[DeSensi et al., *Biophys. J.* **94**, 3798-3809 (2008)]. In this previous work, MD simulations were performed using the AMBER suite of programs, the all-atom AMBER99 force field, the particle mesh Ewald (PME) method for treating long-range electrostatic interactions, and the SPC/E water model. In order to test the effect of the water model used in the AMBER-based molecular dynamics simulations, calculations for a small nitroxide [3-hydroxymethyl-(1-oxy-2,2,5,5-tetramethylpyrroline) or 3MeOHSL] are being performed using a variety of different water models (SPC/E, TIP3P, TIP4P). The EPR spectra calculated from these molecular dynamics simulations of 3MeOHSL will be compared to experimental data.

1584-Pos Board B428

Simulation of Slow Motion EPR Spectra with a General Hindering Potential Expanded in Spherical Harmonics

Khaled Khairy[1], Piotr Fajer[2], David Budil[3].
[1]European Molecular Biology Laboratory, Heidelberg, Germany, [2]National High Magnetic Field Lab and Institute of Molecular Biophysics, Tallahassee, FL, USA, [3]Department of Chemistry and Chemical Biology, Boston, MA, USA.

Electron paramagnetic resonance (EPR) spectra are simulated by solving the stochastic Liouville equation (SLE) of motion with the incorporation of a hindering potential that restricts the Brownian rotational diffusion of the spin-label. Such a potential has been expanded in spherical harmonic functions in the past, under the assumptions of cylindrical and inversion symmetries appropriate for the description of liquid crystals and other ordered systems. In this work, the theory is formulated to allow for a general potential with no symmetry restrictions. This extends the utility of EPR as a structural tool, by facilitating its connection with molecular dynamics (MD),since the spectral simulation incorporates a more realistic representation of the complicated topology around the spin-label that is found in labeled biomolecules.

1585-Pos Board B429

Interaction of Antimalarial Drugs with DMPC Model Membranes

Luis G. Basso[1], Rose M. Naal[2], **Antonio J. Costa-Filho**[1].
[1]University of São Paulo, São Carlos, Brazil, [2]University of São Paulo, Ribeirão Preto, Brazil.

Primaquine Diphosphate (PQD) and Chloroquine Diphosphate (CQD) are potent therapeutic agents used in the treatment of malaria. The investigation of drug-lipid interactions is pivotal for understanding their biological activity. Electron Spin Resonance (ESR) and Differential Scanning Calorimetry (DSC) were used to investigate the effects of drug binding on the lipid phase transition and acyl chain dynamics of model membranes made up of 1,2-Dimyristoyl-sn-Glycero-3-Phosphocholine (DMPC) phospholipids. Labels located at different positions along the lipid chain were used to monitor different membrane regions. ESR results indicated that PQD is more effective in changing the membrane structure than CQD. PQD is effective in perturbing the whole chain of DMPC vesicles, whereas the effect of CQD is more pronounced near the polar headgroup region. Furthermore, the results showed a slight decrease of the membrane packing in DMPC gel phase for both drugs. However, PQD causes a slight increase of the lipid packing close to the membrane center, suggesting a deeper insertion of this molecule into DMPC bilayers. DSC thermograms revealed that PQD interacts with DMPC decreasing the main transition temperature (T_M) by ca. 2°C and completely abolishing its pre-transition. On the other hand, CQD effects are mainly noticed as a decrease in the cooperativity of the main transition. Because of its lipophilic character, PQD penetrates into the bilayer hydrocarbon region causing considerable disorganization. The higher polarity of CQD is probably related with its low membrane permeability. These results shed light on the molecular mechanism of drug-lipid interaction, which may be useful for the development of lipid drug delivery systems of antimalarial drugs. Acknowledgments: FAPESP, CNPq.

1586-Pos Board B430

Development of polymer-coated paramagnetic Implants for biomedical oximetry Applications

Ramasamy P. Pandian, Guruguhan Meenakshisundaram, Anna Bratasz, Edward Eteshola, Periannan Kuppusamy.
The Ohio State University, Columbus, OH, USA.

There are a variety of methods available for measuring and mapping of oxygen concentration in biological tissues. The particulate-based, electron paramagnetic resonance (EPR) oximetry is a powerful technology that allows non-invasive and repetitive monitoring of oxygenation in tissues. Lithium naphthalocyanine (LiNc) forms highly stable paramagnetic crystals which can be used for high resolution oximetry in tissues. To show efficient biocompatibility, long-term *in vivo* stability and responsiveness of LiNc oximetry probes, as well as for making the probes surgically implantable/ retrievable, we coated LiNc microcrystals with Teflon AF 2400 (TAF) polymeric materials. EPR linewidths of polymer-coated LiNc probes under anoxic conditions as well as at varying partial pressures of oxygen (pO_2) did not show appreciable change relative to uncoated LiNc particulates, yet the linewidth of coated LiNc crystals was linearly dependent on varying pO_2. The coated implantable probes responded to changes in pO_2 quickly and reproducibly, enabling dynamic measurements of oxygenation in real time. The implants were unaffected by biological oxidoreductants. The oxygen sensitivity and stability of the coated LiNc was demonstrated *in vivo* in mice for more than two months. Thus, new TAF polymer-coated LiNc crystals are potential candidates for future *in vivo* studies including clinical trials for oxygen measurements in pathophysiological tissues.

Vibrational Spectroscopy

1587-Pos Board B431

Monitoring of mechanically induced transitions in biology using Raman tweezers

Satish K. Rao[1], Stefan Balint[1], Benjamin Cossins[2], Victor Guallar[2], Dmitri Petrov[1].
[1]ICFO - The Institute of Photonic Sciences, Castelldefels, Spain, [2]Barcelona Supercomputing Center, Barcelona, Spain.

Biological systems function within a delicate balance between mechanical forces and chemical reactions. Some well-known examples are the stretching and twisting of DNA during its protein binding actions and protein conformational changes in response to biochemical processes. Indeed, most biological systems could act as mechanochemical transducers since many aspects of chemical binding and enzymatic processes involve changes in structure dimensions. In this work, optical tweezers are used to controllably apply forces to biological systems and the resulting chemical and structural changes are monitored using Raman spectroscopy. The forces are applied in vivo and simulate stretching and compression effects that are normally experienced by the matter.

The first result presented will be spectroscopic evidence of a transition between the oxygenation and deoxygenation states of hemoglobin that is induced through stretching of a red blood cell (1). The applied force mimics that which the cell undergoes mechanically as it passes through vessels and smaller capillaries. The transition is due to hemoglobin-membrane and hemoglobin neighbor-neighbor interactions that are enhanced upon stretching. The latter, lesser known effect is further studied by modeling the electrostatic binding of two of the protein structures using molecular dynamics methods.

This technique is also applied to study DNA stretching. Results will be presented that indicate conformational changes in the DNA structure that are evidenced through changes in its Raman spectrum, upon stretching. The typically low Raman scattering cross section of DNA is countered with the incooperation of silver colloids that enhance the scattered fields. The utilization of surface-enhanced Raman scattering (SERS) allows fast acquisition of spectra during the DNA intermediate stretched states which aides in elucidating its conformational change pathways.

1. S. Rao, et. al., Biophys. J., in press.

1588-Pos Board B432

Pressure-induced Conformational Changes in Poly-peptides and Protein Solutions Probed with Micro-Raman Spectroscopy

Sang Hoon Park, **Alfons Schulte**.
University of Central Florida, Orlando, FL, USA.

Functional properties of proteins and cells are affected by an elevated pressure environment. Combining Raman microscopy with a micro-capillary high pressure cell enables structural sensitive studies of small amounts of biological material using vibrational signatures. The cell contains less than 50 nano-liter of sample, and Raman spectra can be acquired from atmospheric pressure to 4 kBar. The resolution of the setup is evaluated by measuring the Raman spectrum of standard solutions. We investigate pressure effects of the Raman spectrum of poly(L-glutamic acid) and proteins in solution. Spontaneous Raman spectra of poly(L-glutamic acid) in D2O buffer (pH5.4) solution were measured at variable pressure. A shift of the amide I band in poly(L-glutamic acid) to lower frequency with pressure may suggest significant change in secondary structure towards a-helical conformation.