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Surfing the COVID-19 scientific wave

Since the beginning of the COVID-19 pandemic, the number of articles published in scientific journals has skyrocketed; unfortunately, the quality of many of these articles leaves much to be desired.1,2 We read with interest two publications from the same group3,4 whose objectives were to demonstrate that normal speech generates droplets that can be suppressed by covering the mouth and aerosols that persist for several minutes. Briefly, the authors used fluorescent green light to illuminate particles emitted by a person’s mouth when speaking normally in a confined black box and filmed the interior of the black box. The words spoken by the participant were “stay healthy”, chosen by the authors as the “th” sound is known to emit droplets. Unsurprisingly, the authors found that the speaker emitted droplets of various sizes that were suppressed by covering the mouth.3 On the basis of a set of assumptions, the group produced a model suggesting that aerosols smaller than 5 μm were generated. The group concluded that normal speaking is associated with airborne transmission.4

We have issues with several assumptions made by the authors.4 First, the main assumption in the model is that dehydration is key to reducing the diameter of the expelled droplets, allowing droplets to become aerosols. The experiment was done in an environment with a relative humidity of 27%, which is below the minimum recommended indoor relative humidity of 40%.5 Second, the authors assumed an average viral load in saliva of $7 \times 10^7$ copies per mL on the basis of a prospective study6 wherein viral load was measured in sputum. Thus, they assume that viral load in sputum is the same as in saliva. The group also assume that every RNA copy detected is a potentially infectious virion, without acknowledging that in the cited study samples containing fewer than $10^7$ copies per mL never resulted in a viable virus being isolated. An additional required proof would be to show that the viable virus is infectious and that the load is higher than the infectious dose.7

The studies4,6 have methodological flaws that limit their generalisability. We were surprised that experiments in one person were published in leading scientific journals. No report of the loudness, measured in decibels, was found in either manuscript, although in the videos it seems that in some cases the study participant was shouting, so the claim of normal speech is dubious.1,4 The air in the black box might have been filtered by a high-efficiency particulate air filter, but in the 2.33 min preceding the beginning of the speech, we counted at least 12 instances where flying particles were observed.4 Also, the size of the box was small; the authors did not show that these particles could be found more than 60 cm away from the speaker (the maximum length of the black box).

The duration of recorded speech was 25 s, but the results were artificially extrapolated to 1 min.4 Also, the presence of a fan at the bottom of the black box during the speech and for 10 s after the end of speech does not represent real-life conditions; a control condition with no fan would have been expected. Neither aspect is discussed.

In the abstract of one of the articles,4 it is stated that asymptomatic transmission is plausible, but its role has not been clearly elucidated and indeed is highly disputed.3 The authors were mistaken when stating that high viral loads were found in asymptomatic patients while referring to the study by Wölfel and colleagues.6 Only one patient reported being asymptomatic in the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) outbreak in Bavaria, Germany;6 and that patient was not included in Wölfel and colleagues’ study,4 which included only hospitalised patients.

The title of one of the articles4 mentions SARS-CoV-2 transmission, yet the experiment had more to do with sialoquence than with SARS-CoV-2. Although the objectives of these studies are worthy, their findings have no immediate implications. We declare no competing interests.

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SARS-CoV-2 transmission via speech-generated respiratory droplets

During a pandemic, identifying modes of transmission is paramount to devise effective and practical mitigation strategies. Mohamed Abbas and Didier Pittet1 challenge the conclusions of our reports that normal speaking might be an important mode of transmission for severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), involving small particles that remain airborne for minutes.2,3 Whereas the opening remarks in Abbas and Pittet’s correspondence are irrelevant to our work, we eagerly welcome an intellectual debate on the scientific merits of our research. In their correspondence, they claim our “findings have no immediate implications.”1 Nothing could be further from the truth. While we refer readers to the appendix (pp 1–5) for a detailed response to all issues raised, we here address two of Abbas and Pittet’s more pertinent concerns.

Abbas and Pittet contend that our work is flawed by a lack of generalisability because the published results involved only a single speaker.1 Their implication that the generation of speech droplets might be idiosyncratic discounts the well understood physics of speech droplet formation. Speech-generated acoustic waves involve high-speed passage of air, pressurised by the lungs, past the mucosal epithelial layers of the vibrating vocal folds.4 The sounds generated are further modulated by travel of this air through narrow passages between the tongue, lips, and teeth, dislodging oral fluid at all of these locations.4 Emission of droplets is inextricably linked to the physics of speech generation5 and unlikely to differ much from one individual to another. As shown in the appendix (p 6) and video in the supplementary materials, all speakers spit. Fortunately, when exiting the mouth, such droplets are still fairly large and easily blocked from entering the atmosphere by a generic cloth mask.6

Abbas and Pittet also raise the criticism that the size of the box used for observing the shrunk, dried-out nuclei of speech droplets was small, thereby limiting the physical distance such nuclei could travel. Indeed, our measurements only established that, even in a quiescent environment, droplet nuclei require many minutes to descend to the bottom of the box. The extent to which dehydrated speech droplets can travel before reaching the ground in real-life situations depends crucially on factors such as air convection and ventilation. Physics dictates that air movement will carry such particles over considerable distances, fully analogous to the dispersion of cigarette smoke throughout a room.7

The medical community has long acknowledged infection via speech-generated respiratory droplets, including droplet nuclei that might stay airborne for an extended time.1 The importance of symptomless transmission of SARS-CoV-2 (ie, in the absence of coughing or sneezing), whether retrospectively identified as asymptomatic, presymptomatic, or even oligosymptomatic, has also been well established,8,9 despite claims to the contrary by Abbas and Pittet. With high viral titres in the oral fluid of such carriers well documented and a substantial proportion of speech droplets of oral fluid now shown to remain airborne for many minutes, inhalation of such particles represents a direct route to the nasopharynx. Retrospective analyses of indoor superspreader events further support the role of speech droplets in airborne transmission.8

We declare no competing interests.

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Williness to vaccinate against COVID-19 in Australia

More than half of the world’s population faces long-term restrictions as the new normal to prevent the