Abstract Submitted
for the FWS17 Meeting of
The American Physical Society

Substrate mobility produces velocity time dependence in microtubule gliding JOSEPH LOPES, DAVID QUINT, University of California - Merced, DAIL CHAPMAN, University of California - Irvine, AJAY GOPINATHAN, Univ of California - Merced, LINDA HIRST, JING XU, University of California - Merced — Molecular motor based transport is critical for all eukaryotic cell function. Motors often work in small teams to transport a cargo in-vivo, however understanding the factors that control and regulate the group function of multiple motors bound to a lipid membrane remains a challenge. Here we couple kinesin motors to a lipid bilayer, utilizing the microtubule gliding assay, recording and analyzing gliding velocity as a function of time. We observe a constant gliding velocity on glass that is characteristic of solid substrates, while gliding on membrane resulted in a larger than two-fold increase in velocity. When microtubules are immobilized in the absence of ATP, microtubule-bound motors are observed to build up over time. We propose an analytical model relating time dependent motor protein density to microtubule velocity, giving us a motor disassociation rate and a mechanism for the observed velocity increase. Our results provide evidence that motors coupled to a fluid-like membrane exhibit significantly different gliding behavior than observed on rigid substrates such as glass and hypothesize that motor diffusion in the membrane may play a role in biological transport processes.

Joseph Lopes
University of California - Merced

Date submitted: 30 Sep 2017 Electronic form version 1.4