

Breath Sample Collection from Individuals Infected with SARS-CoV-2: Biosafety Methodology



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Introduction

The use of breath samples can be helpful to further research in infection control and public health. The collection and use of these samples can be used in various applications, including indoor air quality surveillance and the development of diagnostic tools. To ensure the safety of those responsible for collecting and transporting samples, the collection methodology requires a multi-layered approach.

Objectives

- **Successfully collect exhaled breath samples from participants who have tested positive for SARS-CoV-2**
- Maintain a simple and safe experience for participants
- Establish a workflow that prioritizes research staff's safety
- Design a methodology that can be easily reproduced to ensure standardization across samples

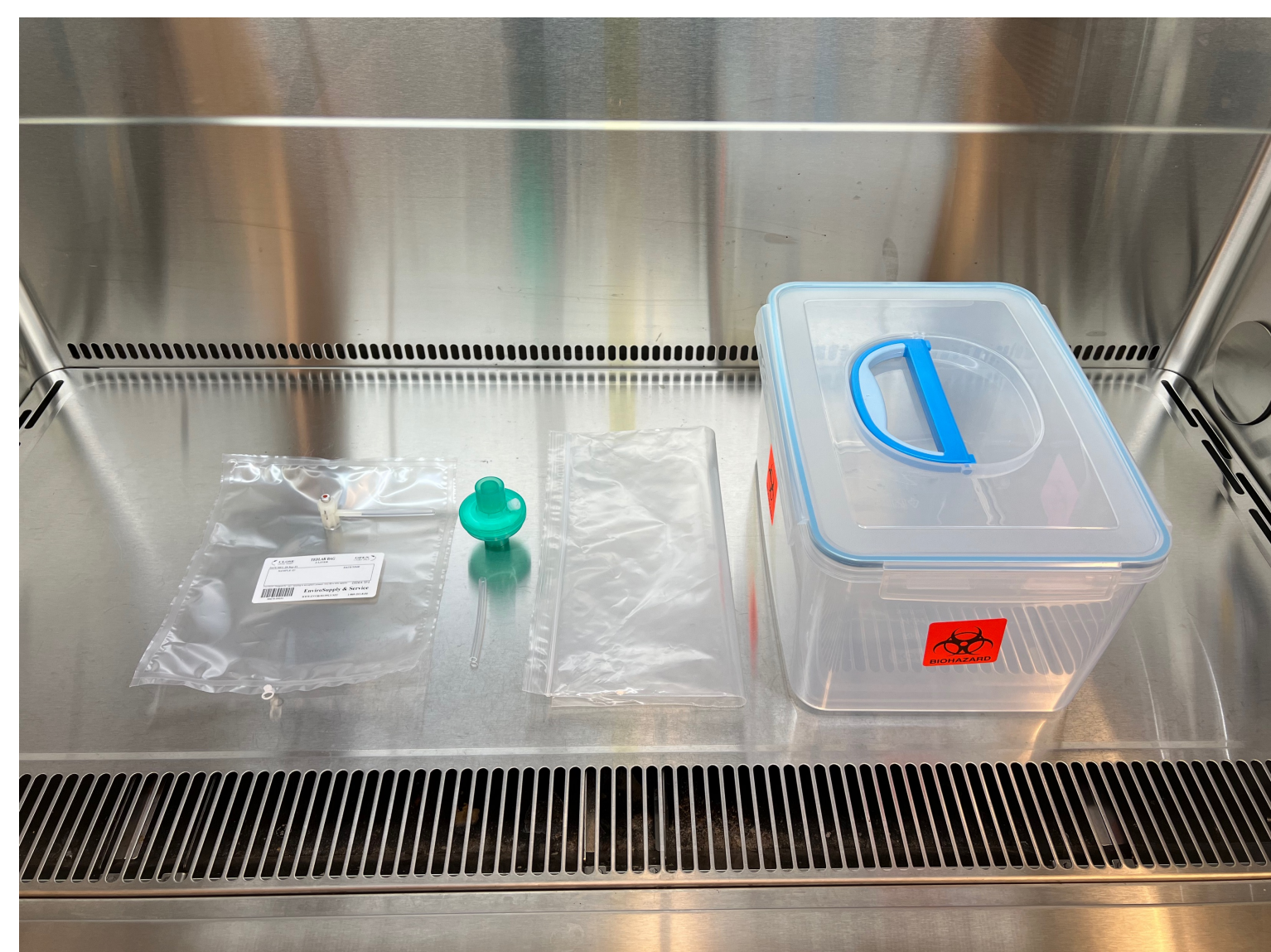


FIGURE 1: Breath sample collection supplies. Supplies include a Tedlar® collection bag, a disposable mouthpiece, a HEPA filter, a zipper seal plastic bag, and a hard sided container.

Methods

- Staff personal protective equipment (PPE) – isolation gown, gloves, N95 respirator, and protective eyewear
- Location – outdoor, in-car collection
- Physical barriers - Tedlar® bag with sealable valve, disposable mouthpiece, HEPA filter on bag, secondary and tertiary container
- Lab side – portable HEPA air filtration unit, opening containers within biosafety cabinet, wearing an N95 respirator while opening containers



FIGURE 2: Demonstration of sample collection. One research staff member assists the participant with the sample collection and one staff member assists with organization and handling of equipment. Both staff members are fully donned in appropriate personal protective equipment (PPE).

FIGURE 4: Demonstration of breath sample in biosafety cabinet. Sample is contained within its secondary and tertiary containers.



FIGURE 3: Demonstration of breath sample collection. Individual blows through a disposable mouthpiece in order to fill the Tedlar® bag to about 90% capacity.



Results

- Total of 64 breath samples were collected from 64 adult participants
- Of the 64 participants, 44 (68.8%) were women; 27 (42.2%) White, 26 (40.6%) Asian, and 11 (17.2%) as other or 2 or more races; median age (IQR) was 41 years (32 – 56)
- Total of 30 (46.9%) participants were within 7 days of their initial COVID-19 diagnosis
- All participants successfully collected samples without the need of additional resources or attempts
- All samples were successfully transported to the lab, free of visible damage or visible loss of breath

Conclusions

- Risks associated with breath sample collection from potentially contagious individuals were mitigated using a combination of multiple safety measures:
 1. Protective Equipment
 2. Physical Barriers
 3. Well-ventilated environments
- The translatable and simple workflow can potentially be used for individuals with other respiratory illnesses

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