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Letters to the Editor

Analysis of awareness and knowledge about *Mycobacterium chimaera* invasive infections among doctors and medical students

Sir,

Since 2013, a growing number of *Mycobacterium chimaera* infections, often fatal, in patients who had undergone cardiothoracic bypass surgery have been notified in several European countries (including Switzerland, Germany, the Netherlands, the UK, Italy, Spain, Belgium and Denmark), the USA, Canada and Australia; the problem is now developing into a global outbreak [1]. Healthcare workers' knowledge concerning this pathogen is critical to identify individual infected patients, and to attempt to control the outbreaks. However, we found no studies in the medical databases about general hospital staff knowledge of *M. chimaera*.

We carried out a survey of doctors and final-year medical students from different clinical specialties at Divina Misericordia Hospital, a Colombian secondary referral hospital with >300 beds. Medical staff were identified through the hospital's employment databases. Following a pilot study, a structured true/false questionnaire designed to assess knowledge and awareness about *M. chimaera* cardiac infections was compiled. The questionnaire was distributed in paper and electronic form. All responses were anonymous. In total, 93 completed questionnaires were analysed (42 doctors, 51 medical students).

The results show poor general knowledge and awareness about *M. chimaera* cardiac infections among doctors and medical students (Table I). No significant difference was observed between the two groups. Of particular concern, only approximately 16% of respondents were aware of the global outbreak of *M. chimaera* infections in patients who had undergone open heart surgery. It is surprising that as many as 22% of respondents did not agree that mycobacterial aetiology should be addressed in cases of cardiac infection, especially in blood culture-negative endocarditis, a condition that is relatively frequent in Colombia, where some studies show it accounts for up to 33% of all cases of endocarditis [2].

Only one-quarter of participants recognized the antecedent of previous cardiothoracic surgery as a risk factor for *M. chimaera* invasive infection. Approximately half of the sample were aware that patients may not experience any symptoms for months to years after surgery, and the identification of *M. chimaera* should be performed by qualified laboratories. Most respondents (89% doctors, 71% medical students) knew that *M. chimaera* is an infrequent cause of infection, but less than half recognized the high fatality rates associated with these invasive infections.

To our knowledge, this is the first study conducted worldwide with the aim of providing a preliminary snapshot of knowledge and awareness about *M. chimaera* in cardiac infections amongst doctors and medical students. Despite the limitations associated with a relatively small convenience sample, there is scope for improvement of clinical suspicion of *M. chimaera* in patients with cardiac infections who had undergone open heart surgery. These results are consistent with the low scientific output about this emerging issue in developing countries [3], including Latin America and Colombia, where no cases have been reported, probably due to the lack of diagnostic assays and low awareness about this emerging

Table I
Summary of correct questionnaire responses from doctors and medical students about *Mycobacterium chimaera*

Statements	Correct answer	Doctors ($N = 42$)	Medical students ($N = 51$)
Mycobacterial aetiology should be addressed in cases of cardiac infection	True	23%	21%
Currently there is a global outbreak of *M. chimaera* infections in patients who have undergone open heart surgery	True	17%	15%
Previous cardiothoracic surgery is not a risk factor for *M. chimaera* infection	False	26%	25%
Patients may not experience any symptoms for months to years after surgery	True	47%	43%
Identification should be performed by qualified laboratories for clinically significant isolates	True	44%	47%
M. chimaera infection is a frequent issue	False	89%	71%
M. chimaera invasive infection has a high fatality rate	False	41%	39%

pathogen among healthcare workers [4], as observed in this study. A lack of experience on how to approach and manage cases remains a major challenge in unaffected countries. Informational and educational tools are required, particularly in cardiothoracic centres.

Conflict of interest statement
None declared.

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Evaluation of microbiological screening in a neonatal intensive care unit to optimize empiric antibiotic use

Sir,

Bacterial infections are a major cause of morbidity and mortality in newborn infants, and treatment with an appropriate antibiotic agent is essential. Bacteria causing nosocomial infections colonize the patient's mucosa and gastrointestinal tract prior to an infection [1]. We implemented screening for colonizing bacteria that were considered in deciding on empiric antibiotic therapy and evaluated the implications of such microbiological screening for clinical practice.

All inpatients hospitalized for at least three days in our tertiary care neonatal intensive care unit (NICU) were systematically screened with weekly pharyngeal and rectal swabs over 22 months. The swabs were analysed using routine methods by the clinical microbiology laboratory at our University Medical Center. Target bacteria were: (i) multidrug-resistant (MDR) bacteria: meticillin-resistant *Staphylococcus aureus* (no patients), vancomycin-resistant enterococci (no patients), and multidrug-resistant Gram-negative bacteria: MDR *Klebsiella pneumoniae* (six patients), MDR *E. coli* (six patients), and MDR *Enterobacter cloacae* (nine patients); (ii) bacteria causing invasive infections: *Acinetobacter* spp. (six patients), *Klebsiella pneumoniae* (eight patients), *Staphylococcus aureus* (12 patients); (iii) highly pathogenic bacteria: *Serratia marcescens* (three patients), *Pseudomonas aeruginosa* (five patients), and *Enterobacter* spp. (30 patients). *Enterobacter* spp. are known to develop resistance to third-generation cephalosporins during antibiotic therapy due to inducible resistance genes and were thus considered potentially to be MDR. Of 204 included patients, 83 had a gestational age $<$32 weeks and 85 a birth weight $<$1500 g. Sixty out of 204 patients (29%) were colonized with one to five different target bacteria. The most frequently isolated bacteria in our NICU and the occurrence of MDR are comparable to other reports [2,3]. Three clusters of colonized patients (definition: $\geq$4 patients colonized simultaneously) were recorded: two clusters of *Enterobacter* spp. and one cluster of ESBL-producing *E. coli*. None of these clusters of colonized patients was followed by clusters of infectious episodes. Clinically undetected clusters have been described previously and probably occur repeatedly [4,5]. Episodes of nosocomial infection were defined as invasive infections occurring after 72 h of admission (Table I). Primary sepsis, necrotizing enterocolitis, and pneumonia were recorded according to previously described case definitions [7]. Peritonitis was defined as clinical symptoms and laboratory changes as for sepsis plus positive peritoneal culture. Standard empiric treatment for nosocomial infection consisted of cefotaxime and vancomycin. Patients colonized with MDR or potential MDR were treated with meropenem and vancomycin. Patients colonized with *Pseudomonas aeruginosa* were treated with ceftazidime. The incidences of infection in infants with a birth weight $<$1500 g were low: bloodstream infection (BSI) 12%, Gram-negative BSI 0.5%, and MDR-related infection 0.5%. Three episodes of infections were attributed to bacteria previously identified by the screening. The patient who suffered from a BSI due to *P. aeruginosa* was colonized with three different bacteria prior to the infection: MDR *Klebsiella pneumoniae*, *Enterobacter cloacae* and *P. aeruginosa*. He was treated with third-generation antibiotics vancomycin and meropenem until the blood culture result revealed *P. aeruginosa*. The other two patients were not colonized with other relevant bacteria. A further 17 out of 44 episodes of nosocomial infection occurred in nine patients on whom MDR or potentially MDR had been detected previously. These nine patients received meropenem as adapted empiric antibiotic therapy during 16 episodes of nosocomial infection. In one episode, meropenem was not used. Three of 204 resistant pathogen-colonized patients suffered from a nosocomial infection caused by bacteria that were previously identified by the screening programme, and we