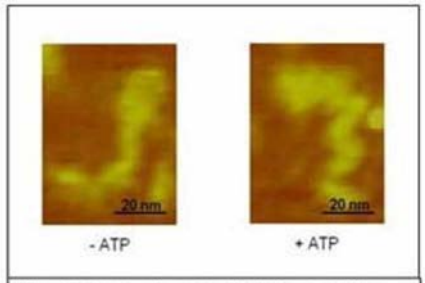
The overarching theme of my research is to better understand the molecular basis of myosin function. Myosins are ATP driven motor proteins. Conventional myosins (skeletal, smooth and cardiac myosin) form bipolar filaments and exert force thru these assemblies. Unconventional myosins such as myosin V and myosin VII function either as single molecules or assemblies in cells. Myosin VIIa is predominantly expressed in the inner ear and the retina, and mutations in the myosin VIIa gene are associated with the USHER 1B syndrome (congenital deafness and prepubertal onset of blindness) in humans and the shaker-1 phenotype in mice.



Atomic force microscopic image of the mouse myosin VIIa molecule

We are currently investigating the structure and function of the myosin VIIa motor protein. We use molecular biological techniques to engineer mutants and express the protein in a baculovirus/insect cell expression system. We study the ATP hydrolysis mechanism using steady-state and transient kinetic assays. I collaborate with Dr. Takeshi Sakamoto (Wayne State University) on the motility studies and with Dr. James Sellers (NIH/NHLBI), Dr. Neil Billington (NIH/NHLBI) and Dr. Attila Nagy (NIH/NHLBI) on the electron microscopy and atomic force microscopy studies.

Another project in the laboratory is studying the consequences of β-cardiac myosin mutations in cardiomyopathy in collaboration with Dr. Donald Winkelmann (Robert Wood Johnson Medical School).