Phosphoglycerate-transporter Protein B as a Most Primitive Protein Predicted by the Poly-tRNA Theory

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1 Introduction

The poly-tRNA model can clearly explain how early tRNAs (= tRNA ribo-organisms) had associated tandemly to make trrnD-operon-type and rrnD-operon-type poly-tRNA structures which could have evolved as RNA-machines for synthesizing trrnD-type and rrnB-type peptides. The trrnD-peptide is defined as a hypothetical peptide whose amino acid (aa) sequence is exactly the same order of the aa-specificities of the 16 tRNAs in the tRNA gene cluster within the Bacillus subtilis trrnD operon. In hitherto published findings, Glycyl-tRNA synthetase (Gly-RS) alpha chain shows a closest similarity to the trrnD-peptide [3].

2 Methods

Amino acid sequences similar to the trrnD peptide, "NSEVMDFTYWHQGCLL" were searched for from Swiss Plot and PIR protein sequence databases using FASTA program [1]. trrnD-mRNA is defined as a 48-base RNA complementary to the 64-base RNA consisting of the 16 anticodons of the 16 tRNAs in the trrnD-poly-tRNA (Fig. 1).

3 Results and Discussions

Phosphoglycerate-transporter protein B (pgtB) (aa's 87-103) from Salmonella typhimurium (ST) was found to show the closest similarity to the trrnD-peptide. The DNA sequence region encoding the aa's 87-103 of the pgtB protein was aligned with the trrnD-mRNA, the E. coli GlyS gene segment encoding the aa's 139-154, Synecococcus sp. F0-ATP synthese a gene, and tRNA-Gly's and tRNA-Met (Fig. 1). The trrnD-mRNA* was so defined by replacing some bases (of trrnD-mRNA) by those bases capable of making wobble-pairing with theanticodons, that could give higher base-matches to the pgtB and GlyS genes (See Fig. 1). The trrnD-mRNA* was thus found to show a 71.7% base-match to the pgtB gene, and 67.0% to the GlyS gene. The "eo-protein", "NSEVXDFTYWQQGCLL", was concluded to be an earliest protein predicted by these analyses (Fig. 1). These results strongly confirms the prediction by the poly-tRNA theory.

References

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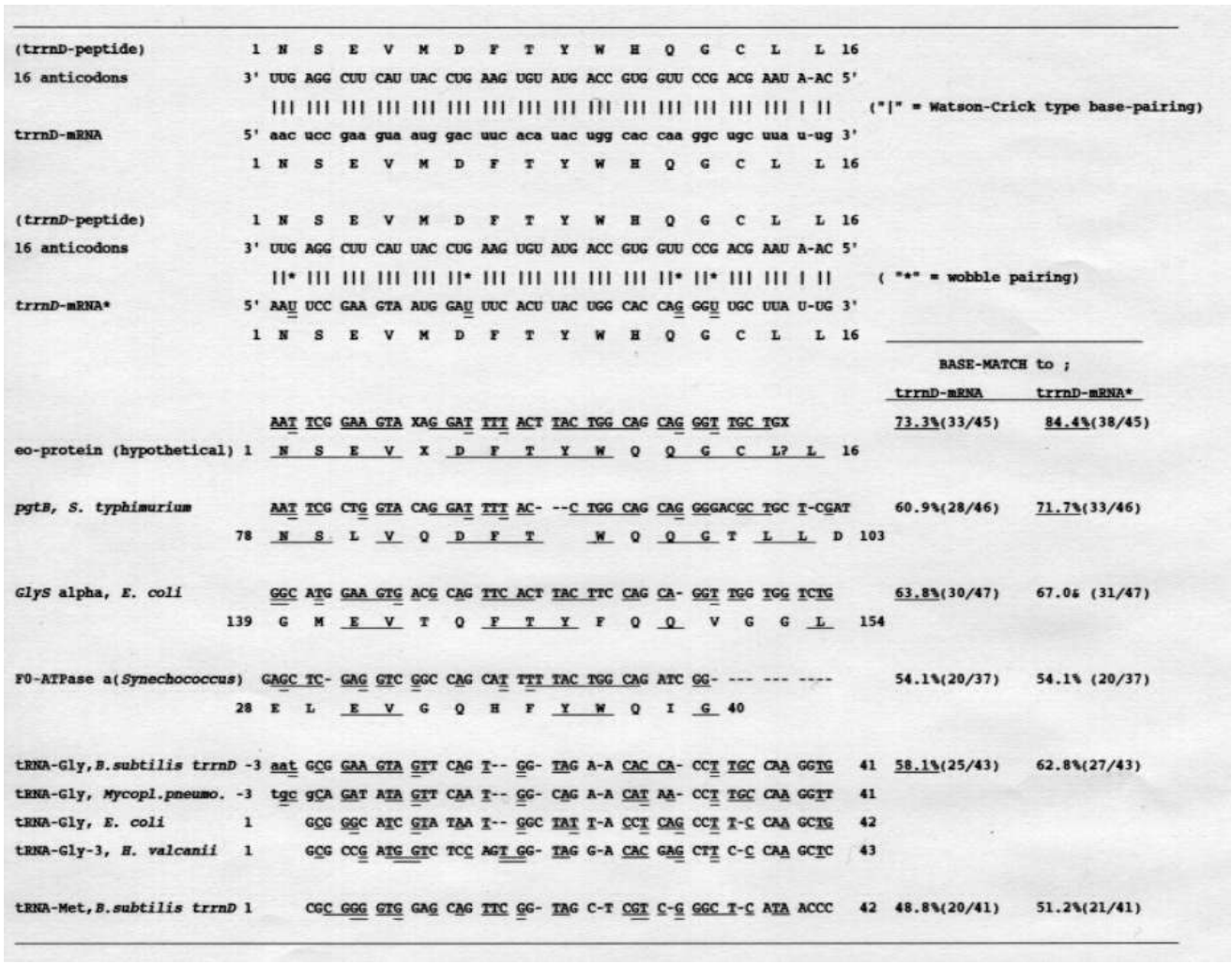

Figure 1: Alignment of trrnD-mRNA with pgtB (*Salmonella typhimurium*) and GlyS (*E. coli*) genes. (Based on ref. [3]). Base- and amino acid-matches to trrnD-mRNA and trrnD-peptide are underlined. Base complementarities of Watson-Crick type and wobble type are indicated by "—" and "*", respectively. The rrnB-mRNA(*) is homologous to pgtB, GlyS, and tRNA-Gly. Double-underlines denote bases capable of making wobble-pairing with trrnD-mRNA.