

Candida (fungus)

From Wikipedia, the free encyclopedia

Candida is a genus of yeasts and is the most common cause of fungal infections worldwide.^[1] Many species are harmless commensals or endosymbionts of hosts including humans; however, when mucosal barriers are disrupted or the immune system is compromised they can invade and cause disease.^[2] *Candida albicans* is the most commonly isolated species, and can cause infections (candidiasis or thrush) in humans and other animals. In winemaking, some species of *Candida* can potentially spoil wines.^[3]

Many species are found in gut flora, including *C. albicans* in mammalian hosts, whereas others live as endosymbionts in insect hosts.^{[4][5][6]} Systemic infections of the bloodstream and major organs (candidemia or invasive candidiasis), particularly in immunocompromised patients, affect over 90,000 people a year in the U.S.^[7]

The genome of several *Candida* species has been sequenced.^[7]

Antibiotics promote yeast infections, including gastrointestinal *Candida* overgrowth, and penetration of the GI mucosa.^[8] While women are more susceptible to genital yeast infections, men can also be infected. Certain factors, such as prolonged antibiotic use, increase the risk for both men and women. People with diabetes or impaired immune systems, such as those with HIV, are more susceptible to yeast infections.^{[9][10]}

Candida antarctica is a source of industrially important lipases.

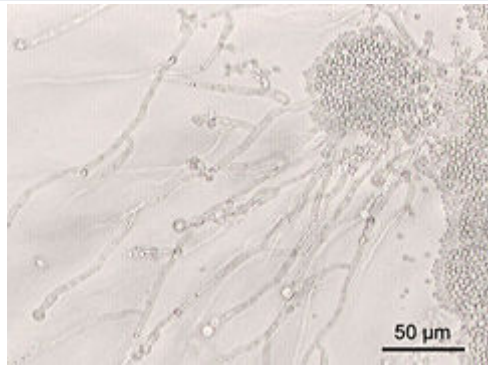
Contents

- 1 Biology
- 2 Pathogen
- 3 Applications
- 4 Species
- 5 References
- 6 External links

Biology

When grown in a laboratory, *Candida* appears as large, round, white or cream (*albicans* means "whitish" in Latin) colonies, which emit a yeasty odor on agar plates at room temperature.^[11] *C. albicans* ferments glucose and maltose to acid and gas, sucrose to acid, and does not ferment lactose, which help to distinguish it from other *Candida* species.^[12]

Recent molecular phylogenetic studies show that the genus *Candida* as currently used is extremely polyphyletic (encompassing distantly related species that don't form a natural group).^[13] Before the advent of inexpensive molecular methods, yeasts that were isolated from infected patients were often called *Candida* without clear

<i>Candida</i>

<i>Candida albicans</i> at 200X magnification
Scientific classification
Kingdom: Fungi
Division: Ascomycota
Class: Saccharomycetes
Order: Saccharomycetales
Family: Saccharomycetaceae
Genus: <i>Candida</i> Berkh. (1923)
Type species
<i>Candida vulgaris</i> Berkh. (1923)

evidence of relationship to other *Candida* species. For example, *Candida glabrata*, *Candida guilliermondii*, and *Candida lusitanae* are clearly misclassified^[13] and will be placed in other genera once phylogenetic reorganization is complete (for example, see^[14]).

Some species of *Candida* use a non-standard genetic code in the translation of their nuclear genes into the amino acid sequences of polypeptides.^[15] The difference in the genetic code between species possessing the alternative code is that the codon CUG (normally encoding the amino acid leucine) is translated by the yeast as a different amino acid, serine. The alternative translation of the CUG codon in these species is due to a novel nucleic acid sequence in the serine-tRNA (ser-tRNACAG), which has a guanosine located at position 33, 5' to the anticodon. In all other tRNAs, this position is normally occupied by a pyrimidine (often uridine). This genetic code change is the only such known alteration in cytoplasmic mRNA, in both the prokaryotes, and the eukaryotes, involving the reassignment of a sense codon.^[16] This novel genetic code may be a mechanism for more rapid adaptation to the organism's environment, as well as playing an important role in the evolution of the genus *Candida* by creating genetic barriers that encouraged speciation^[16]

Pathogen

Candida are almost universal in low numbers on healthy adult skin^[12] and *C. albicans* is part of the normal flora of the mucous membranes of the respiratory, gastrointestinal and female genital tracts. The dryness of skin compared to other tissues prevents the growth of the fungus, but damaged skin or skin in intertriginous regions is more amenable to rapid growth.^[17]

Overgrowth of several species including *C. albicans* can cause infections ranging from superficial, such as oropharyngeal candidiasis (thrush) or vulvovaginal candidiasis (vaginal candidiasis), to systemic, such as fungemia and invasive candidiasis. Oral candidiasis is common in elderly denture wearers.^[18] In otherwise healthy individuals, these infections can be cured with topical or systemic antifungal medications^[19] (commonly over-the-counter antifungal treatments like miconazole or clotrimazole). In debilitated or immunocompromised patients, or if introduced intravenously, candidiasis may become a systemic disease producing abscess, thrombophlebitis, endocarditis, or infections of the eyes or other organs.^{[7][12]} Typically, relatively severe neutropenia is a prerequisite for *Candida* to pass through the defenses of the skin and cause disease in deeper tissues; in such cases, mechanical disruption of the infected skin sites is typically a factor in the fungal invasion of the deeper tissues.^[17]

Applications

C. albicans has been used in combination with carbon nanotubes (CNT) to produce stable electrically conductive bio-nano-composite tissue materials that have been used as temperature sensing elements.^[20]

Species



Among *Candida* species, *C. albicans*, which is a normal constituent of the human flora, a commensal of the skin and the gastrointestinal and genitourinary tracts, is responsible for the majority of *Candida* bloodstream infections (candidemia). Yet, there is an increasing incidence of infections caused by *C. glabrata* and *C. rugosa*, which could be because they are frequently less susceptible to the currently used azole antifungals.^[21] Other medically important species include *C. parapsilosis*, *C. tropicalis* and *C. dubliniensis*.^[7]



Other *Candida* species, such as *C. oleophila* have been used as biological control agents in fruit.^[22]

- *C. albicans*
- *C. ascalaphidarum*
- *C. amphixiae*
- *C. antarctica*
- *C. argentea*
- *C. atlantica*
- *C. atmosphaerica*
- *C. auris*
- *C. blattae*
- *C. bromeliacearum*

- *C. carpophila*
- *C. carvajalis*^[23]
- *C. cerambycidarum*
- *C. chauliodes*
- *C. corydali*
- *C. dosseyi*
- *C. dubliniensis*
- *C. ergatensis*
- *C. fructus*
- *C. glabrata*
- *C. fermentati*
- *C. guilliermondii*
- *C. haemulonii*
- *C. humilis*
- *C. insectamens*
- *C. insectorum*
- *C. intermedia*
- *C. jeffresii*
- *C. kefyri*
- *C. keroseneae*
- *C. krusei*
- *C. lusitaniae*
- *C. lyxosophila*
- *C. maltosa*
- *C. marina*
- *C. membranifaciens*
- *C. mogii*
- *C. oleophila*
- *C. oregonensis*
- *C. parapsilosis*
- *C. quercitrusa*
- *C. rugosa*
- *C. sake*
- *C. shehatei*
- *C. temnochilae*
- *C. tenuis*
- *C. theae*^[24]
- *C. tolerans*
- *C. tropicalis*
- *C. tsuchiyae*
- *C. sinolaborantium*
- *C. sojae*
- *C. subhashii*
- *C. viswanathii*
- *C. utilis*
- *C. ubatubensis*
- *C. zemplinina*

References

1. Manolakaki, D.; Velmahos, G.; Kourkoumpetis, T.; Chang, Y.; Alam, H. B.; De Moya, M. M.; Mylonakis, E. (2010). "Candida infection and colonization among trauma patients" (<http://www.tandfonline.com/doi/full/10.4161/viru.1.5.12796>). *Virulence*. **1** (5): 367–75. PMID 21178472 (<https://www.ncbi.nlm.nih.gov/pubmed/21178472>). doi:10.4161/viru.1.5.12796 (<https://doi.org/10.4161%2Fviru.1.5.12796>).
2. Kourkoumpetis TK, Velmahos GC, Ziakas PD, Tampakakis E, Manolakaki D, Coleman JJ, Mylonakis E (2011). "The effect of cumulative length of hospital stay on the antifungal resistance of *Candida* strains isolated from critically ill surgical patients" (<https://dx.doi.org/10.1007/s11046-010-9369-3>). *Mycopathologia*. **171** (2): 85–91. PMC 4093797 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4093797>) . PMID 20927595 (<https://www.ncbi.nlm.nih.gov/pubmed/20927595>). doi:10.1007/s11046-010-9369-3 (<https://doi.org/10.1007%2Fs11046-010-9369-3>).
3. Fugelsang, K.; Edwards, C. (2010). *Wine Microbiology* (2nd ed.). Springer. pp. 3–28. ISBN 0387333495.
4. Spanakis EK, Kourkoumpetis TK, Livanis G, Peleg AY, Mylonakis E (2010). "Statin therapy and decreased incidence of positive *Candida* cultures among patients with type 2 diabetes mellitus undergoing gastrointestinal surgery" ([https://linkinghub.elsevier.com/retrieve/pii/S0025-6196\(11\)60360-1](https://linkinghub.elsevier.com/retrieve/pii/S0025-6196(11)60360-1)). *Mayo Clin. Proc.* **85** (12): 1073–9. PMC 2996154 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2996154>) . PMID 21123633 (<https://www.ncbi.nlm.nih.gov/pubmed/21123633>). doi:10.4065/mcp.2010.0447 (<https://doi.org/10.4065%2Fmcp.2010.0447>).
5. Nguyen NH, Suh SO, Blackwell M (2007). "Five novel *Candida* species in insect-associated yeast clades isolated from Neuroptera and other insects". *Mycologia*. **99** (6): 842–858. PMID 18333508 (<https://www.ncbi.nlm.nih.gov/pubmed/18333508>). doi:10.3852/mycologia.99.6.842 (<https://doi.org/10.3852%2Fmycologia.99.6.842>).
6. Suh SO, Nguyen NH, Blackwell M (2008). "Yeasts isolated from plant-associated beetles and other insects: seven novel *Candida* species near *Candida albicans*". *FEMS Yeast Res.* **8** (1): 88–102. PMID 17986254 (<https://www.ncbi.nlm.nih.gov/pubmed/17986254>). doi:10.1111/j.1567-1364.2007.00320.x (<https://doi.org/10.1111%2Fj.1567-1364.2007.00320.x>).
7. Enfert C, Hube B (editors) (2007). *Candida: Comparative and Functional Genomics*. Caister Academic Press. ISBN 978-1-904455-13-4.

8. Kennedy MJ, Volz PA, Edwards CA, Yancey RJ (1987). "Mechanisms of association of *Candida albicans* with intestinal mucosa" (<http://jmm.microbiologyresearch.org/pubmed/content/journal/jmm/10.1099/00222615-24-4-333>). *J. Med. Microbiol.* **24** (4): 333–41. PMID 3320372 (<https://www.ncbi.nlm.nih.gov/pubmed/3320372>). doi:10.1099/00222615-24-4-333 (<https://doi.org/10.1099%2F00222615-24-4-333>).
9. Steckelberg, James M. (2012-09-18). "Male yeast infection: Can I get it from my girlfriend?" (<http://www.mayoclinic.org/male-yeast-infection/expert-answers/faq-20058464>). Mayo Clinic. Retrieved 2014-03-23.
10. "Yeast Infections: MedlinePlus" (<http://www.nlm.nih.gov/medlineplus/yeastinfections.html>). Nlm.nih.gov. Retrieved 2014-03-23.
11. "Candida species" (https://web.archive.org/web/20070208004957/http://www.doctorfungus.org/thefungi/Candida_spp.htm). *DoctorFungus.org*. Archived from the original (http://www.doctorfungus.org/thefungi/Candida_spp.htm) on 2007-02-08. Retrieved 2007-02-09.
12. Meyers, Frederick H.; Jawetz, Ernest; Goldfien, Alan (1978). *Review of Medical Pharmacology* (<https://books.google.com/books?id=Yg1tAAAAMAAJ>) (6th ed.). Lange Medical Publications. ISBN 978-0-87041-151-9.
13. Fitzpatrick, David A; Logue, Mary E; Stajich, Jason E; Butler, Geraldine (2006). "A fungal phylogeny based on 42 complete genomes derived from supertree and combined gene analysis" (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1679813>). *BMC Evolutionary Biology*. **6**: 99. PMC 1679813 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1679813>) . PMID 17121679 (<https://www.ncbi.nlm.nih.gov/pubmed/17121679>). doi:10.1186/1471-2148-6-99 (<https://doi.org/10.1186%2F1471-2148-6-99>).
14. Khunnamwong P, Lertwattanasakul N, Jindamorakot S, Limtong S, Lachance MA (2015). "Description of *Diutina* gen. nov., *Diutina siamensis*, f.a. sp. nov., and reassignment of *Candida catenulata*, *Candida mesorugosa*, *Candida neorugosa*, *Candida pseudorugosa*, *Candida ranongensis*, *Candida rugosa* and *Candida scorzettiae* to the genus *Diutina*" (<http://ijs.microbiologyresearch.org/pubmed/content/journal/ijsem/10.1099/ijsem.0.000634>). *Int. J. Syst. Evol. Microbiol.* **65** (12): 4701–9. PMID 26410375 (<https://www.ncbi.nlm.nih.gov/pubmed/26410375>). doi:10.1099/ijsem.0.000634 (<https://doi.org/10.1099%2Fijsem.0.000634>).
15. "CGD Help: Non-standard Genetic Codes" (http://www.candidagenome.org/help/code_tables.shtml). *Candida Genome Database*. Retrieved 1 May 2015.
16. Santos, MA; Ueda, T; Watanabe, K; Tuite, MF (November 1997). "The non-standard genetic code of *Candida* spp.: an evolving genetic code or a novel mechanism for adaptation?". *Molecular Microbiology*. **26** (3): 423–31. PMID 9402014 (<https://www.ncbi.nlm.nih.gov/pubmed/9402014>). doi:10.1046/j.1365-2958.1997.5891961.x (<https://doi.org/10.1046%2Fj.1365-2958.1997.5891961.x>).
17. Goehring, Richard V. (2008). *Mims' medical microbiology*. (4th ed.). Philadelphia, PA: Mosby Elsevier. p. 656. ISBN 9780323044752.
18. Darwazeh A, Lamey P, Samaranayake L, MacFarlane T, Fisher B, Macrury S, MacCuish A (1990). "The relationship between colonisation, secretor status and in-vitro adhesion of *Candida albicans* to buccal epithelial cells from diabetics". *J Med Microbiol.* **33** (1): 43–9. PMID 2231671 (<https://www.ncbi.nlm.nih.gov/pubmed/2231671>). doi:10.1099/00222615-33-1-43 (<https://doi.org/10.1099%2F00222615-33-1-43>).
19. "Yeast Infections (Candidiasis) in Men and Women" (<http://www.webmd.com/skin-problems-and-treatments/candidiasis-yeast-infection>). WebMD. 2012-11-12. Retrieved 2014-03-23.
20. Di Giacomo, R (2013-03-07). "Candida albicans/MWCNTs: A Stable Conductive Bio-Nanocomposite and Its Temperature-Sensing Properties" (<http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6409466>). *IEEE Transactions on Nanotechnology*. **12** (2): 111–114. ISSN 1536-125X (<https://www.worldcat.org/issn/1536-125X>). doi:10.1109/TNANO.2013.2239308 (<https://doi.org/10.1109%2FTNANO.2013.2239308>). Retrieved 2014-03-23.
21. Pfaller, M. A.; Diekema, D. J.; Colombo, A. L.; Kibbler, C.; Ng, K. P.; Gibbs, D. L.; Newell, V. A. (2006). "*Candida rugosa*, an emerging fungal pathogen with resistance to azoles: geographic and temporal trends from the ARTEMIS DISK antifungal surveillance program" (<http://jcm.asm.org/cgi/pmidlookup?view=long&pmid=17021085>). *J. Clin. Microbiol.* **44** (10): 3578–82. PMC 1594768 (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1594768>) . PMID 17021085 (<https://www.ncbi.nlm.nih.gov/pubmed/17021085>). doi:10.1128/JCM.00863-06 (<https://doi.org/10.1128%2FJCM.00863-06>).
22. "Efficacy of *Candida oleophila* strain 128 in preventing *Penicillium Expansum* infection in apricot fruit" (http://www.actahort.org/books/485/485_18.htm). *Acta Hort.* ISHS. **485**: 141–148. 1999.

23. James, S. A.; Carvajal Barriga, E. J.; Bond, C. J.; Cross, K.; Núñez, N. C.; Portero, P. B.; Roberts, I. N. (2009). "Candida carvajalissp. Nov., an ascomycetous yeast species from the Ecuadorian Amazon jungle". *FEMS Yeast Research*. **9** (5): 784–788. PMID 19459983 (<https://www.ncbi.nlm.nih.gov/pubmed/19459983>). doi:10.1111/j.1567-1364.2009.00518.x (<https://doi.org/10.1111%2Fj.1567-1364.2009.00518.x>).
24. Chang, C. F.; Lin, Y. C.; Chen, S. F.; Carvajal Barriga, E. J.; Barahona, P. P.; James, S. A.; Bond, C. J.; Roberts, I. N.; Lee, C. F. (2012). "*Candida theae* sp. nov., a new anamorphic beverage-associated member of the Lodderomyces clade". *International Journal of Food Microbiology*. **153** (1–2): 10–14. PMID 22088606 (<https://www.ncbi.nlm.nih.gov/pubmed/22088606>). doi:10.1016/j.ijfoodmicro.2011.09.012 (<https://doi.org/10.1016%2Fj.ijfoodmicro.2011.09.012>).

External links

- Labs working on Candida

Retrieved from "[https://en.wikipedia.org/w/index.php?title=Candida_\(fungus\)&oldid=796189317](https://en.wikipedia.org/w/index.php?title=Candida_(fungus)&oldid=796189317)"

-
- This page was last edited on 19 August 2017, at 03:22.
 - Text is available under the Creative Commons Attribution-ShareAlike License; additional terms may apply. By using this site, you agree to the Terms of Use and Privacy Policy. Wikipedia® is a registered trademark of the Wikimedia Foundation, Inc., a non-profit organization.