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

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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.

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4.2. Sodium Calcium Exchanger (NCX)

Sodium Calcium Exchanger (NCX)	Ref
$$I_{NCX} = k_{NCX}\left(\frac{[Na]_i^{n_{NCX}}[Ca]_o exp\left(\frac{(n_{NCX}-2)rV_mF}{2RT}\right) - [Na]_o^{n_{NCX}}[Ca]_i exp\left(-\frac{(n_{NCX}-2)(1-r)V_mF}{2RT}\right)}{1 + d_{NCX}\left([Na]_o^{n_{NCX}}[Ca]_i + [Na]_i^{n_{NCX}}[Ca]_o\right)}\right) \quad (146)$$	[15]
$$I_{NCX} = g_{NCX}\left(\frac{1}{(1+\left(\frac{K_{NCX,m}^{Ca}}{[Ca]_{i(M)}}\right)^{\eta_{NCX,h}}}\right) \left(\frac{[Na]_i^{n_{NCX}}[Ca]_o exp\left(\frac{(n_{NCX}-2)rV_mF}{2RT}\right) - [Na]_o^{n_{NCX}}[Ca]_i exp\left(-\frac{(n_{NCX}-2)(1-r)V_mF}{2RT}\right)}{1 + d_{NCX}\left([Na]_o^{n_{NCX}}[Ca]_i + [Na]_i^{n_{NCX}}[Ca]_o\right)}\right) \quad (147)$$	[3, 61]
$$I_{NCX} = I_{NCX}^{max}\left(\frac{1}{1+(\frac{K_{m,NCX}^{Ca}}{[Ca]_{i(M)}})^{\eta_{Hill}}}\right) \left(\frac{[Na]_{i(M)}^{n_{NCX}}[Ca]_{N(o)} exp(\frac{rV_mF}{RT}) - [Na]_{N(o)}^{n_{NCX}}[Ca]_{i(M)} exp(-\frac{(1-r)V_mF}{RT})}{\lambda(1+k_{sat}exp(-\frac{(1-r)V_mF}{RT}))}\right)$$ $$\lambda = [Na]_o^{n_{NCX}}[Ca]_i + [Na]_i^{n_{NCX}}[Ca]_o + K_{m,Cao}[Na]_i^{n_{NCX}} + K_{m,Nai}^{n_{NCX}}[Ca]_o(1+\frac{[Ca]_i}{K_{m,Cai}}) + K_{m,Cai}[Na]_o^{n_{NCX}}\left(1+\frac{[Na]_i^{n_{NCX}}}{K_{m,Nai}}\right)^{n_{NCX}} \quad (148)$$	[53, 62]

Table 28: The corresponding equations describing the flux and current transported via sodium calcium exchanger across the cell membrane