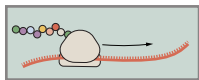


(A)

## translation-limited growth rate



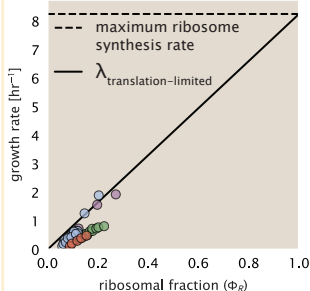
$$\lambda_{\text{translation-limited}} = \frac{r_t \times R}{N_{\text{aa}}}$$

$R$  is related to protein mass by,

$$\Phi_R = \frac{m_R}{m_{\text{protein}}}, \quad R \approx m_R \times \frac{1 \text{ ribosome}}{L_R \times 110 \text{ Da}} \times \frac{6 \times 10^{11} \text{ Da}}{1 \text{ pg}}$$

$N_{\text{aa}}$  is related to protein mass by,

$$N_{\text{aa}} \approx m_{\text{protein}} \times \frac{1 \text{ aa}}{110 \text{ Da}} \times \frac{6 \times 10^{11} \text{ Da}}{1 \text{ pg}}$$



$$\lambda_{\text{translation-limited}} \approx \frac{r_t}{L_R} \Phi_R$$

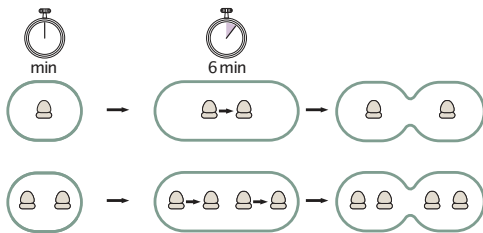
$$r_t \approx 17 \text{ aa/s}$$

$$L_R \approx 7,500 \text{ aa}$$

- Li et al. 2014
- Peebo et al. 2015
- Schmidt et al. 2016
- Valgepea et al. 2013

(B)

## maximum growth rate is set by ribosome



(C)

## ribosomes become rRNA limited at fast growth

