Kss1p is a member of the mitogen-activated protein kinasefamily of serine/threonine-specific kinases, which mediate phosphorylation reactions in signaling pathways that link receptor activation to control of cell proliferation. The S. cerevisiae genome encodes six MAP kinase-like proteins: Fus3p, Kss1p, Smk1p, Slt2p, Hog1p, and Ykl161p, and five of these are known to function in pathways that mediate mating, responses to nutrient deprivation, cell wall remodelling, and responses to osmolarity changes. MAPK pathways comprise a three-component module of kinases that is conserved from yeast to humans. These kinases activate in a sequential order: a MAPK kinase kinaseactivates a MAPK kinase, which activates a MAPK. Kss1p participates in three signaling pathways that control haploid invasivegrowth, pheromone response, and cell wall integrity. In these pathways, Ste11p functions as the MEKK and Ste7p is the MEK.The invasive growth pathway is activated when haploid cells are limited for carbon. This nutrient limitation activates Ras2p, which stimulates either of two pathways: a MAPK cascade or the cAMP-dependent protein kinase pathway. Kss1p functions in the MAPK pathway; it is phosphorylated and hence activated by Ste7p, leading to activation of the heteromeric transcription factor Tec1p-Ste12p and induction of target genes such as PGU1, MUC1, and CLN1. In its inactive unphosphorylated form, Kss1p binds to Ste12p and prevents it from activating genes involved in invasive growth. This same cascade functions to maintain cell wall integrity during vegetative growth.Kss1p also plays a minor role, as part of the same MAPK pathway, in response to pheromones, which mediate mating of haploid yeast cells to form diploids. Mating is initiated by the binding of peptide pheromonesto seven-transmembrane receptor proteins on cells of the opposite type: Ste2por Ste3p. Receptor binding leads to activation of the heterotrimeric G-protein. Activation leads to recruitment of the scaffolding protein Ste5p and its associated MAP kinase cascade components to the membrane, where Ste11p is phosphorylated by the PAK kinase Ste20p; Ste11p then phosphorylates Ste7p, which phosphorylates Fus3p and Kss1p. Both MAPKs phosphorylate the transcription activator Ste12p, which induces a number of mating-specific genes. The difference in substrate specificity between Fus3p and Kss1p contributes to the greater importance of Fus3p in pheromone response, while Kss1p is more prominent in activating the invasive growth pathway. Fus3p also inhibits invasive growth during mating through degradation of Tec1p, which is a cofactor for Ste12p in the expression of filamentation genes. Tec1p is not a substrate for Kss1p, so Tec1p remains stable during filamentous growth. The scaffold protein Ste5p plays a role in insulating the mating pathway from the filamentation pathway, as shown by analysis of a point mutation in Ste5p that confers increased activation of Kss1p and reduced Fus3p-dependent degradation of Tec1p.Mitogen-activated protein kinases are widely conserved in eukaryotic cells. The closest human homolog to Kss1p is MAPK1with 50% identity.