Supporting Information

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SI Text

Supplemental Methods. CHO cells stably expressing Kv2.1 were used for electrophysiology. Currents were recorded in the whole-cell mode and in outside-out patch mode. For both, bath solution contained (mM): 135 NaCl, 15 KCl, 3 MgCl2, 1 CaCl2, 5 Glucose, 10 Hepes-NaOH (pH 7.3, 310 mOsm/kg); and the pipette solution contained (mM): 150 KCl, 3 MgCl2, 5 EGTA, 10 Hepes-KOH (pH 7.3, 310 mOsm/kg). Electrodes were drawn from borosilicate patch glass (VWR) and polished (MF-83, Narishige Co.) to a resistance of 2–4 MΩ. Analog signals were filtered (1 kHz) using the built-in 4-pole Bessel filter of an Axopatch 200B patch clamp amplifier (Molecular Devices) in patch-mode, digitized at 10 kHz (Digidata 1440A, Molecular Devices) and stored on a computer hard disk.

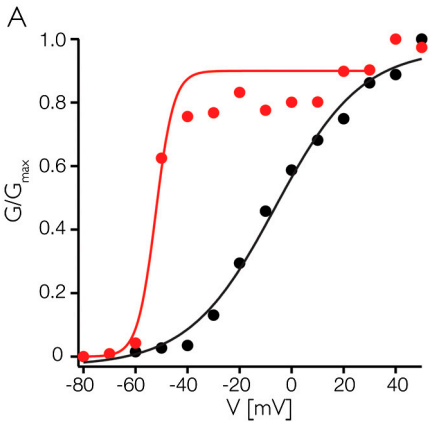


Fig. S1. *The effect of membrane configuration.* Kv2.1 in outside-out patch (red) or whole-cell configuration (black) recorded from the same CHO cell. Boltzmann functions (solid lines) fit data with V_m (mV) and z (q_e): -52.3 ± 1.42, 7.52 ± 2.7 (outside-out patch), and -6.32 ± 2, 1.5 ± 0.1 (whole cell).

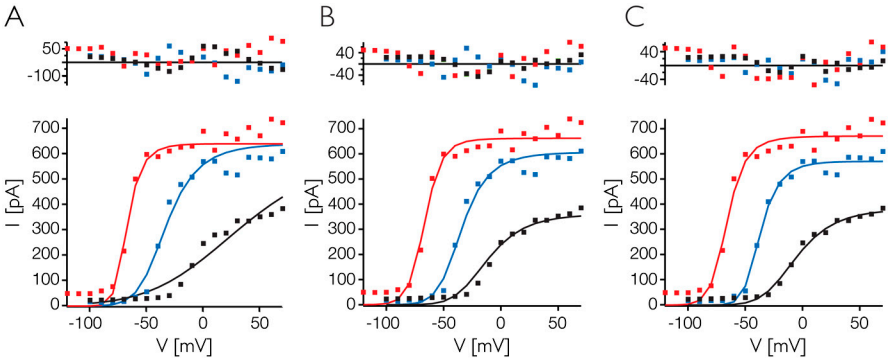


Fig. S2. *Mechanosensitivity can be explained by varying L, but not K(V).* Kv2.1 channels in the same on-cell patch with 0 mmHg (black), 5 mmHg (blue) and 15 mmHg (red) of transient pressure applied. Solid lines are fits to Eq. **1** (see main text) using the relationship $\langle I \rangle = iNP_O$, with the following constraints in place: (*a*) V_m and z independently fit for each pressure value, L constrained to be the same for all pressure values. (*b*) V_m and z constrained to be the same for all pressure values, L independently fit for each pressure value. (**c**) V_m, z and L independently fit for each pressure value. Fitting residuals are plotted above each panel. χ^2 are 95494, 57871, and 45325 for (*a*–*c*) respectively.

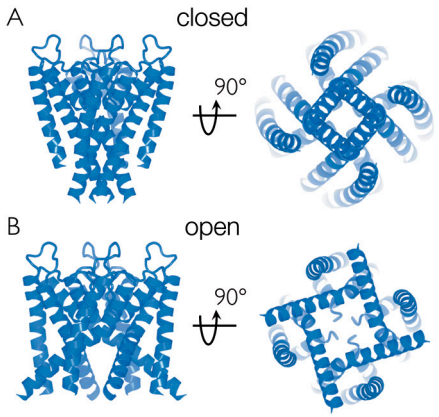


Fig. S3. *A structural description. A*) Pore domain of the KcsA structure (PDB code: 1K4C) in a closed conformation. *B*) Pore domain of the KcsA structure in an open conformation based on the MthK structure (PDB 1LNQ).

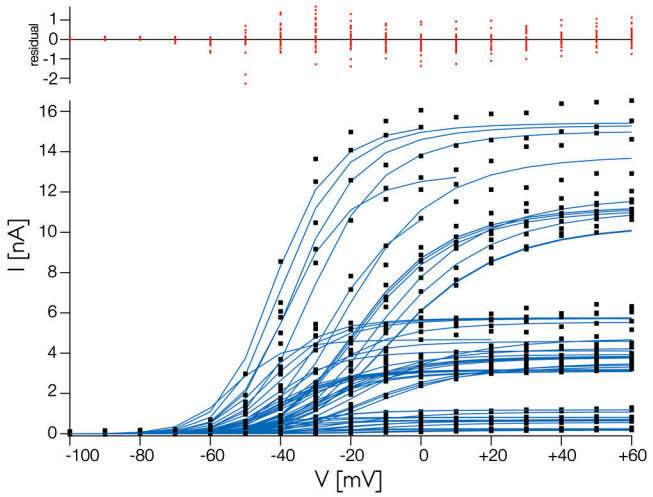
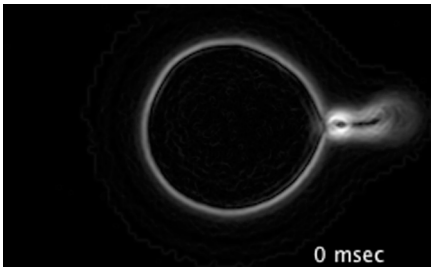


Fig. S4. *Global Fit of all Paddle Chimera datasets. A*, Global fit of 57 families of current extracted from 11 outside-out patches. Solid blue lines represent a fit of each family (black dots) to Eq. **1** with $\langle I \rangle = iNP_O$. Fitting residuals are graphed above (red dots). Fitting parameters are summarized in SI Table S1.



Movie S1. *Lipid adheres to glass.* Giant Unilamellar Vesicles (GUVs) formed with DOPC and Rhodamine-DOPE display rapid surface undulations when suspended in aqueous solution. When brought in contact with a fused borosilicate glass wand (t = 2440 msec) the surface undulations of the GUV cease, and lipids slowly run up the wand.

Movie S1 (MOV)

Table S1. Global fitting parameters for tension scaling

Global	V_m	−25 ± 0.5	[mV]							
Parameters	z	1.12 ± 0.02	[qe]							
Local Parameters	late-step equilibrium constant L								iN	
Patch 1	1.97 ±0.1	1.97 ±0.1	1.95 ±0.1	2.4 ±0.1	3.02 ±0.1	7.4 ±0.4	23.4 ±1.8	41.9 ±3.5	64.7 ±5.7	88.4 ±8	15675 ±87
Patch 2	4.5 ±0.6	13.74 ±2.5	12.4 ±2.3	15.3 ±2.9	23.7 ±4.9						4108 ±90
Patch 3	3.1 ±0.4	9.8 ±1.5	50.5 ±9.8	445 ±99							4688 ±86
Patch 4	6 ±0.4	5.7 ±0.4	5.3 ±0.4	6 ±0.4	12.6 ±1.1	55.2 ±5.8					13215 ±155
Patch 5	7.1 ±5.5	82.4 ±88	261 ±296								821 ±76
Patch 6	4.3 ±3.5	12.3 ±12.7	39.9 ±49	73.9 ±94							691 ±81
Patch 7	4.8 ±0.7	9.86 ±1.8	80.39 ±19								4171 ±103
Patch 8	4.5 ±0.4	21.7 ±3	65 ±10	90 ±14	121 ±20						5806 ±63
Patch 9	8.7 ±4.7	43 ±30	46.6 ±32	44.9 ±31							1210 ±73
Patch 10	23.3 ±5.5	27 ±6.5	46.4 ±12	57.8 ±15	64.4 ±17	54.7 ±14	69.4 ±19	81.7 ±22			3228 ±47
Patch 11	2.2 ±4.4	4.2 ±9	16.5 ±48	60.7 ±206	54.2 ±183						254 ±78