

Biophysical characterisation of the coronavirus nucleoprotein

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Introduction

Coronaviruses are a group of positive strand RNA viruses which can cause severe respiratory disease and gastrointestinal illnesses in both humans and animals. Principal amongst these viruses are severe acute respiratory syndrome coronavirus (SARS-CoV) and avian infectious bronchitis virus (IBV). During virus replication, a variety of proteins are synthesised including the viral RNA binding protein, nucleoprotein (N protein), a multi-functional protein with roles in both the virus life cycle and modulating host cell function. One of the key functions of N protein is to bind viral RNA and selectively incorporate this into virus particles. Using a combination of mass spectrometry coupled with surface plasmon resonance we have shown that phosphorylation of N protein plays a key role in the modulation and specificity of RNA binding. Indeed, we were the first group to fine map the positions of phosphates on the coronavirus N protein. These phosphates clustered in two groups to regions of the protein predicted to be involved in RNA binding and cell signalling. Using bioinformatic analysis (Fig. 1), in conjunction with circular dichroism and NMR we are currently investigating whether RNA binding affects the structure of N protein and to fine map the viral RNA binding domain(s).

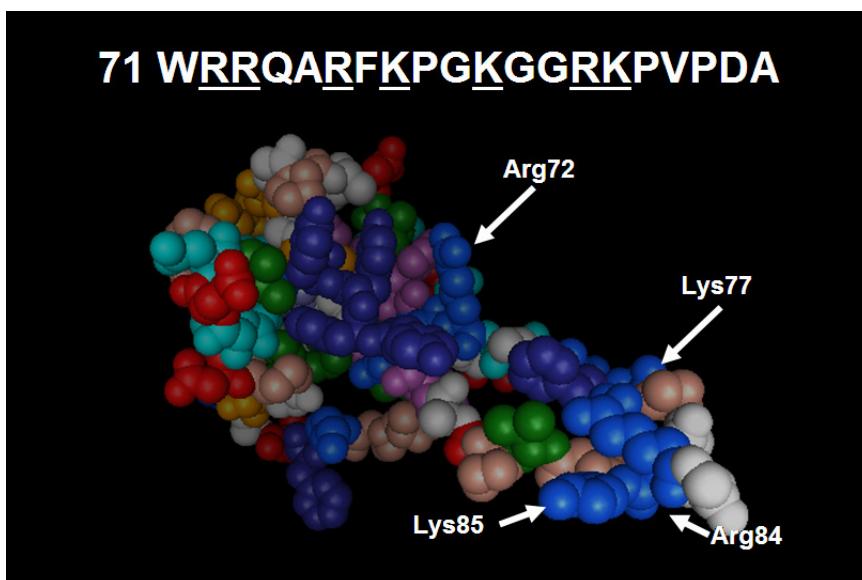


Fig. 1. Predicted structure of the N-terminal region of IBV N protein. Residues thought to be involved in RNA binding are highlighted.

Publications

Chen, H., Gill, A., Dove, B. K., Emmett, S.R., Ritchie, M.A. and. Hiscox, J.A. (2005) Mass spectroscopic characterization of the coronavirus infectious bronchitis virus nucleoprotein and elucidation of the role of phosphorylation in RNA binding using surface plasmon resonance. *Journal of Virology*. **79**, 1164-1179.

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