

### How the Novel Coronavirus Replicates

The novel coronavirus (SARS-CoV-2) can be personified as having an ‘agenda’ of replicating itself. That process entails three phases: attachment; eclipse period (penetration, uncoating, replication of ‘building blocks’, assembly/maturation); and release of potentially thousands of new virions.

#### Attachment

A key step in virus replication is its binding to the host cell. The virion has protein spikes projecting from its surface\* that connect to structures called ‘receptors’ on the cells lining the mucous membranes of the upper and lower respiratory areas.

#### Eclipse Period

##### Penetration

After attaching, the coronavirus is enveloped inwards by the host’s cell membrane wrapping around it, creating a ‘bubble’ called an endosome that essentially hides it from the body’s immune system.

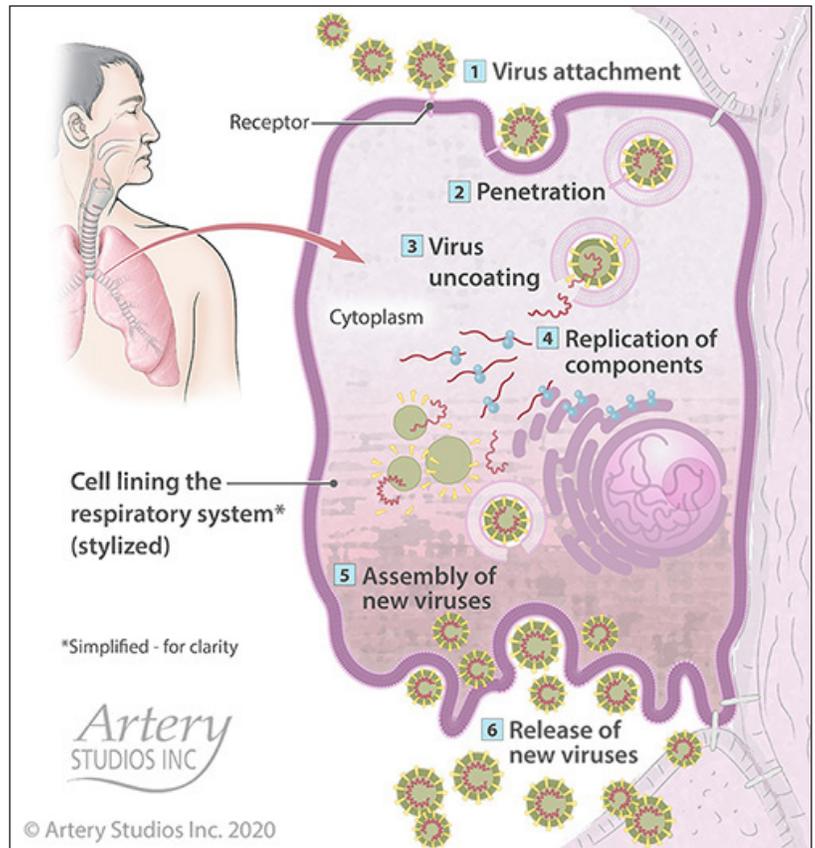
##### Virus uncoating

After it gets inside, the viral membrane breaks down and the virion’s snippet of genetic material (composed of RNA – called the genome) is released into the cytoplasm for it to start its work.

##### Replication of components

The infected host cell begins to ‘read’ the short strand of RNA, which acts as a blueprint to create new copies of genetic material and other structures that compose the virus. The cellular machinery produces the parts needed to eventually make new virus particles, including:

- Nucleocapsid proteins that encapsulate the RNA genome
- Glycoproteins that control assembly, release, and infectivity of the new viruses being created
- Proteins that give the virus its characteristic shape and structure including the spikes (or ‘jewels’) on the surface\*



##### Assembly of new viruses

The different viral proteins and newly-minted genetic pieces are then assembled or matured in organelles within the cytoplasm of the cell.

##### Release of Viruses

The new viruses migrate toward the perimeter of the cell and are released. This intricate replication process can trick the host cell into creating thousands of new virions, which proceed to infect other healthy cells. And onwards the cycle goes until, ideally, the immune system can fight back, or medical treatments can break the pattern of replication, allowing the body to heal itself.

*\*See Number 20.1 (first article of this series) for details of novel coronavirus anatomy.*

**Stephen Mader**, BSc, BSCAAM, MSCBMC, CMI, FAMI, is the President of Artery Studios Inc. and a Certified Medical Illustrator. **Kimberly Chin**, BSc(Hon), MSCBMC, is a Senior Medical Illustrator at Artery Studios.