



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON D.C., 20460

OFFICE OF  
PREVENTION, PESTICIDES AND TOXIC  
SUBSTANCES

March 6, 2008

**MEMORANDUM**

**SUBJECT:** Transmittal of Meeting Minutes of the FIFRA Scientific Advisory Panel Meeting Held February 5-8, 2008 on the Agency's Proposed Action under FIFRA 6(b) Notice of Intent to Cancel Carbofuran

**TO:** Debbie Edwards, Ph.D.  
Director  
Office of Pesticide Programs

**FROM:** Sharlene R. Matten, Ph.D.  
Designated Federal Official  
FIFRA Scientific Advisory Panel  
Office of Science Coordination and Policy

A handwritten signature in black ink, appearing to read "S. R. Matten".

**THRU:** Steven Knott, Executive Secretary  
FIFRA Scientific Advisory Panel  
Office of Science Coordination and Policy

A handwritten signature in black ink, appearing to read "Steven M. Knott".

Elizabeth Resek  
Acting Director  
Office of Science Coordination and Policy

A handwritten signature in black ink, appearing to read "Elizabeth Resek".

Attached, please find the meeting minutes of the FIFRA Scientific Advisory Panel open meeting held in Arlington, Virginia on February 5-8, 2008. This report addresses a set of scientific issues being considered by the Environmental Protection Agency's proposed action under FIFRA 6(b) Notice of Intent to Cancel Carbofuran

Attachment

cc:

James B. Gulliford  
James J. Jones  
Anne Lindsay  
William Jordan  
Margie Fehrenbach  
Donald Brady  
Janet Andersen  
Steven Bradbury  
William Diamond  
Tina Levine  
Lois Rossi  
Frank Sanders  
Richard Keigwin  
Enesta Jones  
Vanessa Vu (SAB)  
OPP Docket

John P. McCarty, Ph.D.  
Cheryl R. Montgomery, Ph.D.  
Nu-may Ruby Reed, Ph.D., D.A.B.T.  
Bradley E. Sample, Ph.D.  
Donald W. Sparling, Ph.D.  
Audra Stinchcomb, Ph.D.

**FQPA Science Review Board Members**

Steven G. Heeringa, Ph.D. (FIFRA SAP Chair)  
John R. Bucher, Ph.D., D.A.B.T.  
Janice E. Chambers, Ph.D., D.A.B.T.,  
A.T.S.  
Stuart Handwerger, M.D.  
Gary Isom, Ph.D.  
Kenneth M. Portier, Ph.D.  
Daniel Schlenk, Ph.D.

**FQPA Science Review Board Members**

Theodore B. Bailey, Ph.D.  
William S. Brimijoin, Ph.D.  
Annette L. Bunge, Ph.D.  
Larry Clark, Ph.D.  
Peter Delorme, Ph.D.  
Lutz Edler, Ph.D.  
Christian Grue, Ph.D.  
Dale Hattis, Ph.D.  
Elwood Hill, Ph.D.  
James P. Kehrer, Ph.D.  
Chensheng Lu, Ph.D.  
Peter D.M. Macdonald, D. Phil., P. Stat.

**SAP Minutes No. 2008-02**

**A Set of Scientific Issues Being Considered by the  
Environmental Protection Agency Regarding:**

**The Agency's Proposed Action Under FIFRA 6(b)  
Notice of Intent to Cancel Carbofuran**

**February 5-8, 2008  
FIFRA Scientific Advisory Panel Meeting  
held at the  
Environmental Protection Agency Conference Center  
Arlington, Virginia**

## NOTICE

These meeting minutes have been written as part of the activities of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA), Scientific Advisory Panel (SAP). The meeting minutes represent the views and recommendations of the FIFRA SAP, not the United States Environmental Protection Agency (Agency). The content of the meeting minutes does not represent information approved or disseminated by the Agency. The meeting minutes have not been reviewed for approval by the Agency and, hence, the contents of these meeting minutes do not necessarily represent the views and policies of the Agency, nor of other agencies in the Executive Branch of the Federal government, nor does mention of trade names or commercial products constitute a recommendation for use.

The FIFRA SAP is a Federal advisory committee operating in accordance with the Federal Advisory Committee Act and established under the provisions of FIFRA as amended by the Food Quality Protection Act (FQPA) of 1996. The FIFRA SAP provides advice, information, and recommendations to the Agency Administrator on pesticides and pesticide-related issues regarding the impact of regulatory actions on health and the environment. The Panel serves as the primary scientific peer review mechanism of the Environmental Protection Agency, Office of Pesticide Programs (OPP), and is structured to provide balanced expert assessment of pesticide and pesticide-related matters facing the Agency. FQPA Science Review Board members serve the FIFRA SAP on an ad hoc basis to assist in reviews conducted by the FIFRA SAP. Further information about FIFRA SAP reports and activities can be obtained from its website at <http://www.epa.gov/scipoly/sap/> or the OPP Docket at (703) 305-5805. Interested persons are invited to contact Sharlene R. Matten, Ph.D., SAP Designated Federal Official, via e-mail at [matten.sharlene@epa.gov](mailto:matten.sharlene@epa.gov).

In preparing these meeting minutes, the Panel carefully considered all information provided and presented by EPA, as well as information presented in public comment. This document addresses the information provided and presented by EPA within the structure of the charge.

## TABLE OF CONTENTS

NOTICE .....	1
TABLE OF CONTENTS.....	3
INTRODUCTION.....	7
PUBLIC COMMENTERS .....	9
SUMMARY OF PANEL DISCUSSION AND RECOMMENDATIONS.....	11
ECOLOGICAL RISK SECTION DETAILED RESPONSES TO CHARGE QUESTIONS.....	16
1. TERRESTRIAL MODEL VERSION EFFECTS ON RISK CONCLUSIONS.....	16
2. ANALYSIS OF NEW DATA IMPACTS.....	18
2a. <i>Avoidance of Pesticide Treated Food</i> .....	19
2b. <i>The Role of Dietary Matrix in Acute Toxicity</i> .....	27
2c. <i>Estimates of Carbofuran Acetylcholinesterase Recovery Kinetics</i> .....	28
2d. <i>Quantitative Results of New Data</i> .....	30
3. INTERPRETATION OF INCIDENT REPORTS.....	34
4. INTERPRETATION OF FIELD STUDIES AND MONITORING EFFORTS.....	36
5. RISKS OF MORTALITY TO BIRDS IN AND AROUND A CARBOFURAN-TREATED USE SITE.....	41
HUMAN HEALTH RISK SECTION DETAILED RESPONSES TO CHARGE QUESTIONS.....	47
1. POINT OF DEPARTURE (POD) AND FQPA SAFETY FACTOR DETERMINATION FOR DIETARY RISK ASSESSMENT FOR INFANTS AND CHILDREN.....	47
1a. <i>New Comparative Acetylcholinesterase (AChE) Studies</i> .....	47
1b. <i>Experimental Dose-Time-Response Model and the Derivation of BMD<sub>10</sub></i> .....	50
1c. <i>Red Blood Cell (RBC) and Brain Acetylcholinesterase (AChE) Inhibition</i> .....	55
1d. <i>Safety Factors in the FQPA Analysis</i> .....	57
2. POINT OF DEPARTURE (POD) DETERMINATION FOR DERMAL RISK ASSESSMENT FOR WORKERS	62
REFERENCES.....	67

**SAP Minutes No. 2008-02**

**A Set of Scientific Issues Being Considered by the  
Environmental Protection Agency Regarding:**

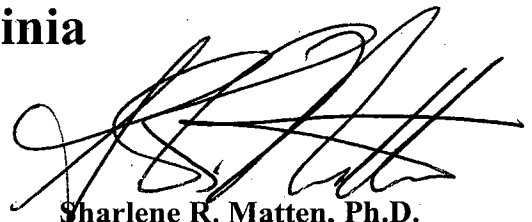
**The Agency's Proposed Action Under FIFRA 6(b)  
Notice of Intent to Cancel Carbofuran**

**February 5-8, 2008  
FIFRA Scientific Advisory Panel Meeting  
held at the  
Environmental Protection Agency Conference Center  
Arlington, Virginia**



**Steven G. Heeringa, Ph.D.  
FIFRA SAP Chair  
FIFRA Scientific Advisory Panel**

**Date: MAR 6 2008**



**Sharlene R. Matten, Ph.D.  
Designated Federal Official  
FIFRA Scientific Advisory  
Panel Staff**

**Date: MAR 6 2008**

**Federal Insecticide, Fungicide, and Rodenticide Act**  
**Scientific Advisory Panel Meeting**  
**February 5-8, 2008**

**The Agency's Proposed Action Under FIFRA 6(b) Notice of Intent to Cancel  
Carbofuran**

**PARTICIPANTS**

**FIFRA SAP Chair**

**Steven G. Heeringa, Ph.D.**, Research Scientist & Director for Statistical Design, University of Michigan, Institute for Social Research, Ann Arbor, MI

**Designated Federal Official**

**Sharlene R. Matten, Ph.D.**, FIFRA Scientific Advisory Panel, Office of Science Coordination and Policy, EPA

**FIFRA Scientific Advisory Panel Members**

**Janice E. Chambers, Ph.D., D.A.B.T., A.T.S.**, Director, Center for Environmental Health Sciences, College of Veterinary Medicine, Mississippi State University, Mississippi State, MS

**Stuart Handwerger, M.D.**, Professor of Pediatrics, University of Cincinnati Children's Hospital Medical Center, Cincinnati, OH

**Gary E. Isom, Ph.D.**, Professor of Toxicology, Department of Medicinal Chemistry and Molecular Pharmacology, School of Pharmacy & Pharmaceutical Sciences, Purdue University West Lafayette, IN

**Kenneth M. Portier, Ph.D.**, Program Director, Statistics, American Cancer Society, Statistics and Evaluation Center, Atlanta, GA

**Daniel Schlenk, Ph.D.**, Professor, Aquatic Toxicology, Department of Environmental Sciences, University of California, Riverside, CA

**FQPA Science Review Board Members**

**Theodore B. Bailey, Ph.D.**, Professor of Statistics, Iowa State University, Ames, IA

**William S. Brimijoin, Ph.D.**, Chair, Department of Molecular Pharmacology and Experimental Therapeutics, Mayo Foundation, Rochester, MN

**Annette L. Bunge, Ph.D.**, Professor Emeritus, Department of Chemical Engineering, Colorado School of Mines, Golden, CO

**Larry Clark, Ph.D.**, Assistant Director, National Wildlife Research Center, Fort Collins, CO

**Peter Delorme, Ph.D.**, Senior Science Advisor, Environmental Assessment Directorate, Pest Management Regulatory Agency, Health Canada, Ottawa, Ontario, CANADA

**Lutz Edler, Ph.D.** Head, Biostatistics Unit, German Cancer Research Center, Heidelberg, GERMANY

**Christian Grue, Ph.D.**, Leader, Washington Cooperative Fish and Wildlife Research Unit, School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA

**Dale Hattis, Ph.D.**, Research Professor, Center for Technology, Environment and Development (CENTED), George Perkins Marsh Institute, Clark University, Worcester, MA

**Elwood Hill, Ph.D.**, Wildlife Toxicologist, Gardnerville, NV

**James, P. Kehrer, Ph.D.**, Dean of the College of Pharmacy, Washington State University, Pullman, WA

**Chensheng Lu, Ph.D.**, Assistant Professor, Department of Environmental and Occupational Health, Rollins School of Public Health, Emory University, Atlanta, GA

**Peter D.M. Macdonald, D.Phil., P.Stat.**, Professor of Mathematics and Statistics, McMaster University, Hamilton, Ontario, CANADA

**John P. McCarty, Ph.D.**, Professor of Biology, Director of Environmental Studies, Department of Biology, University of Nebraska at Omaha, Omaha, NE

**Cheryl R. Montgomery, Ph.D.**, Principal Scientist, Montgomery & Associates, Inc., Arlington, MA

**Nu-may Ruby Reed, Ph.D., D.A.B.T.**, Staff Toxicologist, Department of Pesticide Regulation, California EPA, Sacramento, CA

**Bradley E. Sample, Ph.D.**, Research Scientist, CH2M HILL, Sacramento, CA

**Donald W. Sparling, Ph.D.**, Associate Professor, Cooperative Wildlife Research Laboratory, Department of Zoology, Southern Illinois University Carbondale, Carbondale, IL

**Audra Stinchcomb, Ph.D.**, Assistant Professor, Department of Pharmaceutical Sciences, University of Kentucky, Lexington, KY

## INTRODUCTION

The Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) Scientific Advisory Panel (SAP) has completed its review of **The Agency's Proposed Action Under FIFRA 6(b) Notice of Intent to Cancel Carbofuran**. Advance notice of the SAP meeting was published in the *Federal Register* on **November 20, 2007**. The review was conducted in an open panel meeting February 5-8, 2008 held in Arlington, Virginia. Dr. Steven G. Heeringa chaired the meeting. Dr. Sharlene R. Matten served as the Designated Federal Official. Dr. Debbie Edwards, Director, Office of Pesticide Programs (OPP), provided opening remarks at the meeting. Dr. Steven Bradbury, Director of the Special Review and Reregistration Division, OPP, provided an overview of the goals and objectives for the meeting. Jude Andreasen provided an introduction and background of the carbofuran regulatory history. Dr. Donald Brady, Director of the Environmental Fate and Effects Division provided an overview of the carbofuran ecological risk issues to be considered. Jack Housenger, Associate Director of the Health Effects Division provided an overview of the carbofuran human health risk issues to be considered. Presentations of technical background materials were provided by Dr. Edward Odenkirchen, Dr. Melissa Panger, and Dr. Christopher Salice of the Environmental Fate and Effects Division, OPP and by Dr. Anna Lowit and Dr. Elissa Reaves of the Health Effects Division, OPP. Additional technical clarifications by EPA were provided by Dr. Woodrow Setzer (EPA-Office of Research and Development (ORD)-National Center for Computational Toxicology (NCCT) and Dr. Virginia Moser, EPA-ORD-National Health and Environmental Effects Research Laboratory (NHEERL) and by John Liccione and Jeffrey Dawson of the Health Effects Division, OPP. William Jordan, Senior Policy Advisor, OPP, also provided clarifying remarks.

Carbofuran is an *N*-methyl carbamate (NMC) pesticide. Like other NMCs, carbofuran causes neurotoxicity through the inhibition of acetylcholinesterase (AChE). Inhibition of AChE is the critical toxic effect for evaluating human health risk to carbofuran. A key aspect of the toxicity profile of carbofuran is the rapid onset of toxicity followed by rapid recovery. In 2006, the Health Effects Division (HED) and the Environmental Fate and Effects Division (EFED) of the Office of Pesticide Programs (OPP) developed human health and environmental risk assessments for carbofuran. The human health assessment evaluated exposure to and risk from food and water in a variety of age groups and from occupational activities. At that time, the Agency identified risks that exceeded the level of concern from dietary exposure to food and water as well as from occupational exposures. The environmental risk assessment identified risks to wildlife, particularly birds. These identified risks led the Agency to determine that carbofuran was ineligible for reregistration in August, 2006.

As required by FIFRA, EPA asked the SAP to address whether the Agency has reasonably assessed carbofuran's impact on health and the environment based on the available data, as outlined in the draft Notice of Intent to Cancel Carbofuran (NOIC) and supporting documents. EPA interpreted this statutory directive to mean that the SAP review should focus on providing comments about whether EPA has reasonably assessed the nature and magnitude of potential risks to public health and the environment posed by the use of the pesticides that are the subject of a draft NOIC. Most of the methods and approaches used and policies followed in EPA's carbofuran risk assessments have already been through extensive peer review. At those SAP

meetings, EPA requested and received detailed recommendations regarding the types of information to be used in risk assessment, as well as how to analyze the data. Consequently, the Agency did not ask the Panel to comment on such previously peer reviewed aspects of the carbofuran risk assessment. In addition, unlike those previous SAP meetings, at this meeting the Agency did not ask for (and the statute does not require) the SAP to provide advice and recommendations on a new scientific methodology or whether the scientific basis for a regulatory decision could benefit from additional data. In addition, the Agency posed human health and environmental charge questions to the Panel regarding new data that became available since the Interim Reregistration Eligibility Document (August 2006) was signed or where new analyses had been performed that affected the carbofuran risk assessments.

## **PUBLIC COMMENTERS**

### **Oral statements were presented by:**

- 1) John Cummings, Ph.D., FMC Agricultural Products Group, on behalf of FMC Corporation
- 2) Keith Solomon, Ph.D., University of Guelph, on behalf of the FMC Corporation Avian Risk Assessment Expert Panel
- 3) Dwayne Moore, Ph.D., Intrinsik Environmental, Inc., on behalf of FMC Corporation's Carbofuran Avian Risk Assessment Expert Panel
- 4) James Lamb IV, Ph.D., D.A.B.T., F.A.T.S., The Weinberg Group, on behalf of FMC Corporation
- 5) Jeffrey Driver, Ph.D., D.A.B.T., M.T., C.L.S., risk sciences.net, LLC; on behalf of FMC Corporation
- 6) Robert Sielken, Jr., Ph.D. Sielken & Associates Consulting, Inc., on behalf of FMC Corporation
- 7) Robert Morris, Ph.D., FMC Corporation, on behalf of FMC Corporation
- 8) Bernie Engel, Ph.D., Engel Consulting on behalf of FMC Corporation
- 9) Richard Fawcett, Ph.D., Fawcett Consulting on behalf of FMC Corporation
- 10) W. Martin Williams, P.E., Waterborne Environmental Inc., on behalf of FMC Corporation
- 11) Ray Young on behalf of Young and Young Consultants
- 12) Larry Kleingartner, Executive Director, on behalf of the National Sunflower Association
- 13) Bruce Unruh, Farmer, Burlington, Colorado
- 14) Michael Fry, Ph.D., on behalf of the American Bird Conservancy
- 15) Jennifer Sass, Ph.D., on behalf of the National Resources Defense Council
- 16) Chance McLean, Farmer, Benedict, Nebraska
- 17) Donald Sklarczyk on behalf of the National Potato Council
- 18) Michael Horrall, Farmer, President, Melon Acres, Inc., Oaktown, Indiana
- 19) Brian Bresnahan, on behalf of Servi-Tech Consulting, Benedict, Nebraska
- 20) Scott Schertz on behalf of Schertz Aerial Service, Inc., Bloomington, Illinois
- 21) Gary Edwards on behalf of the Iowa Corn Growers Association
- 22) Douglas Hanks, Farmer, St. Anthony, Idaho

### **Written statements were provided by:**

- 1) Larry Price, President, on behalf of the Oregon Alfalfa Seed Growers Association
- 2) Nsedu O. Witherspoon, MPH, Executive Director on behalf of the Children's Environmental Health Network
- 3) B. Sachau, Private Citizen
- 4) Caroline Kennedy on behalf of the Defenders of Wildlife
- 5) Mr. Basil Tangredi, DVM, Private Citizen
- 6) "Jeannie", [Jane@flyingace.net](mailto:Jane@flyingace.net), Private Citizen
- 7) Diana Post, President, on behalf of the Rachel Carson Council
- 8) Tim Recker, President, on behalf of the Iowa Corn Growers Association
- 9) Jennifer Sass, Ph.D., on behalf of the National Resources Defense Council

- 10) Kenneth Weinstein and Claudia O'Brien, Latham & Watkins LLP on behalf of FMC Corporation
- 11) Louis Best, Ph.D., Larry Brewer, Ph.D., Don Carlson, Ph.D., Jeffrey Driver, Ph.D., D.A.B.T., M.T., C.L.S., Bernie Engel, Ph.D., Richard Fawcett, Ph.D., John Giesy, Ph.D., James Lamb IV, Ph.D., D.A.B.T., F.A.T.S., Dwayne Moore, Ph.D., Robert Morris, Ph.D., John Ross, Ph.D., D.A.B.T., Robert Sielken, Jr., Ph.D., Keith Solomon, Ph.D., and W. Martin Williams, P.E. on behalf of FMC Corporation
- 12) Louis Best, Ph.D., Keith Solomon, Ph.D., John Giesy, Ph.D., Larry Brewer, Ph.D., and Dwayne Moore, Ph.D., on behalf of FMC Corporation's Carbofuran Avian Risk Assessment Expert Panel
- 13) John Cummings, Ph.D., FMC Agricultural Products Group, on behalf of FMC Corporation
- 14) Don Carlson, Ph.D., Registrations Manager, on behalf of FMC Corporation
- 15) Michael Fry, Ph.D., on behalf of the American Bird Conservancy
- 16) Jennifer Sass, Ph.D., on behalf of the National Resources Defense Council
- 17) Elizabeth Cole, Private Citizen
- 18) Bill Norman, D. Engr., Vice President Technical Services on behalf of the National Cotton Council of America
- 19) Keith Solomon, Ph.D., University of Guelph on behalf of FMC Corporation

