Abstract Submitted
for the DFD20 Meeting of
The American Physical Society

Hydrodynamic agitation may naturally disinfect the smallest pathogen-laden aerosols[1] OLIVER MCRAE, Boston University, KENNETH MEAD, Centers for Disease Control and Prevention, JAMES BIRD, Boston University — Lower respiratory tract infections originate from multiple aerosol sources, varying from droplets erupting from bursting bubbles in a toilet or those produced by human speech. A key component of the aerosol-based infection pathway—from source to potential host—is the survival of the pathogen during aerosolization. Due to a rapidly rearranging interface, pinch-off processes occurring during aerosolization have the potential to dissipate energy into these droplets. This dissipated energy can then agitate the fluid, stress objects therein, and if high enough, disrupt biological life within these droplets. However, the extent of the energy dissipated in these droplets is unknown. Here we unlock, using numerical simulations, the spatial and temporal hydrodynamic energy dissipation history within microscale droplets. Our results show that viruses and bacteria likely to reach the lower respiratory tract experience a level of hydrodynamic agitation that has been linked to disinfection of certain pathogens. This introduces a key consideration in determining pathogen transmission, its ability to withstand high levels of agitation. These results suggest that hydrodynamic agitation may be responsible for the viability, and consequently infectivity, differences in aerosolized microbes.

[1]This work was supported by the National Science Foundation under Grant No. 1351466

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Date submitted: 17 Aug 2020 Electronic form version 1.4