ljm Libyan Journal of Medicine

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LETTER TO THE EDITOR

Identification of multidrug-resistant bacteria and *Bacillus cereus* from healthcare workers and environmental surfaces in a hospital

Nosocomial (hospital-acquired, healthcare-associated) infections are a serious health problem worldwide. It is estimated that nosocomial infections account for 10–15% and more than 40% of hospitalizations in developed and developing countries, respectively (1). A wide spectrum of organisms has been associated with nosocomial infections; however, the most common nosocomial pathogens have been methicillin-resistant *Staphylococcus aureus* (MRSA) and drug-resistant gram-negative bacteria (2). Outbreaks of nosocomial infections initiated by colonized healthcare workers (HCWs) have been reported previously (3). In addition, several studies suggest that contaminated environment surfaces (e.g. medical instruments) may play a role in the transmission of nosocomial pathogens (4, 5).

In the summer of 2013, premoistened sterile cotton-tipped swabs were used to collect specimens from the anterior nares and hands of 25 healthcare workers (HCWs) and from 30 environment surfaces (ES) (medical equipment [n = 10], bed rails [n = 10], and floors [n = 10]) in the intensive care unit (ICU) and operation theatre (OT) of Elkhomes hospital, Elkhomes, Libya. Within 3 h of collection, swabs were plated on blood and MacConkey agars and incubated at 37°C overnight. Suspected colonies were identified phenotypically using standard bacteriological procedures (6) and the BD Phoenix Automated Microbiology System (PAMS, MSBD Biosciences, Sparks, MD, USA), according to the manufacturer instructions. Antimicrobial susceptibility of the isolated staphylococci was determined by the disc-diffusion methods according to the guidelines of the Clinical and Laboratory Standards Institute (7). Susceptibility of staphylococci to methicillin was determined by the cefoxitin disc-diffusion method.

We found *Staphylococcus* spp. (76.4% [42/55]) and *Bacillus cereus* (27.3% [15/55]) were the most commonly isolated organisms from HCWs and ES in ICU and OT of Elkhomes hospital. Three *S. aureus* were isolated from the anterior nares of HCWs and one of them was MRSA. However, *B. cereus* was isolated from the hands of three HCWs. Table 1 shows species of bacteria isolated from HCWs and ES in Elkhomes hospital.

B. cereus is a Gram-positive spore-forming facultative-anaerobic rod-shaped organism that can be found in different types of soils and widely distributed in the environment. Although the organism is mainly associated with outbreaks of food poisoning, several nosocomial outbreaks in ICUs due to *B. cereus* have been reported in the past (8–10). Poor disinfection procedures and contaminated medical equipment were associated with such outbreaks.

High resistance rates to commonly used antimicrobials in Libya was observed among 42 staphylococci isolates from Elkhomes hospital; 97.6% were resistant to

Table 1. Bacteria isolated from healthcare workers (HCWs) and environment surfaces (ES) in Elkhomes hospital

Organism	No (%) positive		
	HCWs (*n* = 25)	ES (*n* = 30)	Total (*n* = 55)
Staphylococcus aureus	3 (12)	0 (0.0)	3 (5.5)
S. haemolyticus	3 (12)	7 (23.3)	10 (18.2)
S. hominis	5 (20)	4 (13.3)	9 (16.4)
S. epidermidis	3 (12)	1 (3.3)	4 (7.3)
S. cohnii subsp. *cohnii*	1 (4)	2 (6.7)	3 (5.5)
S. kloosii	1 (4)	2 (6.7)	3 (5.5)
S. saprophyticus	1 (4)	1 (3.3)	2 (3.6)
S. capitis subsp. *ureolyticus*	1 (4)	1 (3.3)	2 (3.6)
S. capitis subsp. *capitis*	2 (8)	0 (0.0)	2 (3.6)
S. lentus	1 (4)	1 (3.3)	2 (3.6)
S. gallinarum	1 (4)	0 (0.0)	1 (1.8)
S. equorum	1 (4)	0 (0.0)	1 (1.8)
Micrococcus luteus	1 (4)	0 (0.0)	1 (1.8)
Bacillus cereus	3 (12)	12 (40)*	15 (27.3)
Paenibacillus alvei	0 (0.0)	1 (3.3)	1 (1.8)
Lysinbacillus sphaericus	0 (0.0)	1(3.3)	1 (1.8)
Corynebacterium matruchotii	1 (4)	0 (0.0)	1 (1.8)
Pantoea agglomerans	0 (0.0)	1 (3.3)	1 (1.8)
Ralstonia pickettii	1 (4)	0 (0.0)	1 (1.8)
Pseudomonas putida	1 (4)	0 (0.0)	1 (1.8)
Acinetobacter baumanni	0 (0.0)	1 (3.3)	1 (1.8)
Acinetobacter lwoffii/haemolyticus	1 (4)	0 (0.0)	1 (1.8)

*Significantly higher than prevalence among HCWs ($P < 0.03$, OR = 4.89).

Citation: Libyan J Med 2014, **9**: 25794 - http://dx.doi.org/10.3402/ljm.v9.25794

ampicillin, 66.7% to amoxicillin–clavulanic acid, cefotaxime, imipenem, and methicillin, 26.2% to gentamicin, 38.1% to ciprofloxacin, 71.4% to erythromycin, and 31% to trimethoprim–sulfamethoxazole. On the other hand, low-resistant rates were observed to daptomycin (2.4%), linozolid (2.4%), and teicoplanin (9.5%). Multidrug resistance (resistance to three drugs or more) was detected among 59.5% (25/42) of staphylococci isolates examined. In addition, both *Acinetobacter* spp. isolated in the present investigation were susceptible only to ciprofloxacin and both were resistant to nearly all other antimicrobials tested, including aztreonam, piperacillin–tazobactam, and ertapenem.

In conclusion, we isolated MRSA, MDR bacteria, and *B. cereus* from HCWs and ES in Elkhomes Hospital. Thorough environmental cleaning and adequate hand hygiene of HCWs may help prevent the spread of such organisms to patients, particularly to those with lowered immunity.

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