

Sexed semen influence replacement numbers

ATTENDANCE at the 13th annual Dairy Calf & Heifer Assn. conference was skewed by fewer attendees but more animals (800,000) represented. These operations were primarily from the western U.S. as the program was held March 24-27 in Tucson, Ariz.

The technology of sexed semen has had various scenarios painted before and now during implementation. Consequently, I found the presentation by Nebel et al. about the effects of sexed semen on replacement numbers to be quite lucid and timely. The following is my synopsis of that paper.

Dairy producers have always been interested in having more heifers than bull calves because of the former's greater value. So, how is this done, and what are the consequences?

All North American companies use the same flow cytometer equipment to sort X-chromosomes (female) from Y-chromosomes (male). This is based on a difference in DNA content of these chromosomes.

After dilution of sperm, they are stained with a DNA-specific fluorescent dye. As these stained sperm are sent through the flow cytometer at 60 mph under 40 psi, the larger X-chromosomes emit more light and are assigned positive charges to each droplet containing a single sperm. Then, three streams of positively charged X-chromosomes and negatively charged Y-chromosomes are deflected in opposite directions, and uncharged droplets of dead, multiple cells or unidentified, unresolvable sperm are collected.

This results in sperm separation by sex of approximately 90%. However, only about 60-70% of sperm are correctly oriented, and half of these are female. Thus, only about 15% of the sperm entering into the flow cytometer are recovered as viable sexed semen.

Because of limited capacity, straws

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Bottom Line

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contain only about 2 million sperm versus a standard straw content of about 20 million per straw. Adding the cost of equipment and labor to limited straws being produced results in a limited supply of more costly semen with a lower sperm count. For 2009, it was estimated that a total of 3.7 million units could be produced.

Current technology achieves about 90% heifer calves when evaluated across larger numbers of calvings. Sexed semen have been recommended for use in virgin heifers because of the reduced number of sperm per unit and greater conception rates in heifers compared to cows.

In nearly 200 herds using sexed semen from January 2005 to January 2008, the unadjusted conception rate was 45%. Also, sexed semen were used primarily (about 75%) for just the first insemination. Thus, sexed semen resulted in about 80% of the conception rate of conventional semen.

Data cited from the U.S. Department of Agriculture's Animal Improvement

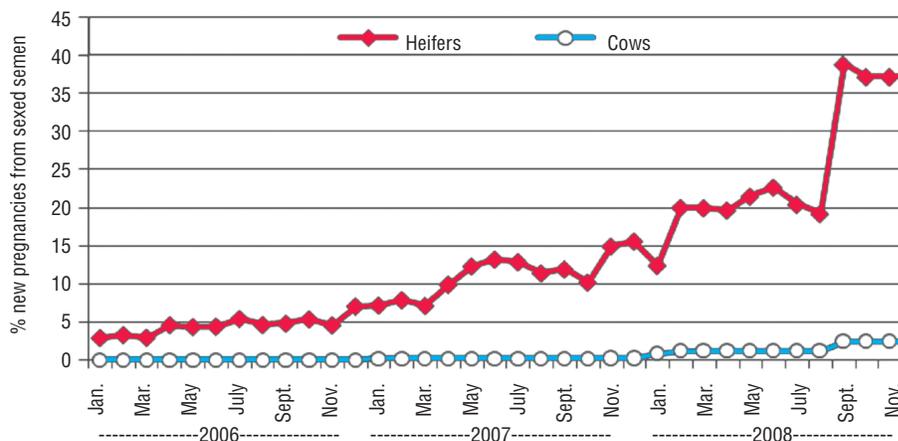
Laboratory found that 9.2% of Holstein heifers had at least one insemination with sexed semen from 2006 to April 2008. However, only 0.9% of all reported inseminations were with Holstein cows.

The following are other findings in greater use of sexed semen:

- Larger herds, herds with higher production levels and herds in the Northwest, Mideast and Midwest used more sexed semen.
- Sexed semen inseminations accounted for 1.5%, 9.6% and 14.2% of all reported inseminations in 2006, 2007 and 2008, respectively.
- Interestingly, there appeared to be more dead heifer calves from sexed semen, and this was associated with a younger age at first calving. This should not occur if heifers were grown appropriately to be bred at a younger age.

There are a number of economic and biological factors in determining if or when sexed semen are used. These include: conception rate differences between normal and sexed semen, the price differential of these two semen sources, the value difference between heifer and bull calves and producing more heifers to increase culling potential, to sell to other dairies or to increase the herd size. Additionally, having more

1. Percentage of new pregnancies with heifer calves in national population (heifers and cows) that result from inseminations with sexed semen from January 2006 to December 2008



heifer calves, especially from first-calf heifers, can reduce the rate and difficulty of calvings.

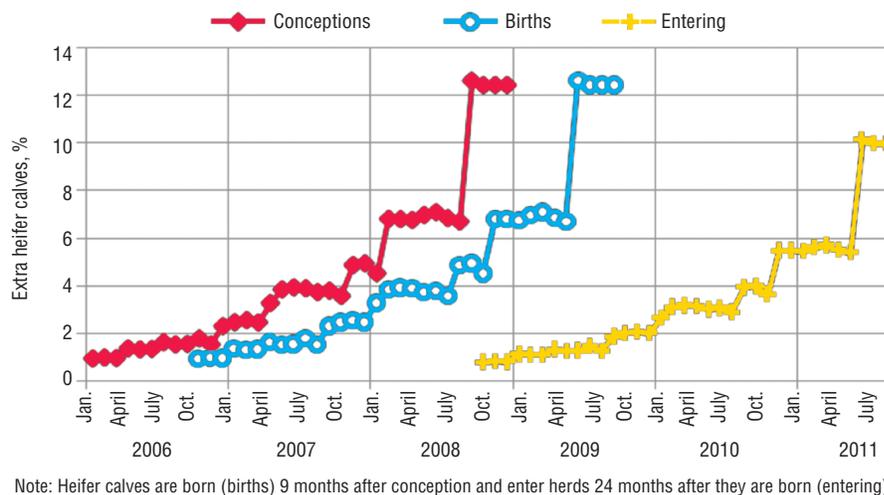
The final aspect is how much the increased use of sexed semen has affected the national heifer supply. From January 2006 to December 2008, sexed semen inseminations resulting in new pregnancies increased from 7,200 to 112,000. Pregnancy rates were 28% versus 45% for cows versus heifers, and cows accounted for 0.6-10.0% of new pregnancies from January 2006 to December 2008. Of conceiving cows that used sexed semen, there was a slight increase from 0.01% in early 2006 to 2.4% in late 2008 (Figure 1). For conceiving heifers over that same period, that increase was from 3% to 37%.

How many extra heifer calves from sexed semen would be expected to enter herds in their first lactation? Figure 2 illustrates the numbers as a percentage of all heifers. Less than 1% of all heifers entering their first lactation in late 2008 (from conceptions in early 2006) would have been from sexed semen, about 2% of all entering first-calf heifers in 2009 and 6% by the end of 2010. This corresponds to 8,100 extra heifers in 2008, 63,000 in 2009 and 161,000 in 2010.

It was projected that these extra heifers would decrease the heifer calf price, the purchase price of springing heifers and, long term, the cost of milk production. If these extra heifers were primarily used to increase the culling rate within a herd, then this would have little effect on the overall milk supply and resultant milk price.

Furthermore, it was expressed that the

2. Percentage of extra heifer calves in national population (heifers and cows) that resulted from inseminations (conceptions) with sexed semen



value of sexed semen in the future would be to source replacement heifers from the best cows in a herd. This would increase the rate of genetic progress in a herd and help to ensure biosecurity.

The effect of sexed semen has been small but could increase, affecting either quality or quantity — or both — of heifers.

The Bottom Line

Sexed semen have their primary value in being used in virgin heifers due to higher conception rates than in cows. They

can be used to increase the number of heifers available as well as to increase the genetic potential. The effect has been low, with estimated contributions increasing from 8,100 in 2008 to 63,000 in 2009 and to 161,000 in 2010.

Reference

Nebel, R., J.M. DeJarnette and A. De Vries. 2009. Effects of sexed semen on replacement numbers and long term economics. Proc. 13th Annual DCHA Dairy Calf & Heifer Conference, Tucson, Ariz. March 24-27. p. 23-36. ■