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**Animal Science Research Centre - Beef Unit Trial Results – 2016 (c)**

**Evaluation of feeding elevated levels of milk replacer (750 v 900g) on the performance and health of artificially reared beef calves to 12 weeks**

**Introduction:**

There is increased interest in feeding elevated levels of calf milk replacer (CMR) to artificially reared calves. In a recent study at Harper Adams (Marsh *et al.*, 2014) Holstein and Continental cross Holstein bull calves were fed either 500 or 750g of CMR per day. The calves had a mean age at the start of the study of 19.6 days old. The calves fed 750g CMR recorded a 12 week weight of 134.6kg which is higher than recognised targets. They had significantly higher ( $P<0.05$ ) daily liveweight gains (DLWG) from start to 3 weeks and 3 week weights. By 12 weeks the 750g fed calves had gained an extra 4.8kg in weight. The calves fed 500g of CMR recorded lower DLWGs to weaning did not exhibit compensatory growth. Concentrate intakes were reduced ( $P=0.124$ ) from start to weaning with the 750g CMR feed rate, however they were higher from weaning to 12 weeks resulting in similar overall concentrate feed intakes. It is now generally recognised by livestock rearers that artificially reared Continental bull calves should be fed 750g of CMR.

The objective of this experiment was to investigate the effect of feeding very high (900g) or high (750g) levels of milk replacer to artificially reared Continental cross Holstein bull calves on their performance and health to 12 weeks. Subsequent performance to slaughter will be monitored.

**Materials & Method:**

40 Oct/Nov 2015 born British Blue x Holstein (n=34) and Holstein bull calves (n=6) transferred from the Harper Adams University dairy unit and bought from local high herd health status dairy farms at a mean age of 15.4 days. This would therefore be similar to purchasing calves from markets. The calves were randomized according to breed, age and weight to the following treatments and housed in individual pens:

**Control (750)** The calves were fed warm whey and hydrolysed wheat protein based milk replacer (Wynngold Bloom [23% CP, 20% Oil], Wynnstay Group Plc) mixed at 40-45°C and fed at 39°C at 150g per 850ml of water and fed at 2.5 litres twice per day (5 litres per day) via a teat from a Wydale feeder offered at head height. They were offered *ad lib* early weaning concentrates (Start 'n' Wean, [18% CP]) Wynnstay Group Plc). Milk feed rates were gradually reduced to weaning at day 42 as shown in table 1 below.

**Table 1: Milk feeding rates (750g/d)**

Days	Litres of milk per day	Milk	g CMR /l milk	Feeds/day	CMR consumed /day (kg)	CMR consumed (kg)
1-35	5	Bloom	150	2	0.75	26.25
36-39	2.5	Bloom	150	1	0.375	1.88
40-42	1.25	Bloom	150	1	0.1875	0.56
					<b>Total</b>	<b>28.69</b>

**High (900)** Calves fed warm Wynngold Bloom milk replacer mixed at 40-45°C and fed at 39°C at 180g per 820ml of water and fed at 2.5 litres twice per day (5 litres per day) via a teat from a Wydale feeder offered at head height. Calves were offered *ad lib* early weaning concentrates (Start 'n' Wean). Milk feed rates were gradually be reduced to weaning at day 42 as shown in table 2.

Table 2: Milk feeding rates (900g/d)

Days	Litres of milk per day	Milk	g CMR /l milk	Feeds/day	CMR consumed /day (kg)	CMR consumed (kg)
1-35	5	Bloom	180	2	0.9	31.50
36-39	2.5	Bloom	180	1	0.45	1.35
40-42	1.25	Bloom	180	1	0.225	0.68
					<b>Total</b>	<b>33.53</b>

The calves were offered *ad lib* fresh water and straw and moved into group pens at weaning until 12 weeks.

### Results:

Table 3: Live weights (kg)

Treatment	750g	900g	s.e.d	P Value	Sig
<b>Start</b>	53.6	51.5	2.32	0.379	NS
<b>3 weeks</b>	66.4	67.8	2.83	0.626	NS
<b>Weaning</b>	84.2	89.7	3.65	0.141	NS
<b>12 weeks</b>	135.0	138.5	5.98	0.565	NS
<b>Increase in livewt</b>	81.4	87.0	4.81	0.270	NS

NS = not significant, \* = P<0.05, \*\* = P<0.01

Table 4: Daily liveweight gains (kg)

Treatment	750g	900g	s.e.d	P Value	Sig
<b>Start - 3 weeks</b>	0.61	0.78	0.063	0.015	*
<b>3-6 weeks</b>	0.85	1.04	0.086	0.028	*
<b>Start - weaning</b>	0.73	0.91	0.056	0.003	**
<b>Wean - 12 weeks</b>	1.21	1.16	0.092	0.607	NS
<b>Start - 12 weeks</b>	0.97	1.04	0.057	0.257	NS

There was a significant improvement in DLWG with calves fed 900g CMR from start to 3 week, 3 to 6 weeks and highly significant increase in DLWG from start to weaning.

Table 5: Frame scores at weaning

Treatment	750g	900g	s.e.d	P Value	Sig
<b>Heart girth (cm)</b>	100.6	102.7	1.53	0.269	NS
<b>Wither height (cm)</b>	87.1	88.4	1.23	0.299	NS
<b>Hip height (cm)</b>	92.6	93.3	1.27	0.539	NS
<b>Hip width (cm)</b>	35.1	36.0	0.91	0.331	NS
<b>Last rib girth (cm)</b>	110.3	112.6	2.37	0.293	NS

Frame scores were numerically higher for the calves fed 900g CMR but this was not statistically different.

Table 6: Feed intakes (kg) and Feed Conversion Ratio (FCR) to 12 weeks

Treatment	750g	900g	s.e.d	P Value	Sig
Milk replacer (kg)	28.7	33.5			
Concs - start to wean (kg)	19.4	17.7	2.09	0.416	NS
Concs - wean to 12 weeks (kg)	197.5	217.5			
Concs – total (kg)	216.9	235.2			
FCR - start to weaning	1.57	1.34			
FCR - start to 12 weeks	3.02	3.09			

Table 7: Financial performance – feed costs per calf and per kg gain to 12 weeks (£)

Feed costs (£/calf)	750g	900g
CMR @ £1,420/t	40.75	47.57
Concs @ £280/t	60.73	65.86
Feed costs/calf (£)	<b>101.48</b>	<b>113.43</b>
Feed cost per kg gain (£)	<b>1.25</b>	<b>1.30</b>

Total feed costs per calf to 12 weeks were increased by £11.95 and by 5p/kg gain with the 900g CMR feed rate. Subsequent performance to slaughter will be evaluated.

The percentage of calving requiring medical treatments for morbidity was significantly higher for the calves fed 750g/d of CMR (30%) compared to the calves fed 900g/d CMR (10%) (P=0.038). No significant difference was found between treatments for any calf health scores (dehydration, cough, nasal and eye discharge, ear, faecal and coat bloom), however coat bloom and faecal scores improved over time (P=0.001). The results for the cost of morbidity and its effect on cost per kg liveweight gain are shown in tables 8 and 9.

Table 8: Cost (£/calf) of morbidity

Treatment	750g		900g	
	No. of cases (20 calves)	Total cost (£)	No. of cases (20 calves)	Total cost (£)
Pneumonia	3	43.47	0	0
Fever	1	13.66	1	13.66
Scours	2	34.75	1	17.38
<b>Total morbidity</b>	<b>6</b>	<b>91.88</b>	<b>2</b>	<b>31.04</b>
<b>Cost per calf (£)</b>		<b>4.59</b>		<b>1.55</b>

Table 9: Pre-weaning cost analysis including feed and health treatments

Treatment	750g	900g
Feed costs/calf to weaning (£)	46.15	52.55
Cost of pre weaning morbidity (£)	4.59	1.55
<b>Total pre weaning costs (£)</b>	<b>50.74</b>	<b>54.10</b>
<b>Cost per kg DLWG (£)</b>	<b>1.66</b>	<b>1.42</b>

### Discussion & Conclusions:

- Overall performance of the calves was excellent exceeding the targets for rearing calves to 15 weeks of 119 to 122kg for Holstein and Continental dairy bred bull calves respectively. This excellent performance is likely to be influenced by the standard of stockmanship, nutrition and health.
- There was a significant increase in DLWG with calves fed 900g CMR from start to 3 week, 3 to 6

weeks and highly significant increase in DLWG from start to weaning. The calves fed 900g of CMR gained an extra 5.6kg in live weight to 12 weeks.

- There were no differences in DLWG from weaning to 12 weeks and the calves on the 750g level of milk replacer did not exhibit compensatory growth.
- There were no significant differences in calf frame score or health. However there was a numerical improvement in all of the frame scores with the 900g CMR fed calves.
- There was no difference in concentrate intakes when it was expected that the 900g CMR fed calves would record a lower intake. Concentrate feed intakes for both groups to 12 weeks are considered to be very high. In previous studies at Harper Adams total concentrate intakes from start to 12 weeks have ranged from 130 to 165kg per calf but this high intake resulted in very good DLWGs.
- Feeding 900g of CMR resulted in a reduction in calf morbidity.
- Rearing costs to weaning including feed and health treatments were reduced from £1.66 to £1.42/kg gain.
- Total feed costs per calf to 12 weeks were increased by £11.95 and by 5p/kg gain with feeding 900g of CMR based on the feed costs prevailing at the time of the trial. This increase in rearing costs would be recouped by valuing the extra 5.6kg live weight gain @ £2.13/kg. Also will this increase in calf rearing costs be recouped by earlier slaughter of the bulls or finishing at heavier weights?

#### **Acknowledgement:**

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#### **Reference:**

The above work was presented as a conference paper at the British Society of Animal Science annual meeting in 2017. The reference is as follows:

Marsh, S.P., Bleach, E.C.L., McGowan, R.M. and Knight, P. 2017. Evaluation of feeding elevated levels of milk replacer (750 v 900g) on the performance and health of artificially reared beef calves to 12 weeks. *Advances in Animal Biosciences*: 8. Paper 87.

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