Stop the mop…when it might transmit pathogens in your restaurants

Hal King, Ph.D. Managing Partner

Active Food Safety by phi

My experience outside of the food industry: Infectious Disease Research and Prevention

US PUBLIC HEALTH SERVICE COMMISSIONED CORPS

Outbreak Investigations

International Disease Prevention

Emerging Diseases Investigations

Interventions for Prevention

Biological Threats - Force Health

Infectious Disease Research

Food Safety- Leadership

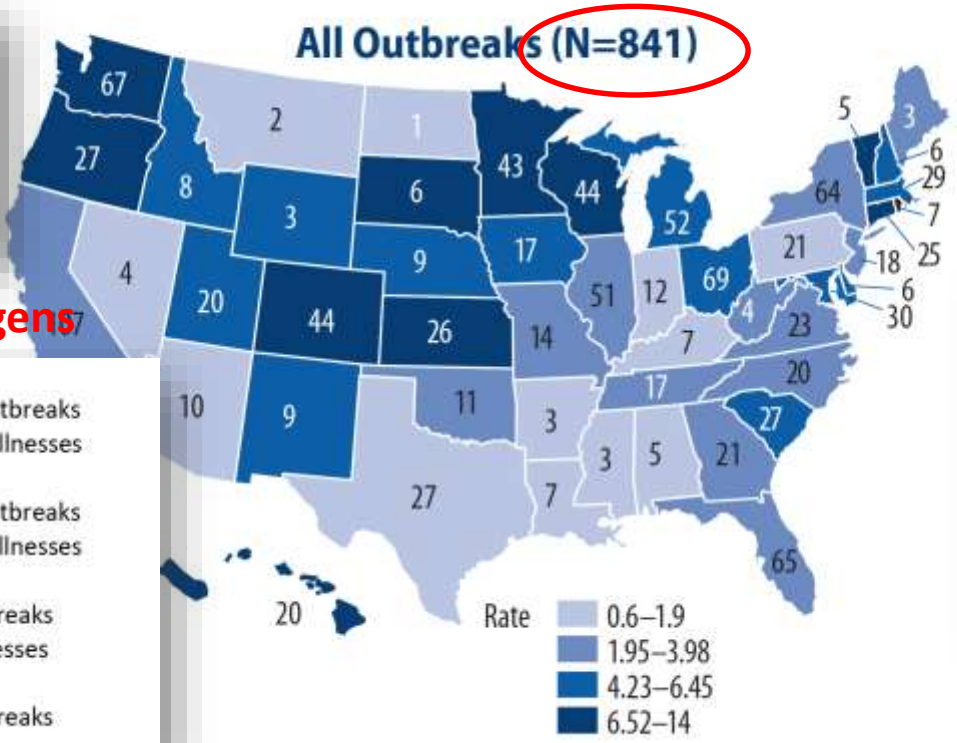
Intervention/Product Innovations

Advisory Services

Before this pandemic: foodborne disease outbreaks/illnesses needed to be a national priority

All foodborne disease outbreaks in the United States- 2017

Figure: Rate of reported foodborne disease outbreaks per one million population* and number of outbreaks,† by state§ and confirmed and suspected etiology¶ — Foodborne Disease Outbreak Surveillance System, United States, 2017.



Top 4 Pathogens

- **Norovirus:**
  - 140 (35%) outbreaks
  - 4,092 (46%) illnesses
- **Salmonella:**
  - 113 (29%) outbreaks
  - 3,007 (34%) illnesses
- **STEC (E. coli):**
  - 19 (5%) outbreaks
  - 513 (6%) illnesses
- **C. perfringens:**
  - 19 (5%) outbreaks
  - 478 (5%) illnesses

More than 60% of all foodborne disease outbreaks in the United States are **caused by restaurants-** 2017

About the same year to year since reporting began

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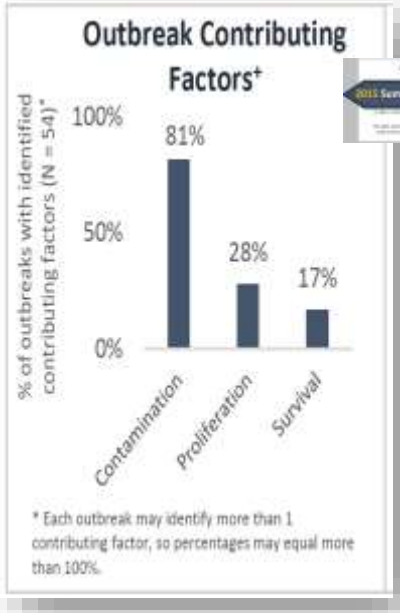
How do the majority of foodborne disease outbreaks/illnesses happen in restaurants?

3 categories (Contamination, Proliferation, and Survival)
covering 32 contributing factors

From surfaces and hands/gloves



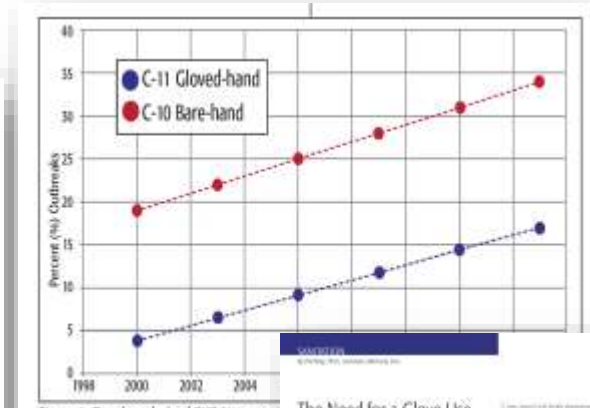


Figure 1. Trend analysis of EHS-Net report contamination contributing factors in food

Some of the cleaning and sanitation tools we use in restaurants actually contribute to the cross contamination of foods when used improperly

Dirty, reusable cloth towels can be a source of cross-contamination (BoH)…
and are poor guest experience (FoH)

Some of the cleaning and sanitation tools we use in restaurants actually contribute to the cross contamination of foods when used improperly

9 out of 10 Public Health Officials observed improper use of cleaners and sanitizer

	Chain Food Safety Professionals	Public Health Officials & Inspectors
Believe using pail/buckets and reusable towels could cause cross-contamination between surfaces even when the sanitizer is maintained at the appropriate concentration	65%	61%
Believe it may be difficult to keep the sanitizing solution at the required concentration due to food soils on towels or in solution	73%	65%
During 3rd party audits or health inspections we see improper storage of reusable towels – outside of the sanitizing solution or incorrect sanitizer concentration	58%	93%
Observed restaurant employee not using a cleaner and sanitizer appropriately	65%	91%
During 3rd party audits or health inspections, observed improper use of reusable towels or sanitizer concentration levels.	65%	76%

REPEAT VIOLATORS

Operators Footnote: Results based on online survey among 45 large chain foodservice operators and members, distributed by NRA-QA in June 2018 (MR# 010-030)Public Health Footnote: Results based on online survey among 35 Public Health Officials, distributed by NACCHO in June 2018 (MR# 010-030)

Some of the cleaning and sanitation tools we use in restaurants actually contribute to the cross contamination of foods when used improperly

PEER-REVIEWED ARTICLE

Rebecca M. Goulter,[1*] James S. Clayton,[2] Robin Grant Moore,[1] Justin M. Bradshaw,[1†] Jason W. Frye,[1] Esa J. Puntch[1] and Lee-Ann Jaykus[1]

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Characterizing Microbial Cross-Contamination on Large Surfaces Using a Traditional "Cloth and Bucket" Disinfection Method

TABLE 2. Numbers of microorganisms detected in bucket solution after wiping experiments

Organism	Treatment	Positive input control (mean CFU/PFU ± standard deviation)	Bucket solution (mean CFU/PFU ± standard deviation)	% transferred to and remaining in bucket solution[a]
L. innocua	PBS	9.58 ± 0.74	9.49 ± 0.99	99.1
	QAC	9.60 ± 0.28	N/A-LOE[b]	N/A-LOE[b]
	QAC + soil	8.83 ± 0.37	N/A-LOE[b]	N/A-LOE[b]
E. coli	PBS	8.13 ± 0.18	8.54 ± 0.78	105.0
	QAC	6.33 ± 0.43	N/A-LOE[b]	N/A-LOE[b]
	QAC + soil	5.81 ± 0.20	N/A-LOE[b]	N/A-LOE[b]
B. cereus	PBS	10.01 ± 0.07	10.54 ± 0.22	105.3
	QAC	10.06 ± 0.03	9.48 ± 0.19	94.2
	QAC + soil	9.98 ± 0.03	9.96 ± 0.03	99.8
MS2	PBS	8.52 ± 1.09	8.39 ± 0.99	98.5
	QAC	7.80 ± 0.18	N/A-LOE[b]	N/A-LOE[b]
	QAC + soil	7.46 ± 0.35	6.56 ± 0.38	87.9

[a]Transferred to, and remaining in, the bucket solution was calculated by dividing the number of organisms detected in the bucket solution by the number of organisms detected in the positive input control and multiplying by 100 [(bucket solution mean/positive input control mean) × 100].

[b]Not applicable (N/A), when the organism was completely inactivated by the disinfectant (limit of enumeration [LOE] reached) and ratios could not be determined.

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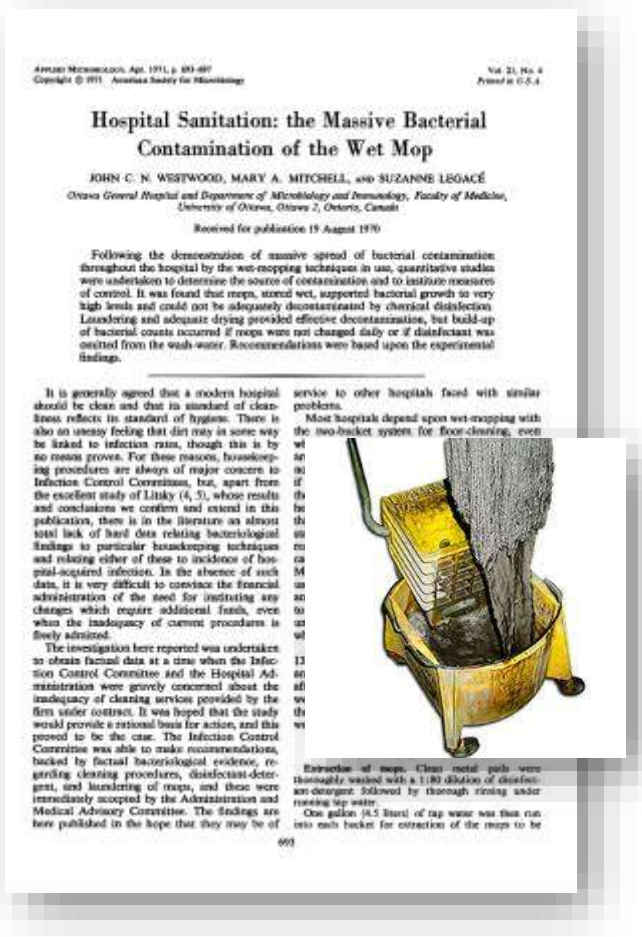
Some of the cleaning and sanitation tools we use in restaurants actually contribute to the cross contamination of foods when used improperly



Hospital Sanitation: the Massive Bacterial Contamination of the Wet Mop

JOHN C. N. WESTWOOD, MARY A. MITCHELL, and SUZANNE LEGACÉ

Ottawa General Hospital and Department of Microbiology and Immunology, Faculty of Medicine, University of Ottawa, Ottawa 2, Ontario, Canada

Received for publication 19 August 1970

Following the demonstration of massive spread of bacterial contamination throughout the hospital by the wet-mopping techniques in use, quantitative studies were undertaken to determine the source of contamination and to institute measures of control. It was found that mops, stored wet, supported bacterial growth to very high levels and could not be adequately decontaminated by chemical disinfection. Laundering and adequate drying provided effective decontamination, but build-up of bacterial counts occurred if mops were not changed daily or if disinfectant was omitted from the wash-water. Recommendations were based upon the experimental findings.

MOPs?

- Large, cotton-string mop heads are bulky and can be difficult to clean, disinfect, and dry after each use
- Single-bucket use can lead to cross-contamination issues and the spread of germs if the buckets are not scrubbed out after each cleaning cycle, per area
- Additionally, hot water use can increase the rate of growth and spread of germs and bacteria within the bucket
- Additionally, cleaning or switching out the single bucket after the restroom floor is sanitized to avoid cross-contamination with a dining or food preparation floor is entirely impractical

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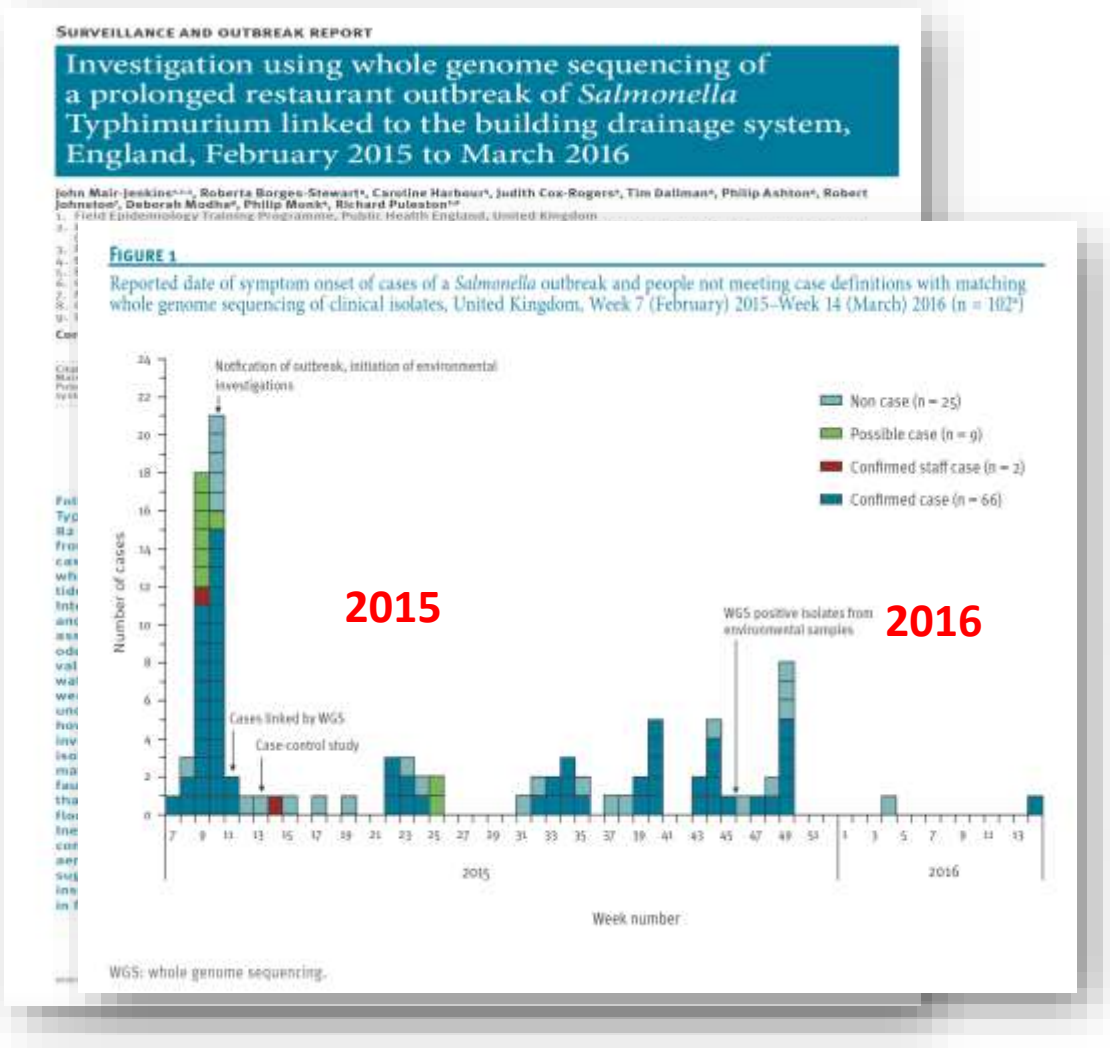
How do floors play a role in cross contamination of foods when this leads to foodborne disease outbreaks



SURVEILLANCE AND OUTBREAK REPORT

Investigation using whole genome sequencing of a prolonged restaurant outbreak of *Salmonella* Typhimurium linked to the building drainage system, England, February 2015 to March 2016

John Mair-Jenkins[1,2,3], Roberta Borges-Stewart[1], Caroline Harbour[1], Judith Cox-Rogers[1], Tim Dallman[4], Philip Ashton[4], Robert Johnston[5], Deborah Modha[6], Phillip Monk[1], Richard Puleston[1,6]

Reported in 2017 in the United Kingdom

- An outbreak from the same strain of *Salmonella* from only one restaurant over the course of 2 years
- Different employees also had illness from the same strain
- The same strain was isolated from several environmental surfaces in this restaurant

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2. European Programme for Intervention Epidemiology Training (EPIET), European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden
3. Field Epidemiology Service, National Infection Service, Public Health England, United Kingdom
4. East Midlands Health Protection Team, Public Health England, United Kingdom
5. Environmental Health, Blaby District Council, Blaby, United Kingdom
6. Gastrointestinal Bacteria Reference Unit, National Infection Service, Public Health
7. Food Water and Environment Laboratory, National Infection Service, Public Health
8. Clinical Microbiology, Leicester Royal Infirmary, University Hospitals of Leicester
9. University of Nottingham, School of Medicine, Division of Epidemiology and Public

Correspondence: John Mair-Jenkins (john.mairjenkins@phe.gov.uk)

Following notification of a *Salmonella enterica* serovar Typhimurium gastroenteritis outbreak, we identified 82 cases linked to a restaurant with symptom onset from 12 February 2015 to 8 March 2016. Seventy-two cases had an isolate matching the nationally unique whole genome sequencing profile (single nucleotide polymorphism (SNP) address: 1.1.1.124.395.395). Interviews established exposure to the restaurant and subsequent case–control analysis identified an association with eating carvery buffet food (adjusted odds ratios (AOR): 20.9; 95% confidence interval (CI): 2.2 – ∞). Environmental inspections, food/water testing, and a food trace-back investigation were inconclusive. Repeated cycles of cleaning were undertaken, including hydrogen peroxide fogging, however, transmission continued. After 7 months of investigation, environmental swabbing identified 106 isolates from kitchen surfaces and restaurant drains matching the outbreak profile. We found structural faults with the drainage system and hypothesised that a reservoir of bacteria in drain biofilm and underfloor flooded areas may have sustained this outbreak. Ineffective drain water-traps (U-bends) may have also contributed by allowing transmission of contaminated aerosols into the kitchen environment. These findings suggest that routine swabbing of sink drain points and inspection of drainage systems should be considered in future outbreak scenarios.

The same strain was isolated from several environmental (drains, floors, equipment, etc.) surfaces in this restaurant

Table 3

Summary of environmental samples (n = 375) with isolates implicated in a Salmonella outbreak (n = 106) by whole genome sequencing, United Kingdom, March 2015–May 2016

Sample date	Water samples (n)	Food samples (n)	Environmental samples (n)	WGS positive isolates within five SNP clade(n)	Positive sample source
Mar 2015	1	0	26	0	NA
Jun 2015	0	1	16	0	NA
Sep 2015	1	2	27	0	NA
Nov 2015	0	0	19	1	Sinks/wash hand basins
				7	Cleaning materials
				3[a]	Sewer swabs
Dec 2015	0	0	67	5	Kitchen cloths
				2[a]	Sinks/wash hand basins
				2[a]	Cleaning materials
Jan 2016	6	9	47	15	Surface and deep drain swabs
				4	Kitchen cloths
				12[a]	Sinks/wash hand basins
				4	Meat sink waste trap
				7	Floor swabs
				10	Kitchen surface swabs
Feb 2016	1	0	42	19	Surface and deep drain swabs
				1	Sinks/wash hand basins
Mar 2016	0	0	41	12	Surface and deep drain swabs
Apr 2016	0	0	59	0	NA
May 2016	0	0	10	0	NA
Total	9	12	354	106	NA

NA: not applicable; SNP: single nucleotide polymorphism; WGS: whole genome sequencing.

[a] Three isolates matched outbreak sequence (0 SNP difference).

[b] One isolate matched outbreak sequence (0 SNP difference).

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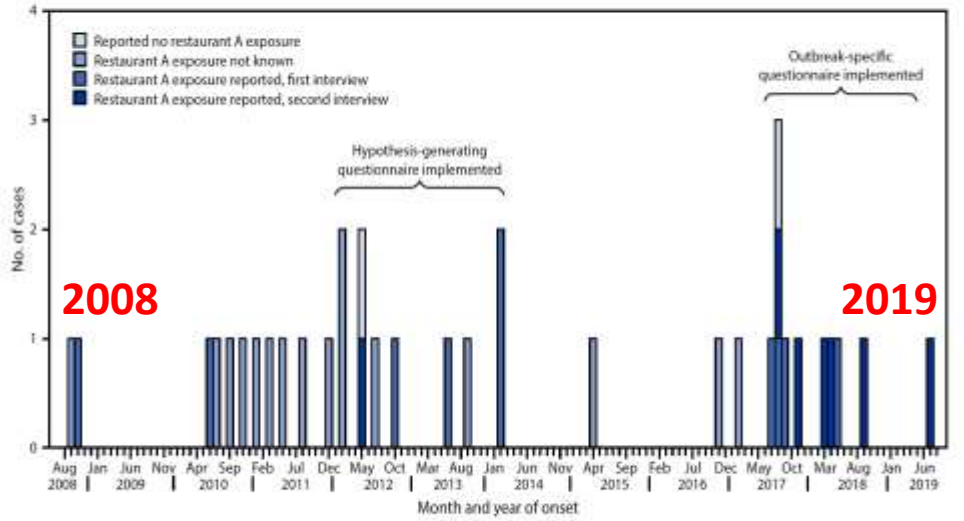
How do floors play a role in cross contamination of foods when this leads to foodborne disease outbreaks

Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 70 / No. 33
August 20, 2021

Protracted, Intermittent Outbreak of *Salmonella* Mbandaka Linked to a Restaurant — Michigan, 2008–2019

William D. Nordstrom, MD[1,2]; Bethany Reimink, MPH[3]; Katherine D. Arends, MPH[3]; Douglas Potter, MBA[1]; Justin J. Henderson, MPH[3]; Stephen Dietrich, MS[3]; Mary Franke, MPH[3]

FIGURE. Cases of *Salmonella* Mbandaka outbreak subtype (N = 35), by month and year of illness onset* and restaurant A exposure — Michigan, September 2008–July 2019†



* Onset date was missing for five patients; for these cases, the date of referral to the health department was used.
† Pulsed-field gel electrophoresis was performed only on the top 20 *Salmonella* serotypes submitted to the Michigan Department of Health and Human Services Bureau of Laboratories from approximately 2009 to early 2010; the *Salmonella* Mbandaka serotype was rare and not a top 20 serotype.

Reported in 2021 in the United States

- An outbreak from the same strain of *Salmonella* from only one restaurant over the course of 10 years
- Different employees also had illness from the same strain
- The same strain was isolated from several environmental surfaces in this restaurant

Sporadic cases of illness over time from the same strain of pathogen from the same source of all cases

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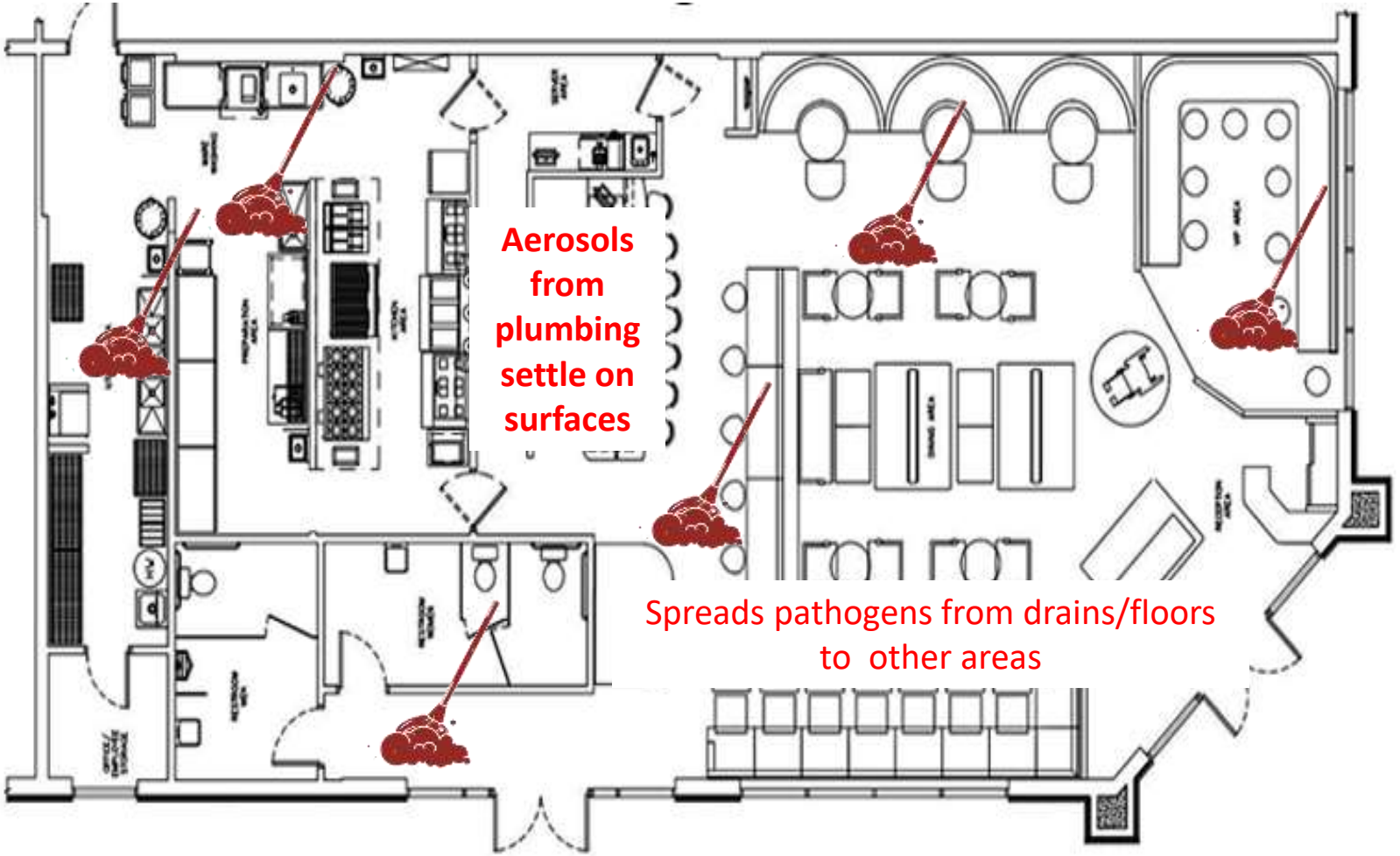
The same strain was isolated from several environmental (drains, floors, equipment, etc.) surfaces in this restaurant

TABLE. Characteristics of *Salmonella* Mbandaka outbreak subtype isolates from symptomatic patients, asymptomatic restaurant A employees, and restaurant A environmental surfaces — Michigan, August 2008–June 2018

Source of isolate	No. of samples collected	No. (%) of isolates identified by PFGE	No. (%) of isolates identified by WGS	Isolation date or date range	Clade by cgMLST
Symptomatic patient	36	36 (100)	30 (83)	2008–2012	B
				2012–2014	C
				2015–2018	A
Asymptomatic employee*	100	5 (5)	5 (5)	Jun 2018	A
Environment (restaurant)	80	39 (49)	26 (33)	Jun 2018	A
Environment (restaurant)	81	11 (14)	10 (12)	Nov 2018	A

Abbreviations: cgMLST = core genome multilocus sequence typing; PFGE = pulsed-field gel electrophoresis; WGS = whole genome sequencing.
* Five isolates were analyzed from four asymptomatic employees.

How could mops play a role in cross contamination of foods when this leads to foodborne disease outbreaks



How could restaurant operators reduce the risk of cross contamination of foods that can lead to foodborne disease outbreaks

Select sanitizers that kill foodborne pathogens quickly

- Does the sanitizer kill all foodborne pathogens (look at the label)
- Does the sanitizer kill pathogens quickly (too much time reduces compliance)
- Does the sanitizer have a means to ensure it remains effective during storage
- Are employees cleaning a surface with a cleaning agent before sanitizing it

How could restaurant operators reduce the risk of cross contamination of foods that can lead to foodborne disease outbreaks

Designate where mops can be used by color coding to reduce spread of pathogens from one area to anther

How could restaurant operators reduce the risk of cross contamination of foods that can lead to foodborne disease outbreaks

Be prepared to clean up body fluid spills properly – **never use a mop**

Must have an Emergency Operating Procedure (EOP)

The risk

- Employee or customer vomits in establishment
- Employee and/or cleaning tools contaminated by *Norovirus*
- *Norovirus* contaminates food
- Most food contact surface sanitizers do not kill *Norovirus*
- Large foodborne disease outbreak

No mop allowed for vomiting event clean up

NO MOPS

How could restaurant operators reduce the risk of cross contamination of foods that can lead to foodborne disease outbreaks

Use single-use mop heads -preferrable microfiber- in areas where highest risk of pathogens on floors exist (e.g., kitchen and restrooms)

NO MOPS

And use for all body fluid spills

How could restaurant operators reduce the risk of cross contamination of foods that can lead to foodborne disease outbreaks

Use single-use mop heads -preferrable microfiber- in areas where highest risk of pathogens on floors exist (e.g., kitchen and restrooms)

Contec® Healthcare — Critical Care

Clinical Advantages of Disposable Microfiber Mops

David J. Flynn
Peter K. Kang, Ph.D.
K. Mark Wiencek, Ph.D.

A study of hygiene and microfiber products for

Overview

The need

The solution

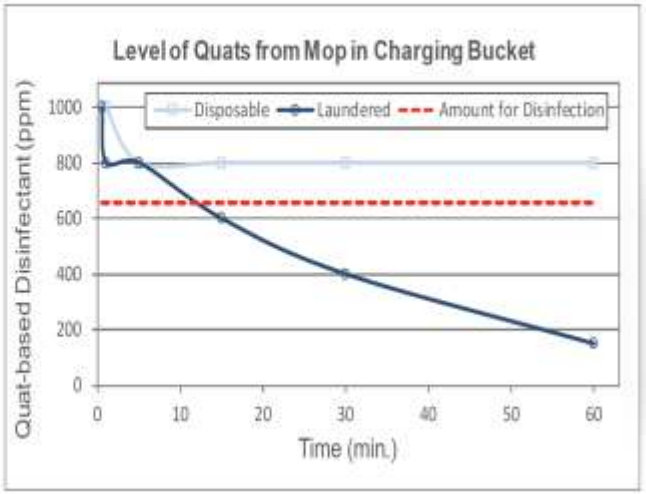
The benefit

Introduction

Study Parameters

CONTEC

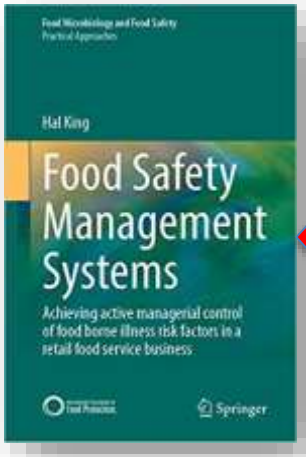
Figure 8 *Levels of quat disinfectant in residual solution sampled from the mop when applied using a laundered versus disposable microfiber mop.*



To ensure chemical disinfectants retain their efficacy

NO MOPS

How could restaurant operators reduce the risk of cross contamination of foods that can lead to foodborne disease outbreaks



Fast Food Restaurants	Non-existent FSMS	Well-developed FSMS
Average # of out of compliance items	4.5	1.7

Full-Service Restaurants	Non-existent FSMS	Well-developed FSMS
Average # of out of compliance items	5.8	2.1

The FDA has shown that Food Safety Management Systems (FSMS) reduce foodborne illness risk in restaurants

What do restaurants need to continue post pandemic to reduce all foodborne illnesses risk

The most effective controls for the prevention of both of these viral diseases in foodservice are similar

1. Ensure **employee wellness (symptoms screening) checks** at each shift (under your Health Policy -all employees know)
2. Ensure **personal hygiene** controls are in place at all times
   - Hand washing and proper hand sanitizer use
   - Proper use of PPE (face coverings and mask use)
   - Proper use of gloves
3. Ensure **environmental contamination controls** to reduce the risk of virus transmission to both employees and food (cleaning and sanitation/disinfection)
4. Ensure use of a **Food Safety Management System (FSMS)**
   - Defined SOP's
   - Defined training
   - Defined monitoring of controls
5. Ensure a **Certified Food Protection Manager (CFPM)** as the PIC at all shifts to manage the FSMS
6. Location (social) distancing of customer seating

A focus on High-Touch Surfaces and floors

All of this!

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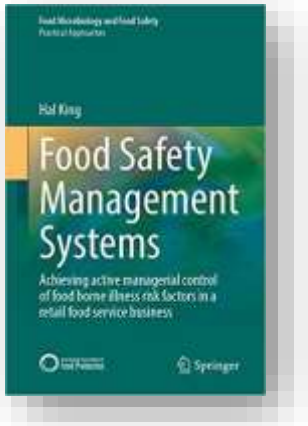
Your Questions?

Active Food Safety by phj

Additional resources



Thank you