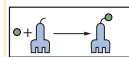


PROTEIN SYNTHESIS

(A)

tRNA charging

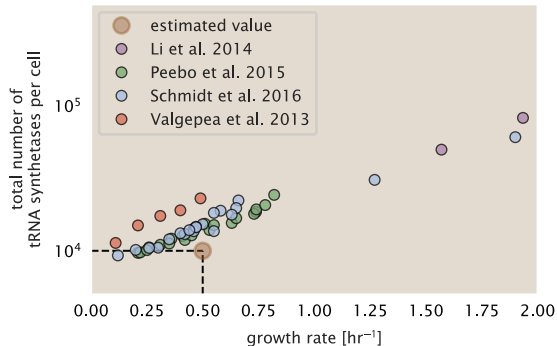


$$N_{\text{amino-acyl tRNA}} \approx 3 \times 10^6 \text{ proteins} \times \frac{300 \text{ amino acids}}{1 \text{ protein}} \times \frac{1 \text{ amino-acyl tRNA}}{1 \text{ amino acid}} \approx 10^9 \text{ amino-acyl tRNAs}$$

$$r_{\text{tRNA supply}} \approx \frac{N_{\text{amino-acyl tRNA}}}{t_{\text{division}}} = \frac{10^9 \text{ amino-acyl tRNAs}}{5,000 \text{ sec}} = 2 \times 10^5 \text{ amino-acyl tRNAs}$$

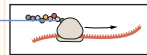
$$r_{\text{tRNA charging}} \approx 20 \text{ amino-acyl tRNA / tRNA synthetase} \times \text{sec} \quad \text{BNID: 105279}$$

$$N_{\text{tRNA synthetase}} \approx \frac{r_{\text{tRNA supply}}}{r_{\text{tRNA charging}}} \approx 10^4 \text{ tRNA synthetases}$$



(B)

translation



$$N_{\text{peptide bonds}} \approx 3 \times 10^6 \text{ proteins} \times \frac{300 \text{ amino acids}}{1 \text{ protein}} \approx 10^9 \text{ peptide bonds}$$

$$r_{\text{translation}} \approx 15 \text{ peptide bonds / ribosome} \times \text{sec} \quad \text{BNID: 109043}$$

$$N_{\text{ribosomes}} \approx \frac{N_{\text{peptide bonds}}}{r_{\text{translation}} \times t_{\text{division}}} \approx 1.5 \times 10^4 \text{ ribosomes}$$

