

Abstract

The biology of the bacterial ribosome of gram positive bacterium *Bacillus subtilis* is the central point of this thesis that includes studies of both ribosomal components – ribosomal RNA (rRNA) and one of ribosomal proteins. The first part of the thesis focuses on the regulation of rRNA synthesis and the second part focuses on the identification and characterization of a new ribosomal protein, YbxF.

rRNA synthesis is mostly regulated at the level of transcription initiation. Initiating nucleoside triphosphates (iNTPs) are important molecule effectors that regulate this process. Varying iNTP concentration in the cell directly affects RNA polymerase (RNAP) at rRNA promoters as these promoters are sensitive to [iNTP] *in vivo*. Most of the knowledge about this regulation is derived from *Escherichia coli*, where the rRNA promoter sequence is key for this regulation. Nevertheless, sequence characteristics of [iNTP]-regulated rRNA promoters from gram positive bacterium *B. subtilis* do not emulate the sequence characteristics derived from [iNTP]-regulated rRNA promoters from gram negative bacterium *E. coli*. Using a combination of *in vitro* and *in vivo* approaches, we determined promoter DNA elements that are responsible for [iNTP] sensitivity of ribosomal and non ribosomal promoters in *B. subtilis*.

The second part of the thesis focuses on the protein part of the ribosome. We investigated the YbxF protein, encoded by the *ybxF* gene, which is in *B. subtilis* a member of the highly conserved streptomycin (*str*) operon coding for essential ribosomal proteins and elongation factors. Using genetic and biochemical approaches and fluorescence microscopy we showed that although YbxF is not essential for bacterial growth it binds to the ribosome, to its large ribosomal subunit (50S) in the course of exponential phase of growth. Subsequent molecular modeling and mutational analysis revealed the region of YbxF that is important for its interaction with the ribosome.