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Equine respiratory viruses in New Zealand

A thesis presented in partial fulfillment of the requirements for the degree Of Masters of Veterinary Studies In Virology At Massey University, Turitea, Palmerston North New Zealand

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Abstract

Equine respiratory disease has been recognised as an important cause of wastage resulting in financial loss for the equine industry worldwide. Limited studies have been conducted on equine respiratory viruses in New Zealand, particularly within the past ten years. As such, the objective of the present study was to determine 1) which respiratory viruses circulate among horses from selected New Zealand locations and 2) whether or not infection with any of the viruses identified was associated with clinical disease. A survey was conducted on 85 horses to detect the presence of viruses known to be associated with equine respiratory disease. Nasal swabs were taken from 52 horses with signs of respiratory disease and from 33 healthy horses. Horses were sampled from within the Manawatu and Hawkes Bay regions by convenience.

Species specific PCR was performed directly on nasal swabs. The only viruses detected were equine herpesviruses (EHV) types 1, 2, 4 and 5. Of the 52 horses with respiratory disease, 3 tested positive for EHV-1, 14 for EHV-4, 23 for EHV-2 and 26 tested positive for EHV-5. Of the 33 healthy horses 2 tested positive for EHV-2, one of which also tested positive for EHV-5. Over all, the detection of herpesviruses was significantly associated with respiratory disease (p value <0.0001). Detection of individual virus species (EHV-2, EHV-4 or EHV-5) was also significantly associated with respiratory disease (p value 0.0002, 0.0006, <0.0001, respectively). The sample size was not large enough to evaluate the significance of EHV-1 detection and respiratory disease.

Virus isolation performed on the samples from the 52 horses with respiratory disease detected EHV types 1, 2, 4 and 5. No viruses were detected from the 33 samples of healthy horses. There was poor correlation between virus isolation and PCR results, particularly with regard to EHV-4.

This work gives a recent contribution to the knowledge of equine respiratory viruses in New Zealand. Although the sampling was performed by convenience, the results suggest an association between equine herpesviruses types 2, 4 and 5 and equine respiratory disease.
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**Abbreviations**

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>7TMR</td>
<td>Seven trans-membrane receptor</td>
</tr>
<tr>
<td>Ab</td>
<td>Antibody</td>
</tr>
<tr>
<td>bp</td>
<td>Base pair</td>
</tr>
<tr>
<td>CF</td>
<td>Complement fixation</td>
</tr>
<tr>
<td>CFU</td>
<td>Colony forming units</td>
</tr>
<tr>
<td>CPE</td>
<td>Cytopathic effect</td>
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<tr>
<td>CTL</td>
<td>Cytotoxic T-lymphocyte</td>
</tr>
<tr>
<td>DIG</td>
<td>Digoxigenin</td>
</tr>
<tr>
<td>DMEM</td>
<td>Dulbecco’s modified eagle medium</td>
</tr>
<tr>
<td>DNTPs</td>
<td>Deoxynucleoside-5’ –triphosphate</td>
</tr>
<tr>
<td>EAdV</td>
<td>Equine Adenovirus</td>
</tr>
<tr>
<td>EAV</td>
<td>Equine arteritis virus</td>
</tr>
<tr>
<td>EDTA</td>
<td>Ethylenediamine tetra-acetic acid</td>
</tr>
<tr>
<td>EFK</td>
<td>Equine fetal kidney (cells)</td>
</tr>
<tr>
<td>EHV</td>
<td>Equine herpesvirus</td>
</tr>
<tr>
<td>ELISA</td>
<td>Enzyme linked immunosorbent assay</td>
</tr>
<tr>
<td>EM</td>
<td>Electron microscope</td>
</tr>
<tr>
<td>ERAV</td>
<td>Equine rhinitis A-virus</td>
</tr>
<tr>
<td>ERBV</td>
<td>Equine rhinitis B-virus</td>
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<tr>
<td>EtBr</td>
<td>Ethidium bromide</td>
</tr>
<tr>
<td>FBS</td>
<td>Fetal bovine serum</td>
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<td>FMDV</td>
<td>Foot and mouth disease virus</td>
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<tr>
<td>Abbreviation</td>
<td>Full Form</td>
</tr>
<tr>
<td>--------------</td>
<td>-----------</td>
</tr>
<tr>
<td>gB</td>
<td>Glycoprotein B</td>
</tr>
<tr>
<td>GM</td>
<td>Growth medium</td>
</tr>
<tr>
<td>IAD</td>
<td>Inflammatory airway disease</td>
</tr>
<tr>
<td>Ig</td>
<td>Immunoglobulin</td>
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<tr>
<td>IL</td>
<td>Interleukin</td>
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<td>INF</td>
<td>Interferon</td>
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<tr>
<td>LRT</td>
<td>Lower respiratory tract</td>
</tr>
<tr>
<td>MHC</td>
<td>Major histocompatibility complex</td>
</tr>
<tr>
<td>MM</td>
<td>Maintenance media</td>
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<tr>
<td>ORF</td>
<td>Open reading frame</td>
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<tr>
<td>PBMC</td>
<td>Peripheral blood mononuclear cells</td>
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<td>PCR</td>
<td>Polymerase chain reaction</td>
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<td>RK-13</td>
<td>Rabbit kidney -13 (cells)</td>
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<td>RT-PCR</td>
<td>Reverse transcriptase -PCR</td>
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<tr>
<td>SDS</td>
<td>Sodium dodecyl sulphate</td>
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<tr>
<td>VERO</td>
<td>African green monkey (cells)</td>
</tr>
<tr>
<td>VN</td>
<td>Virus neutralization</td>
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