An improved open channel structure of MscL

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Mechanosensitive channels act as molecular transducers of mechanical force exerted on the membrane of living cells by opening in response to membrane bilayer deformations occurring in physiological processes such as touch, hearing, blood pressure regulation and osmoregulation. Here, we determine the likely structure of the open state of the mechanosensitive channel of large conductance (MscL) using a combination of patch-clamp, FRET spectroscopy, data from previous EPR experiments and molecular and Brownian dynamics simulations. In our method, structural rearrangements of the protein can be measured in similar conditions as patch clamp recordings while controlling the state of the pore in its natural lipid environment by modifying lipid bilayer morphology. Transition to the open state is less dramatic than previously proposed, while the N-terminus is seen to be able to directly translate membrane tension to the conformation of the pore lining helix. Combining FRET data obtained in physiological conditions with simulations is likely to be of great value for studying conformational changes in a range of multimeric membrane proteins.