Biomimetic nanopores for understanding the Nuclear Pore Complex

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The nuclear pore complex (NPC) provides selective bidirectional transport of proteins and RNAs between the nucleus and cytoplasm.[1] Transport is mediated by a permeability barrier consisting of various nuclear pore proteins (nucleoporins) termed FG-Nups, which contain tandem 'Phe-Gly' motifs.[2]

To understand this complex transport phenomenon, we developed an artificial minimalistic NPC in a bottom-up approach.[3] We show selective transport of proteins (Kap95) across individual biomimetic NPCs at the single-molecule level, which are constructed by covalently tethering purified yeast FG-Nups to a solid-state nanopore.[4] Electrophysiological measurements are performed to monitor and quantitatively characterize individual translocation events. Binding kinetics between FG-Nups and transport carriers are further explored by using a quartz crystal microbalance in dissipative mode (QCM-D).[5] Finally, MD-simulations and Cryo-EM imaging are used as complementing techniques to investigate FG-Nups structural arrangement inside the nanopore.

References

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