The Global Phosphorylation Landscape of SARS-CoV-2 Infection

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M. Bouhaddou et al., June 2020
The causative agent of the coronavirus disease 2019 (COVID-19) pandemic, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has infected millions and killed hundreds of thousands of people worldwide, highlighting an urgent need to develop antiviral therapies. Here we present a quantitative mass spectrometry-based phosphoproteomics survey of SARS-CoV-2 infection in Vero E6 cells, revealing dramatic rewiring of phosphorylation on host and viral proteins. SARS-CoV-2 infection promoted casein kinase II (CK2) and p38 MAPK activation, production of diverse cytokines, and shutdown of mitotic kinases, resulting in cell cycle arrest. Infection also stimulated a marked induction of CK2-containing filopodial protrusions possessing budding viral particles. Eighty-seven drugs and compounds were identified by mapping global phosphorylation profiles to dysregulated kinases and pathways. We found pharmacologic inhibition of the p38, CK2, CDK, AXL, and PIKFYVE kinases to possess antiviral efficacy, representing potential COVID-19 therapies.

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