SL801 Yeast as a Tool for Both Classical and Molecular Genetics

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Since 1935 when the first studies of genetics of yeast was made by Winge at the Carlsberg laboratory at Copenhagen where he demonstrated the alternation of haplophase and diplophase in yeast, yeast has been a useful tool for genetic studies. In early fifties it had been established that yeast follows the Mendelian inheritance and 2:2 segregation of the markers in four-spored asci from diploid cells. In addition the concept of gene conversion theory that segregated as 4:0, 3:1, 1:3, 0:4 was introduced and this became the basis of recombination theory of DNA later years. In the years of sixties mating type. switch of the yeast was discovered and HO gene in the homothallic was discovered to be responsible for switching its mating type frequently. Heterothallic strain that did not switch its mating type did not have HO gene. In early seventies cassette theory of the mating type switch mechanism was elucidated and this became one of the first genes for studying the regulation of gene expression as recombinant DNA technology was introduced in late seventies. Chromosome mapping of the genes on 17 chromosomes and linkage analysis of the genes were established during this period. Hartwell isolated 150 temperature sensitive mutants that were capable of growth at 22C but not at 36C and these made him identify 35 genes that control blocks in various stage of the cell-division cycle and yeast became playing a distinctive role in study of the control of cell division cycle. As recombinant DNA technology and yeast transformation technique were successfully established and yeast-*E.coli* shuttle vectors that contained autonomous replication fragment (ARS) were developed in late seventies, the era of the yeast molecular biology started. Since then molecular cloning of the yeast genes has been booming and during the years of eighties by using the cloned gene fragments elucidation of the molecular mechanism of how gene expression is regulated became the central subject of the molecular biology. As many genes became available to study the mechanisms how cell growth or differentiation are regulated at the molecular level, the cell cycle and signal transduction have became the major areas of many biologists interest recently. By taking advantage of easiness of genetic analysis and molecular cloning of the genes and the fact that it contained most of the basic elements that are conserved through out eukaryotic cells yeast again became the favorite organism to study and will still be one of the organism that is suitable for studying basic biological issues of how living organisms thrive and die. As whole genome of the budding yeast was completely sequenced as of March 1997, functional analysis of the unknown genes will be the major task to be solved in the future. This will be the first model organism to be analyzed for functional genome era in year 2000. I will present some of the landmarks in history of yeast genetics and some of our recent finding on novel genes involved in cell growth and differentiation.