



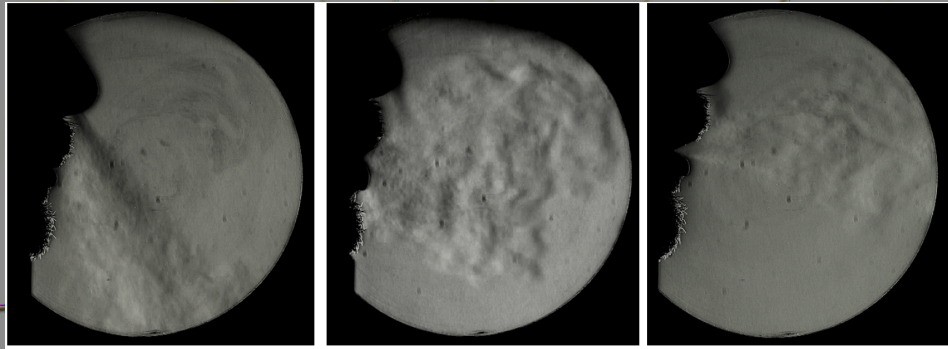
EFFECTIVENESS OF DIFFERENT TYPES OF FACE MASKS: HOW IT CAN POTENTIALLY PREVENT THE SPREAD OF SARS-CoV-2.

By: Clarisel Lozano

Major: Biology

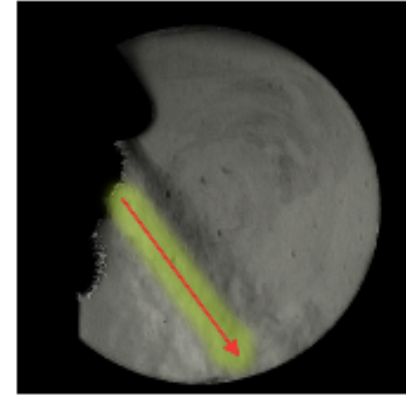
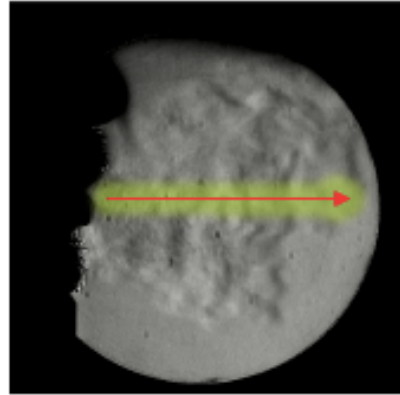
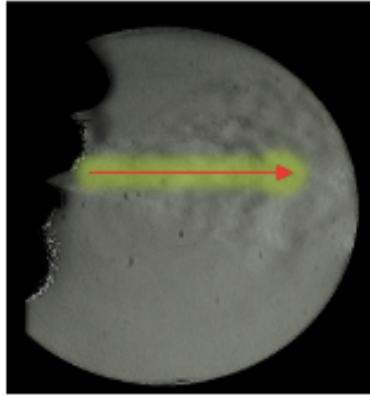
Faculty Advisor: Laura Miller

Faculty Department: Biology



How can face masks effectively prevent transmission of SARS-CoV-2 ?

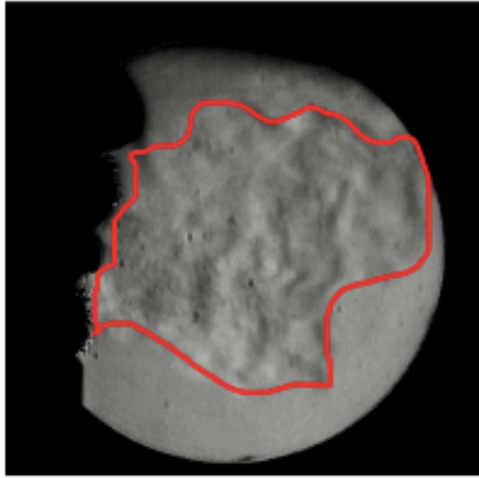
- During expiratory activities, such as talking, breathing, coughing and sneezing; humans can expel droplets composed of various cell types, saliva, mucus and other secretions from the respiratory tract.



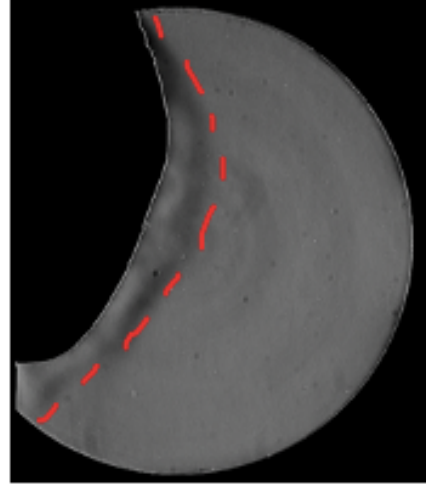
- These droplets provide a vector of transmission for infectious pathogens, such as SARS-CoV-2, that may contribute to different transmission modes.
- The probability of the spread of infection is dependent on
 - The type of pathogen
 - The velocity at which the droplet is expelled and its size.
 - Relative humidity
 - Temperature
 - Ventilation in the environment
- Recent studies on the transmission dynamics of SARS-CoV-2, suggests that human corona viruses are often expelled in smaller droplets.
- An important focus of our project is the analysis of public mask wearing as a droplet source control. This refers to the effectiveness of masks in blocking droplets from an infectious person, particularly during the early stages of the virus.

RESULTS

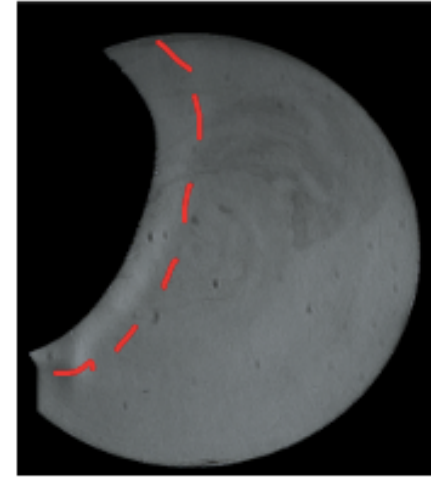
- In order to quantify masks effectiveness, we used computer software analysis (ImageJ) and video recordings using Schlieren Imaging of different human expiratory activities with and without masks.



Coughing without a mask



Coughing Wearing a surgical mask



Coughing Wearing an N95

- Our visualizations show a significant distinction between droplet distance and area when wearing a surgical mask or an N95.
- When coughing while wearing a surgical mask, the maximum area as estimated from the 2D plane of focus in the video was found to be 28 cm^2 ; when wearing an N95, droplets covered an area of 32.2 cm^2 ; whereas without a mask, droplets expanded to an area as great as 129.2 cm^2 .
- Given these numbers, we can conclude that regardless of the type of mask used, they significantly decrease the area and distance traveled by respiratory droplets, potentially decreasing transmission rate among individuals infected with SARS-Cov-2.