Regulation of Piezo2/mechanically-activated (MA) ion channel by static plasma membrane tension

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Function of PIEZO channel...

- Piezo1 is required for the development of the mouse vasculature.
  
  Li, et al., Nature. 2014

- Piezo2 is required for the mechanosensitivity of Merkel cells that detect light touch.
  
  Ikeda, et al., Cell. 2014
  

- Deletion of Piezo2 in sensory neurons and Merkel cells led to loss of low threshold mechanosensation (LTM).
  

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Qust. 1, Gating of mechanically activated (MA) channels.

A laminin-like protein filament (~100 nm) may link RA-MA channel to ECM

Hu J, et al., *EMBO J*. 2010

Qust. 1, Gating of mechanically activated (MA) channels.

Mechanical sensitivity of Piezo1 ion channels can be tuned by cellular membrane tension.

Removal of the mechanoprotective influence of the cytoskeleton reveals PIEZO1 is gated by bilayer tension.
Osmotic-induced cell swelling increase the membrane tension.

1. Osmotic swelling (420 mOsm) potentiates rapidly adapting mechanically activated (RA-MA) currents in rat DRG neurons.
2. Osmotic swelling potentiates DRG neuronal RA-MA currents at different mechanical stimulation intensities.
Osmotic swelling potentiates RA-MA currents in HEK293 cells expressing Piezo2 channels.
4. Assessment of channel numbers and unitary current sizes of RA-MA channels of rat DRG membranes. (hypo = 220 mOsm)
5. Static plasma membrane tension of primary afferent neurons is measured by the micropipette aspiration technique.
6. Disruption of actin filaments by cytochalasin D (CD) abolishes osmotic swelling-induced potentiation of RA-MA currents.
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7. Osmotic swelling-induced potentiation of RA-MA currents is diminished by latrunculin A and jasplakinodide.
8. Osmotic swelling, static plasma membrane tension, and RA-MA currents can be rapidly reversed in isotonic condition.
10. Extracellular hypotonicity induces behavioral mechanical hypersensitivity.

Piezo1/2 MA channel function positively modulated by membrane tension

Piezo1/2 MA channel function modulated by tether model?

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