The paralogous genes HYP2 and ANB1 encode the translation elongation factor eIF-5A. The two gene products are 90% identical to each other. Because Hyp2p is expressed under normal, aerobic growth conditions while Anb1p is expressed only under anaerobic conditions, most functional studies have focused on Hyp2p. However, since the two proteins are functionally interchangeable in vivo, results obtained with Hyp2p are likely to be directly applicable to Anb1p.eIF-5A was long considered to be a translation initiation factor based on in vitro assays of certain aspects of translation; however, since some in vitro assays did not suggest a role in initiation, and since depletion of eIF-5A does not severely affect overall translation, its role was unclear. Since then, detailed studies of hyp2 conditional mutant phenotypes have revealed translational defects and alterations in polysome profiles characteristic of elongation factor mutations, as well as decreased accumulation of P-bodies, which is known to occur in elongation mutants. HYP2 also displays synthetic genetic interactions with translation elongation factor mutants, and physical interaction with elongation factor eEF2. Furthermore, Hyp2p stimulates both translation elongation and termination in vitro. Thus, multiple lines of evidence are consistent with a primary role for eIF-5A in promoting translation elongation.eIF-5A is highly conserved across all species. The human ortholog EIF5Acomplements the inviability of the yeast hyp2 anb1 double null mutant. Both Hyp2p and Anb1p undergo the conversion of a single lysine residue to hypusine-lysine), which is essential for function. The modification is conserved among eIF-5A orthologs in eukaryotes and Archaea, and eIF-5A orthologs are the only known hypusinated proteins. eIF-5A orthologs in Eubacterial species, such as elongation factor P, are not hypusinated. Hypusination of Hyp2p is essential for two kinds of protein-protein interactions in which it participates: homodimer formation; and binding to intact 80S ribosomes, with a preference for actively translating ribosomes. Both Hyp2p and Anb1p are also phosphorylated on a serine residue, but this modification has no obvious effects on function.The hyp2 null mutant in strain W303 is inviable under standardconditions although growth is observed under anaerobic conditions due to ANB1 expression; conversely, the anb1 null mutant fails to grow under anaerobic conditions but has no apparent phenotype under aerobic conditions. The hyp2 null mutant is slow-growing, rather than inviable, under standard conditions in a different strain background. The hyp2 anb1 double null mutant is inviable under all conditions.Transcription of ANB1 is tightly regulated by the presence of oxygen, and ANB1 has been studied extensively as an example of an anaerobically expressed gene. Anb1p is undetectable under aerobic conditions, and its mRNA is 200-fold more abundant in the absence of oxygen than in its presence. Transcriptional repression of ANB1 under aerobic conditions is mediated by the transcription factors Rox1p and Mot3p, which cooperate to recruit the Cyc8p-Tup1p general co-repressor complex to the ANB1 promoter.