

PROJECT TITLE:

STRUCTURED ABSTRACT

Purpose: To evaluate the dispersion of norovirus in simulated vomitus.

Scope: Long-term care facilities.

Methods: Epidemiological and laboratory studies were employed to complete four aims – (1)

quantify the dispersion of norovirus; (2) measure dispersion of vomitus into the environment; (3) determine the persistence of norovirus in the environment.

Results: Two epidemiological studies support control measures that limit exposure to vomitus during HuNoV outbreaks in long-term care facilities. The average dispersion of simulated vomitus was 44.8 m², spanning a width of 3.6 m and a length of 7.7 m from the source.

hydrogen peroxide-based disinfectants can serve as an effective control measure.

Author's address:

PURPOSE

Human norovirus (HuNoV) is the leading cause of acute gastroenteritis outbreaks in the United States. Long-term care facilities (LTCFs), home for nearly 2.5 million people, mostly older adults, are the most common setting for such outbreaks. Epidemiologic studies have identified vomiting, which occurs among more than 50% of symptomatic norovirus cases, to be a strong risk factor for norovirus transmission. Vomitus can contain over 30,000,000 million viral particles per vomitus event resulting in contamination of environmental surfaces via aerosolization and/or improper clean up. Vomitus clean-up guidelines are available but the evidence base informing procedures is limited resulting in procedural steps ſ Z ſ œ insufficiently detailed (e.g., radius of clean up and disinfection procedures for porous surfaces, such as carpet). This lack of detail could result in multiple interpretations of how to execute a clean-up step possibly resulting in the ineffective removal of HuNoV. In this multidisciplinary study, we conducted translational research to fill key knowledge gaps impeding development of detailed infection control procedures for vomitus. Sp

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nonporous surfaces. As EPA does not recognize TuV as a target agent, e 8] } µ • [Å • . v
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Aim 4: The persistence of HuNoV on porous and nonporous surfaces was determined using a very new culture system for HuNoV available only in two laboratories (Baylor College of Medicine and the U.S. Centers for Disease Control

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Table 1. 8 C P feline calicivirus (FCV) and Tulane virus (TuV) v Ø % š • Á] š Z] + a Ø v š I] v P •

Disinfectant	Active ingredient	Concentration Reduction					
		TuV		FCV		X L(())o	
		Suspension	Steel	Suspension	Steel	Suspension	Steel
A	0.5 % Hydrogen peroxide	3.8±0.6 ^{AB}	0.8	5.1±0.6 ^A	>5.1 ^A	>6.0 ^A	3.4±0.4 ^B
B	0.88 % Hydrogen peroxide	3.4±0.7 ^{AB}	1.1	4.1±1.4 ^{AB}	>5.1 ^A	0.1±0.1 ^B	0.2±0.1 ^D
C	1.4 % Hydrogen peroxide	3.8±0.8 ^A	2.4	5.0±0.4 ^A	>5.1 ^A	1.4±0.1 ^C	1.0±0.3 ^{CD}
D	3.13 % Hydrogen peroxide/0.05 % Peracetic acid	3.9±0.5 ^A	>3.1	>5.4 ^A	>5.1 ^A	>6.0 ^A	>6.0 ^A
E	5 % Hydrogen peroxide/0.01 % Silver	2.5±0.0 ^B	0.8	2.7±0.2 ^B	2.2±0.7 ^C	1.3±0.2 ^C	1.3±0.1 ^C
F	Citric acid/Silver	0.2±0.2 ^C	1.0	2.2±0.2 ^B	>5.1 ^A	0.0±0.1 ^B	0.1±0.2 ^D
G	Chlorine dioxide/QACs/	1.8±0.8 ^B	0.9	0.3±0.1 ^C	0.2±0.2 ^B	0.4±0.3 ^B	0.4±0.3 ^D
H	QACs/Ethanol/Isopropanol	3.8±0.6 ^{AB}	1.0	1.9±1.3 ^B	>5.1 ^A	0.4±0.4 ^B	0.3±0.2 ^D
I	Ethyl and isopropyl alcohols	4.3±0.2 ^A	1.9	5.2±0.8 ^A	>5.1 ^A	0.0±0.1 ^B	0.1±0.1 ^D

^a Contact time (min) & survival (%) of spores of *Clostridium perfringens* ATCC 13665 endospores was 10 min in suspension and on stainless steel.

Table 2. Reduction of feline calicivirus (FCV) and Tulane virus (TuV), and

Disinfectant

Reduction (logs)

Table 4. Viral reduction of Feline calicivirus (FCV) and Tulane virus (TuV) on Amicon column units

Microorganism	Surface	Lighting	Reduction (logs) ^a	
			60 min	120 min
FCV	Stainless steel	Controlled light	>5.3	n.a.
	Stainless steel	Indoor lighting	2.4±0.3	4.3±0.2
	Color Accent® (water-permeable)	Controlled light	1.3±0.3	n.a.
	Highlight® (waterproof)	Controlled light	2.9±0.5	n.a.
TuV	Stainless steel	Controlled light	3.3±0.3	n.a.
	Stainless steel	Indoor Lighting	0.8±0.1	1.4±0.1
	Color Accent® (water-permeable)	Controlled light	1.1±0.5	n.a.
	Highlight® (waterproof)	Controlled light	2.5±0.7	n.a.
X]((] o	Stainless steel	Controlled light	0.0±0.1	0.5±0.2
	Color Accent® (water-permeable)	Controlled light	n.a.	0.3±0.2
	Highlight® (waterproof)	Controlled light	n.a.	0.3±0.2

^a The table shows the percentage reduction of FCV and TuV on Amicon column units under different conditions. The reduction is expressed as logs, with a reduction of 1 log equivalent to a 90% reduction. The data is presented as mean ± standard deviation. "n.a." indicates data not available.

Table 5. Viral recovery of Feline calicivirus (FCV) and Tulane virus (TuV) on Amicon column units

Table 6

List of Publications and Products Use

u • ~~u μ v P ' u š y RAC~~ Paul P, Marsh Z, Hall AJ, Lopman BA. Quantifying the roles of vomiting, diarrhea, and residents vs. staff in norovirus transmission in U.S. nursing home outbreaks. *PLoS Comput Biol.* 2020 Mar 25;16(3):e1007271.

Chen Y, Lopman BA, Hall AJ, Kambhampati AK, Roberts L, Mason J, Vilen K, Salehi E, Fraser A, Adams C. Factors driving norovirus transmission in long-term care facilities: A case-level analysis of 10~~10~~ 15~~15~~ 16~~16~~ 17~~17~~ 18~~18~~ 19~~19~~ 20~~20~~ 21~~21~~ 22~~22~~ 23~~23~~ 24~~24~~ 25~~25~~ 26~~26~~ 27~~27~~ 28~~28~~ 29~~29~~ 30~~30~~ 31~~31~~ 32~~32~~ 33~~33~~ 34~~34~~ 35~~35~~ 36~~36~~ 37~~37~~ 38~~38~~ 39~~39~~ 40~~40~~ 41~~41~~ 42~~42~~ 43~~43~~ 44~~44~~ 45~~45~~ 46~~46~~ 47~~47~~ 48~~48~~ 49~~49~~ 50~~50~~ 51~~51~~ 52~~52~~ 53~~53~~ 54~~54~~ 55~~55~~ 56~~56~~ 57~~57~~ 58~~58~~ 59~~59~~ 60~~60~~ 61~~61~~ 62~~62~~ 63~~63~~ 64~~64~~ 65~~65~~ 66~~66~~ 67~~67~~ 68~~68~~ 69~~69~~ 70~~70~~ 71~~71~~ 72~~72~~ 73~~73~~ 74~~74~~ 75~~75~~ 76~~76~~ 77~~77~~ 78~~78~~ 79~~79~~ 80~~80~~ 81~~81~~ 82~~82~~ 83~~83~~ 84~~84~~ 85~~85~~ 86~~86~~ 87~~87~~ 88~~88~~ 89~~89~~ 90~~90~~ 91~~91~~ 92~~92~~ 93~~93~~ 94~~94~~ 95~~95~~ 96~~96~~ 97~~97~~ 98~~98~~ 99~~99~~ 100~~100~~ 101~~101~~ 102~~102~~ 103~~103~~ 104~~104~~ 105~~105~~ 106~~106~~ 107~~107~~ 108~~108~~ 109~~109~~ 110~~110~~ 111~~111~~ 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