

TABLE 2. Parameters related to *lacZ* expression from P_{spc} in strain SL106^a

Parameter	Symbol	Unit ^b	Interpolated value at the indicated μ (τ) ^c					
			0.6 (100)	1.0 (60)	1.5 (40)	2.0 (30)	2.5 (24)	3.0 (20)
Total protein ^d	P_i/OD	10^{16} aa/OD ₄₆₀	58	55	51	48	45	40
Total RNA ^d	R_i/OD	10^{16} nt/OD ₄₆₀	3.3	3.8	4.4	5.3	6.3	6.7
β -Gal sp act ^e	$\beta\text{-Gal}/\text{OD}$	$(\Delta A_{420}/\text{h})/\text{OD}_{600}$	280	195	140	120	105	80
β -Gal sp act ^f	$\beta\text{-Gal}/P_i$	$(\Delta A_{420}/\text{h})/10^{16}$ aa	3.0	2.2	1.7	1.6	1.5	1.3
<i>lacZ</i> mRNA/total RNA ^g	R_{lac}/R_i	Relative units	1.20	1.18	1.15	1.10	1.05	1.00
<i>lacZ</i> mRNA translation rate ^h	$(d\beta\text{-Gal}/dt)/R_{lac}$	Relative units	0.31	0.32	0.30	0.30	0.29	0.26
Stable RNA synthesis rate ⁱ	r_s/r_i	Fraction	0.41	0.52	0.68	0.78	0.85	0.90
Stable RNA synthesis rate ^j	r_s/OD	10^{14} nt/min/OD ₄₆₀	2.7	5.1	8.8	14.4	21.2	27.3
mRNA synthesis rate ^k	r_m/r_i	Fraction	0.59	0.48	0.32	0.22	0.15	0.10
mRNA synthesis rate ^l	r_m/OD	10^{14} nt/min/OD ₄₆₀	3.9	4.7	4.2	4.1	3.7	3.0
mRNA avg life ^m	τ_m	min	1.9	2.0	2.1	2.2	2.3	2.4
mRNA/OD ⁿ	R_m/OD	10^{14} nt/OD ₄₆₀	7.4	9.4	8.8	9.0	8.6	7.3
mRNA/total RNA ^o	R_m/R_i	Fraction	0.022	0.025	0.020	0.017	0.014	0.011
<i>lacZ</i> mRNA/total mRNA ^p	R_{lac}/R_m	Relative units	54	47	57	65	76	92
Protein synthesis rate/total RNA ^q	$(dP/dt)/R_i$	aa/min/nt	0.12	0.17	0.20	0.21	0.21	0.21
Peptide chain elongation rate ^r	c_p	aa polymerized/active ribosome	13	18	22	22	22	22
Distribution of ribosomes on mRNA ^s	d_r	nt/ribosome	143	160	129	108	88	70
Avg protein synthesis rate/mRNA ^t	$(dP/dt)/R_m$	aa/min/nt	5.5	6.8	10.0	12.4	15.1	19.0
mRNA translation rate ^u	$(di/dt)/R_m$	translations/min/mRNA	16	20	30	37	45	57

^a Values are interpolated from observed data to match growth rate values in reference 4, Tables 2 and 3.

^b aa, amino acids.

^c μ , growth rate, expressed as doublings per hour; τ , doubling time in minutes.

^d Per OD₄₆₀ unit of culture mass (2).

^e Per OD₆₀₀ unit (Fig. 1) (17). The value at 0.6 doubling/h has been obtained by extrapolation and is consistent with similar data from *E. coli* K-12 strains, which grow more slowly in glycerol minimal medium than B/r strains (19).

^f Per amount of protein, calculated as $(\beta\text{-Gal}/\text{OD}_{600})/(1.6 P_i/\text{OD}_{460})$; the factor 1.6 converts OD₄₆₀ units into OD₆₀₀ units (2).

^g Amount of *lacZ* mRNA per amount of total RNA in relative units, normalized to the hybridization value observed in LB medium at 3.0 doublings/h, which was set at 1.0 (17).

^h Calculated as $(\ln 2/\tau) \cdot (\beta\text{-Gal}/P_i) \cdot (P_i/R_i)/(R_{lac}/R_i)$.

ⁱ Rate of stable RNA (rRNA plus tRNA) synthesis as a fraction of total RNA synthesis rate (30; Table 3 of reference 4). The value at 3.0 doublings/h was obtained by extrapolation.

^j Per OD₄₆₀ unit of culture mass; calculated as $(\ln 2/\tau) \cdot 0.98 \cdot 1.2 \cdot R_s$. The factors 0.98 and 1.2 reflect the facts that 98% of total RNA is stable RNA (about 2% is mRNA; see values for R_m/R_i below) and 20% of stable RNA precursors are rapidly degraded spacers.

^k As a fraction of total RNA synthesis rate, calculated as $1 - r_s/r_i$.

^l Per OD₄₆₀ unit of culture mass; calculated as $r_m/\text{OD} \cdot (r_m/r_i)/(r_s/r_i)$.

^m The average functional life of mRNA is assumed to be equal to the average functional life of *lacZ* mRNA (18) (see the text). For *E. coli* B/r in glucose minimal medium, the average life of total mRNA has previously been estimated from pulse-labeling data to be about 1 min (1).

ⁿ Amount of total mRNA/OD₄₆₀ unit of culture mass; calculated as $(r_m/\text{OD}) \cdot \tau_m$.

^o Calculated as $(R_m/\text{OD})/(R_i/\text{OD})$.

^p Calculated as $(R_{lac}/R_i)/(R_m/R_i)$.

^q Calculated as $(\ln 2/\tau) \cdot (P_i/R_i)$.

^r Calculated as $(dP/dt)/R_i \cdot 4,566/(0.84 \cdot 0.85 \cdot 60)$. The factor 4,566 is the number of rRNA nucleotides per ribosome; 0.84 is the fraction of total RNA that is rRNA (14% is tRNA, and 2% is mRNA); 0.85 is the fraction of total ribosomes that is active at any given time; and 60 is the number of seconds per minute (see Table 3 in reference 4 for details).

^s Average distance in mRNA nucleotides between translating ribosomes for average (bulk) mRNA; calculated as $60 \cdot c_p / [(dP/dt)/R_m]$.

^t Calculated as $[(dP/dt)/R_i]/(R_m/R_i)$.

^u Average rate of initiation (*i*) of translation (initiations per minute) per mRNA molecule; calculated as $3 \cdot (dP/dt)/R_m = 60 \cdot 3 \cdot c_p/d_r$, where the factor 3 represents the coding ratio (3 nt per amino acid) and the factor 60 is the number of seconds in a minute.