

# Animal and Bioscience Department

## Title

Development of a pen-side biosensor diagnostic device blueprint for detection of IBR in bovines

## Abstract

Pen-side diagnostics will address the need for label-free, point-of-care diagnostic technologies essential for stakeholders (veterinarians, farmers, processors) to make better informed decisions concerning the management of challenges to bovine health and welfare. This project will exploit new technology based on multiple nanowire-based electrochemical sensors fully integrated on silicon chips for use as rapid on-farm diagnostic tools. Nanowire-based sensors were selected due to their ability to directly interface with electronic circuitry. Interfacing with electronic circuitry enables real time measurement and rapid signal processing and the potential to store and transmit disease data directly to databases (e.g. ICBF) critical to AHI aims. Multiple nanowire on-chip sensors will also enable multiplexed direct detection of disease bio-marker signatures. The small nanowire array size (40 x 40mm) also has the advantage of requiring significantly reduced quantities of probe and target volumes. This project will target bovine herpesvirus-1 (BoHV-1), the causative agent of infectious bovine rhinotracheitis (IBR). Efforts will also be made to source BoHV-1 strain-specific monoclonal antibodies that will allow identification of differing IBR strains which will be of critical importance to future epidemiological studies. Initially, antibody-antigen pairings will be identified and sourced. Label-free assays will then be developed using SPR technology and transferred to nanowire chip sensors. Serum samples of known disease status will be used to initially interrogate the response. The use of additional non-invasive sample matrices, such as milk, nasal swabs, and saliva, will also be investigated. Application of this technology has potential to enable the start of pre-clinical vaccination for IBR which is critical to the prevention of whole herd infection. Such a step will minimise the length of any IBR control/eradication programme that may be initiated on farm thereby reducing the impact on farm profit. The results will aim to decrease and even prevent the occurrence of clinical diseases by early intervention, consequently limiting the use of antimicrobial drugs for therapeutic purposes, and contributing to better animal welfare and quality products that will match consumers' expectations. Such a diagnostic device would also have a critical role to play in the sourcing and isolation of IBR-free bull calves for the AI industry.

**Project Leader:** Riona Sayers

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