ADE12 encodes adenylosuccinate synthase, which catalyzes the first step in the conversion of inosine monophosphateto adenosine monophosphatein the purine nucleotide biosynthetic pathway. Ade12p also exhibits single-stranded DNA-binding activity, with high specificity for the single-stranded T-rich region of the core ARS. The DNA binding activity, but not the enzymatic activity, is abolished by dephosphorylation of Ade12p, suggesting that binding could be regulated by phosphorylation state. Ade12p has been localized to the cytoplasm, and the significance of the DNA binding activity is unclear.Mutations in ade12 that reduce or abolish enzymatic activity cause adenine auxotrophy, and even when supplemented with adenine cultures of mutant cells do not exhibit wild-type growth rates. ade12 mutants also accumulate inosine and excrete hypoxanthine, and they germinate poorly. Expression of ADE12 and most of the other purine biosynthetic genes is repressed by adenine and activated by transcription factors Bas1p and Pho2p. The main mechanism of ADE12 regulation appears to be transcriptional, as studies of purified overexpressed Ade12p indicate that adenylosuccinate synthase activity is not tightly regulated by precursors, intermediates or products of the purine-synthesizing pathway. Ade12p orthologs have been identified in archaea, E. coli, S. pombe, D. discoideum, and humans. The enzymes from E. coli and Dictyostelium do not exhibit single-stranded ARS-specific binding.