Case Report

Correspondence

S. J. Taj-Aldeen

stajaldeen@hmc.org.qa

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Kodamaea (Pichia) ohmeri fungaemia in a premature neonate

S. J. Taj-Aldeen,¹ S. H. Doiphode¹ and X. Y. Han²

¹Microbiology Division, Department of Laboratory Medicine and Pathology, Hamad Medical Corporation, PO Box 3050 Doha, Qatar

²Department of Laboratory Medicine, The University of Texas M.D. Anderson Cancer Center, Houston, TX 77030, USA

Kodamaea ohmeri is a yeast that rarely causes human infections. The first case of *K. ohmeri* fungaemia in a premature neonate is reported; it was successfully treated with liposomal amphotericin B. Biochemical identification of the yeast was performed by Vitek II and API and was confirmed by rRNA gene sequencing. *K. ohmeri* as a human pathogenic yeast is uncommon to hospitalized neonates and immunocompromised individuals.

Introduction

Kodamaea ohmeri is a rare clinical isolate that has recently become known to cause various human infections. This yeast, previously known as *Pichia ohmeri* and *Yamadazyma ohmeri* (Yamada *et al.*, 1995), is commonly used in the food industry for its fermentation properties in pickles (Kurtzman, 1998). *K. ohmeri* has been implicated in causing fungaemia (Bergman *et al.*, 1998; Matute *et al.*, 2000; Hitomi *et al.*, 2002; Shin *et al.*, 2003; Han *et al.*, 2004), peritonitis (Choy & Wong, 2000), endocarditis (João *et al.*, 2002; Reina & Larone, 2002), fungiurea (Puerto *et al.*, 2002) and wound infection (Han *et al.*, 2004). We report the first case of *K. ohmeri* fungaemia in a premature neonate successfully treated with liposomal amphotericin B.

Case report

A newborn baby, one of quadruplets, was delivered in October 2004 to a 26-year-old mother in the 25th week of gestation due to spontaneous rupture of membranes and premature labour pains. The baby was a low birth weight female (680 g). She was intubated because of a low APGAR score, and work up for sepsis was done and antimicrobial therapy with gentamicin and penicillin was initiated. The three initial blood cultures were negative. During the first week the baby developed clinical necrotizing enterocoli. Cefotaxime was added to the treatment. Due to hypoactivity the baby was reintubated on day 10.

A blood culture taken on the 13th day of life showed a yeast-like organism. Based on this finding, amphotericin B was started (0.7 mg o.d.). In the following week, four successive blood cultures were positive for the yeast. The organism was tentatively identified as *K. ohmeri* by biochemical methods. The Antifungal Etest (Solna; Sweden) was used to determine susceptibility of the yeast; it was shown to be susceptible to

amphotericin B (MIC, 0.064 µg ml⁻¹) and flucytosine (MIC, <0.002 µg ml⁻¹), but dose-dependently susceptible to itraconazole (MIC, 0.25 µg ml⁻¹) and fluconazole (MIC, 32 µg ml⁻¹). The dosage of amphotericin B was increased to 0.9 mg o.d. and fluconazole was started initially with 10 mg, which was later tapered to 5 mg. The yeast still grew in blood cultures on the 30th day of life. Amphotericin B was replaced by liposomal amphotericin B at 5 mg o.d. Three successive blood cultures during 3 weeks were negative for yeast growth. The antifungal therapy was continued for one more week and then discontinued. On the 8th week the baby was doing well and after 89 days post-birth she weighed 1710 g and was breathing without a ventilator.

Microbiological studies

Biochemical identification of the yeast was confirmed by sequence analysis of 5.8S rRNA using the methods previously applied by Han *et al.* (2004). The sequence matched 217/217 = 100 % with *K. ohmeri* ATCC 46053^T, GenBank AF218977 (Chen *et al.*, 2000). The organism failed to produce ascospores on Sabouraud dextrose agar and malt extract agar + 2.5 % glucose even with prolonged incubation period (14 days).

Blood cultures were performed using the Bactec automated culturing system (BD Diagnostic Systems) and paediatric bottle (Shannon Industrial Estate, Ireland). Identification of the yeast isolate was carried out through biochemical profiles with Vitek II and API ID 32C (bioMérieux). Sequence analysis of the 5.8S rRNA was performed to confirm the biochemical identification. Analysis methods were performed as previously mentioned (Han *et al.*, 2004). Yeast genomic DNA was extracted using a simple method described previously for bacteria (Han *et al.*, 2002).

Table 1. Clinical and microbiological data on the published cases of *K. ohmeri*

	Age/sex	Predisposing factor	Episode	Treatment*	5·8S rRNA match	Outcome	Reference
1	48/F	Diabetes, kidney transplant	Fungaemia	AB	ND	Died	Bergman <i>et al.</i> (1998)
2	71/M	Pacemaker, endocarditis	Fungaemia	AB	ND	Died	Matute <i>et al.</i> (2000)
3	64/M	Peritoneal dialysis	Peritonitis	FC then AB	ND	Resolved	Choy & Wong (2000)
4	76/M	Pacemaker, prosthetic valve	Endocarditis	Surgery, FC, AB	ND	Resolved	Reina & Larone (2002)
5	73/M	Lymphoma, steroids	Fungiurea	FC	ND	Resolved	Puerto <i>et al.</i> (2002)
6	42/M	Hepatitis C, i.v. drug use	Endocarditis	Surgery	ND	Resolved	João <i>et al.</i> (2002)
7	84/M	Sinus cancer with central venous catheter	Fungaemia	FC	ND	Resolved	Hitomi <i>et al.</i> (2002)
8	59/M	Long hospitalization period, antibacterial therapy	Phlebitis		ND	Resolved	Shin <i>et al.</i> (2003)
9	14/M	Leukaemia, neutropenia	Fungaemia	FC	100 %	Died	Han <i>et al.</i> (2004)
10	75/M	Hip tumour with wound	Polymicrobial wound infection	Drainage	99·5 %	Resolved	Han <i>et al.</i> (2004)
11	Neonate/F	Premature, 680 g weight	Fungaemia	FC, AB then liposomal AB	100 %	Resolved	Present study

*AB, amphotericin B; FC, flucytosine.

Discussion

The clinical and microbiological data available on *K. ohmeri* from the reported cases are shown in Table 1. All the 10 cases of *K. ohmeri* infections reported so far have been associated with adult patients, aged 14–84 years (median age of 67 years). Thus the present case is the first case of *K. ohmeri* fungaemia in a premature neonate. The most predominant underlying condition for the reported infections is the immunocompromised status of the patients. Our case further suggests that premature birth is also a risk factor.

Kodamaea is a genus of ascosporogenic yeast which belongs to the class Ascomycetes. *K. ohmeri* is the telomorph of *Candida guilliermondii* var. *membranaefaciens*. However, our strain failed to produce ascospores in culture media. The strain was identified by biochemical tests (Vitek II and API ID 32C), and confirmed by rRNA gene sequencing analysis. The 5·8S rRNA sequence of *K. ohmeri* is unique among various yeasts (Chen *et al.*, 2000).

Antifungal susceptibility data are available for five strains (Han *et al.*, 2004). All were susceptible *in vitro* to amphotericin B (MIC = 0·2–1 µg ml⁻¹), as was our *K. ohmeri* strain (0·064 µg ml⁻¹). Our patient did not respond to empiric treatment with fluconazole (*in vitro* dose-dependent susceptibility to this strain ≥ 32 µg ml⁻¹). Regular amphotericin B was not effective either as appeared from the positive successive blood culture results; however, the patient responded to liposomal amphotericin B. Noteworthy, of the 11 reported cases so far, eight patients recovered and three died.

The study case represents a hospital-acquired infection. Disseminated candidiasis is the most common nosocomial fungal infection, and *Candida albicans* has been reported to account for most cases of invasive candidiasis (Emori & Gaynes, 1993; Pfaller, 1995). However, recent reports have also suggested emergence of infections caused by non-*C. albicans* *Candida* species (Wingard, 1995). In addition, less common pathogenic yeasts such as *Trichosporon* and *Malassezia* spp. have been reported with increased frequency as causes of nosocomial infections, especially in NICU patients (Fridkin & Jarvis, 1996). Although reports on emerging fungal pathogens fail to include *K. ohmeri* as a human pathogenic yeast, based on the recent series of case reports (Table 1) and this case report it could be considered an uncommon pathogen for premature neonates.

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