The Spread of Macroscopic Droplets from a Simulated Cough with and without the Use of Masks or Barriers

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One main challenge during the COVID-19 pandemic is the lack of safety measures to reduce the risk of viral spread during gatherings. This study evaluated oral and nasal droplet spread in an author-designed model simulating coughing and sneezing in a school setting, to guide students, faculty and staff with safety measures to reduce droplet spread. Several scenarios were prepared to simulate respiratory droplet spread in the classroom and cafeteria, where students would be more susceptible to contracting a virus since masks cannot be worn while eating. For all trials, a 2.54 cm balloon with 0.30 ml diluted fluorescent paint was placed inside a mannequin head and inflated outward from the mouth at 5.00 psi until it burst. A black light was used to visualize the expelled fluorescent macroscopic droplets. Wearing a mask properly over the nose and mouth and using an extended barrier around a personal eating area without a mask was extremely effective in reducing droplet spread. These studies helped develop innovative barrier designs which were implemented in the school cafeteria and a major local medical practice, without any cases of COVID transmission during meals. Without face masks or barriers, social distancing was ineffective. In conclusion the most effective way to prevent droplet spread during activities where masks simply cannot be worn, such as eating, is to apply barriers between the individuals. Applying barriers with innovative measures and wearing masks successfully prevented macroscopic droplet spread and can help safely return students and faculty to school.

Awards Won:
Air Force Research Laboratory on behalf of the United States Air Force: First Award of $750 in each Regeneron ISEF Category