Medical Xpress

Human genomic pathways to bronchitis virus therapy

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Viral replication and spread throughout a host organism employs many proteins, but the process is not very well understood. Scientists at A*STAR have led a collaborative study to learn which host factors play a key role in viral replication. The aim was to identify host pathways and processes that operate at various stages of infection by a bronchitis virus

that could be targeted to fight viruses.

Led by Frederic Bard at the A*STAR Institute of Molecular and Cell Biology, the researchers infected human lung cancer cells with a special bronchitis virus that causes the cell to glow when it replicates. The bronchitis virus belongs to a family, known as coronaviruses, which represent a significant threat to public health: they cause diseases such as severe acute respiratory syndrome (SARS), Middle East respiratory system (MERS), as well as the common cold.

The method by which a virus can infect cells and replicate requires multiple steps. The first step is for the virus to bind to receptors on the host cell membrane, which then folds to enclose the virus in a process called endocytosis. Next the virus is uncoated so that its genome can enter the host cell cytoplasm to allow for host factors to create viral proteins. Finally the viral particles are generated and secreted from the host cell to allow for viral spread.

To determine which factors in the host cell are required for viral replication the researchers systematically knocked down the expression of more than 21,000 human genes in the cells. They identified 83 factors in eight different host cellular compartments that are recruited by the virus.

The pertinent pathways include ones that play a role in the movement of vesicles from one part of the cell to another, that splice immature RNAs into more mature forms, and that degrade or refold proteins.

One protein identified by the researchers is called valosin-containing protein (VCP), which they were surprised to find plays a powerful role in viral replication. To determine which part of viral replication it regulates, they looked at which stage the viral assembly got stuck.

They found that knocking down VCP still permitted viral entry into the cell, but caused viruses to get stuck in vesicle structures called early endosomes, rendering the viral genome unable to move into the cytoplasm. "Blocking viruses in endosomes could help the cells to degrade them more effectively and the body to get rid of them without much toxicity," explains Bard.

More information: Hui Hui Wong et al. Genome-Wide Screen Reveals Valosin-Containing Protein Requirement for Coronavirus Exit from Endosomes, *Journal of Virology* (2015). DOI: 10.1128/JVI.01360-15

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