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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1.1.2. *Calcium-Activated Potassium (K) channels (CaKC)*

Calcium-Activated Potassium (K) channels (CaKC)	**Ref**
$$\boxed{I''^{M-N}_{K,X_{CaKC}} = n''^{M-N}_{X_{CaKC}}\, g_{X_{CaKC}}\, f_o^{K,X_{CaKC}}\, A\left(V_m^{M-N} - V_{K,rev}^{M-N}\right)} \quad (5)$$ where X denotes SK or IK or BK $$f_o^{K,CaKC} = \frac{1}{1 + \left(\frac{K_{Ca}^{CaKC}}{[Ca]_{i(c)}}\right)^{\eta_{CaKC}}} \quad (6)$$	[5–7]
$$\boxed{I''^{M,N}_{K,X_{CaKC}} = n''_{X_{CaKC}} P^{M-N}_{K,X_{CaKC}}\, \frac{z_K^2 F^2 V_m^{M-N}}{RT}\, \frac{[K]_M - [K]_N exp\frac{-z_K F V_m^{M-N}}{RT}}{1 - exp\frac{-z_K F V_m^{M-N}}{RT}}} \quad (7)$$ where X denotes IK or BK.	[8]
$$\boxed{i^{M-N}_{K,BK_{CaKC}} = g_{BK_{CaKC}} f_o^{BK_{CaKC}}\left(V_m^{M-N} - V_{K,rev}^{M-N}\right)} \quad (8)$$ $$f_o^{BK_{CaKC}} = C_f f_f^{BK_{CaKC}} + C_s f_s^{BK_{CaKC}} \quad (9)$$ $$\frac{df_f^{BK_{CaKC}}}{dt} = \frac{\bar{f}_f^{BK_{CaKC}} - f_f^{BK_{CaKC}}}{\tau_{f_f}^{BK_{CaKC}}} \quad (10)$$ $$\frac{df_s^{BK_{CaKC}}}{dt} = \frac{\bar{f}_s^{BK_{CaKC}} - f_s^{BK_{CaKC}}}{\tau_{f_s}^{BK_{CaKC}}} \quad (11)$$ $$\bar{f}^{BK_{CaKC}} = \frac{1.0}{1.0 + exp[\frac{-(V_m^{M-N} - V_{1/2,BK_{CaKC}}^{M-N})}{k_{CaKC}}]} \quad (12)$$ $$\bar{f}_f^{BK_{CaKC}} = \bar{f}_s^{BK_{CaKC}} - \bar{f}^{BK_{CaKC}} \quad (13)$$ $$V_{1/2,BK_{CaKC}} = A \log[Ca]_i + B \quad (14)$$	[4]

Table 2: The corresponding equations describing the ionic current transported via Calcium-Activated Potassium (K) channels (CaKC) across the cell membrane