

***Candida krusei*: Morphological Characteristics and Its Impact on the Epidemiology of Fungal Diseases**

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Candida spp. can be found as commensals on the skin, in the mouth, and in the gastrointestinal tract. The growth and spread of this fungus in the normal flora and epithelial cells. *Candida spp.* has pathogenic potential, causing infections ranging from hair and nail infections to life-threatening systemic infections.¹ *Candida krusei* should be reclassified into a different genus based on its ultrastructure, cell wall composition, and co-enzyme number. The average chromosome number of *Candida krusei* is 8, while that of *Candida albicans* is 16. *Candida krusei* has the most distant relationship compared to *Candida albicans*, which is medically important in the genus *Candida spp.* The genus *Candida* consists of more than 100 species.²

Candida krusei is a yeast classified as an opportunistic organism. It has a unicellular form and appears as elongated or oval buds with a cell size of 2.0-5.5 x 4.0-15.0 µm. When cultured on Malt Agar, it forms large, round, white colonies, while on Wallerstein Laboratory (WL) medium, it appears similar to colonies on Malt Agar but with faster growth.³

Invasive infections caused by *Candida* species are known as a major cause of morbidity and mortality in healthcare settings. Death caused by candidemia reaches 47%, especially those accompanied by septic shock. The main cause of candidemia is *Candida albicans*, but in recent years, it has shifted to *Candida* non-*albicans*, including *C. glabrata*, *C. tropicalis*, *C. parapsilosis* and *C. krusei*.¹

The distribution of the *Candida krusei* fungus is widespread globally. Infections caused by this fungus in humans have also been reported worldwide, particularly as systemic infections. The percentage of *C. krusei* isolates from various studies ranges between 0.4-16.1% depending on the location, with vaginal candidiasis being the lowest and candidemia with *C. krusei* infection found in 0-9% of cases.⁴

In its natural habitat, *Candida krusei* can be found in the atmosphere, on fruits, in feces, soil, and food.⁵ In humans, it typically colonizes the skin, mouth, and gastrointestinal tract. *Candida krusei*, initially an opportunistic organism as part of the normal human flora, can become parasitic and pathogenic under conditions of imbalance, causing a wide spectrum of conditions ranging from superficial hair and nail infections to life-threatening systemic infections.⁶

The epidemiology of *Candida spp.* infections has changed in recent decades, likely due to medical practices. Risk factors for *Candida spp.* infections are similar to those for fungal infections in general and vary, but are commonly caused by medical interventions or the patient's health status. Risk factors are divided into two categories: the first is physiological factors such as pregnancy, which affects hormones and the immune system, the menstrual cycle which affects the condition/moisture of the vagina, and age (very young/old) which affects a person's immunity level. The second factor is non-physiological. Non-physiological factors include trauma (skin damage due to work, skin maceration in laundry workers, and oral mucosal damage due to denture pressure), malnutrition (riboflavin deficiency), endocrine disorders (diabetes mellitus), malignancy (carcinoma, hematological malignancy), patients in intensive care units, treatment with antibiotics, corticosteroids, cytotoxic drugs, and immunosuppressants, other infectious diseases or chronic diseases, and immune deficiency (AIDS).⁷

Candida spp. possess virulence factors such as the ability to bind to host cell receptors, produce phospholipases and proteases, and form hyphae, which aid in evading the host immune system. Some studies have shown that *Candida krusei* adheres more easily to surfaces (e.g., acrylic dentures, implants, catheters, or other non-biological surfaces) compared to *C. albicans*, requiring fewer adhesins in the adhesion process. After adhering to an inert substrate and given adequate nutrients, the organism multiplies and colonizes the surface, forming a thin pellicle or biofilm. The formation of biofilms by microorganisms on implant materials (such as urinary catheters, prosthetic heart valves, pacemakers, and silicone voice prostheses) helps these microorganisms to survive and persist in the host body.²

Candida krusei is known as a pathogenic fungus in patients with hematological malignancies and transplant recipients. *Candida krusei* accounts for 24% of all nosocomial bloodstream infections caused by *Candida spp.* This species is known to have a tendency to emerge after the administration of fluconazole as prophylaxis.⁶ Fluconazole belongs to the triazole drug class and has the best penetration into the CSF and vitreous.¹ Fluconazole is also the treatment of choice for symptomatic cystitis. *Candida krusei* has been detected as an uncommon and potentially multi-drug resistant (MDR) pathogen.⁸ While fluconazole remains a drug for the management of candidiasis.

Candida krusei has intrinsic resistance to fluconazole and primarily infects patients with hematological and other immunocompromised conditions. In *Candida spp.*, resistance and point mutations in the ERG11p allele have been found.⁵ This mutation causes amino acid substitutions that alter the protein structure and make azole binding less efficient. Alterations in

the gene sequence of this species lead to inhibition of ergosterol synthesis.⁶ Compared to other species, this species is more resistant to fluconazole.

In conclusion, *Candida krusei* is a type of yeast. *Candida krusei* is unicellular and opportunistic. *Candida krusei* is usually found in two morphological forms: yeast cells and pseudohyphae. The distribution of *Candida krusei* is widespread worldwide with the highest frequency of infection in humans. Its habitat in the human body is usually found on the skin, in the mouth, and in the gastrointestinal tract. *Candida krusei* living in the human body is initially opportunistic as a normal flora but if its balance is disrupted, it will become parasitic and infect hair and nails up to life-threatening systemic infections.

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