

Abstract

Regulation of transcription by extracytoplasmic-function (ECF) sigma factors of RNA polymerase is an efficient way of cell adaptation to diverse environmental stresses. Amino acid-producing gram-positive bacterium *Corynebacterium glutamicum* codes for seven sigma factors: the primary sigma factor SigA, the primary-like sigma factor SigB and five ECF stress-responsive sigma factors (SigC, SigD, SigE, SigH and SigM). The *sigH* gene encoding SigH sigma factor is located in a gene cluster together with the *rshA* gene, encoding the anti-sigma factor of SigH. Anti-sigma factors bind to their cognate sigma factors and inhibit their transcriptional activity. Under the stress conditions the binding is released allowing the sigma factors to bind to the RNAP core enzyme.

In this thesis, regulation of expression of genes encoding the most important ECF sigma factor SigH and its anti-sigma factor RshA as well as genes belonging to the SigH-regulon were mainly studied.

The transcriptional analysis of the *sigH-rshA* operon revealed four housekeeping promoters of the *sigH* gene and one SigH-dependent promoter of the *rshA* gene.

For testing the role of the complex SigH-RshA in gene expression, the *C. glutamicum* $\Delta rshA$ strain was used for genome-wide transcription profiling with DNA Microarrays technique under the normal growth conditions. In total 83 genes (including those previously detected using $\Delta sigH$ mutant strains) demonstrated increased transcript levels in the deletion mutant defective in RshA anti-sigma factor when compared to *C. glutamicum* wild-type strain and they can be thus considered as SigH-dependent. These genes encode proteins related to disulphide stress response, heat stress proteins, components of the SOS-response to DNA damage and proteasome components.

The promoter activities of some newly identified SigH-dependent genes *dnaJ2*, *uvrA* and *uvrD* were estimated, their transcription start points were determined and the -10 and -35 hexamers of the respective promoters were proposed.

Using *in-vitro* transcription system it was found that the typical housekeeping promoter *Pper* interacts with the alternative sigma factor SigB in addition to the primary sigma factor SigA. Some promoters of SigH-dependent promoters of genes involved in stress responses (*clgR*, *dnaK* and *dnaJ2*) were found to be recognized also ECF sigma factor SigE. For the first time it was demonstrated that in *C. glutamicum* one promoter can be recognized by more than one sigma factor.