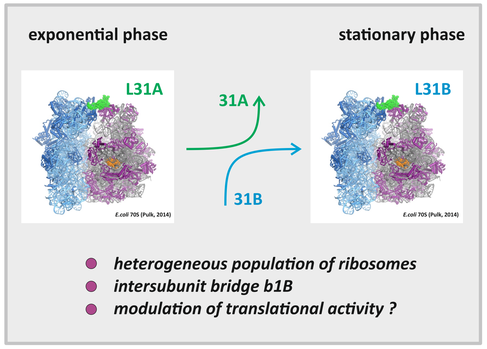


- *heterogeneous population of ribosomes*
- *intersubunit bridge b1B*
- *modulation of translational activity ?*

On Ribosome Heterogeneity on the Example of *E. coli* R-protein L31

Silva Lilleorg, Aivar Liiv, Jaanus Remme

Institute of Molecular and Cell Biology, University of Tartu, Estonia

Euroopa Liit
Euroopa Sotsiaalfond

Eesti tuleviku heaks

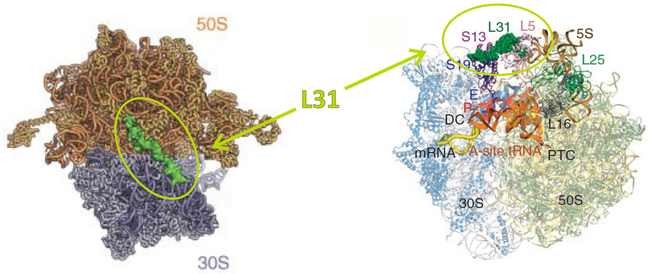
INTRODUCTION

Ribosome heterogeneity

- defined as the coexistence of structurally different ribosomes in an organism
- demonstrated at rRNA and r-protein level in prokaryotic and eukaryotic organisms
- at r-protein level, r-protein paralogs as a possibility of creating heterogeneous ribosomes in addition to stoichiometric differences of r-proteins and their post-translational modifications

R-protein L31

- bacteria-specific, positionized into the central protuberance (CP) of 50S subunit (Selmer *et al.*, 2006)
- part of an bacteria-specific intersubunit bridge B1b, connecting the head of 30S subunit and the CP of 50S subunit in *T. thermophilus* (Jenner *et al.*, 2010)
- duplicated genes in several (5) bacterial genomes, including *E. coli* and *B. subtilis*, but not *T. thermophilus* (Makarova *et al.*, 2001)
- in *E. coli,* L31 paralogs (<10 kDa) are 35,6% identical in sequence



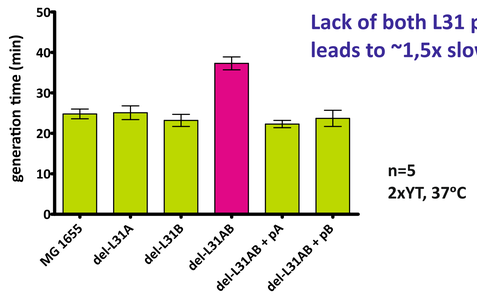
Melnikov *et al.*, 2012 — ***T. thermophilus*** — Jenner *et al.*, 2010

The aim of this study
to elucidate the biological functions of L31 paralogs

Speculation
L31 paralogs could be needed to improve fitness by adjusting ribosome's working cycle in different environmental conditions.

RESULTS

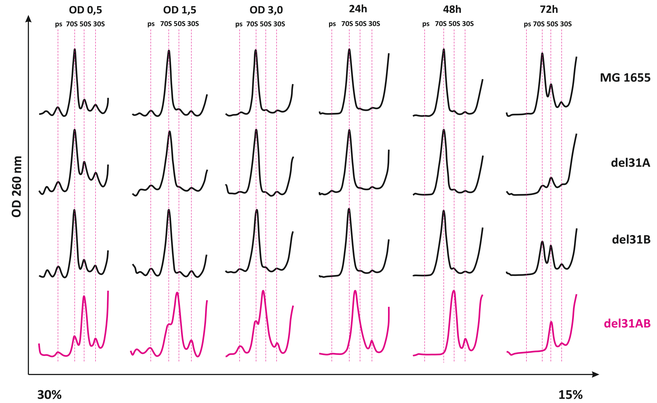
Bacterial growth rate



Lack of both L31 paralogs leads to ~1,5x slower growth.

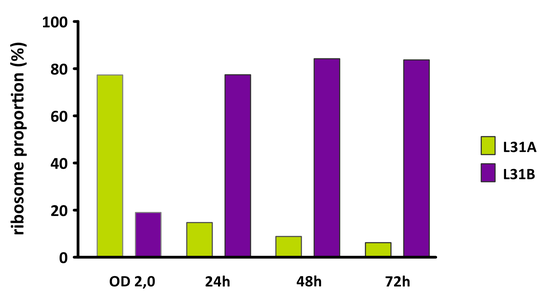
n=5
2xYT, 37°C

The effect of L31 paralogs on 70S formation *in vivo*



Ribosome profiles indicate that the deletion of L31A and L31B resulted in the increase of free subunits and in the decrease of 70S particles' proportions.

The L31 paralog content changes of 70S ribosomes determined by MS

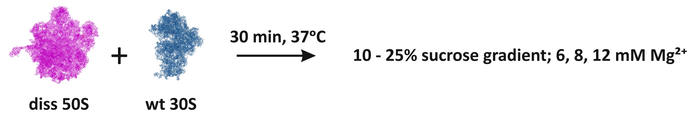


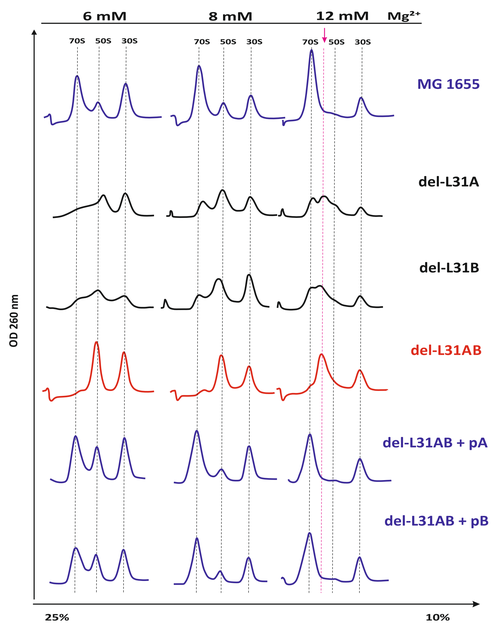
The ribosome population of *E.coli* MG-SILAC strain (minimal medium, 37°C) is heterogeneous with respect to its L31 content.

Conclusions

- *E. coli* ribosome population is heterogeneous concerning its L31 paralog content. Ribosomes contain preferentially L31A in the stationary phase and L31B in the exponential phase.
- Heterogeneity can arise by protein exchange as L31B replaces L31A.
- Both L31A and B participate in subunit association, able to functionally replace each other.
- Only one L31 paralog is necessary for optimal growth.

The effect of L31 paralogs on subunit association *in vitro*





50S subunits from L31 double deletion strain are able to associate, resulting in particles with intermediate sedimentation coefficient. Overexpression of L31A or L31B is sufficient for restoring wild type association profile.