This part is in Word to facilitate joint editing by multidisciplinary collaborators.

**Model goals:**

* Basic framework for multiscale model of COVID19 dynamics in lung epithelium
* Modular and extensible – later add
* Simple and fast enough to give early insights and high-throughput on HPC
* Link to nanoHUB for rapid dissemination and testing of prototype models.

**Basic model assumptions:**

* Tightly packed cell monolayer.
  + 2D for first prototypes.
  + Cell monolayer + mucus coating later.
* Virions are endocytosed with probability proportional to exposure time and local virion concentration
* Endocytosed virion needs to be uncoated in the cell
* SARS-CoV-2 is a single-stranded RNA virus. Uncoated virus immediately starts making virus proteins.
  + Replication occurs in cytoplasm.
  + Relication is largely independent of cell cycle status.
* Virus proteins are assembled into virions
* Virions are released from living cells (at some rate proportional to number of assembled virions)
  + Cell lysis is not necessary for virion release.
* Viral load is used for a basic PD: AUC of viral load increases probability of cell apoptosis
* Apoptosed cells lyse and release all contents:
  + Uncoated virus
  + Viral RNA
  + Viral proteins
  + Assembled virions
* Uncoated virus, viral RNA, viral proteins, and assembled virions all diffuse.
* In future prototypes, we’ll add immune cell components.
  + Death of epithelial cells should expose basement membrane and contribute to inflammation
  + Uncoated virions, viral RNA, viral protein, vrion, and inflammatory excretions could all contribute