Long distance transport trial

The impact on live animal, carcass, metabolic and eating quality traits

Rod Polkinghorne, Judy Philpott, John Thompson

Experimental design

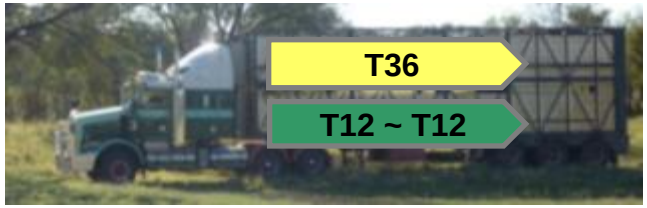
Treatment	12hrs	12hrs	12hrs
T12			
T24			
T12~T12		Rested on feed & water	
T36			

12 hrs Lairage

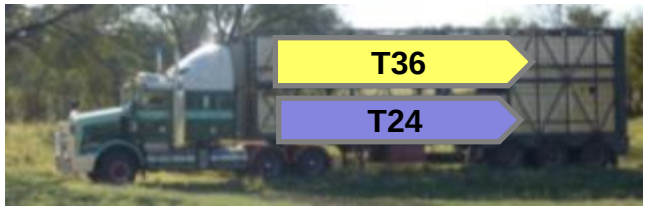
4 replicates with minimum 20 head per treatment

Trucking management

Day 2 – 6am



Day 2 – 6pm



T12 ~ T12 Rested 12 hrs

Day 3 – 6am

Evening arrival at Dinmore

Commercial constraints

- Suitable and willing collaborators
- End of season
  - Late cattle drafts
  - Numbers available
  - Declining feed
- Available yards and holding paddocks
- Proximity of cattle to yards

Day 1

Drafting into treatment groups

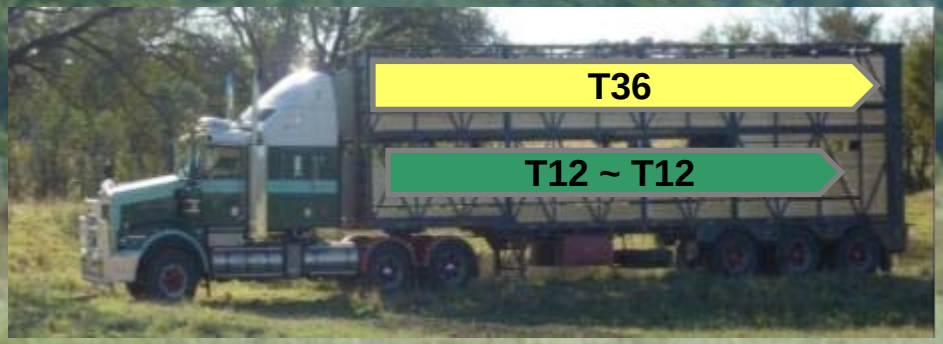
Cattle

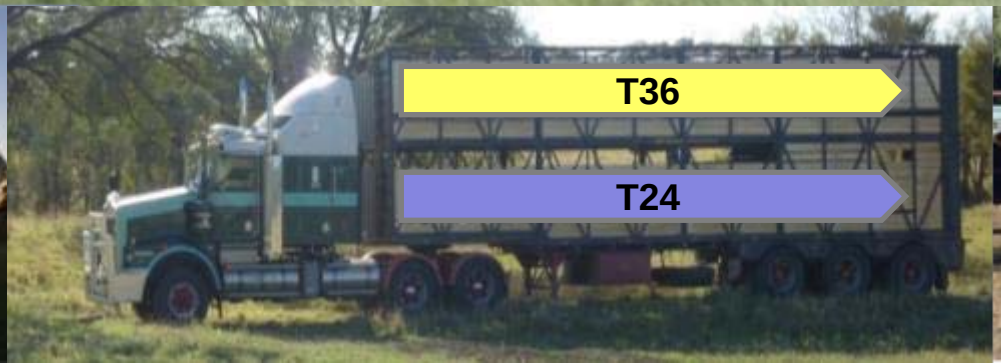
Cattle (n=343)

Trait	Mean	STD	Min	Max
EstBI	21	22	0	100
Live wt	603	50	489	790
Dressing%	51.5	2.2	46.5	59.5
HSCWT	311	25	243	391
Ribfat	6.6	2.8	1	19
EMA	77.6	7.7	58	100
Meat Colour	3.2	0.9	1.7	6
pHu	5.55	0.12	5.32	6.30
T@pH6	24.5	5.1	13.1	35.3

Day 2

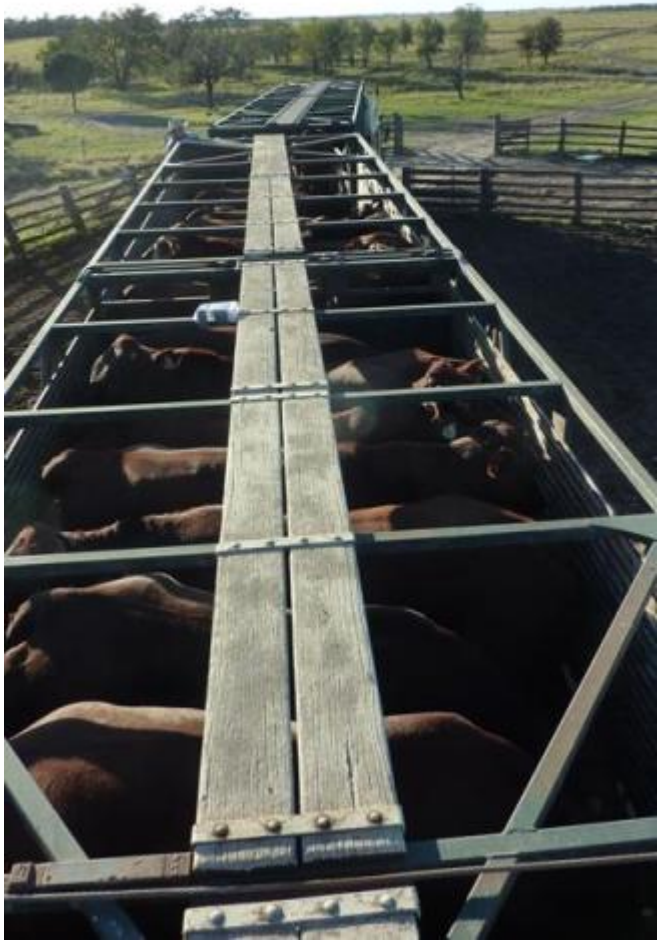
Sequential trucking – cycles 1 and 2





Day 3
6am

Sequential trucking – cycle 3



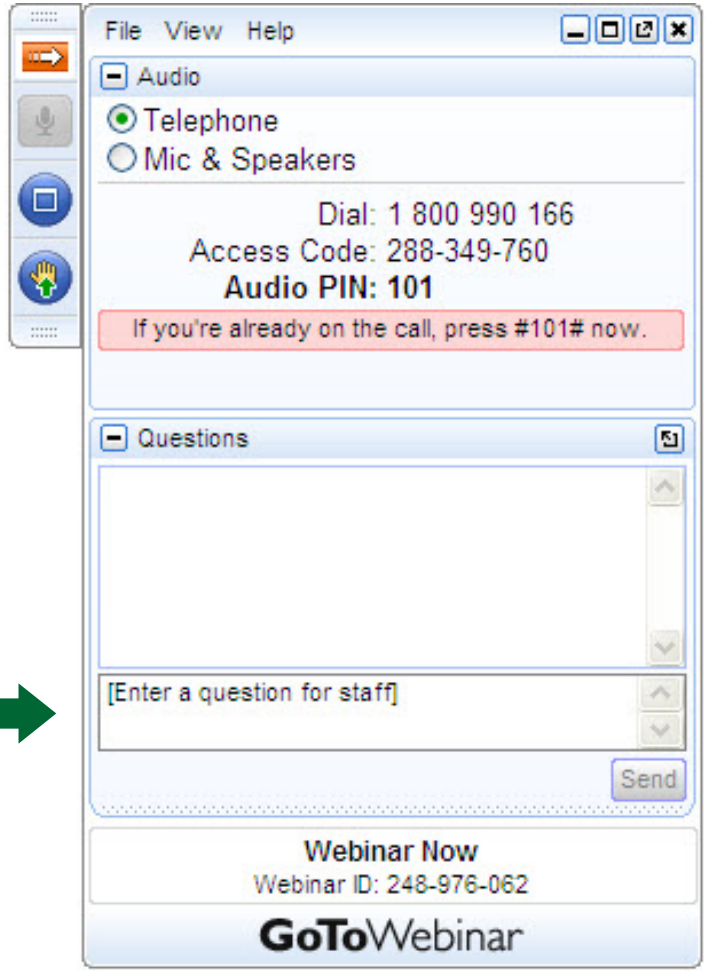
Trucking times and distance

	Trucking treatments							
	T12		T24		T12~T12		T36	
Rep	h	km	h	km	h	km	h	km
Rep 1	**13.4**	794	**25.2**	1065	**24.4**	1387	**36.5**	1659
Rep 2	**12.9**	843	**26.3**	1438	**23.0**	1491	**36.9**	2086
Rep 3	**12.7**	750	**23.6**	1386	**22.7**	1312	**34.1**	1948
Rep 4	**17.4**	1123	**30.0**	1597	**27.5**	1681	**40.9**	2156

T12 - travelled 12h from property to abattoir
T24 - travelled 24h from property to abattoir
T12~T12 - travelled 12 h, 12 h on feed and water, travelled 12h
T35 - travelled 36h from property to abattoir

Questions?

Type your questions here anytime



Day 4
6am

Slaughter, grading & collection of primals

Day 5
6am

Live & carcass effects

	Trucking treatments				
	T12	T24	T12 T12	T36	Sign
Est BI	23.8	21.7	18.8	23.3	NS
Live wt	599	607	603	606	NS
Dress%	51.7	51.7	51.3	51.3	NS
Carc wt	309	314	309	310	NS
Ribfat	6.6	6.7	6.9	6.1	NS
EMA	77.8	78.5	76.2	77.9	NS
Oss	169	167	171	171	NS
Mb	287	300	287	290	NS
Meat col	3.2	3.2	3.2	3.2	NS
pHu	5.56	5.56	5.57	5.55	NS
t@pH6	23.2	24.6	25.2	24.9	NS

% Exclusions: Ribfat <3 mm

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	23	9	10	23	
Replicate 2	9	9	23	23	
Replicate 3	5	0	0	10	
Replicate 4	5	9	5	0	
Average	10	7	9	14	NS

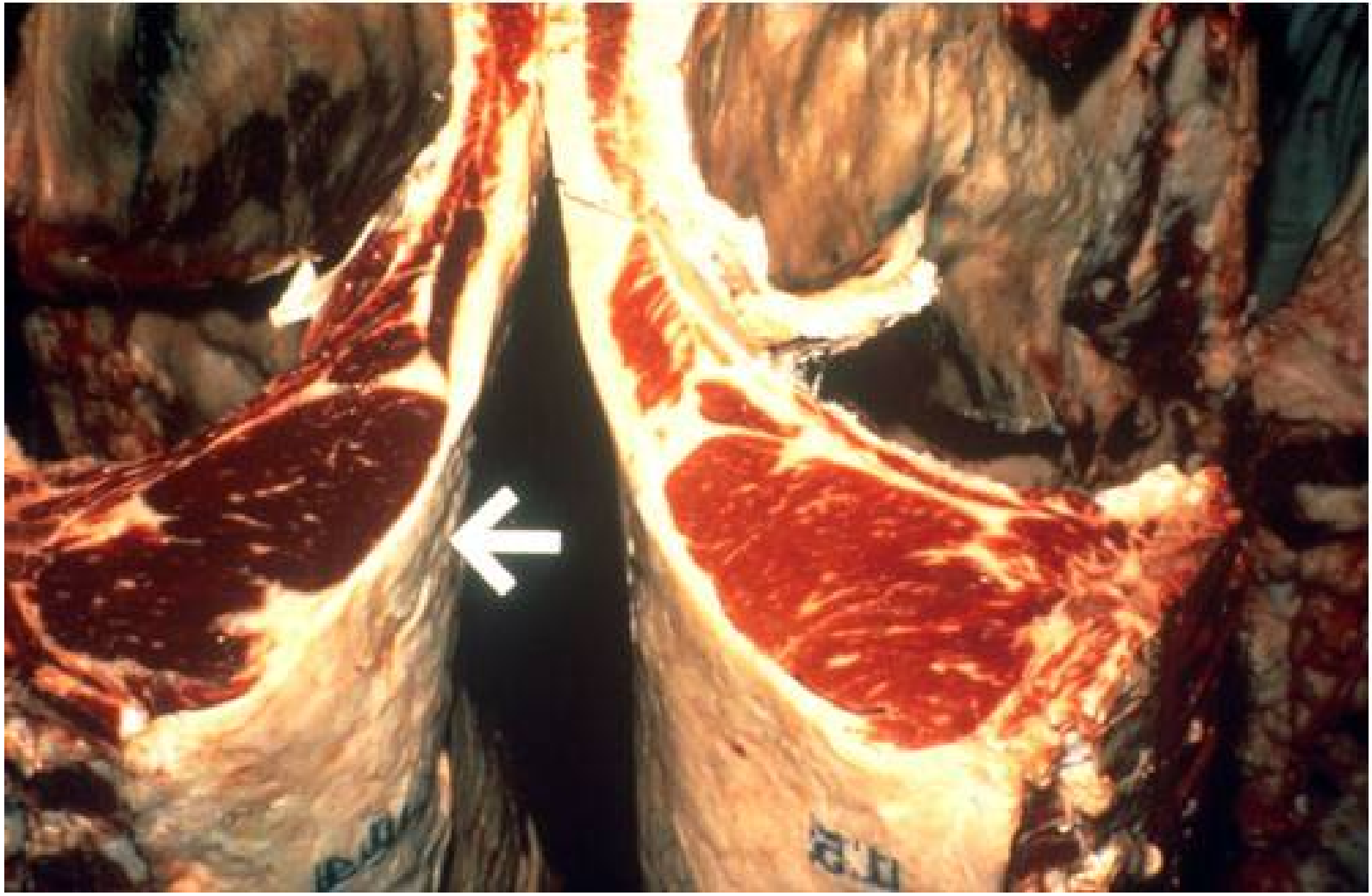
% Exclusions: pHu > 5.7

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	18	14	10	18	
Replicate 2	0	5	5	0	
Replicate 3	30	5	25	0	
Replicate 4	0	5	9	5	
Average	12	7	12	6	NS

% Exclusions: Meat colour >3

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	27	27	5	27	
Replicate 2	5	14	5	0	
Replicate 3	90	70	80	75	
Replicate 4	23	14	27	24	
Average	36	31	29	32	NS

Dark cutting meat



% Exclusions: Ribfat, pHu, MC

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	40	36	24	36	
Replicate 2	14	23	27	23	
Replicate 3	90	70	80	75	
Replicate 4	23	23	32	24	
Average	42	38	41	40	NS

Blood parameters (n=343)

Trait	Mean	STD	Min	Max
BHB (mM/L)	0.19	0.07	0.05	0.44
NEFA (mM/L)	0.430	0.194	0.086	1.208
Glucose (mM/L)	6.85	1.10	4.71	11.61
L Lactate (mM/L)	9.44	3.24	3.93	23.22
Urine SG	1.01	0.01	1.00	1.04

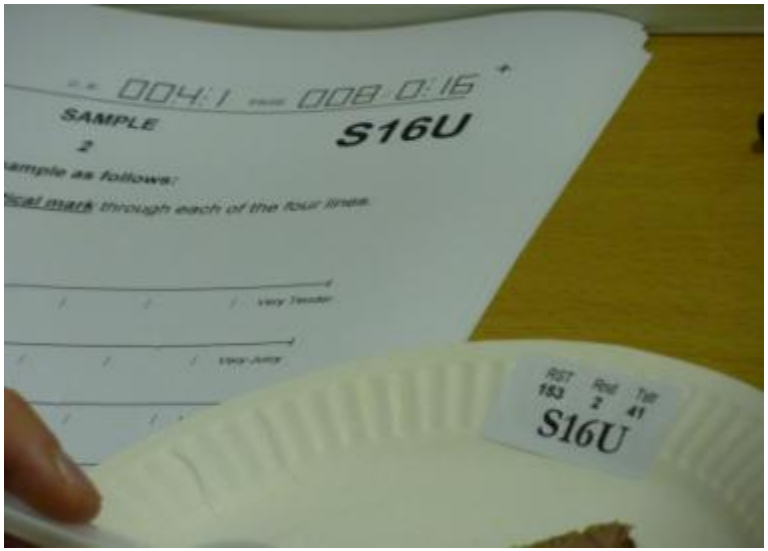
Treatment effects: Blood parameters

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
BHB	0.17	0.18	0.21	0.21	NS
NEFA	0.37	0.43	0.43	0.49	NS
Glucose	6.9	7.2	6.7	6.6	*
L lactate	9.3	9.8	9.9	8.7	NS
Urine SG	1.01	1.01	1.01	1.01	NS

Day 7

Prep consumer samples - UNE

Consumer testing



Meat quality (n=343)

Meat quality traits	Mean	STD	Min	Max
Tenderness	51.9	14.4	16	84
Juiciness	56.2	12.3	22	85
Like flavour	54.4	11.3	21	84
Overall liking	54.1	12.6	18	87
MQ4	53.4	12.0	21	83
Shear force	5.1	1.4	2.2	9.6
Cook loss %	24.4	3.4	14.4	32.2

Rep/ treatment means: Tenderness

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	47	48	48	51	
Replicate 2	64	55	59	59	
Replicate 3	55	44	55	57	
Replicate 4	51	50	44	44	
Average	54	49	52	53	NS

Rep/ treatment means: Juiciness

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	56	53	57	57	
Replicate 2	64	59	64	62	
Replicate 3	61	53	59	63	
Replicate 4	51	50	45	47	
Average	58	54	56	57	NS

Rep/ treatment means: Flavour

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	52	50	53	53	
Replicate 2	61	58	60	59	
Replicate 3	56	50	54	59	
Replicate 4	53	54	48	49	
Average	56	53	54	55	NS

Rep/ treatment means: Overall

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	50	50	53	52	
Replicate 2	63	57	60	59	
Replicate 3	56	48	54	60	
Replicate 4	52	53	48	48	
Average	55	53	53	55	NS

Rep/ treatment means: MQ4

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	50	52	49	53	
Replicate 2	62	56	60	59	
Replicate 3	56	48	54	59	
Replicate 4	52	52	47	47	
Average	55	51	53	54	NS

Rep/ treatment means: Peak force

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	5.9	5.7	5.5	5.0	
Replicate 2	4.9	5.9	5.5	5.5	
Replicate 3	4.8	4.3	4.4	4.3	
Replicate 4	4.0	4.1	4.1	4.5	
Average	5.0	5.4	4.9	4.9	NS

Rep/ treatment means: Cook loss %

	Trucking treatments				
	T12	**T24**	**T12 T12**	**T36**	**Sign**
Replicate 1	22.6	22.0	22.0	21.4	
Replicate 2	27.0	27.1	27.1	27.6	
Replicate 3	25.3	26.4	25.7	26.2	
Replicate 4	22.1	22.1	22.2	21.0	
Average	24.4	24.5	24.3	24.2	NS

Treatment effects: Meat quality

		Trucking treatments				
		T12	**T24**	**T12 T12**	**T36**	**Sign**
Tender	a)	54	49	52	53	NS
	b)	53	51	50	54	NS
MQ4	a)	55	51	53	54	NS
	b)	54	53	52	56	NS
LDPF	a)	4.9	5.3	4.9	4.9	NS
	b)	4.9	5.2	4.9	4.9	NS

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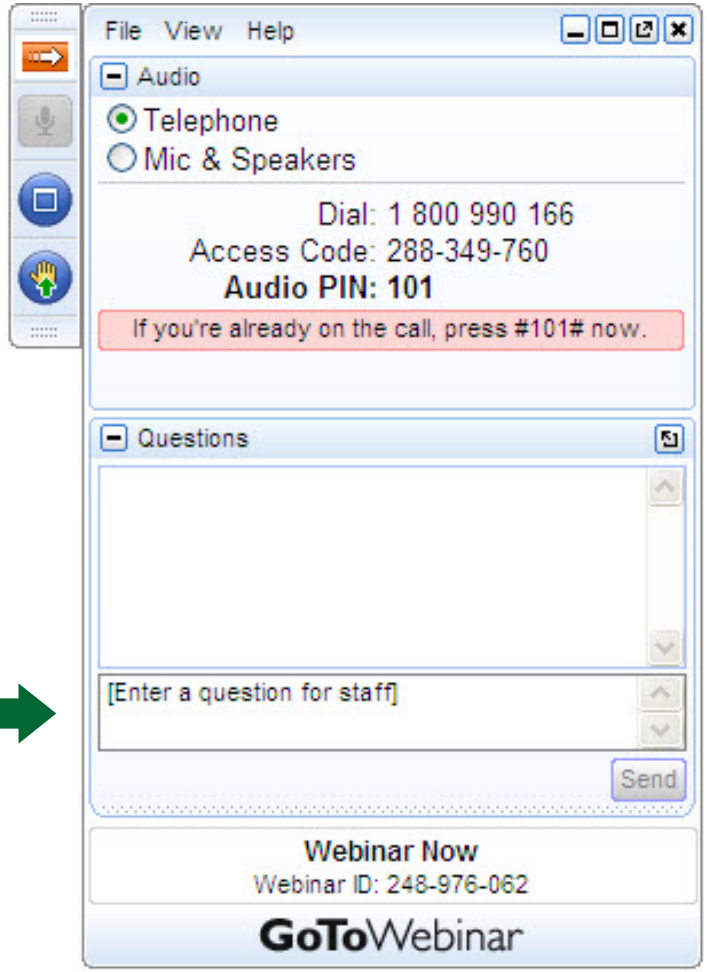
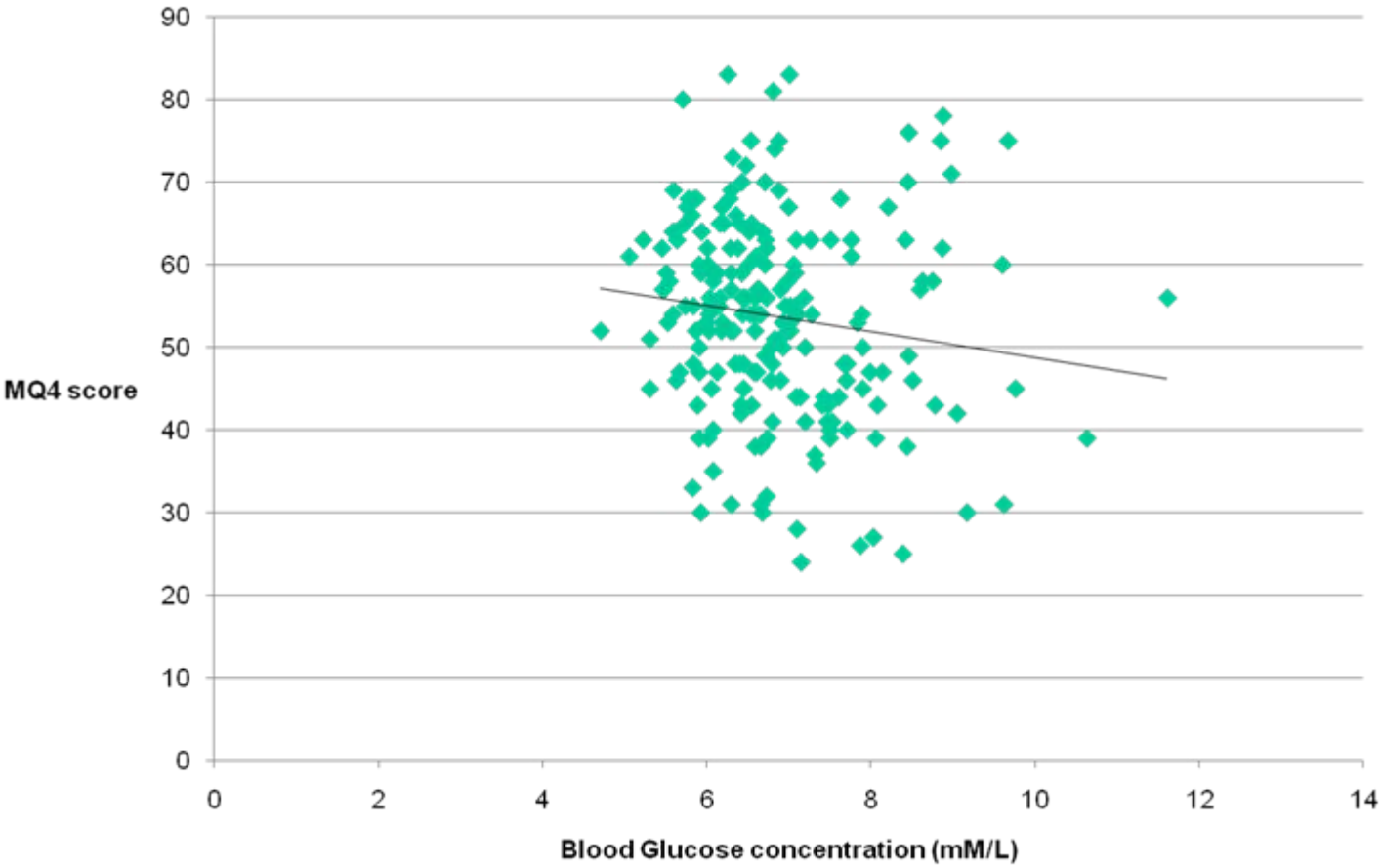


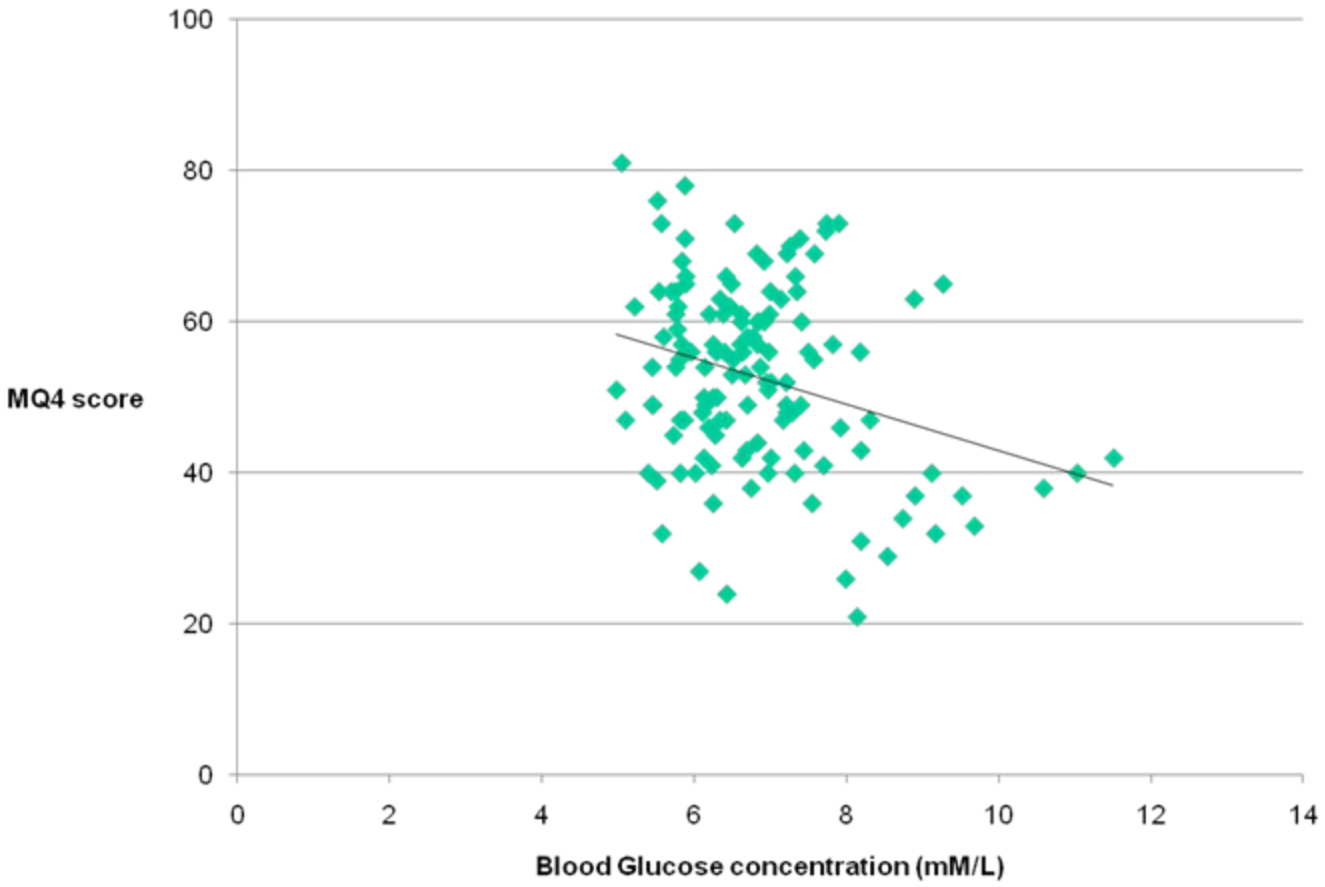
Can glucose predict palatability?

	Tenderness		MQ4	
a) Full data (n=343)	MSA	MSA +gluc	MSA	MSA +gluc
R^2	13.7	16.6	14.5	17.7
b) Reduced Data (n=208)	MSA	MSA +gluc	MSA	MSA +gluc
R^2	24.3	25.8	26.3	27.7

Can glucose be used as a threshold in MSA graded carcasses?



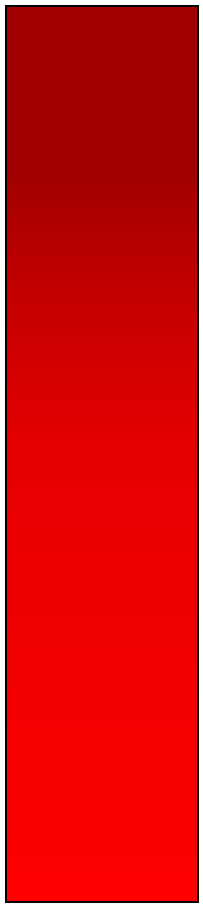
Can glucose be used as a threshold in carcasses which failed MSA?



Bottom line

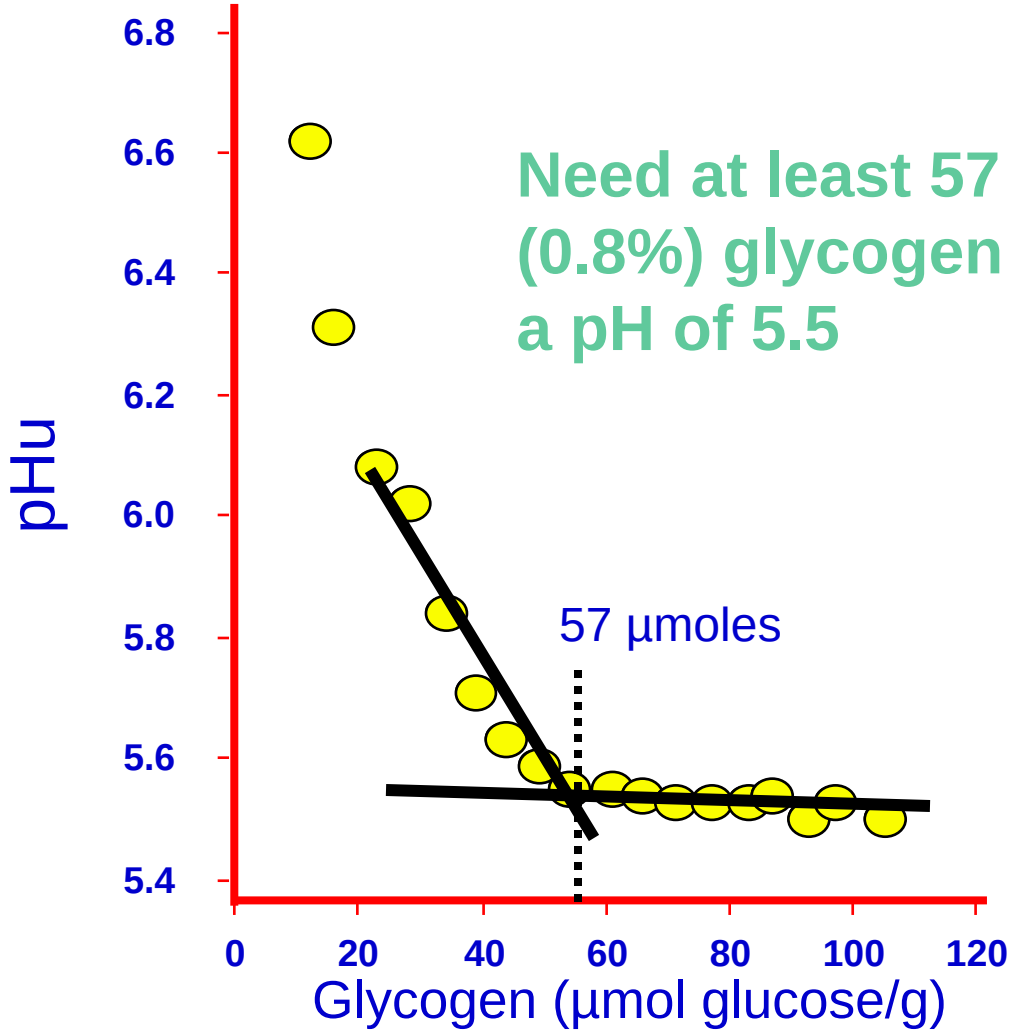
1. Transport distance and time to 36 hrs had no impact
2. 12 hrs rest break of no benefit
3. Major differences in compliance driven by events pre-loading
4. Management prior to trucking critical

Muscle glycogen vs meat pH



Dark

Light



Need at least 57 µmoles (0.8%) glycogen to achieve a pH of 5.5

Cautions

1. The weather was ideal
2. Highly skilled drivers
3. Results scientifically consistent but at odds with industry belief regarding rest breaks

Should we re-validate through commercial pathways?

Pathways recommendation

1. That MSA property to slaughter requirements be provisionally amended to allow up to 48 hours from property to slaughter with up to 36 hours transport within this period.

2. That the arrangements be reviewed after evaluation of results of subsequent research.

Further issues

1. Management pre loading
2. Rest breaks? Post arrival?
3. Stationary trailer/ shipping/ rail?

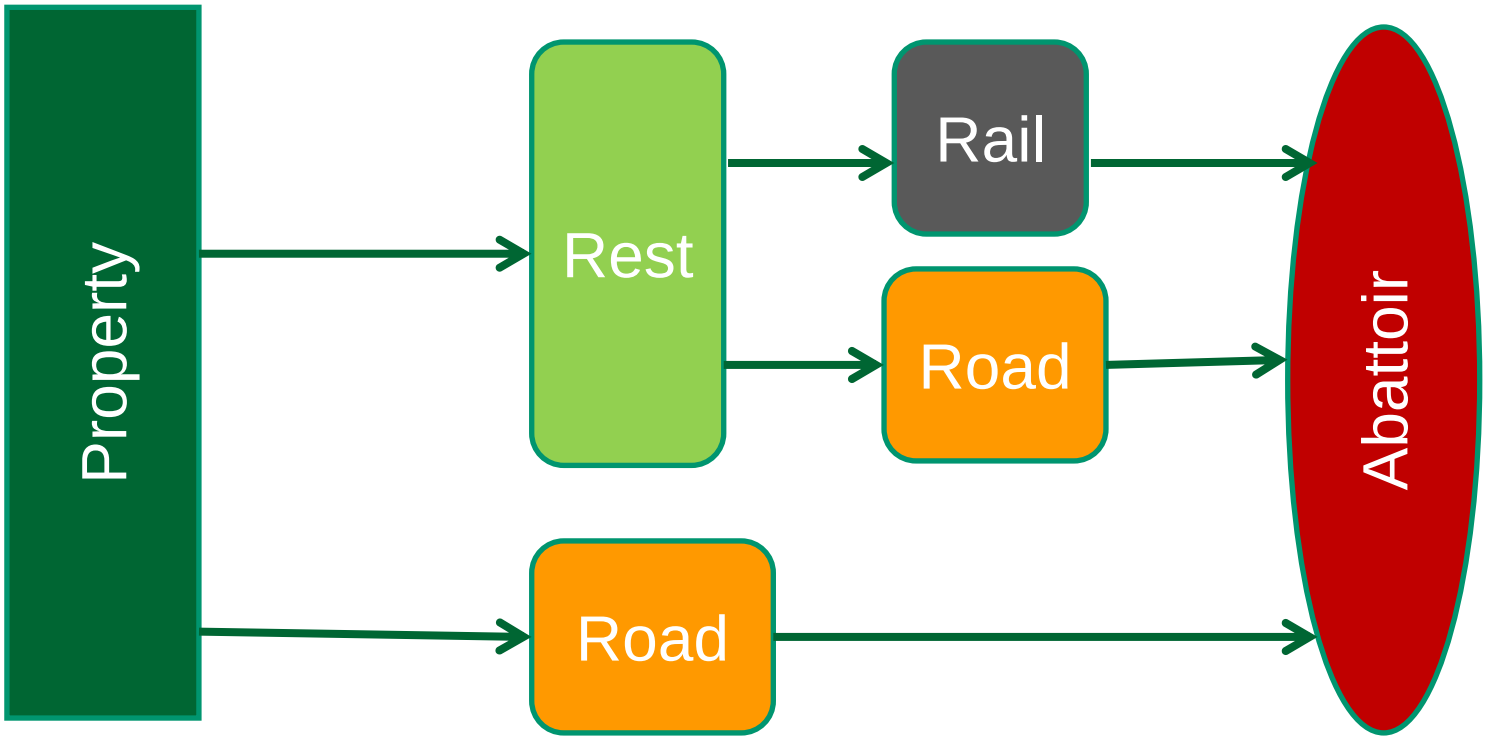
Reliable stress indicators at the abattoir?

Potential new grading inputs?

1. Blood parameters - glucose most promising
2. Urine – not valid to date
3. Body temperature
4. Retinal scan

Success would emphasise the result rather than the cause(s)

Potential new work road, rail and rest



Our sincere thanks to:

- **The four participating properties**
- **Frasers Transport**
- **JBS Dinmore**

Further information

- **MSA information**: www.mla.com.au/msa
- **Final report**: www.mla.com.au/Research-and-development/Final-report-details?projectid=15391
- **Rod Polkinghorne**
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