**Case Report**

**Kodamaea (Pichia) ohmeri** fungaemia in a premature neonate

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**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 (Joa˜o et al., 2002; Reina & Larone, 2002), funguirea (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 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.

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 Erost (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 still 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 46053², 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**

<table>
<thead>
<tr>
<th>Age/sex</th>
<th>Predisposing factor</th>
<th>Episode</th>
<th>Treatment*</th>
<th>5-8S rRNA match</th>
<th>Outcome</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 48/F</td>
<td>Diabetes, kidney transplant</td>
<td>Fungaemia</td>
<td>AB</td>
<td>ND</td>
<td>Died</td>
<td>Bergman et al. (1998)</td>
</tr>
<tr>
<td>2 71/M</td>
<td>Pacemaker, endocarditis</td>
<td>Fungaemia</td>
<td>AB</td>
<td>ND</td>
<td>Died</td>
<td>Matute et al. (2000)</td>
</tr>
<tr>
<td>3 64/M</td>
<td>Peritoneal dialysis</td>
<td>Peritonitis</td>
<td>FC then AB</td>
<td>ND</td>
<td>Resolved</td>
<td>Choy &amp; Wong (2000)</td>
</tr>
<tr>
<td>4 76/M</td>
<td>Pacemaker, prosthetic valve</td>
<td>Endocarditis</td>
<td>Surgery, FC, AB</td>
<td>ND</td>
<td>Resolved</td>
<td>Reina &amp; Larone (2002)</td>
</tr>
<tr>
<td>5 73/M</td>
<td>Lymphoma, steroids</td>
<td>Fungiurea</td>
<td>FC</td>
<td>ND</td>
<td>Resolved</td>
<td>Puerto et al. (2002)</td>
</tr>
<tr>
<td>6 42/M</td>
<td>Hepatitis C, i.v. drug use</td>
<td>Endocarditis</td>
<td>Surgery</td>
<td>ND</td>
<td>Resolved</td>
<td>João et al. (2002)</td>
</tr>
<tr>
<td>7 84/M</td>
<td>Sinus cancer with central venous catheter</td>
<td>Fungaemia</td>
<td>FC</td>
<td>ND</td>
<td>Resolved</td>
<td>Hitomi et al. (2002)</td>
</tr>
<tr>
<td>8 59/M</td>
<td>Long hospitalization period, antibacterial therapy</td>
<td>Phlebitis</td>
<td>ND</td>
<td>Resolved</td>
<td>Shin et al. (2003)</td>
<td></td>
</tr>
<tr>
<td>9 14/M</td>
<td>Leukaemia, neutropenia</td>
<td>Fungaemia</td>
<td>FC</td>
<td>100 %</td>
<td>Died</td>
<td>Han et al. (2004)</td>
</tr>
<tr>
<td>10 75/M</td>
<td>Hip tumour with wound</td>
<td>Polymeric microbe wound infection</td>
<td>Drainage</td>
<td>99.5 %</td>
<td>Resolved</td>
<td>Han et al. (2004)</td>
</tr>
<tr>
<td>11 Neonate/F</td>
<td>Premature, 680 g weight</td>
<td>Fungaemia</td>
<td>FC, AB then liposomal AB</td>
<td>100 %</td>
<td>Resolved</td>
<td>Present study</td>
</tr>
</tbody>
</table>

*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 teleomorph 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.

**References**


