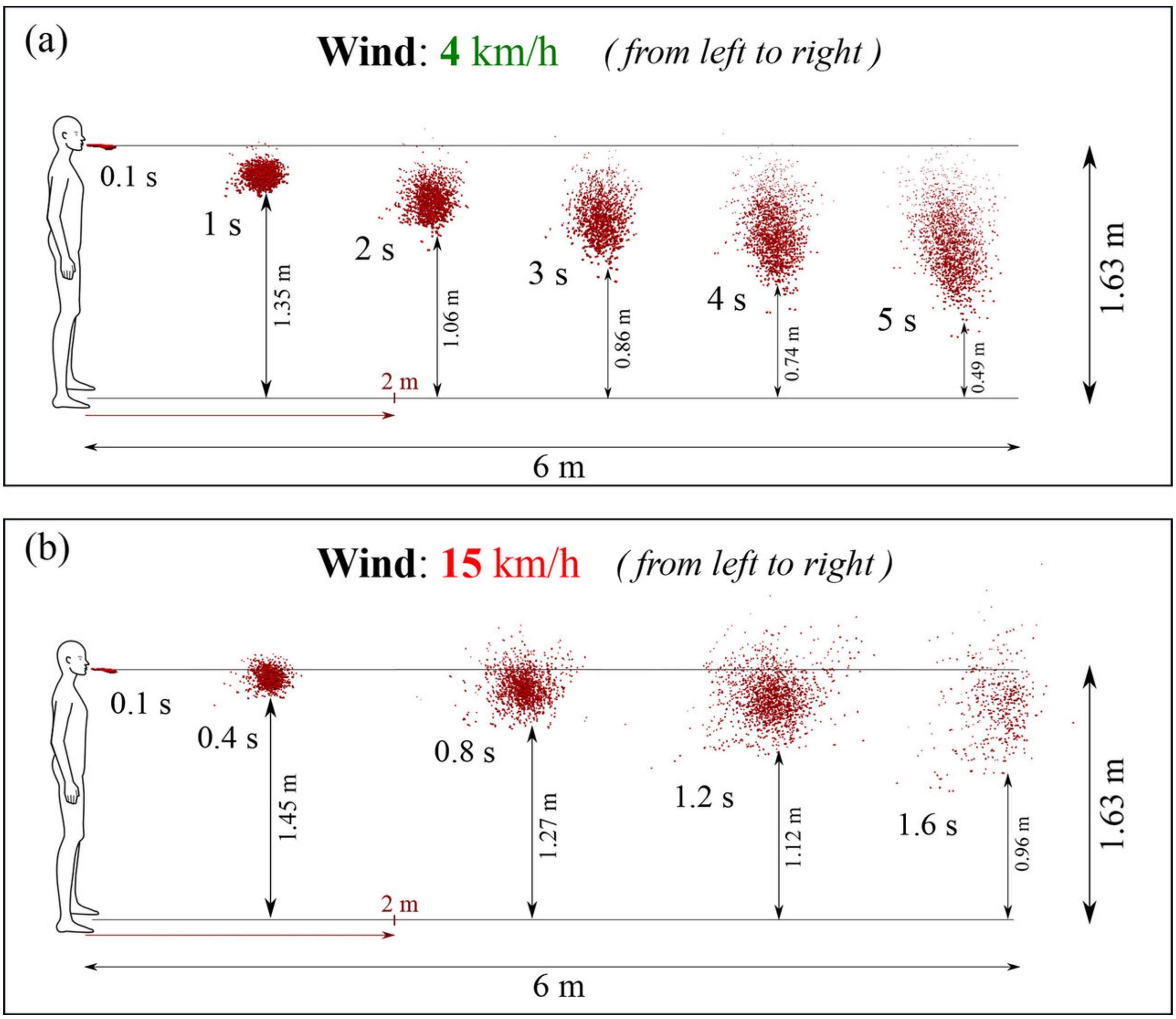
Medical Xpress

Six feet not far enough to stop virus transmission in light winds: study

May 19 2020



Saliva droplets can travel large distances, depending on environmental conditions such as wind speed, temperature, pressure and humidity. Wind shown blowing left to right at speeds of 4 kph (top) and 15 kph (bottom) can transport saliva droplets up to 6 meters (18 feet). Credit: the authors

Airborne transmission of viruses, like the virus causing COVID-19, is not well understood, but a good baseline for study is a deeper understanding of how particles travel through the air when people cough.

In a paper published in *Physics of Fluids*, Talib Dbouk and Dimitris Drikakis discovered that with even a slight breeze of 4 kph, saliva travels 18 feet in 5 seconds.

"The droplet cloud will affect both adults and children of different heights," Drikakis said. "Shorter adults and children could be at higher risk if they are located within the trajectory of the traveling saliva droplets."

Saliva is a complex fluid, and it travels suspended in a bulk of surrounding air released by a cough. Many factors affect how saliva droplets travel, including the size and number of droplets, how they interact with one another and the surrounding air as they disperse and evaporate, how heat and mass are transferred, and the humidity and temperature of the surrounding air.

To study how saliva moves through air, Dbouk and Drikakis created a computational fluid dynamics simulation that examines the state of every saliva droplet moving through the air in front of a coughing person. Their simulation considered the effects of humidity, dispersion force, interactions of molecules of saliva and air, and how the droplets change from liquid to vapor and evaporate.

The computational domain in the simulation is a grid representing the space in front of a coughing person. The analysis involved running partial differential equations on 1,008 saliva droplets and solving approximately 3.7 million equations in total.

"Each cell holds information about variables like pressure, fluid velocity, temperature, droplet mass, droplet position, etc.," Dbouk said. "The purpose of the mathematical modeling and simulation is to take into account all the real coupling or interaction mechanisms that may take place between the main bulk fluid flow and the saliva droplets, and between the saliva droplets themselves."

Further studies are needed to determine the effect of ground surface temperature on the behavior of saliva in air and to examine indoor environments, where air conditioning significantly affects the particle movement through air.

"This work is vital, because it concerns health and safety distance guidelines, advances the understanding of spreading and transmission of airborne diseases, and helps form precautionary measures based on scientific results," said Drikakis.

More information: "On coughing and airborne droplet transmission to humans," *Physics of Fluids* (2020). aip.scitation.org/doi/10.1063/5.0011960

Provided by American Institute of Physics

Citation: Six feet not far enough to stop virus transmission in light winds: study (2020, May 19) retrieved 20 May 2024 from https://medicalxpress.com/news/2020-05-feet-virus-transmission.html