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New technology will provide dairy herd health and milk quality indicators from every cow at every milking

Dairy farmers face an ongoing barrage of tough questions and management decisions every day that could affect their herd and farm's future. Are my rations sufficient? Is this new bedding worth it? Are we catching cases of mastitis early? Is that cow pregnant? Am I fully minimizing antibiotic use? The list of questions never seems to end.

Real-time answers to these questions and more are now available from SomaDetect's technology platform, which will launch commercially in early 2019. SomaDetect is a sensor that can detect fat in milk and early disease symptoms.

Let's examine how the technology works. At the heart of the system is a sensor invented by Dr. Satish Deshpande, who obtained a doctorate in biophysics from the University of Guelph in 1987. Satish had been doing research and development at the company he'd started in Guelph in 1992 called SpectraDigital, developing a simple and economical light-scattering sensor that could identify agents in blood that cause diseases, such as malaria, tuberculosis and AIDS. Sensors that use light-scattering to analyze fluids already existed at the time, but their application was limited and costly. They work by directing a beam of light through a medium, which scatters when it hits small particles within. Particles of varying sizes, in various concentrations, create different scattering patterns. Satish's sensor differs in that it can

detect multiple compounds across a wide range of sizes, and is cost-effective.

Satish discovered his sensor by accident and that it could analyze milk. He'd been using milk to calibrate it, and realized he could easily determine differences in fat content. After discussing it with someone in the dairy industry, he tweaked the device so it could also detect somatic cells. A patent for somatic cell count (SCC) detection soon followed.

His entrepreneurial daughter, Dr. Bethany Deshpande, suggested they talk to dairy farmers about whether they would be interested in using a device that could provide rapid analysis of milk fat and SCC. She and her husband, Nicholas Clermont, had positive discussions with dairy farmers in New Brunswick, where they lived at the time. Bethany established SomaDetect in Fredericton in 2016 as chief executive officer, and with new team members, began analyzing sensor data using cutting-edge machine-learning algorithms. She and her team soon realized they had a platform that could instantly identify the presence and amount of every major compound in raw milk, from SCC and fat to protein, progesterone and even trace antibiotics.

SomaDetect quickly moved forward and by 2017, the system was ready for testing. The sensor is enclosed in a box that attaches to a farm's milking hose. Data collected by the sensor are analyzed by system software and presented to

farmers on a web-based platform. Farmers can instantly see the component counts for each cow and are alerted to those outside normal range or chosen from pre-set ranges. Data for individual cows and the entire herd can be tracked over time.

"Some robotic milking systems, or their add-ons, currently provide farmers with fast and direct measurements of fat, protein and SCC, but they rely on adding a reagent to milk, and those costs add up," Bethany notes. "Those who farm conventionally, receive individual measurements of milk quality indicators every six weeks, and have to rely on averaged measurements from bulk milk to make critical management decisions in the meantime. Our system provides cost-effective, instant analysis at every milking, enabling any farmer to make rapid and proactive decisions relating to disease management, reproduction and overall herd management. This means better decisions, higher profits and better animal welfare. Farmers can take the data and reduce the severity and spread of disease, minimize the use of unnecessary antibiotics, better manage reproduction, more accurately prevent contamination and maximize the quality of milk going into the bulk tank."

In terms of which milk component measurement makes the biggest difference to a dairy farmer, Bethany says that's a hard question to answer. "It depends on the specific farm's chal-

lenges and goals,” she explains. “All farms and farmers are unique. From our many discussions with hundreds of farmers, I’d say what they’re interested in most is progesterone levels for better reproduction management and also SCC, for mastitis and health management. These are critical indicators that have been hard to measure in the past.”

Bethany says it’s important for SomaDetect’s user experience to be very easy as it paves a way toward commercialization. “Farmers don’t need any more chores or extra work,” she observes. “They have so much to do, so we want to provide the maximum benefit for the least amount of work. We want farmers to be using it the same day it’s installed, and we’re there soon after.”

The SomaDetect system can identify cows through their robotic milker collar or their radio-frequency identification ear tags, and will soon offer a new type of cow identification system, Bethany adds.

Early-adopter sales of SomaDetect are available now at a reduced price, but the price after commercial launch will be C\$2,000, plus a few dollars per month per cow for software use.

RAPID DEVELOPMENTS

SomaDetect moved this year to Buffalo, New York, after its founders won a \$1 million grand prize startup contest (see sidebar for more). In April, SomaDetect began a research partnership with Cornell University to validate and further develop the technology. These new studies will supplement an on-farm pilot program SomaDetect began in June 2017, in association with Milk2020 and the New Brunswick Crop and Livestock Health and Quality Program. “It’s a very exciting time for us,” Bethany says. “We will be installing it on farms in Ontario, Atlantic Canada and Western New York for commercial, herd-level validations this fall.”

SomaDetect was also a finalist in the New Brunswick Innovation Foundation Breakthru startup competition, and winner of the Ontario Fierce Founders Bootcamp and the Ag Innovation Showcase in St. Louis, Missouri. The firm also took part in the 2018 Sprint Accelerator Cohort and the NVIDIA Inception program, which aims to nurture startups that are changing industries with artificial intelligence software. The Sprint event took place from March to June in Kansas City, and Bethany says she and her team were extremely pleased

» **DR. BETHANY** Deshpande is pictured with her father, Dr. Satish Deshpande, who invented the sensor that led to the development of SomaDetect. Bethany and her husband, Nicholas Clermont, took the technology to dairy farmers to gauge their interest in using the device on their farms, and received positive feedback.



to interact with one of the event’s corporate sponsors, Dairy Farmers of America (DFA), a co-op of more than 13,000 farmers.

“It was a fantastic opportunity,” she says. “We worked a lot on various parts of moving the business forward, and most importantly, we got to know DFA’s leadership team. They were very excited and it was great to have their encouragement and talk to them about how the technology can benefit their members and the industry as a whole. They have been very supportive and we are incredibly appreciative.”

Bioenterprise Services, a Canadian startup business accelerator, also provided SomaDetect with mentoring services and introduced the team to strategic partners. “We also helped the company prepare for investment pitches by reviewing pitch decks, hosting rehearsal sessions and offering feedback on the company’s valuation and financials,” says Rattan Gill, Bioenterprise’s agriculture and regulatory affairs analyst. Bioenterprise also funded the firm’s initial technology validation and software development activities. Gill believes SomaDetect’s technology “promises to revolutionize how farmers receive information about their herd and about the milk they produce.”

Bethany reflects that “it’s lovely to work with my dad,” who is still involved in SomaDetect and still runs SpectraDigital. “He is thrilled to see this technology commercialized and see how excited farmers are,” she says. “For me, I’ve learned so much about so many different things—how dairy farmers work and business and design engineering. Most of all, I’ve gotten to know my dad as a scientist and inventor. This means a lot to me in commercializing something very cool and very impactful.”

WINNING 2017 GRAND PRIZE

In October 2017, SomaDetect won the \$1 million grand prize in the fourth annual 43North business plan competition, beating out 15 other startups from around the world. The 43North contest is sponsored by New York, and aims to stimulate economic development through awarding cash, mentoring, tax-free benefits and incubator space to new businesses. In return, 43North gets a five per cent ownership stake, and each

business must move a substantial portion of its operation to Buffalo for at least a year. It’s a particularly good fit for SomaDetect, Bethany says, because New York is home to more than one million dairy cattle, more than in all of Canada.

SomaDetect plans to hire eight people in Buffalo later this year, ranging from engineers and developers to technicians and support staff, and could hire another 15 in 2019.