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Sandwiching of Caffeine Anticancer Agents in Aqueous Solution

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Sandwiching of Caffeine and Anticancer Agents in Aqueous Solutions

A Proposal for the Research and Creative Experience for Undergraduates (RCEU) Program, Summer 2018

Faculty Sponsors: Bernhard Vogler, PhD,

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Project Summary:

Introduction: It is known that if patients being treated with aromatic anticancer agents the efficacy of the drug is influenced by other aromatic compounds such as caffeine. It is speculated that the effect is due to stacking of the hydrophobic compounds in an aqueous environment.

Research Plan:

Aromatic anticancer agents will be co-mixed with various concentrations of caffeine, subsequently the relaxation times of the resulting complexes and their diffusion behavior will be measured. This will lead to binding curves.

Student Duties:

Prepare different concentrations of aromatic concentrations to study self-assembly of aromatic entities in aqueous solution. Monitor self-assembly using relaxation studies and diffusion behavior. Subsequently mix various concentrations of caffeine with the respective drugs to see the influence of stacking.

Tentative plan for the 10 week schedule:

- week 1/2: familiarization with NMR measurements in general.
- week 3/4: Self assembly studies establishing concentration curves .
- week 5/6: Preparation and measurement of caffeine/drug mixtures.
- week 7/8: analysis of data sets.
- week 9/10: refine measurements.

Manuscript preparation:

Dr. Vogler encourages all undergraduate student researchers to write up their results in the form of a manuscript for publication. The RCEU participant, under the supervision of Dr. Vogler, will help prepare the manuscript(s), which may include data from other undergraduate or graduate students.

Expected Student Background :

Students should have good background in General Chemistry, knowledge of Organic Chemistry is advantageous, so typically students with a major in Biology, Chemistry, and or Chemical Engineering should be ok. Previous exposure to analytical instrumentation is a clear benefit.

Expected results and deliverables:

The student will be exposed to important instrumental techniques such as mass spectrometric analysis, NMR analysis, preparation of samples in smallest concentrations, error analysis, literature studies. Exposure to state of the art instrumental techniques will greatly enhance any students' career chances in chemistry or related disciplines. Instrumental skills are highly regarded.

Faculty Supervision and Mentoring:

NMR measurements will be supervised by Dr. Vogler. Manuscript preparation will be supervised by Dr. Vogler. We will hold regular group meetings weekly. The student will have access to the instructor at least once a day.