

Supplementary File:

Genes, Transcription Factors, Protein Kinases, Intracellular Proteins, and Other Abbreviations as Used in the Article

Aap – amino acid permease
Aat – amino acid transporter
Aca – adenylyl cyclase-associated protein
Acc1 – acetyl-CoA decarboxylase
Acl1 – ATP-citrate lyase
Aco1 – aconitase
Acs1 – acetyl-CoA synthetase for histone acetylation
Acs2/Kbc1 – 2-ketobutyryl-CoA synthetase
Ada2 – histone acetyltransferase complex SAGA/ADA
Ady2 – acetate transporter
Afr1 – ATP-binding cassette transporter
Ags – α -1,3-glucan synthase
Agt1 – α -glucoside transporter or maltose permease
Ald1 – aldehyde dehydrogenase
Ald5 – aldehyde dehydrogenase
AMPK – 5' adenosine monophosphate-activated protein kinase
Amt1/Mep1 – ammonium permease/transporter
Aox1 – alternative oxidase
Apc – amino acid-polyamine-organocation secondary carrier protein (APC) superfamily (including the amino acid-polyamine-organocation (APC), the amino acid/auxin permease (AAAP), the alanine or glycine:cation symporter (AGCS), the cation-chloride cotransporter (CCC), the hydroxy/aromatic amino acid permease (HAAAP), the betaine/carnitine/choline transporter (BCCT), the solute:sodium symporter (SSS), the neurotransmitter:sodium symporter (NSS), the nucleobase:cation symporter-1 (NCS1), the nucleobase:cation symporter-2 or nucleobase:ascorbate transporter (NCS2), the sulfate permease (SulP) as family members)
Apn1/2 – DNA-apurinic/apyrimidinic site lyase (endonuclease) 1 and 2 function in the base excision repair pathway
Aro80 – transcription activator of genes involved in the tolerance and metabolism of aromatic amino acids
Atf1 – *Cre*-binding basic leucine-zipper (bZIP) domain activating transcription factor regulated by Hog1
Atg – serine/threonine-protein kinase involved in autophagy
Atg26 – UDP-glucose:sterol glucosyltransferase in the biosynthesis of sterol glucoside membrane lipids
Atg4 – C54 peptidase family protein
Atg8 – autophagy-related protein (a ubiquitin-like protein associated with phosphatidylethanolamine) involved in autophagosome
Atm1 – mitochondrial inner membrane ABC transporter/iron-sulfur clusters transporter Atm1p
Atp1 – α -subunit F₀F₁-type ATP synthase
Bck1 – bypass of *c* kinase – an activator of mitogen-activated protein kinase
Bwc – Basidiomycete white collar
Cac1 – *Cryptococcus* adenylyl cyclase
Cam1 – calmodulin
Can – carbonic anhydrase CO₂-sensor
Cbk – cell wall biosynthesis serine/threonine kinase (a member of RAM signalling network protein kinase belonging to the AGC kinase family)
Cbp – ubiquinol-cytochrome c chaperone
Ccc1/2 – copper transporter, a P-type ATPase
Cda – chitin deacetylase
Cdc – cell division cycle transcription factors
Cdc10 – septin *aspD*
Cdc11 – septin *aspA*
Cdc12 – septin *aspC*
Cdc14 – phosphoprotein phosphatase
Cdc16/23 – anaphase-promoting complex subunits protein
Cdc24 – a GEF protein mediating a conserved signalling event for thermotolerance, polarised growth, and pathogenesis via Ras1, Cdc24, Cdc42, and Pak kinase Ste20
Cdc31 – EF-hand Ca²⁺-binding protein

Cdc36 – CCR4-NOT transcription complex
Cdc4 – myosin regulatory light chain
Cdc40 – cell division cycle 40
Cdc420 – a paralogue of Cdc42 gene
Cdc43 – encoding β -subunit of geranylgeranyltransferase-1 (Ggtase-1), catalysing the attachment of hydrophobic isoprenoid moieties onto C-terminal CaaX motifs (cysteine, 2 aliphatic amino acids, and variable amino acid)
Cdk – cyclin-dependent kinase
Cdk8 – cyclin-dependent protein kinase *c*, and a suppressor of Snf1; a homologue of yeast Ssn3
Chs – chitin synthase
Cin1 – cryptococcal intersectin 1 (human endocytic ITSN1 homologue)
Cir1/2 – *Cryptococcus* iron regulator electron transfer flavoprotein-ubiquinone oxidoreductase homologue of *S. cerevisiae*
Clr6 – cryptic loci regulator encoding putative class I histone deacetylase that removes an acetyl group from ϵ -N-acetyl-lysine amino acid residue on a histone, thereby enhancing tighter wrapping of histones on DNA to prevent access to transcription factors and DNA expression. Clr6p is a transcriptional epigenetic repressor of the Mat2 – Mat3 region and centromere for precise heterochromatin packaging during chromosomal segregation in fission yeast
Cna/Cnb – temperature- and calcium-induced calcineurin, inhibited by FK506
Coq10 – ubiquinone-binding protein
Coq11 – a putative protein involved in FMN-dependent decarboxylation in CoQ biosynthesis
Cpk1 – putative MAP kinase Ubc3
Cpp – *Cryptococcus* purine/cytosine permease, e.g., Cpp2 homologues of *S. cerevisiae* Fcy2 and Fcy21
Cpr – constitutive pheromone receptor, e.g., *Cpra* gene is a *MATa* strain-specific gene encoding putative seven-transmembrane domain pheromone receptors with diverse functions – mating, virulence, and capsule
Cps1 – hyaluronic acid synthase/celluluburonic synthase essential in transcellular transmigration
Cps1/10 – vacuolar carboxypeptidase yscS
CPY – carboxypeptidase Y
Cqs1/2 (Qsp1/2) – *Cryptococcus* quorum sensing-like molecule/quorum sensing-like protein
Crg – a regulator of G-protein signalling
CRIB – Cdc42/Rac interaction binding domain, e.g., Ste20p, which can interact via CRIB with Cdc42p, activate Rac1p and Dch2p
Crk1 – Cdk-related kinase 1
Crz1/Sp1 – cell wall transcriptional regulator known as calcineurin-responsive zinc finger 1
CSR – common stress response/regulatory genes
Csr1, Csr2, Csr3 – chitin synthase regulators
Cta11 – catalase 1
Cta12/Cat3 – catalase, homologue of *S. cerevisiae*
Ctr1 – high-affinity copper transporter
Cwc1/2 – *Cryptococcus* white collar photoregulator, a homologue of *N. Crassa* white collar 1 and 2 (Wc-1/2)
Cwc24 – pre-mRNA-splicing factor homologue of *S. pombe* Cwf24p
CWI – cell wall integrity
Ddc1 – DNA damage checkpoint protein associated with Mec1
Ena1/5/50/51/52 – Na⁺ or K⁺ P-type membrane ATPase cation transporter
Erg – ergosterol regulatory gene
Erg1 – squalene epoxidase/monooxygenase
Erg10 – acetyl-CoA acetyltransferase
Erg11 – *Cyt P₄₅₀* lanosterol 14 α -demethylase
Erg110 – Δ^{14} -sterol demethylase activity with heme-binding pocket
Erg13 – 3-hydroxy-3-methylglutaryl-CoA (HMG-CoA) synthase in mevalonate biosynthesis
Erg2 – Δ^8 -sterol isomerase
Erg20 – polyprenyl synthetase
Erg24 – Δ^{14} -sterol reductase
Erg25 – Δ^4 -methylsterol oxidase (sterol desaturase)
Erg26 – Δ^3 -sterol dehydrogenase/3- β -hydroxysteroid dehydrogenase, a homologue of *S. cerevisiae*
Erg27 – 3-keto sterol reductase
Erg3 – Δ^5 -sterol desaturase
Erg4 – $\Delta^{24/28}$ -sterol reductase

Erg5 – Δ^{22} -sterol desaturase
Erg50 – Δ^{22} -sterol desaturase with cyt *P₄₅₀*
Erg6 – Δ^{24} -sterol methyltransferase
Erg7 – lanosterol synthase
Erg8 – phosphomevalonate kinase
Erk – extracellular signal-regulated kinase MAPK with T-E-Y motif (Cpk1 and Mpk1)
ESR – environmental stress response/regulatory groups of genes/ER-stress response genes
Fet – iron transporter
Fet3/5 – ferroxidase/multicopper oxidase or iron transporter
Fhb1 – flavohemoglobin denitrosylase (nitric oxide dioxygenase)
Fre2/7/20 – cell surface iron reductase/ferric-chelate reductase
Ftr/Fth – high-affinity ferrous iron permease/transporter (*Cft* gene in *C. neoformans*)
Fzc31 – fungal-specific Zn₂Cys₆ DNA binding protein regarded as a core virulence transcription factor for thermotolerance, antioxidation, and mating but inhibit melanin formation
Gat – transcriptional activator capable of binding -G-A-T-A- sequence within the DNA to regulate other genes. Popular GATAs are zinc-finger protein families, such as Gat1, Gat2, and Gat3
Gcs1 – glucosylceramide synthase 1, which synthesises the membrane sphingolipid GlcCer from the C⁹-methyl ceramide
Gpa – G-protein α subunit
Gre2 – homologue of mammalian 3- β -hydroxysteroid dehydrogenase (gene de respuesta an estrés –stress-responsive gene)
Grx – glutathione-dependent oxidoreductase (e.g., Grx4 and Grx5 monothiol glutaredoxin in *C. neoformans* but Grx3 and Grx4 in *S. cerevisiae*)
GSR – genotoxic stress response/regulatory groups of genes
Hap1 – haem-binding transcription factor
HMSR/HMR – heavy-metal stress response/regulatory groups of genes/heavy-metal resistance
Hog1 – a *p38* family of MAPK with a T-G-Y motif
Hsp10 – mitochondrial matrix co-chaperonin ATPase inhibitor
Hsp104 – heat shock protein 104
Hsp12 – plasma membrane heat-shock protein for membrane organisation during stress conditions, homologue to Hsp122. While Hsp12 appears constitutive, Hsp122 is slightly induced in *C. neoformans*. Under the cAMP and Hog1 regulations, both chaperons are involved in polyene antifungal susceptibility
Hsp31 – DJ-1/Thi1/Pfp1 superfamily, yeast stress-inducible homodimeric heat shock protein chaperone with methylglyoxalase activity
Hsp60 – a tetradecameric mitochondrial chaperonin
Hsp70 – multifunctional ATP-dependent heat-shock molecular chaperon expressed against stress
Hsp78 – heat shock protein chaperone
Hsp90 – ATP-dependent molecular chaperone activator of protein turnover during stress
HTG – high-temperature growth
Hxl1 – Hac1, Xbp1-Like gene 1 encoding UPR transcriptional factor
Icl1 – isocitrate lyase catabolising isocitrate into succinate and glyoxylate
Idh1/Idp1/Lys1 – isocitrate/isopropylmalate dehydrogenase
Idi1 – isopentenyl diphosphate Δ^1 -isomerase
Ilv1 – threonine deaminase in isoleucine biosynthesis
Ilv2 – acetolactate synthase for isoleucine and valine biosynthesis
Ilv3 – dihydroxyacid dehydratase in the branched-chain amino acid biosynthesis
Ilv5 – acetohydroxyacid reductoisomerase
Ipc1 – inositolphosphoceramide synthase
Ire1 – ER-resident transmembrane kinase/RNase
Jac1 – J-type accessory chaperone
Kcs1 – protein kinase *c* suppressor
Kic1 – serine/threonine-protein kinase related to Pak/Ste20 protein family
Kre – β -glucan synthase
Leu1 – 2-isopropylmalate synthase
Leu2 – 3-isopropylmalate dehydrogenase – an Fe-S cluster protein required for leucine biosynthesis
Leu3 – a repressor that, together with Gcn4, regulates amino acid biosynthesis

Leu9 – α -isopropylmalate synthase II (2-isopropylmalate synthase) in leucine biosynthesis
Liv3 – a Wor1-motif DNA binding protein (orthologue of *C. albicans* Wor1)
LPL – lysophospholipase
LPTA – lysophospholipase/transacylase
Lys10 – dihydrodipicolinate synthase in lysine biosynthesis
Lys2 – aminoadipate-semialdehyde dehydrogenase
Lys2 – α -aminoadipate reductase in lysine biosynthesis
Lys21 – homocitrate synthase isozyme in lysine biosynthesis
Lys4/Lys40/Lys41/Lys42 – homoaconitase, converting homocitrate to homoisocitrate in lysine biosynthesis
Mal – hexose transporter
Man1 – phosphomannose isomerase
MAPK – mitogen-activated protein kinases such as Mpk1, a homologue of *S. cerevisiae* Slt2 or human Erk5
May1 – major aspartyl peptidase 1
Mbs1 – APSES-like transcription factor (**Mbp1**- and orthologue of Swi4-like DNA binding protein 1)
Mbs2 – orthologue to Swi6-like DNA binding protein regulating the cell cycle. It can form a complex, Mbs1/Mbs2- or Swi4/Swi6-dependent cell cycle box-binding factor
Mdr1 – multidrug resistance protein 1
Met13 – methylenetetrahydrofolate reductase
Met14 – adenylylsulfate kinase
Met17 – cysteine synthase
Met2 – homoserine transacetylase
Met3 – sulfate adenylyltransferase/ATP sulfurylase
Met30 - sulfur metabolite repression control protein and a negative regulator of sulfur amino acids genes expression for biosynthesis
Met5 – nitrite and sulphite reductase with a 4Fe-4S binding domain
Met5/10 – sulfite reductase α -subunit converting sulfite into sulfide
Met7 – folylpolyglutamate synthase
Mp88 – T cell-stimulating mannoprotein
Mrs4 – inner membrane solute transporter
Mup1 – high-affinity methionine/cysteine permease
Mup3 – low-affinity methionine/cysteine permease
NCR – nitrogen catabolite repression
Ncs1 – neuronal calcium sensor 1
Nde2 – pyridine nucleotide-disulfide oxidoreductase, a homologue of *S. cerevisiae*
Ndh1– mitochondria external NADH dehydrogenase
NF- κ B – nuclear factor kappa-light-chain-enhancer of activated B cells
Nha1 – Na⁺/H⁺ antiporter induced for acidoresistance
Nic1 – nickel transporter
Nrg1/2 – putative C2H2-type transcription factor controlled by cAMP to regulate capsule production
NSR – nitrosative stress regulatory groups of genes
OMSR – osmotic stress response/regulatory groups of genes
Opt1 – oligopeptide transporter
OSR – oxidative stress response/regulatory groups of genes
Pbx – parallel β -helix repeat protein
Pck1 – phosphoenolpyruvate carboxykinase 1
Pcl12 – alternative cyclin
Pho4 – phosphate signalling pathway (PHO) activator
Pho81 – cyclin-dependent kinase (Cdk) inhibitor with conserved lysine surface cluster in the SPX domain
Pho84, Pho85, Pho89, Pho840 – high-affinity phosphate transporter/permease
Pka – cAMP-dependent protein kinase A catalytic subunit
Pkc1 – protein kinase *c*
Pqp1 – pro-Qsp1 protease 1 (a secreted serine protease)
Ptp – protein tyrosine kinase – Ptp1 and Ptp2 (a major negative repressor of Hog1 hyperphosphorylation)
Ptp1 – polyol transporter protein 1
Ptr – peptide transporter
Pub1 – polyadenylated RNA-binding protein

Puf4 – PUmilio-FBF (FEM-3 binding factor) homology domain family 4 of mRNA binding proteins very similar to yeast Mpt5. Together with **Lhp1** and **Pbp1** are calcineurin (Crz1) target genes for virulence and stress survival. They belong to P-bodies/stress granules

Pum1 – translational repressing RNA-binding protein

Rad17 – **Radiation-sensitive** cell cycle checkpoint protein associated with Mec1

Rad24 – Radiation-sensitive protein that promotes the binding of Rad17-Mec3-Ddc1 complex to DNA

Ras1 – GTPase involved in G-protein signalling in the adenylate cyclase-activating pathway

Rho – Rho-GTPase protein with C-terminal CAAX box motifs for prenylation and membrane localisation, a homologue of mammalian Rac proteins

Rim101 – cell wall transcriptional regulator

SCAP – SREBP cleavage-activating protein (same as Scp1p)

Sch9 – AGC/AKT protein kinase

Sec – exocyst complex component

Sec13 – COPII protein

Sec16 – COPII vesicle coat protein

Sec27 – coatomer β -subunit

Sec28 – COPI protein

Sec4 – secretory vesicle-associated Rab GTPase

Sec53 – phosphomannomutase:glycosylation secretory proteins

Sec61 – γ -subunit of protein translocation complex for misfolded proteins out of ER

Skn1 – β -glucan synthesis-associated protein putatively tagged glucosidase

Smt1 – sphingolipid C9 methyltransferase

Snf1 – sucrose non-fermenting serine/threonine-protein kinase 1 complex (homologue of AMPK in mammals)

Snf3 – glucose permease

Snf4 – Snf1 kinase complex with CBS binding domain

Snf7 – sucrose non-fermenting protein 7 – a key regulator of the endosomal sorting complex required for transport (ESCRT)-III for the formation and cargo of multivesicular bodies (MVB). It is a vacuolar-sorting protein

Soa1 – putative sulfonate/sulfur transporter

Sod1 – copper/zinc cytoplasmic superoxide dismutase

Sod2 – mitochondrial manganese superoxide dismutase

SRE – stress response elements

SREBP – mammalian sterol regulatory element-binding protein (*Sre* gene in fungus)

Ssk1 – sensory transduction histidine kinase

Ssn8/Srb11 – C-type cyclin protein associating with specific cyclin-dependent kinase (Cdk) like Cdk8

Ssn801 – cyclin C

Ssr – specific-stress regulatory genes

Suc2 – sucrose- and raffinose-degrading enzyme, invertase

Sul1/Sul2 – sulfate transporter/permease

Sur2 – sphinganine/sphingosine C-4 hydroxylase – an ER enzyme converting sphinganine to phytosphingosine; sterol desaturase

Swe102 – a homologue of *S. cerevisiae* Swe1 checkpoint protein kinase that regulates yeast morphogenesis by inhibiting Cdk via phosphorylation, an anti-stress mechanism in the budding yeast

Sxi1 α – sex inducer 1 α for cell identity factor in MAT α similar to Sxi2 α in MAT α

Tah18 – NAPDH-dependent diflavin reductase

Tao3 – RAM (Regulation of Ace2p activity and cellular Morphogenesis) is a cell polarity signalling network protein

Tco – two-component system

Tps1 – trehalose-6-phosphate synthase, catalysing the conversion of UDP-glucose and glucose-6-phosphate to trehalose-6-phosphate. UDP-galactose is an epimer of UDP-glucose, which is reported as a poor substrate and inhibitor of Tps1

Tps2 – trehalose-6-phosphate phosphatase

Trp1 – phosphoribosyl anthranilate isomerase in tryptophan biosynthesis

Trp2 – anthranilate synthase component I – ASCO-I of chorismate aminase

Trp3 – anthranilate synthase component II – ASCOII of glutamine amidotransferase/phosphoribosyl anthranilate isomerase/indole glycerol phosphate synthase

Trp4 – anthranilate phosphoribosyltransferase (APRT)

Trp5 – tryptophan synthase

Tsa1 – thiol-specific antioxidant thioredoxin peroxidase (thioredoxin-dependent peroxide reductase)
Usv101 – master regulator of *C. neoformans* pathogenesis and virulence, a C₂H₂ yeast transcription factor orthologue
Uve1 – endonuclease for base/nucleotide excision repair pathway in UV-DNA damage
Uxs1 – UDP-xylose synthase/UDP-glucuronate decarboxylase 1
Vad1 – virulence-associated DEAD-Box RNA helicase-encoding protein, a member of the RCK/p54 subfamily of RNA
Vcx1 – Ca²⁺/H⁺ antiporter
Vph1 – vacuolar/vesicular H⁺-ATPase proton pump
Vps1 – vacuolar protein sorting regulator, dynamin
Vps17 – a membrane coat complex retromer subunit Vps5/Snx1
Vps29/Vps36 – retrograde transporter (yeast vacuolar protein sorting-associated protein 29)
Vps34 – phosphatidylinositol-3-kinase (PI3K)
Vps4 – AAA⁺-type ATPase
Vrk1 – a homologue of vaccinia-related serine/threonine kinase induced by DNA damage
Yah1 – 2Fe-2S iron-sulfur cluster binding domain homologue of *S. cerevisiae*
Yor1 – yeast oligomycin resistance
Ypc – alkaline phytoceramidase
Ypd – phosphotransfer protein/phosphorelay intermediate protein