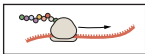


TRANSLATION

(A)

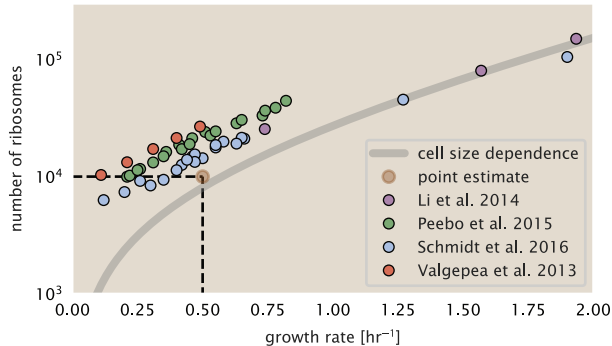
protein synthesis



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

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

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



(B)

ribosomal protein synthesis

$$N_{\text{peptide bonds}}^{\text{(ribosome)}} \approx 7500 \text{ peptide bonds / ribosome} \quad \text{BNID: 101175}$$

$$t_{\text{division}} \approx \frac{7500 \text{ peptide bonds}}{1 \text{ ribosome}} \times \frac{1 \text{ sec} \times \text{ribosome}}{15 \text{ peptide bonds}} \approx 500 \text{ seconds}$$

