Table 1

Parameters and variables for Eqs. (1) and (2). Dimensions of 3T3 cells were obtained from Coulter counter measurements.

Symbol	Description	Value	SI unit
V	Volume	(Variable)	m^3
T	Temperature	(Variable)	K
T_R	Reference temperature	273.15	K
Lp	Membrane hydraulic permeability	(Variable)	$ms^{-1}\,Pa^{-1}$
Lpg	Permeability of the membrane to water at T_R	(Parameter)	$ms^{-1}\,Pa^{-1}$
E_{Lp}	Activation energy for the permeation process	(Parameter)	$J\,mol^{-1}$
A	Membrane surface area of the cell	781×10^{-12}	m^2
R	Universal gas constant	8.314	$JK^{-1}\,mol^{-1}$
B	Cooling rate	0.0167	Ks^{-1}
v_w	Molar volume of water	18×10^{-6}	$m^3\,mol^{-1}$
V_o	Isotonic volume	2053×10^{-18}	m^3
V_b	Osmotically inactive volume	1068×10^{-18}	m^3
v_s	Dissociation constant of salt	2	(–)
n_s	Number of moles of solutes in the cell	5.694×10^{-15}	mol
n_{cpa}	Number of moles of CPA (DMSO) in the cell	$6.59 \cdot 10^{-13}$	mol
v_{cpa}	Molar volume of CPA (DMSO)	71×10^{-6}	$m^3\,mol^{-1}$
ΔH_f	Heat of fusion of water	6011	$J\,mol^{-1}$

$$\frac{dV}{dt} = LpART(\Delta C) \tag{1}$$

$$\frac{dV}{dT} = \frac{L_p ART}{v_w B}\left[\ln\left(\frac{\left(V_o - V_b - n_{cpa}v_{cpa}\right)}{\left(V_o - V_b - n_{cpa}v_{cpa}\right) + v_w\left(v_s n_s + n_{cpa}\right)}\right)\right.$$
$$\left. - \frac{\Delta H_f}{R}\left(\frac{1}{T_R} - \frac{1}{T}\right)\right] \tag{2}$$