Improving fertility through management and genetics.

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Introduction

It is a great pleasure to be giving this talk to an international group of enthusiast Holstein breeders and supporters. A part of our gathering, every four years, is to celebrate and discuss the many virtues of our cow. However, it is also our responsibility to find those areas that can be improved upon.

An area that is on the minds of many breeders is fertility. Simple put, we have seen a worldwide decline in pregnancy rates and we need to address it. The title of this session is "A Holistic Approach to Improvement in Dairy Cow Fertility", which means we need to address this challenge from all of the different areas, such as, management, feeding programs, reproductive protocols and genetics. I will mostly be speaking about two aspects, on-farm decision-making and genetic improvement.

Within every dairy farm, there are a multitude of decisions to be made. For example, in the area of breeding herd replacements, at least three decisions are needed:

A. How many cows need to be bred,
B. Which cows should be bred and
C. When should you start breeding them?

I mention these three questions because there have been clear trends in all of them (Huang et al., 2006). All three trends point to the growing difficulty in getting cows bred. And all three trends clearly show that it's been the farmers who have been carrying the burden of the decline in fertility. In fact, most of the early response against the fertility problem has come from the farmers.

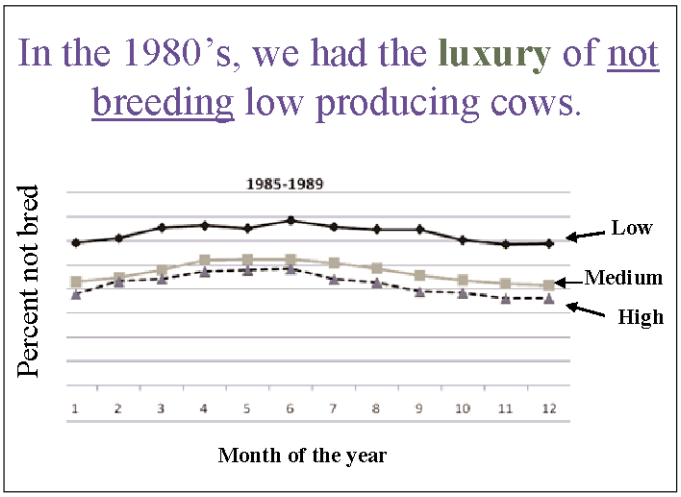
We must all work together to address this challenge. The good news is that these trends have not gone unnoticed. Researchers around the globe have been working on the development of genetic tools. These new genetic tools have now been in place long enough where we are starting to see their effects – a reversal of the downward trend in fertility and positive genetic improvement being made in Holsteins.

On farm decision-making

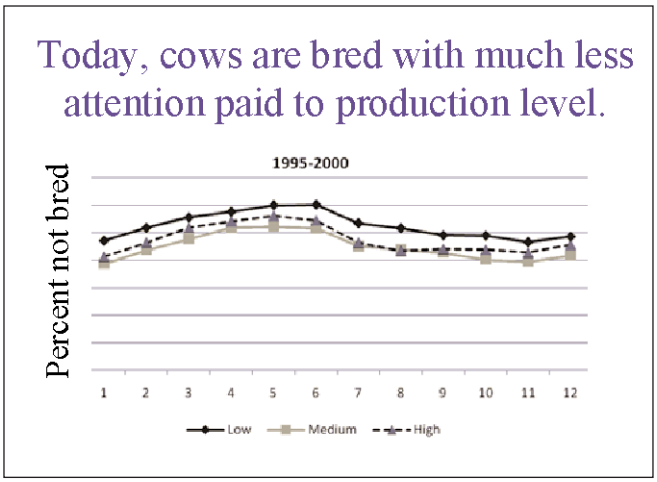
A good way to study a problem is to go where it's most challenging. The southeastern part of the U.S. fits the bill. It's noted for its hot and humid summers making it particular difficult to get

cows bred. In the southeastern part of the U.S., farmers want a seasonal calving pattern so that cows, will calve in the fall, and the peak yields will occur during the cool winter months. An inspection of the calving pattern over the last 15 years shows they have had great success in achieving this goal (Huang et al., 2006). However, below the surface, one can see the difficulties the farmers have faced.

Every herd has cows that the owner would like to cull. These cows may have some faults that the owner does not want to be passed onto the next generation or the cow may have a minor health issue or low production that keeps her from being profitable. When fertility levels are high, the farmer has the opportunity to voluntarily cull these cows. When fertility levels are lower, more undesirable cows must be kept. One of the changes that have occurred in the southeastern U.S. is that more cows are being bred. That is, as fertility has decreased, farmers need to breed more cows in order to obtain the number of pregnant cows as before.



By categorizing cows into three production levels; high, medium and low; we see that in the late 1980's, farmers would purposely leave open a higher proportion of the lower producing cows. These cows were deemed less profitable and good management dictated that these cows should be removed from the herd. By the late 1990's, there's little distinction amongst the production levels on who's bred and who's not. The opportunity to cull undesirable cows has decreased.



A recent study by USDA and Holstein USA (Norman et al, 2007) quantifies the lost opportunity to cull lower producing cows and the growing emphasis now being placed upon fertility. Amongst cows born in 1982, the relative emphasis of production to fertility in explaining which cows were culled was 4.3 to 1. That is the level of production was 4.3 times more important than the ease to get the cow bred. By 2000, the relative emphasis had dropped to 1.3 to 1. More farmers are faced with the situation of "if the cow is pregnant, she's staying whether I like her or not."

Another change that has occurred is breeding cows earlier. In the U.S., the number of days to first service has declined by 6 days from 2001 to 2005 (Norman, et al., 2008a). The use of timed AI is certainly behind this trend. In a study of New York herds, Tsuruta et al. 2008 found that use of a synchronization program is at a much higher frequency for large versus small herd size. Although the larger herds (avg. number of cows= 198) had higher production per day (34kg) and lower conception rates (29%) versus the small herds (average number of cows = 27; 31 kg production per day with 34% conception rate), the larger herds had fewer days open (138 vs. 145) due to the earlier start (75 vs. 92 days). In the national data set (Norman et al., 2008a), an earlier start to breeding (72 vs. 90 days) helped to provide those herds, with synchronization programs, a higher pregnancy rate (21.7 vs. 20.2%).

Breeding cows today is unquestionably harder than it was 20 or 30 years ago. Farmers are breeding more cows. They're breeding more lower producing cows and they're breeding them earlier all in effort to combat a general decline in fertility. These efforts have allowed many sectors of the dairy industry to carry on as before. However, these trends are not sustainable. Improvements in fertility must be made.

World Situation

The World Holstein Friesian Federation (WHFF) conducted a survey on fertility in Holstein populations around the world (Sørensen et al., 2007). The objective of the survey was to assess the status, trends, problems, challenges and opportunities of the Holstein cow as perceived by the respective national Holstein organization. By the end of June 2007, 21 national Holstein associations had responded. For the current time period, on average, countries reported a continuation of a slightly unfavorable trend in fertility.

However, there is good reason to be optimistic for the future. Action has been taken, both internationally as well as within each country, in order to change the decline in fertility. Many countries have initiated genetic evaluations for fertility traits in recent years. Seventeen of the twenty-one countries believe that their national dairy industry has the genetic tools to help farmers improve the genetic potential of their cows for fertility.

On an international level, 18 of the 19 countries that responded believe that Interbull's four measures of fertility are the best set of uniformly available traits for international comparisons. Those four traits are: cow's ability to recycle (interval from calving to first insemination); conception rate; interval from first insemination to conception; and days open. New technologies such as sexed semen; synchronized breeding and genomic research were presented as examples of ongoing research that could bring about improvement.

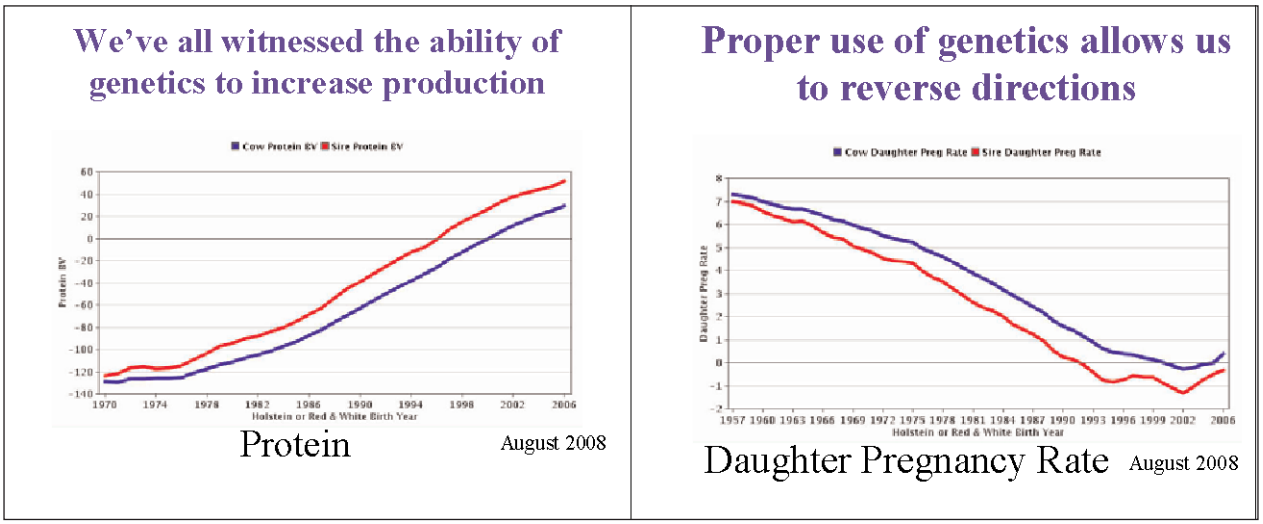
Future Trends

Is it realistic to believe the optimism expressed amongst national Holstein populations that the trend on fertility will soon be reversed? Yes it is! Allow me to show you what's happening in the U.S. The TPI formula is currently placing 19% of its emphasis on fertility through the traits: Productive Life, Daughter Pregnancy Rate and Angularity.

The trait Productive Life (PL) measures the amount of time that a cow is productive, i.e. when she's milking. The amount of credit given to the cow resembles the lactation curves, e.g., second and later lactations receive more credit than first, and, time during peak production receives more credit than months at the tail end of lactation. In other words, PL rewards those cows who get pregnant early and remains in the herd for several lactations.

The trait Daughter Pregnancy Rate (DPR) is a measure of the percentage of non-pregnant cows that become pregnant during each 21-day period. An increase of 1.0 in PTA DPR equals a decrease of 4 days open. The trait angularity is a good measure of a cow's ability to convert body reserves into milk production. Our classification program has been modified so that cows with extreme dairyness but lack the strength to sustain that production are now being penalized. Our selection index, TPI, has a negative weight on angularity along with a positive weight on production so that we select cows that produce more milk while maintaining body condition.

Inspection of genetic trends of U.S. Holsteins for fertility shows a reversal in DPR. The amount of genetic variation for the trait DPR is quite large. Within our active AI bull line up we have a difference of 6.9% in pregnancy rate (28 days open) between the top and bottom bulls. This genetic information allows Holstein breeders a great opportunity to turn things around.



A more important aspect, than the availability of genetic tools, is the value placed upon these tools by Holstein breeders. In recent years, there has been strong acceptance and usage of the genetic information for fertility in the U.S. Many breeders have been able to make their own comparison of daughter groups from high and low DPR bulls and have been impressed with the actual difference in daughter fertility.

USDA has published several studies showing the benefits of long-term usage of high fertility sires (Norman et al. 2008 b and c). Much of the decline that Holstein breeders have experienced in fertility in the last 40 years can be reversed in 2 generations. Another exciting tool for U.S. breeders are the national Sire Fertility Evaluations introduced this past August 2008 (Kuhn and Hutchison, 2008). Mating sires can now be evaluated for their expected conception rate. Improvements of 3 to 4% in conception rate, within an individual herd, can be achieved by the judicious choice of a mating sire.

Additional optimism amongst U.S. Holstein breeders comes from the recent introduction of a 50,000 SNP panel of genetic markers. Limited access to genomic predictions has been available to the U.S industry since April 2008. A validation study was conducted to prove the effectiveness of the new genomic information. When picking amongst full-sibs, the genomic test proved to be correct 71% of the time. We just boosted the odds of picking the right calf from a 50 – 50 proposition to being right 71% of the time. Not bad!

One of the exciting aspects of genomic selection is that the traits with the lowest heritability are the traits that benefit the most. The largest improvement in accuracy of the genetic evaluations occurs with the fertility traits.

Summary

Breeding cows today is unquestionably harder than it was 20 or 30 years ago. Farmers are breeding more cows; breeding more lower producing cows and breeding them earlier all in effort to combat a general decline in fertility. In a WHFF survey of national Holstein organizations, seventeen of the twenty-one countries believed that their national dairy industry has the genetic tools to help farmers improve the genetic potential of their cows for fertility. On an international level, 18 of the 19 countries that responded believe that Interbull's four measures of fertility are the best set of uniformly available traits for international comparisons. These new genetic tools have now been in place long enough where we are starting to see their effects – a reversal of the downward trend in fertility and positive genetic improvement being made in some Holstein populations. New technologies such as sexed semen; synchronized breeding and genomic research are examples of ongoing research that could bring about further improvement.

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