Relation between calf birth weight and dam weight in Belgian Blue double-muscled cattle

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Summary

Belgian Blue double-muscled (BBDM) cows frequently calf with cesarean. There is an increasing aversion against this practice, so called for reasons of animal welfare. One of the main causes of dystocia is the relatively high calf birth weight (CBW). Therefore, the relation between CBW and dam body weight (DBW) was studied, using 374 dams and their offspring involving 916 parturitions. Only full-term gestation periods and single births were investigated. Dam birth weight and CBW were correlated, going from 0.148 for female calves ($P<0.003$) to 0.173 for all calves ($P<0.001$) and 0.207 for males ($P<0.001$). However, large variations from 0.439 to -0.454 were observed within parities and calf gender. A higher correlation was found between CBW and dam weight before (0.325) or after calving (0.301). Postpartum DBW increased significantly up to the 5th parturition, while CBW increased up to the 2nd and the 3rd parturition, respectively for females and males. Consequently, postpartum DBW: CBW increased from 11.3 at the 1st parturition to 13.7 at the 5th parturition and then leveled off. Dam birth weight was moderately correlated with daily gain during the first 4 months of live: 0.178 ($P=0.001$) and BW after the 1st calving 0.279 ($P<0.001$). DBW after the 1st calving was moderately correlated with BW gain during the first 4 months of live: 0.143 ($P=0.008$). However, especially a daily BW-gain below 0.6 kg resulted in a lower postpartum DBW. Only 4.4% of the calvings occurred without cesarean. These calvings were characterized by a higher cow age and parity ($P<0.001$), and a lower CBW, a lower ratio of CBW to postpartum DBW, and a lower frequency of male calves ($P<0.01$) than calvings with cesarean. Five cows had 59% calvings without cesarean. From the low correlations between birth weights of dams and offspring and between half-sibs, and the occurrence of dams with several calvings without cesarean, it can be concluded that there may be a possibility to select for BBDM cows that calve with a lower frequency of cesarean.

Introduction and objective

Characteristics of Belgian Blue double-muscled cattle:

- extreme meatiness
- excellent carcass quality
- high value meat cuts
- reduced pelvic area
- relatively high birth weight

} Dystocia, Elective caesarean

Objective

- To study the relationship between calf birth weight (CBW) and dam body weight (DBW) to reduce the occurrence of cesarean in Belgian Blue double-muscled cows, knowing that:
  Calving difficulty (%) = 2.30 CBW (kg) (Laster et al., 1973)
- To investigate the effect of early life daily gain on calving difficulty

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Material and methods

- 374 dams
- 916 parturitions
- only single births involved
- weighing (BW):
  - dam:
    - birth – 4 mo.; BWgain (BWG): <500; 500-649; 650-799; 800-950; >950 g/d
    - before + after (3rd day) calving
  - calf: 3rd day
- statistical analysis
  - analysis of (co)variance
  - regression analysis

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Results

Effect of BWG from 0-4 mo. on pp. dam weight (DBW) and calf birth weight (CBW)

BWG Class	BWG (g/d)	DBW (kg)	CBW (kg)	CBW (% of DBW)	Caesa-rean (%)
<500	476[a]	504[a]	45.4[a]	9.1[ab]	100
500-649	602[b]	559[b]	50.3[b]	9.0[b]	99.2
650-799	733[c]	578[b]	49.5[b]	8.7[a]	93.2
800-950	859[d]	599[b]	50.3[b]	8.4[c]	95.7
>950	1011[e]	604[b]	51.5[b]	8.5[ac]	97.0

[abcde] P <0.05

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Effect of BWG* from 0-4 mo.

BWG Class	BWG (g/d)	DBW (kg)	CBW (kg)	CBW (% of DBW)	Caesa-rean (%)
<500	476[a]	538[a]	46.7[a]	8.8	98.0
500-649	602[b]	572[b]	50.9[bc]	8.9	98.5
650-799	733[c]	582[b]	49.6[ab]	8.6	93.0
800-950	859[d]	586[bc]	49.7[ac]	8.5	96.5
>950	1011[e]	599[c]	51.2[c]	8.6	97.2

[abc] P <0.05 * calf sex and dam age as covariates

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Relationship calf birth weight (CBW) – pp. dam weight (DBW)

		DBW (1)	CBW (2)	Relationship	
				1:2	2:1 (%)
Parity	1	517.2^{a}	46.8^{a}	11.3^{a}	9.08^{a}
	2	587.6^{b}	51.2^{b}	11.7^{b}	8.72^{b}
	3	647.3^{c}	53.0^{c}	12.5^{c}	8.21^{c}
	4	672.3^{d}	54.9^{c}	12.8^{c}	8.01^{cd}
	5	704.1^{e}	52.3^{bc}	13.7^{d}	7.49^{d}
	6	727.8^{e}	53.5^{c}	13.9^{d}	7.37^{d}
Sex	M	748.5^{a}	54.4^{a}	12.1^{a}	8.50^{a}
	F	742.2^{a}	49.4^{b}	13.2^{b}	7.81^{b}
No interaction					

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Characteristics of calvings w/ or w/o caesarean

	+ Caesarean	- Caesarean
Dam birth weight (kg)	48.2	49.7
Dam DBWG 0-4 mo. (kg)	0.78	0.78
Age at 1st calving (d)	793	775
BW before 1st calving (kg)	608	601
BW after 1st calving (kg)	519	515
Age at calving (d)	1230	1581***
Parity	2.1	3.0***
*** P < 0.001		

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Characteristics of calvings w/ or w/o caesarean

	+ Caesarean	- Caesarean
BW pre-partum (kg)	679	720**
BW post-partum (kg) (DBW)	581	615*
Calf birth weight (kg) (CBW)	50.2	46.2***
DBW post-partum/CBW	11.8	14.2***
CBW/DBW post-partum (%)	8.7	7.4***
Male calf frequency (%)	51.7	30.0**

* P < 0.05; ** P < 0.01; *** P < 0.001

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Characteristics of calvings w/o caesarean

	Cows calving	
	w/o caesarean	Several times w/o caesarean
No. of cows	32	5
No. of calvings w/o caesarean	40	13
	32%	59%
Total No. of calvings	124	22
No. of primiparous cows	7	2

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Relationship (r) between dam birth weight and calf birth weight

Parturition	All calves	Males	Females
1	0.235***	0.260***	0.227**
2	0.168**	0.277**	0.102
3	0.084	0.100	0.109
4	0.280*	0.174	0.238
5	0.072	-0.451	0.431
6	0.366	0.439	0.149
all	0.173***	0.207***	0.148**

*** P<0.001; ** *** P<0.01; * *** P<0.05

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Relationship between calf birth weights from subsequent parturitions (P)

	P1	P2	P3	P4	P5
P2	N = 250 0.228***				
P3	N = 168 0.239**	N = 163 0.221**			
P4	N = 82 0.343**	N = 81 0.206	N = 82 0.165		
P5	N = 28 -0.117	N = 27 0.318	N = 27 0.279	N = 28 0.298	
P6	N = 12 -0.141	N = 12 0.093	N = 12 -0.204	N = 12 0.469	N = 10 0.365

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Regression analysis

CBW (kg) = 23.5 + 0.0179 prepart.DBW + 0.0030 Dam age + 0.180 dam birth weight + 3.45 male sex

R^2 = 0.228; P < 0.001; RSD = 6.84

CBW/DBW (%) = 11.739 - 0.006 prepart.DBW – 0.680 Dam BWgain 0-4mo + 0.025 dam birth weight + 0.603 male sex

R^2 = 0.225; P < 0.001; RSD = 1.26

Conclusions

The relationship between calf birth weight (CBW) and dam body weight in Belgian Blue cattle depends on:

- ❖ sex of the calf
- ❖ dam birth weight
- ❖ dam growth

Dystocia increases with:

- ❖ male calves
- ❖ higher dam birth weight
- ❖ a slower dam growth during 0-4 mo. of life

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