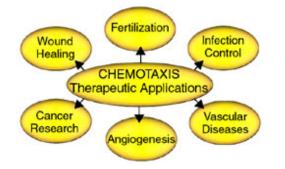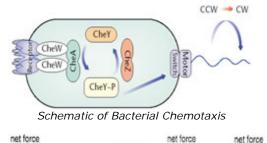# Cell Motility, Chemosensing and Chemotaxis

Many cells and all microorganisms move in response to their environments. Cells use membrane receptors for chemosensing the surroundings which stimulate signaling pathways in the cytoplasm. In bacterial cells chemosensing signaling cascades modulate the flagellar motor controlling the speed and direction of motion. In mammalian cells the signaling cascades rearrange the cytoskeletal structure, which pushes on the membrane to form protruding fillopodia and rearranges the membrane attachments to a substrate or stratum.
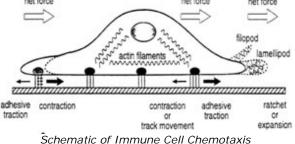
CFDRC has developed hierarchical integrative biology modeling tools of bacterial and immune cell chemotaxis. The high fidelity model will combine membrane chemosensing events, signaling pathways, cell energetics, species diffusion, electro chemo mechanics of molecular motors, and chemo-mechanics of flagellar rotation and cytoskeleton-membrane interaction dynamics.
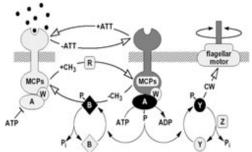
Examples of systems that we have modeled include E Coli chemotaxis and Neutrophil Chemotaxis.

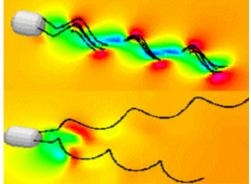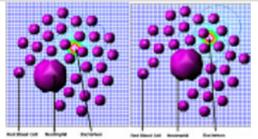Potential applications of an advanced chemotaxis model are plentiful:

Schematic of Bacterial Chemotaxis

Schematic of Immune Cell Chemotaxis

Chemotactic Signaling Pathway for E. Coli

4D Simulation of E. Coli Chemotaxis

4D Simulation of Human Neutrophil Chemotaxis

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