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Optimized viral potassium channels as biological nanopores

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Biological nanopores are optimized throughout evolution to be high efficient ion conductors. They are more selective and sensitive than any technical gadget. But in case of the robustness, they are only stable and functional in lipid bilayers and therefore they cannot be used as analytical and sensory tools. In contrast, synthetic nanopores which are fabricated in silicium and various synthetic materials are robust. But regarding their efficiency they are inferior to the biological nanopores, because of their low selectivity and sensitivity. The combination of both as a hybrid system by coupling biological and synthetic nanopores would lead to a new generation of analytical devices with an unmatched efficiency. One part of the project is to construct stable miniature bilayers with inserted ion channels, to produce small potassium channels with new sensor properties and to couple gateable proteins with synthetic pores. Small viral potassium channels are ideal components for synthetic sensors, which can detect medical relevant molecules. Their small size and their nearly identical homologs facilitate to a good understanding of their electrophysiological properties and gating behavior. By using protein engineering it is possible to equip these ion channels with new gating and sensor properties.