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Evaluation of infection risk due to airborne virus transmission in an restaurant environment

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The disastrous impact of airborne disease on the public health and socio-economic activities is evident from the global impact of COVID-19. The primary mode of transmission of such airborne diseases are direct person-to-person contact, through touching surfaces and respiratory droplets/aerosols. Through proper hygiene practices it may be possible to minimize the transmission through the former two modes. However, mitigation of airborne transmission through respiratory droplets is more challenging. It is well established by now that respiratory droplets and aerosols are generated not only during events like coughing and sneezing, but also during routine activities like talking, sining and breathing. The primary mitigation strategy of mask usage has been found to be effective, however during activities like eating a meal it is not possible to use masks. Therefore, socializing over a meal or drink can turn out be hot spots of airborne disease transmission. The focus of this work is such situations. In this work we investigate the dispersion of aerosols and respiratory droplets in a restaurant environment where people socialize over food and drinks. We carry out numerical simulation of a restaurant environment incorporating the details of a typical restaurant such as ventilation, air conditioning, kitchen exhaust, furnitures, etc. and including detailed human models who are modeling to be speaking. An immersed boundary method is used to model the geometries and a discrete droplet model is employed to model the droplet dynamics. We will report the results of of our analysis through these simulations on the efficacy of mitigation strategies like ventilation, air conditioning, physical partition between subjects, etc. on the risk of infection assuming any one person at random may be infected.