The canonical transient receptor potential channel 1 is an essential structural component of the mechanosensitive calcium permeable channel in vertebrate cells

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The mechanosensitive cation channel (MscCa) transduces membrane stretch into cation (Na^+, K^+, Ca^{2+} and Mg^{2+}) flux across the cell membrane, and is implicated in cell volume regulation, cell locomotion, muscle dystrophy and cardiac arrhythmias (Hamill & Martinac, 2001). However, the membrane protein(s) forming the MscCa in vertebrates remains unknown. Here we use an identification strategy based on detergent-solubilizing of frog oocyte membrane proteins followed by liposome reconstitution and evaluation by patch-clamp (Sukharev *et al.*, 1993; Maroto *et al.*, 2005). The oocyte was chosen because it expresses the prototypical MscCa ($\geq 10^7$ MscCa/oocyte) that is preserved in cytoskeleton-deficient membrane vesicles (Zhang *et al.*, 2000). We identified a membrane protein fraction that reconstituted high MscCa activity and showed an abundance of an 80 kDa protein identified immunologically as the canonical transient receptor potential channel 1 (TRPC1) (Wes *et al.*, 1995; Brereton *et al.*, 2000). Heterologous expression of the human TRPC1 resulted in a > 1000% increase in MscCa patch density, whereas injection of a TRPC1-specific antisense RNA abolished endogenous MscCa activity. hTRPC1 transfection of CHO-K1 cells also significantly increased MscCa expression. These observations indicate that TRPC1 is a component of the vertebrate MscCa, which like various prokaryotic Ms channels (Martinac & Kloda, 2004), is gated by tension developed in the lipid bilayer.

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