

The Biology of SARS-CoV-2 Infection and COVID-19

A virus is composed primarily of genetic material, either DNA or RNA, encased in a protein “shell” called a capsid or nucleocapsid, which may or may not be enclosed in an envelope. To multiply, a virus must attach to and enter an appropriate host cell, where it hijacks the host’s genetic material and cellular machinery to produce more copies of the viral genetic material and capsid and envelope proteins.

SARS-CoV-2 uses RNA as its genetic material. This RNA encodes four major proteins: the spike, nucleocapsid, membrane, and envelope proteins. The spike protein can attach to proteins called angiotensin-converting enzyme 2 (ACE2), which are found on the surface of certain human cells in the nasal passages, lungs, and gastrointestinal tract. To enter these human cells, the virus needs another protein, called TMPRSS2, to be present on the cells. TMPRSS2 is naturally found in several tissues of the human body including the prostate, lung, gastrointestinal tract, and urinary tract, and it is frequently found together with ACE2 in cells in the nasal passages and lungs.

