State of California
AIR RESOURCES BOARD

RESEARCH PROPOSAL

Resolution 11-6

February 24, 2011

Agenda Item No.: 11-1-1

WHEREAS, the Air Resources Board (ARB or 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 2715-269, entitled "Persistent Immune Effects of Wildfire Particulate Matter (PM) Exposure During Childhood Development," has been submitted by the University of California, Davis;

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 2715-269 entitled "Persistent Immune Effects of Wildfire PM Exposure During Childhood Development," submitted by the University of California, Davis, for a total amount not to exceed $268,029.

NOW, THEREFORE, BE IT RESOLVED that ARB, 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 2715-269 entitled "Persistent Immune Effects of Wildfire PM Exposure During Childhood Development," submitted by the University of California, Davis, for a total amount not to exceed $268,029.

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 $268,029.

I hereby certify that the above is a true and correct copy of Resolution 11-6, as adopted by the Air Resources Board.

Mary Alice Morency, Clerk of the Board

ATTACHMENT A

"Persistent Immune Effects of Wildfire PM Exposure during Childhood Development"

Background
Little is known about whether air pollution exposure during early life has life-long impacts. Some have speculated that air pollution exposure during the early childhood lung development period could alter lung and immune system development in ways that increase susceptibility to lung-related morbidity later in life.

Objective
The primary objective of this proposal is to determine the impact of early life exposure to ambient ozone and wildfire PM on development of lung function and immune parameters that modulate responses to infectious disease. The specific objectives are: (1) to determine if the peripheral blood response to Toll-like receptor ligands has been persistently modulated with combined episodic ozone and PM exposure during early childhood, and (2) to determine if lung function and mechanics have been persistently compromised with combined episodic ozone and PM exposure.

Methods
The study will involve a cohort of rhesus macaque monkeys that were born within the three months prior to the summer wildfires of July 2008 and have always lived outdoors. The development of lung function and several aspects of the immune system of these animals will be compared to cohorts of animals of the same age that were born outdoors the following year, and to animals of the same age that were born and raised under specific pathogen free conditions indoors. The monkeys will undergo lung function testing and peripheral blood draws. The investigators will assess whether ambient ozone and PM exposures alter inflammatory mediator production (interleukins 6 and 8) that is controlled through signaling pathways regulated by Toll-like receptors 3, 4, and 5 in peripheral blood samples, and standard lung function and airway reactivity studies. All animals are housed at the California National Primate Research Center at the University of California, Davis. This is a non-terminal and minimally invasive experiment.

Expected Results
The study is expected to show whether exposure to high levels of ambient ozone and PM during the early childhood period of rapid lung and immune system growth leads to persistent effects that could affect health later in life.

Significance to the Board
The hypothesis and objectives address important gaps in the literature on the effects of ozone and PM on lung and immune system development in children. This project also addresses the policy question of whether or not the existing ambient air quality standards are adequate to protect the health of infants and children, as required by Senate Bill 25, the Children's Environmental Health Protection Act.

Contractor:
University of California, Davis

Contract Period:
24 months

Principal Investigator (PI):
Lisa A. Miller, Ph.D.

Contract Amount:
$268,029

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

Past Experience with this Principal Investigator:
The PI was a contributor to a past ARB-funded study and performed her portion of the work to a high standard of quality. She has published a number of peer-reviewed papers, and is well regarded in the scientific community.

Prior Research Division Funding to the University of California, Davis:

Year	2009	2008	2007
Funding	$1,588,387	$1,419,135	$ 773,346

BUDGET SUMMARY

Contractor: University of California, Davis

"Persistent Immune Effects of Wildfire PM Exposure during Childhood Development"

DIRECT COSTS AND BENEFITS				
1.	Labor and Employee Fringe Benefits	$	93,241	
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	$	45,515[1]	
9.	Analyses	$	83,048[2]	
10.	Miscellaneous	$	21,859[3]	
	Total Direct Costs			$243,663
INDIRECT COSTS				
1.	Overhead	$	24,366	
2.	General and Administrative Expenses	$	0	
3.	Other Indirect Costs	$	0	
4.	Fee or Profit	$	0	
	Total Indirect Costs			$24,366
TOTAL PROJECT COSTS				**$268,029**

Notes: all costs are the total for 100 animals.

1. Materials and Supplies: Cell culture supplies (plasticware, cell culture media, toll-like receptor ligands): $31,515. ELISA reagents: plates/antibodies for IL-8 and IL-6 protein analyses: $10,000. Blood collection fee: animal care staff are required to draw blood from the animals: $4000.

2. Analyses: Airway responsiveness testing: $40,534. Static Lung Mechanics Testing: $8,303. Peripheral blood processing: $10,161. Toll-like receptor assay: $14,800. ELISA assay: $9,250.

3. Miscellaneous: Veterinary anesthesia for lung function tests: $21,859.