S1 Text. Estimation of endosomal Ca^{2+} content and release rate

For the estimation of the Ca^{2+} amount that can be released from an endosome upon illumination the following parameters are assumed:

C_i	Cytosolic Ca^{2+} concentration	100 nM
C_e	Endosomal Ca^{2+} concentration [2]	40 µM
σ	Single channel conductance of CatCh [1]	140 fS
n	Estimated number of proteins [3]	500 / µm²
A	Endosome surface	3.1416 µm²
r	Endosome radius	0.5 µm
p	open probability	0.5
E	Membrane potential Endosome [4]	20 mV
z	valence of Ca^{2+}	2
e	elementary charge	$1.60218 * 10^{-19}$ C
N_A	Avogadro constant	$6.02214*10^{23}$ mol^{-1}

The total amount of Ca^{2+} ions present in one endosome can be estimated assuming a spherical shape:

$$n_{Ca2+} = \frac{4}{3}\pi r^3 * c_e * N_A = \frac{4}{3}\pi(5 * 10^{-7})^3 m^3 * 0.04\frac{mol}{m^3} * 6.02214 * 10^{23}\ mol^{-1} = 12613$$

The rate at which ions leave the endosome through tCXCR4/CatCh into the cytosol right upon illumination of the cell can be estimated by the following formula:

$$J_{Ca2+} = E * n * A * \sigma * p * (ze)^{-1} = 0.02\ V * 500 * 3.1416 * 140 * 10^{-15} C(sV)^{-1} * 0.5 * (2 * 1.60218\ *\ 10^{-19}\ \mathrm{C})^{-1} = 6.86 * 10^6\ s^{-1}$$

Thus, the amount of calcium released from the endosomes is mainly limited by the number of ions present rather than by the permeability of CatCh.

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