Table 6. Kinetic data previously published for growth with and transport of glucose, galactose, maltose, and ribose.

Substrate	Strain	Ty[a]	K_x[b] (mg·L^{-1})	μ_{max} (h^{-1})	T[c] (°C)	Reference
Glucose	H	(1)*s*	4.0	0.94	37	(Monod 1942)
		(2)*s*	8.0	0.65	20	(Jannasch 1968)
	ML30	(3)	0.068 (HA)	0.78	30	(Shehata and Marr 1971)
		(3)	12.6 (LA)	0.03	30	(Shehata and Marr 1971)
	ML308	(4)*s*	2.3	1.23	37	(Koch and Wang 1982)
		(4)*s*	0.10	0.54	37	(Koch and Wang 1982)
	ML30	(5)*s*	0.058	0.82	37	(Senn et al. 1994)
	AB257 (*mel*$^-$)	(6)*m*	1.8		30	(Villarejo et al. 1978)
	AB257 (*mel*$^-$)	(6)*m*	5.4		30	(Villarejo et al. 1978)
	K12 (BW2901)	(7)*m*	1.1		25	(Death et al. 1993)
Galactose	K12 (KL16)	(8)*s*	108	0.65	37	(Kornberg and Riordan 1976)
	ML32400	(9)*m*	0.72 (LA)		25	(Rotman and Radojkovic 1964)
	ML32400	(9)*m*	0.088 (HA)		25	(Rotman and Radojkovic 1964)
	K12 (D115)	(10)*m*	16 (LA)		21	(Wilson 1974)
	K12 (D115)	(10)*m*	0.09 (HA)		21	(Wilson 1974)
	K12 (W3092)	(11)*d*	0.086		4	(Zukin et al. 1977)
	B/r	(12)*d*	0.063		?	(Quiocho et al. 1979)
Maltose	RV	(13)*s*	8.64	0.76	27	(Dykhuizen and Davies 1980)
	K12 (HfrG6)	(14)*m*	0.32		21	(Szmelcman et al. 1976)
	K12 (HfrG6)	(14)*d*	0.36		21	(Szmelcman et al. 1976)
	K12 (HfrG6)	(15)*d*	0.79		21	(Schwartz et al. 1976)
Ribose	W289	(16)*m*	0.065		37	(David and Wiesmeyer 1970)
	W3092	(17)*m*	0.045		23	(Willis and Furlong 1974)
	W3092	(17)*d*	0.02		?	(Willis and Furlong 1974)

Notes: Explanations to individual reports. (1) Determined by measuring the growth rate in small intervals during retardation phase in batch culture. Actual substrate concentrations (s_t) were calculated with the equation $s_t = S_0 - S_0(x_t - x_0)/M$. S_0, initial substrate concentration; x_0, initial biomass concentration; x_t, biomass concentration at time t; M, biomass concentration reached in stationary phase. (2) Determined during chemostat growth at various dilution rates. Glucose concentrations were calculated from biomass concentration and yield data. (3) Determined by measuring growth rates at various initial glucose concentrations in batch culture. The high affinity (HA) K_s (68 µg·L^{-1}) and μ_{max} (0.775·h^{-1}) were obtained by Lineweaver–Burk linearization. The low affinity (LA) μ_{max} (0.031·h^{-1}) was obtained by subtracting the high affinity μ_{max} from the maximum specific growth rate observed in batch culture (0.806·h^{-1}). Subsequently, the low affinity K_s was obtained by data fitting using above parameters and a growth model comprising the sum of two Monod terms (Shehata and Marr 1971) (see eq. 7). (4) Determined by measuring growth continuously in a 10-cm flow-through cuvette. The first experiment was carried out with batch- and the second with chemostat-grown cells. (5) Determined according to the same method as presented above for galactose. (6) Determined by measuring of initial uptake rates of [^{14}C]glucose. Both batch and chemostat grown (D = 0.17·h^{-1}) bacteria were used. K_m of chemostat-grown cells was approximately three times lower. (7) Determined by measuring initial uptake rates of [^{14}C]glucose of cells harvested from continuous culture (D = 0.3·h^{-1}). (8) Derived from growth rate measurements at various initial galactose concentrations in batch culture. (9) Derived from [^{14}C]galactose accumulation after incubation of cells for 15 min at various external concentrations. The presence of a low affinity (LA) and high affinity (HA) uptake system was proposed on the basis of a biphasic accumulation pattern. (10) Measured as function of cellular accumulation of [^{14}C]galactose. To measure activity of GalP (low affinity proton symport transport system) Mgl (high affinity binding-protein system) was inhibited competitively with β-glycerol-galactoside. (11) Determined by equilibrium dialysis with purified binding protein. (12) Determined by equilibrium dialysis at unknown temperature. (13) Determined in chemostat culture. Steady-state substrate concentrations (s) were estimated from yield data of two identical chemostat runs with different maltose feed concentrations. (14) K_m determined by measuring initial uptake rates (40 s) of [^{3}H]maltose. K_d was determined by fluorescence titration. (15) Determined by equilibrium dialysis with osmotic shock released binding protein. (16) K_m determined by initial uptake rates (2 min) of [^{14}C]ribose. (17) K_m determined by measuring initial uptake rates (30 s) of different concentrations of [^{14}C]ribose. K_d determined by equilibrium dialysis.

[a]Type of saturation constant: *s*, K_s for growth; *m*, K_m for substrate uptake; *d*, K_d affinity constants of binding proteins.

[b]Value of saturation constant.

[c]Growth or assay temperature. A comprehensive list of previously published kinetic constants is given in (Lendenmann 1994).

David, J., and Wiesmeyer, H. 1970. Regulation of ribose metabolism in *Escherichia coli* I. The ribose catabolic pathway. Biochim. Biophys. Acta, **208**: 45–55.

Death, A., Notley, L., and Ferenci, T. 1993. Derepression of LamB protein facilitates outer membrane permeation of carbohydrates into *Escherichia coli* under conditions of nutrient stress. J. Bacteriol. **175**: 1475–1483.

Dykhuizen, D., and Davies, M. 1980. An experimental model: bacterial specialists and generalists competing in chemostats. Ecology, **61**: 1213–1227.

Jannasch, H.W. 1968. Competitive elimination of *Enterobacteriaceae* from seawater. Appl. Microbiol. **16**: 1616–1618.

Koch, A.L., and Wang, C.H. 1982. How close to the theoretical diffusion limit do bacterial uptake systems function. Arch. Microbiol. **131**: 36–42.

Kornberg, H.L., and Riordan, C. 1976. Uptake of galactose into *Escherichia coli* by facilitated diffusion. J. Gen. Microbiol. **94**: 75–89.

Monod, J. 1942. Recherches sur la croissance des cultures bactériennes. Hermann, Paris.

Quiocho, F.A., Meador, W.E., and Pflugrath, J.W. 1979. Preliminary crystallographic data of receptors for transport and chemotaxis in *Escherichia coli*: D-galactose and maltose-binding proteins. J. Mol. Biol. **133**: 181–184.

Rotman, B., and Radojkovic, J. 1964. Galactose transport in *Escherichia coli*. J. Biol. Chem. **239**: 3153–3156.

Schwartz, M., Kellermann, O., Szmelcman, S., and Hazelbauer, G.L. 1976. Further studies on the binding of maltose to the maltose-binding protein of *Escherichia coli*. Eur. J. Biochem. **71**: 167–170.

Senn, H., Lendenmann, U., Snozzi, M., Hamer, G., and Egli, T. 1994. The growth of *Escherichia coli* in glucose-limited chemostat cultures: a reexamination of the kinetics. Biochim. Biophys. Acta, **1201**: 424–436.

Shehata, T.E., and Marr, A.G. 1971. Effect of nutrient concentration on the growth of *Escherichia coli*. J. Bacteriol. **107**: 210–216.

Szmelcman, S., Schwartz, M., Silhavy, T.J., and Boos, W. 1976. Maltose transport in *Escherichia coli* K12. Eur. J. Biochem. **65**: 13–19.

Villarejo, M., Stanovich, S., Young, K., and Edlin, G. 1978. Differences in membrane proteins, cyclic AMP levels, and glucose transport between batch and chemostat cultures of *Escherichia coli*. Curr. Microbiol. **1**: 345–348.

Willis, R.C., and Furlong, C.D. 1974. Purification and properties of a ribose-binding protein from *Escherichia coli*. J. Biol. Chem. **249**: 6926–6929.

Wilson, D.B. 1974. The regulation and properties of the galactose transport system in *Escherichia coli* K12. J. Biol. Chem. **249**: 553–558.

Zukin, R.S., Strange, P.G., Heavey, L.R., and Koshland, D.E. 1977. Properties of the galactose binding protein of *Salmonella typhimurium* and *Escherichia coli*. Biochemistry, **16**: 381–386.