# APPENDIX S.A

# List of Equations

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|  |
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|  |
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|  |
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|  |
| 1.59 Astrocytic lactate oxidation (Mangia et al., 2009) |
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| 1.85 Glucose flux from basal lamina to interstitial space (Mangia et al., 2009) |
|  |
| 1.86 Lactate flux from basal lamina to astrocyte (Mangia et al., 2009) |
|  |
| 1.87 Lactate flux from astrocyte to interstitial space (Mangia et al., 2009) |
|  |
| 1.88 Lactate flux from interstitial space to neuron (Mangia et al., 2009) |
|  |
| 1.89 Lactate flux from basal lamina to interstitial space (Mangia et al., 2009) |
|  |

# APPENDIX S.B

# List of Constants

|  |  |  |
| --- | --- | --- |
|  | Peak Potassium Conductance | Hodgkin & Huxley, 1952 |
|  | Peak Sodium Conductance | Hodgkin & Huxley, 1952 |
|  | Peak Leakage Conductance | Hodgkin & Huxley, 1952 |
|  | Leakage Membrane Potential | Hodgkin & Huxley, 1952 |
|  | Membrane Capacitance | Hodgkin & Huxley, 1952 |
|  |  | Kager et al. 2000 |
|  |  | Kager et al. 2000 |
|  | Maximum Na/K ATPase Pump Current | Kager et al. 2000 |
|  | Intracellular Calcium Concentration Gain per Action Potential | Lee et al. 2009 |
|  |  | Fitted to Kager et al. 2000 |
|  |  | Fitted to Lee et al. 2009 |
|  | Faraday’s Constant |  |
|  | Calcium Sensitivity Regarding Transmitter Release | Lee et al. 2009 |
|  | Maximum Probability of Release | Lee et al. 2009 |
|  | Initial Recovery Rate of Synaptic Vesicle from Empty to Releasable State | Lee et al. 2009 |
|  | Maximum Recovery Rate of Synaptic Vesicle from Empty to Releasable State | Lee et al. 2009 |
|  | Calcium Sensitivity Regarding Transmitter Release | Lee et al. 2009 |
|  | Total Surface Area of Neuron | Kager et al. 2000 |
|  | Total Internal Volume of Neuron | Kager et al. 2000 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  | Dissociation Constant | Bennett et al. 2008 |
|  | G-Protein Dissociation Constant | Bennett et al. 2008 |
|  | IP3 Degradation Rate | Bennett et al. 2008 |
|  | Ca2+ concentration in ER | Bennett et al. 2008 |
|  | Maximum Pumping Rate of Ca2+ into ER | Bennett et al. 2008 |
|  | Pump Dissociation Constant | Bennett et al. 2008 |
|  | Maximum Ca2+ Channel Current | Bennett et al. 2008 |
|  | IP3 Channel Kinetic Parameter | Bennett et al. 2008 |
|  | IP3 Channel Kinetic Parameter | Bennett et al. 2008 |
|  | IP3 Channel Kinetic Parameter | Bennett et al. 2008 |
|  | Minimum Ca2+ Concentration for EET Production | Bennett et al. 2008 |
|  | Endogenous Buffer Parameter | Bennett et al. 2008 |
|  | IP3 Channel Kinetic Parameter | Bennett et al. 2008 |
|  | Determined by Steady State Balance Condition | Bennett et al. 2008 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  | EET Production Rate | Bennett et al. 2008 |
|  |  | Mangia et al. 2009 |
| (#) |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
| mM | Serum Glucose Concentration | Mangia et al. 2009 |
|  | Minimum Vessel Radius |  |
|  | Maximum Vessel Radius |  |
|  |  | Mangia et al. 2009 |
|  | Serum Lactate Concentration | Mangia et al. 2009 |
| (#) |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
| µL | Extracellular Volume | Kager et al. 2000 |
|  |  | Kager et al. 2000 |
|  |  | Kager et al. 2000 |
|  | Extracellular Na+ Concentration |  |
|  | Extracellular K+ Concentration |  |
|  | Neuronal Cytosolic Na+ Concentration |  |
|  | Neuronal Cytosolic K+ Concentration |  |
|  | Initial Probability of Activation of Na+ Ion Channel | Hodgkin & Huxley, 1952 |
|  | Initial Probability of Inactivation of Na+ Ion Channel | Hodgkin & Huxley, 1952 |
|  | Initial Probability of Activation of K+ Ion Channel | Hodgkin & Huxley, 1952 |
|  | Resting Membrane Potential of Neuron | Hodgkin & Huxley, 1952 |
|  | Initial Neuronal Ca2+ Concentration | Lee et al. 2009 |
|  | Initial Neuronal ATP Concentration unless mentioned otherwise |  |
| mM | Initial K+ Buffer Capacity of Astrocyte | Kager et al. 2000 |
| mM | Initial K+ Buffered | Kager et al. 2000 |
| (#) | Remaining Ratio of Vesicles Releasable | Lee et al. 2009 |
|  | Time constant for clearance of synaptic glutamate | Clements et al. 1992 |
|  | Initial Synaptic Glutamate Concentration | Bennett et al. 2008 |
|  | Inflow Calcium Current as Dirac Delta Function | Kager et al. 2000 |
|  | IP3 Production Rate | Bennett et al. 2008 |
|  | Initial Astrocytic IP3 Concentration | Bennett et al. 2008 |
|  | Initial Astrocytic Ca2+ Concentration | Bennett et al. 2008 |
|  | Initial Probability of Ca2+ Occupying its Inhibitory Binding Site | Bennett et al. 2008 |
|  | Initial Extracellular EET Concentration | Bennett et al. 2008 |
|  |  | Bennett et al. 2005 |
| L | Interstitial Volume | Mangia et al. 2009 |
| L | Neuronal Volume | Mangia et al. 2009 |
| L | Basal Lamina Volume | Mangia et al. 2009 |
| L | Astrocyte Volume | Mangia et al. 2009 |
| L | Endothelium Volume | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
|  |  | Mangia et al. 2009 |
| mM | Initial Concentration of Glucose in Interstitium | Mangia et al. 2009 |
| mM | Initial Concentration of Lactate in Interstitium | Mangia et al. 2009 |
| mM | Initial Concentration of Glucose in Neuron | Mangia et al. 2009 |
| mM | Initial Concentration of Lactate in Neuron | Mangia et al. 2009 |
| mM | Initial Concentration of Glucose in Astrocyte | Mangia et al. 2009 |
| mM | Initial Concentration of Lactate in Astrocyte | Mangia et al. 2009 |
| mM | Initial Concentration of Glucose in Endothelium | Mangia et al. 2009 |
| mM | Initial Concentration of Glucose in Basal Membrane | Mangia et al. 2009 |
| mM | Initial Concentration of Lactate in Endothelium | Mangia et al. 2009 |