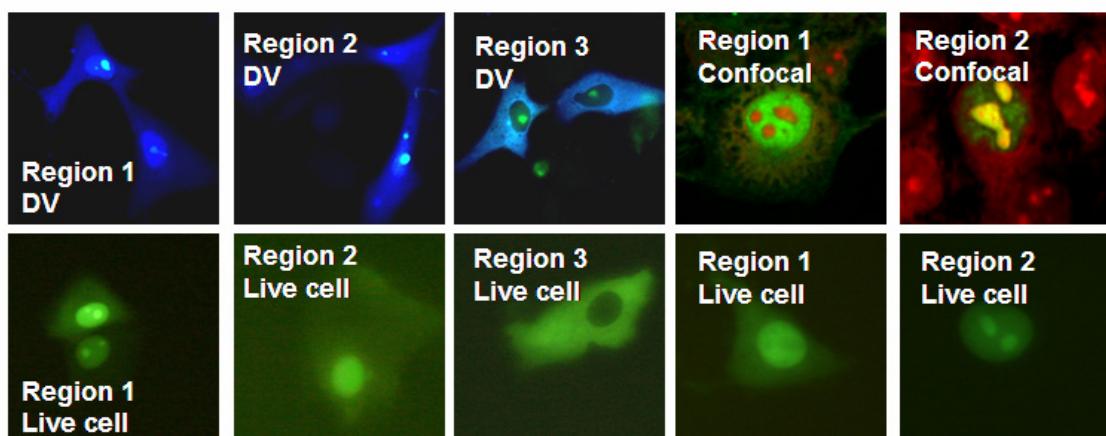


# Cellular characterisation of the coronavirus nucleoprotein - delineating cell cycle control and nucleolar targeting

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## Introduction

The nucleolus is a dynamic sub-nuclear structure involved in ribosome subunit biogenesis and cell cycle control. The specific mechanism by which proteins localise to the nucleolus and regulate the cell cycle is unknown. We have been using viral proteins as model systems to investigate the signalling involved in such pathways, specifically focusing on the coronavirus nucleoprotein (N protein). 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, N protein, a multi-functional protein with roles in both the virus life cycle and modulating host cell function. Using a combination of deletion and site specific mutagenesis we have identified potential nuclear localisation and nucleolar retention signals in the coronavirus N protein (Fig. 1). Our data also indicates that the cell cycle is perturbed in virus infected cells and that p53 is redistributed from the nucleus/nucleolus to the cytoplasm. This underlines current thinking that the nucleolus acts as a cellular stress sensor through the action of p53.



**Fig. 1.** Both confocal imaging (top row) and live cell microscopy are used to study the sub-cellular localisation of N protein. In this case N protein is either tagged with ECFP or EGFP. Confocal microscopy is particularly powerful as the localisation of multiple tagged proteins can be studied simultaneously.

## Publications

Emmett, S.R., Dove, B.K., Mahoney, L., Wurm, T. and Hiscox, J.A. (2004) The cell cycle and virus infection. *Methods in Molecular Biology*. **296**, 197-218.

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