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Environmental and Nasal Pathogen Surveillance in Seattle Area Homeless Shelters

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Introduction

- Respiratory tract infections (RTI) are a global cause of illness that can significantly impair quality of life and productivity.
- People experiencing homelessness (PEH) are at an increased risk and burden of infectious diseases, including RTIs.
- We describe pathogens detected on high-touch surfaces and in nasal swabs of residents in homeless shelters in King County, Washington

Methods

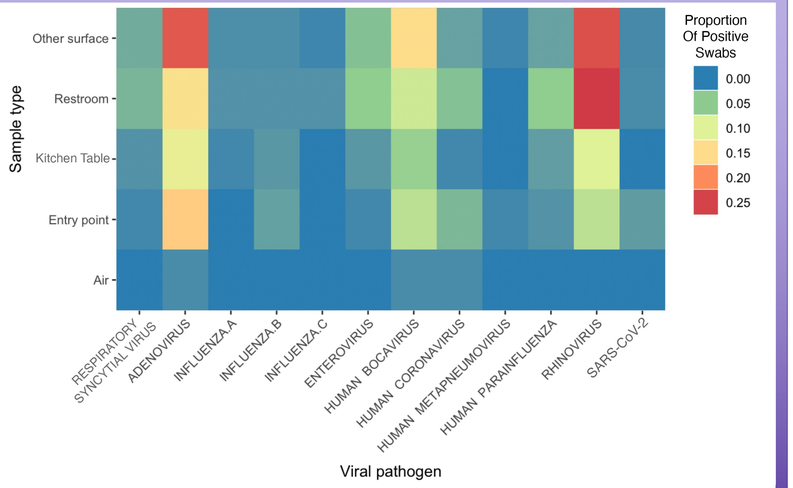
- Environmental samples were collected weekly from homeless shelters in King County, WA from November 2019 – April 2020.
- All samples were tested via RT-PCR for 27 viral pathogens.
- With residents present, 10cm^2 areas of selected high-touch surfaces were swabbed with Berkshire Lab-Tip 125S swabs, stored in Universal Transport Medium (UTM) and transported on ice.
- Surfaces that were swabbed in each shelter included entrance and restroom doorknobs, front desk and kitchen counters,
- Surfaces unique to each shelter were also swabbed.
- Bioaerosol samples were collected for 60 minutes in high-traffic areas with a SKC QuickTake 30 air pump. Ambient air was pumped through Millipore filter papers, which were placed in UTM and transported on ice.
- Mid-turbinate nasal swabs were collected from shelter residents with symptoms of acute respiratory illness.

Table. Count and period prevalence of environmental and respiratory viral detection by shelter type from Nov 2019 – Apr 2020

Pathogen	Surface Swabs			Nasal Swabs	Aerosol Samples
	Family (n=285)	Adult (n=503)	Total^ (n=788)	Total (n=1509)	Total (n=98)
Adenovirus	99 (34.7%)	10 (2.0%)	109 (13.8%)	11 (0.7%)	1 (1.0%)
Enterovirus	4 (1.4%)	14 (2.8%)	18 (2.3%)	18 (1.2%)	0 (0%)
Human bocavirus	61 (21.4%)	1 (0.2%)	62 (7.9%)	11 (0.7%)	2 (2.0%)
Human coronavirus*	11 (3.9%)	6 (1.2%)	17 (2.2%)	79 (5.2%)	1 (1.0%)
Human metapneumovirus	2 (0.7%)	0 (0%)	2 (0.3%)	9 (0.6%)	0 (0%)
Human parainfluenza	10 (3.5%)	9 (1.8%)	19 (2.4%)	10 (0.7%)	0 (0%)
Influenza A	1 (0.4%)	4 (0.8%)	5 (0.6%)	19 (1.3%)	0 (0%)
Influenza B	7 (2.5%)	5 (1.0%)	12 (1.5%)	43 (2.9%)	1 (1.0%)
Influenza C	2 (0.7%)	1 (0.2%)	3 (0.4%)	4 (0.3%)	0 (0%)
Rhinovirus	35 (12.3%)	72 (14.3%)	107 (13.6%)	160 (10.6%)	0 (0%)
Respiratory Syncytial Virus	9 (3.2%)	5 (1.0%)	14 (1.8%)	19 (1.3%)	0 (0%)
SARS-CoV-2** (n=562)	2 (0.7%)	2 (0.4%)	4 (0.5%)	9 (0.6%)	0 (0%)

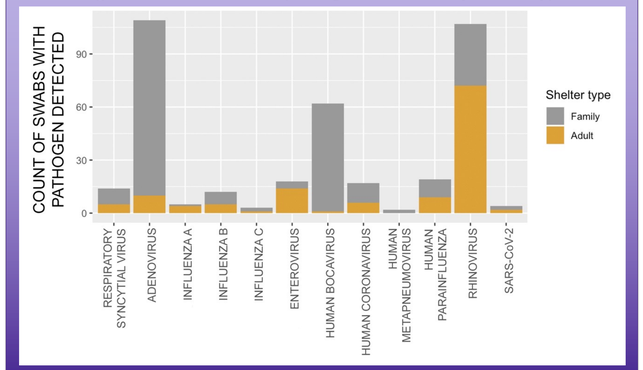
^ Three family shelters, six adult shelters
** CoV-HKU1, CoV-NL63, CoV-229E, CoV-OC43*
***Samples tested for SARS-CoV-2 collected from January 1, 2020 - April 10, 2020.*

Figure 1. Viral pathogen detection prevalence by surface swab location



Other surface - front desks, kids play tables, computer keyboards and video game controllers
Restroom – exterior restroom doorknobs or handles
Entry point – interior entry point doorknobs or handles

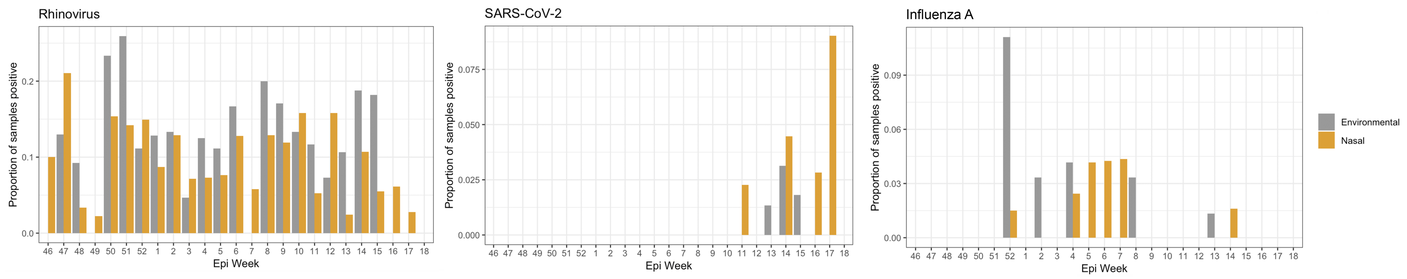
Figure 3. Environmental pathogens detected by shelter type



Results

- A total of 788 environmental swabs, 1509 nasal swabs, and 98 bioaerosol samples were tested.
- Adenovirus, rhinovirus and human bocavirus were the most detected viruses in surface swabs.
- SARS-CoV-2 was first detected in surface swabs on 3/20/20, and in nasal swabs on 3/10/20.

Figure 2. Prevalence of respiratory virus detection in mid-turbinate nasal swabs and environmental samples by epidemiologic week November 2019 – April 2020. Environmental samples include surface swabs and bioaerosol samples



Conclusion

- Environmental surface sampling presents a minimally invasive method of surveillance for both endemic and emerging respiratory pathogens.
- Further research could explore sampling public locations for broader community surveillance and culturing viruses found on these surfaces.

Acknowledgments

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