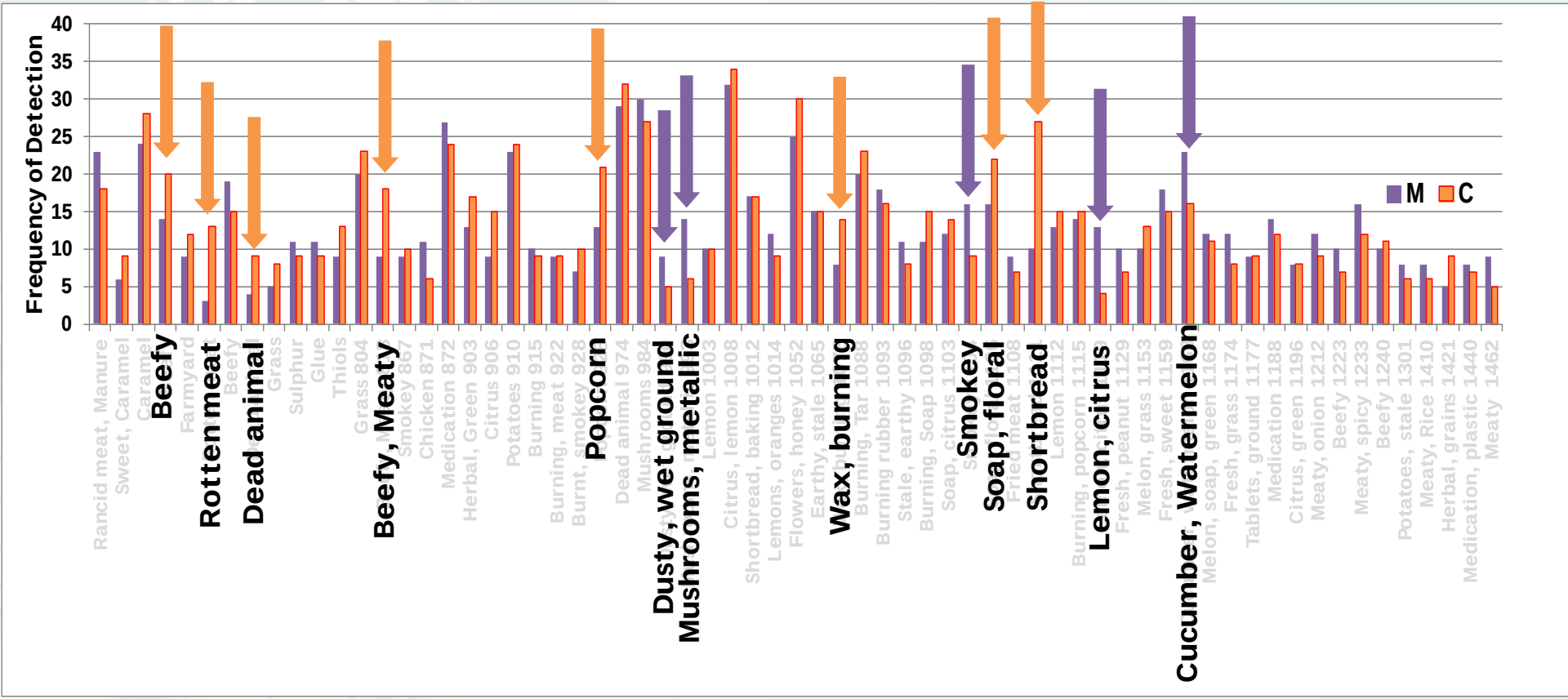
Main odours detected using GC-MS-O

Descriptor	Compound
Sweet, caramel	2,3-Butanedione*
Caramel	3-Methyl butanal*
Glue	Toluene*
Grass	Hexanal*
Potatoes	Methional
Mushrooms	1-Octen-3-ol
Mushrooms, metallic	1-Octen-3-one*
Citrus, Lemon	Octanal*
Flowers, Honey	Phenylacetaldehyde*
Earthy, stale	E-2-Octenal*
Cigarettes, burning	p-Cresol*

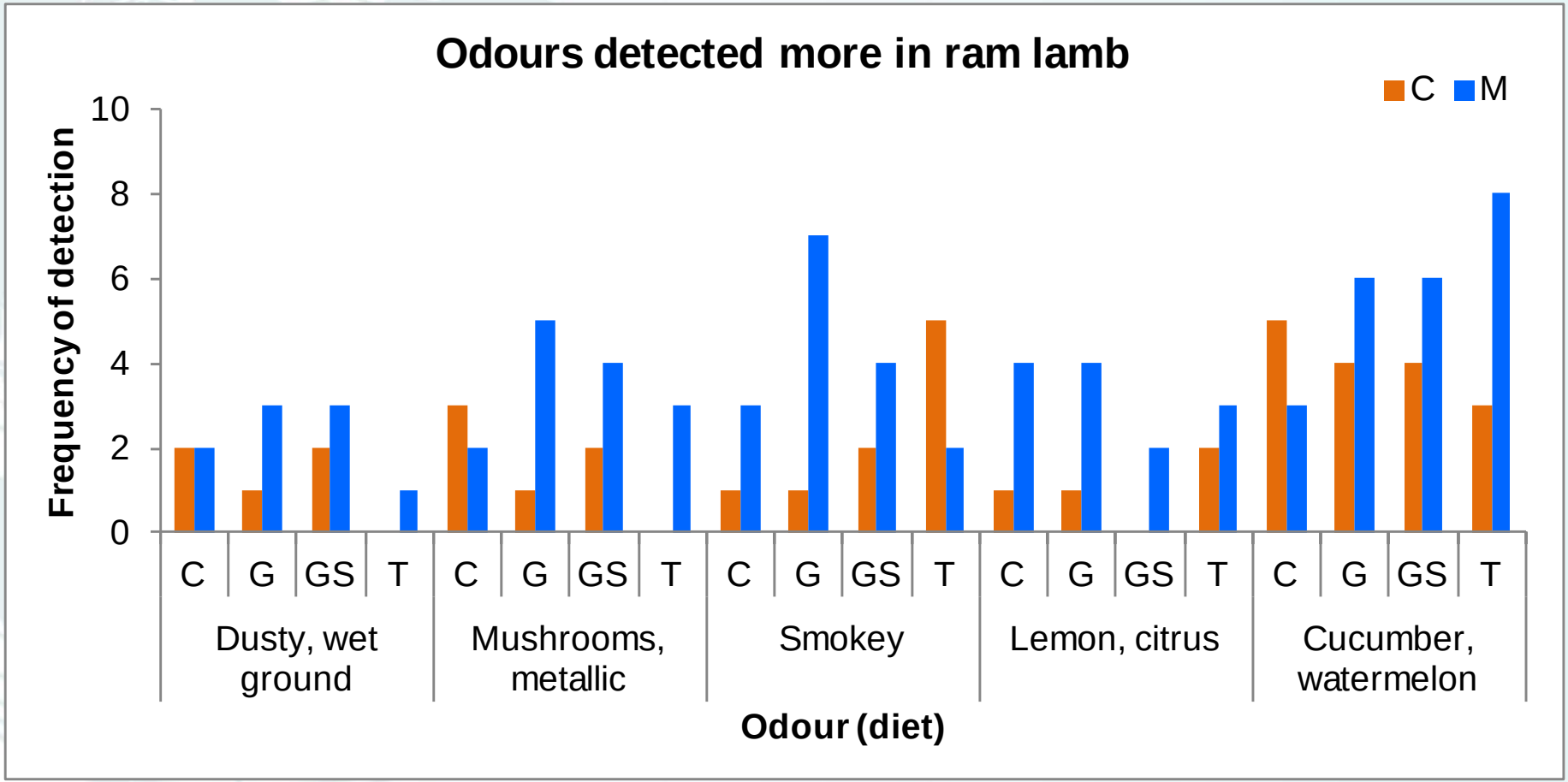
Descriptor	Compound
Burning	m-Cresol*
Burning rubber	Ethyl dimethyl pyrazine
Soap, floral	Nonanal*
Shortbread	2-Acetylthiazoline*
Lemon	Linalool*
Burning, popcorn	Furaneol
Melon, Grass	E-2-Nonenal*
Cucumber, watermelon	(E,Z)-2,6-Nonadienal
Tablets, ground	4-Ethyl phenol*
Meaty, onion	(E,E)-2,4-Heptadienal*

** Tentative identification*

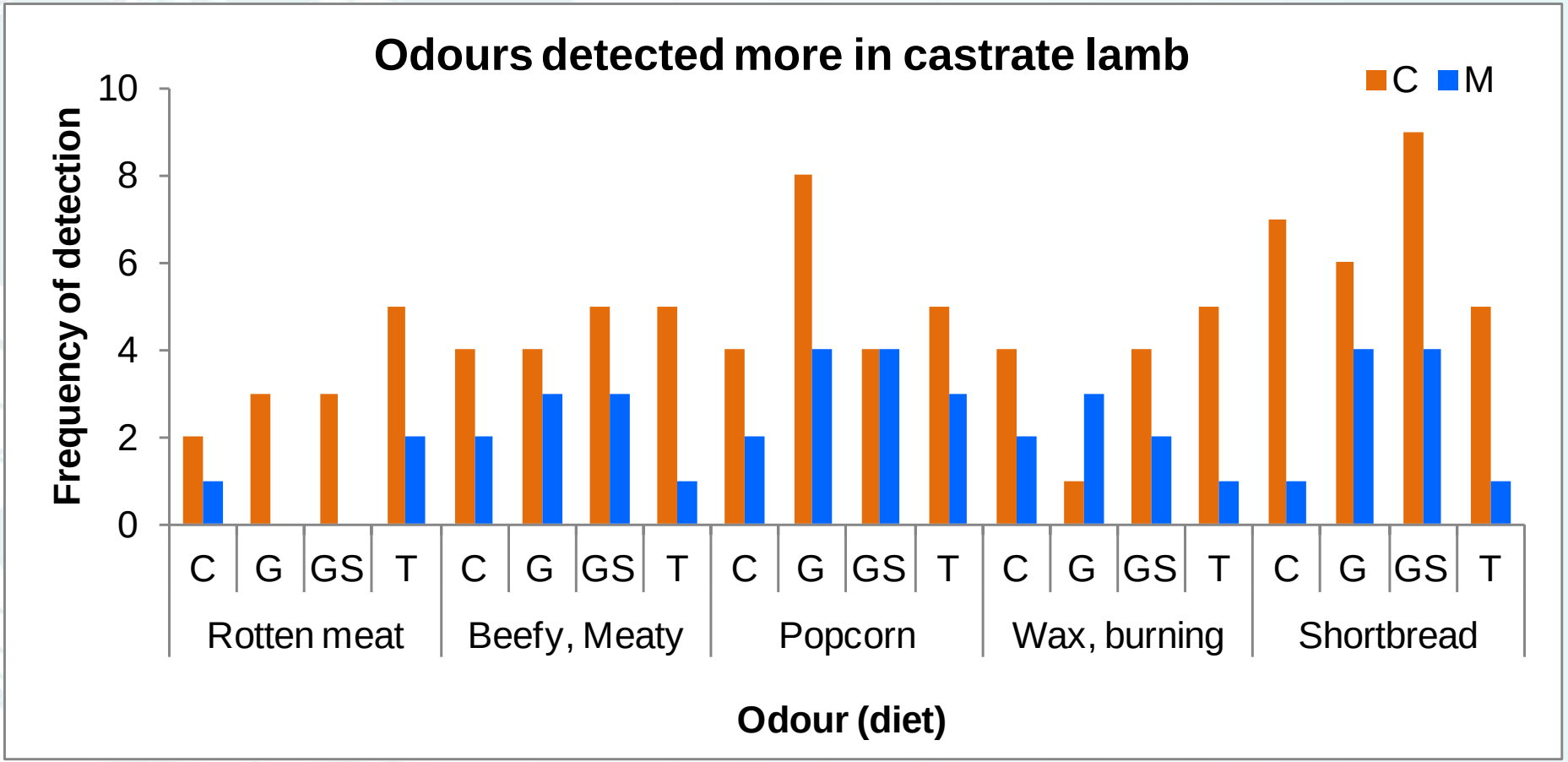
Main odours detected using GC-MS-O



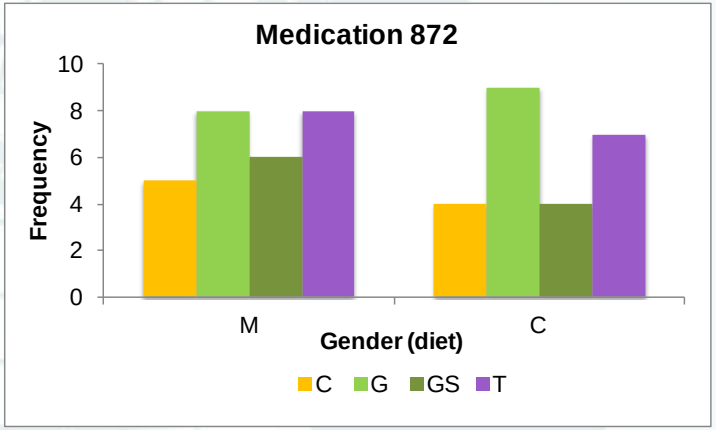
Odours from rams vs castrate lamb

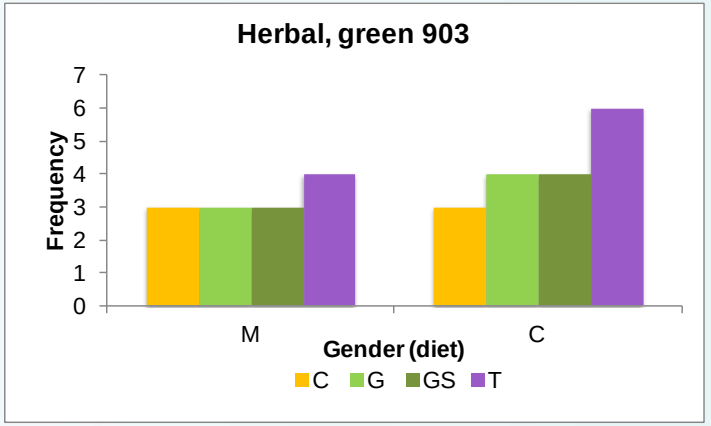


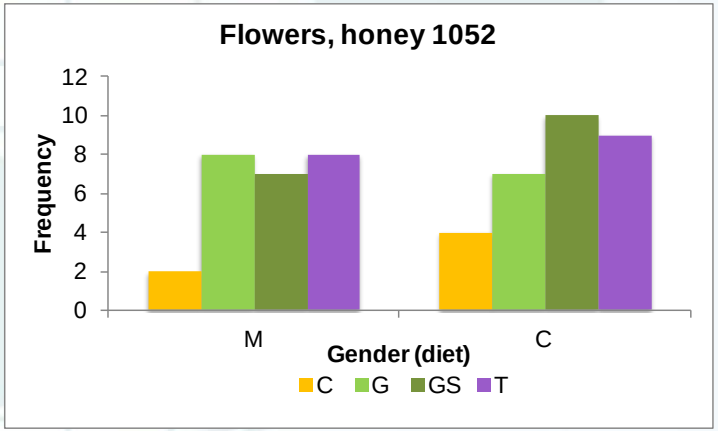
Odours from rams vs castrate lamb

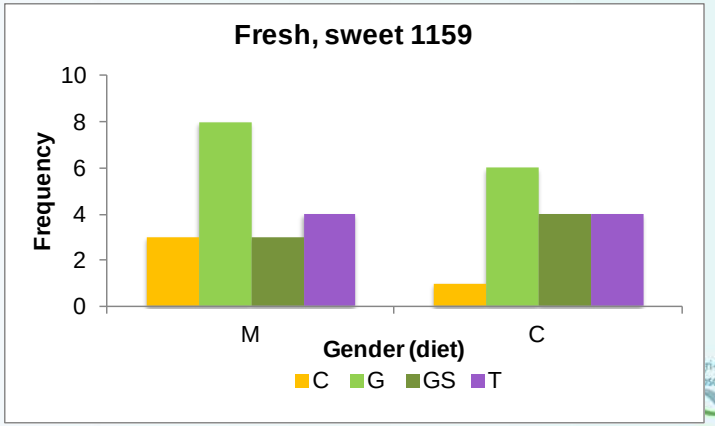


Effect of diet









4. Conclusions

Conclusions

- There are sensory differences due to sex & diet
- Some odour differences detected by GC-O analysis
- Work in progress to confirm identities & quantify compounds

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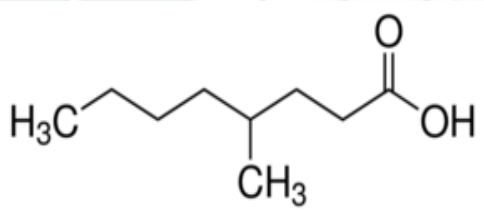
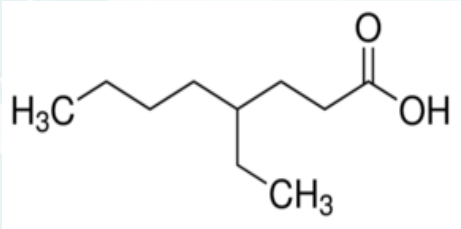
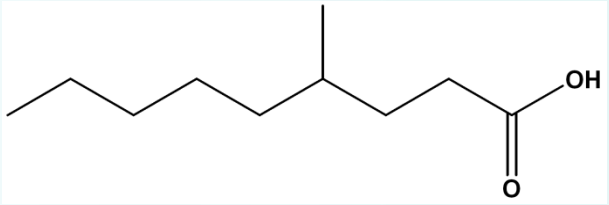
Compounds NOT detected using GC-MS-O…BUT detected by nose



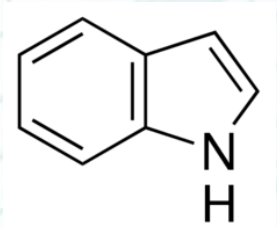
4-Methyloctanoic Acid



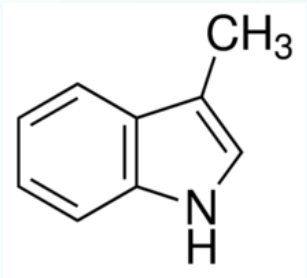
4-Ethyloctanoic Acid



4-Methylnonanoic Acid



Indole



Skatole

Etc…

Compound	Literature Descriptors	GC-MS peak detected?	Assessor descriptors matching LRI
4-methyloctanoic acid	Goaty, mutton, fatty, waxy	No	Burnt fat, hot oil, soap
4-methylnonanoic acid	Sweaty-sour, Sheepmeat, Waxy-sweet, soapy, fatty, wet wood	No	Wet ground, stale water, hot oil, soap
4-ethyloctanoic acid	Mutton, Fatty, Waxy, creamy, moldy, cheesy	No	Hot oil, vegetable oil, fat
Indole	Musty, Faecal, Mothball-like	No	Stale, Faeces
Skatole	Manure, Urine, (Boar taint)		
p-cresol	Animal, Barnyard-like, Leather, Faecal	Yes	Leather belt, Rubber, Wax
2-Isopropyl phenol	Ink-like & Fruity	-	-
3,4-dimethylphenol	Horse stable-like, fecal, ink-like	-	-
Thymol	Phenolic, Medicinal	No	Tablets
3-Isopropyl phenol	Ink-like & leather-like	-	-
Dimethyl disulphide	Sweet, honey, acrid, cooked vegetables, sulphuric	Yes	Bad eggs, rotten eggs, suphur, toffee, boiled veg
3-methylbutanoic	Sweaty, Vomit, Parmesan cheese		

Main off-odour compounds from literature