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An Evaluation of the Prevalence of VRE and MRSA in Hospital Food

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Abstract

This prospective cohort study evaluated the presence of MRSA and VRE in the food of hospitalized patients. 149 patients were enrolled and 910 food specimens cultured; 3.2% were positive for MRSA and 2.4% positive for VRE, from a variety of food types.

Keywords

MRSA; VRE; food; colonization

Introduction

Methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococci* (VRE) are associated with significant patient morbidity and mortality.[1] MRSA and VRE have been found in retail foods, primarily animal products,[2–6] but the role of hospital food in MRSA and VRE transmission in healthcare facilities is unknown. The purpose of this study was to determine the prevalence of MRSA and VRE in hospital food, with an emphasis on foods actually consumed by hospital patients.

Methods

This prospective cohort study was conducted at Barnes-Jewish Hospital, a 1,250 bed tertiary care center in St. Louis, MO from May 2011 through July 2012 in conjunction with a study of *Clostridium difficile* in hospital food.[7] Our methods have been described previously.[7,8]

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Briefly, patients on medical and surgical wards collected food samples from their meals in sterile specimen cups (1 cup per meal; ≥1 food item per cup); this ensured that the foods sampled were those consumed by patients. Food specimens were frozen at −30°C; prior to culture, specimens were thawed, combined with 10mL of sterile water, and homogenized for 1 minute. 1 mL of food homogenate was added to TSB broth with 6.5% NaCl then incubated overnight at 35°C. The broth was sub-cultured on to sheep's blood agar (Hardy Diagnostics), Spectra MRSA (Remel), and chromID VRE (bioMerieux). The VITEK MS MALDI-TOF MS was utilized to identify *S. aureus* or *Enterococcus* spp. Susceptibility testing was performed using Kirby Bauer Disk Diffusion in accordance with CLSI standards[9] and SCC*mec* typing was performed.[10]

Data were collected from patient interviews, chart review, and Medical Informatics queries, including MRSA and VRE clinical laboratory results from one year pre-enrollment to one year post-enrollment. Data analyses were descriptive (SPSS version 21, IBM, Armonk, NY). The study was approved by the Washington University Institutional Review Board.

Results

149 patients were enrolled in the study and 910 food specimens were collected (median = 5 specimens per patient; range 1 – 24). The median age was 55 years (range, 23 – 90) and 80 (54%) were female. 8 (5%) of patients had clinical cultures (infection and/or surveillance) positive for MRSA and 7 (5%) with VRE in the year before enrollment.

Overall, 17 (11%) patients had ≥1 food specimen positive for MRSA and 17 (11%) had ≥1 food specimen positive for VRE. MRSA was cultured from 29 (3.2%) and VRE from 22 (2.4%) specimens (some patients had >1 positive specimen). Of the 29 MRSA positive isolates, 9 (31%) were SCC*mec* II, 2 (7%) were SCC*mec* III, and 18 (62%) were SCC*mec* IV. Notably, 7 SCCmec IV isolates came from a single patient (39% of SCC*mec* IV isolates). MRSA and VRE were cultured from every food category except nuts (Table 1). VRE was recovered from 5% of dairy/egg specimens and MRSA from 5% of bread/grains and "other" specimens; for all other foods, the culture positivity rate was <5%.

Only 4 (3%) patients had a clinical culture positive for MRSA or VRE after having positive food without a previous clinical history of MRSA or VRE. Patient A had MRSA isolated from urine 28 days after positive food (SCC*mec* IV). Patient B had 2 positive MRSA surveillance screens 48 and 50 days after positive food; this patient had MRSA cultured from food on 5 separate days and was responsible for 7 of the SCC*mec* IV isolates. Patient C had *E. faecalis* cultured from food 23 days before a positive VRE surveillance screen; between the food and screen dates, the patient had 2 urine specimens positive for *Enterococcus* (1 vancomycin susceptible, the other unknown) and 1 blood culture positive for *E. faecalis* (vancomycin susceptible). Patient D had 2 food specimens positive for MRSA and *E. faecalis* on 2 separate days, and a VRE surveillance screen positive >3 months after the positive food specimens.

Discussion

To the best of our knowledge, ours is the first study to evaluate the presence of MRSA and VRE in the food of hospitalized patients. We previously found that food is unlikely to be a significant source of *C. difficile* acquisition for hospitalized patients.[7] The prevalence of MRSA and VRE found in food in the current study (3.2% and 2.4%, respectively) was higher than the prevalence of *C. difficile* (0.2%), but the overall contamination rate was still low.

While this study was not designed to determine conclusively whether patients acquired MRSA or VRE from their hospital food, our results suggest acquisition via food may be rare. Additionally, patients enrolled in this study collected their own food specimens; thus, we cannot rule out that the patients themselves may have been the source of the contamination. Of the 4 patients with positive MRSA/VRE clinical cultures after positive food and no prior clinical history of MRSA/VRE, 2 had MRSA/VRE cultured from food specimens on >1 day. Because the overall food contamination rate was low, this pattern suggests patient contamination. Thus, prior clinical history or possible self-contamination may eliminate the possibility of food acquisition in all but 2 patients (1%).

While MRSA and VRE have been documented in retail food previously, the comparability of prior results to our study is unknown.[2,3,5,6] The effect of food preparation on the bacterial burden in hospital food is unknown. Despite these limitations, our study indicates MRSA and VRE can be present in the food of hospitalized patients, and the implications of this finding warrant additional study.

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Table 1.

MRSA, MSSA, and VRE positive food specimens, by food type (N=149 patients; 910 food specimens)[a]

Food item	Number of samples (N=910)[b]	MRSA positive (N [%])	VRE positive (N [%])
Meat	308	7 (2)	9 (3)
Poultry	142	2 (1)	2 (1)
Fruit	179	2 (1)	2 (1)
Vegetable	455	14 (3)	5 (1)
Nuts	1	0	0
Dairy/eggs	210	7 (3)	11 (5)
Bread/grains	376	19 (5)	12 (3)
Other	200	9 (5)	3 (2)
Other (list)		Veggie burger, sauce, pudding, jelly, gravy (2), fish, cake (2)	Gravy (2), fish

[a]Percentages are number of positive specimens / all food items of that type.

[b]More than one food item could be included in a sample