

### **Description of Additional Supplementary Files**

File Name: Supplementary Movie 1

Description: Coarse-grained 6HB simulated in 0.3 M NaCl. This trajectory slice represents 30 ns of simulation time.

File Name: Supplementary Movie 2

Description: Coarse-grained 6HB simulated in 1.0 M NaCl. This trajectory slice represents 30 ns of simulation time.

File Name: Supplementary Movie 3

Description: Coarse-grained 6HB simulated in a POPC bilayer in 0.3 M NaCl solution. The clip corresponds to the first 100 ns of a single trajectory, sped up by a factor of 4.

File Name: Supplementary Movie 4

Description: Coarse-grained 6HB simulated in a POPC bilayer in 1.0 M NaCl solution. The clip corresponds to the first 100 ns of a single trajectory, sped up by a factor of 4.

File Name: Supplementary Movie 5

Description: Expulsion of 6HB from the POPC bilayer in 0.3 M NaCl solution. The clip is taken from a trajectory that featured an expulsion event, and corresponds to 400 ns of simulation time, sped up by a factor of 20.