

## Swine Embryo Transfer Called 'Next Frontier'

DEKALB, Ill. — Within 10 to 15 years, embryo transfer could replace artificial insemination as the primary means of accelerating genetic development in progressive swine operations, said Dr. David Fox, a geneticist and vice president of research and development for Dekalb Swine Breeders, Inc.

"Today, a sow has the capability to produce 2.5 litters a year, but she actually produces enough eggs to have many, many more," he said. "What we're looking at is the potential of taking ovaries from superior females, extracting the eggs, maturing them in a lab, fertilizing them with semen from top sire lines, and then implanting them in recipient sows."

"The technique needs to be perfected for on-farm use," he said, "but within the next decade or so, I could see embryo transfer becoming a commercially viable as A.I. is today. It's the next frontier."

In theory, nonsurgical embryo transfer would allow producers to significantly reduce genetic variation, improve consistency and change the way they manage their breeding programs.

"It may be possible for a 2,500-sow operation to produce all the embryos it needs with only 100 sows and three boars," Fox said. "The 2,500 sows would serve as surrogates."

With embryo transfers, he explains, the variation in progeny would be minimized, and producers could be more selective about their genetics. "The surrogate females would only need to be selected for maximizing reproductive traits, while the donor females would be selected with the optimum market pig in mind," he said.

Embryo transfer in swine will have to "walk before it runs," however. Any commercial applications in the near future probably would have to be done surgically. "But even then, embryo transfer offers obvious potential benefits," Fox said.

"Any time you're moving stock from one farm to another, there are always concerns about the animals' health profiles and the risk of introducing different disease organisms," he said. "Embryo transfer could greatly reduce that risk."

As an added benefit, embryo transfer could help reduce transportation costs, while also giving producers even broader genetic diversity. "Producers could buy embryos that are well suited to their specific needs or market," he said.

Dekalb has the technology in place to produce embryos for export to other countries for surgical implantation. "It's not something we're promoting at the moment, but we clearly have the capability," Fox said. "For now, our focus is in vitro fertilization and working with in vitro culture conditions needed to grow embryos to a cell stage that can be implanted surgically."

Longer term, one of Dekalb's goals is to make embryo transfer a dependable means of accelerating genetic improvement for commercial hog operations. "I think the

day will come when instead of having an A.I. lab, we'll have an on-farm embryo lab and we'll implant them nonsurgically. We'd simply transfer embryos into the sow instead of inseminating semen."

The development of embryo technology will be facilitated by Dekalb's new Discovery Research Center. According to Fox, it houses one of the only commercial biotechnology laboratories in the world specific to swine.

Dekalb's commitment to biotechnology and R&D has already spawned numerous benefits for the U.S. pork industry. For example: for more than 20 years, Dekalb has been screening its breeding stock for positive carriers of the halothane gene. In 1992, technology involving DNA screening enabled the company to identify not only animals that were positive, but those that were carriers or negative for the gene.

"We made the decision to eliminate the halothane gene from our breeding herd," Fox said. "We felt this was an important not only for Dekalb, but for the entire U.S. pork industry."

He explains that the halothane gene lowers pH and water retention, which in turn produces more PSE (pale, soft, exudative) pork. In addition, the halothane gene causes more stress in pigs, which results in higher death loss from birth to market. "The halothane gene has no place in U.S. pork production," he said.

But Dekalb didn't stop there. In 1997, Dekalb suspected that Hampshire-derived breeding stock had a higher incidence of the Rn (Napole) gene, which often results in pale, watery meat. This was reinforced by Dekalb's own internal assessment, which showed its Hampshire line to have unacceptable meat quality.

"A DNA test for this gene has not yet been developed, so producers must rely on careful genetic selection," the geneticist said. "We felt it was important to eliminate all Hampshire-derived breeding stock from our breeding program."

Dekalb's use of PCR technology is also benefiting the pork industry. PCR, which stands for polymerase chain reaction, is a highly sensitive and extremely accurate tool that biotechnologists use to amplify DNA by several million times and then search for the presence or absence of certain genes.

Marker-assisted selection is another key element of Dekalb's biotechnology program. Identification markers that are associated with economically important traits can dramatically speed genetic progress, Fox said.

Biotechnology is hardly a new area for Dekalb Swine Breeders. Inspired by breakthroughs its sister company was making in seed corn and other plant genetics, the swine group established its first biotechnology laboratory in 1990.

"At Dekalb, I guess you could say that biotechnology is in our genes," Fox said. "We're very proud of the contributions we've made to the pork industry, but I feel our best work is yet to come."

## Short-Term Drought Prediction May Help Communities

BOSTON, Mass. — The ability to predict drought one to several seasons in advance may save water resource planners and farmers billions of dollars, according to a team of Penn State researchers.

These researchers developed a computer model that can predict reliably the severity and timing of drought episodes six months in the future.

"Farmers would find it useful to have drought predictions in the spring for three or six months later," said Kelly Brennan, recent recipient of a Penn State master's degree in civil engineering. "Farmers could then change the crop they plant for something that is more late-summer drought tolerant."

One suggestion would be to plant crops with deeper root systems.

"Another important area, especially in the Ohio River Basin where we worked, is the need to maintain adequate river levels for barge traffic," Brennan told at-

tendees at the spring meeting of the American Geophysical Union recently in Boston.

The normal practice is to lower reservoirs in winter and early spring to create enough storage capacity to retain excessive spring runoff that would otherwise cause flooding downstream. This practice can have very harmful consequences in years of drought, especially during the summer.

"A grounded barge can cost as much as \$10,000 a day," said Brennan. "Low water levels may also affect water purity and supply and recreation."

Working with Dr. Ana Barros, assistant professor of civil engineering, Brennan developed a model that can predict extreme drought episodes three, six, and nine months in advance.

"The model uses a measure of the temporal evolution of the spatial variability of precipitation over a period of time in the past," said Brennan.

The researchers combine this

measure with the accepted measure of current drought, the Palmer Drought Severity Index. The PDST uses soil moisture, temperature and precipitation along with specific parameters for the region to detect if there is a current drought. The PDSI is used to issue drought emergencies and to rescind them as well.

The model was tested and validated on historic data through 1996.

"We can predict drought three to six months in advance pretty well," said Brennan. "At the nine-month scale we can capture the timing of extreme droughts, but the severity of the drought is not as accurate."

The researchers would like to see their model running on current data so that it could be used as a real-time forecast model.

Lisa Mead, a biology undergraduate and a participant in the Women in Science and Engineering Internship program, also participated in this research.

## Beekeepers Swarm To Pa. For Regional Conference

UNIVERSITY PARK (Centre Co.) — Beekeepers from 22 American states and Canadian provinces will attend the 1998 Eastern Apicultural Society (EAS) of North America Convention and Short Course at Seven Springs Resort in Champion July 13-17.

"Typically about 500 commercial and hobby beekeepers attend the event to get the latest information on beekeeping techniques, management practices, and research," said Jennifer Finley, EAS president and entomology research technician in Penn State's College of Agricultural Sciences. "Some of the top bee scientists and experts from across the United States and Canada will present workshops."

The event kicks off at 8 a.m. on July 13 with registration. The short course begins at 9 a.m., with two levels of instruction. Level I is designed for entry-level beekeepers with five or fewer colonies or years of experience. Level II, ti-

tled "Making Money with Your Bees," is aimed at more experienced intermediate beekeepers. The short course concludes at noon on July 15.

The conference begins at 1:30 p.m. on July 15 and concludes with a banquet on the evening of July 17. Workshops will focus on apitherapy (medicinal use of bee venom and related products), crop pollination by bees, bee products, and control of diseases, and parasitic mites. An open apiary session on the afternoon of July 16 will give participants a chance to visit the conference beeyard for hands-on instruction presented by Master Beekeepers.

Among the speakers for the conference and short course are Finley; Maryann Frazier, Penn State extension entomologist; Scott Camazine, Penn State associate professor of entomology; Steve Taber, queen breeder and bee geneticist from California; Theo Cherbuliez, recent president of the American Apitherapy So-

ciety; David Hackenburg, Pennsylvania's largest commercial beekeeper and president of the American Beekeeping Federation; and several USDA-ARS research scientists, including Hachiro Shimanuki and Robert Danka. Friday night's banquet speaker will be John Root, head of the A.I. Root Company, the first and oldest bee supply company in the United States. The event also will feature commercial exhibitors as well as the EAS Annual Honey and Honey Products Show.

The EAS was established in 1959 to promote honey bee culture, the education of beekeepers, and excellence in bee research. It is the largest noncommercial beekeeping organization in the United States and one of the largest in the world.

For more information on the short course and conference, contact Jennifer Finley at (814) 865-1731 or Kathy Summers at (330) 725-6677, ext. 3215.

## Liquid Dispensing Unit Available

MADISON, Wis. — Bou-Matic, a company of DEC International, Inc., has introduced Dari-Chem, a programmable liquid chemical dispensing unit designed to convert manual chemical fill pipeline and milk cooler washers to automatic chemical dispensing operation.

The Dari-Chem programmable liquid chemical dispensing unit automatically dispenses the proper amount of liquid chemical or concentrates at the precise time in the cleaning cycle, without the need to manually refill chemical jars. "The basic purpose of this product is to convert manual chemical fill, either powder or liquid, washers to automatic liquid dispensing washers," according to Bou-Matic Product Manager, John Brzezinski. By using the Dari-Chem programmable liquid chemical dispensing unit, dairy producers can reduce handling chemicals by hand, make sure the

proper concentration of chemicals is used every time at the right time, and save money by cleaning properly.

"With easy installation and programming, the Dari-Chem is a must for all dairy operators who demand simplicity, dependability and efficiency from their C.I.P. systems," Brzezinski said. The Dari-Chem can be used with all Deco-Matic cooler wash controls, as well as with Guardian I and PW-100 pipeline washers. Brzezinski said, "Three microprocessor controlled peristaltic pumps can be set to provide custom, dependable and economic wash cycles for dairy C.I.P. applications. And a manual override feature allows manual dispensing."

The Dari-Chem is microprocessor controlled for accuracy, versatility, and dependability. Replaceable PROM software for future product enhancements is included in the Dari-Chem, as well as an

LED display indicating individual pump parameters. The Dari-Chem dispensing unit must be used in conjunction with either a cooler or pipeline wash control, according to Brzezinski.

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