

Visualization of autophagy-mediated uncoating process of Dengue virus in live cells at single-virus level

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Visualizing and quantifying the molecular mechanisms of complex biological processes such as virus infection in living cells become important issues in biomedical studies. Following the fate of individual virus particles using a single-virus tracking (SVT) technology allows us to probe dynamic interactions between virus and cellular factors, and to dissect the steps of the infectious process. Dengue virus (DENV) is one of most significant human viral pathogens globally, especially in tropical areas. Unfortunately, effective anti-Dengue drugs to treat patients are not in sight. Their development requires more detail insights into DENV-host interactions during infections. By tracking a single fluorescence-labeled DENV particle in a living cell, we recently

elucidated a novel autophagy-mediated intracellular transportation of DENV. In addition, we further dissected the uncoating process of DENV by visualizing various steps of uncoating including the acidification of virus-containing vesicle and the membrane fusion between viral envelop and membrane of transport vesicle. Real-time single-virus particle tracking assay showed that the intensity of pHrodo Red-labeled DENV elevated when DENV particle was co-localized with autophagosome, suggesting that DENV-containing autophagosome undergo acidification. FRET imaging of DENV particles also revealed that DENV particles located within autophagosomes undergo membrane fusion. Taken together, we not only uncovered new insights into DENV infection process, but also provided invaluable feedback to the development of the novel biophotonics approaches.

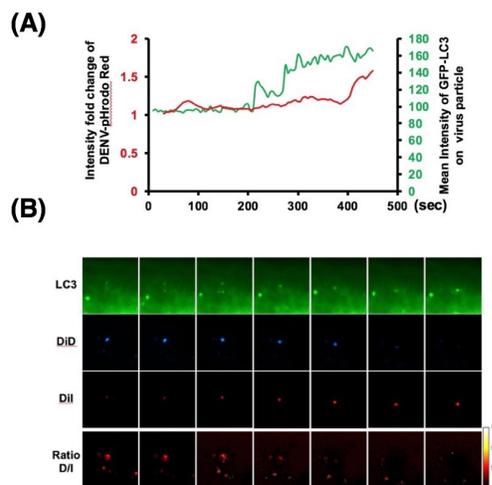


Figure. (A) The dynamic change of fluorescence intensities of pHrodo Red-labeled DENV particle occurred within GFP-LC3 labeled autophagosome. (B) FRET imaging of single-virus particle indicated the membrane fusion of DENV with transport vesicle in a living cell.

Reference:

L.-W. Chu, Y.-L. Huang, J.-H. Lee, L.-Y. Huang, W.-J. Chen, Y.-H. Lin, J.-Y. Chen, R. Xiang, C.-H. Lee, and Y.-H. Ping, "A single-virus tracking approach to reveal the interaction of Dengue virus with autophagy during the early stage of infection," *Journal of Biomedical Optics* 19, 011018 (2014).