State of California
AIR RESOURCES BOARD

Resolution 03-35

December 11, 2003

Agenda Item No.: 03-10-5

WHEREAS, the Air Resources Board has been directed to carry out an effective research program in conjunction with its efforts to combat air pollution, pursuant to Health and Safety Code sections 39700 through 39705;

WHEREAS, a research proposal, number 2539-232, entitled "Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones," has been submitted by the University of California, Riverside.

WHEREAS, the Research Division staff has reviewed and recommended this proposal for approval; and

WHEREAS, the Research Screening Committee has reviewed and recommends for funding:

> Proposal Number 2539-232 entitled "Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones," submitted by the University of California, Riverside, for a total amount not to exceed $120,000.

NOW, THEREFORE BE IT RESOLVED, that the Air Resources Board, pursuant to the authority granted by Health and Safety Code section 39703, hereby accepts the recommendation of the Research Screening Committee and approves the following:

> Proposal Number 2539-232 entitled "Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones," submitted by the University of California, Riverside, for a total amount not to exceed $120,000.

BE IT FURTHER RESOLVED, that the Executive Officer is hereby authorized to initiate administrative procedures and execute all necessary documents and contracts for the research effort proposed herein, and as described in Attachment A, in an amount not to exceed $120,000.

ATTACHMENT A

"Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones"

Background
Exposure to fine particulate matter in ambient air has been associated with high rates of morbidity and mortality. Although the causes are not established, much of these health effects may be due to quinones residing on the particles. After inhalation, quinones can generate large amounts of toxic 'reactive oxygen species' that can overwhelm cellular defenses. PAH-quinones, which are formed from atmospheric reactions of polycyclic aromatic compounds (PAHs) present in vehicle exhaust, may have significant consequences for the health of Californians.

Objective
The objective of this study is to evaluate the potential for atmospheric reactions to contribute to PAH-quinone exposure by:
1) assessing the formation of PAH-quinones from the atmospheric reactions of naphthalene, alkyl-naphthalenes, and phenanthrene; and
2) identifying the dimethyl-nitro-naphthalenes formed from atmospheric reactions of dimethyl-naphthalenes and studying their photolysis products, which are expected to include quinones.

Methods
PAHs will be chosen based upon their abundance in ambient air, and photolyzed in an environmental chamber. The investigators will screen the products derived from these reactions for the presence of quinones. The investigators will also screen for quinone products from the reaction of phenanthrene with the nitrate radical and with ozone, as well as from the photolysis products of nitronaphthalenes. Based on the screening experiments, the investigators will conduct further experiments on those PAHs that show the highest abundance of tentative quinone products.

Expected Results
Products of reactions of likely PAH-quinone precursors will be analyzed, with an emphasis on the quinones. Sufficient quantities of PAH-quinones will be produced to allow isomer-specific identification of the quinone products. If possible, the rate and extent of quinone formation will be determined.

Significance to the Board
Several researchers have been referring to the hypothesis that much of the high morbidity and mortality associated with fine particulate matter may be due to quinones. Also, significant airborne levels of quinones may derive from PAHs emitted by motor vehicles, particularly diesel-powered vehicles. This study will provide important information to help staff understand the role of atmospheric reactions in the production of PAH-quinones. The resulting data will be needed for future assessment of the potentially significant health risk to California residents that is associated with emissions of traffic-derived PAHs.

Contractor:
University of California, Riverside

Contract Period:
24 months

Principal Investigators (PIs):
Janet Arey and Roger Atkinson

Contract Amount:
$120,000

Cofunding:
none

Basis for Indirect Cost Rate:
The State and UC System have agreed to a ten percent indirect cost rate.

Past Experience with these Principal Investigators:
The PIs have consistently provided high-quality, cost-effective research results for the ARB. Their lab has state-of-the art environmental chambers for their proposed experiments, as well as access to extensive analytical instrumentation. They have successfully used their environmental chambers and appropriate analytic instrumentation in previous ARB contracts to characterize important PAH reaction products.

BUDGET SUMMARY

University of California, Riverside

"Polycyclic Aromatic Hydrocarbons (PAHs): Sources of Ambient Quinones"

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	83,278	
2.	Subcontractors	$	0	
3.	Equipment	$	0	
4.	Travel and Subsistence	$	0	
5.	Electronic Data Processing	$	0	
6.	Reproduction/Publication	$	0	
7.	Mail and Phone	$	0	
8.	Supplies	$	22,397	
9.	Analyses	$	0	
10.	Miscellaneous	$	3,416	
	Total Direct Costs			$ 109,091
INDIRECT COSTS				
1.	Overhead	$	10,909	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$ 10,909
TOTAL PROJECT COSTS				**$ 120,000**