



Genetics and nitrogen efficiency

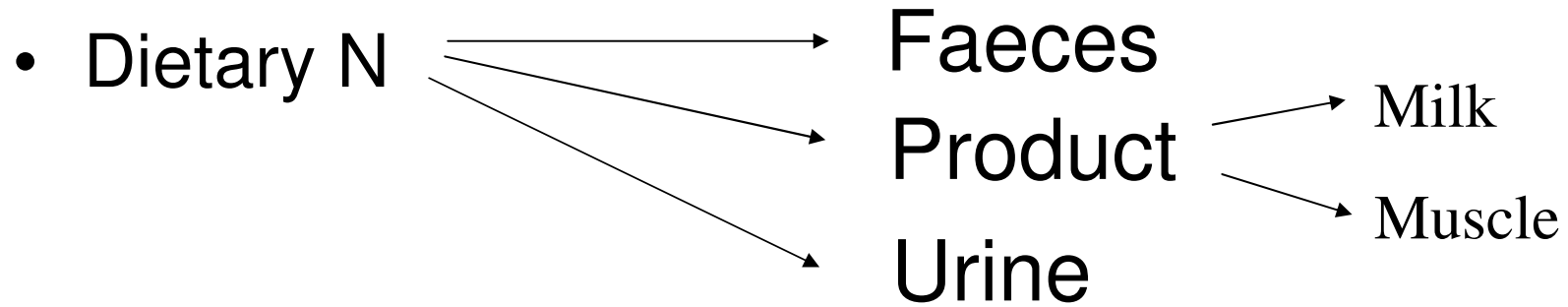
Garry Waghorn

Crude protein (CP) requirements from forage diets (% of the dry matter)

	CP	Nitrogen
Dairy cows: over 30 kg milk/d:	22	3.5
15 – 30 kg milk/d:	20	3.2
Under 15 kg/day:	18	2.9
Young growing lambs, calves	18	2.9
Mature growing lambs, calves	15	2.4
Maintenance	12	1.9
Rumen microflora	9	1.4

When diets meet these requirements, other factors limit production; **N is excreted**

The fate of dietary nitrogen



Nitrogen flows (g/day)

	<u>cows</u>		<u>sheep</u>	
Pasture quality	med	good	med	good
Intake	430	830	26	44
Product	100	160	2.2	3.8
Faeces	175	160	7.4	7.9
Urine	155	510	16.8	32.3



Nitrogen isn't Protein!

10g N retained in live-weight gain

$10 \times 6.25 = 62.5\text{g protein}$

Muscle is 80% water, 20% protein

$62.5\text{g protein} = 312\text{ g muscle}$

Live-weight gain includes fat; e.g. 40% fat, 60% lean
so 10 g N retention = about 450g gain.

Crude protein is $N \times 6.25$ (or 6.38)

but

Up to 30% of pasture CP is not true protein



Reducing urinary N

- Low nitrogen diet – by far the best solution
- Lower N digestibility (more N to faeces)
 - With out reducing energy digestion?
 - Condensed tannin?
- Higher production – good for profit; small effects on urinary N

Reducing N losses to leachate and N₂O

- Less concentrated urine
 - drink more or lower N excretion
 - keep moving (on the run)



Animal genetics for N efficiency?

- High productivity
 - More into product
- Low nitrogen digestibility; rest of diet unaffected
 - An unlikely animal
- Low urinary N concentration
 - higher water requirements?
- Pee on the run – low concentrations to lessen N₂O

Rumen proteolysis is not important

Absorbed amino acids surplus to requirements are also excreted – N in the urine



Implications of too much Nitrogen

- Redistribution of soil fertility
- Reduced grazing area
- Reduced efficiency of feed utilisation
- Reduced feed intakes?
- Negative effects on animal health
- Faecal flavour in milk
- Leachate to ground water
- Nitrous oxide and ammonia emissions
- Financial costs of nitrogenous fertiliser



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