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Kinesin Motor Number Modulates the Effect of Load on Cargo Run Length JOHN WILSON, ARTURO ZARAGOZA, JING XU, University of California, Merced — Kinesin-1 is a major microtubule-based motor that drives long-range transport of cargos in living cells. The distance that kinesin transports its cargos (run length) is strongly hindered by the load the motor experiences. We previously found that load arising from the thermal diffusion of the cargo can significantly shorten run length when the cargo is carried by a single kinesin. It remains uncertain how such quantitative insights into single-molecule effects gleaned *in vitro* can be translated to the *in vivo* scenario; crucially, cargos in cells are often carried by small teams of motors rather than by a single motor. To close this gap, here we employed Monte Carlo-based simulations to quantify cargo transport by small teams of kinesin-1 under physiological loads. Our simulations utilize experimentally determined single-molecule characteristics of kinesin-1, include loads arising from both cargo diffusion and viscous drag, and encompass a wide range of local viscosities reported for living cells. We model the number of kinesins on the cargo using a Poisson distribution, with the mean motor number approximating the physiological range of 1-2 kinesins per cargo. Strikingly, although groups of kinesin-1 are thought to function non-cooperatively, our simulations indicate that modest increases in kinesin motor number substantially enhances the cargo run length under a variety of load conditions. Our results highlight the potential of kinesin motor number as an important control for cargo transport *in vivo*.

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