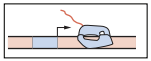
RNA SYNTHESIS

(A)



$r_{transcription} \approx 40$ nucleotides / sec BNID: 111871

rRNA synthesis

$L_{rRNA\ genes} \approx 4500$ nucleotides

$r_{RNAP\ loading} \approx 1$ / sec BNID: 111997

$L_{RNAP\ footprint} \approx 40$ nucleotides BNID: 107873

$L_{between\ RNAP} \approx L_{RNAP\ footprint} + \frac{r_{transcription}}{r_{RNAP\ loading}} \approx 80$ nucleotides

$N_{RNAP}^{(rRNA)} \approx \frac{L_{rRNA\ genes}}{L_{between\ RNAP}} \times N_{rRNA\ genes} \approx 400$ RNAP

mRNA synthesis

BNID: 104186;106254

$N_{mRNA} \approx \frac{1\ mRNA}{1000\ proteins} \times 3 \times 10^6$ proteins

≈ 3000 mRNA

$L_{mRNA} \approx 1000$ nucleotides BNID:100022

$N_{RNAP}^{(mRNA)} \approx \frac{N_{mRNA} \times L_{mRNA}}{r_{transcription} \times t_{division}} \approx 10$ RNAP

tRNA synthesis

BNID: 105280

$N_{tRNA} \approx \frac{3000}{amino\ acid} \times 20$ amino acids

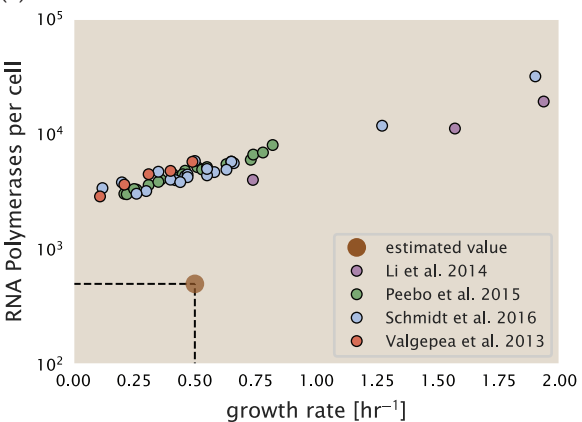
$\approx 6 \times 10^4$ tRNA

$L_{tRNA} \approx 80$ nucleotides BNID:102340

$N_{RNAP}^{(tRNA)} \approx \frac{N_{tRNA} \times L_{tRNA}}{r_{transcription} \times t_{division}} \approx 20$ RNAP

$N_{RNAP} \approx N_{RNAP}^{(rRNA)} + N_{RNAP}^{(mRNA)} + N_{RNAP}^{(tRNA)} \approx 500$ RNAP

(B)



(C)