

QUALITY ASSURANCE FOR FLAVOUR OF PASTURE-FED RUMINANTS

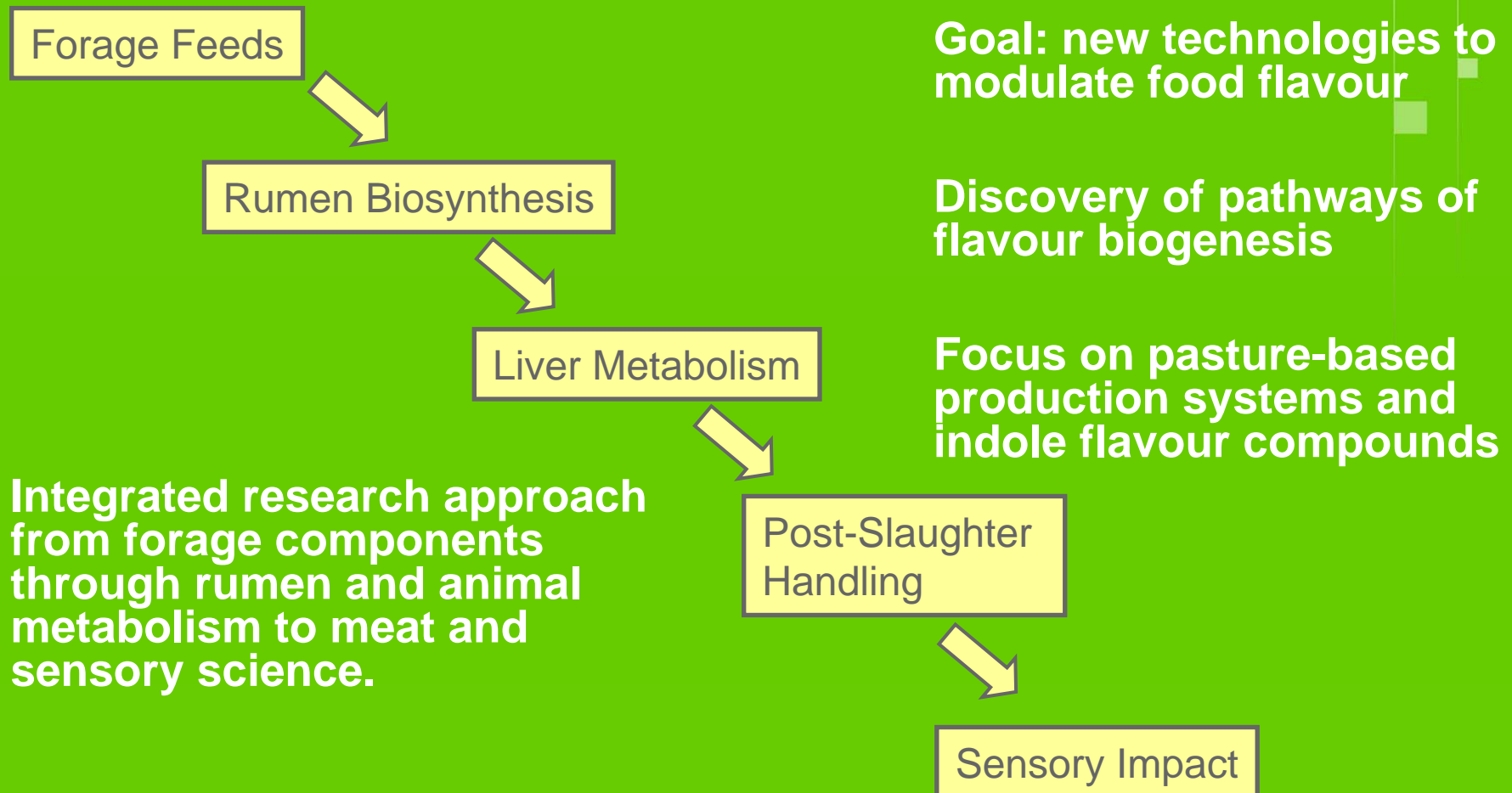
Geoff Lane, Mike Tavendale and Mustafa Farouk
Food, Metabolism & Microbiology



Farming, Food and Health. **First**

Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi

FRST Programme Objective: Creating Flavour Experiences



Farming, Food and Health. **First**

Te Ahuwhenua, Te Kai me te Whai Ora. Tuatahi

Multidisciplinary Research team

AgResearch; Forage Biotechnology

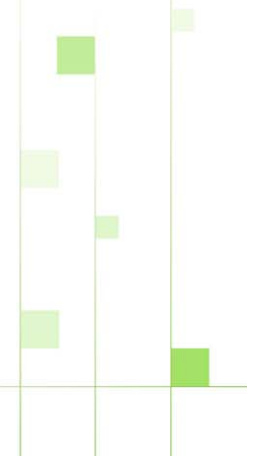
- Geoff Lane: Chemistry of forage, flavour and flavour metabolism.

AgResearch; Food, Metabolism & Microbiology

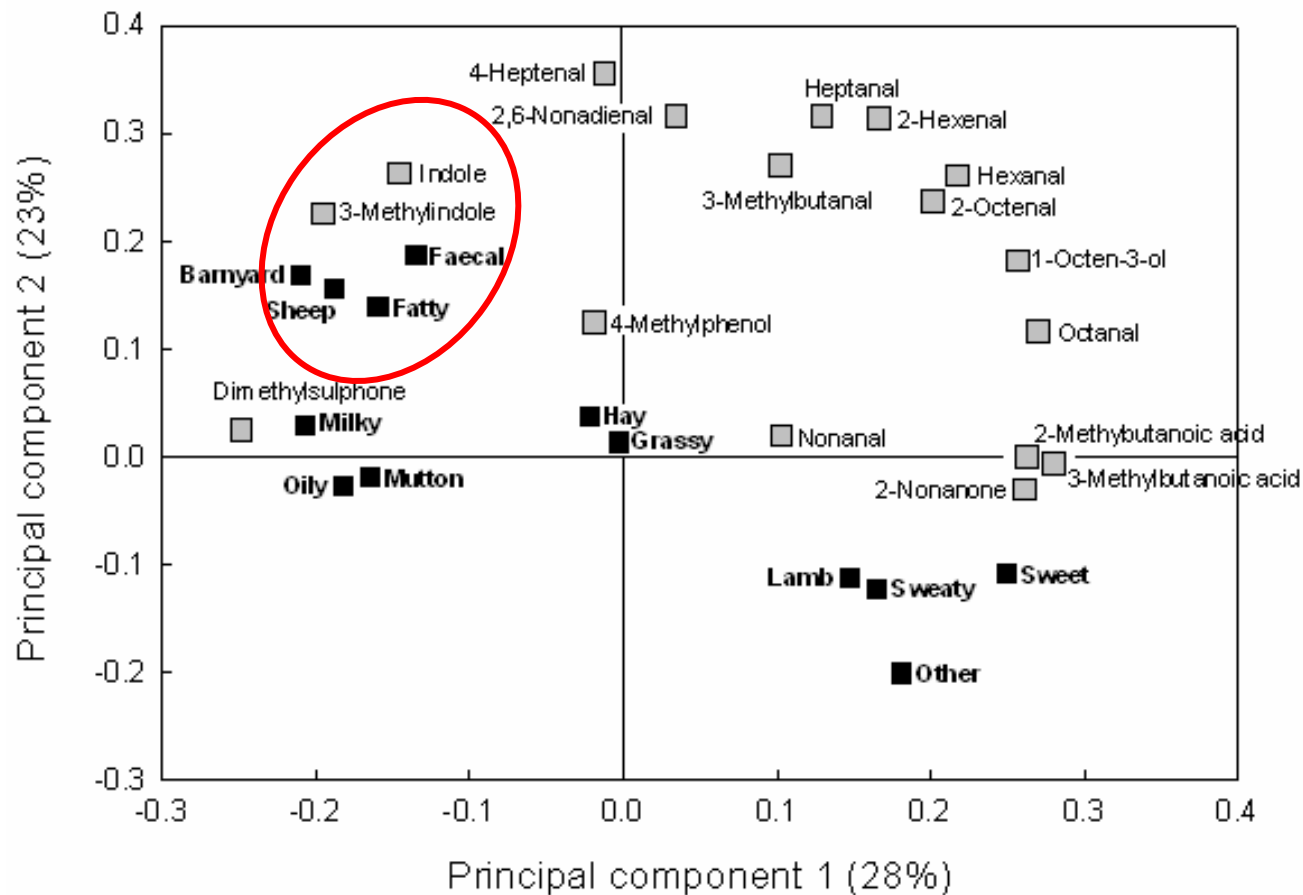
- Michael Tavendale: Metabolism and chemistry in the rumen and animal.
- Graeme Attwood: Rumen microbiology
- Nicole Roy: Ruminant physiology
- David Pacheco: Ruminant physiology, modelling
- Mustafa Farouk: Meat science

Collaborators:

- Chris Morris, AgResearch, Animal Genomics
- Owen Young, Food Technology, Auckland University of Technology
- Professor Tom Barry, Massey University, IVABS
- Nicola Schreurs, INRA, Clermont-Ferrand, France

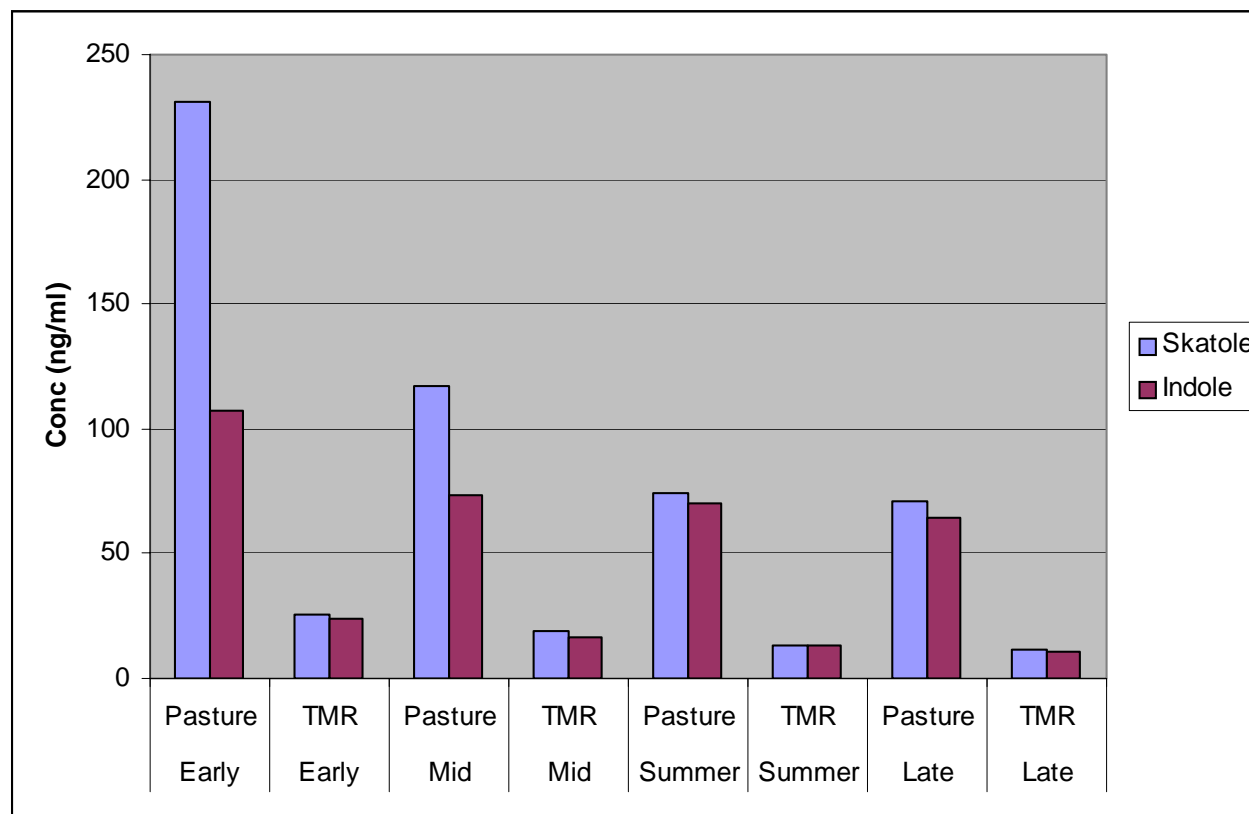


Pasture-Feeding, Flavour and Flavour Chemistry - Lambs



Skatole and indole levels were higher in the fat of pasture-fed lambs than concentrate-fed lambs and were associated with “pastoral” sensory attributes. - Young et al., 2003

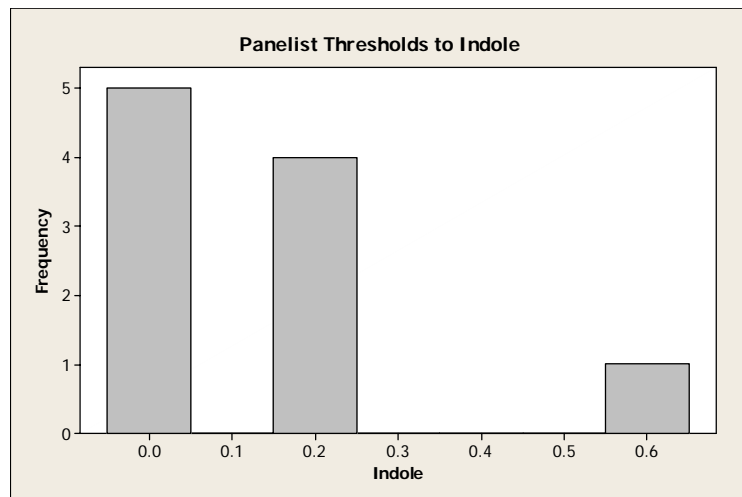
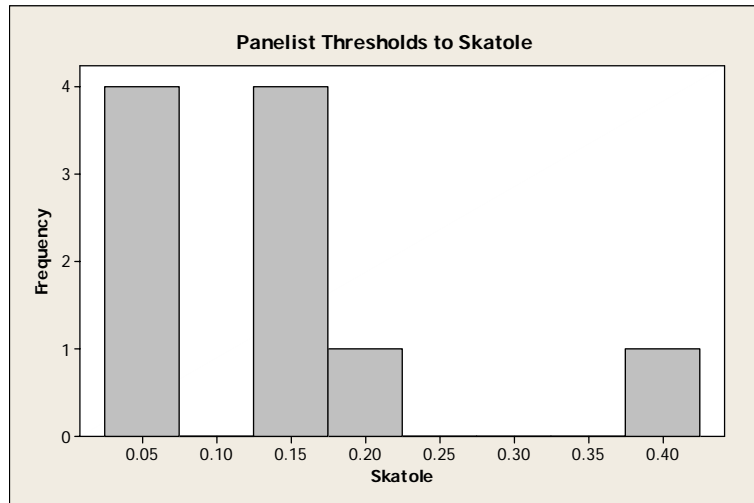
Pasture-Feeding and Flavour Chemistry - Dairy Cows



Levels of the flavour compounds skatole and indole were much higher in the milk of pasture-fed cows than TMR-fed cows especially in spring.

- Lane et al., NZSAP (2002).

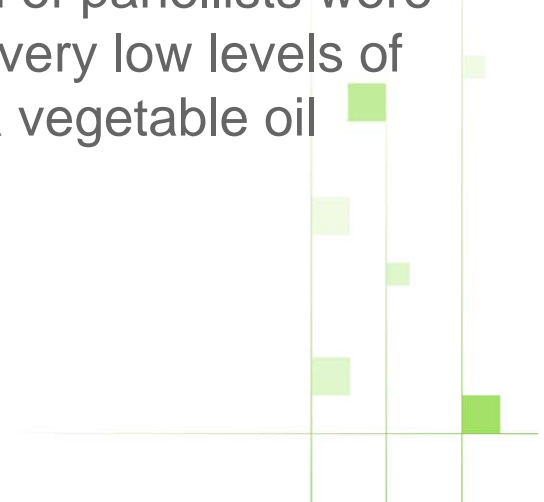
Sensory panellist responses to skatole and indole



The sensitivity of panellists to skatole and indole was very heterogeneous.

Several panellists associated skatole and indole with “camphor” or “faecal” notes.

A proportion of panellists were sensitive to very low levels of skatole (in a vegetable oil base).



Accumulation in fat depots,
exchange with mammary gland

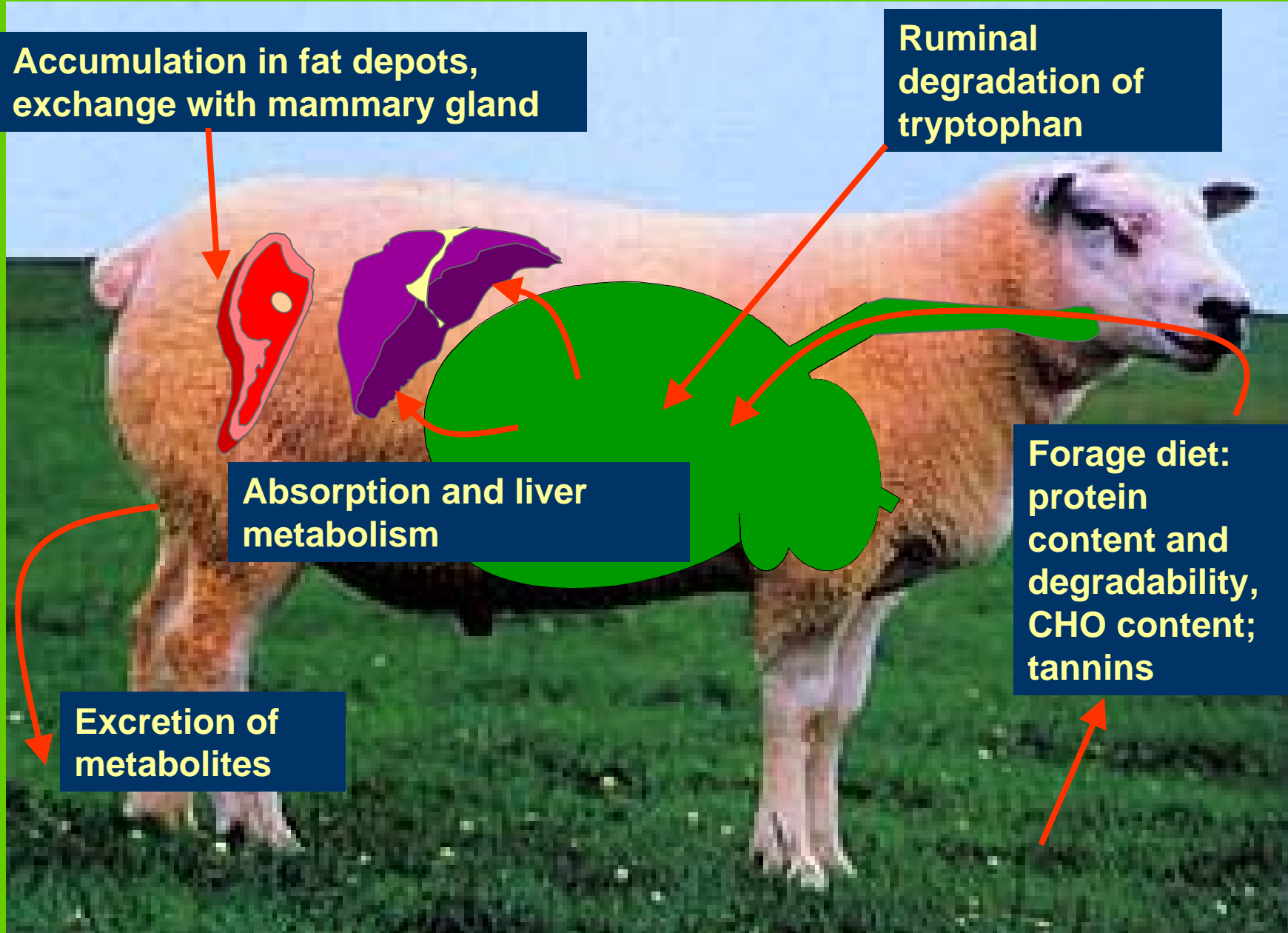
Ruminal
degradation of
tryptophan

Absorption and liver
metabolism

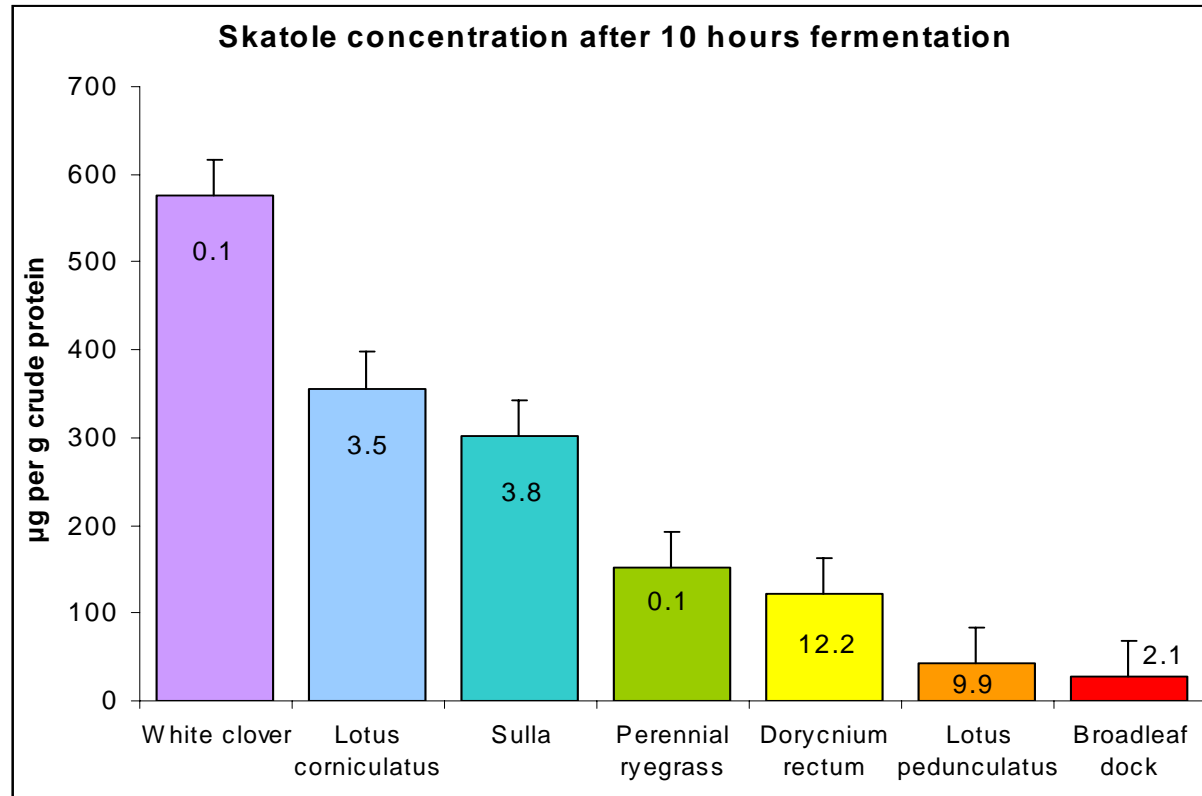
Forage diet:
protein
content and
degradability,
CHO content;
tannins

Excretion of
metabolites

Factors in skatole biogenesis, accumulation and clearance

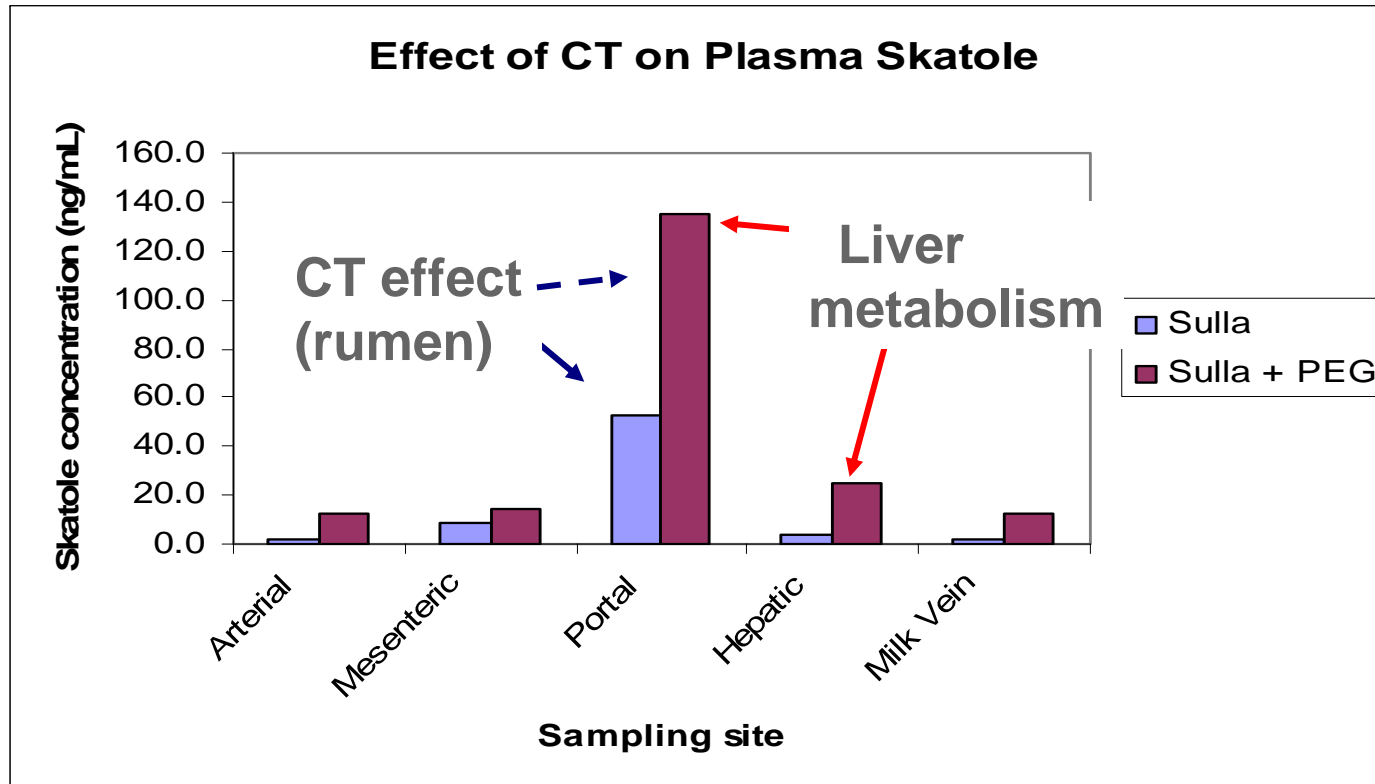


Flavour Biogenesis in the Rumen: Effects of Different Forages



- Wide differences in skatole formation on *in vitro* fermentation of different forages with rumen fluid
 - Affected by degradability of the forage protein
 - Depends on condensed tannin concentration (on bar) and structure.
- Schreurs *et al* (In press)

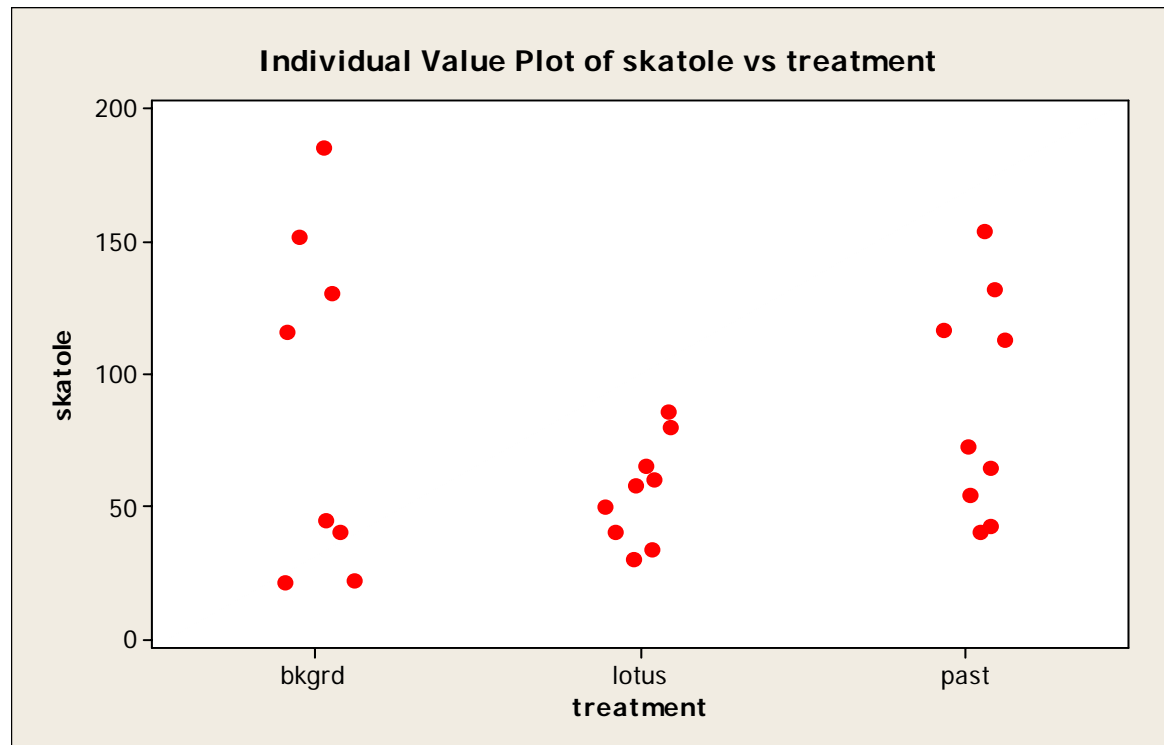
Flavour Biogenesis: Rumen and Liver Metabolism



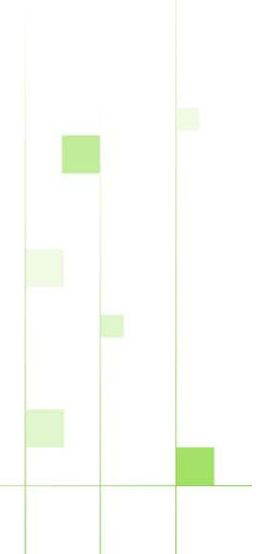
Indoor feeding trial: lactating ewes fed sulla, sulla + PEG

- skatole formation in the rumen is inhibited by forage tannins (CT)
- skatole is cleared from the blood by liver metabolism (>80%)
 - Roy, et al., 2002 , 2004, 2005.

Forage Treatments and Animal Variation Farm trial

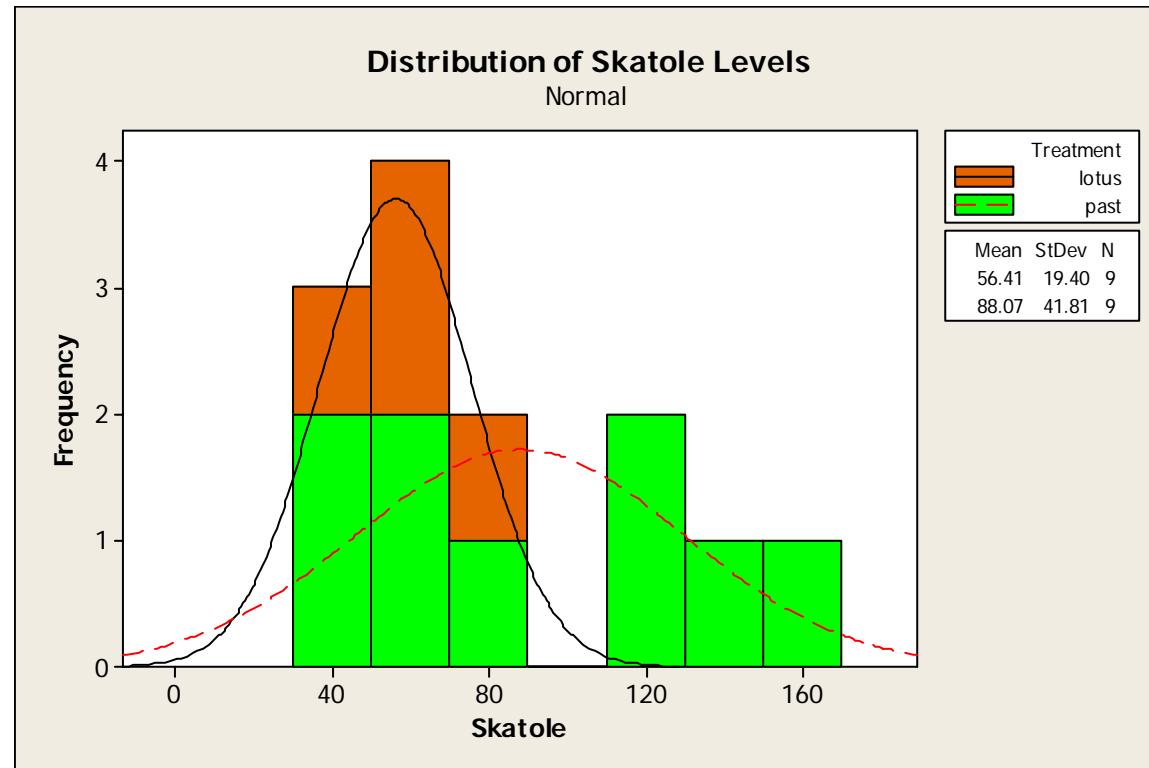


Lambs were grazed on pasture or *Lotus corniculatus* for 111 days. Mean levels of skatole in subcutaneous fat from the lambs grazing *Lotus corniculatus* were lower than for lambs grazing pasture.
- Schreurs, 2006



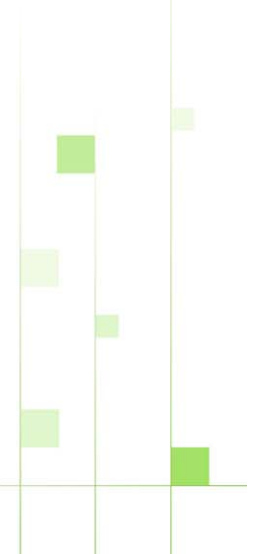
Forage Treatments and Animal Variation

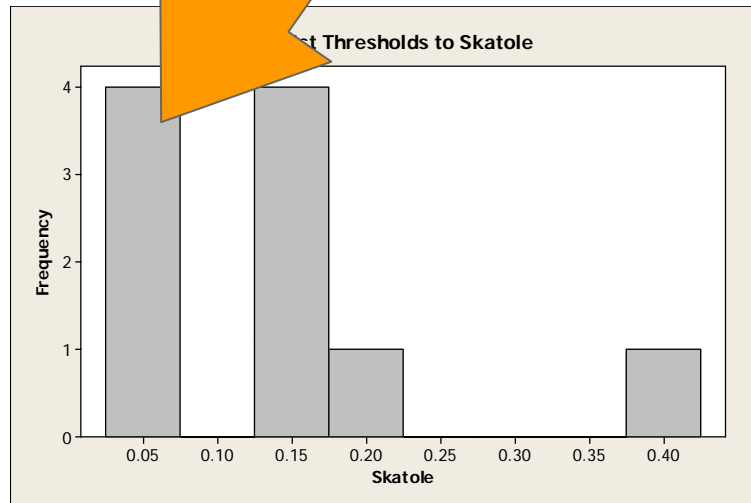
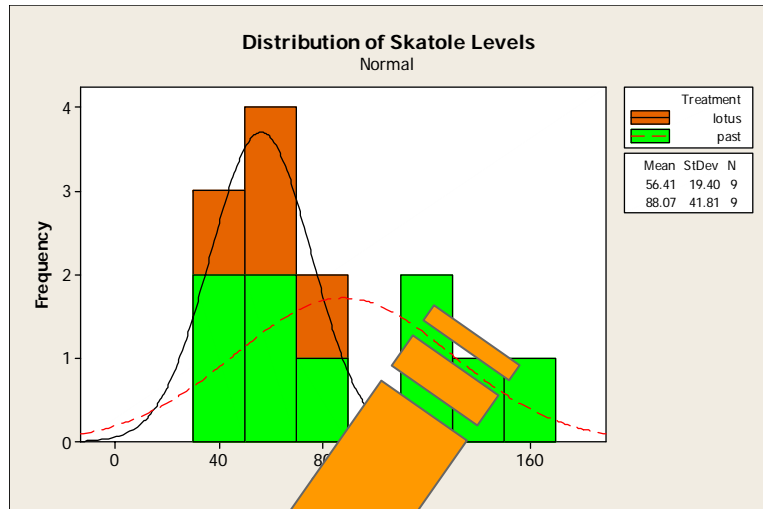
Farm trial



The difference between the treatments was the in the number of animals with high skatole levels in the fat.

A sensory panel did not detect an overall treatment difference. For several panellists sensory responses to flavour attributes correlated to the level of skatole.





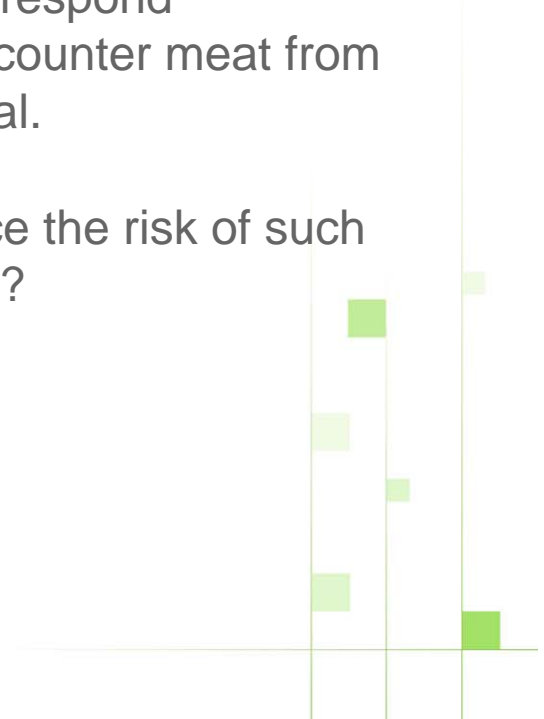
- Skatole levels can vary widely in fat from forage-fed animals

- Panellist (consumer) sensitivities also vary widely.

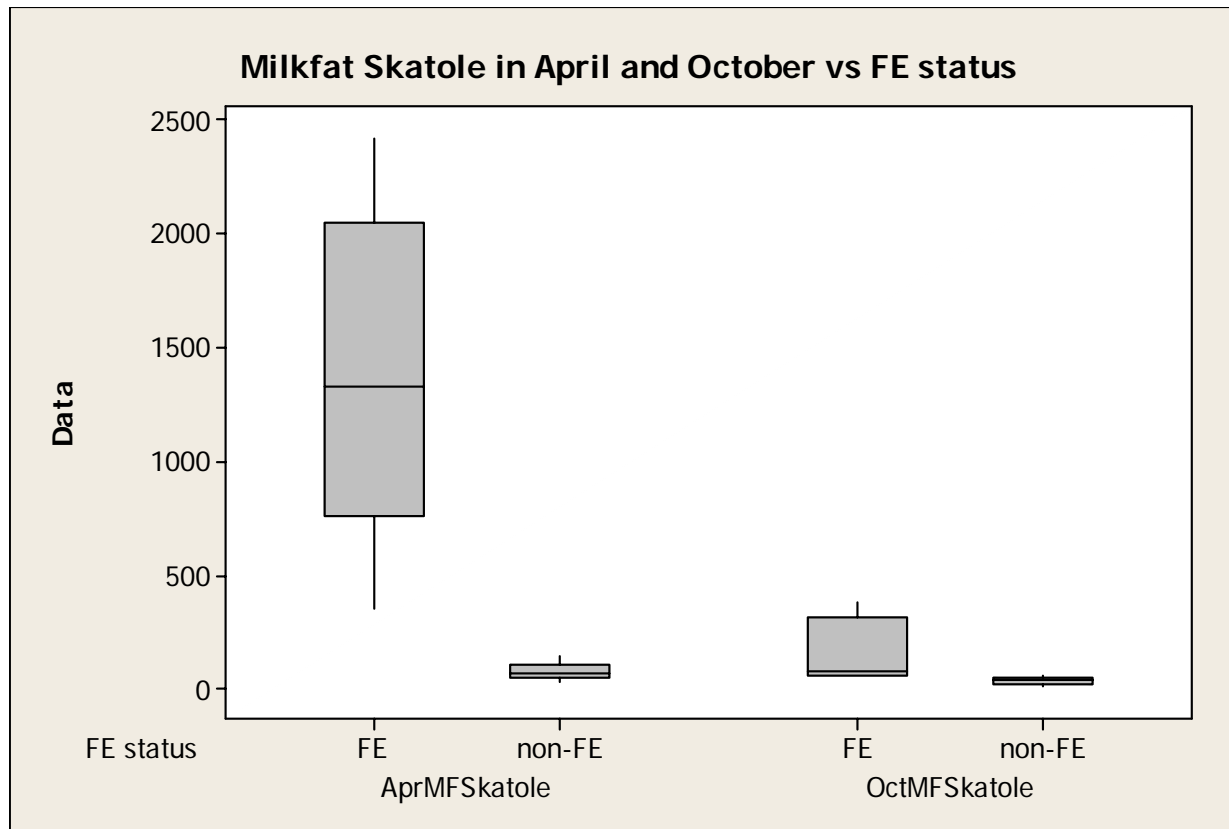
- Individual consumers sensitive to skatole are likely to respond adversely if they encounter meat from a high skatole animal.

- How can we reduce the risk of such adverse encounters?

- prevention?
- detection?



Possible sources of high skatole outliers - impaired liver function



- Milk samples from a Bay of Plenty dairy farm
- Cows selected for high and low GGT (indicator of liver damage due to facial eczema)
- Both short-term and longer-term effects on milkfat skatole
- *Fraser et al, NZSAP 2006.*

Current Research



Development of a Rapid Assay to Detect High Levels of Skatole in Produce

- Initially development of assay for milk matrices
“proof of concept”
- Application to detect meat containing high levels of skatole
“skatole flavoured meat enters the appropriate market”

