Table S1. Growth-rate-dependent parameters

Parameter	Symbol	Growth rate μ, doublings/h					Notes and references
		0.6	1.0	1.5	2.0	2.5	
Total number of RNAP molecules per cell	N_{total}	1,500	2,800	5,000	8,000	11,400	5*
DNA per cell (genome equivalents)	G_C	1.6	1.8	2.3	3.0	3.8	5
rrn operons per cell	N_{rrn}	12.4	15.1	20.0	26.9	35.9	5
Mass per cell, OD_{460} units/10^9 cells	M_C	0.85	1.49	2.5	3.7	5.0	5
Cell volume, μm^3	V_C	0.34	0.55	0.84	1.11	1.32	Calculated from M_C and the volumes measured in ref. 6†
mRNA elongation speed, nt/s	c_m	39	45	50	52	55	5
rRNA elongation speed, nt/s	c_r	85	85	85	85	85	5
mRNA synthesis rate per cell, 10^5 nt/min	r_m	4.3	9.2	13.7	18.7	23.4	5
rRNA synthesis rate per cell, 10^5 nt/min	r_r	3.0	9.9	29.0	66.4	132.5	5
Number of RNAPs transcribing mRNA per cell	N_m	184	341	457	599	709	Calculated as r_m/c_m
Number of RNAPs transcribing rRNA per cell	N_r	59	194	569	1,302	2,598	Calculated as r_r/c_r

*The numbers of total RNAPs per cell at different growth rates as given in ref. 5 and as used here are based on measurements from ref. 26, which are in good agreement with corresponding measurements from several other labs (27–30). A recent study, however, has reported considerably higher numbers of RNAPs per cell (31). All of these studies are based on measurements of the mass fraction of total protein that is RNAP, usually called α_P, from which the number of RNAPs per cell is obtained by multiplication with mass per cell. [More precisely, these experiments determine the amounts of the β and β' subunits of RNAP, as the α subunit is known to be present in excess (27, 29, 30)]. Comparison of the measured α_P values shows that all studies including ref. 31 agree on the growth-rate dependence of this value and that the discrepancy between ref. 31 and the older studies is due to a unusually large amount of total protein per cell in ref. 31, ≈3-fold larger than in the older studies.

†In ref. 6, the cell mass and volume was measured for growth rates of 1.3 doublings per hour and 2.14 doublings per hour, from these measurements, the mass per volume appears to increase slightly with growth rate, taken into account here by inter- and extrapolation. Larger values (≈1.5-fold) for the cell volume are given in ref. 23. We have also used these larger values in our calculation, and obtained very similar results (data not shown). In particular, we obtained almost the same prediction for the concentration of free RNAPs (which, in the larger volume, however, corresponds to a larger number of free RNAPs) and for the nonspecific dissociation constant, but a smaller maturation time (1.9 min), and thus a smaller number of immature RNAPs per cell.