Maximising Omega-3 in Beef and Lamb

Dr Edward Clayton

NSW Department of Primary Industries

Wagga Wagga Agricultural Institute

Mr Richard Meyer, Dr Robert Taylor,

Mr Tim Dale, Ms Helen Burns,

Mr Bryan Ward, Ms Patricia O'Keeffe,

Dr Michael Wilkes, Mr Greg Ferrier,

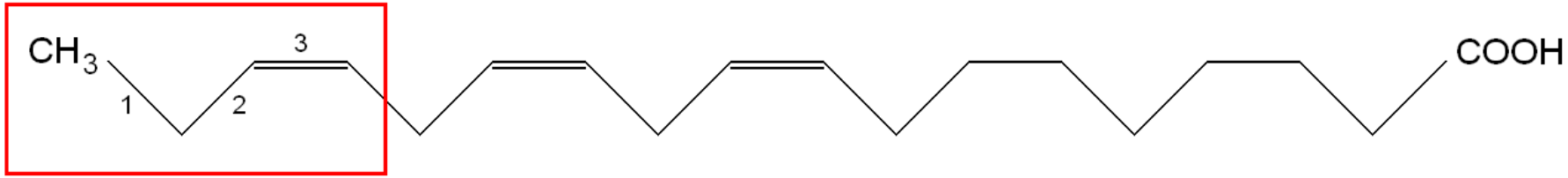
Dr Peter Orchard, Dr Michael Campbell

NSW GOVERNMENT Department of Primary Industries

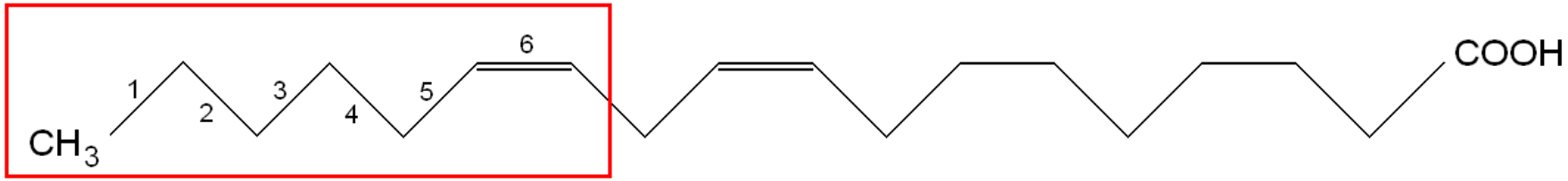
Omega-3 in Plants and Meat

- What are omega-3 fatty acids
- How do we alter them in plants and meat
- What are the implications for our diet

Omega-3 and Omega-6 in Plants

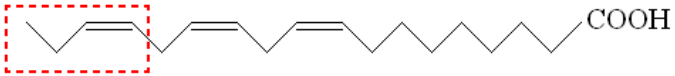
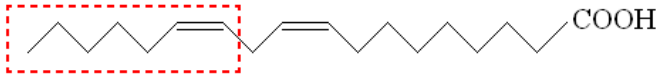
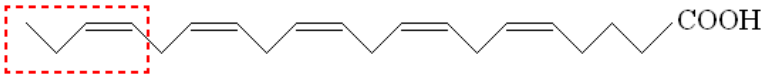
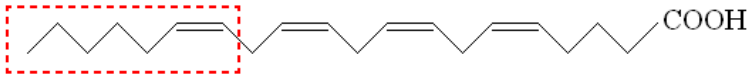


α-linolenic acid (ALA) - C18:3n-3 - **Omega-3**

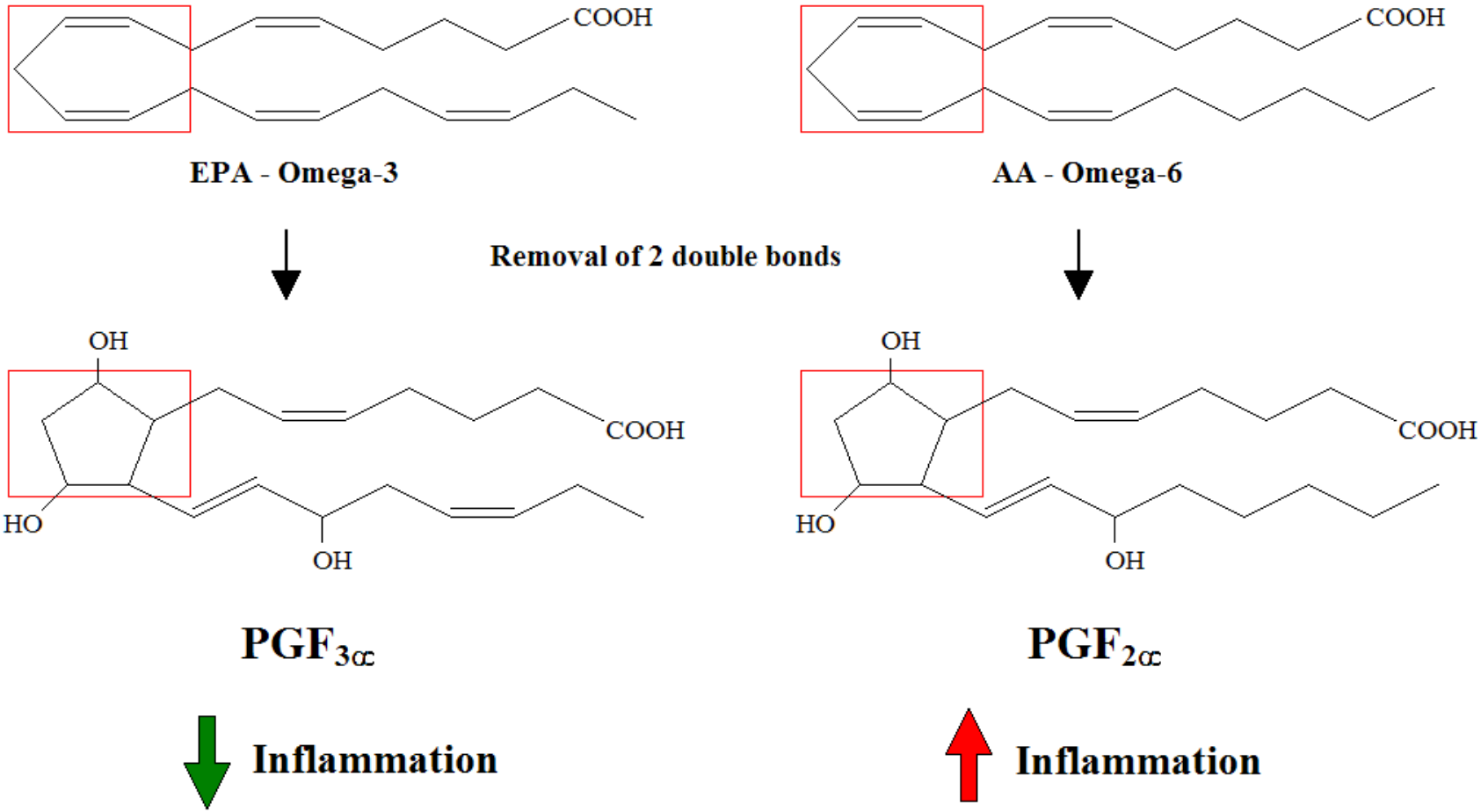


linoleic acid (LA) - C18:2n-6 - **Omega-6**

Sources of Omega-3 and Omega-6

Omega-3	Omega-6
Pasture, vegetative cereals (including silage), forage legumes, linseed (flaxseed)	Grains, soybean oil/meal sunflower/safflower oil, cottonseed meal
α - linolenic acid (ALA) (C18:3n-3)	**Linoleic acid (LA)** (C18:2n-6)
	
Eicosapentaenoic acid (EPA) (C20:5n-3)	**Arachidonic acid (AA)** (C20:4n-6)
	

Metabolism to Prostaglandin



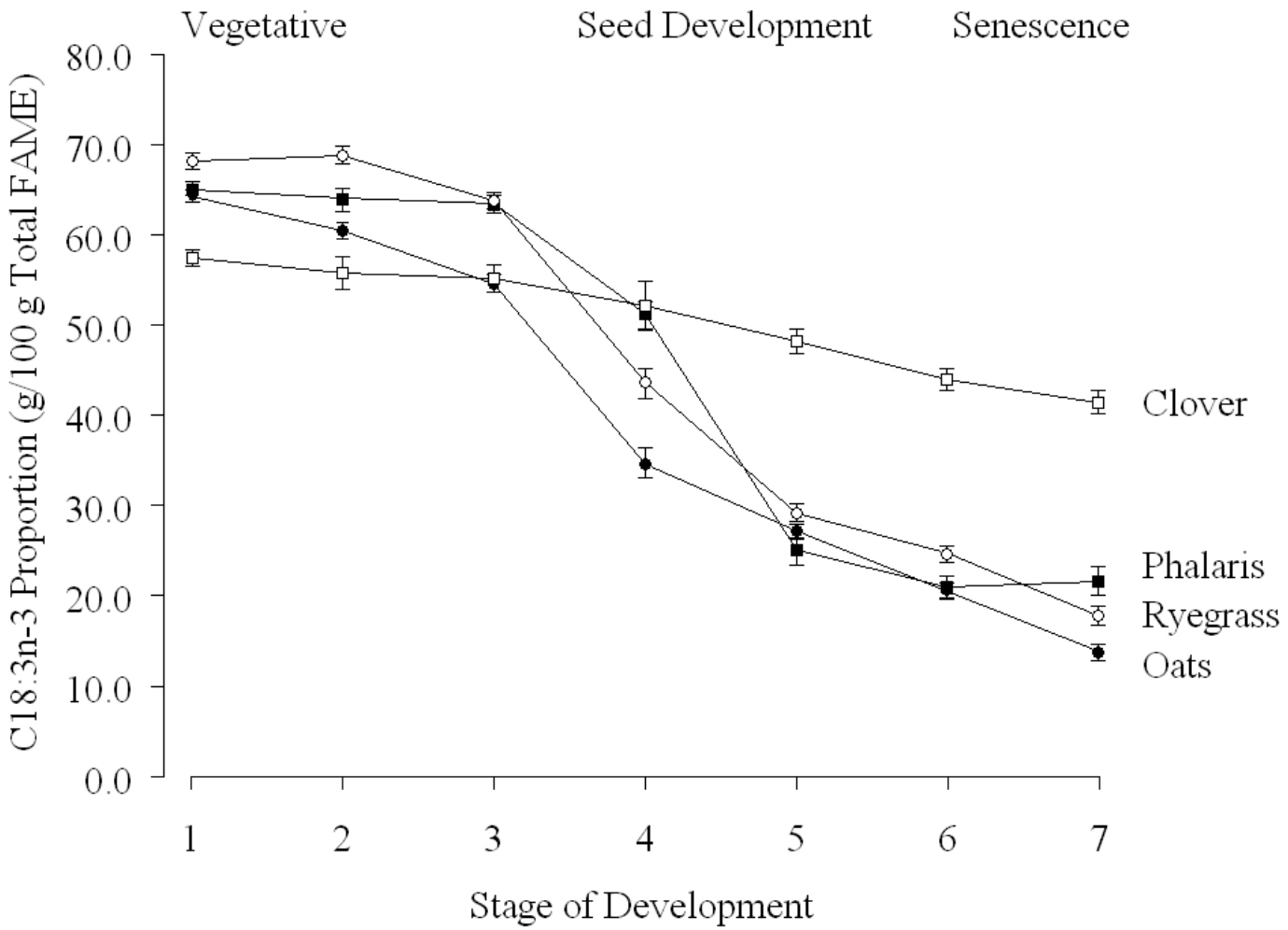
Omega-3 in Animal Feed

Forage	Type	Omega-3 (%)	Omega-6 (%)	n-6:n-3 Ratio
Pasture	Improved	47.9	10.0	0.21
Pasture	Lucerne	46.6	14.7	0.32
Cereal	Oat/Pea	44.9	14.8	0.33
Pasture	Native/Improved	28.8	18.0	0.62
Silage	Ryegrass	49.1	3.59	0.31
Silage	Oats	37.1	13.3	0.36
Silage	Barley	31.4	12.8	0.41
Grain	Oats	1.1	33.7	31.5
Grain	Barley	4.3	47.6	11.0
Grain	Maize	11.0	52.5	4.8
Cottonseed	CSM	0.3	42.7	164.3

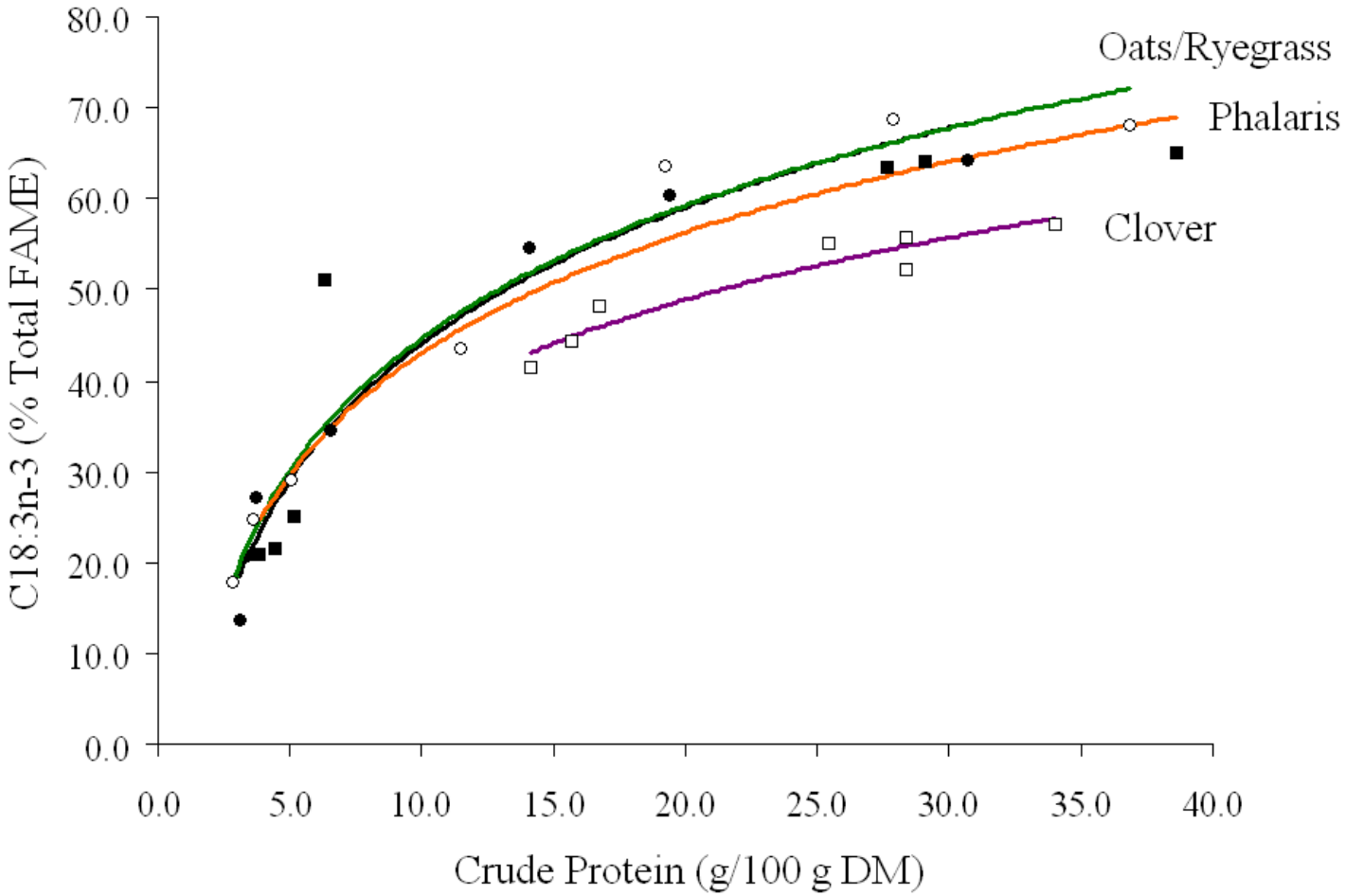
Manipulating Omega-3 in Forages

- Species
- Stage of growth
- Fertiliser application
  - In particular, N status

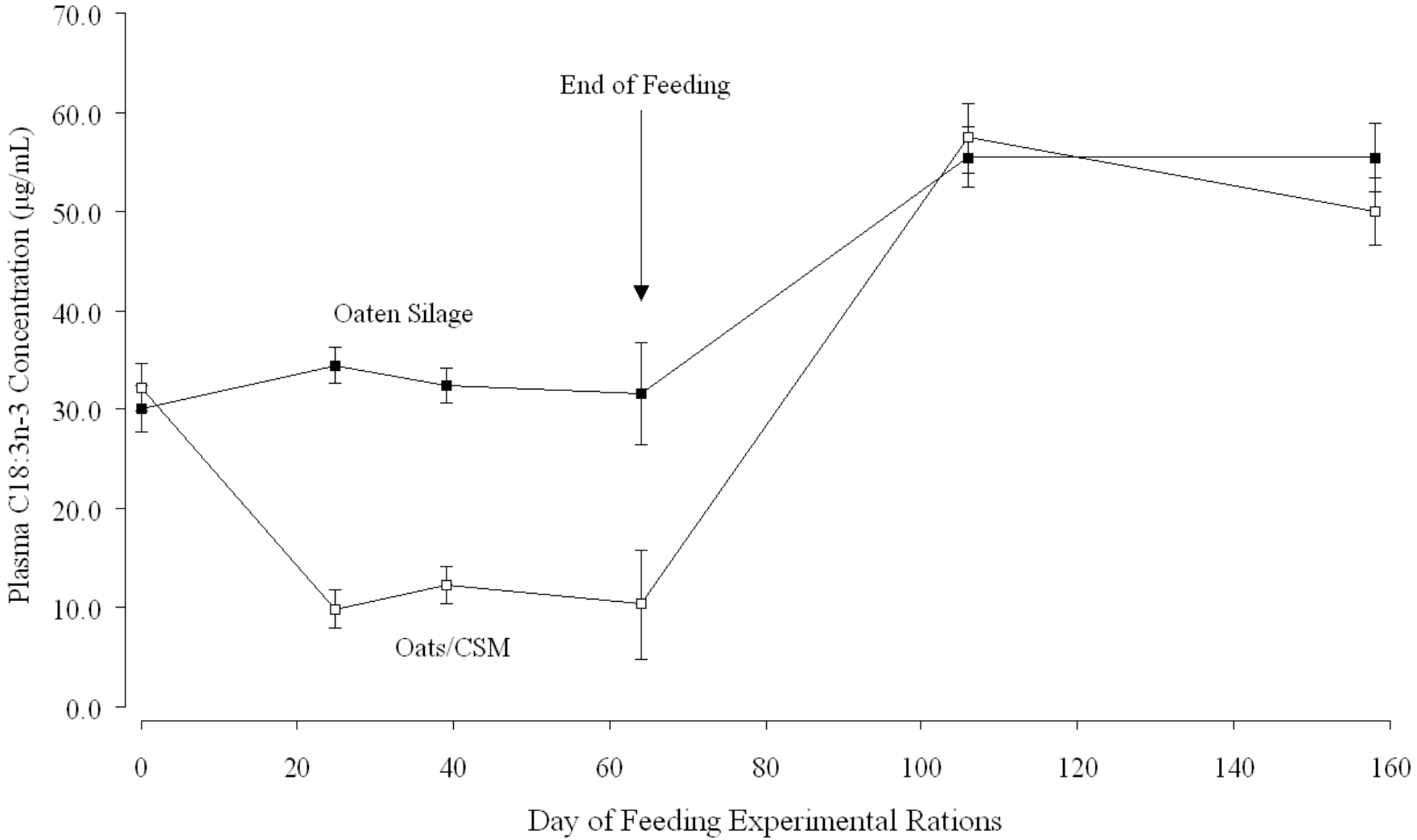
Species and Stage of Growth



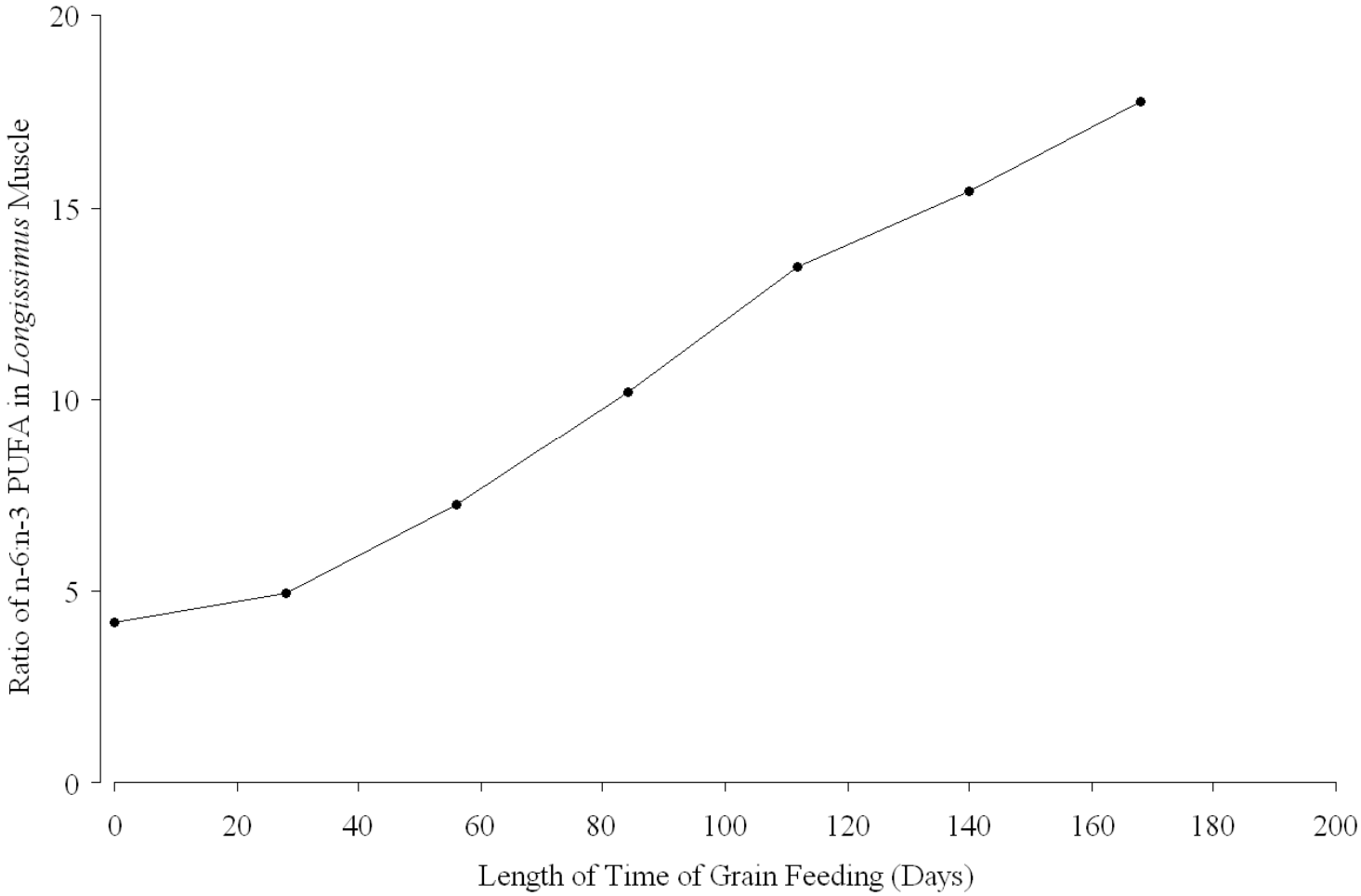
Species and Protein Content



Depleting Omega-3 - Grain Feeding



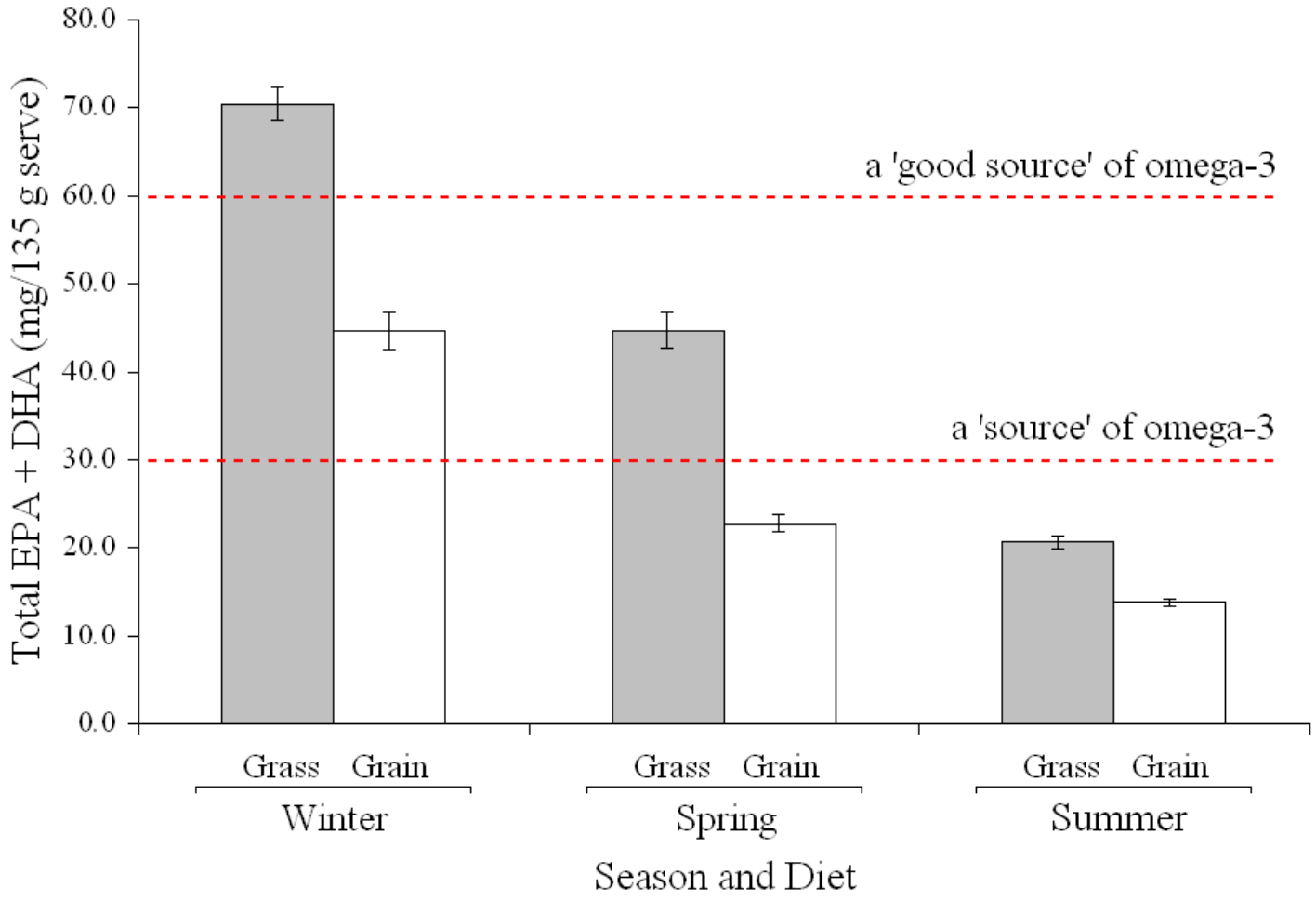
Grain Feeding - Cattle



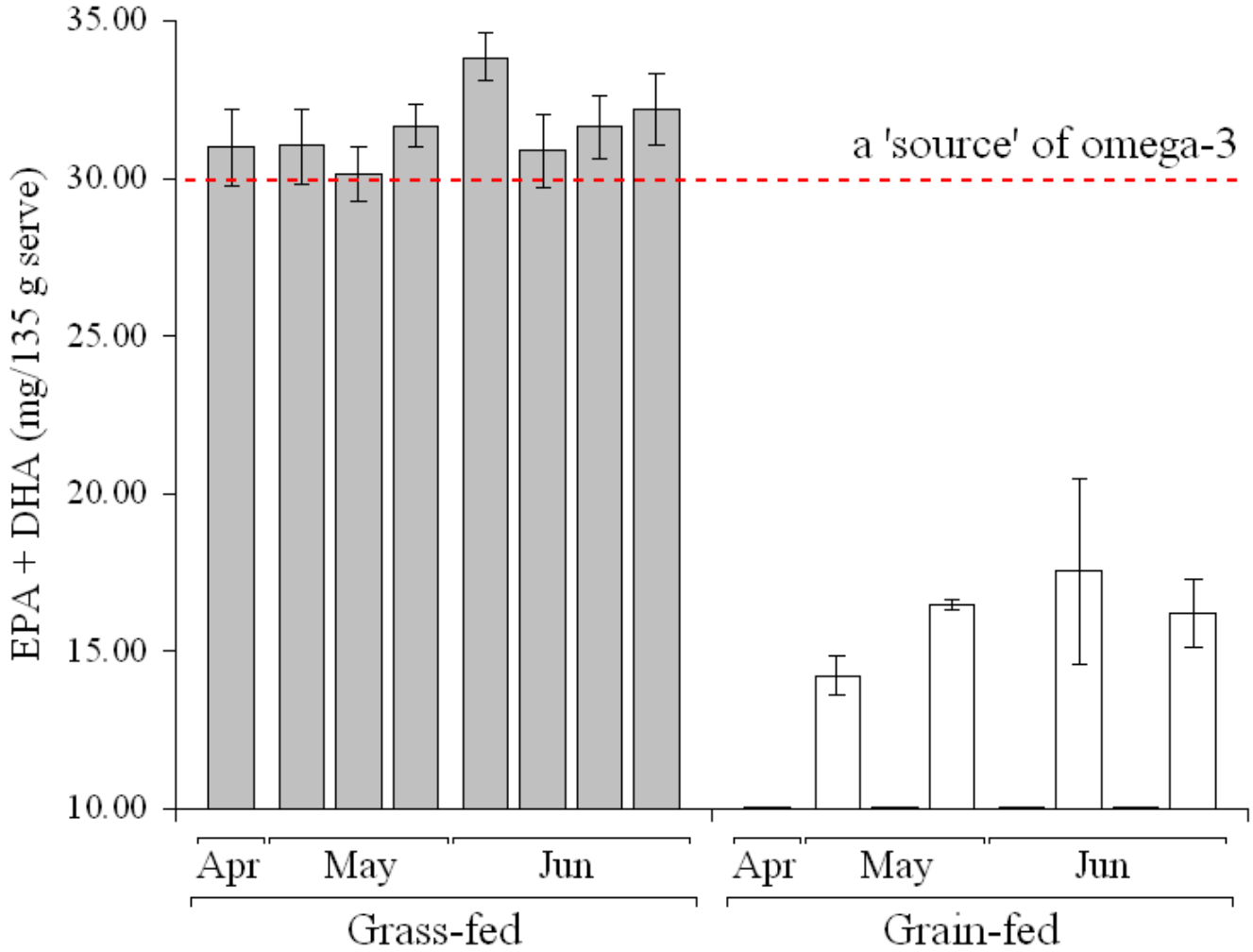
Source: Duckett et al. (1993)

‹ Research Officer - Ruminant Nutrition)

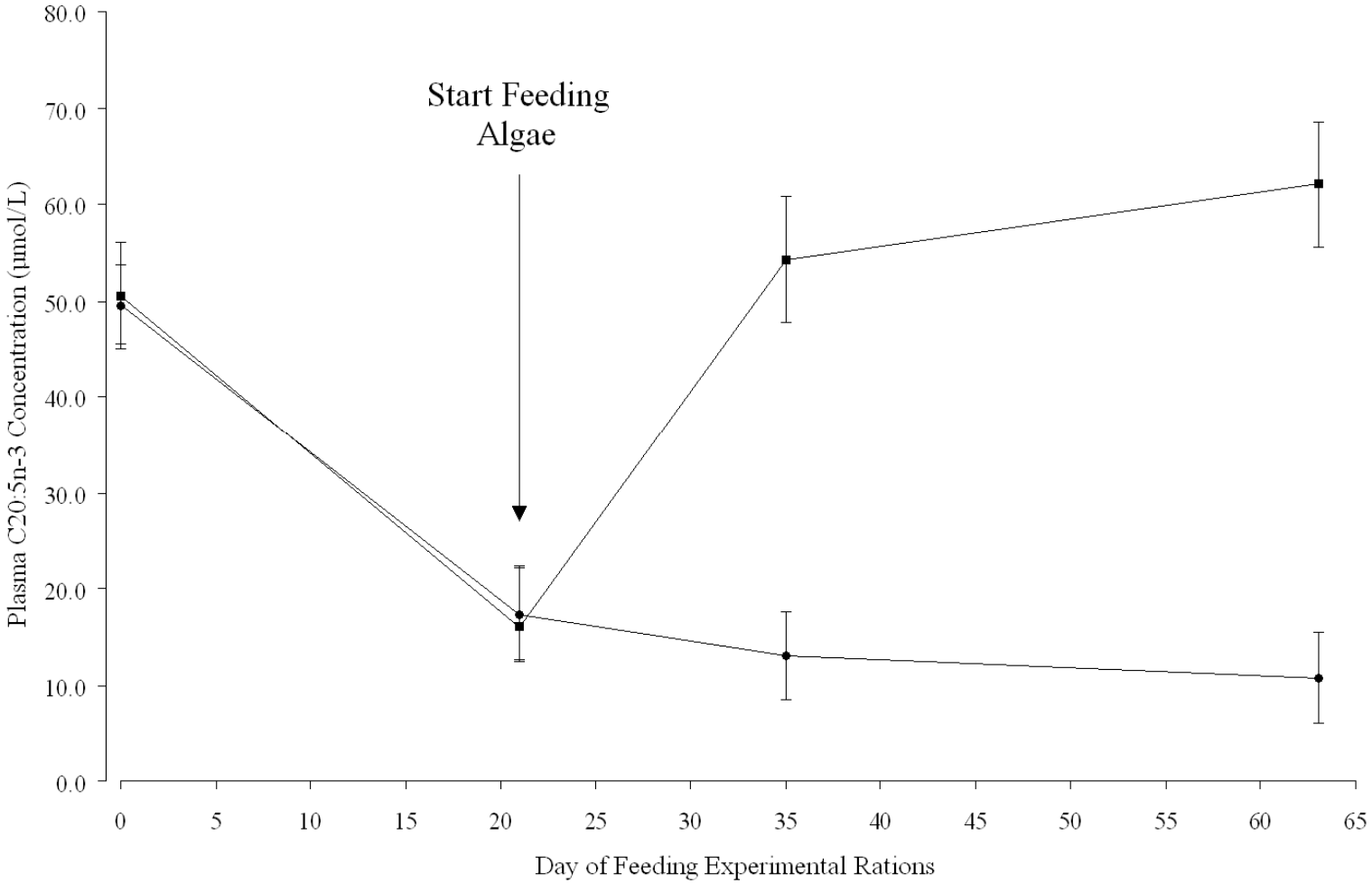
Omega-3 in Beef - Season and Feeding



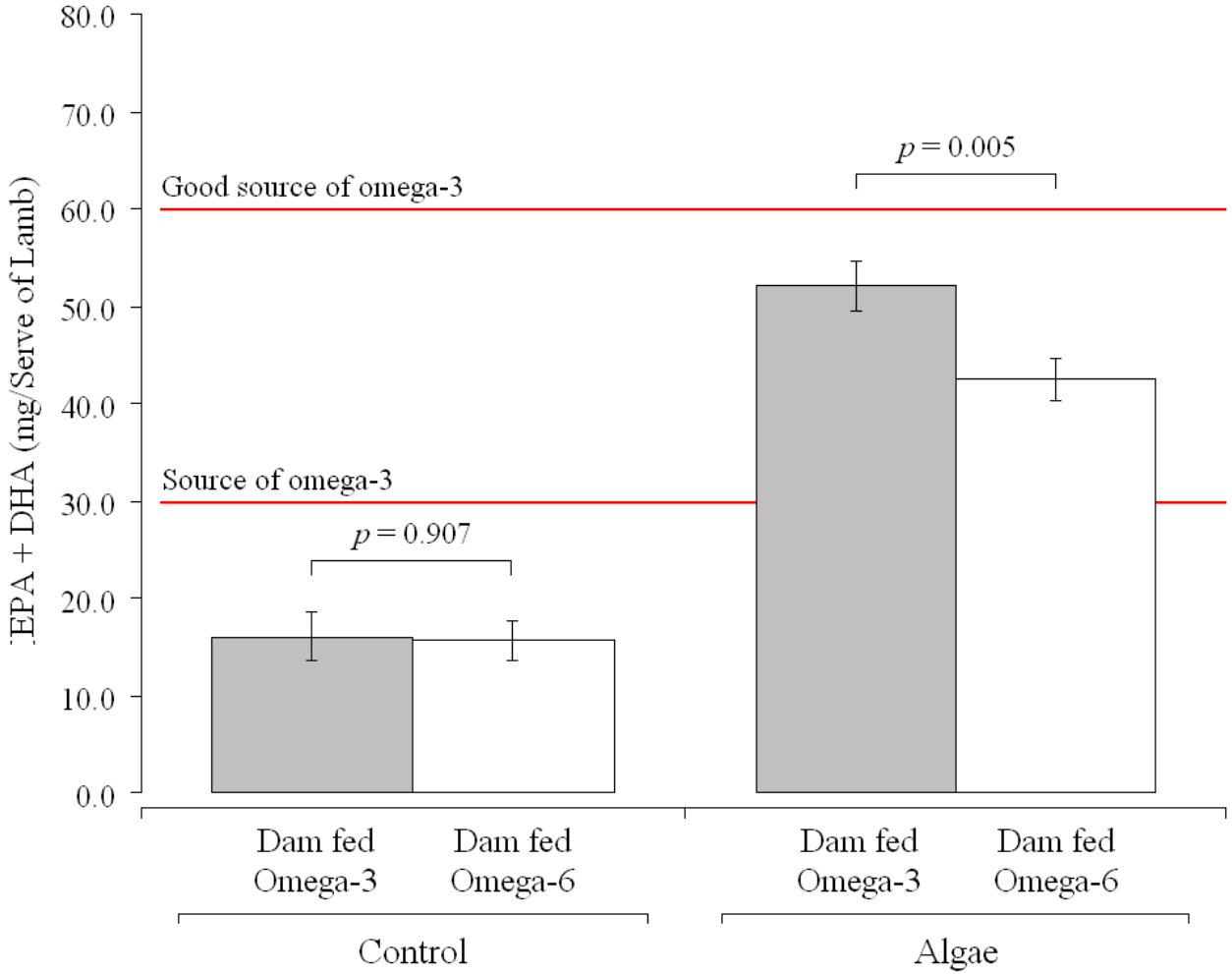
Omega-3 in Lamb - Diet/Season



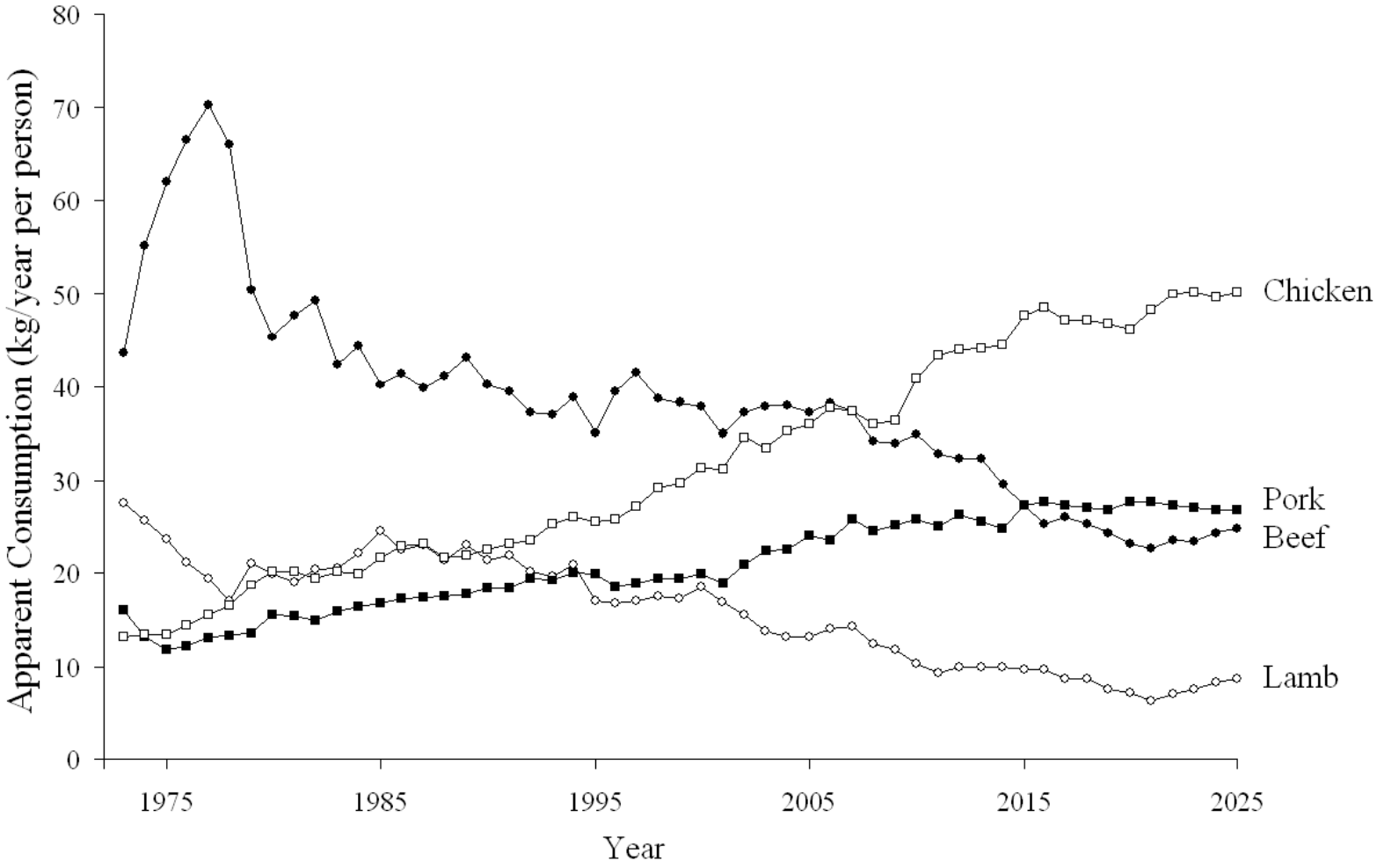
Feeding Algae to Lambs



Algae and Omega-3 in Lamb



Intake of Meat in Australia

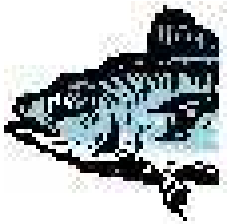


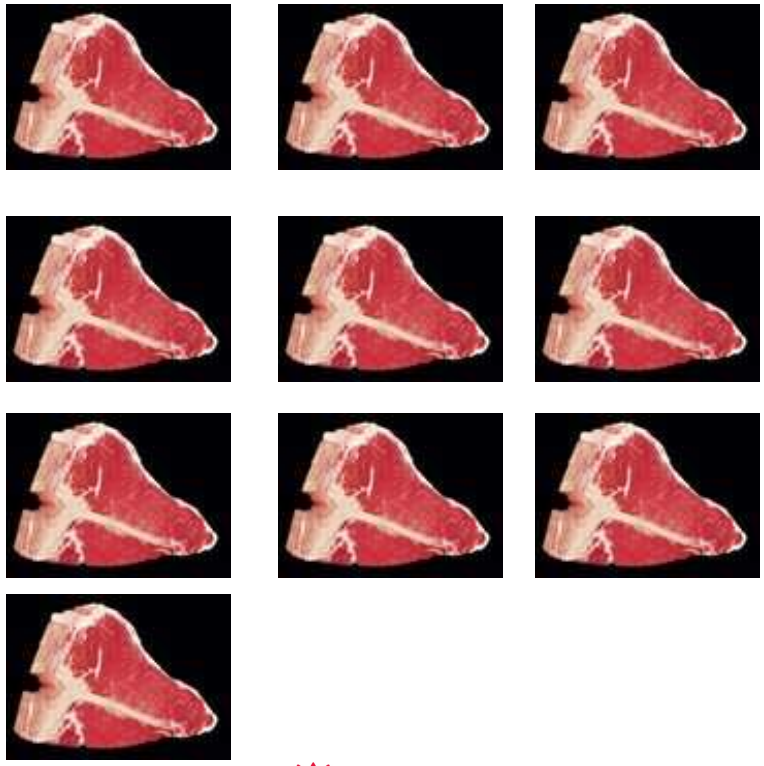
Current Intake (g/day per person)

- Beef/veal = 68.0 g/day
- Sheep meat = 23.4 g/day
- Fish = 18.6 - 28.0 g/day (Average)
- However, the median intake of fish = 0 g/day
- We need other sources of omega-3 rather than fish

Recommended Intakes of Omega-3

- Suggested Dietary Target (Adults) = 520 mg/d





Australian Nutrient Reference Values, NHMRC (2006)

Omega-3 Intake from Beef/Lamb

- Recommended intake for males = 160 mg/d
- Total intake from Beef/Lamb
- Low omega-3 meat - 32 mg/day (20% RDI)
- High omega-3 meat - 115 mg/day (71% RDI)

Summary

- The main factor influencing the amount of omega-3 in meat is diet
- Maximising the amount of omega-3 in forages can enhance omega-3 in meat
- Red meat could contribute significantly to total omega-3 intake in Australia
- Future work will identify production strategies to maximise omega-3 in red meat

Acknowledgements

- McCaughey Memorial Trust
- Meat and Livestock Australia
- NSW DPI Feed Quality Service
- MEQ Probe
- Gundagai Meat Processors (GMP)
- Craig Lihou, Tim Dale, Michael Friend
- Paul Meggison (Ausfarm Nutrition)
- Murray and Bryce Ridell (Multicube)