Project

Molecular mechanisms underlying flagellar assembly and function in spirochetes

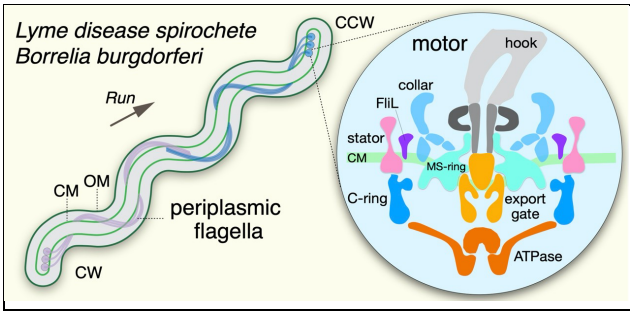

Figure 1. Lyme disease spirochete and its motility apparatus - periplasmic flagellum. A cartoon of the Lyme disease spirochete *Borrelia burgdorferi*. Periplasmic flagella are enclosed between cytoplasmic membrane (CM) and outer membrane (OM). The periplasmic flagella can rotate in CCW or CW direction. A flagellar motor model is shown on the right. Major components of the flagellar motor are highlighted: export apparatus (export gate and ATPase complex), stator, and C-ring.

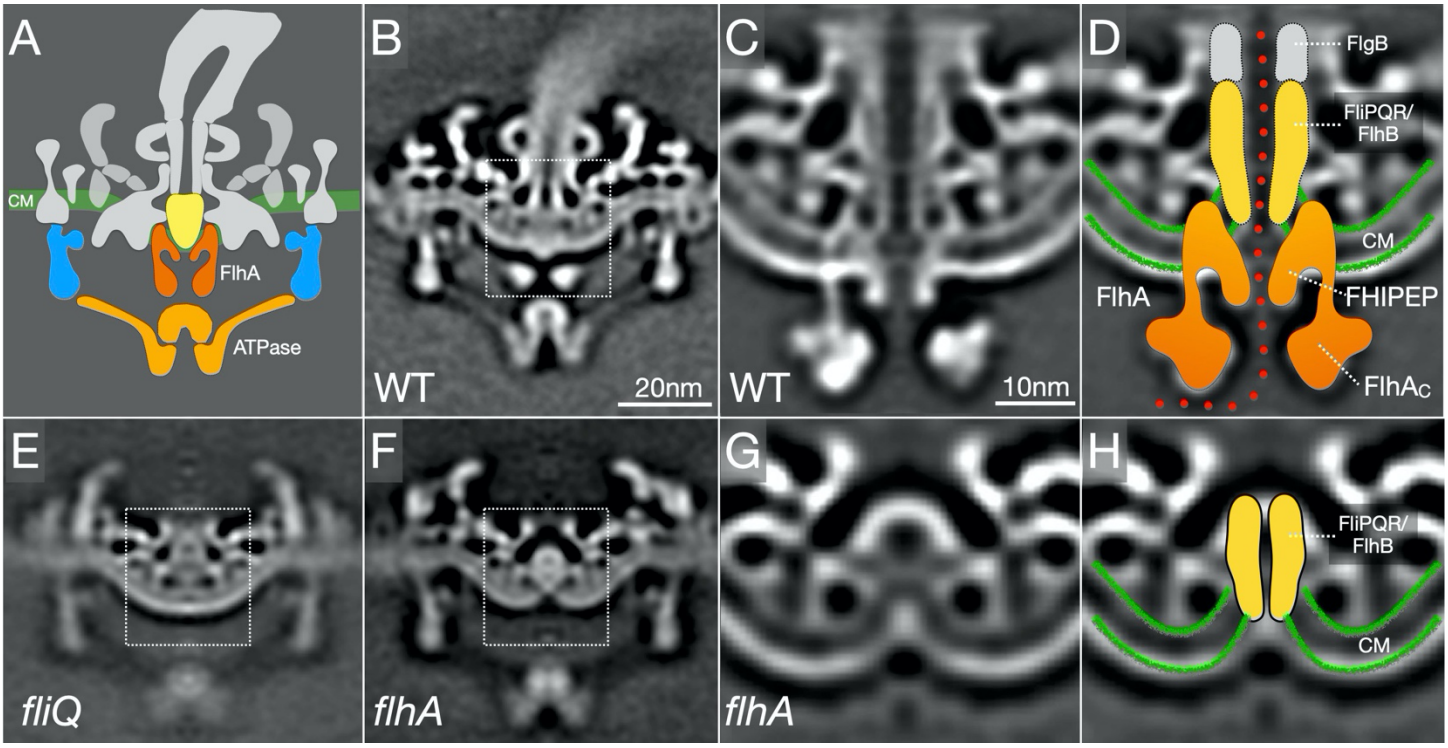

Figure 2. Characterization of the export gate complex. (A) A cartoon of the flagellar motor highlighting the export gate complex. (B) An overall structure of the WT motor. (C) Focused refinement shows detailed structure of the export gate embedded in the membrane. (D) Models of FlhA, FliPQR, and the cytoplasmic membrane (CM) are overlaid on the density map. Note that the FlhA and FliPQR channels appear open. (E) An overall structure of the Δ*fliQ* mutant motor. Note that the membrane is smooth. (F) An overall structure of the Δ*flhA* mutant motor. FlhA density is absent. (G) A zoom-in view of the Δ*flhA* motor shows profound remodeling of the membrane. The FliPQR complex looks strikingly different from that in the WT motor (C). (H) Models of FliPQR and CM are overlaid on the map.

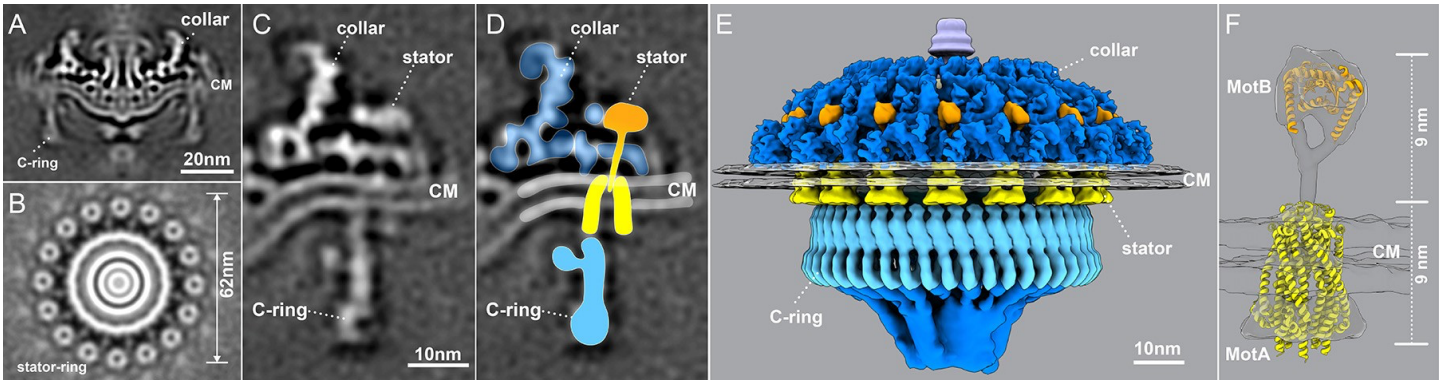

Figure 3. Stator complexes revealed *in situ*. (A, B) Two perpendicular sections of an intact motor structure reveal a 62 nm stator ring. (C) A zoom-in view of a stator complex embedded in the cytoplasmic membrane (CM). (D) Models of stator, C-ring, and collar are overlaid on the map. (E) Surface rendering of an intact motor. The stator complexes (colored in yellow and orange), collar (blue), and C-ring (cyan) are highlighted. (F) The stator complex adopts an extended conformation. Atomic models of stator proteins MotA and MotB are fitted into our *in-situ* map. High resolution *in-situ* structure is needed to understand the active state.