

Table 6.9. ATP and precursors required to produce the monomers needed for the formation of one gram of *Escherichia coli* cells

Cell constituent	Content		Requirement for ATP and precursors ($\mu\text{mol}/\mu\text{mol}$)					
	($\mu\text{mol}/\text{g}$ dry wt)	Precursor	ATP	NADH	NADPH	Cl	NH ₃	S
<i>Amino acids</i>								
alanine	488	1 pyr	0	0	1	0	1	0
arginine	281	1 2-kg	7	-1	4	0	4	0
asparagine	229	1 oaa	3	0	1	0	2	0
aspartate	229	1 oaa	0	0	1	0	1	0
cysteine	87	1 pga	4	-1	5	0	1	1
glutamate	250	1 2-kg	0	0	1	0	1	0
glutamine	250	1 2-kg	1	0	1	0	2	0
glycine	282	1 pga	0	-1	1	-1	1	0
histidine	90	1 penP	6	-3	1	1	3	0
isoleucine	276	1 oaa, 1 pyr	2	0	5	0	1	0
leucine	428	2 pyr, 1 acCoA	0	-1	2	0	1	0
lysine	326	1 oaa, 1 pyr	2	0	4	0	2	0
methionine	146	1 oaa	7	0	8	1	1	1
phenylalanine	176	1 eryP, 2 pep	1	0	2	0	1	0
proline	210	1 2-kg	1	0	3	0	1	0
serine	205	1 pga	0	-1	1	0	1	0
threonine	241	1 oaa	2	0	3	0	1	0
tryptophan	54	1 penP, 1 eryP, 1 pep	5	-2	3	0	2	0
tyrosine	131	1 eryP, 2 pep	1	-1	2	0	1	0
valine	402	1 pyr	0	0	2	0	1	0
<i>Ribonucleotides</i>								
ATP	165	1 penP, 1 pga	11	-3	1	1	5	0
GTP	203	1 penP, 1 pga	13	-3	0	1	5	0
CTP	126	1 penP, 1 oaa	9	0	1	0	3	0
UTP	136	1 penP, 1 oaa	7	0	1	0	2	0
<i>Deoxyribonucleotides</i>								
dATP	24.7	1 penP, 1 pga	11	-3	2	1	5	0
dGTP	25.4	1 penP, 1 pga	13	-3	1	1	5	0
dCTP	25.4	1 penP, 1 oaa	9	0	2	0	3	0
dTTP	24.7	1 penP, 1 oaa	10.5	0	3	1	2	0
<i>Lipids</i>								
glycerol phosphate	129	1 triosP	0	0	1	0	0	0
serine	129	1 pga	0	-1	1	0	0	0
average fatty acid	258	8.2 acCoA	7.2	0	14	0	0	0
<i>Lipopolysaccharide</i>								
UDP-glucose	15.7	1 gluP	1	0	0	0	0	0
CDP-ethanolamine	23.5	1 pga	3	-1	1	1	1	0

Table 6.9: (cont.)

Cell constituent	Content		Requirement for ATP and precursors ($\mu\text{mol}/\mu\text{mol}$)					
	($\mu\text{mol}/\text{g}$ dry wt)	Precursor	ATP	NADH	NADPH	Cl	NH ₃	S
fatty acid	47	7 acCoA	6	0	11.5	0	0	0
CMP-KDO	23.5	1 penP, 1 pep	2	0	0	0	0	0
CDP-heptose	23.5	1.5 gluP	1	0	-4	0	0	0
UDP-glucosamine	15.7	1 fruP	2	0	0	1	1	0
<i>Murein</i>								
UDP-GlcNAc	27.6	1 fruP, 1 acCoA	3	0	0	0	1	0
UDP-MurNAc	27.6	1 fruP, 1 pep, 1 acCoA	4	0	1	0	1	0
alanine	55.2	1 pyr	0	0	1	0	1	0
diaminopimelate	27.6	1 oaa, 1 pyr	2	0	3	0	2	0
glutamate	27.6	1 2-kg	0	0	1	0	1	0
<i>Polyamine</i>								
ornithine equivalent	59.3	1 2-kg	2	0	3	0	2	0

acCoA, acetyl-CoA; eryP, erythrose-4-phosphate; fruP, fructose-6-phosphate; gluP, glucose-6-phosphate; 2-kg, 2-ketoglutarate; oaa, oxaloacetate; penP, pentose-5-phosphate; pep, phospho-enolpyruvate; pga, 3-phosphoglycerate; pyr, pyruvate; triosP, triose phosphate; KDO, 2-keto-3-deoxyoctonate; UDP-GlcNAc, UDP-N-acetylglucosamine; UDP-MurNAc, UDP-N-acetylmuramic acid.