

Detection of Bovine Respiratory Syncytial Virus Using Commercial Human Respiratory Syncytial Virus Rapid Immunomigration Assays

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Introduction

Bovine respiratory syncytial virus (BRSV) causes a severe interstitial pneumonia primarily in calves from birth to 12 months of age, and is a significant component of the bovine respiratory disease complex. Current detection of BRSV is performed by laboratory-based methods including direct and indirect immunofluorescence, real time-polymerase chain reaction (RT-PCR), or enzyme-linked immunosorbent assay (ELISA). The development of a rapid patient-side BRSV detection assay would facilitate timely disease diagnosis and the institution of appropriate therapeutic and control plans. Rapid immunomigration assays are readily available for the detection of human respiratory syncytial virus (HRSV). BRSV and HRSV share significant genetic and antigenic homology. Taking advantage of this homology, this study investigated the use of commercially available HRSV immune migration assays to detect BRSV.

Materials and Methods

This study was divided into three phases. Phase One: as an initial proof of concept, two commercially available HRSV assays were evaluated for their ability to detect a laboratory strain of BRSV (Strain A51908, ATCC vr794) at different concentrations. Virus was serially diluted from 10^2 to 10^5 TCID₅₀ and then tested in triplicate in both of the following assays; TRU RSV[®] (Meridian Biosciences Inc., Cincinnati, OH) and Clearview[®] RSV (Inverness Medical Innovations Inc., Waltham MA). Phase Two: to determine if the assays could detect different strains of BRSV, nine characterized cell culture strains of BRSV were obtained and tested in each of the assays. Phase Three: nasal and lung swabs from cattle with clinical signs of respiratory disease were tested with the assays. In every phase of the project, RT-PCR

was performed on all BRSV samples and served as the "gold standard" for comparison.

Results

Phase One: BRSV was detected by each of the assays at a virus concentration ranging from 10^2 to 10^5 CCID₅₀. These concentrations are in the range of virus that is expected to be found in nasal secretions in cattle clinically infected with BRSV. Phase Two: both the TRU RSV[®], and Clearview[®] RSV were able to detect the nine different BRSV isolates tested. Phase Three: 30 nasal or lung swabs were tested in each of the assays, and compared to results obtained by RT-PCR. RT-PCR identified five samples positive for BRSV. The TRU RSV[®] assay was in agreement on 26 of the 30 samples ($k=0.56$), while the Clearview[®] RSV was in agreement for only 25 of the samples ($k=0.44$).

Significance

Rapid immune migration assays designed to detect HRSV and tested in this study are capable of detecting BRSV at concentrations consistent with nasal shedding in clinically infected cattle. Both assays were able to detect multiple different isolates of BRSV. When clinical samples were tested, the TRU RSV[®] assay performed better; however, correlation with results obtained from RT-PCR was not high. This may be due to low levels of virus in nasal swabs or interference of bovine nasal swab matrix with the assay. The ability to rapidly detect BRSV patient-side would facilitate timely disease diagnosis and the institution of appropriate therapies and control plans. Further development of the assay using bovine samples is necessary to make either assay useful as a patient-side test for cattle.