

# Appendix: Parts Lists

Parts are listed alphabetically in tables that define different functions, i.e., chemoreception (Table A.1), signal processing (Table A.2), motor output (Table A.3), and gene regulation (Table A.4). Components involved in chemoreception are found near the surface of the cell, either between the outer and inner membranes or spanning the inner membrane. Components involved in signal processing are found in the cytoplasm. Components involved in motor output are either exposed to the cytoplasm, span the inner or outer membranes, or extend out into the external medium. Components involved in gene regulation are found in the cytoplasm. One of these, FlgM, can be pumped out into the external medium.

TABLE A.1. Proteins involved in chemoreception.<sup>a</sup>

Gene product	Binds or senses	Size (kd)	Gene map loc. (min)
Periplasmic binding proteins <sup>b</sup>			
DppA	Di or tripeptides, then Tap	60	80
MalE	Maltose, then Tar	43	91
MglB	Galactose, then Trg	36	48
NikA	Ni <sup>2+</sup> , then Tar	59	78
RbsB	Ribose, then Trg	31	85
Transmembrane receptors/transducers <sup>c</sup>			
Tap	DppA	58	42
Tar (MCP2)	Aspartate, MalE, NikA	60	42
Trg (MCP3)	MglB, RbsB	59	32
Tsr (MCP1)	Serine	59	99
Transmembrane receptors also involved in transport of sugars and sugar alcohols <sup>d</sup>			
BglF	$\beta$ -glucosides	66	84
FruA (PtsF)	Fructose	58	49
GatA	Galacitol	17	47
GutA (SrlA)	Glucitol (sorbitol)	21	61
MtlA	Mannitol	68	81
NagE	N-acetyl glucosamine	68	15
PtsG	Glucose	51	25
PtsM	Mannose	31	41
Cytoplasmic receptors bound to the inner membrane			
Aer	Redox potential	55	69

<sup>a</sup> These data are for *E. coli* K12. The gene product has the same name as the gene, except it is capitalized and not italicized. Size for the gene product is given in kilodaltons (kd, thousands molecular weight). Map location for the gene is given in minutes (0–100); this calibration is based on times required for DNA transfer during bacterial mating.

<sup>b</sup> The periplasm is the space between the inner and outer membranes. These components also are involved in transport.

<sup>c</sup> These components span the inner membrane. They bind a chemical either directly or indirectly, via its binding protein. They also are called methyl-accepting chemotaxis proteins (MCPs), because they are methylated in the course of the chemotactic response.

<sup>d</sup> These are components EnzII of the sugar phosphotransferase system (PTS). Their substrates are phosphorylated when transported through the inner membrane.

TABLE A.2. Proteins involved in signal processing.<sup>a</sup>

Gene product	Function	Size (kd)	Gene map loc. (min)
Components that process signals generated by MCPs <sup>b</sup>			
CheA <sub>L</sub> <sup>c</sup>	When activated by an MCP, transfers phosphate to CheB, CheY	71	42
CheB	When phosphorylated, demethylates MCPs	37	42
CheR	Methylates MCPs	33	42
CheW	Couples CheA to MCPs	18	42
CheY	When phosphorylated, binds to the motor and promotes CW rotation	14	42
CheZ	Accelerates removal of phosphate from CheY-P	24	42
Components involved in the sugar phosphotransferase system			
HPr (PtsH)	Transfers phosphate from EnzI to EnzII, or for glucose, to EnzIII	9	55
EnzI (PtsI)	Transfers phosphate from phosphoenolpyruvate (PEP) to HPr and modulates activity of CheA	64	55
EnzIII <sup>glc</sup> (Crr)	Transfers phosphate from HPr to EnzII <sup>glc</sup>	18	55

<sup>a</sup> See note a, Table A.1.

<sup>b</sup> See note c, Table A.1.

<sup>c</sup> There also is a short form of CheA, missing 97 amino acids at its N-terminus, including the phosphorylation site. The long form is called CheA<sub>L</sub>, the short form CheA<sub>S</sub>.

TABLE A.3. Proteins involved in motor output.

Gene product	Function or component	Size (kd)	Gene map loc. (min)
FlgA	P-ring assembly	24	24
FlgB	Proximal rod	15	24
FlgC	Proximal rod	14	24
FlgD	Hook cap	24	24
FlgE	Hook	42	24
FlgF	Proximal rod	26	24
FlgG	Distal rod	28	24
FlgH	L-ring	25	24
FlgI	P-ring	38	24
FlgJ	Muramidase	34	25
FlgK	Hook-filament junction; at hook	58	25
FlgL	Hook-filament junction; at filament	34	25
FlgN	FlgK, FlgL chaperone	16	24
FlhA <sup>a</sup>	Protein export	75	42
FlhB <sup>a</sup>	Hook-length control	42	42
FlhE	?	14	42
FliC	Filament (flagellin)	51	43
FliD	Filament cap	48	43
FliE	Rod MS-ring junction (?)	11	43
FliF	MS-ring	61	43
FliG	Switch component; interacts with MotA	37	43
FliH	Protein export	26	43
FliI <sup>a</sup>	Protein export ATPase	49	43
FliJ	Rod, hook, and filament chaperone	17	43
FliK	Hook-length control	39	43
FliL	Inner-membrane associated; unknown function	17	43
FliM	Switch component; binds CheY-P	38	44
FliN	Switch component	15	44
FliO	Protein export	11	44
FliP <sup>a</sup>	Protein export	27	44
FliQ <sup>a</sup>	Protein export	10	44
FliR <sup>a</sup>	Protein export	29	44
FliS	FliC chaperone	15	43
FliT	FliD chaperone	14	43
MotA	Force-generator; proton channel	32	43
MotB	Force-generator; spring	34	43

<sup>a</sup> Homologous to proteins in other species that serve as virulence factors.

TABLE A.4. Proteins involved in gene regulation.

Gene product	Function	Size (kd)	Gene map loc. (min)
FlgM	Anti-sigma factor	10	24
FlhC	Master regulator for middle genes	22	43
FlhD	Master regulator for middle genes	14	43
FliA	Sigma factor for late genes	28	43

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