

S2 Computation of total synthesis cost of amino acids present in the cell

For the computation of total amino acid synthesis cost, first the number of each amino acid present in one *E. coli* cell had to be determined. In ref. (Feist et al., 2007), the concentrations of all amino acids per gram dry-cell-mass in *E. coli* are documented. Multiplying this number with the dry-cell mass of an *E. coli* cell ($3 \cdot 10^{-13}$ g) and the number of molecules in one millimole ($6.022 \cdot 10^{20}$), for each amino acid, we can determine the number of molecules of each amino acid in one *E. coli* cell. These numbers are (in molecules per cell): Ala, $9.3E+7$; Arg, $5.3E+7$; Asn, $4.4E+7$; Asp, $4.4E+7$; Cys, $1.7E+7$; Glu, $4.8E+7$; Gln, $4.8E+7$; Gly, $1.1E+8$; His, $1.7E+7$; Ile, $5.2E+7$; Leu, $8.1E+7$; Lys, $6.2E+7$; Met, $2.8E+7$; Phe, $3.2E+7$; Pro, $4.0E+7$; Ser, $3.9E+7$; Thr, $4.6E+7$; Trp, $1.0E+7$; Tyr, $2.5E+7$ and Val, $7.6E+7$. Subsequently, this number has been multiplied with the inverse of the yield of the amino acid produced from glucose (from the 'manual' computations) to obtain the number of glucose molecules required to produce the corresponding amount of amino acid molecules.