O-14

Intranuclear Movement of Viruses through the Chromatin Network

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Various DNA viruses such as parvoviruses, herpesviruses and baculoviruses elicit the formation of large nuclear replication compartments alongside with host chromatin marginalization. Newly assembled nucleocapsids travel through the nucleoplasm and chromatin to egress at the nuclear envelope. Parvoviruses and herpesviruses rely on passive diffusion for intranuclear movement, whereas baculoviruses are actively transported in an actin-dependent manner. We have analyzed nuclear dynamics and interactions of viral capsids by employing an interdisciplinary approach, which combines biology and biophysics with state-of-the-art techniques of imaging, advanced image analysis, and biophysical modelling. Our studies with canine parvovirus showed that viral capsids diffuse rapidly within the replication compartment and accumulate close to the nuclear envelope. Herpesvirus studies showed that compacted host chromatin restricts nucleocapsid diffusion. However, herpesvirus capsids are able to reach the nuclear envelope due to interchromatin channels. Numerical modelling of baculovirus particles in a reconstruction of an infected cell nucleus demonstrated that although a significant part of the nucleocapsids become trapped in dense chromatin network, a portion of them is able to navigate through the chromatin when propelled by actin comet tails.

Publications:

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