The *thrS* Messenger Path on the Ribosome

Lasse Jenner^a, Pascale Romby^b, Bernard Rees^a, Dino Moras^a, Gulnara Yusupova^a, Marat Yusupov^a, ^aInstitut de Génétique et de Biologie Moléculaire et Cellulaire, Illkirch, France. ^bInstitut de Biologie Moléculaire et Cellulaire, Strasbourg, France. E-mail: lasse@jgbmc.u-strasbg.fr

Initiation of translation generally determines the efficiency of protein synthesis, and is the key step for the control of gene expression when fast adaptation is required. Binding of the messenger to the eubacterial ribosome involves several mRNA elements, which affect the kinetics of the initiation complex formation. These elements may include binding sites for translational regulatory proteins. *E. coli* threonyl-tRNA synthetase (ThrRS) plays such a role, as it inhibits its own synthesis by binding to *thrS* mRNA in a region located upstream from the ribosome binding site.

Here we show the path of *thrS* mRNA on the ribosome in the presence of the initiator tRNA^{Met} at 5.5 Å of resolution determined by X-ray crystallography. Our data show the first visualization of a translational regulatory domain of mRNA and explain how a repressor protein can interfere with initiation of ribosome translation.

Keywords: ribosome structure and function, tRNA synthetases, regulation