were equally discriminative; strains Ec 614 and Ec 782 had an identical pattern (pattern A), whereas Ec 461 was different (pattern B) by both of the typing methods.

The presence of the OXA-2 gene has been frequently detected in *Pseudomonas* and it was first reported in *E. coli* from Israel in 2005. To the best of our knowledge, the presence of this gene in *E. coli* is the first report from India and the second in the world. The implication/s of the recent detection of the OXA-2 group gene in *E. coli* needs further investigation and action.

Acknowledgements

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Transparency declarations

None to declare.

References

Of the 23 isolates, 7 were obtained from humans in Denmark and the remaining 16 were isolated in Thailand from: humans \((n = 6)\), chicken \((n = 5)\), pork \((n = 3)\) and beef \((n = 2)\). All 23 isolates carried the \(qnrS\) gene and sequencing revealed that it was the \(qnrS1\) variant. None of the isolates tested was positive either for \(qnrA\), \(qnrB\) or \(aac(6\prime)Ib\) genes and none showed mutations in the quinolone resistance determining regions (QRDR) sequenced. PFGE revealed seven different types although all were related (Figure 1) and some of the types could be observed in both countries in humans and foodstuffs. Some of the isolates were susceptible to all antimicrobials tested except ciprofloxacin, others were in addition resistant to streptomycin, sulfamethoxazole and tetracycline \((n = 16)\). In none of these isolates was resistance observed towards penicillins or cephalosporins and therefore we did not investigate the presence of ESBL genes in these isolates, although they are usually found in association with \(qnr\) genes.\(^7\)

This is the first report of \(qnr\) genes detected in 23 \(S.\) enterica Corvallis isolates and also the first report of \(qnr\) in \(Salmonella\) isolates from Denmark and Thailand.

The epidemiology of \(Salmonella\) infections in Denmark is complicated. It is interesting that isolates of the same serovar, with the same newly emerged resistance mechanisms and the same PFGE type were found in patients in Thailand, patients in Denmark and imported food products. Denmark has been importing an increasing amount of chicken meat, and much of the imported chicken originates from Thailand. These data support the possibility that some patients in Denmark acquired \(S.\) Corvallis from imported chicken meat from Thailand. We have recently indicated a similar phenomenon of infections with multidrug-resistant \(S.\) Schwarzengrund.\(^6\)

Regarding the detection of quinolone resistance, the presence of the \(qnr\) genes alone does not necessarily mediate full resistance to nalidixic acid and thus makes the use of nalidixic acid for screening for fluoroquinolone resistance unreliable. This is in contrast to the mutation-mediated resistance, where one mutation encodes low-level resistance to fluoroquinolones and full resistance to nalidixic acid. Low-level fluoroquinolone resistance is difficult to detect in routine diagnostic laboratories and these isolates might easily be considered susceptible especially when using diffusion testing. Further studies are needed on optimization of detection in clinical laboratories of low-level resistance.

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**Figure 1.** Comparison showing dendrogram of PFGE profiles after \(XbaI\) digestion and observed antimicrobial susceptibility results (MIC) for the 23 \(Salmonella\) Corvallis strains. Black square, resistant; grey square, intermediate susceptibility; white square, susceptible; AUG2, amoxicillin-clavulanic acid; AMP, ampicillin; APR, apramycin; POD, cefpodoxime; XNL, cefotaxime; CHL, chloramphenicol; CIP, ciprofloxacin; FFN, florfenicol; GEN, gentamicin; SPE, spectinomycin; STR, streptomycin; SMX, sulfamethoxazole; TET, tetracycline; TMP, trimethoprim; CEP, cefepime; COL, colistin; NAL, nalidixic acid; NEO, neomycin. CLSI breakpoints were used for the interpretation of results except for ciprofloxacin where low-level resistance was considered (MIC >0.06 mg/L).
Since antibiotic-lock therapy (ALT) was first proposed in 1988 to its relatively high failure rate.1 This report describes the use treating catheter-related fungal infections has been disputed due as a solution to catheter-related biofilm infections, its value for Sir, Fax: +886-2-23934749; E-mail: pinging@ntu.edu.tw

Keywords: candidiasis, macrolides/azalides, catheter-related infections

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Sir,

Since antibiotic-lock therapy (ALT) was first proposed in 1988 as a solution to catheter-related biofilm infections, its value for treating catheter-related fungal infections has been disputed due to its relatively high failure rate.1 This report describes the use of ALT to treat catheter-related Candida parapsilosis candidae mia. Additionally, a catheter insertion site infection by Staphylococcus aureus was successfully treated with ALT by adding erythromycin after antistaphylococcal antibiotics had failed. Although in vitro studies have demonstrated that macrolides may be able to inhibit biofilms in catheter-related infections, this is the first proof of its use in a patient.2

A 13-year-old female suffered short bowel syndrome after surgical treatment for Hirschsprung’s disease. After insertion of a Hickman catheter for home total parenteral nutrition, the patient suffered recurrent Hickman catheter infections with multiple pathogens. To control the infections, the Hickman catheter was replaced six times. No evidence of immunodeficiency was noted by immunological tests.

On 24 June 2006, the patient was hospitalized with fever. Due to her infection history, ampicillin/sulbactam, gentamicin and fluconazole were used empirically. Cultures of four blood specimens from the Hickman catheter on 25, 26, 27 and 30 June revealed growth of C. parapsilosis, indicating that systemic fluconazole could not eradicate the infection.

ALT was started on 1 July with 2.5 mg/mL amphotericin B in 5 mL of normal saline containing no heparin. The solution was retained for 24 h each day. Intravenous amphotericin B at a dose of 1 mg/kg/day was also given and total parenteral nutrition was infused through a peripheral venous line. Acute renal failure with a serum creatinine level of 2.5 mg/mL occurred on 7 July. Because systemic amphotericin B was the suspected cause of the renal dysfunction, the drug was replaced by intravenous fluconazole at a dose of 6 mg/kg/day. Culture for C. parapsilosis was negative throughout the 20 days of ALT. Fever and inflammatory changes at the catheter insertion site were noted 3 days after the completion of ALT. Blood drawn from the Hickman catheter and peripheral vein grew methicillin-susceptible S. aureus. Before the antibiotic susceptibility results were available, vancomycin was given at a dose of 28 mg/kg/day. Subsequent blood culture showed no growth of pathogen. However, the local lesion showed no improvement after 3 days. Antibiotic treatment was shifted to intravenous oxacillin and oral rifampicin, but no therapeutic effect was noted. After 5 days, 40 mg/kg/day of oral erythromycin was given. Surprisingly, local erythema and tenderness improved on the next day and local inflammatory changes completely subsided 2 days after adding erythromycin despite any drug susceptibility reference. Follow-up cultures 3 months later showed no growth of either S. aureus or C. parapsilosis.

In such a patient with repeated catheter reinsertions, any possible means of eradicating the pathogen and preserving the catheter should be considered. Although ALT is not a recognized option for treating catheter-related candidaemia in the 2001 Infectious Diseases Society of America (IDSA) guidelines for the management of catheter-related fungaemia,1,5 we chose to try ALT in this patient.

Previous reports have demonstrated that most failures to treat catheter-related infections are due to the biofilm formed by invading pathogens.1 As for the highly potentialized pathogen in patients receiving parenteral nutrition and with a catheter device, C. parapsilosis exhibits significantly less biofilm growth than the more pathogenic Candida albicans.3 This may explain why C. parapsilosis catheter-related infection has been reported to be associated with a better prognosis.4

Notably, ALT may be more successful for treating catheter-related fungaemia when duration of treatment is longer.5 Conversely, some failures have been observed in studies administering ALT over shorter periods.5 These experimental findings indicate that the total duration of treatment may be a key factor for successful ALT. In refractory cases such as

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References


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Antibiotic-lock therapy and erythromycin for treatment of catheter-related Candida parapsilosis and Staphylococcus aureus infections

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Keywords: candidiasis, macrolides/azalides, catheter-related infections

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