Supplementary Information (SI) for Molecular Omics.

Preliminary Datasets:

Name of the protein	References	Description from CGD
Ace2	1. Kelly MT, MacCallum DM, Clancy SD, Odds FC, Brown AJ, Butler G. The Candida albicans CaACE2 gene affects morphogenesis, adherence and virulence. Molecular microbiology. 2004 Aug;53(3):969-83. 2. Mulhern SM, Logue ME, Butler G. Candida albicans transcription factor Ace2 regulates metabolism and is required for filamentation in hypoxic conditions. Eukaryotic cell. 2006 Dec;5(12):2001-13.	Transcription factor; similar to S. cerevisiae Ace2 and Swi5; regulates morphogenesis, cell separation, adherence, virulence in a mice; mutant is hyperfilamentous; rat catheter and Spider biofilm induced
Aco1	Lan CY, Rodarte G, Murillo LA, Jones T, Davis RW, Dungan J, Newport G, Agabian N. Regulatory networks affected by iron availability in Candida albicans. Molecular microbiology. 2004 Sep;53(5):1451-69.	Aconitase; induced in high iron; 2 upstream CCAAT motifs; amino acid starvation (3-AT), amphotericin B, phagocytosis, farnesol induced; Hap43, fluconazole-repressed; Gcn4-regulated; antigenic in infection; flow and Spider biofilm repressed
Act1	Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70.	Actin; gene has intron; transcript regulated by growth phase, starvation; at polarized growth site in budding and hyphal cells; required for wild-type Cdc42 localization; unprocessed N terminus; Hap43-induced; Spider biofilm repressed
Als1	Nobile CJ, Schneider HA, Nett JE, Sheppard DC, Filler SG, Andes DR, Mitchell AP. Complementary adhesin function in C. albicans biofilm formation. Current biology. 2008 Jul 22;18(14):1017-24.	Cell-surface adhesin; adhesion, virulence, immunoprotective roles; band at hyphal base; Rfg1, Ssk1, Spider biofilm induced; flow model biofilm repressed; CAI-4 strain background effects; promoter bound Bcr1, Tec1, Efg1, Ndt80, and Brg1
Als3	Cleary IA, Reinhard SM, Miller CL, Murdoch C, Thornhill MH, Lazzell AL, Monteagudo C, Thomas DP, Saville SP. Candida albicans adhesin Als3p is dispensable for virulence in the mouse model of disseminated candidiasis. Microbiology. 2011 Jun;157(6):1806-15.	Cell wall adhesin; epithelial adhesion, endothelial invasion; alleles vary in adhesiveness; immunoprotective in mice; binds SspB adhesin of S. gordonii in mixed biofilm; induced in/required for Spider biofilm; flow model biofilm repressed
Arr3	Murad AM, d'Enfert C, Gaillardin C, Tournu H, Tekaia F, Talibi D, Marechal D, Marchais V, Cottin J, Brown AJ. Transcript profiling in Candida albicans reveals new cellular functions for the transcriptional repressors CaTup1, CaMig1 and CaNrg1. Molecular microbiology. 2001 Nov;42(4):981-93.	Ortholog of S. cerevisiae Arr3; arsenite transporter of the plasma membrane required for resistance to arsenic compounds; benomyl-induced; Gcn4-regulated; Hap43-repressed; mutant is viable; Spider biofilm induced
Atp6	Jõers P, Gerhold JM, Sedman T, Kuusk S, Sedman J. The helicase CaHmi1p is required for wild-type mitochondrial DNA organization in Candida albicans. FEMS yeast research. 2007 Jan 1;7(1):118-30.	Subunit 6 of the F0 sector of mitochondrial F1F0 ATP synthase, which is a large, evolutionarily conserved enzyme complex required for ATP synthesis

Bck1	1. Monge RA, Roman E, Nombela CP, Pla J. The MAP kinase signal transduction network in Candida albicans. Microbiology. 2006 Apr;152(4):905-12. 2. Blankenship JR, Fanning S, Hamaker JJ, Mitchell AP. An extensive circuitry for cell wall regulation in Candida albicans. PLoS pathogens. 2010 Feb 5;6(2):e1000752.	Ortholog of S. cerevisiae Bck1; MAP kinase kinase kinase of cell integrity pathway; mutant is hypersensitive to caspofungin
Bcr1	1. Nobile CJ, Mitchell AP. Regulation of cell-surface genes and biofilm formation by the C. albicans transcription factor Bcr1p. Current Biology. 2005 Jun 21;15(12):1150-5. 2. Srikantha T, Daniels KJ, Pujol C, Kim E, Soll DR. Identification of genes upregulated by the transcription factor Bcr1 that are involved in impermeability, impenetrability, and drug resistance of Candida albicans a/α biofilms. Eukaryotic cell. 2013 Jun;12(6):875-88.	Transcription factor; regulates a/alpha biofilm formation, matrix, cell-surface-associated genes; confers adherence, impermeability, impenetrability, fluconazole resistance; Tup1/Tec1/Mnl1-regulated; mRNA binds She3; Spider biofilm induced
Bcy1	1. Ding X, Cao C, Zheng Q, Huang G. The regulatory subunit of protein kinase A (Bcy1) in Candida albicans plays critical roles in filamentation and white-opaque switching but is not essential for cell growth. Frontiers in Microbiology. 2017 Jan 5;7:2127. 2. Giacometti R, Souto G, Silberstein S, Giasson L, Cantore ML, Passeron S. Expression levels and subcellular localization of Bcy1p in Candida albicans mutant strains devoid of one BCY1 allele results in a defective morphogenetic behavior. Biochimica et Biophysica Acta (BBA)-Molecular Cell Research. 2006 Jan 1;1763(1):64-72.	Protein kinase A regulatory subunit; involved in regulation of filamentation, phenotypic switching and mating; required for nuclear localization of Tpk1; physically interacts with Tpk1; apoptosis-regulated
Bem1	1.Bassilana M, Blyth J, Arkowitz RA. Cdc24, the GDP-GTP exchange factor for Cdc42, is required for invasive hyphal growth of Candida albicans. Eukaryotic cell. 2003 Feb;2(1):9-18. 2.Zhou Z, Liu HP, Chen JY. Cloning of Candida albicans CaBEM1 and its role in filamentous growth of Saccharomyces cerevisiae. Sheng wu hua xue yu Sheng wu wu li xue bao Acta Biochimica et Biophysica Sinica. 2002 Sep 1;34(5):553-9.	Protein required for wild-type budding, hyphal growth, and virulence in a mouse systemic infection; suppresses pseudohyphal and filamentous growth defects of various S. cerevisiae mutants and heat sensitivity of S. cerevisiae cdc24-4 mutant

Bem2	Nobile CJ, Fox EP, Nett JE, Sorrells TR, Mitrovich QM, Hernday AD, Tuch BB, Andes DR, Johnson AD. A recently evolved transcriptional network controls biofilm development in Candida albicans. Cell. 2012 Jan 20;148(1):126-38.	Putative Rho1p GTPase activating protein (GAP); serum-induced transcript; Spider biofilm induced; flow model biofilm repressed
Bem3	Court H, Sudbery P. Regulation of Cdc42 GTPase activity in the formation of hyphae in Candida albicans. Molecular biology of the cell. 2007 Jan;18(1):265-81.	Putative GTPase-activating protein (GAP) for Rho-type GTPase Cdc42p; involved in cell signaling pathways that control cell polarity; similar to S. cerevisiae Bem3p
Bmh1	1. Cognetti D, Davis D, Sturtevant J. The Candida albicans 14-3-3 gene, BMH1, is essential for growth. Yeast. 2002 Jan 15;19(1):55-67. 2. Palmer GE, Johnson KJ, Ghosh S, Sturtevant J. Mutant alleles of the essential 14-3-3 gene in Candida albicans distinguish between growth and filamentation. Microbiology. 2004 Jun;150(6):1911-24.	Sole 14-3-3 protein in C. albicans; role in hyphal growth; possibly regulated by host interaction; localizes to yeast-form cell surface, not hyphae; alternatively spliced 5' UTR intron; Spider biofilm repressed
Bni1	Li CR, Wang YM, De Zheng X, Liang HY, Tang JC, Wang Y. The formin family protein CaBni1p has a role in cell polarity control during both yeast and hyphal growth in Candida albicans. Journal of cell science. 2005 Jun 15;118(12):2637-48.	Formin; role in cytoskeletal organization, cell polarity; role in systemic virulence in mouse; cell-cycle regulated localization to site of polarized growth, bud neck; localizes to Spitzenkorper of hyphae, minor localization at septum
Bnr1	Li CR, Wang YM, De Zheng X, Liang HY, Tang JC, Wang Y. The formin family protein CaBni1p has a role in cell polarity control during both yeast and hyphal growth in Candida albicans. Journal of cell science. 2005 Jun 15;118(12):2637-48.	Formin; probable role in hyphal cytoskeletal polarity; synthetic lethality if Bnr1p and Bni1p are absent
Brg1	1. Srikantha T, Daniels KJ, Pujol C, Kim E, Soll DR. Identification of genes upregulated by the transcription factor Bcr1 that are involved in impermeability, impenetrability, and drug resistance of Candida albicans a/α biofilms. Eukaryotic cell. 2013 Jun;12(6):875-88. 2. Lu Y, Su C, Liu H. A GATA transcription factor recruits Hda1 in response to reduced Tor1 signaling to establish a hyphal chromatin state in Candida albicans. PLoS pathogens. 2012 Apr 19;8(4):e1002663.	Transcription factor; recruits Hda1 to hypha-specific promoters; Tn mutation affects filamentation; Hap43-repressed; Spider and flow model biofilm induced; required for Spider biofilm formation; Bcr1-repressed in RPMI a/a biofilms

Cap1	1. Cao Y, Wang Y, Dai B, Wang B, Zhang H, Zhu Z, Xu Y, Cao Y, Jiang Y, Zhang G. Trehalose is an important mediator of Cap1p oxidative stress response in Candida albicans. Biological and Pharmaceutical Bulletin. 2008 Mar 1;31(3):421-5. 2. Mogavero S, Tavanti A, Senesi S, Rogers PD, Morschhäuser J. Differential requirement of the transcription factor Mcm1 for activation of the Candida albicans multidrug efflux pump MDR1 by its regulators Mrr1 and Cap1. Antimicrobial agents and chemotherapy. 2011 May;55(5):2061-6. 3. Wang Y, Cao YY, Jia XM, Cao YB, Gao PH, Fu XP, Ying K, Chen WS, Jiang YY. Cap1p is involved in multiple pathways of oxidative stress response in Candida albicans. Free Radical Biology and Medicine. 2006 Apr 1;40(7):1201-9.	AP-1 bZIP transcription factor; apoptotic, oxidative stress response/resistance, multidrug resistance; nuclear in oxidative stress; complements S. cerevisiae yap1 mutant; oralpharyngeal candidasis-, human neutrophil, Spider biofilm induced
Cat1	1. García-Sánchez S, Mavor AL, Russell CL, Argimon S, Dennison P, Enjalbert B, Brown AJ. Global roles of Ssn6 in Tup1-and Nrg1-dependent gene regulation in the fungal pathogen, Candida albicans. Molecular biology of the cell. 2005 Jun;16(6):2913-25. 2. Bensen ES, Martin SJ, Li M, Berman J, Davis DA. Transcriptional profiling in Candida albicans reveals new adaptive responses to extracellular pH and functions for Rim101p. Molecular microbiology. 2004 Dec;54(5):1335-51. 3. Role of the Hog1 stress-activated protein kinase in the global transcriptional response to stress in the fungal pathogen Candida albicans. Mol Biol Cell 17(2):1018-32	Catalase; resistance to oxidative stress, neutrophils, peroxide; role in virulence; regulated by iron, ciclopirox, fluconazole, carbon source, pH, Rim101, Ssn6, Hog1, Hap43, Sfu1, Sef1, farnesol, core stress response; Spider biofilm induced
Ccc1	1. Chen C, Pande K, French SD, Tuch BB, Noble SM. An iron homeostasis regulatory circuit with reciprocal roles in Candida albicans commensalism and pathogenesis. Cell host & microbe. 2011 Aug 18;10(2):118-35. 2. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70.	Manganese transporter; required for normal filamentous growth; mRNA binds She3, localized to hyphal tips; repressed by NO, alkaline pH; colony morphology-related regulation by Ssn6; regulated by Sef1, Sfu1, Hap43; Spider biofilm induced

Cch1	1. Brand A, Lee K, Veses V, Gow NA. Calcium homeostasis is required for contact-dependent helical and sinusoidal tip growth in Candida albicans hyphae. Molecular Microbiology. 2009 Mar;71(5):1155-64. 2. Brand A, Shanks S, Duncan VM, Yang M, Mackenzie K, Gow NA. Hyphal orientation of Candida albicans is regulated by a calcium-dependent mechanism. Current Biology. 2007 Feb 20;17(4):347-52.	Voltage-gated Ca2+ channel of the high affinity calcium uptake system; roles in thigmotropism, establishment of galvanotropism; transcript regulated by Nrg1 and Mig1; flow model biofilm repressed
Cdc24	1. Bassilana M, Blyth J, Arkowitz RA. Cdc24, the GDP-GTP exchange factor for Cdc42, is required for invasive hyphal growth of Candida albicans. Eukaryotic cell. 2003 Feb;2(1):9-18. 2. Cheng S, Clancy CJ, Checkley MA, Handfield M, Hillman JD, Progulske-Fox A, Lewin AS, Fidel PL, Nguyen MH. Identification of Candida albicans genes induced during thrush offers insight into pathogenesis. Molecular Microbiology. 2003 Jun;48(5):1275-88. 3. Bassilana M, Hopkins J, Arkowitz RA. Regulation of the Cdc42/Cdc24 GTPase module during Candida albicans hyphal growth. Eukaryotic cell. 2005 Mar;4(3):588-603.	GDP-GTP exchange factor for Cdc42p; phosphorylated; required for maintenance of hyphal growth; misexpression blocks hyphal growth and causes avirulence in a mouse model of systemic infection; antigenic during human oral infection
Cdc28	1. Umeyama T, Kaneko A, Niimi M, Uehara Y. Repression of CDC28 reduces the expression of the morphology-related transcription factors, Efg1p, Nrg1p, Rbf1p, Rim101p, Fkh2p and Tec1p and induces cell elongation in Candida albicans. Yeast. 2006 May;23(7):537-52.	Cyclin-dependent protein kinase; interacts with regulatory subunit Cyb1; determination of cell morphology during the cell cycle; phosphorylated mostly by Swe1 and phosphorylation is regulated by Hsl1; 5'-UTR intron; Spider biofilm repressed
Cdc42	1. Lash E, Prudent V, Stogios PJ, Savchenko A, Noble SM, Robbins N, Cowen LE. Ent2 Governs Morphogenesis and Virulence in Part through Regulation of the Cdc42 Signaling Cascade in the Fungal Pathogen Candida albicans. Mbio. 2023 Apr 25;14(2):e03434-22. 2. Kowalewski GP, Wildeman AS, Bogliolo S, Besold AN, Bassilana M, Culotta VC. Cdc42 regulates reactive oxygen species production in the pathogenic yeast Candida albicans. Journal of Biological Chemistry. 2021 Aug 1;297(2).	Rho-type GTPase; required for budding and maintenance of hyphal growth; GGTase I geranylgeranylated; misexpression blocks hyphal growth, causes avirulence in mouse IV infection; shows actin-dependent localization to hyphal tip

Cek1	1. Wagner AS, Lumsdaine SW, Mangrum MM, King AE, Hancock TJ, Sparer TE, Reynolds TB. Cek1 regulates ss (1, 3)-glucan exposure through calcineurin effectors in Candida albicans. PLoS Genetics. 2022 Sep 19;18(9):e1010405. 2. Xie Y, Hua H, Zhou P. Magnolol as a potent antifungal agent inhibits Candida albicans virulence factors via the PKC and Cek1 MAPK signaling pathways. Frontiers in Cellular and Infection Microbiology. 2022 Jul 22;12:935322. 3. Chen H, Zhou X, Ren B, Cheng L. The regulation of hyphae growth in Candida albicans. Virulence. 2020 Dec 31;11(1):337-48.	ERK-family protein kinase; required for wild-type yeast-hypha switch, mating efficiency, virulence in mice; Cst20-Hst7-Cek1-Cph1 MAPK pathway regulates mating, and invasive hyphal growth under some conditions; Spider biofilm induced
Cek2	1. Chen H, Zhou X, Ren B, Cheng L. The regulation of hyphae growth in Candida albicans. Virulence. 2020 Dec 31;11(1):337-48. 2. Correia I, Prieto D, Román E, Wilson D, Hube B, Alonso-Monge R, Pla J. Cooperative Role of MAPK Pathways in the Interaction of Candida albicans with the Host Epithelium. Microorganisms. 2019 Dec 25;8(1):48. 3. Correia I, Román E, Prieto D, Eisman B, Pla J. Complementary roles of the Cek1 and Cek2 MAP kinases in Candida albicans cell-wall biogenesis. Future Microbiology. 2016 Jan 1;11(1):51-67.	MAP kinase required for wild-type efficiency of mating; component of the signal transduction pathway that regulates mating; ortholog of S. cerevisiae Fus3; induced by Cph1, pheromone; transposon mutation affects filamentous growth
Cgr1	1. Kusch H, Engelmann S, Bode R, Albrecht D, Morschhäuser J, Hecker M. A proteomic view of Candida albicans yeast cell metabolism in exponential and stationary growth phases. International Journal of Medical Microbiology. 2008 Apr 1;298(3-4):291-318. 2. Cho T, Sudoh M, Tanaka T, Nakashima Y, Chibana H, Kaminishi H. Isolation and expression of a gene (CGR1) regulated during the yeast-hyphal transition in Candida albicans. Biochimica et Biophysica Acta (BBA)-Gene Structure and Expression. 2001 Jan 26;1517(2):288-92.	Negative regulator of yeast-form growth; HSP70 family member; induced by growth cessation at yeast-hyphal transition or in planktonic growth; physically interacts with Msi3p; similar to rat anti-aging gene, SMP30, stationary phase enriched

Cla4	1. Gil-Bona A, Parra-Giraldo CM, Hernáez ML, Reales-Calderon JA, Solis NV, Filler SG, Monteoliva L, Gil C. Candida albicans cell shaving uncovers new proteins involved in cell wall integrity, yeast to hypha transition, stress response and host–pathogen interaction. Journal of proteomics. 2015 Sep 8;127:340-51. 2.Kramara J, Kim MJ, Ollinger TL, Ristow LC, Wakade RS, Zarnowski R, Wellington M, Andes DR, Mitchell AG, Krysan DJ. Systematic analysis of the Candida albicans kinome reveals environmentally contingent protein kinase-mediated regulation of filamentation and biofilm formation in vitro and in vivo. mBio. 2024 Aug 14;15(8):e01249-24.	Ste20p family Ser/Thr kinase required for wild-type filamentous growth, organ colonization and virulence in mouse systemic infection; role in chlamydospore formation; functional homolog of S. cerevisiae Cla4p; mutant caspofungin sensitive
Clb2	1. Bensen ES, Clemente-Blanco A, Finley KR, Correa-Bordes J, Berman J. The mitotic cyclins Clb2p and Clb4p affect morphogenesis in Candida albicans. Molecular biology of the cell. 2005 Jul;16(7):3387-400. 2. Cdc28 provides a molecular link between Hsp90, morphogenesis, and cell cycle progression in Candida albicans. Mol Biol Cell 23(2):268-83	B-type mitotic cyclin (cyclin-dependent protein kinase regulatory subunit); essential; required for wild-type mitotic exit; role in cell polarization; interacts with catalytic subunit Cdk1; Spider biofilm repressed
Clb4	1. Ofir A, Kornitzer D. Candida albicans cyclin Clb4 carries S-phase cyclin activity. Eukaryotic Cell. 2010 Sep;9(9):1311-9. 2. Bensen ES, Clemente-Blanco A, Finley KR, Correa-Bordes J, Berman J. The mitotic cyclins Clb2p and Clb4p affect morphogenesis in Candida albicans. Molecular biology of the cell. 2005 Jul;16(7):3387-400.	B-type mitotic cyclin; nonessential; negative regulator of pseudohyphal growth; dispensible for mitotic exit, cytokinesis; Fkh2-represed; flow model biofilm repressed; farnesol-upregulated in biofilm; reduced total RNA in clb4 mutant
Cmp1	1. Lu H, Zhu Z, Dong L, Jia X, Sun X, Yan L, Chai Y, Jiang Y, Cao Y. Lack of trehalose accelerates H2O2-induced Candida albicans apoptosis through regulating Ca2+ signaling pathway and caspase activity. PLoS One. 2011 Jan 5;6(1):e15808. 2. Hameed S, Dhamgaye S, Singh A, Goswami SK, Prasad R. Calcineurin signaling and membrane lipid homeostasis regulates iron mediated multidrug resistance mechanisms in Candida albicans. PloS one. 2011 Apr 12;6(4):e18684.	Catalytic subunit of calcineurin (Ca[2+]-calmodulin-regulated S/T protein phosphatase); required for wild-type virulence, resistance to high pH, Na(+), Li(+), Mn(2+), and fluconazole tolerance; micafungin is fungicidal to null mutant

Cnb1	Shapiro RS, Robbins N, Cowen LE. Regulatory circuitry governing fungal development, drug resistance, and disease. Microbiology and molecular biology reviews. 2011 Jun;75(2):213-67.	Regulatory subunit of calcineurin B (Ca[2+]-calmodulin-regulated S/T protein phosphatase); required for wild-type resistance to fluconazole or to SDS; micafungin is fungicidal to null mutant
Cox1	1. Jung PP, Schacherer J, Souciet JL, Potier S, Wincker P, De Montigny J. The complete mitochondrial genome of the yeast Pichia sorbitophila. FEMS yeast research. 2009 Sep 1;9(6):903-10. 2. Athikomkulchai S, Prawat H, Thasana N, Ruangrungsi N, Ruchirawat S. COX-1, COX-2 inhibitors and antifungal agents from Croton hutchinsonianus. Chemical and pharmaceutical bulletin. 2006;54(2):262-4. 3. Yu X, Mao Y, Li G, Wu X, Xuan Q, Yang S, Chen X, Cao Q, Guo J, Guo J, Wu W. Alpha-Hemolysin from Staphylococcus aureus Obstructs Yeast-Hyphae Switching and Diminishes Pathogenicity in Candida albicans. Journal of Microbiology. 2023 Feb;61(2):233-43.	Subunit I of cytochrome c oxidase, which is the terminal member of the mitochondrial (mt) inner membrane electron transport chain; one of three mt-encoded subunits; alternatively spliced transcripts encode 4 putative splicing endonucleases
Cph1	1. Wagner AS, Hancock TJ, Lumsdaine SW, Kauffman SJ, Mangrum MM, Phillips EK, Sparer TE, Reynolds TB. Activation of Cph1 causes ss (1, 3)-glucan unmasking in Candida albicans and attenuates virulence in mice in a neutrophil-dependent manner. PLoS Pathogens. 2021 Aug 25;17(8):e1009839. 2. Kumpakha R, Gordon DM. Inhibition of morphological transition and hyphae extension in Candida spp. by occidiofungin. Journal of Applied Microbiology. 2022 Apr 1;132(4):3038-48.	Transcription factor involved in mating, filamentation on solid media, and pheromone-stimulated biofilms; in a pathway with ESS1 and CZF1; required with EFG1 for host cytokine response; rat cathether biofilm repressed
Cph2	1. Lane, S., Di Lena, P., Tormanen, K., Baldi, P. and Liu, H., 2015. Function and regulation of Cph2 in Candida albicans. Eukaryotic cell, 14(11), pp.1114-1126. 2. Kornitzer D. Regulation of Candida albicans hyphal morphogenesis by endogenous signals. Journal of Fungi. 2019 Feb 28;5(1):21.	Myc-bHLH transcription factor; promotes hyphal growth; directly regulates Tec1 to induce hypha-specific genes; probably homodimeric, phosphorylated; required for colonization of the mouse GI tract; rat catheter and Spider biofilm induced

Crh11	1. Liu Y, Solis NV, Heilmann CJ, Phan QT, Mitchell AP, Klis FM, Filler SG. Role of retrograde trafficking in stress response, host cell interactions, and virulence of Candida albicans. Eukaryotic cell. 2014 Feb;13(2):279-87. 2. Ene IV, Walker LA, Schiavone M, Lee KK, Martin-Yken H, Dague E, Gow NA, Munro CA, Brown AJ. Cell wall remodeling enzymes modulate fungal cell wall elasticity and osmotic stress resistance. MBio. 2015 Sep 1;6(4):10-128. 3. Ballou ER, Avelar GM, Childers DS, Mackie J, Bain JM, Wagener J, Kastora SL, Panea MD, Hardison SE, Walker LA, Erwig LP. Lactate signalling regulates fungal β-glucan masking and immune evasion. Nature microbiology. 2016 Dec 12;2(2):1-9.	GPI-anchored cell wall transglycosylase, putative ortholog of S. cerevisiae Crh1p; predicted glycosyl hydrolase domain; similar to Csf4p and to antigenic A. fumigatus Aspf9; predicted Kex2p substrate; caspofungin-induced.
Crz1	1. Jiang L, Xu H, Wei M, Gu Y, Yan H, Pan L, Wei C. Transcriptional expression of PHR2 is positively controlled by the calcium signaling transcription factor Crz1 through its binding motif in the promoter. Microbiology Spectrum. 2024 Jan 11;12(1):e01689-23. 2. Jiang L, Xu H, Gu Y, Wei L. A glycosylated Phr1 protein is induced by calcium stress and its expression is positively controlled by the calcium/calcineurin signaling transcription factor Crz1 in Candida albicans. Cell Communication and Signaling. 2023 Sep 18;21(1):237.	Calcineurin-regulated C2H2 transcription factor; role in maintenance of membrane integrity, azole tolerance; not required for mouse virulence; repressed by low iron; regulates Ca++ influx during alkaline pH response; Spider biofilm induced
Csr1	1. Wilson D, Deepe Jr GS. The intersection of host and fungus through the zinc lens. Current opinion in microbiology. 2019 Dec 1;52:35-40. 2. Kumar R, Breindel C, Saraswat D, Cullen PJ, Edgerton M. Candida albicans Sap6 amyloid regions function in cellular aggregation and zinc binding, and contribute to zinc acquisition. Scientific reports. 2017 Jun 6;7(1):2908.	Transcription factor; role in zinc homeostasis and regulation of Spider biofilm matrix; mutation affects filamentous growth; can suppress S. cerevisiae rok1 mutant inviability; Spider biofilm induced; mutants for abnormal Spider biofilms

Cst5	1. Scaduto CM, Kabrawala S, Thomson GJ, Scheving W, Ly A, Anderson MZ, Whiteway M, Bennett RJ. Epigenetic control of pheromone MAPK signaling determines sexual fecundity in Candida albicans. Proceedings of the National Academy of Sciences. 2017 Dec 26;114(52):13780-5. 2. Yi S, Sahni N, Daniels KJ, Lu KL, Huang G, Garnaas AM, Pujol C, Srikantha T, Soll DR. Utilization of the mating scaffold protein in the evolution of a new signal transduction pathway for biofilm development. MBio. 2011 Mar 1;2(1):10-128.	Scaffold protein for the mitogen-activated protein (MAP) kinase cascade that regulates mating; required for opaque mating or white biofilm formation in response to mating pheromone; induced in response to pheromone; Hap43p-repressed
Cyp1	1. Gil-Bona A, Parra-Giraldo CM, Hernáez ML, Reales-Calderon JA, Solis NV, Filler SG, Monteoliva L, Gil C. Candida albicans cell shaving uncovers new proteins involved in cell wall integrity, yeast to hypha transition, stress response and host–pathogen interaction. Journal of proteomics. 2015 Sep 8;127:340-51. 2. Martínez JP, Blanes R, Casanova M, Valentín E, Murgui A, Domínguez Á. Null mutants of Candida albicans for cell-wall-related genes form fragile biofilms that display an almost identical extracellular matrix proteome. FEMS Yeast Research. 2016 Nov 1;16(7):fow075.	Peptidyl-prolyl cis-trans isomerase; cyclosporin A sensitive activity; soluble in hyphae; biofilm induced, macrophage-induced protein; downregulated upon treatment of biofilm with farnesol; present in exponential and stationary phase cells
Cyr1	1. Ng AW, Li L, Ng EW, Li C, Qiao Y. Molecular docking reveals critical residues in Candida albicans Cyr1 for peptidoglycan recognition and hyphal Growth. ACS Infectious Diseases. 2023 Jun 15;9(7):1362-71. 2. Sriram K. A mathematical model captures the role of adenyl cyclase Cyr1 and guanidine exchange factor Ira2 in creating a growth-to-hyphal bistable switch in Candida albicans. FEBS Open bio. 2022 Oct;12(10):1700-16. 3. Glazier VE. EFG1, everyone’s favorite gene in Candida albicans: A comprehensive literature review. Frontiers in Cellular and Infection Microbiology. 2022 Mar 22;12:855229.	Class III adenylyl cyclase; mutant lacks cAMP; involved in regulation of filamentation, phenotypic switching and mating; mutant hyphal growth defect rescued by exogenous cAMP; downstream of Ras1p and CO2 signaling

Czf1	1. Modrzewska B, Kurnatowski P. Adherence of Candida sp. to host tissues and cells as one of its pathogenicity features. Annals of parasitology. 2015;61(1). 2. Rodriguez DL, Quail MM, Hernday AD, Nobile CJ. Transcriptional circuits regulating developmental processes in Candida albicans. Frontiers in Cellular and Infection Microbiology. 2020 Dec 3;10:605711. 3. Glazier VE. EFG1, everyone's favorite gene in Candida albicans: A comprehensive literature review. Frontiers in Cellular and Infection Microbiology. 2022 Mar 22;12:855229.	Transcription factor; regulates white-opaque switch; hyphal growth regulator; expression in S. cerevisiae causes dominant-negative inhibition of pheromone response; required for yeast cell adherence to silicone; Spider biofilm induced
Dck1	1. Hope H, Bogliolo S, Arkowitz RA, Bassilana M. Activation of Rac1 by the guanine nucleotide exchange factor Dck1 is required for invasive filamentous growth in the pathogen Candida albicans. Molecular biology of the cell. 2008 Sep;19(9):3638-51. 2. Hope H, Schmauch C, Arkowitz RA, Bassilana M. The Candida albicans ELMO homologue functions together with Rac1 and Dck1, upstream of the MAP Kinase Cek1, in invasive filamentous growth. Molecular microbiology. 2010 Jun;76(6):1572-90.	Putative guanine nucleotide exchange factor; required for embedded filamentous growth; activates Rac1; has a DOCKER domain; similar to adjacent DCK2 and to S. cerevisiae Ylr422wp; regulated by Nrg1; Spider biofilm induced
Efg1	1. Schena NC, Baker KM, Stark AA, Thomas DP, Cleary IA. Constitutive ALS3 expression in Candida albicans enhances adhesion and biofilm formation of efg1, but not cph1 mutant strains. Plos one. 2023 Jul 13;18(7):e0286547. 2. Zeng G, Xu X, Kok YJ, Deng FS, Chow EW, Gao J, Bi X, Wang Y. Cytochrome c regulates hyphal morphogenesis by interfering with cAMP-PKA signaling in Candida albicans. Cell Reports. 2023 Dec 26;42(12). 3. Pang C, Chen J, Yang L, Yang Y, Qi H, Li R, Cao Y, Miao H. Shikonin inhibits Candida albicans biofilms via the Ras1-cAMP-Efg1 signalling pathway. International Journal of General Medicine. 2023 Dec 31:2653-62. 4. Ganser C, Staples MI, Dowell M, Frazer C, Dainis J, Sircaik S, Bennett RJ. Filamentation and biofilm formation are regulated by the phase-separation capacity of network transcription factors in Candida albicans. Plos Pathogens. 2023 Dec 13;19(12):e1011833.	bHLH transcription factor; required for white-phase cell type, RPMI and Spider biofilm formation, hyphal growth, cell-wall gene regulation; roles in adhesion, virulence; Cph1 and Efg1 have role in host cytokine response; binds E-box

Far1	1. Côte P, Whiteway M. The role of Candida albicans FAR1 in regulation of pheromone-mediated mating, gene expression and cell cycle arrest. Molecular microbiology. 2008 Apr;68(2):392-404. 2. Côte P, Hogues H, Whiteway M. Transcriptional analysis of the Candida albicans cell cycle. Molecular biology of the cell. 2009 Jul 15;20(14):3363-73.	Protein involved in regulation of pheromone-mediated mating; repressed by A1p and Alpha2p in white-phase cells; null mutant shows no pheromone response in opaque cells; overexpression causes enhanced pheromone response and cell cycle arrest
Fas2	1. Zhao XJ, McElhaney-Feser GE, Bowen WH, Cole MF, Broedel Jr SE, Cihlar RL. Requirement for the Candida albicans FAS2 gene for infection in a rat model of oropharyngeal candidiasis. Microbiology. 1996 Sep;142(9):2509-14. 2. Bonhomme J, Chauvel M, Goyard S, Roux P, Rossignol T, d'Enfert C. Contribution of the glycolytic flux and hypoxia adaptation to efficient biofilm formation by Candida albicans. Molecular microbiology. 2011 May;80(4):995-1013.	Alpha subunit of fatty-acid synthase; required for virulence in mouse systemic infection and rat oropharyngeal infection models; regulated by Efg1; fluconazole-induced; amphotericin B repressed; flow model and Spider biofilm repressed
Fgr22	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Mba IE, Nweze EI. Mechanism of Candida pathogenesis: revisiting the vital drivers. European Journal of Clinical Microbiology & Infectious Diseases. 2020 Oct;39(10):1797-819.	Putative phosphatidylinositol-specific phospholipase C (PI-PLC); predicted type 2 membrane protein; no S. cerevisiae ortholog; role in, and regulated by, filamentation, Hap43p; almost identical to orf19.5797
Fkh2	1. Zakikhany K, Naglik JR, Schmidt-Westhausen A, Holland G, Schaller M, Hube B. In vivo transcript profiling of Candida albicans identifies a gene essential for interepithelial dissemination. Cellular microbiology. 2007 Dec;9(12):2938-54. 2. Greig JA, Sudbery IM, Richardson JP, Naglik JR, Wang Y, Sudbery PE. Cell cycle-independent phospho-regulation of Fkh2 during hyphal growth regulates Candida albicans pathogenesis. PLoS pathogens. 2015 Jan 24;11(1):e1004630.	Forkhead transcription factor; morphogenesis regulator; required for wild-type hyphal transcription, cell separation, and for virulence in cell culture; mutant lacks true hyphae, is constitutively pseudohyphal; upregulated in RHE model

Flo8	1. Cao F, Lane S, Raniga PP, Lu Y, Zhou Z, Ramon K, Chen J, Liu H. The Flo8 transcription factor is essential for hyphal development and virulence in Candida albicans. Molecular biology of the cell. 2006 Jan;17(1):295-307. 2. Du H, Guan G, Xie J, Cottier F, Sun Y, Jia W, Mühlschlegel FA, Huang G. The transcription factor Flo8 mediates CO2 sensing in the human fungal pathogen Candida albicans. Molecular biology of the cell. 2012 Jul 15;23(14):2692-701. 3. Jin X, Luan X, Xie F, Chang W, Lou H. Erg6 acts as a downstream effector of the transcription factor Flo8 to regulate biofilm formation in Candida albicans. Microbiology Spectrum. 2023 Jun 15;11(3):e00393-23.	Transcription factor; required for hyphal formation and CO2 induced white-opaque switching; activates ERG6 and regulates hyphal gene expression; required for virulence in mice; binds Efg1p and Mss1p
Fus1	1. Sahni N, Yi S, Daniels KJ, Srikantha T, Pujol C, Soll DR. Genes selectively up-regulated by pheromone in white cells are involved in biofilm formation in Candida albicans. PLoS pathogens. 2009 Oct 2;5(10):e1000601. 2. Chen J, Chen J, Lane S, Liu H. A conserved mitogen-activated protein kinase pathway is required for mating in Candida albicans. Molecular microbiology. 2002 Dec;46(5):1335-44. 3. Guan G, Tao L, Li C, Xu M, Liu L, Bennett RJ, Huang G. Glucose depletion enables Candida albicans mating independently of the epigenetic white-opaque switch. Nature Communications. 2023 Apr 12;14(1):2067.	Membrane protein required for mating; ortholog of S. cerevisiae Fus1; transcript induced by Cph1 in cells homozygous for the MTLa locus; alpha factor induced
Gca1	1. Bonhomme J, Chauvel M, Goyard S, Roux P, Rossignol T, d'Enfert C. Contribution of the glycolytic flux and hypoxia adaptation to efficient biofilm formation by Candida albicans. Molecular microbiology. 2011 May;80(4):995-1013. 2. Sturtevant J, Dixon F, Wadsworth E, Latge JP, Zhao XJ, Calderone R. Identification and cloning of GCA1, a gene that encodes a cell surface glucoamylase from Candida albicans. Medical mycology. 1999 Jan 1;37(5):357-66. 3. Maicas S, Caminero A, Martínez JP, Sentandreu R, Valentín E. The GCA1 gene encodes a glycosidase-like protein in the cell wall of Candida albicans. FEMS Yeast Research. 2016 Jun 1;16(4):fow032.	Extracellular/plasma membrane-associated glucoamylase; expressed in rat oral infection; regulated by carbohydrates, pH, galactose; promotes biofilm matrix formation; flow model biofilm induced; Bcr1 repressed in RPMI a/a biofilms

Gca2	1. Srikantha T, Daniels KJ, Pujol C, Kim E, Soll DR. Identification of genes upregulated by the transcription factor Bcr1 that are involved in impermeability, impenetrability, and drug resistance of Candida albicans a/α biofilms. Eukaryotic cell. 2013 Jun;12(6):875-88. 2. Rodríguez-Cerdeira C, Martínez-Herrera E, Carnero-Gregorio M, López-Barcenas A, Fabbrocini G, Fida M, El-Samahy M, González-Cespón JL. Pathogenesis and clinical relevance of Candida biofilms in vulvovaginal candidiasis. Frontiers in Microbiology. 2020 Nov 11;11:544480. 3. Yang W, Tu J, Ji C, Li Z, Han G, Liu N, Li J, Sheng C. Discovery of piperidol derivatives for combinational treatment of azole-resistant candidiasis. ACS Infectious Diseases. 2021 Feb 16;7(3):650-60.	Predicted extracellular glucoamylase; induced by ketoconazole; possibly essential, disruptants not obtained by UAU1 method; promotes biofilm matrix formation; Spider biofilm induced; Bcr1-induced in RPMI a/a biofilms
Gpd1	1. Desai JV, Bruno VM, Ganguly S, Stamper RJ, Mitchell KF, Solis N, Hill EM, Xu W, Filler SG, Andes DR, Fanning S. Regulatory role of glycerol in Candida albicans biofilm formation. MBio. 2013 May 1;4(2):10-128. 2. Neves L, Oliveira R, Lucas C. Yeast orthologues associated with glycerol transport and metabolism. FEMS yeast research. 2004 Oct 1;5(1):51-62. 3. Urban C, Xiong X, Sohn K, Schröppel K, Brunner H, Rupp S. The moonlighting protein Tsa1p is implicated in oxidative stress response and in cell wall biogenesis in Candida albicans. Molecular microbiology. 2005 Sep;57(5):1318-41.	Glycerol-3-phosphate dehydrogenase; glycerol biosynthesis; regulated by Efg1; regulated by Tsa1, Tsa1B under H2O2 stress conditions; Sflow model and Spider biofilm induced

Gpd2	1. Enjalbert B, Moran GP, Vaughan C, Yeomans T, MacCallum DM, Quinn J, Coleman DC, Brown AJ, Sullivan DJ. Genome-wide gene expression profiling and a forward genetic screen show that differential expression of the sodium ion transporter Ena21 contributes to the differential tolerance of Candida albicans and Candida dubliniensis to osmotic stress. Molecular microbiology. 2009 Apr;72(1):216-28. 2. Enjalbert B, Nantel A, Whiteway M. Stress-induced gene expression in Candida albicans: absence of a general stress response. Molecular biology of the cell. 2003 Apr 1;14(4):1460-7. 3.Luo S, Hoffmann R, Skerka C, Zipfel PF. Glycerol-3-phosphate dehydrogenase 2 is a novel factor H–, factor H–like protein 1–, and plasminogen-binding surface protein of Candida albicans. The Journal of infectious diseases. 2013 Feb 15;207(4):594-603.	Surface protein similar to glycerol 3-P dehydrogenase; binds host Factor H, FHL-1, plasminogen; regulated by Ssn6, Nrg1, Efg1; induced by cell wall regeneration, macrophage/pseudohyphal growth, core stress response; Spider biofilm induced
Gpr1	1. Miwa T, Takagi Y, Shinozaki M, Yun CW, Schell WA, Perfect JR, Kumagai H, Tamaki H. Gpr1, a putative G-protein-coupled receptor, regulates morphogenesis and hypha formation in the pathogenic fungus Candida albicans. Eukaryotic cell. 2004 Aug;3(4):919-31. 2. Maidan MM, De Rop L, Serneels J, Exler S, Rupp S, Tournu H, Thevelein JM, Van Dijck P. The G protein-coupled receptor Gpr1 and the Gα protein Gpa2 act through the cAMP-protein kinase A pathway to induce morphogenesis in Candida albicans. Molecular biology of the cell. 2005 Apr;16(4):1971-86. 3. Avelar GM, Dambuza IM, Ricci L, Yuecel R, Mackenzie K, Childers DS, Bain JM, Pradhan A, Larcombe DE, Netea MG, Erwig LP. Impact of changes at the Candida albicans cell surface upon immunogenicity and colonisation in the gastrointestinal tract. The Cell Surface. 2022 Dec 1;8:100084.	Plasma membrane G-protein-coupled receptor of the cAMP-PKA pathway; detects lactate and triggers signaling pathway that regulates beta-glucan masking and immune evasion; binds Gpa2; regulates HWP1 and ECE1; required for WT hyphal growth

Grp2	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Kwak MK, Ku M, Kang SO. Inducible NAD (H)-linked methylglyoxal oxidoreductase regulates cellular methylglyoxal and pyruvate through enhanced activities of alcohol dehydrogenase and methylglyoxal-oxidizing enzymes in glutathione-depleted Candida albicans. Biochimica et Biophysica Acta (BBA)-General Subjects. 2018 Jan 1;1862(1):18-39. 3. Kang SO, Kwak MK. Alcohol dehydrogenase 1 and NAD (H)-linked methylglyoxal oxidoreductase reciprocally regulate glutathione-dependent enzyme activities in Candida albicans. Journal of Microbiology. 2021 Jan;59:76-91.	NAD(H)-linked methylglyoxal oxidoreductase involved in regulation of methylglyoxal and pyruvate levels; regulation associated with azole resistance; induced in core stress response or by oxidative stress via Cap1, fluphenazine, benomyl
Gsc1	1. Mio T, Adachi-Shimizu M, Tachibana Y, Tabuchi H, Inoue SB, Yabe T, Yamada-Okabe T, Arisawa M, Watanabe T, Yamada-Okabe H. Cloning of the Candida albicans homolog of Saccharomyces cerevisiae GSC1/FKS1 and its involvement in beta-1, 3-glucan synthesis. Journal of bacteriology. 1997 Jul;179(13):4096-105. 2. Douglas CM, D'ippolito JA, Shei GJ, Meinz M, Onishi J, Marrinan JA, Li W, Abruzzo GK, Flattery A, Bartizal K, Mitchell A. Identification of the FKS1 gene of Candida albicans as the essential target of 1, 3-beta-D-glucan synthase inhibitors. Antimicrobial agents and chemotherapy. 1997 Nov;41(11):2471-9. 3. Hosseini Bafghi M, Zarrinfar H, Darroudi M, Zargar M, Nazari R. Green synthesis of selenium nanoparticles and evaluate their effect on the expression of ERG3, ERG11 and FKS1 antifungal resistance genes in Candida albicans and Candida glabrata. Letters in Applied Microbiology. 2022 May 1;74(5):809-19.	Essential beta-1,3-glucan synthase subunit; gsc1 allele determines resistance/sensitivity to echinocandins; 16 predicted membrane-spanning regions; mRNA abundance declines after yeast-to-hypha transition; Spider biofilm induced

Gsl1	1. Srikantha T, Daniels KJ, Pujol C, Kim E, Soll DR. Identification of genes upregulated by the transcription factor Bcr1 that are involved in impermeability, impenetrability, and drug resistance of Candida albicans a/α biofilms. Eukaryotic cell. 2013 Jun;12(6):875-88. 2. Xie Y, Hua H, Zhou P. Magnolol as a potent antifungal agent inhibits Candida albicans virulence factors via the PKC and Cek1 MAPK signaling pathways. Frontiers in Cellular and Infection Microbiology. 2022 Jul 22;12:935322.	Beta-1,3-glucan synthase subunit; 10 predicted transmembrane regions; caspofungin induced; repressed by yeast-to-hypha transition; young biofilm repressed, induced by biofilm drug exposure; Bcr1-repressed in RPMI a/a biofilms
Gtr1	1. Flanagan PR, Liu NN, Fitzpatrick DJ, Hokamp K, Köhler JR, Moran GP. The Candida albicans TOR-activating GTPases Gtr1 and Rhb1 coregulate starvation responses and biofilm formation. Msphere. 2017 Dec 27;2(6):10-128. 2. Liu NN, Uppuluri P, Broggi A, Besold A, Ryman K, Kambara H, Solis N, Lorenz V, Qi W, Acosta-Zaldivar M, Emami SN. Intersection of phosphate transport, oxidative stress and TOR signalling in Candida albicans virulence. PLoS pathogens. 2018 Jul 30;14(7):e1007076.	Putative GTP-binding protein; involved in activation of TOR1C during starvation response; transcript is upregulated in clinical isolates from HIV+ patients with oral candidiasis
Hap43	1. Hsu PC, Yang CY, Lan CY. Candida albicans Hap43 is a repressor induced under low-iron conditions and is essential for iron-responsive transcriptional regulation and virulence. Eukaryotic Cell. 2011 Feb;10(2):207-25. 2. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70.	CCAAT-binding factor-dependent transcription factor; repressor; also called CAP2; required for low iron response; similar to bZIP transcription factor AP-1; repressed by Sfu1; ciclopirox olamine induced; rat catheter, Spider biofilm induced

Hgc1	1. García-Sánchez S, Mavor AL, Russell CL, Argimon S, Dennison P, Enjalbert B, Brown AJ. Global roles of Ssn6 in Tup1-and Nrg1-dependent gene regulation in the fungal pathogen, Candida albicans. Molecular biology of the cell. 2005 Jun;16(6):2913-25. 2. Zheng X, Wang Y, Wang Y. Hgc1, a novel hypha-specific G1 cyclin-related protein regulates Candida albicans hyphal morphogenesis. The EMBO journal. 2004 Apr 21;23(8):1845-56. 3. Wilson D, Hube B. Hgc1 mediates dynamic Candida albicans-endothelium adhesion events during circulation. Eukaryotic cell. 2010 Feb;9(2):278-87. 4. Sharma A, Solis NV, Huang MY, Lanni F, Filler SG, Mitchell AP. Hgc1 independence of biofilm hyphae in Candida albicans. Mbio. 2023 Apr 25;14(2):e03498-22.	Hypha-specific G1 cyclin-related protein involved in regulation of morphogenesis, biofilm formation; Cdc28-Hgc1 maintains Cdc11 S394 phosphorylation during hyphal growth; required for virulence in mice; regulated by Nrg1, Tup1, farnesol
Hms1	1. Shapiro RS, Sellam A, Tebbji F, Whiteway M, Nantel A, Cowen LE. Pho85, Pcl1, and Hms1 signaling governs Candida albicans morphogenesis induced by high temperature or Hsp90 compromise. Current Biology. 2012 Mar 20;22(6):461-70. 2. Hossain S, Lash E, Veri AO, Cowen LE. Functional connections between cell cycle and proteostasis in the regulation of Candida albicans morphogenesis. Cell reports. 2021 Feb 23;34(8).	hLh domain Myc-type transcript factor; required for morphogenesis induced by elevated temperature or Hsp90 compromise; acts downstream of Pcl1; Spider biofilm induced.
Hog1	1. Correia I, Alonso-Monge R, Pla J. MAPK cell-cycle regulation in Saccharomyces cerevisiae and Candida albicans. Future microbiology. 2010 Jul 1;5(7):1125-41. 2. Sellam A, Chaillot J, Mallick J, Tebbji F, Richard Albert J, Cook MA, Tyers M. The p38/HOG stress-activated protein kinase network couples growth to division in Candida albicans. PLoS genetics. 2019 Mar 28;15(3):e1008052. 3. The defective gut colonization of Candida albicans hog1 MAPK mutants is restored by overexpressing the transcriptional regulator of the white opaque transition WOR1. Virulence 14(1):2174294	MAP kinase of osmotic-, heavy metal-, and core stress response; role in regulation of response to stress; phosphorylated in response to H2O2 or NaCl; acts as repressor of START; mutant induces protective mouse immune response

Hot1	1. Ahn CH, Lee S, Cho E, Kim H, Chung B, Park W, Shin J, Oh KB. A farnesoic acid-responsive transcription factor, Hot1, regulates yeast-hypha morphogenesis in Candida albicans. FEBS letters. 2017 May;591(9):1225-35. 2. Rodríguez-Cerdeira C, Martínez-Herrera E, Carnero-Gregorio M, López-Barcenas A, Fabbrocini G, Fida M, El-Samahy M, González-Cespón JL. Pathogenesis and clinical relevance of Candida biofilms in vulvovaginal candidiasis. Frontiers in Microbiology. 2020 Nov 11;11:544480.	Putative transcription factor; required for inhibition of filamentous growth by farnesoic acid and for expression of PHO81; filament induced
Hsf1	1. Nicholls S, Leach MD, Priest CL, Brown AJ. Role of the heat shock transcription factor, Hsf1, in a major fungal pathogen that is obligately associated with warm-blooded animals. Molecular microbiology. 2009 Nov;74(4):844-61. 2. Nair R, Shariq M, Dhamgaye S, Mukhopadhyay CK, Shaikh S, Prasad R. Non-heat shock responsive roles of HSF1 in Candida albicans are essential under iron deprivation and drug defense. Biochimica et Biophysica Acta (BBA)-Molecular Cell Research. 2017 Feb 1;1864(2):345-54. 3. Veri AO, Miao Z, Shapiro RS, Tebbji F, O'Meara TR, Kim SH, Colazo J, Tan K, Vyas VK, Whiteway M, Robbins N. Tuning Hsf1 levels drives distinct fungal morphogenetic programs with depletion impairing Hsp90 function and overexpression expanding the target space. PLoS genetics. 2018 Mar 28;14(3):e1007270. 4. Veri AO, Robbins N, Cowen LE. Regulation of the heat shock transcription factor Hsf1 in fungi: implications for temperature-dependent virulence traits. FEMS yeast research. 2018 Aug;18(5):foy041. 5. Guan G, Tao L, Yue H, Liang W, Gong J, Bing J, Zheng Q, Veri AO, Fan S, Robbins N, Cowen LE. Environment-induced same-sex mating in the yeast Candida albicans through the Hsf1–Hsp90 pathway. PLoS Biology. 2019 Mar 13;17(3):e2006966.	Essential transcription factor, mediates heat shock transcriptional induction; in the absence of heat stress, Cta8p levels are modulated by growth temperature to regulate basal expression of genes involved in protein folding

Hsl1	1. Umeyama T, Kaneko A, Nagai Y, Hanaoka N, Tanabe K, Takano Y, Niimi M, Uehara Y. Candida albicans protein kinase CaHsl1p regulates cell elongation and virulence. Molecular microbiology. 2005 Jan;55(2):381-95. 2. Wightman R, Bates S, Amornrrattanapan P, Sudbery P. In Candida albicans, the Nim1 kinases Gin4 and Hsl1 negatively regulate pseudohypha formation and Gin4 also controls septin organization. The Journal of cell biology. 2004 Feb 16;164(4):581-91.	Probable protein kinase involved in determination of morphology during the cell cycle of both yeast-form and hyphal cells via regulation of Swe1p and Cdc28p; required for full virulence and kidney colonization in mouse systemic infection
Hsp12	1. Sheth CC, Mogensen EG, Fu MS, Blomfield IC, Mühlschlegel FA. Candida albicans HSP12 is co-regulated by physiological CO2 and pH. Fungal Genetics and Biology. 2008 Jul 1;45(7):1075-80. 2. Fu MS, De Sordi L, Mühlschlegel FA. Functional characterization of the small heat shock protein Hsp12p from Candida albicans.	Heat-shock protein; induced by osmotic/oxidative/cadmium stress, fluphenazine treatment, low iron, CDR1 and CDR2 overexpression, or ssn6 or ssk1 null mutation; overexpression increases resistance to farnesol and azoles
Hsp21	1. Mayer FL, Wilson D, Jacobsen ID, Miramon P, Slesiona S, Bohovych IM, Brown AJ, Hube B. Small but crucial: the novel small heat shock protein Hsp21 mediates stress adaptation and virulence in Candida albicans. PloS one. 2012 Jun 7;7(6):e38584. 2. Mayer FL, Wilson D, Hube B. Hsp21 potentiates antifungal drug tolerance in Candida albicans. PLoS One. 2013 Mar 22;8(3):e60417. 3. Yang D, Tu Y, Wang X, Cao C, Hu Y, Shao J, Weng L, Mou X, Dong X. A photo-triggered antifungal nanoplatform with efflux pump and heat shock protein reversal activity for enhanced chemo-photothermal synergistic therapy. Biomaterials Science. 2021;9(9):3293-9.	Small heat shock protein; role in stress response and virulence; fluconazole-downregulated; induced in cyr1 or ras1 mutant; stationary phase enriched protein; detected in some, not all, biofilm extracts; Spider biofilm induced

Hsp90	1. Gong Y, Li T, Yu C, Sun S. Candida albicans heat shock proteins and Hsps-associated signaling pathways as potential antifungal targets. Frontiers in cellular and infection microbiology. 2017 Dec 19;7:520. 2. Shapiro RS, Uppuluri P, Zaas AK, Collins C, Senn H, Perfect JR, Heitman J, Cowen LE. Hsp90 orchestrates temperature-dependent Candida albicans morphogenesis via Ras1-PKA signaling. Current Biology. 2009 Apr 28;19(8):621-9. 3. Robbins N, Cowen LE. Roles of Hsp90 in Candida albicans morphogenesis and virulence. Current opinion in microbiology. 2023 Oct 1;75:102351.	Essential chaperone, regulates several signal transduction pathways and temperature-induced morphogenesis; activated by heat shock, stress; localizes to surface of hyphae, not yeast cells; mediates echinocandin and biofilm azole resistance
Hst7	1. Eisman B, Alonso-Monge R, Roman E, Arana D, Nombela C, Pla J. The Cek1 and Hog1 mitogen-activated protein kinases play complementary roles in cell wall biogenesis and chlamydospore formation in the fungal pathogen Candida albicans. Eukaryotic Cell. 2006 Feb;5(2):347-58. 2. Xie Y, Hua H, Zhou P. Magnolol as a potent antifungal agent inhibits Candida albicans virulence factors via the PKC and Cek1 MAPK signaling pathways. Frontiers in Cellular and Infection Microbiology. 2022 Jul 22;12:935322.	MAP kinase kinase involved in mating and hyphal growth signal transduction pathways; phosphorylates Cek1p; wild-type virulence in mouse systemic infection; functional homolog of S. cerevisiae Ste7p; mutants are hypersensitive to caspofungin
Hwp1	1. Sundstrom P, Cutler JE, Staab JF. Reevaluation of the role of HWP1 in systemic candidiasis by use of Candida albicans strains with selectable marker URA3 targeted to the ENO1 locus. Infection and immunity. 2002 Jun;70(6):3281-3. 2. Ene IV, Bennett RJ. Hwp1 and related adhesins contribute to both mating and biofilm formation in Candida albicans. Eukaryotic cell. 2009 Dec;8(12):1909-13.	Hyphal cell wall protein; host transglutaminase substrate; opaque-, a-specific, alpha-factor induced; at MTLa side of conjugation tube; virulence complicated by URA3 effects; Bcr1-repressed in RPMI a/a biofilms; Spider biofilm induced

Icl1	1. Lattif AA, Prasad R, Banerjee U, Gupta N, Mohammad S, Baquer NZ. The glyoxylate cycle enzyme activities in the pathogenic isolates of Candida albicans obtained from HIV/AIDS, diabetic and burn patients. Mycoses. 2006 Mar;49(2):85-90. 2. Piekarska K, Hardy G, Mol E, van den Burg J, Strijbis K, van Roermund C, van den Berg M, Distel B. The activity of the glyoxylate cycle in peroxisomes of Candida albicans depends on a functional β-oxidation pathway: evidence for reduced metabolite transport across the peroxisomal membrane. Microbiology. 2008 Oct 1;154(10):3061-72. 3. Kamal LZ, Adam MA, Shahpudin SN, Shuib AN, Sandai R, Hassan NM, Tabana Y, Basri DF, Than LT, Sandai D. Identification of Alkaloid Compounds Arborinine and Graveoline from Ruta angustifolia (L.) Pers for their Antifungal Potential against Isocitrate lyase (ICL 1) gene of Candida albicans. Mycopathologia. 2021 May;186:221-36. 4. Vico SH, Prieto D, Monge RA, Román E, Pla J. The glyoxylate cycle is involved in white-opaque switching in Candida albicans. Journal of Fungi. 2021 Jun 24;7(7):502.	Isocitrate lyase; glyoxylate cycle enzyme; required for virulence in mice; induced upon phagocytosis by macrophage; farnesol regulated; Pex5-dependent peroxisomal localization; stationary phase enriched; rat catheter, Spider biofilm induced
Bud4	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Lopes JP, Lionakis MS. Pathogenesis and virulence of Candida albicans. Virulence 13: 89–121. 3. Thomas G, Bain JM, Budge S, Brown AJ, Ames RM. Identifying Candida albicans gene networks involved in pathogenicity. Frontiers in Genetics. 2020 Apr 24;11:375.	Protein structurally similar to alpha-subunit of human leukocyte integrin; role in morphogenesis, adhesion, and mouse cecal colonization and systemic virulence; similar to S. cerevisiae Bud4; Hap43-induced gene

Ira2	1. Inglis DO, Sherlock G. Ras signaling gets fine-tuned: regulation of multiple pathogenic traits of Candida albicans. Eukaryotic cell. 2013 Oct;12(10):1316-25. 2. Hogan DA, Sundstrom P. The Ras/cAMP/PKA signaling pathway and virulence in Candida albicans. Future microbiology. 2009 Dec 1;4(10):1263-70.	GTPase-activating protein; negatively regulates RAS by converting it from the GTP- to the GDP-bound inactive form; Spider biofilm induced; flow model biofilm repressed
Iro1	1. Chibana H, Uno J, Cho T, Mikami Y. Mutation in IRO1 tightly linked with URA3 gene reduces virulence of Candida albicans. Microbiology and immunology. 2005 Oct;49(10):937-9.	Protein with a role in iron utilization, pathogenesis; both IRO1 and adjacent URA3 are mutated in strain CAI4; suppresses S. cerevisiae aft1 mutant low-iron growth defect; hyphal-induced; reports differ about iron regulation
Lrg1	1. Xie JL, Grahl N, Sless T, Leach MD, Kim SH, Hogan DA, Robbins N, Cowen LE. Signaling through Lrg1, Rho1 and Pkc1 governs Candida albicans morphogenesis in response to diverse cues. PLoS genetics. 2016 Oct 27;12(10):e1006405. 2. Chen T, Wagner AS, Tams RN, Eyer JE, Kauffman SJ, Gann ER, Fernandez EJ, Reynolds TB. Lrg1 regulates β (1, 3)-glucan masking in Candida albicans through the Cek1 MAP kinase pathway. MBio. 2019 Oct 29;10(5):10-128.	GTPase activator (GAP) that negatively controls small GTPases Cdc42p and Ras1p, involved in signaling pathway that controls morphogenesis in response to environmental signals
Mca1	1. Cao Y, Huang S, Dai B, Zhu Z, Lu H, Dong L, Cao Y, Wang Y, Gao P, Chai Y, Jiang Y. Candida albicans cells lacking CaMCA1-encoded metacaspase show resistance to oxidative stress-induced death and change in energy metabolism. Fungal Genetics and Biology. 2009 Feb 1;46(2):183-9. 2. Laprade DJ, Brown MS, McCarthy ML, Ritch JJ, Austriaco N. Filamentation protects Candida albicans from amphotericin B-induced programmed cell death via a mechanism involving the yeast metacaspase, MCA1. Microbial Cell. 2016 Jul 7;3(7):285.	Putative metacaspase, cysteine protease involved in apoptosis in response to stresses; has similarity to S. cerevisiae Mca1p; fungal-specific (no human or murine homolog); farnesol-induced

Mcm1	1. A screen in Saccharomyces cerevisiae identified CaMCM1, an essential gene in Candida albicans crucial for morphogenesis. Mol Microbiol 47(4):943-59 2. Srikantha T, Tsai L, Daniels K, Klar AJ, Soll DR. The histone deacetylase genes HDA1 and RPD3 play distinct roles in regulation of high-frequency phenotypic switching in Candida albicans. Journal of bacteriology. 2001 Aug 1;183(15):4614-25. 3. Mba IE, Nweze EI. Mechanism of Candida pathogenesis: revisiting the vital drivers. European Journal of Clinical Microbiology & Infectious Diseases. 2020 Oct;39(10):1797-819.	Transcription factor; regulator of hyphal growth; may act with Wor1p; canonical and non-canonical binding sites; MADS domain DNA-binding motif; similar to S. cerevisiae Mcm1p; greater expression in white than opaque cells; intron in 5'-UTR
Mdh1	1. Lan CY, Rodarte G, Murillo LA, Jones T, Davis RW, Dungan J, Newport G, Agabian N. Regulatory networks affected by iron availability in Candida albicans. Molecular microbiology. 2004 Sep;53(5):1451-69. 2. Shareck J, Nantel A, Belhumeur P. Conjugated linoleic acid inhibits hyphal growth in Candida albicans by modulating Ras1p cellular levels and downregulating TEC1 expression. Eukaryotic cell. 2011 Apr;10(4):565-77.	Mitochondrial malate dehydrogenase; regulated by Mig1, Tup1, white-opaque switch, phagocytosis; induced in high iron; antigenic during murine and human infection; repressed in Spider biofilms by Bcr1, Tec1, Ndt80, Rob1, Brg1
Mdh1-3	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Kunze M, Hartig A. Permeability of the peroxisomal membrane: lessons from the glyoxylate cycle. Frontiers in physiology. 2013 Aug 14;4:204.	Predicted malate dehydrogenase; farnesol regulated; protein present in exponential and stationary growth phase yeast; Hap43p-repressed gene

MFALPHA	1. Newport G, Kuo A, Flattery A, Gill C, Blake JJ, Kurtz MB, Abruzzo GK, Agabian N. Inactivation of Kex2p diminishes the virulence of Candida albicans. Journal of Biological Chemistry. 2003 Jan 17;278(3):1713-20. 2. Panwar SL, Legrand M, Dignard D, Whiteway M, Magee PT. MFα1, the gene encoding the α mating pheromone of Candida albicans. Eukaryotic cell. 2003 Dec;2(6):1350-60. 3. Li C, Tao L, Guan Z, Hu T, Wang S, Liang W, Zhao F, Huang G. Candida albicans MTLa2 regulates the mating response through both the a-factor and α-factor sensing pathways. Fungal Genetics and Biology. 2022 Apr 1;159:103664.	Alpha factor mating pheromone precursor; three copies of pheromone that are proteolytically processed by Kex2p and possibly by Orf19.5851p; required for alpha cells to mate; expressed specifically in opaque phase MTLalpha/MTLalpha cells
MID1	1. Brand A, Shanks S, Duncan VM, Yang M, Mackenzie K, Gow NA. Hyphal orientation of Candida albicans is regulated by a calcium-dependent mechanism. Current Biology. 2007 Feb 20;17(4):347-52. 2. Brand A, Lee K, Veses V, Gow NA. Calcium homeostasis is required for contact-dependent helical and sinusoidal tip growth in Candida albicans hyphae. Molecular Microbiology. 2009 Mar;71(5):1155-64. 3.Li W, Shrivastava M, Lu H, Jiang Y. Calcium-calcineurin signaling pathway in Candida albicans: A potential drug target. Microbiological research. 2021 Aug 1;249:126786.	Putative stretch-activated Ca2+ channel of the high affinity calcium uptake system; role in thigmotropism; decreased transcription is observed upon fluphenazine treatment or in an azole-resistant strain with CDR1 and CDR2 overexpression
MKC1	1. Navarro-Garcia F, Alonso-Monge R, Rico H, Pla J, Sentandreu R, Nombela C. A role for the MAP kinase gene MKC1 in cell wall construction and morphological transitions in Candida albicans. Microbiology. 1998 Feb;144(2):411-24. 2. Ibe C, Munro CA. Fungal cell wall proteins and signaling pathways form a cytoprotective network to combat stresses. Journal of Fungi. 2021 Sep 8;7(9):739.	MAP kinase; role in biofilm formation, contact-induced invasive filamentation, systemic virulence in mouse, cell wall structure/maintenance, caspofungin response; phosphorylated on surface contact, membrane perturbation, or cell wall stress

MKK2	1. Fernández-Arenas E, Cabezón V, Bermejo C, Arroyo J, Nombela C, Diez-Orejas R, Gil C. Integrated proteomics and genomics strategies bring new insight into Candida albicans response upon macrophage interaction. Molecular & Cellular Proteomics. 2007 Mar 1;6(3):460-78. 2. Román E, Alonso-Monge R, Miranda A, Pla J. The Mkk2 MAPKK regulates cell wall biogenesis in cooperation with the Cek1-pathway in Candida albicans. PloS one. 2015 Jul 21;10(7):e0133476.	Ortholog of S. cerevisiae Mkk2; MAP kinase kinase involved in signal transduction; macrophage-downregulated; mutants are viable and hypersensitive to caspofungin
Mlp1	Xu D, Jiang B, Ketela T, Lemieux S, Veillette K, Martel N, Davison J, Sillaots S, Trosok S, Bachewich C, Bussey H. Genome-wide fitness test and mechanism-of-action studies of inhibitory compounds in Candida albicans. PLoS pathogens. 2007 Jun;3(6):e92.	Ortholog(s) have promoter-terminator loop anchoring activity, ribonucleoprotein complex binding activity
MLS1	1. Lorenz MC, Fink GR. The glyoxylate cycle is required for fungal virulence. Nature. 2001 Jul 5;412(6842):83-6. 2. Lan CY, Newport G, Murillo LA, Jones T, Scherer S, Davis RW, Agabian N. Metabolic specialization associated with phenotypic switching in Candida albicans. Proceedings of the National Academy of Sciences. 2002 Nov 12;99(23):14907-12. 3. Piekarska K, Hardy G, Mol E, van den Burg J, Strijbis K, van Roermund C, van den Berg M, Distel B. The activity of the glyoxylate cycle in peroxisomes of Candida albicans depends on a functional β-oxidation pathway: evidence for reduced metabolite transport across the peroxisomal membrane. Microbiology. 2008 Oct 1;154(10):3061-72.	Malate synthase; glyoxylate cycle enzyme; no mammalian homolog; regulated upon white-opaque switch; phagocytosis, strong oxidative stress induced; stationary phase enriched; flow model biofilm repressed; rat catheter, Spider biofilm induced
MNL1	Ramsdale M, Selway L, Stead D, Walker J, Yin Z, Nicholls SM, Crowe J, Sheils EM, Brown AJ. MNL1 regulates weak acid–induced stress responses of the fungal pathogen Candida albicans. Molecular biology of the cell. 2008 Oct;19(10):4393-403.	Transcription factor; induces transcripts of stress response genes via SLE (STRE-like) elements; required for adaptation to weak acid stress; activates a subset of the genes that are repressed by Nrg1

MRS4	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Xu N, Cheng X, Yu Q, Zhang B, Ding X, Xing L, Li M. Identification and functional characterization of mitochondrial carrier Mrs4 in Candida albicans. FEMS yeast research. 2012 Nov 1;12(7):844-58. 3. Xu N, Dong Y, Cheng X, Yu Q, Qian K, Mao J, Jia C, Ding X, Zhang B, Chen Y, Zhang B. Cellular iron homeostasis mediated by the Mrs4–Ccc1–Smf3 pathway is essential for mitochondrial function, morphogenesis and virulence in Candida albicans. Biochimica et Biophysica Acta (BBA)-Molecular Cell Research. 2014 Mar 1;1843(3):629-39.	Mitochondrial carrier family member, involved in iron homeostasis; putative membrane transporter localized to the mitochondrial membrane; transcription under control of Atf2p; regulated by Sef1p, Sfu1p, and Hap43p
MSB2	1. Román E, Cottier F, Ernst JF, Pla J. Msb2 signaling mucin controls activation of Cek1 mitogen-activated protein kinase in Candida albicans. Eukaryotic cell. 2009 Aug;8(8):1235-49. 2. Saraswat D, Kumar R, Pande T, Edgerton M, Cullen PJ. Signalling mucin msb2 regulates adaptation to thermal stress in c andida albicans. Molecular microbiology. 2016 May;100(3):425-41.	Mucin family adhesin-like protein; cell wall damage sensor; required for Cek1 phosphorylation by cell wall stress; Rim101-repressed; activation releases extracellular domain into medium; Spider biofilm induced
MSI3	1. Li H, Hu L, Cuffee CW, Mohamed M, Li Q, Liu Q, Zhou L, Liu Q. Interdomain interactions dictate the function of the Candida albicans Hsp110 protein Msi3. Journal of Biological Chemistry. 2021 Sep 1;297(3). 2. Nagao JI, Cho T, Uno J, Ueno K, Imayoshi R, Nakayama H, Chibana H, Kaminishi H. Candida albicans Msi3p, a homolog of the Saccharomyces cerevisiae Sse1p of the Hsp70 family, is involved in cell growth and fluconazole tolerance. FEMS yeast research. 2012 Sep 1;12(6):728-37.	Essential HSP70 family protein; required for fluconazole resistance and calcineurin-dependent transcription; interacts with Cgr1; transcript regulated by iron; rat catheter biofilm induced; farnesol repressed in biofilm; sumoylation target
Msn4	1. Nicholls S, Straffon M, Enjalbert B, Nantel A, Macaskill S, Whiteway M, Brown AJ. Msn2-and Msn4-like transcription factors play no obvious roles in the stress responses of the fungal pathogen Candida albicans. Eukaryotic Cell. 2004 Oct;3(5):1111-23.	Zinc finger transcription factor; similar to S. cerevisiae Msn4, but not a significant stress response regulator in C. albicans; partly complements STRE-activation defect of S. cerevisiae msn2 msn4 double mutant; flow model biofilm induced

Mss11	1. Su C, Li Y, Lu Y, Chen J. Mss11, a transcriptional activator, is required for hyphal development in Candida albicans. Eukaryotic Cell. 2009 Nov;8(11):1780-91. 2. Tsai PW, Chen YT, Yang CY, Chen HF, Tan TS, Lin TW, Hsieh WP, Lan CY. The role of Mss11 in Candida albicans biofilm formation. Molecular genetics and genomics. 2014 Oct;289:807-19.	Transcription factor; activator that binds to Flo8 via a LisH motif to cooperatively activate transcription of hypha-specific genes; required for hyphal growth
Mss4	1. Hairfield ML, Westwater C, Dolan JW. Phosphatidylinositol-4-phosphate 5-kinase activity is stimulated during temperature-induced morphogenesis in Candida albicans. Microbiology. 2002 Jun;148(6):1737-46. 2. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 3. Ghugtyal V, Garcia-Rodas R, Seminara A, Schaub S, Bassilana M, Arkowitz RA. Phosphatidylinositol-4-phosphate-dependent membrane traffic is critical for fungal filamentous growth. Proceedings of the National Academy of Sciences. 2015 Jul 14;112(28):8644-9.	Phosphatidylinositol-4-phosphate 5-kinase; activity induced by phosphatidic acid (Pld1 product); macrophage/pseudohyphal-repressed; mRNA binds to She3, localized to yeast cell buds and hyphal tips; Hap43-induced; Spider biofilm induced
NAD2	1. Li D, She X, Calderone R. Functional diversity of complex I subunits in Candida albicans mitochondria. Current genetics. 2016 Feb;62:87-95. 2. Nosek J, Fukuhara H. NADH dehydrogenase subunit genes in the mitochondrial DNA of yeasts. Journal of bacteriology. 1994 Sep;176(18):5622-30.	Subunit 2 of NADH:ubiquinone oxidoreductase (NADH:ubiquinone dehydrogenase), a multisubunit enzyme complex (complex I) of the mitochondrial inner membrane that catalyzes the first step in mitochondrial respiration
NAD5	1. Li D, She X, Calderone R. Functional diversity of complex I subunits in Candida albicans mitochondria. Current genetics. 2016 Feb;62:87-95. 2. Nosek J, Fukuhara H. NADH dehydrogenase subunit genes in the mitochondrial DNA of yeasts. Journal of bacteriology. 1994 Sep;176(18):5622-30.	Subunit 5 of NADH:ubiquinone oxidoreductase (NADH:ubiquinone dehydrogenase), a multisubunit enzyme complex (complex I) of the mitochondrial inner membrane that catalyzes the first step in mitochondrial respiration

NDT80	1. Chen CG, Yang YL, Shih HI, Su CL, Lo HJ. CaNdt80 is involved in drug resistance in Candida albicans by regulating CDR1. Antimicrobial Agents and Chemotherapy. 2004 Dec;48(12):4505-12. 2. Rodríguez-Cerdeira C, Martínez-Herrera E, Carnero-Gregorio M, López-Barcenas A, Fabbrocini G, Fida M, El-Samahy M, González-Cespón JL. Pathogenesis and clinical relevance of Candida biofilms in vulvovaginal candidiasis. Frontiers in Microbiology. 2020 Nov 11;11:544480.	Ortholog of Ndt80; meiosis-specific transcription factor; activator of CDR1 induction by antifungal drugs; required for wild-type drug resistance and for Spider biofilm formation; transcript induced by antifungal drug treatment
Nrg1	1. Staib P, Morschhäuser J. Differential expression of the NRG1 repressor controls species-specific regulation of chlamydospore development in Candida albicans and Candida dubliniensis. Molecular Microbiology. 2005 Jan;55(2):637-52. 2. Murad AM, d'Enfert C, Gaillardin C, Tournu H, Tekaia F, Talibi D, Marechal D, Marchais V, Cottin J, Brown AJ. Transcript profiling in Candida albicans reveals new cellular functions for the transcriptional repressors CaTup1, CaMig1 and CaNrg1. Molecular microbiology. 2001 Nov;42(4):981-93. 3. Uppuluri P, Pierce CG, Thomas DP, Bubeck SS, Saville SP, Lopez-Ribot JL. The transcriptional regulator Nrg1p controls Candida albicans biofilm formation and dispersion. Eukaryotic cell. 2010 Oct;9(10):1531-7.	Transcription factor/repressor; regulates chlamydospore formation/hyphal gene induction/virulence and rescue/stress response genes; effects both Tup1 dependent and independent regulation; flow model biofilm induced; Spider biofilm repressed
OLE1	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Krishnamurthy S, Plaine A, Albert J, Prasad T, Prasad R, Ernst JF. Dosage-dependent functions of fatty acid desaturase Ole1p in growth and morphogenesis of Candida albicans. Microbiology. 2004 Jun;150(6):1991-2003.	Fatty acid desaturase, essential protein involved in oleic acid synthesis; required for aerobic hyphal growth and chlamydospore formation; subject to hypoxic regulation; fluconazole-induced; caspofungin repressed; Hap43p-induced
OPY2	De Dios CH, Román E, Diez C, Alonso-Monge R, Pla J. The transmembrane protein Opy2 mediates activation of the Cek1 MAP kinase in Candida albicans. Fungal Genetics and Biology. 2013 Jan 1;50:21-32.	Predicted transmembrane protein; role in cell wall biogenesis; required for Cek1 phosphorylation; Spider biofilm induced

Pbs2	1. Arana DM, Nombela C, Alonso-Monge R, Pla J. The Pbs2 MAP kinase kinase is essential for the oxidative-stress response in the fungal pathogen Candida albicans. Microbiology. 2005 Apr;151(4):1033-49. 2. Thomas G, Bain JM, Budge S, Brown AJ, Ames RM. Identifying Candida albicans gene networks involved in pathogenicity. Frontiers in Genetics. 2020 Apr 24;11:375.	MAPK kinase (MAPKK); role in osmotic and oxidative stress responses, oxidative stress adaptation; required for stress regulation of Hog1p localization and activity; functional homolog of S. cerevisiae Pbs2p
PCL1	1. Bennett RJ, Johnson AD. The role of nutrient regulation and the Gpa2 protein in the mating pheromone response of C. albicans. Molecular microbiology. 2006 Oct;62(1):100-19. 2. Shapiro RS, Sellam A, Tebbji F, Whiteway M, Nantel A, Cowen LE. Pho85, Pcl1, and Hms1 signaling governs Candida albicans morphogenesis induced by high temperature or Hsp90 compromise. Current Biology. 2012 Mar 20;22(6):461-70.	Cyclin homolog; transcript induced by filamentous growth; induced by alpha pheromone in SpiderM medium
PDE1	Wilson D, Fiori A, De Brucker K, Van Dijck P, Stateva L. Candida albicans Pde1p and Gpa2p comprise a regulatory module mediating agonist-induced cAMP signalling and environmental adaptation. Fungal Genetics and Biology. 2010 Sep 1;47(9):742-52.	Low affinity cyclic nucleotide phosphodiesterase; mediates cAMP signaling in response to glucose or intracellular acidification; macrophage-repressed; Spider biofilm induced
PDE2	1. Wilson D, Tutulan-Cunita A, Jung W, Hauser NC, Hernandez R, Williamson T, Piekarska K, Rupp S, Young T, Stateva L. Deletion of the high-affinity cAMP phosphodiesterase encoded by PDE2 affects stress responses and virulence in Candida albicans. Molecular microbiology. 2007 Aug;65(4):841-56. 2. Bahn YS, Staab J, Sundstrom P. Increased high-affinity phosphodiesterase PDE2 gene expression in germ tubes counteracts CAP1-dependent synthesis of cyclic AMP, limits hypha production and promotes virulence of Candida albicans. Molecular microbiology. 2003 Oct;50(2):391-409. 3. Jung WH, Warn P, Ragni E, Popolo L, Nunn CD, Turner MP, Stateva L. Deletion of PDE2, the gene encoding the high-affinity cAMP phosphodiesterase, results in changes of the cell wall and membrane in Candida albicans. Yeast. 2005 Mar;22(4):285-94.	High affinity cyclic nucleotide phosphodiesterase; moderates signaling by cAMP; required for virulence, switching, cell wall, hyphal, not pseudohyphal growth; expressed shortly after hyphal induction; rat catheter and Spider biofilm induced

PHO4	Zheng Q, Guan G, Cao C, Li Q, Huang G. The PHO pathway regulates white–opaque switching and sexual mating in the human fungal pathogen Candida albicans. Current Genetics. 2020 Dec;66:1155-62.	bHLH transcription factor of the myc-family; required for phosphate acquisition and for resistance to stresses; induced by Mnl1 under weak acid stress
PHO84	Zheng Q, Guan G, Cao C, Li Q, Huang G. The PHO pathway regulates white–opaque switching and sexual mating in the human fungal pathogen Candida albicans. Current Genetics. 2020 Dec;66:1155-62.	High-affinity phosphate transporter; transcript regulated by white-opaque switch; Hog1, ciclopirox olamine or alkaline induced; caspofungin, stress repressed; required for normal TORC1 function
PHO85	1. Shapiro RS, Sellam A, Tebbji F, Whiteway M, Nantel A, Cowen LE. Pho85, Pcl1, and Hms1 signaling governs Candida albicans morphogenesis induced by high temperature or Hsp90 compromise. Current Biology. 2012 Mar 20;22(6):461-70. 2. Zheng Q, Guan G, Cao C, Li Q, Huang G. The PHO pathway regulates white–opaque switching and sexual mating in the human fungal pathogen Candida albicans. Current Genetics. 2020 Dec;66:1155-62.	Functional homolog of S. cerevisiae Pho85p, a cyclin-dependent kinase that regulates transcription of PHO genes involved in phosphate metabolism; necessary for geldanamycin-induced filamentation; gene has intron
PHO87	Zheng Q, Guan G, Cao C, Li Q, Huang G. The PHO pathway regulates white–opaque switching and sexual mating in the human fungal pathogen Candida albicans. Current Genetics. 2020 Dec;66:1155-62.	Putative phosphate permease; transcript repressed by Rim101 at pH 8; regulated by white-opaque switch; caspofungin repressed; virulence-group-correlated expression; flow model biofilm induced
PHO89	Zheng Q, Guan G, Cao C, Li Q, Huang G. The PHO pathway regulates white–opaque switching and sexual mating in the human fungal pathogen Candida albicans. Current Genetics. 2020 Dec;66:1155-62.	Putative phosphate permease; transcript regulated upon white-opaque switch; alkaline induced by Rim101; possibly adherence-induced; F-12/CO2 model, rat catheter and Spider biofilm induced
PHR1	1. Calderon J, Zavrel M, Ragni E, Fonzi WA, Rupp S, Popolo L. PHR1, a pH-regulated gene of Candida albicans encoding a glucan-remodelling enzyme, is required for adhesion and invasion. Microbiology. 2010 Aug;156(8):2484-94. 2. Srikantha T, Daniels KJ, Pujol C, Kim E, Soll DR. Identification of genes upregulated by the transcription factor Bcr1 that are involved in impermeability, impenetrability, and drug resistance of Candida albicans a/α biofilms. Eukaryotic cell. 2013 Jun;12(6):875-88.	Cell surface glycosidase; may act on cell-wall beta-1,3-glucan prior to beta-1,6-glucan linkage; role in systemic, not vaginal virulence (neutral, not low pH); high pH or filamentation induced; Bcr1-repressed in RPMI a/a biofilm

PKC1	1. Sussman A, Huss K, Chio LC, Heidler S, Shaw M, Ma D, Zhu G, Campbell RM, Park TS, Kulanthaivel P, Scott JE. Discovery of cercosporamide, a known antifungal natural product, as a selective Pkc1 kinase inhibitor through high-throughput screening. Eukaryotic cell. 2004 Aug;3(4):932-43. 2. Chen S, Xu Z, Liu S, Duan W, Huang Y, Wei X. A possible mechanism of farnesol tolerance in C. albicans biofilms implemented by activating the PKC signalling pathway and stabilizing ROS levels. Journal of Medical Microbiology. 2022 Jan 12;71(1):001476. 3. Xie Y, Hua H, Zhou P. Magnolol as a potent antifungal agent inhibits Candida albicans virulence factors via the PKC and Cek1 MAPK signaling pathways. Frontiers in Cellular and Infection Microbiology. 2022 Jul 22;12:935322.	Protein kinase C; functional homolog of S. cerevisiae Pkc1p; mutant has abnormal yeast-form cell morphology and increased cell lysis; activated by phosphatidylserine; target of antifungal, cercosporamide; R400P mutant is activated
Pkh2	1. Pastor-Flores D, Schulze JO, Bahí A, Giacometti R, Ferrer-Dalmau J, Passeron S, Engel M, Süß E, Casamayor A, Biondi RM. PIF-pocket as a target for C. albicans Pkh selective inhibitors. ACS chemical biology. 2013 Oct 18;8(10):2283-92. 2. Ramírez-Zavala B, Krüger I, Wollner A, Schwanfelder S, Morschhäuser J. The Ypk1 protein kinase signaling pathway is rewired and not essential for viability in Candida albicans. PLoS Genetics. 2023 Aug 10;19(8):e1010890. 3. Pohlers S, Martin R, Krüger T, Hellwig D, Hänel F, Kniemeyer O, Saluz HP, Van Dijck P, Ernst JF, Brakhage A, Mühlschlegel FA. Lipid signaling via Pkh1/2 regulates fungal CO2 sensing through the kinase Sch9. MBio. 2017 Mar 8;8(1):10-128.	Probable serine/threonine protein kinase; predicted role in sphingolipid-mediated signaling pathway that controls endocytosis; mRNA binds She3 and is localized to hyphal tips; appears redundant with Pkh3 within the Ypk1 signaling pathway

Pkh3	1. Pastor-Flores D, Schulze JO, Bahí A, Giacometti R, Ferrer-Dalmau J, Passeron S, Engel M, Süß E, Casamayor A, Biondi RM. PIF-pocket as a target for C. albicans Pkh selective inhibitors. ACS chemical biology. 2013 Oct 18;8(10):2283-92. 2. Ramírez-Zavala B, Krüger I, Wollner A, Schwanfelder S, Morschhäuser J. The Ypk1 protein kinase signaling pathway is rewired and not essential for viability in Candida albicans. PLoS Genetics. 2023 Aug 10;19(8):e1010890. 3. Pohlers S, Martin R, Krüger T, Hellwig D, Hänel F, Kniemeyer O, Saluz HP, Van Dijck P, Ernst JF, Brakhage A, Mühlschlegel FA. Lipid signaling via Pkh1/2 regulates fungal CO2 sensing through the kinase Sch9. MBio. 2017 Mar 8;8(1):10-128.	Probable serine/threonine protein kinase; appears to act redundantly with Pkh2 within the Ypk1 signaling pathway
PST1	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Foderaro JE, Konopka JB. Differential roles of a family of flavodoxin-like proteins that promote resistance to quinone-mediated oxidative stress in Candida albicans. Infection and Immunity. 2021 Mar 17;89(4):10-128. 3. Li L, Naseem S, Sharma S, Konopka JB. Flavodoxin-like proteins protect Candida albicans from oxidative stress and promote virulence. PLoS Pathogens. 2015 Sep 1;11(9):e1005147.	Flavodoxin-like protein involved in oxidative stress protection and virulence; putative 1,4-benzoquinone reductase; hyphal-induced; regulated by Cyr1, Ras1, Efg1, Nrg1, Rfg1, Tup1; Hap43-induced; Spider biofilm induced
Ptc1	1. Hanaoka N, Takano Y, Shibuya K, Fugo H, Uehara Y, Niimi M. Identification of the putative protein phosphatase gene PTC1 as a virulence-related gene using a silkworm model of Candida albicans infection. Eukaryotic cell. 2008 Oct;7(10):1640-8. 2. Arino J, Casamayor A, González A. Type 2C protein phosphatases in fungi. Eukaryotic cell. 2011 Jan;10(1):21-33.	Putative protein phosphatase of the Type 2C-related family (serine/threonine-specific), similar to S. cerevisiae Ptc1p; mutant shows virulence defect .

Ptp2	1. Su C, Lu Y, Liu H. Reduced TOR signaling sustains hyphal development in Candida albicans by lowering Hog1 basal activity. Molecular biology of the cell. 2013 Feb 1;24(3):385-97. 2. Ramsdale M, Selway L, Stead D, Walker J, Yin Z, Nicholls SM, Crowe J, Sheils EM, Brown AJ. MNL1 regulates weak acid–induced stress responses of the fungal pathogen Candida albicans. Molecular biology of the cell. 2008 Oct;19(10):4393-403. 3.	Predicted protein tyrosine phosphatase; involved in regulation of MAP kinase Hog1 activity; induced by Mnl1 under weak acid stress; rat catheter and Spider biofilm induced
Ptp3	1. Harcus D, Nantel A, Marcil A, Rigby T, Whiteway M. Transcription profiling of cyclic AMP signaling in Candida albicans. Molecular biology of the cell. 2004 Oct;15(10):4490-9. 2. Shareck J, Nantel A, Belhumeur P. Conjugated linoleic acid inhibits hyphal growth in Candida albicans by modulating Ras1p cellular levels and downregulating TEC1 expression. Eukaryotic cell. 2011 Apr;10(4):565-77. 3. Day AM, Smith DA, Ikeh MA, Haider M, Herrero-de-Dios CM, Brown AJ, Morgan BA, Erwig LP, MacCallum DM, Quinn J. Blocking two-component signalling enhances Candida albicans virulence and reveals adaptive mechanisms that counteract sustained SAPK activation. PLoS pathogens. 2017 Jan 30;13(1):e1006131.	Putative protein tyrosine phosphatase; hypha induced; alkaline induced; regulated by Efg1, Ras1, cAMP pathways; mutants are viable; Spider biofilm induced; rat catheter biofilm repressed; flow model biofilm repressed
Rac1	1. Bassilana M, Arkowitz RA. Rac1 and Cdc42 have different roles in Candida albicans development. Eukaryotic cell. 2006 Feb;5(2):321-9. 2. Vauchelles R, Stalder D, Botton T, Arkowitz RA, Bassilana M. Rac1 dynamics in the human opportunistic fungal pathogen Candida albicans. PLoS One. 2010 Oct 28;5(10):e15400. 3. Chen H, Zhou X, Ren B, Cheng L. The regulation of hyphae growth in Candida albicans. Virulence. 2020 Dec 31;11(1):337-48.	G-protein of RAC subfamily; required for embedded filamentous growth, not for serum-induced hyphal growth; dynamic localization at plasma membrane and nucleus; similar to, but not interchangeable with, Cdc42p; lacks S. cerevisiae homolog

RAS1	1. Shareck J, Nantel A, Belhumeur P. Conjugated linoleic acid inhibits hyphal growth in Candida albicans by modulating Ras1p cellular levels and downregulating TEC1 expression. Eukaryotic cell. 2011 Apr;10(4):565-77. 2. Phillips AJ, Crowe JD, Ramsdale M. Ras pathway signaling accelerates programmed cell death in the pathogenic fungus Candida albicans. Proceedings of the National Academy of Sciences. 2006 Jan 17;103(3):726-31. 3. Leberer E, Harcus D, Dignard D, Johnson L, Ushinsky S, Thomas DY, Schröppel K. Ras links cellular morphogenesis to virulence by regulation of the MAP kinase and cAMP signalling pathways in the pathogenic fungus Candida albicans. Molecular microbiology. 2001 Nov;42(3):673-87. 4. Zhu Y, Fang HM, Wang YM, Zeng GS, Zheng XD, Wang Y. Ras1 and Ras2 play antagonistic roles in regulating cellular cAMP level, stationary-phase entry and stress response in Candida albicans. Molecular microbiology. 2009 Nov;74(4):862-75. 5. Davis-Hanna A, Piispanen AE, Stateva LI, Hogan DA. Farnesol and dodecanol effects on the Candida albicans Ras1-cAMP signalling pathway and the regulation of morphogenesis. Molecular microbiology. 2008 Jan;67(1):47-62.	RAS signal transduction GTPase; regulates cAMP and MAP kinase pathways; role in hyphal induction, virulence, apoptosis, heat-shock sensitivity; nonessential; plasma membrane-localized; complements viability of S. cerevisiae ras1 ras2 mutant
RBT1	1. Braun BR, Johnson AD. TUP1, CPH1 and EFG1 make independent contributions to filamentation in Candida albicans. Genetics. 2000 May 1;155(1):57-67. 2. Kadosh D, Johnson AD. Rfg1, a protein related to the Saccharomyces cerevisiae hypoxic regulator Rox1, controls filamentous growth and virulence in Candida albicans. Molecular and cellular biology. 2001 Apr 1. 3. Monniot C, Boisrame A, Da Costa G, Chauvel M, Sautour M, Bougnoux ME, Bellon-Fontaine MN, Dalle F, d'Enfert C, Richard ML. Rbt1 protein domains analysis in Candida albicans brings insights into hyphal surface modifications and Rbt1 potential role during adhesion and biofilm formation. PloS one. 2013 Dec 5;8(12):e82395.	Cell wall protein with similarity to Hwp1; required for virulence; predicted glycosylation; fluconazole, Tup1 repressed; farnesol, alpha factor, serum, hyphal and alkaline induced; Rfg1, Rim101-regulated

RBT5	1. Okamoto-Shibayama K, Kikuchi Y, Kokubu E, Sato Y, Ishihara K. Csa2, a member of the Rbt5 protein family, is involved in the utilization of iron from human hemoglobin during Candida albicans hyphal growth. FEMS yeast research. 2014 Jun 1;14(4):674-7. 2. Mao Y, Solis NV, Sharma A, Cravener MV, Filler SG, Mitchell AP. Use of the iron-responsive RBT5 promoter for regulated expression in Candida albicans. Msphere. 2022 Aug 31;7(4):e00305-22.	GPI-linked cell wall protein; hemoglobin utilization; Rfg1, Rim101, Tbf1, Fe regulated; Sfu1, Hog1, Tup1, serum, alkaline pH, antifungal drugs, geldamycin repressed; Hap43 induced; required for RPMI biofilms; Spider biofilm induced
RFG1	1. Cleary IA, Mulabagal P, Reinhard SM, Yadev NP, Murdoch C, Thornhill MH, Lazzell AL, Monteagudo C, Thomas DP, Saville SP. Pseudohyphal regulation by the transcription factor Rfg1p in Candida albicans. Eukaryotic Cell. 2010 Sep;9(9):1363-73. 2. Khalaf RA, Zitomer RS. The DNA binding protein Rfg1 is a repressor of filamentation in Candida albicans. Genetics. 2001 Apr 1;157(4):1503-12. 3. Kadosh D, Johnson AD. Rfg1, a protein related to the Saccharomyces cerevisiae hypoxic regulator Rox1, controls filamentous growth and virulence in Candida albicans. Molecular and cellular biology. 2001 Apr 1. 4. Guan G, Li S, Bing J, Liu L, Tao L. The Rfg1 and Bcr1 transcription factors regulate acidic pH–induced filamentous growth in Candida albicans. Microbiology Spectrum. 2023 Dec 12;11(6):e01789-23.	HMG domain transcriptional repressor of filamentous growth and hyphal genes; in Tup1-dependent and -independent pathways; binds DNA; transcript not regulated by oxygen or serum; not responsible for hypoxic repression; Spider biofilm induced

Rga2	1. Court H, Sudbery P. Regulation of Cdc42 GTPase activity in the formation of hyphae in Candida albicans. Molecular biology of the cell. 2007 Jan;18(1):265-81. 2. Pulver R, Heisel T, Gonia S, Robins R, Norton J, Haynes P, Gale CA. Rsr1 focuses Cdc42 activity at hyphal tips and promotes maintenance of hyphal development in Candida albicans. Eukaryotic cell. 2013 Apr;12(4):482-95. 3. Kowalewski GP, Wildeman AS, Bogliolo S, Besold AN, Bassilana M, Culotta VC. Cdc42 regulates reactive oxygen species production in the pathogenic yeast Candida albicans. Journal of Biological Chemistry. 2021 Aug 1;297(2).	Putative GTPase-activating protein (GAP) for Rho-type GTPase Cdc42; involved in cell signaling pathways controlling cell polarity; induced by low-level peroxide stress; flow model biofilm induced
RHB1	1. Tsao CC, Chen YT, Lan CY. A small G protein Rhb1 and a GTPase-activating protein Tsc2 involved in nitrogen starvation-induced morphogenesis and cell wall integrity of Candida albicans. Fungal Genetics and Biology. 2009 Feb 1;46(2):126-36. 2. Flanagan PR, Liu NN, Fitzpatrick DJ, Hokamp K, Köhler JR, Moran GP. The Candida albicans TOR-activating GTPases Gtr1 and Rhb1 coregulate starvation responses and biofilm formation. Msphere. 2017 Dec 27;2(6):10-128.	Putative small G protein from the Ras superfamily involved in cell wall integrity and control of filamentous growth under nitrogen starvation; involved in activation of TOR1C during starvation response

Rho1	1. Xie JL, Grahl N, Sless T, Leach MD, Kim SH, Hogan DA, Robbins N, Cowen LE. Signaling through Lrg1, Rho1 and Pkc1 governs Candida albicans morphogenesis in response to diverse cues. PLoS genetics. 2016 Oct 27;12(10):e1006405. 2. Smith SE, Csank C, Reyes G, Ghannoum MA, Berlin V. Candida albicans RHO1 is required for cell viability in vitro and in vivo. FEMS yeast research. 2002 May 1;2(2):103-11. 3. Murthi KK, Smith SE, Kluge AF, Bergnes G, Bureau P, Berlin V. Antifungal activity of a Candida albicans GGTase I inhibitor-alanine conjugate. Inhibition of Rho1p prenylation in C. albicans. Bioorganic & medicinal chemistry letters. 2003 Jun 2;13(11):1935-7. 4. Yang SL, Zeng G, Chan FY, Wang YM, Yang D, Wang Y. Sac7 and Rho1 regulate the white-to-opaque switching in Candida albicans. Scientific reports. 2018 Jan 17;8(1):875.	Small GTPase of Rho family; regulates beta-1,3-glucan synthesis activity and binds Gsc1p; essential; expected to be geranylgeranylated by geranylgeranyltransferase type I; plasma membrane-localized
Rim101	1. El Barkani A, Kurzai O, Fonzi WA, Ramon A, Porta A, Frosch M, Mühlschlegel FA. Dominant active alleles of RIM101 (PRR2) bypass the pH restriction on filamentation of Candida albicans. Molecular and cellular biology. 2000 Jul 1. 2. Davis D, Wilson RB, Mitchell AP. RIM101-dependent and-independent pathways govern pH responses in Candida albicans. Molecular and cellular biology. 2000 Feb 1. 3. Davis D, Edwards Jr JE, Mitchell AP, Ibrahim AS. Candida albicans RIM101 pH response pathway is required for host-pathogen interactions. Infection and immunity. 2000 Oct 1;68(10):5953-9. 4.	Transcription factor; alkaline pH response; required for alkaline-induced hyphal growth; role in virulence in mice; activated by C-terminal proteolytic cleavage; mediates both positive and negative regulation; Spider biofilm induced

Rim13	1. Li M, Martin SJ, Bruno VM, Mitchell AP, Davis DA. Candida albicans Rim13p, a protease required for Rim101p processing at acidic and alkaline pHs. Eukaryotic cell. 2004 Jun;3(3):741-51. 2. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70.	Protease of the pH response pathway; likely to mediate activation of Rim101 via C-terminal cleavage; required for alkaline pH-induced hyphal growth and for normal chlamydospore formation; Hap43-repressed; flow model biofilm induced
Rim20	1. Xu W, Mitchell AP. Yeast PalA/AIP1/Alix homolog Rim20p associates with a PEST-like region and is required for its proteolytic cleavage. Journal of bacteriology. 2001 Dec 1;183(23):6917-23. 2. Davis D, Wilson RB, Mitchell AP. RIM101-dependent and-independent pathways govern pH responses in Candida albicans. Molecular and cellular biology. 2000 Feb 1.	Protein involved in the pH response pathway; binds to the transcription factor Rim101 and may serve as a scaffold to facilitate the C-terminal proteolytic cleavage that activates Rim101; required for alkaline pH-induced hyphal growth
Rim21	Gomez-Raja J, Davis DA. The β-arrestin-like protein Rim8 is hyperphosphorylated and complexes with Rim21 and Rim101 to promote adaptation to neutral-alkaline pH. Eukaryotic cell. 2012 May;11(5):683-93.	Plasma membrane pH-sensor involved in the Rim101 pH response pathway; required for processing and activation of Rim101 and for alkaline pH-induced hyphal growth; Spider biofilm induced
Rim8	1. Davis D, Wilson RB, Mitchell AP. RIM101-dependent and-independent pathways govern pH responses in Candida albicans. Molecular and cellular biology. 2000 Feb 1. 2. Gomez-Raja J, Davis DA. The β-arrestin-like protein Rim8 is hyperphosphorylated and complexes with Rim21 and Rim101 to promote adaptation to neutral-alkaline pH. Eukaryotic cell. 2012 May;11(5):683-93.	Beta-arrestin-like protein; involved in pH response; required for pathogenesis, activation of Rim101 and alkaline pH-induced hyphal growth; colony morphology-related gene regulation by Ssn6p negative feedback regulation target
Rlm1	Heredia MY, Ikeh MA, Gunasekaran D, Conrad KA, Filimonava S, Marotta DH, Nobile CJ, Rauceo JM. An expanded cell wall damage signaling network is comprised of the transcription factors Rlm1 and Sko1 in Candida albicans. PLoS genetics. 2020 Jul 8;16(7):e1008908.	Transcription factor required for wild-type resistance to cell wall perturbation caused by caspofungin treatment; regulates caspofungin-induced transcription of SKO1

Rsp5	Leach MD, Cowen LE. Membrane fluidity and temperature sensing are coupled via circuitry comprised of Ole1, Rsp5, and Hsf1 in Candida albicans. Eukaryotic cell. 2014 Aug;13(8):1077-84.	Putative NEDD4 family E3 ubiquitin ligase; induced during infection of murine kidney, compared to growth in vitro; has murine homolog; possibly an essential gene, disruptants not obtained by UAU1 method
Sac7	1. Yang SL, Zeng G, Chan FY, Wang YM, Yang D, Wang Y. Sac7 and Rho1 regulate the white-to-opaque switching in Candida albicans. Scientific reports. 2018 Jan 17;8(1):875. 2. Marchais V, Kempf M, Licznar P, Lefrançois C, Bouchara JP, Robert R, Cottin J. DNA array analysis of Candida albicans gene expression in response to adherence to polystyrene. FEMS microbiology letters. 2005 Apr 1;245(1):25-32.	Putative GTPase activating protein (GAP) for Rho1; repressed upon adherence to polystyrene; macrophage/pseudohyphal-repressed; transcript is upregulated in RHE model of oral candidiasis and in clinical oral candidiasis
SAP4	1. Sanglard D, Hube B, Monod M, Odds FC, Gow NA. A triple deletion of the secreted aspartyl proteinase genes SAP4, SAP5, and SAP6 of Candida albicans causes attenuated virulence. Infection and immunity. 1997 Sep;65(9):3539-46. 2. Correia A, Lermann U, Teixeira L, Cerca F, Botelho S, Gil da Costa RM, Sampaio P, Gärtner F, Morschhäuser J, Vilanova M, Pais C. Limited role of secreted aspartyl proteinases Sap1 to Sap6 in Candida albicans virulence and host immune response in murine hematogenously disseminated candidiasis. Infection and immunity. 2010 Nov;78(11):4839-49. 3. Naglik JR, Challacombe SJ, Hube B. Candida albicans secreted aspartyl proteinases in virulence and pathogenesis. Microbiology and molecular biology reviews. 2003 Sep;67(3):400-28.	Secreted aspartyl proteinase; sap4,5,6 mutant defective in protein utilization for nitrogen; virulence role complicated by URA3 effects; expressed during mucosal and systemic infections; N-glycosylated; rat catheter, Spider biofilm induced

SCH9	1. Kim SW, Joo YJ, Chun YJ, Park YK, Kim J. Cross-talk between Tor1 and Sch9 regulates hyphae-specific genes or ribosomal protein genes in a mutually exclusive manner in Candida albicans. Molecular microbiology. 2019 Sep;112(3):1041-57. 2. Stichternoth C, Fraund A, Setiadi E, Giasson L, Vecchiarelli A, Ernst JF. Sch9 kinase integrates hypoxia and CO2 sensing to suppress hyphal morphogenesis in Candida albicans. Eukaryotic cell. 2011 Apr;10(4):502-11. 3. Liu W, Jingwen Z, Li X, Li Y, Jiang L. The protein kinase CaSch9p is required for the cell growth, filamentation and virulence in the human fungal pathogen Candida albicans. FEMS yeast research. 2010 Jun 1;10(4):462-70.	Protein kinase; involved in growth control, ribosomal protein synthesis, cell size, resistance to rapamycin,, chlamydospore formation, filamentous growth, and virulence; prevents hyphal growth in hypoxia at high CO2
SEF1	1. Vandeputte P, Ischer F, Sanglard D, Coste AT. In vivo systematic analysis of Candida albicans Zn2-Cys6 transcription factors mutants for mice organ colonization. PloS one. 2011 Oct 31;6(10):e26962. 2. Ror S, Panwar SL. Sef1-regulated iron regulon responds to mitochondria-dependent iron–sulfur cluster biosynthesis in Candida albicans. Frontiers in Microbiology. 2019 Jul 9;10:1528.	Zn2-Cys6 transcription factor; regulates iron uptake; negatively regulated by Sfu1p, positively regulated by Tbf1; promotes virulence in mice; mutants display decreased colonization of mouse kidneys; Spider biofilm induced
SGT1	Shapiro RS, Zaas AK, Betancourt-Quiroz M, Perfect JR, Cowen LE. The Hsp90 co-chaperone Sgt1 governs Candida albicans morphogenesis and drug resistance.	Putative co-chaperone protein with a predicted role in kinetochore assembly; mutation confers hypersensitivity to radicicol; sumoylation target
SHO1	1. Kumar R, Maulik M, Pathirana RU, Cullen PJ, Edgerton M. Sho1p connects Glycolysis to Ras1-cAMP signaling and is required for microcolony formation in Candida albicans. Msphere. 2020 Aug 26;5(4):10-128. 2. Román E, Nombela C, Pla J. The Sho1 adaptor protein links oxidative stress to morphogenesis and cell wall biosynthesis in the fungal pathogen Candida albicans. Molecular and cellular biology. 2005 Dec 1.	Predicted adaptor protein involved in activation of MAP kinase-dependent signaling pathways; links response to oxidative stress to morphogenesis and cell wall biosynthesis; mediates formation of microcolonies; caspofungin repressed

SKO1	1. Alonso-Monge R, Román E, Arana DM, Prieto D, Urrialde V, Nombela C, Pla J. The Sko1 protein represses the yeast-to-hypha transition and regulates the oxidative stress response in Candida albicans. Fungal Genetics and Biology. 2010 Jul 1;47(7):587-601. 2. Heredia MY, Ikeh MA, Gunasekaran D, Conrad KA, Filimonava S, Marotta DH, Nobile CJ, Rauceo JM. An expanded cell wall damage signaling network is comprised of the transcription factors Rlm1 and Sko1 in Candida albicans. PLoS genetics. 2020 Jul 8;16(7):e1008908. 3. Deneault S, Smith FJ, Nantel A, Mitchell AP, Mitchell AP. Regulation of the Candida albicans Cell Wall Damage Response by Transcription Factor Sko1 and PAS Kinase Psk1 Jason M. Rauceo1, Jill R. Blankenship1, Saranna Fanning1, Jessica J. Hamaker1, Jean.	bZIP transcription factor involved in cell wall damage response; represses the yeast-to-hypha transition; mutants are caspofungin sensitive; induced by osmotic stress via Hog1; activated by Rlm1p; induced by Mnl1 under weak acid stress
SLN1	1. Nagahashi S, Mio T, Ono N, Yamada-Okabe T, Arisawa M, Bussey H, Yamada-Okabe H. Isolation of CaSLN1 and CaNIK1, the genes for osmosensing histidine kinase homologues, from the pathogenic fungus Candida albicans. Microbiology. 1998 Feb;144(2):425-32. 2. Yamada-Okabe T, Mio T, Ono N, Kashima Y, Matsui M, Arisawa M, Yamada-Okabe H. Roles of three histidine kinase genes in hyphal development and virulence of the pathogenic fungus Candida albicans. Journal of Bacteriology. 1999 Dec 1;181(23):7243-7. 3.	Histidine kinase involved in a two-component signaling pathway that regulates cell wall biosynthesis; mutants are sensitive to growth on H2O2 medium; rat catheter and Spider biofilm induced
SMC6	1. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 2. Côte P, Hogues H, Whiteway M. Transcriptional analysis of the Candida albicans cell cycle. Molecular biology of the cell. 2009 Jul 15;20(14):3363-73.	Putative structural maintenance of chromosomes (SMC) protein; Hap43-induced; cell-cycle regulated periodic mRNA expression; S. cerevisiae ortholog not cell-cycle regulated; Spider biofilm induced

SMF3	1. Xu N, Dong Y, Cheng X, Yu Q, Qian K, Mao J, Jia C, Ding X, Zhang B, Chen Y, Zhang B. Cellular iron homeostasis mediated by the Mrs4–Ccc1–Smf3 pathway is essential for mitochondrial function, morphogenesis and virulence in Candida albicans. Biochimica et Biophysica Acta (BBA)-Molecular Cell Research. 2014 Mar 1;1843(3):629-39. 2. Singh RP, Prasad HK, Sinha I, Agarwal N, Natarajan K. Cap2-HAP complex is a critical transcriptional regulator that has dual but contrasting roles in regulation of iron homeostasis in Candida albicans. Journal of Biological Chemistry. 2011 Jul 15;286(28):25154-70. 3. Lv Q, Yan L, Jiang Y. The importance of vacuolar ion homeostasis and trafficking in hyphal development and virulence in Candida albicans. Frontiers in Microbiology. 2021 Dec 9;12:779176.	Putative vacuolar iron transporter; alkaline upregulated; caspofungin repressed; induced by Mnl1 under weak acid stress; Hap43-repressed
SOD5	1. Gleason JE, Galaleldeen A, Peterson RL, Taylor AB, Holloway SP, Waninger-Saroni J, Cormack BP, Cabelli DE, Hart PJ, Culotta VC. Candida albicans SOD5 represents the prototype of an unprecedented class of Cu-only superoxide dismutases required for pathogen defense. Proceedings of the National Academy of Sciences. 2014 Apr 22;111(16):5866-71. 2. Martchenko M, Alarco AM, Harcus D, Whiteway M. Superoxide dismutases in Candida albicans: transcriptional regulation and functional characterization of the hyphal-induced SOD5 gene. Molecular biology of the cell. 2004 Feb;15(2):456-67. 3. Wildeman AS, Patel NK, Cormack BP, Culotta VC. The role of manganese in morphogenesis and pathogenesis of the opportunistic fungal pathogen Candida albicans. PLoS pathogens. 2023 Jun 26;19(6):e1011478.	Cu-containing superoxide dismutase; protects against oxidative stress; induced by neutrophils, hyphal growth, caspofungin, osmotic/oxidative stress; oralpharyngeal candidiasis induced; rat catheter and Spider biofilm induced

Spa2	1. Zheng XD, Wang YM, Wang Y. CaSPA2 is important for polarity establishment and maintenance in Candida albicans. Molecular microbiology. 2003 Sep;49(5):1391-405. 2. Wang H, Huang ZX, Au Yong JY, Zou H, Zeng G, Gao J, Wang Y, Wong AH, Wang Y. CDK phosphorylates the polarisome scaffold Spa2 to maintain its localization at the site of cell growth. Molecular microbiology. 2016 Jul;101(2):250-64.	Protein involved in cell polarity, Spitzenkorper formation; required for mouse virulence; localizes to hyphal tip; cell-cycle regulated localization in yeast-form cells; functional domains conserved with S. cerevisiae ; Hap43p-induced gene
SPT23	1. Oh CS, Martin CE. Candida albicans Spt23p controls the expression of the Ole1p Δ9 fatty acid desaturase and regulates unsaturated fatty acid biosynthesis. Journal of Biological Chemistry. 2006 Mar 17;281(11):7030-9. 2. Zhu P, Li M, Yan C, Sun J, Peng M, Huang Z, Shi P. Aspirin causes lipid accumulation and damage to cell membrane by regulating DCI1/OLE1 in Saccharomyces cerevisiae. Microbial Drug Resistance. 2020 Aug 1;26(8):857-68.	Protein involved in regulation of unsaturated fatty acid biosynthesis; controls the expression of the Ole1p delta-9-fatty acid desaturase
SSA1	1. Vylkova S, Li XS, Berner JC, Edgerton M. Distinct antifungal mechanisms: β-defensins require Candida albicans Ssa1 protein, while Trk1p mediates activity of cysteine-free cationic peptides. Antimicrobial agents and chemotherapy. 2006 Jan;50(1):324-31. 2. Weissman Z, Pinsky M, Wolfgeher DJ, Kron SJ, Truman AW, Kornitzer D. Genetic analysis of Hsp70 phosphorylation sites reveals a role in Candida albicans cell and colony morphogenesis. Biochimica et Biophysica Acta (BBA)-Proteins and Proteomics. 2020 Mar 1;1868(3):140135.	HSP70 family chaperone; cell wall fractions; antigenic; beta-defensin peptides impport; ATPase domain binds histatin 5; at hyphal surface, not yeast; farnesol-repressed in biofilm; flow model, Spider biofilm repressed; caspofungin repressed

SSA2	Sun JN, Li W, Jang WS, Nayyar N, Sutton MD, Edgerton M. Uptake of the antifungal cationic peptide Histatin 5 by Candida albicans Ssa2p requires binding to non-conventional sites within the ATPase domain. Molecular microbiology. 2008 Dec;70(5):1246-60. 2. Weissman Z, Pinsky M, Wolfgeher DJ, Kron SJ, Truman AW, Kornitzer D. Genetic analysis of Hsp70 phosphorylation sites reveals a role in Candida albicans cell and colony morphogenesis. Biochimica et Biophysica Acta (BBA)-Proteins and Proteomics. 2020 Mar 1;1868(3):140135.	HSP70 family chaperone; cell wall fractions; antigenic; beta-defensin peptides impport; ATPase domain binds histatin 5; at hyphal surface, not yeast; farnesol-repressed in biofilm; flow model, Spider biofilm repressed; caspofungin repressed
SSK1	1. Calera JA, Calderone RA. Identification of a putative response regulator two-component phosphorelay gene (CaSSK1) from Candida albicans. Yeast. 1999 Sep 15;15(12):1243-54. 2. Chauhan N, Inglis D, Roman E, Pla J, Li D, Calera JA, Calderone R. Candida albicans response regulator gene SSK1 regulates a subset of genes whose functions are associated with cell wall biosynthesis and adaptation to oxidative stress. Eukaryotic cell. 2003 Oct;2(5):1018-24. 3. Calera JA, Zhao XJ, Calderone R. Defective hyphal development and avirulence caused by a deletion of the SSK1 response regulator gene in Candida albicans. Infection and immunity. 2000 Feb 1;68(2):518-25. 4. Menon V, De Bernardis F, Calderone R, Chauhan N. Transcriptional profiling of the Candida albicans Ssk1p receiver domain point mutants and their virulence. FEMS yeast research. 2008 Aug 1;8(5):756-63.	Response regulator of two-component system; role in oxidative stress response, cell wall biosynthesis, virulence, hyphal growth on solid media; expressed in hyphae and yeast; peroxisomal targeting sequence (PTS1); Spider biofilm induced
SSK2	1. Cheetham J, Smith DA, da Silva Dantas A, Doris KS, Patterson MJ, Bruce CR, Quinn J. A single MAPKKK regulates the Hog1 MAPK pathway in the pathogenic fungus Candida albicans. Molecular biology of the cell. 2007 Nov;18(11):4603-14. 2. Walia A, Calderone R. The SSK2 MAPKKK of Candida albicans is required for oxidant adaptation in vitro. FEMS yeast research. 2008 Mar 1;8(2):287-99.	MAP kinase kinase kinase (MAPKKK); regulates Hog1 activation and signaling; repressed by ciclopirox olamine

Ssn6	1. Hwang CS, Oh JH, Huh WK, Yim HS, Kang SO. Ssn6, an important factor of morphological conversion and virulence in Candida albicans. Molecular microbiology. 2003 Feb;47(4):1029-43. 2. García-Sánchez S, Mavor AL, Russell CL, Argimon S, Dennison P, Enjalbert B, Brown AJ. Global roles of Ssn6 in Tup1-and Nrg1-dependent gene regulation in the fungal pathogen, Candida albicans. Molecular biology of the cell. 2005 Jun;16(6):2913-25.	Functional homolog of S. cerevisiae Cyc8/Ssn6; hyphal growth regulator; repressed during hyphal growth; Ssn6 and Tup1 regulate distinct sets of genes; overexpression or mutation causes avirulence in mouse IV infection; TPR motifs
Sst2	1. Dignard D, Whiteway M. SST2, a regulator of G-protein signaling for the Candida albicans mating response pathway. Eukaryotic cell. 2006 Jan;5(1):192-202. 2. Bennett RJ, Uhl MA, Miller MG, Johnson AD. Identification and characterization of a Candida albicans mating pheromone. Molecular and cellular biology. 2003 Nov 1.	Predicted regulator of G-protein signaling in mating pathway; null mutation causes alpha-factor hypersensitivity and mating defect (in opaque MTLa/MTLa background); transcript induced by alpha factor
Ste11	1. Bennett RJ, Johnson AD. Mating in Candida albicans and the search for a sexual cycle. Annu. Rev. Microbiol.. 2005 Oct 13;59(1):233-55. 2. Bennett RJ, Uhl MA, Miller MG, Johnson AD. Identification and characterization of a Candida albicans mating pheromone. Molecular and cellular biology. 2003 Nov 1.	Protein similar to S. cerevisiae Ste11p; mutants are sensitive to growth on H2O2 medium
Ste18	1. Lu H, Sun Y, Jiang YY, Whiteway M. Ste18p is a positive control element in the mating process of Candida albicans. Eukaryotic cell. 2014 Apr;13(4):461-9.	Protein similar to S. cerevisiae Ste18p; expressed in opaque or white MTLa/MTLa or MTLalpha/MTLalpha, but not MTLa/MTLalpha cells; MTLa1p, MTLalpha2p bind promoter region
Ste2	1. Maiti P, Ghorai P, Ghosh S, Kamthan M, Tyagi RK, Datta A. Mapping of functional domains and characterization of the transcription factor Cph1 that mediate morphogenesis in Candida albicans. Fungal Genetics and Biology. 2015 Oct 1;83:45-57. 2. Newport G, Kuo A, Flattery A, Gill C, Blake JJ, Kurtz MB, Abruzzo GK, Agabian N. Inactivation of Kex2p diminishes the virulence of Candida albicans. Journal of Biological Chemistry. 2003 Jan 17;278(3):1713-20.	Receptor for alpha factor mating pheromone, MFalpha; required for a-type cells to respond to alpha factor, for opaque a-form mating and white a-form response; possible Kex2p substrate; a-specific, alpha-factor induced, A1p-Alpha2p repressed

CST20	1. Leberer E, Harcus D, Broadbent ID, Clark KL, Dignard D, Ziegelbauer K, Schmidt A, Gow NA, Brown AJ, Thomas DY. Signal transduction through homologs of the Ste20p and Ste7p protein kinases can trigger hyphal formation in the pathogenic fungus Candida albicans. Proceedings of the National Academy of Sciences. 1996 Nov 12;93(23):13217-22. 2. Chen H, Zhou X, Ren B, Cheng L. The regulation of hyphae growth in Candida albicans. Virulence. 2020 Dec 31;11(1):337-48.	Protein kinase of Ste20p/p65PAK family, required for wild-type mating efficiency and virulence in a mouse model; Cst20p-Hst7p-Cek1p-Cph1p MAPK pathway regulates some hyphal growth; involved in Cdc42p growth regulation
Ste3	Li C, Tao L, Guan Z, Hu T, Wang S, Liang W, Zhao F, Huang G. Candida albicans MTLa2 regulates the mating response through both the a-factor and α-factor sensing pathways. Fungal Genetics and Biology. 2022 Apr 1;159:103664.	Protein similar to S. cerevisiae Ste3p, the receptor for a-factor mating pheromone; alpha mating-type-specific transcription
Ste4	1. Lockhart SR, Zhao R, Daniels KJ, Soll DR. α-Pheromone-induced "shmooing" and gene regulation require white-opaque switching during Candida albicans mating. Eukaryotic cell. 2003 Oct;2(5):847-55. 2. Yi S, Sahni N, Daniels KJ, Pujol C, Srikantha T, Soll DR. The same receptor, G protein, and mitogen-activated protein kinase pathway activate different downstream regulators in the alternative white and opaque pheromone responses of Candida albicans. Molecular biology of the cell. 2008 Mar;19(3):957-70.	Beta subunit of heterotrimeric G protein of mating signal transduction pathway; required for mating; transcript is specific to cells homozygous at MTL; induced by alpha pheromone; ortholog of S. cerevisiae Ste4
Ste50	1. Ramezani-Rad M. The role of adaptor protein Ste50-dependent regulation of the MAPKKK Ste11 in multiple signalling pathways of yeast. Current genetics. 2003 Jun;43:161-70.	Protein with sterile alpha motif (SAM) and Ras-associated domain (RAD); similar to S. cerevisiae Rad50p, which is involved in signal transduction via interaction with and regulation of MAPKKK
Stt4	Garcia-Rodas R, Labbaoui H, Orange F, Solis N, Zaragoza O, Filler SG, Bassilana M, Arkowitz RA. Plasma membrane phosphatidylinositol-4-phosphate is not necessary for Candida albicans viability yet is key for cell wall integrity and systemic infection. Mbio. 2022 Feb 22;13(1):e03873-21.	Phosphatidylinositol-4-kinase; forms a complex with Ypp1p and Efr3p that is required for phosphatidylinositol-4-phosphate, PI(4)P, in plasma membrane; required for invasive growth and cell wall organization

Swe1	1. Gale CA, Leonard MD, Finley KR, Christensen L, McClellan M, Abbey D, Kurischko C, Bensen E, Tzafrir I, Kauffman S, Becker J. SLA2 mutations cause SWE1-mediated cell cycle phenotypes in Candida albicans and Saccharomyces cerevisiae. Microbiology. 2009 Dec;155(12):3847-59.	Putative protein kinase with a role in control of growth and morphogenesis, required for full virulence; mutant cells are small, rounded, and sometimes binucleate; not required for filamentous growth; mutant is hypersensitive to caspofungin
SWI4	1. Hussein B, Huang H, Glory A, Osmani A, Kaminskyj S, Nantel A, Bachewich C. G1/S transcription factor orthologues Swi4p and Swi6p are important but not essential for cell proliferation and influence hyphal development in the fungal pathogen Candida albicans. Eukaryotic cell. 2011 Mar;10(3):384-97.	Putative component of the SBF transcription complex involved in G1/S cell-cycle progression; periodic mRNA expression, peak at cell-cycle G1/S phase; predicted, conserved MBF binding sites upstream of G1/S-regulated genes
SWI6	1. Hussein B, Huang H, Glory A, Osmani A, Kaminskyj S, Nantel A, Bachewich C. G1/S transcription factor orthologues Swi4p and Swi6p are important but not essential for cell proliferation and influence hyphal development in the fungal pathogen Candida albicans. Eukaryotic cell. 2011 Mar;10(3):384-97.	Putative component of the MBF and SBF transcription complexes involved in G1/S cell-cycle progression; periodic mRNA expression, peak at cell-cycle G1/S phase
TEC1	1. Shareck J, Nantel A, Belhumeur P. Conjugated linoleic acid inhibits hyphal growth in Candida albicans by modulating Ras1p cellular levels and downregulating TEC1 expression. Eukaryotic cell. 2011 Apr;10(4):565-77. 2. Staib P, Binder A, Kretschmar M, Nichterlein T, Schröppel K, Morschhäuser J. Tec1p-independent activation of a hypha-associated Candida albicans virulence gene during infection. Infection and immunity. 2004 Apr;72(4):2386-9. 3. Sahni N, Yi S, Daniels KJ, Huang G, Srikantha T, Soll DR. Tec1 mediates the pheromone response of the white phenotype of Candida albicans: insights into the evolution of new signal transduction pathways. PLoS biology. 2010 May 4;8(5):e1000363.	TEA/ATTS transcription factor; white cell pheromone response, hyphal gene regulation; required for Spider and RPMI biofilm formation; regulates BCR1; Cph2 regulated transcript; alkaline, rat catheter, Spider, flow model biofilm induced

TOR1	1. Su C, Lu Y, Liu H. Reduced TOR signaling sustains hyphal development in Candida albicans by lowering Hog1 basal activity. Molecular biology of the cell. 2013 Feb 1;24(3):385-97. 2. Kim SW, Joo YJ, Chun YJ, Park YK, Kim J. Cross-talk between Tor1 and Sch9 regulates hyphae-specific genes or ribosomal protein genes in a mutually exclusive manner in Candida albicans. Molecular microbiology. 2019 Sep;112(3):1041-57. 3. Qi W, Acosta-Zaldivar M, Flanagan PR, Liu NN, Jani N, Fierro JF, Andrés MT, Moran GP, Köhler JR. Stress-and metabolic responses of Candida albicans require Tor1 kinase N-terminal HEAT repeats. PLoS pathogens. 2022 Jun 10;18(6):e1010089.	Protein similar to TOR family phosphatidylinositol kinases; mutation confers resistance to rapamycin; involved in regulation of ribosome protein synthesis, starvation response, and adhesion
TPK1	1. Giacometti R, Kronberg F, Biondi RM, Passeron S. Catalytic isoforms Tpk1 and Tpk2 of Candida albicans PKA have non-redundant roles in stress response and glycogen storage. Yeast. 2009 May;26(5):273-85. 2. Bockmühl DP, Krishnamurthy S, Gerads M, Sonneborn A, Ernst JF. Distinct and redundant roles of the two protein kinase A isoforms Tpk1p and Tpk2p in morphogenesis and growth of Candida albicans. Molecular microbiology. 2001 Dec;42(5):1243-57. 3. Giacometti R, Kronberg F, Biondi RM, Passeron S. Candida albicans Tpk1p and Tpk2p isoforms differentially regulate pseudohyphal development, biofilm structure, cell aggregation and adhesins expression. Yeast. 2011 Apr;28(4):293-308.	cAMP-dependent protein kinase (PKA) catalytic subunit; isoform of Tpk2; involved in regulation of filamentation, phenotypic switching and mating; WT nuclear localization requires Bcy1; produced during stationary, not exponential growth

TPK2	1. Giacometti R, Kronberg F, Biondi RM, Passeron S. Catalytic isoforms Tpk1 and Tpk2 of Candida albicans PKA have non-redundant roles in stress response and glycogen storage. Yeast. 2009 May;26(5):273-85. 2. Bockmühl DP, Krishnamurthy S, Gerads M, Sonneborn A, Ernst JF. Distinct and redundant roles of the two protein kinase A isoforms Tpk1p and Tpk2p in morphogenesis and growth of Candida albicans. Molecular microbiology. 2001 Dec;42(5):1243-57. 3. Giacometti R, Kronberg F, Biondi RM, Passeron S. Candida albicans Tpk1p and Tpk2p isoforms differentially regulate pseudohyphal development, biofilm structure, cell aggregation and adhesins expression. Yeast. 2011 Apr;28(4):293-308.	AMP-dependent protein kinase (PKA) catalytic subunit; isoform of Tpk1; involved in regulation of filamentation, phenotypic switching and mating; needed for epithelial cell damage, engulfment and oral virulence in mice
TSC2	Tsao CC, Chen YT, Lan CY. A small G protein Rhb1 and a GTPase-activating protein Tsc2 involved in nitrogen starvation-induced morphogenesis and cell wall integrity of Candida albicans. Fungal Genetics and Biology. 2009 Feb 1;46(2):126-36.	utative GTPase-activating protein; similar to mammalian tuberin; involved in control of filamentous growth; mutants are viable
Tup1	1. Braun BR, Johnson AD. TUP1, CPH1 and EFG1 make independent contributions to filamentation in Candida albicans. Genetics. 2000 May 1;155(1):57-67. 2. Kebaara BW, Langford ML, Navarathna DH, Dumitru R, Nickerson KW, Atkin AL. Candida albicans Tup1 is involved in farnesol-mediated inhibition of filamentous-growth induction. Eukaryotic cell. 2008 Jun;7(6):980-7. 3. Zhao R, Lockhart SR, Daniels K, Soll DR. Roles of TUP1 in switching, phase maintenance, and phase-specific gene expression in Candida albicans. Eukaryotic cell. 2002 Jun;1(3):353-65.	Transcriptional corepressor; represses filamentous growth; regulates switching; role in germ tube induction, farnesol response; in repression pathways with Nrg1, Rfg1; farnesol upregulated in biofilm; rat catheter, Spider biofilm repressed

Tus1	1. Ramsdale M, Selway L, Stead D, Walker J, Yin Z, Nicholls SM, Crowe J, Sheils EM, Brown AJ. MNL1 regulates weak acid–induced stress responses of the fungal pathogen Candida albicans. Molecular biology of the cell. 2008 Oct;19(10):4393-403. 2. Nobile CJ, Fox EP, Nett JE, Sorrells TR, Mitrovich QM, Hernday AD, Tuch BB, Andes DR, Johnson AD. A recently evolved transcriptional network controls biofilm development in Candida albicans. Cell. 2012 Jan 20;148(1):126-38.	Putative guanine nucleotide exchange factor; induced by Mnl1 under weak acid stress; Spider biofilm induced
UME6	1. Carlisle PL, Kadosh D. Candida albicans Ume6, a filament-specific transcriptional regulator, directs hyphal growth via a pathway involving Hgc1 cyclin-related protein. Eukaryotic cell. 2010 Sep;9(9):1320-8. 2. Zeidler U, Lettner T, Lassnig C, Müller M, Lajko R, Hintner H, Breitenbach M, Bito A. UME6 is a crucial downstream target of other transcriptional regulators of true hyphal development in Candida albicans. FEMS yeast research. 2009 Feb 1;9(1):126-42. 3. Banerjee M, Thompson DS, Lazzell A, Carlisle PL, Pierce C, Monteagudo C, Lopez-Ribot JL, Kadosh D. UME6, a novel filament-specific regulator of Candida albicans hyphal extension and virulence. Molecular biology of the cell. 2008 Apr;19(4):1354-65.	Zn(II)2Cys6 transcription factor; has a long 5'-UTR that regulates translational efficiency and controls transition to filamentous growth; stability controlled by Grr1p, Ubr1p, Ptc2p in response to CO_2 and O_2 levels
URA3	1. Cheng S, Nguyen MH, Zhang Z, Jia H, Handfield M, Clancy CJ. Evaluation of the roles of four Candida albicans genes in virulence by using gene disruption strains that express URA3 from the native locus. Infection and immunity. 2003 Oct;71(10):6101-3. 2. Sharkey LL, Liao WL, Ghosh AK, Fonzi WA. Flanking direct repeats of hisG alter URA3 marker expression at the HWP1 locus of Candida albicans. Microbiology. 2005 Apr;151(4):1061-71. 3. Staab JF, Sundstrom P. URA3 as a selectable marker for disruption and virulence assessment of Candida albicans genes. TRENDS in Microbiology. 2003 Feb 1;11(2):69-73.	Orotidine-5'-phosphate decarboxylase; pyrimidine biosynthesis; gene used as genetic marker; decreased expression when integrated at ectopic chromosomal locations can cause defects in hyphal growth and virulence; Spider biofilm repressed

UTR2	1. Alberti-Segui C, Morales AJ, Xing H, Kessler MM, Willins DA, Weinstock KG, Cottarel G, Fechtel K, Rogers B. Identification of potential cell-surface proteins in Candida albicans and investigation of the role of a putative cell-surface glycosidase in adhesion and virulence. Yeast. 2004 Mar;21(4):285-302.	Putative GPI anchored cell wall glycosidase; role in adhesion, hyphal growth on Spider (not serum) medium; chitin-binding, glycosyl hydrolase domains; induced during cell wall regeneration; mRNA in yeast-form cells; Spider biofilm induced
WOR1	1. The defective gut colonization of Candida albicans hog1 MAPK mutants is restored by overexpressing the transcriptional regulator of the white opaque transition WOR1. Virulence 14(1):2174294	Transcription factor ("master switch") of white-opaque phenotypic switching; required to establish and maintain the opaque state; opaque-specific, nuclear; regulates its own expression; suggested role in regulation of adhesion factors
WOR3	1. Fox EP, Cowley ES, Nobile CJ, Hartooni N, Newman DK, Johnson AD. Anaerobic bacteria grow within Candida albicans biofilms and induce biofilm formation in suspension cultures. Current biology. 2014 Oct 20;24(20):2411-6. 2. Hernday AD, Lohse MB, Fordyce PM, Nobile CJ, DeRisi JL, Johnson AD. Structure of the transcriptional network controlling white-opaque switching in C andida albicans. Molecular microbiology. 2013 Oct;90(1):22-35.	Transcription factor; modulator of white-opaque switch; induced in opaque cells; promoter bound by Wor1; overexpression at 25 degr shifts cells to opaque state; deletion stabilizes opaque cells at higher temperatures; Spider biofilm induced
Wsc1	1. Bonhomme J, Chauvel M, Goyard S, Roux P, Rossignol T, d'Enfert C. Contribution of the glycolytic flux and hypoxia adaptation to efficient biofilm formation by Candida albicans. Molecular microbiology. 2011 May;80(4):995-1013. 2. Ng AW, Li L, Ng EW, Li C, Qiao Y. Molecular docking reveals critical residues in Candida albicans Cyr1 for peptidoglycan recognition and hyphal Growth. ACS Infectious Diseases. 2023 Jun 15;9(7):1362-71. 3. Zucchi PC, Davis TR, Kumamoto CA. A Candida albicans cell wall-linked protein promotes invasive filamentation into semi-solid medium. Molecular microbiology. 2010 May;76(3):733-48.	Putative cell wall component; transcript upregulated in cyr1 mutant (yeast or hyphae); Spider and flow model biofilm induced

Wsc2	1. Nobile CJ, Fox EP, Nett JE, Sorrells TR, Mitrovich QM, Hernday AD, Tuch BB, Andes DR, Johnson AD. A recently evolved transcriptional network controls biofilm development in Candida albicans. Cell. 2012 Jan 20;148(1):126-38. 2. Zucchi PC, Davis TR, Kumamoto CA. A Candida albicans cell wall-linked protein promotes invasive filamentation into semi-solid medium. Molecular microbiology. 2010 May;76(3):733-48.	Putative cell wall integrity and stress response protein; mRNA binds She3; Spider biofilm induced
Yck2	1. Caplan T, Lorente-Macías Á, Stogios PJ, Evdokimova E, Hyde S, Wellington MA, Liston S, Iyer KR, Puumala E, Shekhar-Guturja T, Robbins N. Overcoming fungal echinocandin resistance through inhibition of the non-essential stress kinase Yck2. Cell chemical biology. 2020 Mar 19;27(3):269-82. 2. Liboro K, Yu SR, Lim J, So YS, Bahn YS, Eoh H, Park H. Transcriptomic and metabolomic analysis revealed roles of Yck2 in carbon metabolism and morphogenesis of Candida albicans. Frontiers in Cellular and Infection Microbiology. 2021 Mar 16;11:636834. 3. Caplan T, Lorente-Macías Á, Stogios PJ, Evdokimova E, Hyde S, Wellington MA, Liston S, Iyer KR, Puumala E, Shekhar-Guturja T, Robbins N. Overcoming fungal echinocandin resistance through inhibition of the non-essential stress kinase Yck2. Cell chemical biology. 2020 Mar 19;27(3):269-82.	Plasma membrane protein similar to S. cerevisiae casein kinase I; mutation or inhibition impairs virulence and morphogenesis; transcription is activated in weak acid stress or on contact with with host cells

Ypd1	1. Day AM, Smith DA, Ikeh MA, Haider M, Herrero-de-Dios CM, Brown AJ, Morgan BA, Erwig LP, MacCallum DM, Quinn J. Blocking two-component signalling enhances Candida albicans virulence and reveals adaptive mechanisms that counteract sustained SAPK activation. PLoS pathogens. 2017 Jan 30;13(1):e1006131. 2. Calera JA, Herman D, Calderone R. Identification of YPD1, a gene of Candida albicans which encodes a two-component phosphohistidine intermediate protein. Yeast. 2000 Aug;16(11):1053-9. 3. Mavrianos J, Desai C, Chauhan N. Two-component histidine phosphotransfer protein Ypd1 is not essential for viability in Candida albicans. Eukaryotic cell. 2014 Apr;13(4):452-60.	Phosphohistidine intermediate protein in a phosphorelay signal transduction pathway; residue His69 is the phosphoacceptor histidine; predicted to be soluble and cytosolic; functional homolog of S. cerevisiae Ypd1p

Final Datasets:

Name of the protein
Ace2
Aco1
Act1
Als1
Als3
Atp6
Bck1
Bcr1
Bcy1
Bem1
Bem2
Bem3
Bmh1
Bni1
Bnr1
Brg1
Cap1
Cat1
Ccc1
Cch1
Cdc24
Cdc28
Cdc42
Cek1
Cek2
Cla4
Clb2
Clb4
Cmp1
Cnb1
Cox1
Cph1
Cph2
Crh11
Crz1
Cst5
Cyr1
Czf1
Dck1
Efg1

Far1
Fas2
Fgr22
Fkh2
Flo8
Fus1
Gca1
Gca2
Gpd1
Gpd2
Gpr1
Gsc1
Gsl1
Gtr1
Hap43
Hgc1
Hms1
Hog1
Hot1
Hsf1
Hsl1
Hsp12
Hsp21
Hsp90
Hst7
Hwp1
Icl1
Ira2
Iro1
Lrg1
Mcm1
Mdh1
Mdh1-3
MFALPHA
MID1
MKC1
MKK2
MLS1
MNL1
MRS4
MSB2
MSI3

Msn4
Mss11
Mss4
NAD2
NAD5
NDT80
Nrg1
OLE1
OPY2
Pbs2
PCL1
PDE1
PDE2
PHO84
PHO85
PHO87
PHO89
PHR1
PKC1
Pkh2
Pkh3
Ptc1
Ptp2
Ptp3
Rac1
RAS1
RBT1
RBT5
RFG1
Rga2
RHB1
Rho1
Rim101
Rim13
Rim20
Rim21
Rim8
Rlm1
Rsp5
Sac7
SAP4
SCH9

SEF1
SGT1
SHO1
SKO1
SLN1
SMF3
SOD5
Spa2
SPT23
SSA1
SSA2
SSK1
SSK2
Ssn6
Sst2
Ste11
Ste18
Ste2
CST20
Ste3
Ste4
Ste50
Stt4
Swe1
SWI4
SWI6
TEC1
TOR1
TPK1
TPK2
TSC2
Tup1
Tus1
UME6
URA3
WOR1
WOR3
Wsc1
Wsc2
Yck2
Ypd1