Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Drug-Membrane Interactions Studied by Vibrational Sum-Frequency Spectroscopy LAUREN WOLF, KIMBERLY BRIGGMAN, NIST — The activity of a number of drugs depends directly on their interaction with cell membranes and, thus, an understanding of drug-membrane interactions is necessary for improving their pharmacological performance. Drug molecules can interact with membranes by directly binding to membrane-bound proteins or by intercalating into the lipid matrix itself, altering membrane properties such as fluidity, thickness, internal pressure, and phase transition temperature. Here, we focus on the effects of local anesthetics incorporated into the lipid matrix, studying the structural changes induced in supported lipid bilayers by vibrational sum-frequency spectroscopy (VSFS). We find that in addition to depressing the phase transition temperature of the lipid bilayers, most anesthetics also sharpen the gel to liquid- crystalline transition, suggesting an increase in membrane constituent cooperativity. This behavior contrasts the effects of cholesterol on lipid bilayers, which increases membrane rigidity and broadens the phase transition. The structure of the membrane-intercalated anesthetics themselves will also be discussed. This work demonstrates the potential of using supported lipid bilayers and surface-sensitive techniques for future pharmacological studies.

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Date submitted: 14 Jan 2008 Electronic form version 1.4