

Abstract

Promoters which can be regulated by different chemical or physical factors are often used in cell manipulations. This thesis focuses predominantly on promoter systems which use light as an inductor. There are two main approaches to controlling a promoter by light. The first one uses so-called „caged molecules“, chemical inducers whose inducing activity is „masked“ by a photolabile protecting group. The second approach includes optogenetic systems, which can regulate transcription in cells. These systems are encoded in the DNA of the organism, and light is the only external regulatory stimulus. Photoreceptors that need a specific cofactor (chromophore) are the main components of optogenetic systems. There are several groups of photoreceptors classified by the type of chromophore and photoactivation mechanism. This thesis gives an overview of optogenetic systems used for transcription regulation and focuses on different photoreceptors and induction mechanism used. The systems using photocaged molecules are described as well. Furthermore, the thesis deals with light-systems in yeast as a model organism as well as organism used for biotechnological purposes. Finally, some limitations of light inducible promoters are discussed, including the chromophore type, the wavelength of the light, and the efficiency of the particular system.

Key words: optogenetics, inductor, promoter, yeast, fotoactivation, light