# TCA cycle rates[[1]](#footnote-20)

## Citrate synthase (CS)

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 0.23523 | Hz | Catalytic constant |
|  | 0.4 | mM | Enzyme concentration of CS |
|  | 0.0126 | mM | Michaelis constant for AcCoA |
|  | 6.4E-4 | mM | Michaelis constant for OAA |
|  | 1 | mM | Acetyl CoA concentration |
| (cell) | 0.15891 | Hz | Catalytic constant (cellular model) |

## Aconitase (ACO)

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 0.11688 | Hz | Forward rate constant of ACO |
|  | 2.22 | - | Equilibrium constant of ACO |
|  | 1.300 | mM | Sum of TCA cycle intermediates |
| (cell) | 0.078959 | Hz | Forward rate constant (cellular model) |

## Isocitrate dehydrogenase, NADH-producing (IDH3)

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 11880 | Hz | Rate constant of IDH3 |
|  | 0.109 | mM | Concentration of IDH3 |
|  | 1E-6 | mM | Ionization constant of IDH3 |
|  | 9E-4 | mM | Ionization constant of IDH3 |
|  | 0.923 | mM | Michaelis constant for NAD |
|  | 1.520 | mM | Michaelis constant for isocitrate |
|  | 2 | - | Cooperativity for isocitrate |
|  | 0.62 | mM | Activation constant by ADP |
|  | 5E-4 | mM | Activation constant for calcium |
|  | 0.19 | mM | Inhibition constant by NADH |
| (cell) | 535 | Hz | Rate constant (cellular model) |

## Alpha-ketoglutarate dehydrogenase (KGDH)

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 13.2 | Hz | Rate constant of KGDH |
|  | 0.5 | mM | Concentration of KGDH |
|  | 4E-5 | mM | Ionization constant of KGDH |
|  | 7E-5 | mM | Ionization constant of KGDH |
|  | 38.7 | mM | Michaelis constant for NAD |
|  | 30 | mM | Michaelis constant for αKG |
|  | 1.2 | - | Hill coefficient for αKG |
|  | 0.0308 | mM | Activation constant for Mg |
|  | 1.5E-4 | mM | Activation constant for Ca |
| (cell) | 17.9 | Hz | Rate constant (cellular model) |

## Succinate-CoA ligase (SL)

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 2.8E-5 | mM \* Hz | Forward rate constant of SL |
|  | 3.115 | - | Equilibrium constant of SL |
| [CoA] | 0.020 | mM | Coenzyme A concentration |
| (cell) | 2.84E-5 | mM \* Hz | Forward rate constant (cellular model) |

## Succinate dehydrogenase (SDH)

See OXPHOS part: complex II (Succinate dehydrogenase).

## Fumarate hydratase (FH)

| Parameter | Value | Unit | Description |
| --- | --- | --- | --- |
|  | 8.3 | Hz | Forward rate constant |
|  | 1.0 | - | Equilibrium constant |
| (cell) | 8.4 | Hz | Forward rate constant (cellular model) |

## Malate dehydrogenase (MDH)

| Parameter | Value | Units | Description |
| --- | --- | --- | --- |
|  | 124.2 | Hz | Rate constant |
|  | 0.154 | mM |  |
|  | 1.131E-5 | mM | Ionization constant |
|  | 26.7 | mM | Ionization constant |
|  | 6.68E-9 | mM | Ionization constant |
|  | 5.62E-6 | mM | Ionization constant |
|  | 0.0399 |  | Offset of MDH pH activation factor |
|  | 0.2244 | mM | Michaelis constant for NAD |
|  | 1.493 | mM | Michaelis constant for malate |
|  | 0.031 | mM | Inhibition constant for oxaloacetate |
| (cell) | 125.9 | Hz | Rate constant for cellular model |

## Aspartate aminotransferase (AAT)

| Parameter | Value | Units | Description |
| --- | --- | --- | --- |
|  | 21.4 | Hz | Forward rate constant |
|  | 0.0015 | Hz | Rate constant of aspartate consumption |
|  | 6.6 |  | Equilibrium constant |
| [GLU] | 30.000 | mM | Glutamate concentration |
| (cell) | 21.7 | Hz | Forward rate constant (cellular model) |

## ODEs specifically to the Citric acid cycle (CAC)

1. Wei AC, Aon MA, O’Rourke B, Winslow RL, Cortassa S. Mitochondrial energetics, pH regulation, and ion dynamics: a computational-experimental approach. Biophys J. 2011;100(12):2894-903. [PMC3123977](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3123977/) [↑](#footnote-ref-20)