UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

11 November 2024

NEWS RELEASE
How University of Pretoria led advances in diagnostic technologies are tackling cattle abortions

Dr Angelika Loots setting up a run on the xMAP machine

PRETORIA - Cattle farming is a cornerstone of global agriculture – it provides essential resources such as dairy products and meat. However, farmers face a major challenge: the occurrence of cattle abortion.

The loss of unborn calves causes significant losses in animal production. In South Africa, this loss has not been quantified, but in California, USA, for example; the cost of a lost bovine foetus amounted to US$1,900 per foetus in 2016. In Argentina in the early 2000s, the annual estimated cost was US$165 million. These losses not only impact the economic viability of farms but also raise concerns about herd health.

Several factors can contribute to the loss of the developing calf; these include infectious disease, genetic abnormalities, toxicity, and nutrition. Determining the cause of abortion in cattle is important for implementing effective preventative measures. This, however, can often be challenging with a global success rate of 30-40%.

Too often abortions are investigated without determining the actual cause. Traditional methods to diagnose cattle abortions often involve post-mortem examinations and laboratory testing such as serology or isolation/culturing of the organisms. These methods are prone to environmental contamination, are costly, and involve lengthy waiting periods.

Polymerase Chain Reaction (PCR) assays that can rapidly detect abortion-causing pathogens such as bacteria and viruses have partly overcome some of the challenges of traditional diagnostic methods. This is a laboratory technique used to provide rapid, simple, and sensitive detection of bacterial genes. These assays, however, are currently limited to testing each suspected pathogen individually.

Emerging PCR techniques such as multiplex PCR or real-time PCR, allow multiple pathogens to be detected at once. However, even these advanced methods can only identify a small number of pathogens simultaneously. This is because each target pathogen requires a unique fluorescent dye, which limits how many can be tested at once due to a limited number of available dyes.

Diagnostic advancements

Advancements that we are exploring at the University of Pretoria's Faculty of Veterinary Science, particularly with Luminex xMap technology, are opening new doors for diagnosing cattle abortions more quickly and accurately.

This cutting-edge technology tackles some major limitations of traditional diagnostic methods by using tiny magnetic beads, each dyed with two different colours. By adjusting the concentration of these dyes, the xMap machine can distinguish between up to 500 unique beads.

This is where it becomes powerful: each bead can be labelled with a molecule that detects a specific pathogen. This means scientists can load the system with beads for up to 500 different pathogens, allowing for a “multiplex” setup that tests all these at once. In just one test, xMap technology could screen for all known infectious causes of bovine abortion, delivering results quickly and efficiently.

This advancement could be a game-changer, allowing for rapid, large-scale testing that would improve disease management in cattle and help prevent outbreaks by detecting multiple pathogens simultaneously.

Thanks to funding from the Red Meat Industry Services, the Faculty of Veterinary Science at UP is exploring the capabilities of xMap technology. We are developing a multiplex system for the simultaneous detection of several abortive agents of importance in South Africa.

These include Brucella spp., Listeria spp., infectious bovine rhinotracheitis (IBR), and bovine viral diarrhoea virus (BVDV).

Latest findings

Early laboratory testing of this new approach shows promising results. In lab trials, the technology successfully detected known samples of Brucella abortus, Listeria monocytogenes, and bovine alphaherpesvirus 1 (BoHV-1) – all pathogens that can cause cattle abortions.

We have also determined the optimal conditions for attaching the labelled beads to each pathogen, a key step that ensures accurate detection.

As further validation of this method for real-world field samples continues, the potential benefits are clear: the ability to detect multiple pathogens at once not only speeds up the diagnostic process but also increases the chances of identifying the exact cause of the abortion. This advancement could lead to faster, more informed decisions, leading to quicker responses and more effective prevention strategies.

As these technologies continue to evolve and as new insights emerge from these advanced diagnostic methods, farmers can expect more efficient tools for swift and accurate identification of the causes of abortion in their herds.

Dr Angelika Loots holds a PhD in Veterinary Tropical Diseases and is a Postdoctoral Fellow at the University of Pretoria. Professor Melvyn Quan is a researcher and associate professor at the university's Department of Veterinary Tropical Diseases.

--- End ---

Media enquiries can be directed to Mr Sashlin Girraj - Public Relations & Events Manager

Email: sashlin.girraj@up.ac.za | Cell: +27(0)72 447 3784

ABOUT THE UNIVERSITY OF PRETORIA

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on its Hatfield Campus in Pretoria. This 115-year-old institution is also one of the largest producers of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only university in the country with a Faculty of Veterinary Science, which is ranked the best in Africa. UP has 120 academic departments and 92 centres and institutes, accommodating more than 56 000 students and offering about 1 100 study programmes. It has the most academic staff with PhDs (70%), NRF-rated researchers (613).

The 2024 Times Higher Education subject rankings placed UP first in South Africa in the fields of Law, Veterinary Science, Accounting and Finance; Agriculture and Forestry and Electrical and Electronic Engineering. Quacquarelli Symonds (QS) ranked the University among the top five in Africa, as part of their 2024 World University Rankings (WUR). UP was the only South African university featured in the 2023 World University Rankings for Innovation (WURI), falling within in the 101-200 range of innovative universities.

For more information, please go to www.up.ac.za