CRC for High Integrity Australian Pork

2A 102: *Real-time detection of airborne pathogens in the piggery*

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Aims and Objectives

To develop a robust method to quantify microbes in the air of piggeries. Monitoring the concentration of airborne microorganisms helps to improve general hygiene standards in the farm, and to detect problems in herd management or in building ventilation.

To assemble a panel of rapid assays for the detection and quantification of bacterial pathogens commonly found in pigs. These assays are integrated into a standardised air analysis protocol, in order to diagnose pathogenic agents and to control infectious risks with minimal disturbance to the animals, introduction of sampling bias, or lengthy laboratory analyses**.**

Key Findings

A cyclonic air sampler was successfully tested and validated in laboratory and in farm conditions. Up to 3 cubic meters of air can be collected in 10 minutes. Airborne particles are trapped into a small volume of liquid for laboratory analysis. The sampler gave consistent results with varied operating settings.

The counts of bacterial colonies accurately reflected the concentration of airborne bacteria and correlated well with animal densities. In normal farm conditions, the ambient microbial load ranged between 10 and 100 organisms per litre of air.

Four quantitative Real time PCR (qPCR) assays were validated for the detection of Entero-toxinogenic *E. coli* (ETEC), and a unique, two-step qPCR assay was designed for the detection of *Actinobacillus pleuropneumoniae* (APP). Three conventional PCR assays for the detection of *Streptococcus suis*, *Haemophilus parasuis* and *Mycoplasma hyopneumoniae* are also under validation.

The lowest limits of detection for the qPCR assays was estimated at 10 organisms for APP, and 200-1000 organisms for ETEC.

Farm air samples were found to contain ETEC and APP close to the limit of detection by qPCR, in the absence of overt clinical signs.

Application to Industry

The data recorded from regular monitoring of ambient microbial loads in the farm can be integrated into genetic selection schemes to increase the resilience of pigs in adverse microbial conditions, and to manage infectious risks by improving the general hygiene of piggeries. The analysis requires conventional microbiology to count total colonies on agar plates, which can be automated. Targets values can be set for each farm area and deviations from the normal titres can be detected rapidly (24 - 48 hours).

Specific pathogens can be detected at low levels in the farm environment. The sample can be frozen and analysed without culture by PCR or qPCR, or processed fresh for isolation and identification of live pathogens and antimicrobial susceptibility testing. The quantitative detection of pathogens by qPCR can be completed in 24 - 72 hours and can help to differentiate true outbreaks from background endemic infections.