

Table S2 – Phosphorelay circuits for which there is abundance information.

Organism (average cell volume in μm^3)	Phosphorelay	Protein abundances (ppm)	Estimated number of proteins per cell ¹	Ratios of abundance (order of magnitude)
<i>Saccharomyces cerevisiae</i> (~ 70 ⁷⁹)	Sln1:Ypd1:Ssk1 HKRR:Hpt:RR	151:188:177 ⁸⁰	66000: 82000: 77000	1:1:1:1
	Sln1:Ypd1:Skn7 HKRR:Hpt:RR	151:188:175 ⁸⁰	66000: 82000: 77000	1:1:1:1
<i>Schizosaccharomyces pombe</i> (~ 100 ^{81,82})	Mak1:Mpr1:Mcs4 HKRR:Hpt:RR	44:62:470 ⁸³	11000: 39000: 293000	1:1:1:10
	Mak2:Mpr1:Mcs4 HKRR:Hpt:RR	53:62:470 ⁸³	33000: 39000: 293000	1:1:1:10
	Mak3:Mpr1:Mcs4 HKRR:Hpt:RR	53:62:470 ⁸³	33000: 39000: 293000	1:1:1:10
<i>Cryptococcus neoformans</i> (~ 50-70 ⁸⁴)	CNH02350 HKRRHptRR	2.63 ⁸⁵	980	1:1:1:1
	CNC03340:CNM01530:CNB03090 HKRR:Hpt:RR	42:367:14 ⁸⁵	16000: 137000: 5000	10:10:100:1
	CNA03400:CNM01530:CNB03090 HKRR:Hpt:RR	3:367:14 ⁸⁵	1000: 137000: 5000	1:1:100:1

¹ This number is calculated by multiplying cell volume (μm^3) by the average number of proteins in cells per μm^3 times the protein abundance in parts per million:

$$\frac{\text{Cell Volume} \times 6.23 \times 10^6 \times \text{Protein abundances}}{10^6}$$

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Organism (average cell volume in μm^3)	Phosphorelay	Protein abundances (ppm)	Estimated number of proteins per cell ²	Ratios of abundance (order of magnitude)
<i>Arabidopsis thaliana</i> (2000 ⁸⁶)	AKH2:AHP1-AHP4 HKRRRR:Hpt	0.15:8-50 ⁸⁷	2000: 99000-623000	1:1:10:1 1:1:100:1
	AKH3:AHP1-AHP4 HKRRRR:Hpt	1: 8-50 ⁸⁷	12000: 99000-623000	1:1:10:1 1:100:1:1
	AKH4:AHP1-AHP4 HKRRRR:Hpt	0.62: 8-50 ⁸⁷	8000:99000-623000	1:1:10:1 1:1:100:1
	AHK1:AHP2-AHP3:ARR1-3,5,7,9,14,16 HKRR:Hpt:RR	0.3:15-50:0.01-2 ⁸⁷	4000: 187000-623000:100-25000	1:1:100:1 1:1:100:10 10:10:1000:1
	AHK5:Ahp1-3, AHP5-6:ARR1-2 HKRR:Hpt:RR	0.1:9-50:2 ⁸⁷	1200: 112000-623000: 25000	1:1:100:10
	ETR1:AHP5:RR1-2 HKRR:Hpt:RR	2.5:0.02:2 ⁸⁷	31000: 250-623000: 25000	1:1:1:1 10:10:1:10

² This number is calculated by multiplying cell volume (μm^3) by the average number of proteins in cells per μm^3 times the protein abundance in parts per million:

$$\frac{\text{Cell Volume} \times 6.23 \times 10^6 \times \text{Protein abundances}}{10^6}$$

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Organism (average cell volume in μm^3)	Phosphorelay	Protein abundances (ppm)	Estimated number of proteins per cell ³	Ratios of abundance (order of magnitude)
<i>Escherichia coli</i> (~ 0.1-3 ^{88,89})	TorS:TorR	0.34:6 ^{90,91}	212:3728	1:1:1:10
	HKRRHpt:RR			
	EvgS:EvgA	0.31:88 ^{90,91}	193:54800	1:1:1:100
	HKRRHpt:RR			
	BarA:UvrY	3.5:55 ^{90,91}	2180:34265	1:1:1:10
	HKRRHpt:RR			
	ArcB:ArcA	51:1065 ^{90,91}	30:6600	1:1:1:10
	HKRRHpt:RR			
<i>Shigella flexneri</i> (~ 0.1-3 ^{88,89})	RcsC:RcsD:RcsB	3.:7.4:375 ^{90,91}	19:46: 2340	1:1:1:100
	HKRR:Hpt:RR			
	BarA:UvrY	3.94:8.74 ^{92,93}	24:54	1:1:1:1
	HKRRHpt:RR			
<i>Pseudomonas aeruginosa</i> (~ 0.5 ⁹⁴)	ArcB:ArcA	34.9:1094	220:.6800	1:1:1:100
	HKRRHpt:RR			
	PA0413:PA0416	158:BDL ^{91,95}	580:-	1:<1
	HKRRHpt:RR			
<i>Shewanella oneidensis</i> (1-4 ⁹⁶)	PA4112	7.2 ^{91,95}	26	1:1:1:1
	HKRRHptRR			
	SO3207:SO3206:SO3209	452:17.1:768 ⁹¹	2800: 110: 4800	10:1:10:10
	HKHpt:RR:RR			10:1:10:100
<i>Desulfovibrio vulgaris</i> (2.4 ⁹⁷)	SO0859:SO0860	88:79 ⁹¹	550:490	1:1:1:1
	HKRRHpt:RR			
	DVU_3062:DVU_3061	80:79 ^{98,99}	1200:1200	1:1:1:1
	HKRRHpt:RR			

³ These numbers are calculated by multiplying cell volume (μm^3), average number of proteins in cells per μm^3 , and the protein abundance in parts per million:

$$\frac{\text{Cell Volume} \times 6.23 \times 10^6 \times \text{Protein abundances}}{10^6}$$

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Organism (average cell volume in μm^3)	Phosphorelay	Protein abundances (ppm)	Estimated number of proteins per cell ⁴	Ratios of abundance (order of magnitude)
<i>Salmonella enterica</i> (0.8 ⁹⁴)	RcsC:RcsD:RcsB	3.4:3.9:327 ⁹¹	17:19:1600	1:1:1:100
	HKRR:Hpt:RR			
<i>Bacillus subtilis</i> (1.5 ⁹⁴)	KinA:Spo0F:Spo0B:Spo0A	1.3:446:12.4:185 ⁹¹	12:4200:110:1700	1:100:1:100
	HK:RR:Hpt:RR			
	KinB:Spo0F:Spo0B:Spo0A	10:446:12.4:185 ⁹¹	93:4200:110:1700	1:100:1:100
	HK:RR:Hpt:RR			
	KinC:Spo0F:Spo0B:Spo0A	8.8:446:12.4:185 ⁹¹	82:4200:110:1700	1:100:1:100
	HK:RR:Hpt:RR			

BDL: Below detection limit

⁴ These numbers are calculated by multiplying cell volume (μm^3), average number of proteins in cells per μm^3 , and the protein abundance in parts per million:

$$\frac{\text{Cell Volume} \times 6.23 \times 10^6 \times \text{Protein abundances}}{10^6}$$

10⁶