3D Imaging of Virus Infection in Solvent-Cleared Organs

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The visualization of infection events in tissues and organs using immunolabeling is a key method of modern infection biology. The ability to observe and study the distribution, tropism, and abundance of pathogens inside of organ samples provides pivotal data on disease development and progression. Until recently, immunolabeling was mostly restricted to thin sections of paraffin-embedded or frozen samples. Because of the limited 2D image plane provided by thin sections, crucial information on the complex structure of respective organs and the surrounding cellular context of the infection environment is lost. Consequently, distinct assertions on topics like infiltration of cells to the site of infection or directed virus spread can prove difficult. The introduction of a new tissue-clearing technique and its successor uDISCO as well as the implementation of an applicable immunostaining protocol now provide an efficient tool to study high-volume image stacks of infected organs. Here, we applied uDISCO to both brain and lung tissue samples from animals infected with rabies virus and swine influenza virus, respectively. Confocal laser scanning microscopy enabled us to obtain high-resolution image stacks of organ slices as thick as 1 mm in order to gain further insights into the infection environment of respective target tissues.

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