acid sequences were identical to IMP-1 carbapenemase and, hence, different from other known IMP variants. PFGE showed that the three isolates belonged to a single strain; nevertheless, no epidemiological link was identified between the renal and haematology patients, or with hospitals elsewhere in the UK or overseas.

This is the first identification of E. cloacae with an IMP carbapenemase in the UK based on submissions to HPA Microbiology Services, Colindale. It is part of a pattern whereby carbapenemase production is becoming more widespread in the Enterobacteriaceae, though, generally, KPC, NDM and VIM enzymes are more frequent than IMP types.6–6 The emergence of carbapenemases, which is often linked, as here, to resistance to multiple other drug classes, is a great public health concern. Producer strains should be actively sought to prevent their transmission among patients.

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Transparency declarations

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Trends in carbapenemase-producing Escherichia coli and Klebsiella spp. from Europe and the Americas: report from the SENTRY antimicrobial surveillance programme (2007–09)

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Sir,

A large number of acquired carbapenemases have been identified and characterized among Gram-negative pathogens. These diverse enzymes, belonging to either molecular classes A and D (serine carbapenemases and oxacillinases) or molecular class B [metallo-β-lactamases (MBLs)], have emerged on a global scale and represent serious public health challenges, compromising therapeutic choices and complicating patient management.1–3

Genes encoding carbapenemases are associated with mobile genetic elements that allow rapid dissemination in the clinical setting. Therefore, detection and surveillance of carbapenemase-producing organisms have become matters of major importance for the selection of appropriate therapeutic schemes and the implementation of infection control measures.1–3

In this study, we analysed the rates of carbapenem resistance and carbapenemase production among a total of 15948 isolates of Escherichia coli (n=10 432) and Klebsiella spp. (n=5516) consecutively collected during 2007–09, which were evaluated as part of the SENTRY antimicrobial surveillance programme.

E. coli and Klebsiella spp. were sampled from 83 medical centres located in the USA, Europe and Latin America (30, 10 and 43 institutions, respectively). These consecutive non-duplicate isolates were cultured from bloodstream, respiratory tract, and skin and skin structure infections. Isolates were tested for antimicrobial susceptibility using the 2009 CLSI broth microdilution method4 and results were interpreted according to the M100-S20-U document (CLSI, 2010).5 E. coli ATCC 25922 and Pseudomonas aeruginosa ATCC 27853 were concurrently tested for quality assurance; all results were in the CLSI published range.5

Overall, resistance to imipenem and/or meropenem (MIC values ≥2 mg/L) was observed among 2.0% (323/15948) of the E. coli (n=29) and Klebsiella spp. (n=294; 281 Klebsiella pneumoniae and 13 Klebsiella oxytoca) isolates (Table 1). All 323 isolates resistant to imipenem or meropenem were tested with the modified Hodge test (MHT)5 using imipenem and meropenem discs, and
among E. coli 3.8%, respectively (Table 1). Resistance and carbapenemase production were 5.3% and 2009, respectively detected by MHT in 2009 [ ] carbapenemase production. In the first 2 years, carbapenemase a n da n a l y s e s by ear d e m o n s t r a t e d a ni n c r e a s i n gt r e n dt o w a r d 3 years surveyed [ ] P 2007 and 2008, respectively, to 27 isolates in 2009. The number of OXA-48-producing isolates in Turkish hospitals increased from 2 and 6 isolates in hospitals in 2007 and 2008. The number of OXA-48-producing KPC-2-producing isolates were found in four hospitals located (Argentina) in 2007–08; however, in 2009, a total of 10 One KPC-producing isolate was detected in Latin America ted in all regions, with a high prevalence in the USA and Israel. Genes encoding OXA-48 (38 isolates) and IMP-type enzymes (2 isolates) were detected in Europe and Latin America. VIM-type enzymes (30 isolates) were observed only in Europe, and KPC serine carbapenemases (158 isolates) were documented in all regions, with a high prevalence in the USA and Israel. One KPC-producing isolate was detected in Latin America (Argentina) in 2007–08; however, in 2009, a total of 10 KPC-2-producing isolates were found in four hospitals located in Brazil and Argentina. OXA-48-producing isolates were detected in Turkey in all studied years and in two Argentinean hospitals in 2007 and 2008. The number of OXA-48-producing isolates in Turkish hospitals increased from 2 and 6 isolates in 2007 and 2008, respectively, to 27 isolates in 2009. In contrast, MBL production rates were stable throughout the 3 years surveyed [P=0.3836; OR 1.64 (95% CI 0.49–5.74)]. The increase in MBL production observed in 2008 was due to the detection of 17 VIM-like isolates in Greek hospitals (epidemic clone); however, the institutions from that country were not sampled during 2007 or 2009. MBLs were mainly noted in Europe. VIM enzymes (VIM-1 and -2) were found in Spain, Italy, Turkey and Greece. Only one MBL-harbouring isolate was detected in Latin America, an IMP-18-producing K. oxytoca from Mexico. The NDM-1-encoding gene was not detected. Only five strains (all K. pneumoniae) showed repeatedly discrepant results between MHT and PCR. One blaOXA-48 and one blaKPC-2-carrying strain were negative for MHT. Three strains (one from Turkey and two from the USA) were positive for MHT and negative for PCR. Carbapenemase production significantly increased in this systematic evaluation of a contemporary worldwide E. coli and Klebsiella spp. collection, whereas MBL rates were stable over the study period or associated with local epidemic, clonal occurrences. The dissemination of KPC-producing isolates in all geographical regions and of OXA-48 in Turkish hospitals contributed directly to the described escalating resistance trends. Carbapenemase production cannot be inferred from the antimicrobial resistance profile; thus, the dissemination of these enzymes must be closely monitored (molecular and/or phenotypic tests (MHT)) and strategies implemented, as effective surveillance initiatives.\textsuperscript{7,8}

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Sepsis in neonates due to imipenem-resistant Klebsiella pneumoniae producing NDM-1 in India

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Sir,

Treatment of neonatal infections is becoming increasingly difficult due to multidrug-resistant organisms. Carbapenems are the last resort for the treatment of severe infections, however, the emergence of carbapenemases in Enterobacteriaceae has left the clinician cornered with very few options. Recently a new carbapenemase designated New Delhi metallo-β-lactamase (NDM-1) was identified in Klebsiella pneumoniae. Most reported cases of infection with NDM-1 producers have involved adult patients. This communication reports the presence of blaNDM-1 in two isolates of K. pneumoniae from neonates admitted to a neonatal intensive care unit (NICU) at a tertiary care centre in India.

The first neonate was clinically septic. Imipenem-resistant K. pneumoniae (Kp-1) was isolated from an endotracheal aspirate, but blood culture was negative. The patient was started on colistin, however, the parents removed the child from the hospital against medical advice and the patient was lost to follow-up. The other neonate was born at a different hospital and was admitted to the NICU with suspected sepsis. Blood culture yielded imipenem-resistant K. pneumoniae (Kp-2). A combination of colistin and minocycline was given for a period of 10 days, after which the patient recovered and was discharged.

The identity of the isolates was confirmed by an ID 32 E kit (bioMérieux, Marcy l’Étoile, France). A disc diffusion test using antibiotics (BD Diagnostics, Franklin Lakes, NJ, USA) was performed according to CLSI guidelines. MICs were determined using Etest (AB Biodisk, Solna, Sweden). MICS were also determined with 40 mg/L phenylalanine arginine β-naphthylamide (PAβN) (Sigma-Aldrich, St Louis, MO, USA). Testing with the cephalosporin/clavulanic acid combination disc test, modified Hodge test and imipenem/EDTA double-disc combination tests was also undertaken.

Both isolates were resistant to a range of antibiotics, including β-lactams, quinolones and aminoglycosides. Kp-1 was susceptible only to colistin and tigecycline, but Kp-2 was susceptible to colistin, tigecycline, tetracycline, minocycline and doxycycline (Table 1). Both isolates showed phenotypic evidence of carbapenemase, metallo-β-lactamase (MBL) and extended-spectrum β-lactamase (ESBL) production. Augmentation of the zone was noted in both isolates with ceftazidime, but not cefotaxime. Investigations of production of AmpC using cefoxitin, cefotixin with 3-aminocephalosporanic acid (APB (Sigma) and cefotixin plus APB containing EDTA (Sigma) were negative. PFGE performed following PulseNet standardized procedures with XbaI (http://www.cdc.gov/pulsenet/protocols.htm) demonstrated that the two isolates were clonally distinct (Figure S1, available as Supplementary data at JAC Online).

The MICs of imipenem were >32 mg/L and not affected by the presence of PAβN, indicating that efflux did not contribute to carbapenem resistance. To elucidate the mechanism of carbapenem resistance, PCR for blaOXA-23, blaVIM-Imp-SPM-1-GIM-1-SIM-1 and blaNDM-1 carried out as previously described. Detection of NDM-1 was performed by PCR with

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Table S1 is available as Supplementary data at JAC Online (http://jac.oxfordjournals.org/).