Glycolysis is the lysis, or splitting, of one molecule of glucose into two molecules of pyruvate, producing a net gain of two ATP molecules. Pyruvate can then be used in anaerobicor aerobicmetabolism. The glycolysis pathway and the genes involved are illustrated here.CDC19 encodes pyruvate kinasewhich catalyzes the conversion of phosphoenolpyruvate to pyruvate, the final step in glycolysis. cdc19 deletion mutants cannot grow using glucose or other fermentable sugars as the sole carbon source, but grow normally on ethanol or lactate indicating that there is an alternate route for pyruvate synthesis. Genetic studies indicated that MAE1 is the likely candidate for this role. MAE1 encodes malic enzyme which catalyzes the oxidative decarboxylation of malate to pyruvate. Indeed, a cdc19 mae1 double deletion mutant cannot grow using ethanol as the sole carbon source. Genetic analysis of CDC19 also showed that it is involved in the cell division cycle; temperature-sensitive cdc19 mutants arrest growth in G1 at the restrictive temperature of 36 degrees C.Overexpression of PYK2, which encodes a second yeast pyruvate kinase, restores growth on glucose to cdc19 mutant cells. However, CDC19 is tightly regulated and activated by fructose-1,6-bisphosphatewhereas PYK2 is subject to glucose repression and appears to be insensitive to FBP levels, suggesting that it may be active when FBP levels are too low to activate CDC19. Therefore, PYK1 appears to be the main pyruvate kinase in the glycolytic pathway.Transcription of CDC19 is induced in the presence of glucose; the CDC19 promoter contains binding sites for the transcription factors Rap1p and Abf1p. Genes encoding pyruvate kinase have been identified in several other species, including humanand mouse; mutations in the human gene can cause hemolytic anemia.