# Predictions for the Future

## What technologies will cattlemen be using 10 years down the road?

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Reproductive Strategies

Ten years into the future of the beef industry is just two breeding decisions away, George Seidel, professor emeritus at Colorado State University (CSU), told attendees of the 2013 Applied Reproductive Strategies in Beef Cattle (ARSBC) Symposium in Staunton, Va., Oct. 15-16. Seidel shared a futuristic look at reproductive technologies in beef cattle, sharing his expectations for synchronizing ovulation, sexed semen, *in vitro* fertilization (IVF), cloning and transgenics.

### Practices with broad application

"I think we should be talking about **ovulation synchronization,** not estrous synchronization, and minimizing handling cattle," said Seidel, adding that ideally there would just be two handlings — "one to set the system up, and one to breed her" — in a synchronized AI program.

Seidel envisioned a subcutaneous device that could dispense hormones in a sequence over a period of time. A device called an osmotic pump is already available. He described it as a little plastic device that can "leak" fluid at a very predictable rate. He explained that this device might be programmed to deliver hormones in sequence to set the female up for timed breeding. The pump could be removed at breeding or even be made to biodegrade with time.

"Another mission I've got is to put the cleanup bull out of business," Seidel said, explaining that a CSU researcher is close to developing a 16-day pregnancy test. By testing at 16 days, those found open could be given a shot of prostaglandin and synchronized for another round of AI.

Another broadly applicable practice is the use of **sexed semen,** he said. Accuracy is greater than 90%, though fertility is reduced to 80% and the cost is roughly double that of unsexed semen. The reduction in fertility is the technology's biggest drawback, he said, though advances have been made that will improve that in the future. Seidel suggested the use of sexed semen only if one sex is worth about $200 more than the other to justify the additional cost.

### Specialized practices

The specialized practices are too costly and labor-intensive for wide use now, but as technology advances, these tools can have advantages, he predicted.

***In vitro* fertilization** is a complicated system in which oocytes are aspirated, matured *in vitro* or *in vivo,* and fertilized in a lab setting, where the embryo can be matured before transfer or cryopreservation. The practice requires precise timing with many steps over an eight-day period. It has to be done in a lab and it has a relatively high cost per pregnancy, averaging 1.5 pregnancies and 1.2 healthy calves per 10 oocytes aspirated.

PHOTO BY TROY SMITH

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Seidel said IVF can work well with sexed semen since the sperm are mixed with the oocytes in a small volume of fluid. Oocytes can be collected from the donor more frequently, as often as every 4 days. IVF can be used to circumvent infertility in superior females and to get eggs from a recently deceased donor. However, for most producers wanting to amplify reproduction of a donor, he said, it is simpler and less expensive to use superovulation and embryo transfer.

**Cloning** by nuclear transfer makes a genetic copy of an animal, though not a phenotypic copy. Seidel explained that a clone of a sire whose progeny win shows will also produce show winners. A clone of a show winner itself will most likely disappoint the owner since the phenotype will not be an exact copy. However, he said, cloning can serve as insurance for extremely valuable animals; you can make bulls out of steers; and you can replicate $F_1$s, which typically don't breed true.

The technology carries some of the same complications (and a few more) as IVF, and success is generally one normal calf per 100 fused oocytes. Seidel said the cloning process is incredibly expensive, averaging $15,000-$20,000 per clone.

**A transgenic animal** is defined as one that has a deliberately altered genetic makeup, either by adding genes, deleting genes or correcting genes, Seidel explained. The term transgenic has been replaced with "genetically modified organisms," or GMOs, in the popular press, especially as applied to plants.

He predicted that transgenic technology will be used more prevalently in livestock in the future, explaining, as an example, that the polled gene could be imposed on breeds with horns. The polled gene often is introduced into a horned strain of cattle through introgression — making half-bloods, three-quarter-bloods, etc., over successive generations. It's an expensive and time-consuming process that could be replaced in one step with transgenics.

Seidel said one of his favorite potential uses for transgenics would be to put terminal-cross genes, such as growth genes, on the Y chromosome. You then could have both maternal- and terminal-cross characteristics in the same strain of cattle; males would grow faster and larger, but females would stay smaller.

"One would need to regulate the genes for growth so that they are expressed after birth to keep birth weights low," he added.

**Editor's Note:** *Seidel spoke during Wednesday's ARSBC session focused on special issues on beef cattle reproduction. Visit the Newsroom at* www.appliedreprostrategies.com/2013 *to listen to his presentation and to view his PowerPoint slides and proceedings paper. Comprehensive coverage of the symposium is compiled by the* Angus Journal *editorial team. The site is made possible through sponsorship by the Beef Reproduction Task Force.*