CARS AND TWO-PHOTON IMAGING OF HOST-VIRUS INTERACTIONS

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The use of light microscopy in the study of virus life cycles concentrates on imaging the interactions between the virus and its host cell. All viruses appropriate the machinery of the host cell for their own replication, causing observable changes in cell shape and structure. Confocal microscopy is an established technique for this type of imaging [1], however the addition of exogenous labels can disrupt the cell functions being studied and often limits the technique to fixed samples. In contrast, coherent anti-Stokes Raman scattering (CARS) microscopy enables non-invasive intracellular imaging of living cells without the need for labelling [2].

We report a technique to study the effects of viral infection on host cell morphology and lipid droplet distribution. We apply this to study fibroblast cells infected by cytomegalovirus. The virus is genetically modified to cause expression of the green fluorescent protein in the host cell upon infection. Using a microscope platform which combines multiple imaging modalities [3] we can record CARS and two-photon images of the same living cell. The CARS image shows the cell morphology and lipid droplet distribution, whilst the two-photon image confirms the infection state of the cell and reveals the extent of viral protein expression (Figure 1). This method has potential further applications in the study of various viruses, especially those which modulate host cell lipid metabolism, such as hepatitis C [1].

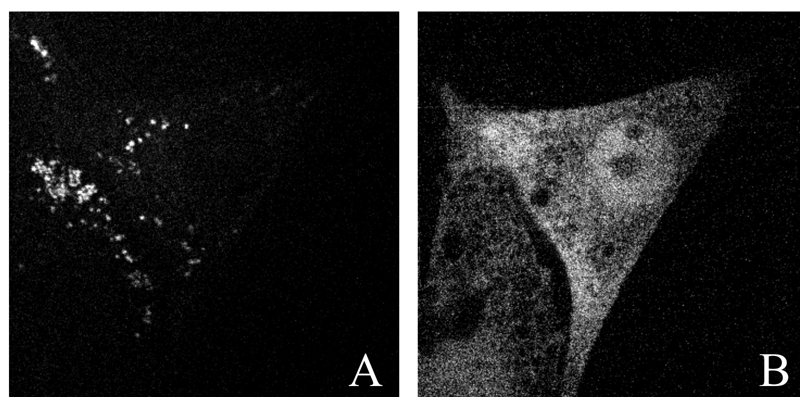

Figure 1: CARS (A) and two-photon (B) images of live infected fibroblast cells

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