

GAL4/UAS system is a bipartite gene engineering tool, enabling ectopic expression in temporal and tissue-specific manner *in vivo*. Design of this technique is based on a mechanism of gene transcription, which was elucidated of large portion by an experimental study of *Saccharomyces cerevisiae* regulation of metabolic control circuit for processing galactose. It is possible to generate hundreds of stable transgenic lines by independent incorporation of the gene for the transcription factor Gal4p and its binding sequence (UAS), respectively, by using transposable or specific-sequence integration techniques. An individual organism, manifesting ectopic expression in suitable, adjustable conditions, can be obtained by cross breeding individual of GAL4 lines with individual from UAS line. This thesis represents a synthesis of the basic principles of GAL4/UAS system and its variants, particularly adapted to the needs of genetic manipulation of model organisms *Drosophila melanogaster* and *Danio rerio*. Additionally, this text summarizes the connection GAL4/UAS system with other techniques and briefly highlights the potential for practical applications mainly in research area of neurology.