BEEF CATTLE RESEARCH UPDATE

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March 2016

Effect of Dam Age on Offspring Productivity

It is well accepted that first calf heifers and old cows are less productive than middle age cows. The Beef Improvement Federation (BIF) recommends adjusting the birth and weaning weight of calves based on age of the dam at birth of the calf[1]. Data in Table 1 shows the suggested BIF adjustment factors for birth and weaning weight of calves. Breed specific adjustment factors have been developed by individual breed associations.

Table1. BIF Standard Adjustment Factors for Birth and Weaning Weight.

Age of Dam at Birth of Calf	Birth Weight	Weaning Weight	
		Male	Female
2	+8	+60	+54
3	+5	+40	+36
4	+2	+20	+18
5-10	0	0	0
11 and older	+3	+20	+18

Most research studies evaluating the effect of dam age on performance have limited their comparisons to primiparous (first calf) vs. multiparous (given birth two or more times) females and concentrate on dam performance or offspring performance only in the pre-weaning phase. For this reason, recent University of Nebraska research evaluated the effects of dam age at calving on male calf performance from birth to slaughter and female calf productivity from birth through her second breeding season.[2]

In this study, records were collected from a composite Red Angus × Simmental herd from the Gudmundsen Sandhills Laboratory (GSL, Whitman, NE) from 1997 to 2014 for heifer calves (1,524 calves) and from 2003 to 2014 for steer calves (1,195 calves). In this herd, cows and heifers were culled when they failed to become pregnant and cows were also culled for advanced age or health issues. First calving heifers replaced culled cows and all replacement heifers were born and developed at GSL. The performance parameters evaluated for heifer calves included birth body weight (BW), adjusted 205 day weaning BW, pre- breeding BW, BW and body condition score (BCS) at pregnancy diagnosis, at calving, and at weaning of their first calf. Reproductive performance parameters included pubertal status and pregnancy rate for their first and second breeding seasons. The performance parameters evaluated for steer calves included birth BW, adjusted 205 day weaning BW, BW at slaughter, average daily gain (ADG) from birth to weaning, and ADG from weaning to slaughter. At slaughter, hot carcass weight (HCW), marbling score, fat thickness, ribeye area, and yield grade were measured.

These researchers reported that male calves born from primiparous dams had lower birth BW and adjusted 205 day weaning BW compared to calves from multiparous dams ($P < 0.05$). There was also a linear and quadratic effect ($P < 0.05$) of dam age on birth BW and adjusted 205 day weaning BW. Dam age had a quadratic effect on final BW ($P < 0.05$). As dam age increased, offspring BW at different phases increased until the dam was 7 to 8 years old and then decreased.

In addition, male calves born from primiparous dams had greater marbling scores, lower fat thickness, lower percentage of carcasses grading Select, a higher percentage of carcasses grading Choice and upper 2/3 Choice, and a lower percentage of carcasses with USDA yield grade 3 ($P < 0.05$) compared to calves from multiparous dams. As dam age increased, more carcasses graded Standard (linear effect, $P < 0.05$). Furthermore, dam age had a quadratic effect on ribeye area and

HCW (P < 0.05). As dam age increased, steers had greater ribeye area and heavier HCW until dam age was 7 to 8 years old, and then offspring performance decreased. Steers born to young dams produced lighter, less muscled, and more marbled carcasses. These authors suggested that this might explain the better carcass quality grades for steers born from young mothers

They also reported that heifer calves from primiparous dams had lower birth BW, adjusted 205 day weaning BW, pre-breeding BW and pregnancy diagnosis BW (P < 0.05). There was a linear and quadratic effect (P < 0.05) of dam age on birth BW and adjusted 205 day weaning BW. The same pattern that was observed for steer calves occurred with heifers; as dam age increased, offspring BW at different phases increased until the dam was 7 to 8 years old and then decreased.

The effect of dam age on heifer reproductive performance is shown in Table 2. A lower percentage of heifers born from primiparous dams were pubertal prior to the first breeding season compared with heifers born from multiparous dams (P < 0.01). In addition, dam age tended to have a linear effect (P = 0.06) on the percentage of heifers pubertal prior to the breeding season; heifers born from young dams tended to have a lower cycling rate compared with heifers from older dams. However, dam age had no effect on pregnancy rates in the first breeding season. Heifers born from cows 4 to 9 years old had more calves born in the first 21 days of the calving season (quadratic effect, P < 0.01).

Table 2. Effect of dam age on heifer reproductive performance.

	Dam Age									Contrast P-value		
Item	2	3	4	5	6	7	8	9	10	Primiparous vs. Multiparous	Linear	Quadratic
1st Breeding and Calving Season Performance:												
Heifers pubertal, %	56	69	76	74	75	83	74	68	83	< 0.01	0.06	0.72
Pregnancy rate, %	86	86	86	90	84	87	87	89	77	0.88	0.22	0.25
Calved in 1st 21 days, %	73	72	76	80	76	82	83	76	64	0.50	0.32	< 0.01
2nd Breeding Season Performance:												
Pregnancy rate, %	58	81	85	78	82	90	83	94	87	0.01	0.61	0.69

Adapted from da Silva et al. 2016

In addition, heifer calves born to multiparous cows had greater BW and BCS at calving and greater BCS when their first calf was weaned (P < 0.05, data not shown). Even though, first breeding season pregnancy rates did not differ due to dam age, heifers born from 2 year old dams had lower pregnancy rates in their second breeding season (P = 0.01). These researchers suggested that the improved BCS of heifers born from multiparous dams at calving and weaning may have contributed to greater pregnancy rates in the second breeding season compared with heifers born from primiparous dams.

These researchers concluded that dam age has a quadratic effect on offspring performance; as dam age increased, offspring performance increased until dam age reached 7 to 8 years and then offspring performance decreased. In addition, they concluded that this data suggest that producers should select heifers born from cows 4 to 8 year old as herd replacements since “heifers born from dams 3 years old and younger are unable to express their genetics for growth and have an increased chance of failure in the first calving season and second breeding season, increasing their likelihood to be removed from the herd”.

[1] BIF. 2010. Guidelines for Uniform Beef Improvement Programs, 9th ed. p. 133.

[2] da Silva, A. G., J. A. Musgrave, D. C. Adams, J. Nollette, A. Applegarth, and R. N. Funston. 2016. Effect of Dam Age on Offspring Productivity. Nebraska Beef Cattle Report MP103: 19-21.