A mathematical modeling toolbox for ion channels and transporters across cell membranes

Shadi Zaheri[a], Fatemeh Hassanipour[a,*]

[a]*Department of Mechanical Engineering, The University of Texas at Dallas, Richardson, TX, 75080, USA*

The following supplementary material is from " A mathematical modeling toolbox for ion channels and transporters across cell membranes" manuscript. It contains an overview of all equations related to Ion channels, Pumps, Cotransporters, and Symporters, organized in a table form. The detailed transporters along with the descriptions of their equatuons can be found from here.

⋆This document is the result of the research project funded by the National Science Foundation.

*Corresponding author

Email addresses: shadi.zaheri@utdallas.edu (Shadi Zaheri), fatemeh@utdallas.edu (Fatemeh Hassanipour)

2.4.2. *Sacro Endoplasmic Reticulum Calcium ATPase (SERCA)*

Sacro Endoplasmic Reticulum Calcium ATPase (SERCA)	**Ref**
$$I_{SERCA} = I_{SERCA}^{max} \frac{1}{1 + \left(\frac{K_{SERCA}}{[Ca]_{M(cyt)}}\right)^{\eta_{SERCA}}} \quad (120)$$	[3, 4, 7, 24, 37, 42, 43]
$$J_{SERCA} = J_{SERCA}^{max} \frac{(1)}{1 + (\frac{[Ca]_i}{K_{SERCA}})^{\eta_{serca}}} \quad \frac{1}{[Ca]_{er}} \quad (121)$$	[43, 44]
$$J_{SERCA} = \frac{V_{maxf}\left(\frac{[Ca]_i}{K_{mf}}\right)^{\eta_f} - V_{maxr}\left(\frac{[Ca]_{sr}}{K_{mr}}\right)^{\eta_r}}{1 + \left(\frac{[Ca]_i}{K_{mf}}\right)^{\eta_f} + \left(\frac{[Ca]_{sr}}{K_{mr}}\right)^{\eta_r}} + K([Ca]_{sr} - [Ca]_i) \quad (122)$$	[45]
$$I_{SERCA} = I_{SERCA}^{max} \frac{\left(\frac{[Ca]_i}{K_{mf}}\right)^{\eta_{serca}} - \left(\frac{[Ca]_{sr}}{K_{mr}}\right)^{\eta_{serca}}}{1 + \left(\frac{[Ca]_i}{K_{mf}}\right)^{\eta_{serca}} + \left(\frac{[Ca]_{sr}}{K_{mr}}\right)^{\eta_{serca}}} \quad (123)$$	[2, 18]

Table 14: The corresponding equations describing the flux and current transported via sacro endoplasmic reticulum calcium ATPase (SERCA) pumps across the cell membrane