

Case Report

***Kodamaea ohmeri*: A rare yeast causing invasive infections in immunocompromised patients**

Parul Singh¹, Smriti Srivastava¹, Sharin Varma¹, Neha Sharad¹, Aparna Ningombam², Chandan Peddapulla³, Rajesh Malhotra⁴, Purva Mathur²

¹ Department of Microbiology, Trauma Centre, AIIMS, New Delhi, India

² Department of Laboratory Medicine, Trauma Centre, AIIMS, New Delhi, India

³ Department of Gastroenterology, AIIMS, New Delhi, India

⁴ Department of Orthopaedics, AIIMS, New Delhi, India

Abstract

Introduction: *Kodamaea ohmeri* is a rare, recognized pathogen that has previously been isolated from environmental sources. The patients commonly affected by this yeast include immunocompromised as well as immunocompetent patients having several associated risk factors.

Methodology: We report three cases in which *K. ohmeri* was isolated from blood using Bact T/ALERT. Identification was carried out by MALDI-TOF MS (Vitek-MS, BioMérieux, Marcy-l'Etoile, France) in addition to color characteristics on chromogenic media. The patients had diminished immune response on account of a multitude of comorbidities.

Results: *K. ohmeri* can be misidentified as *Candida tropicalis*, *Candida albicans*, or *Candida hemolounii* by conventional methods; correct and timely identification can be achieved by MALDI-TOF MS. Antifungal susceptibility breakpoints for *K. ohmeri* are currently not defined. An Echinocandin was added to the treatment regimen of all three of the cases.

Conclusions: Identification of *K. ohmeri* using conventional methods is difficult and unusual yeasts should be carefully observed, especially upon prolonged incubation.

Key words: *Kodamaea ohmeri*; immunocompromised; fungemia.

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Introduction

Kodamaea ohmeri (earlier known as *Pichia ohmeri* or *Yamadazyma ohmeri*) is the telomorphic form of *C.guilliermondii* var. *membranaefaciens* and belongs to the *Saccharomycetaceae* family and class *Ascomycetae*. It is often mistaken for *Candida* [1,2]. The genus *Kodamaea* includes five species (*K. anthropila*, *K. kakaduensis*, *K. laetipori*, *K. nitidulidarum*, *K. ohmeri*), but only *K. ohmeri* causes human infections [3]. It has been isolated from environmental sources, such as sand, seawater, pools, and fruits, and lately, it has earned the reputation of a pathogen capable of causing life-threatening infections [1,2,4]. Here we present a series of three cases of *K. ohmeri* fungemia in individuals with compromised immune response and clues towards identification.

Methodology

Case 1

A 22-year-old male from North India presented with complaints of generalized skin lesions. He had

been receiving intravenous (IV) steroids over the past year (Dexamethasone from an unregistered practitioner). At presentation, he was morbidly obese, hypotensive and all skin lesions were infected. Initial laboratory investigations showed anemia, hyponatremia, hyperkalemia, raised total leukocyte counts (TLC), and Procalcitonin.

He was suspected of having Cushing's syndrome due to exogenous steroid use. Electrolyte correction was initiated together with IV Piperacillin Tazobactam and Teicolplanin, given the skin infection. A biopsy of skin lesions was obtained and the findings were suggestive of Pemphigus Vulgaris, thereupon Dapsone was started. The course of his stay was further complicated by Deep Vein Thrombosis (DVT) and difficulty in breathing. Injection Enoxaparin was started and was later switched to oral Dabigatran. Pulmonary embolism was ruled out after a Computed Topography Pulmonary Angiogram (CTPA). Supplementary steroids were added because of suppressed endogenous steroids. On Day 2, Blood cultures were collected

(Bact/ALERT FA Plus) which had no growth after 5 days of incubation in Bact/ALERT (BioMérieux, Marcy-l'Etoile, France). Pus from skin lesions showed mixed growth of Gram-negative organisms. Repeat blood cultures on Day 6 showed growth of *Acinetobacter baumannii* susceptible to, Meropenem, Imipenem, Colistin, and Cefoperazone sulbactam, following which antibiotics were upgraded to Meropenem. After an initial response, fever, and leukocyte counts began increasing again from Day 16. Procalcitonin was serially decreasing suggesting fungal infection hence serum Galactomannan and blood (fungal) culture was done. Galactomannan was negative but blood culture (Bact T/ALERT) from the central line grew cream-colored, glabrous, yeast-like colonies on blood agar and blue-colored colonies on the chromogenic media, HiCrome candida differential agar (Himedia, Mumbai, India), identified as *Kodamaea ohmeri* by MALDI-TOF, Vitek-MS (BioMérieux, Marcy-l'Etoile, France). Results were communicated to the physician and the central line was removed the same day. However, worsening of clinical parameters ensued, and intravenous Caspofungin, a loading dose of 70 mg followed by 50 mg given daily, was started. After initial improvement over the next 10 days, he developed sudden onset dyspnoea and palpitation on day 27. An electrocardiogram (ECG) showed sinus tachycardia, pulmonary embolism was suspected and the patient was taken for CTPA, unfortunately, he could not recover.

Case 2

An 81-year-old lady from North India was admitted to the Emergency with complaints of fever and pain abdomen in July 2021. She was a known case of chronic kidney disease for the past 5 years along with hypertension for the past 2 years. On examination, she was found to have pallor, icterus, and tachycardia as positive findings, whereas her abdomen was soft and non-tender. Further investigations were performed which detected cholelithiasis, and bilobar intra-hepatic biliary radical dilatation (IHBRD) with common bile duct (CBD) dilatation. Initial Laboratory investigations revealed leucocytosis, anemia, increased total bilirubin, and impaired renal function. Hemodialysis was started on day 13 and endoscopic retrograde cholangiopancreatography (ERCP) was performed on day 17. Daily monitoring of Haemoglobin, total counts, Liver enzymes, and Kidney function were done. Fever initially responded to Piperacillin-Tazobactam only to recur later. Considering increasing serum procalcitonin levels, antibiotics were upgraded to Meropenem and Teicoplanin. Blood and urine cultures were sent on day

18. Blood culture was performed using the Bact T/ALERT (BioMérieux, Marcy-l'Etoile, France) system, which flagged positive after about 24 hours of incubation, and budding yeasts were seen upon the gram's staining. Culture was additionally performed on HiCrome candida differential agar and incubated aerobically at 37°C. Light blue to purple colonies of yeasts grew on the chromogenic media. Identification was carried out by MALDI-TOF, Vitek-MS (BioMérieux, Marcy-l'Etoile, France). Findings were communicated to the physician and Caspofungin was added to the regimen, given as described earlier, i.e., a loading dose of 70 mg given followed by 50 mg given intravenously daily. Later, the patient's condition gradually deteriorated and she succumbed to cardiac arrest.

Case 3

A 21-year-old male from South India was admitted to the Burns emergency for scalding of over 70% of the total body surface area (TBSA). The young man was a worker at a jaggery factory where he accidentally fell in the jaggery tank. After 3 days of treatment at another hospital, he was brought to the burns and plastic surgery department of our center. He was managed with IV fluids, analgesics, antibiotics (IV Cefoperazone-sulbactam) wound cleaning, and dressing. Fever spikes were noted on day 15, following which wound swabs, blood cultures, and serum Procalcitonin levels were obtained. Serum Procalcitonin was found to be 97.07 ng/mL. Wound swabs demonstrated growth of *Pseudomonas aeruginosa* susceptible only to Colistin. Accordingly, antibiotics were updated to Polymyxin B, Metronidazole, and Vancomycin for broad-spectrum coverage. Blood culture (Bact T/ALERT) had no growth after 5 days of incubation. After settling initially, the fever returned on day 30, and blood cultures were repeated; this time the automated system flagged positive after about 20 hours of incubation and budding yeasts were apparent on gram's staining. Microscopy finding was conveyed to the treating team immediately, and Micafungin (100 mg IV once a day) was added to the treatment regimen. Culture and identification were performed as in the previous two cases. A repeat blood culture from the sample collected on day 32 also had growth of yeasts demonstrating the same morphology. On day 34 patient's vitals began deteriorating rapidly and he was given inotrope support and mechanical ventilation. Despite all efforts, he could not survive septic shock on day 35.

Growth of *Kodamaea ohmeri* on HiCrome candida differential agar directly from a positive blood culture bottle is shown in Figure 1.

Discussion

Kodamaea ohmeri is an ascomycetous yeast. Earlier it was known as *Pichia ohmeri*/*Yamadazyma ohmeri*. While the taxonomy has changed in recent times, it is now emerging as a pathogen. Infections due to *K. ohmeri* occur in patients of different age groups and immune profiles. The patient group includes the immunocompromised, cancer patients, neonates and children, patients with other chronic illnesses such as diabetes as well as immunocompetent patients [5].

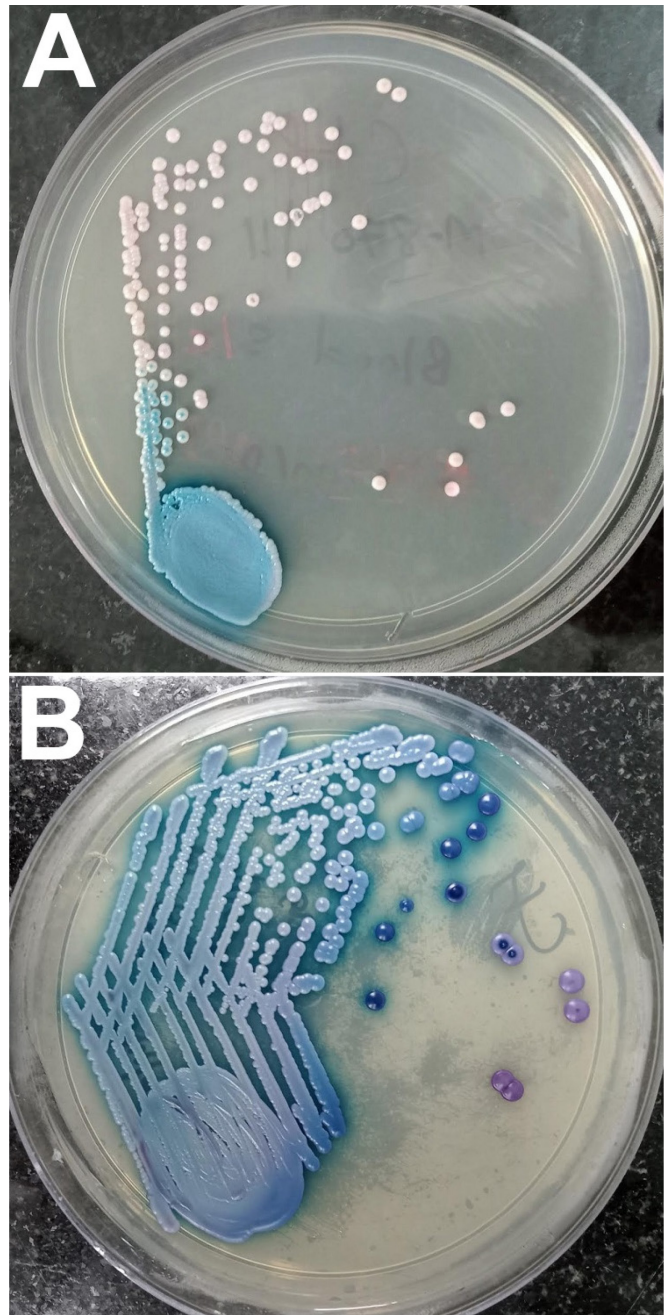
A review of previous cases suggests central venous catheters are a major predisposing factor [2,6]. Similarly, broad-spectrum antibiotic use, especially Piperacillin tazobactam use has been significantly associated with *K. ohmeri* fungemia [2]. In our case, the first patient was immunocompromised on account of corticosteroid usage, had a central venous line, and was treated with broad-spectrum antibiotics for not less than two weeks. The second patient was undergoing hemodialysis and was treated with Piperacillin-tazobactam for over two weeks, whereas the third patient had lost a major part of the skin because of burns. Of note, another case of *K. ohmeri* fungemia in a patient with extensive burns has been described in the literature [7].

Identification of *Kodamaea* in a routine laboratory using conventional methods is not always possible. Microscopically, it is no different from other budding yeasts such as *Candida*. On Saboroud's dextrose agar, it grows as smooth, dry, pale-white, yeast-like colonies; it may variably be reported as *Candida tropicalis*, *C. albicans* or *Candida hemolounii* by conventional methods. On the other hand, one simple step of having a 'second look' after prolonged incubation on chromogenic media might give the clue. Often, the two types of colonies can be present in the same culture.

Automated identification systems like API 20C, Vitek 2 ID YST, and Microscan may also be helpful. Finally, molecular methods are confirmatory for identification, although not feasible in most clinical Microbiology laboratories [8]. We confirmed all three of our yeast isolates as *K. ohmeri* by MALDI TOF. MALDI-TOF is a simpler and accurate technique but is not widely available in most developing countries, for this reason, a degree of suspicion on the part of the Microbiologist is all-important. The susceptibility pattern of *K. ohmeri* is difficult to comment on as there is a paucity of cases reported so far. However, in vitro

resistance to Fluconazole has been reported, Shang et al suggested Voriconazole and echinocandins as optimal therapy [9,10]. Amphotericin B is recommended by the ESCMID and ECMM joint clinical guidelines [11]. In our case Caspofungin was started in the first two patients, one of the patients initially improved, while the second patient did not respond well and continued

Figure 1. A. Growth after 24 hours of incubation at 37 °C; B. Growth after 48 hours of incubation at 37 °C.



Note the two types, blue and light purple colonies, exhibiting phenotypic switching a phenomenon commonly seen in *Candida albicans*. At a first glance, this can easily be mistaken as *Candida tropicalis* or *Candida albicans*.

to deteriorate. The third patient was given Micafungin. Nevertheless, the outcome may not reflect on role of echinocandins because of the severity of underlying conditions in these patients.

Conclusions

K. ohmeri infection mostly occurs in people with compromised immune systems. Laboratory diagnosis is complicated by the fact that this fungus is a look-alike of other species such as *C. tropicalis*, *C. albicans*, and *C. hemolounii*. In this scenario, prolonged incubation on chromogenic media and looking for a "phenotypic switch" from one type of colony to the other type is distinctly helpful.

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References

1. Yamada Y, Suzuki T, Matsuda M, Mikata K (1995) The phylogeny of *Yamadazyma ohmeri* (Etchellsset Bell) Billon-Grand based on the partial sequences of 18S and 26S ribosomal RNAs: the proposal of *Kodamaea* gen. nov. (Saccharomycetaceae). *Biosci Biotechnol Biochem*: 1172-4. doi: 10.1271/bbb.59.1172.
2. Chakrabarti A, Rudramurthy SM, Kale P, Hariprasath P, Dhaliwal M, Singhi S, Rao KL (2013) Epidemiological study of a large cluster of fungaemia cases due to *Kodamaea ohmeri* in an Indian tertiary care centre. *Clin Microbiol Infect* 20: O83–O89. doi: 10.1111/1469-0691.12337.
3. Kurtzman CP, Fell JW, Boekhout T (2011) *The yeasts: a taxonomic study*. 5th ed. Elsevier Science Publishers, Amsterdam.
4. Das K, Bhattacharyya A, Chandy M, Roy MK, Goel G, Hmar L, Bhattacharya S, Roy P, Chakrabarti A (2015) Infection control challenges of infrequent and rare fungal pathogens: lessons from disseminated *Fusarium* and *Kodamaea ohmeri* infections. *Infect Control Hosp Epidemiol* 36: 866-868. doi: 10.1017/ice.2015.103.
5. Biswal D, Sahu M, Mahajan A, Advani S, Shah S (2015) *Kodamaea ohmeri*- an emerging yeast: two cases and literature review. *JCDR9*: DD01–DD3. doi: 10.7860/JCDR/2015/11586.5661.
6. Hitomi S, Kumao T, Onizawa K, Miyajima Y, Wakatsuki T (2002) A case of central venous-catheter-associated infection caused by *Pichia ohmeri*. *J Hosp Infect* 51: 75–77. doi: 10.1053/jhin.2002.1209.
7. Tashiro A, Nei T, Sugimoto R, Watanabe A, Hagiwara J, Takiguchi T, Yokota H, Kamei K (2018) *Kodamaea ohmeri* fungemia in severe burn: case study and literature review. *Med Mycol Case Rep* 20: 21-23. doi: 10.1016/j.mmcr.2018.07.005.
8. Lee JS, Shin JH, Kim MN, Jung SI, Park KH, Cho D, Kee SJ, Shin MG, Suh SP, Ryang DW (2007) *Kodamaea ohmeri* isolates from patients in a university hospital: identification, antifungal susceptibility, and pulsed-field gel electrophoresis analysis. *J Clin Microbiol* 45: 1005-1010. doi: 10.1128/JCM.02264-06.
9. Yang BH, Peng MY, Hou SJ, Sun JR, Lee SY, Lu JJ (2009) Fluconazole-resistant *Kodamaea ohmeri* fungemia associated with cellulitis: case report and review of the literature. *Int J Infect Dis* 13: e493-e497. doi: 10.1016/j.ijid.2009.02.003.
10. Shang ST, Lin JC, Ho SJ, Yang YS, Chang FY, Wang NC (2010) The emerging life threatening opportunistic fungal pathogen *Kodamaea ohmeri*: optimal treatment and literature review. *J Microbiol Immunol Infect* 43: 200–206. doi: 10.1016/S1684-1182(10)60032-1.
11. Arendrup MC, Boekhout T, Akova M, Meis JF, Cornely OA, Lortholary O (2014) ESCMID and ECMM joint clinical guidelines for the diagnosis and management of rare invasive yeast infections. *Clin Microbiol Infect* 20: 76-98. doi: 10.1111/1469-0691.12360.

Corresponding author

Professor Purva Mathur, MD
Department of Laboratory Medicine,
Trauma Centre AIIMS,
New Delhi, 110029
Tel: 9810350650
Email: purvamathur@yahoo.co.in

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