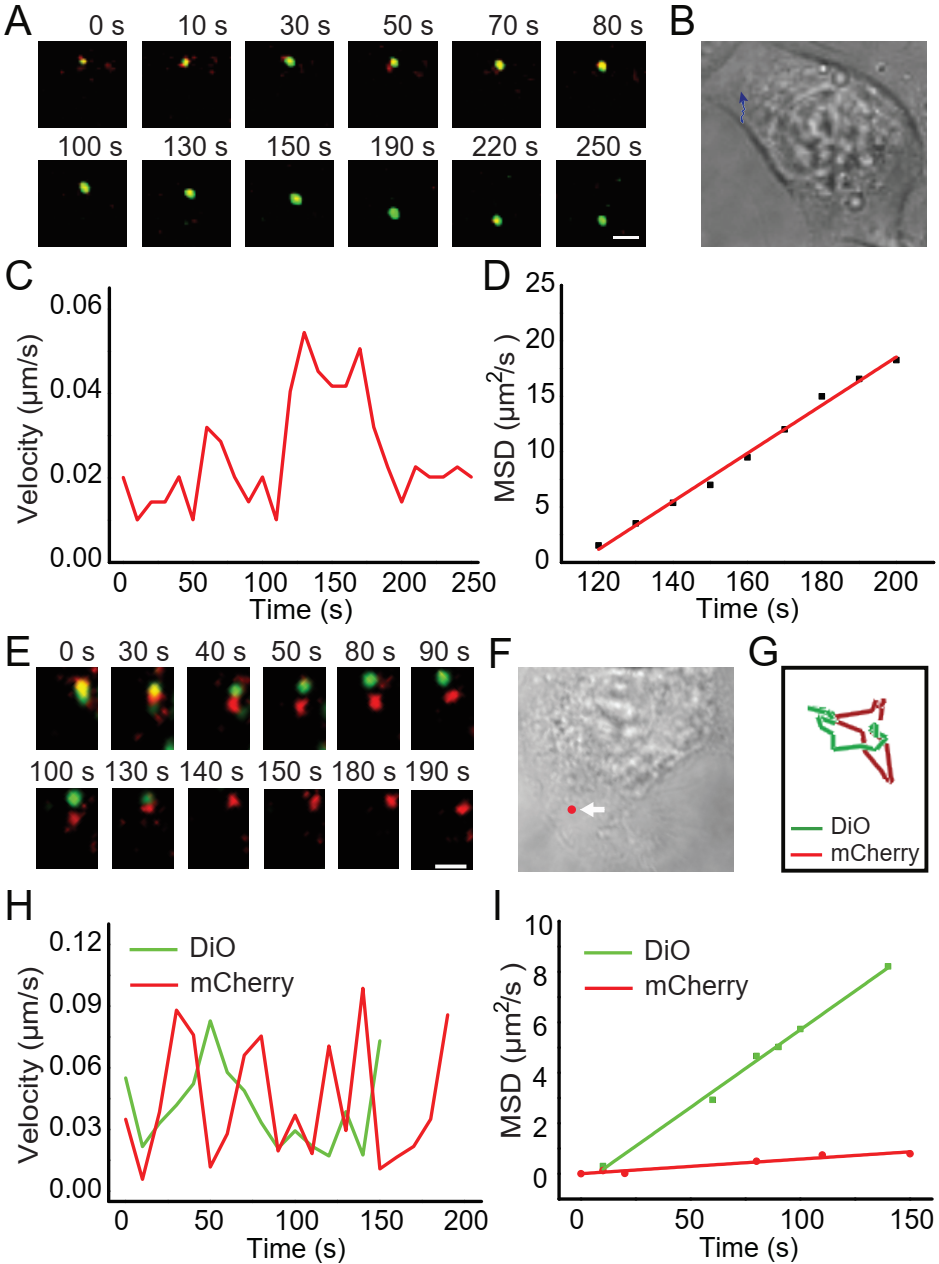


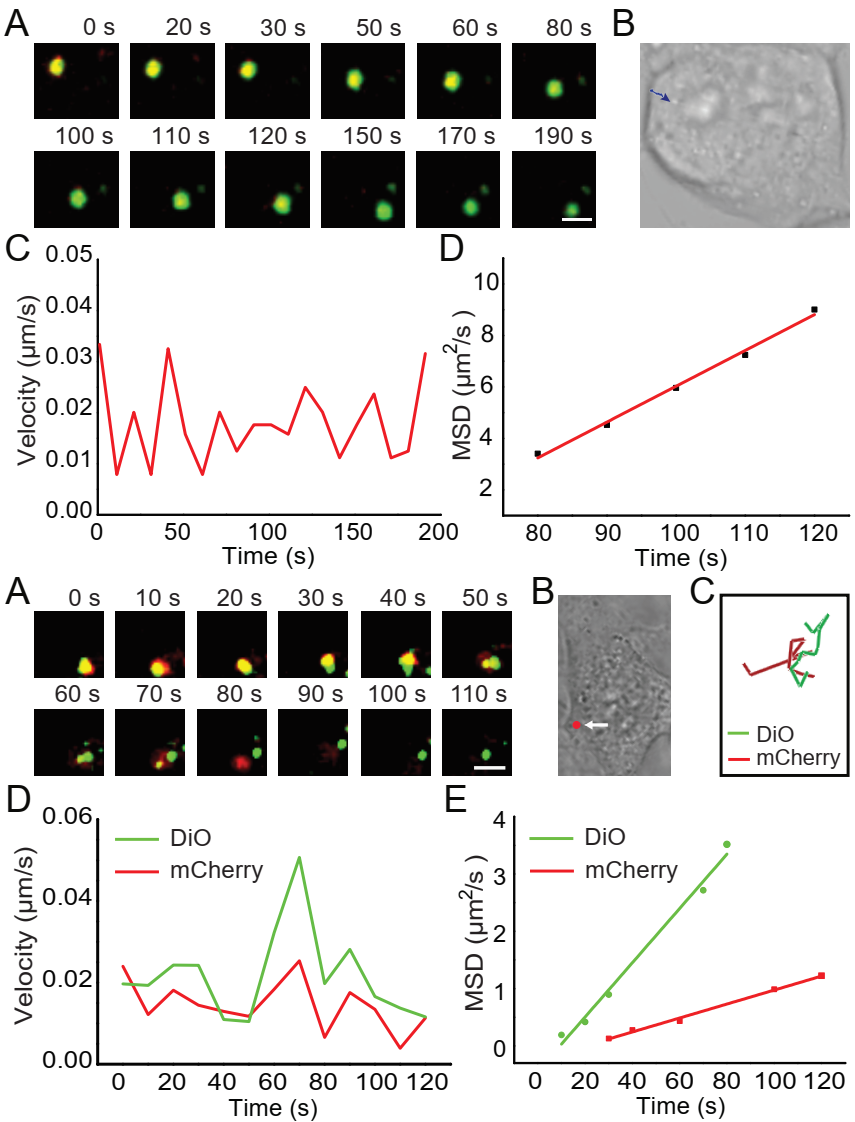
**Supplementary Figure 1.** Co-localization of mCherry fluorescent proteins and anti-p24 antibody (FITC) signals in pseudo-SARS-CoV-2. Co-localization of anti-S antibody (TRITC) and anti-p24 antibody (FITC) signals in pseudo-SARS-CoV-2. Co-localization of anti-p24 antibody (TRITC) and DiO signals in pseudo-SARS-CoV-2. The insert (right) is a zoomed view of the co-localized dots (Scale bar: 2 µm).



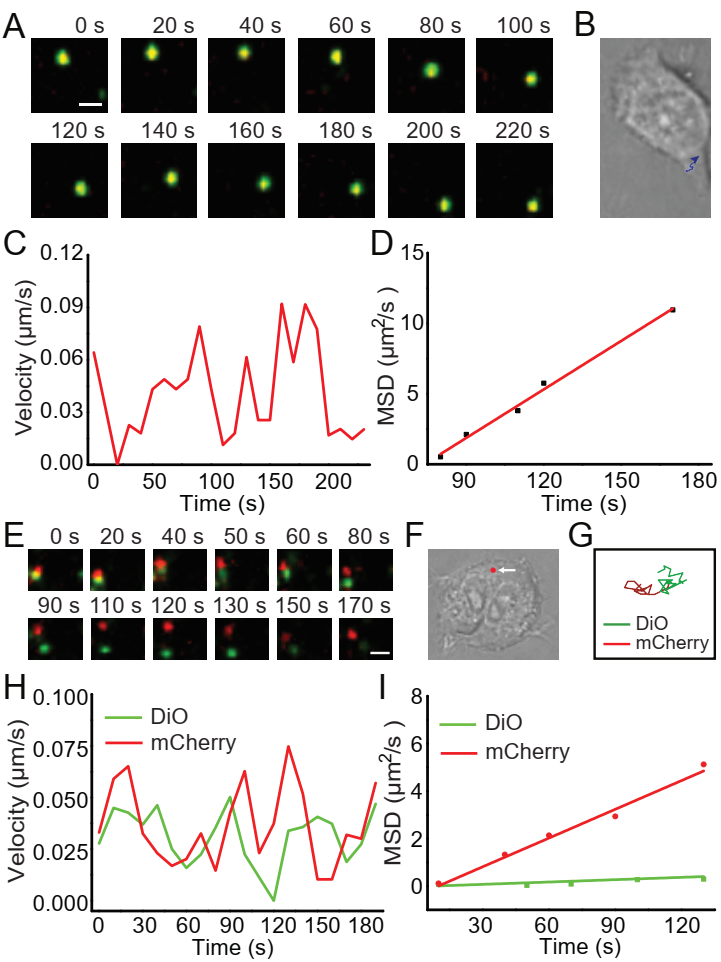
**Supplementary Figure 2.** (A) Sequential snapshots of the entry of the VSV-G pseudotyped virus into the HNEpC cell (Scale bar: 1 µm). (B) DIC image of the host cell. The blue line shows the trajectory of the virus. (C-D) Analysis of mean velocity (C) and MSD plot (D) of the virus particle shown in (A). (E) Sequential images of the separation of mCherry-Vpr and DiO of VSV-G pseudotyped virus in an HNEpC cell (Scale bar: 1 µm). (F) DIC image of the host cell. The red spot indicates the separation site. (G-I) Trajectories (G), mean velocities (H), and MSD plots (I) of mCherry-Vpr and DiO.



**Supplementary Figure 3.** (A) Sequential snapshots of the entry of the VSV-G pseudotyped virus into an HPAEpiC cell (Scale bar: 1 µm). (B) DIC image of the host cell. The blue line shows the trajectory of the virus. (C-D) Analysis of mean velocity (C) and MSD plot (D) of the virus particle shown in (A). (E) Sequential images of the separation of mCherry-Vpr and DiO of VSV-G pseudotyped virus in an HPAEpiC cell (Scale bar: 1 µm). (F) DIC image of the host cell. The red spot indicates the separation site. (G-I) Trajectories (G), mean velocities (H), and MSD plots (I) of mCherry-Vpr and DiO.



**Supplementary Figure 4.** (A) Sequential snapshots of the entry of the VSV-G pseudotyped virus into a BEP-2D cell (Scale bar: 1 µm). (B) DIC image of the host cell. The blue line shows the trajectory of the virus. (C-D) Analysis of mean velocity (C) and MSD plot (D) of the virus particle shown in (A). (E) Sequential images of the separation of mCherry-Vpr and DiO of VSV-G pseudotyped virus in a BEP-2D cell (Scale bar: 1 µm). (F) DIC image of the host cell. The red spot indicates the separation site. (G-I) Trajectories (G), mean velocities (H), and MSD plots (I) of mCherry-Vpr and DiO.



**Supplementary Figure 5.** (A) Sequential snapshots of the entry of the VSV-G pseudotyped virus into a HOEC cell (Scale bar: 1 µm). (B) DIC image of the host cell. The blue line shows the trajectory of the virus. (C-D) Analysis of mean velocity (C) and MSD plot (D) of the virus particle shown in (A). (E) Sequential images of the separation of mCherry-Vpr and DiO of the VSV-G pseudotyped virus in a HOEC cell (Scale bar: 1 µm). (F) DIC image of the host cell. The red spot indicates the separation site. (G-I) Trajectories (G), mean velocities (H), and MSD plots (I) of mCherry-Vpr and DiO.

**Supplementary Movie 1.** Dynamic tracking of the endocytic entry of pseudo-SARS-CoV-2 into the HNEpC cells.

**Supplementary Movie 2.** Dynamic tracking of the viral core of pseudo-SARS-CoV-2 release from the envelope membrane in HNEpC cells.

**Supplementary Movie 3.** Dynamic tracking of the endocytic entry of pseudo-SARS-CoV-2 into the HPAEpiC cells.

**Supplementary Movie 4.** Dynamic tracking of the viral core of pseudo-SARS-CoV-2 release from the envelope membrane in HPAEpiC cells.

**Supplementary Movie 5.** Dynamic tracking of the endocytic entry of pseudo-SARS-CoV-2 into the BEP-2D cells.

**Supplementary Movie 6.** Dynamic tracking of the viral core of pseudo-SARS-CoV-2 release from the envelope membrane in BEP-2D cells.

**Supplementary Movie 7.** Dynamic tracking of the endocytic entry of pseudo-SARS-CoV-2 into the HOEC cells.

**Supplementary Movie 8.** Dynamic tracking of the viral core of pseudo-SARS-CoV-2 release from the envelope membrane in HOEC cells.

**Supplementary Movie 9.** Dynamic tracking of the endocytic entry of VSV-G pseudovirions into the HNEpC cells.

**Supplementary Movie 10.** Dynamic tracking of the viral core of VSV-G pseudovirions release from the envelope membrane in HNEpC cells.

**Supplementary Movie 11.** Dynamic tracking of the endocytic entry of VSV-G pseudovirions into the HPAEpiC cells.

**Supplementary Movie 12.** Dynamic tracking of the viral core of VSV-G pseudovirions release from the envelope membrane in HPAEpiC cells.

**Supplementary Movie 13.** Dynamic tracking of the endocytic entry of VSV-G pseudovirions into the BEP-2D cells.

**Supplementary Movie 14.** Dynamic tracking of the viral core of VSV-G pseudovirions release from the envelope membrane in BEP-2D cells.

**Supplementary Movie 15.** Dynamic tracking of the endocytic entry of VSV-G pseudovirions into the HOEC cells.

**Supplementary Movie 16.** Dynamic tracking of the viral core of VSV-G pseudovirions release from the envelope membrane in HOEC cells.