Réseau laitier canadien
Canadian Dairy Network

Calving Ability for Sires with Sexed Semen

All major A.I. organizations offering proven sire semen in Canada now include some form of product line that increases the likelihood of producing a heifer rather than a male calf. Given that heifer calves are born easier, a logical question can be asked: "To what extent is the Calving Ability increased for a particular bull when the semen available is expected to yield more than 50% female calves?" A recent analysis at Canadian Dairy Network (CDN) provides the answer to this question.

Currently Available Semen Products

While most, if not all bulls, have semen available that was produced using traditional laboratory processes, some bulls also have either "Sexed" or "Gender-Bias" semen (trademarked as Bovitel™) available for commercial use. All semen labelled as "Sexed" that is available in Canada through various A.I. companies has been produced using flow cytometry technology licensed by XY, Inc. located in Colorado, USA. Research and field trials indicate an expected progeny sex ratio of 90% females and 10% males using this technology, which is highly desirable to most producers. On the downside, there is also an associated sacrifice in conception rates such that they are roughly two-thirds of that achieved using traditional semen for A.I. For this reason, the use of "Sexed" semen is primarily being promoted for breeding heifers rather than cows, which already have lower conception rates. Semen labelled as "Gender-Bias" has been produced exclusively by Accelerated Genetics based on patented technology that shifts the expected sex ratio of resulting progeny to 60% heifers and 40% males without any impact found on conception rates in heifers or cows.

Impact on Expected Calving Ability

In Canada, sires are evaluated for Calving Ability (CA) and Daughter Calving Ability (DCA), which both combine performance for calving ease and calf survival. The genetic evaluation system at CDN that evaluates calving performance accounts for the fact that heifer calves are born easier than male calves, and therefore the interpretation of resulting proofs is based on the standard 50:50 sex ratio of any bull's progeny. Since the semen available that is "Sexed" or "Gender-Bias" has an expected increase in the proportion of heifer calves born compared to traditionally processed semen, the average percentage of progeny births expected to be "Unassisted" or "Easy Pull" also increases.

Table 1 provides the expected percentage of progeny born from virgin heifers with an appraisal of "Unassisted" or "Easy Pull" depending on their sire's Calving Ability proof, expressed as a Relative Breeding Value (RBV) from 115 down to 85. The values in the column labelled "Traditional Semen" reflect the usual expectation for Holstein bulls with proofs in Canada whereas the columns labelled "Gender-Bias Semen" or "Sexed Semen" show the analogous expectations based on the resulting change in the progeny sex ratio, yielding 60% and 90% females, respectively.

For “Gender-Bias” semen, the shift to 60% female progeny has relatively little impact to increase the probability of births from virgin heifers that are “Unassisted” or “Easy Pull” for bulls that have a Calving Ability of breed average (i.e.: 100) or better. Sires that are below breed average for Calving Ability do, however, improve the expected calving ease of their progeny from heifers by 1-2 percentage points due to the slightly increased frequency of female calves.

In the case of “Sexed” semen, which yields 90% female calves, the impact on improved calving ease of resulting progeny from virgin heifers is logically more significant. Bulls that are already strong Calving Ability sires with an RBV higher than 105 improve the proportion of easy progeny births by 1-2 percentage points but this increases to 3-4 percentage points for sires around breed average, ranging from 95 to 105 for Calving Ability. The biggest advantage of the impact of “Sexed” semen to improve calving performance comes, however, for sires that are undesirable for Calving Ability with a rating from 94 down to 85. For these bulls, the percentage of progeny from virgin heifers that is expected to be born “Unassisted” or “Easy Pull” increases by 5-6 percentage points. Another way to interpret this result is that the calving performance from an inferior Calving Ability sire can be improved by the use of “Sexed” semen such that it equals the expected calving performance using traditional semen from a sire with a Calving Ability proof that is 5-6 RBV points higher. While not shown in Table 1, this advantage also exists for progeny born from cows but is less significant since it increases the likelihood of calvings that are “Unassisted” or “Easy Pull” by 1.5 to 2 percentage points for sires with a Calving Ability below 95.

Table 1: Percentage of Progeny Born from Heifers Expected to be "Unassisted" or "Easy Pull" by Calving Ability Proof and Type of Semen - Holstein

Calving Ability (RBV)	Traditional Semen (50% Females)	Gender-Bias Semen (60% Females)		Sexed Semen (90% Females)	
	Expected %	Increase	Expected %	Increase	Expected %
115	96	0.3	96	1.1	97
114	96	0.3	96	1.3	97
113	95	0.4	95	1.4	96
112	94	0.4	95	1.6	96
111	93	0.4	94	1.8	95
110	93	0.5	93	1.9	95
109	92	0.5	92	2.1	94
108	91	0.6	92	2.2	93
107	90	0.6	91	2.4	93
106	90	0.6	90	2.5	92
105	89	0.7	90	2.7	92
104	88	0.7	89	2.8	91
103	87	0.7	88	3.0	90
102	86	0.8	87	3.1	90
101	86	0.8	86	3.3	89
100	**85**	**0.9**	**86**	**3.4**	**88**
99	84	0.9	85	3.6	87
98	83	0.9	84	3.8	87
97	82	1.0	83	3.9	86
96	81	1.0	82	4.1	85
95	80	1.1	81	4.2	84
94	79	1.1	80	4.4	84
93	78	1.1	79	4.5	83
92	77	1.2	79	4.7	82
91	76	1.2	78	4.8	81
90	75	1.2	77	5.0	80
89	74	1.3	76	5.1	80
88	73	1.3	75	5.3	79
87	72	1.4	74	5.4	78
86	71	1.4	73	5.6	77
85	70	1.4	72	5.7	76

Summary

As reproductive technology advances, various new semen products are being made available to dairy producers for their breeding decisions. In addition to the traditional frozen semen that has been available for decades, two other semen products are currently available that alter the standard 50:50 sex ratio expected in resulting progeny. “Gender-Bias” semen yields a ratio of 60% heifers without any known impact on fertility while “Sexed” semen produces 90% females but cuts conception rates down to about two-thirds of what is achieved using traditional semen. An additional advantage of using semen with higher rates of female progeny, especially “Sexed” semen, is the significant gain in calving performance expected for sires that are otherwise difficult for Calving Ability with a proof below 95. In fact, calving performance for progeny born from heifers bred using “Sexed” semen is improved such that it is equivalent to that expected from bulls with a Calving Ability rating that is 5 to 6 points higher based on progeny births resulting from traditional semen.

Author: Brian Van Doormaal
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