The Label-Free Quantification of Drug Permeability Coefficients across Lipid Bilayers

J. Cama, C. Chimerel, S. Pagliara, A. Javer and U.F. Keyser

Dept. of Physics, University of Cambridge – jc632@cam.ac.uk
(Address: Cavendish Laboratory, JJ Thomson Avenue, Cambridge CB3 0HE, UK)

Abstract

The recent surge in numbers of antibiotic resistant bacteria has stimulated interest in the mechanisms of antibiotic transport across cell membranes. We present a label-free microfluidic assay that quantifies the permeability coefficient of a broad spectrum fluoroquinolone antibiotic, Norfloxacin, as it diffuses across lipid membranes. Giant unilamellar vesicles are used as highly controlled model systems and the Norfloxacin molecules are tracked using their autofluorescence in the UV with a custom built UV epifluorescence microscope. We directly determine the permeability coefficient of the antibiotic without requiring knowledge of its partition coefficient. This technique can be further extended to quantify the effect of protein pores embedded in the membrane on drug diffusion.