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***Molecular Partitioning Between Aqueous and Hydrophobic Environments***

The overall objective of this research is to explore and predict the thermodynamic consequences of functional group alterations in biphasic partitioning behavior of closely related solutes. The predominant focus of the research is the effect of the primary, secondary, and tertiary 7-amino group on coumarin molecules. Partitioning experiments across planar interfaces were performed but only the primary amine coumarins showed reproducible quantitative behavior. Temperature dependent studies yielded a change in enthalpy of 18.6 KJ/mol and a change in entropy of 65.3J/mol, revealing that solute migration from the aqueous to the nonpolar organic phase was endothermic but led to increased system disorder. The principle of biphasic partitioning was also examined in 2-dimensional systems using the interior of phospholipids vesicles as the hydrophobic medium. The primary amine coumarin, C151, in DLPC and DMPC vesicles was found to partition exclusively into an environment similar to that of ethyl ether instead of water or alkane. This result shows that the molecules are most likely setting within the vesicle bilayer. The tertiary amine coumarins, C152, was found to partition exclusively into the aqueous environment. Future work examining 2-dimensional partitioning will be performed using an in-house designed total reflection sample chamber that can be installed into our current steady-state fluorescence spectrometer.