Supplementary Table 1

Overview of kinetic constants used for the construction of the model.

Enzyme	EC number	Kinetic parameter	References	Rate Law
NADA	3.5.1.19	K_M:9.6μM K_{iP}:120μM k_{cat}:0.65s^{-1}	[1]	Product inhibition
NADS	6.3.5.1	K_M:190μM k_{cat}:21s^{-1}	[2]	HMM
NMNAT	2.7.7.1/2.7.7.18	$K_{M_{NaMN}}$:67.7μM $k_{cat_{NaMN}}$:42.9s^{-1} $K_{M_{NMN}}$:22.3μM $k_{cat_{NMN}}$:53.8s^{-1} $K_{M_{NMN}}$:59μM $k_{cat_{NAD}}$:129.1s^{-1} $K_{M_{NaAD}}$:502μM $k_{cat_{NaAD}}$:103.8s^{-1}	[3][1] [4][2] [4][3]	Substrate Competition
NMNT	2.1.1.1	K_M:400μM K_{iP}:60μM k_{cat}:8.1s^{-1}	[5] [6]	Product inhibition
NamPRT	6.3.5.1	K_M:5nM k_{cat}:0.0077s^{-1}	[7]	HMM
NAPRT	2.4.2.11	K_M:23μM k_{cat}:3.3s^{-1}	[8]	HMM
SIRT1	3.5.1.-	K_M:29μM K_{iP}:60μM k_{cat}:0.67s^{-1}	[9]	Product inhibition
NT5[4]	3.1.3.5	K_M:100μM k_{cat}:10s^{-1}[6]	[10][5]	HMM

The total enzyme concentration was set to 10 for all enzymes if not mentioned otherwise. Concentration of potentiantial cosubstrate was assumed to be constant and considered to be not limitng the reaction and thus represented by the maximal velocities given.

[1] Values for NMNAT1 used

[2] Keq used for calculation of turnover rate of reverse reaction

[3] Equilibrium constant used for calculation of turnover rate of reverse reaction

[4] As parameter values for NRK and PNP were not available we omited these enzymes and simulated NA and NAM as direct products

[5] approx. IC50 value for NAD used

[6] Avarage value for pyrimidines used

Kinetic Rate Laws

Product Inhibition

$$v = \frac{E_T \cdot k_{cat} \cdot S}{K_M + S + \frac{K_M \cdot P}{K_{iP}}} \tag{1}$$

Henry-Michaelis Menten for irreversible reactions (HMM)

$$v = \frac{E_T \cdot k_{cat} \cdot S}{K_M + S} \tag{2}$$

Substrate Competition at NMNAT

$$v = E_T \cdot \frac{\frac{k_{cat_A} \cdot A \cdot B}{K_{M_A}} - \frac{k_{cat_P} \cdot P \cdot Q}{K_{M_P}}}{1 + \frac{A}{K_{M_A}} + \frac{B}{K_{M_B}} + \frac{P}{K_{M_P}} + \frac{Q}{K_{M_Q}}} \tag{3}$$

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