**Title and Subtitle:**
Effects of Pressure on Lipid Lateral Distribution in Membranes

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**Abstract:**
This final report summarizes the work being completed in the funding period (7.1.1988-6.30.1991). Ten papers have been published as the result of the ARO support. The most important results are summarized as follows. The Birks model is not good for describing the pyrene fluorescence in membranes. We have developed a better model and have used this new model to study the lateral distribution and lateral diffusion coefficient of pyrene-10-phosphatidylcholine in dimyristoyl phosphatidylcholine vesicles. We continue to work on this subject, namely, the effects of pressure on lipid lateral distribution in membranes.
Final Report

1. ARO Proposal Number: 25506-LS-H

2. Period Covered by Report: 7/1/88 - 6/30/91

3. Title of Proposal: Effects of Pressure on Lipid Lateral Distribution in Membranes.

4. Grant Number: DAAL03-88-G-0018

5. Names of Institution: Meharry Medical College & Mount Sinai Medical Center

6. Principal Investigators: Dr. Parkson Lee-Gau Chong (P.I.) Meharry Medical College
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7. Progress Report Date: October 10, 1991

8. Progress Has Been Made

   A. Statement of the Problem Studied

The goals of this research are:

(i) to develop a general method describing the relationship between the photophysical model and the fluorescence parameter,

(ii) to use this general method to evaluate the adequacy of the Birks model in describing pyrene fluorescence,

(iii) to use this general method to derive a new model which can satisfactorily describe pyrene fluorescence in membrane systems,
(iv) to use the new model to determine the lateral distribution of pyrene-labeled phosphatidylcholine in membranes,

(v) to determine the lateral distribution of pyrene-labeled lipids in membranes at high pressures, and

(vi) to study other membrane phenomena at high pressures.

B. Summary of the Most Important Results

(i) The Birks model proved to be failed in the case of membrane systems. We have demonstrated that the three-excited model proposed in our paper provides a better description of pyrene fluorescence in membranes.

(ii) Based on the three-state model, the lateral diffusion coefficient of the pyrene-labeled phosphatidylcholine is determined to 23 \( \mu m^2/sec \) in the liquid crystalline phase of dimyristoylphosphatidylcholine vesicles and 2.6 \( \mu m^2/sec \) in the gel phase.

(iii) The implication of our data is that the fluorescence data of a membrane probe depends on the lateral distribution of the probe molecule in the membrane, and

(iv) It is found that pressure assists ethanol in forming the highly ordered interdigitated gel state of dipalmitoylphosphatidylcholine. The pharmacological implication is that ethanol toxicity in terms of lipid interdigitation will be enhanced under pressure.

C. List of All Publications and Technical Reports


D. Scientific Personnel Supported by this Project and Degrees Awarded during this Reporting Period

Mr. Junwen Zeng, a graduate research assistant (100% time)
Ms. Yvonne L. Kao, a graduate research assistant (10% time)
---No degree was awarded during this reporting period.