



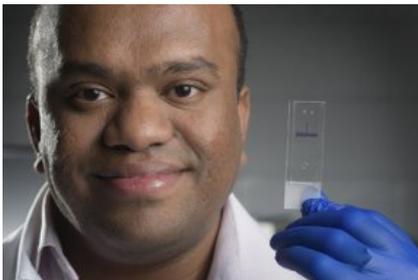
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U of G engineers develop new test for common cattle disorder

by Andrew Vowles, atGuelph | Mar 2015



Engineering professor Suresh Neethirajan and researchers in Guelph's BioNano Laboratory have developed a hand-held instrument, called a nano biosensor, as a cheaper and faster alternative to existing technology used to test cattle for subclinical ketosis. **Photo by atGuelph.**

March 20, 2015 - A new device invented by U of G researchers will help cattle farmers looking for an efficient and reliable test for a disorder that affects roughly half of newly calved cows in Canada.

Engineering professor Suresh Neethirajan and researchers in Guelph's BioNano Laboratory developed the hand-held instrument, called a nano biosensor, as a cheaper and faster alternative to existing technology used to test cattle for subclinical ketosis.

An estimated 40 to 60 per cent of newly calved cows have the condition, according to surveys done in Canada, the United States, the United Kingdom and Australia.

Testing and treating the disorder and its side effects costs more than \$13,000 per hundred head of cattle each year. Not only do farmers have to treat symptoms such as

reproductive issues, but they may also lose revenue as milk production falls.

Neethirajan says the new test gives farmers a better way to detect the disorder before cattle develop full-blown ketosis, which is more difficult and costly to treat. In ketosis, an animal lacks enough glucose for energy, so the body turns to stored fat for fuel. As the liver breaks down that fat, it produces acidic ketones. As this acid builds up within the body, it becomes poisonous to the cattle and can cause illnesses.

Ketosis often occurs in a lactating cow just after giving birth. Not only has its body become weakened, but it also has eaten less during the late stages of pregnancy and is making more milk. "Their feed intake simply does not match the amount of energy their body needs in order to be physically healthy," says Neethirajan. He says farmers and veterinarians need a more efficient and effective on-farm test for subclinical ketosis.

Current tests involve drawing vials of blood to look for beta-hydroxybutyrate (BHBA); BHBA levels rise as ketones accumulate. Those samples are sent to a lab for analysis, which Neethirajan says is expensive, labour intensive and time consuming.

As well, those tests use technology adapted from glucose tests for humans and can yield inaccurate results in cattle.

The new device, developed in collaboration with Prof. Todd Duffield, Ontario Veterinary College, allows for more accurate and rapid on-farm diagnosis of subclinical ketosis. This portable test requires only a tiny blood sample and yields results in about a minute. The instrument can pinpoint subclinical ketosis in recently calved cows that appear healthy. That allows a farmer to supplement cattle feed to avoid the major ailments, side effects and costs of full-blown ketosis. The instrument combines four aspects of technology, as follows:

- microfluidics, or tiny fluid samples measured in nanometres, or billionths of metres, rather than full vials of blood;
- biosensors for detecting tiny amounts of biological material and developed specifically for cattle fluids rather than for human use;
- quantum dot technology using optical sensors and colour filters to measure BHBA levels extremely accurately; and
- lab-on-a-chip technologies that hold the workings of a large laboratory within a portable device.

"It's exciting to see all four of these technological advances come together to help further advance farming processes," says Neethirajan.

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