PICOGRAM
And Abstracts

AMERICAN CHEMICAL SOCIETY

Division of Agrochemicals

227th ACS National Meeting

March 28 – April 1, 2004, Anaheim, CA

Spring 2004 Issue No. 66

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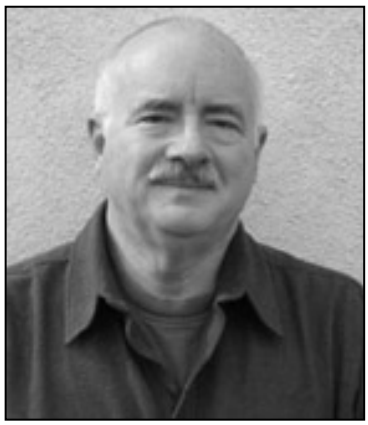

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HOSPITALITY COMMITTEE REPORT

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Twenty-five hundred and fifty dollars were contributed by fourteen companies in support of the Coffee Lounge in New York City. Please note the sponsors named below and on the poster in the AGRO Desk area. Enjoy their generosity, check out their literature and thank their representatives.

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DIVISION SOCIAL HOUR

All AGRO Division and FERT Subdivision members, speakers and spouses were invited to attend the Social Hour in the Gramercy Park Room of the New Yorker Ramada Inn. Al Barefoot put together a gala of food and drinks. Awards and door prizes were presented.

Hospitality Co-chairs Jeff Jenkins and Terry Spittler are delighted to welcome David J. Smith, USDA, Fargo, ND who will take over responsibilities for the Coffee Lounge. However, we would love a few new committee members to help with various Hospitality functions: party animals must have shots of required proof … er, proof of required shots.

FROM THE CHAIR

Welcome to the 227th ACS Spring National Meeting in the original "Magic Kingdom"! This spring again offers an opportunity for professional interaction and fun with friends and family in Anaheim, CA. As I write this note, we are entering into a New Year 2004. This year we again have the opportunity to share ideas and experiences with old and new colleagues. The economy appears to have begun its recovery, and 2003 yielded some modest profits for the agrichemical industry. The 2003 fall program in New York had good attendance. The program had diversity of subject and depth in content. The 2004 Spring program will again broaden and expand our knowledge and interest base.

Program Chair, Allan Felsot, has assembled an excellent program, containing both invited and general paper and poster sessions, as well as two of our standing symposia. The invited and general sessions include symposia on new analytical methodology, pesticide risk assessment, herbicide resistant crops from biotechnology, plant uptake and interactions of perchlorate, and agrochemical issues in urban environments. The two standing symposia include: 1) The Young Scientist Research Recognition Award, and 2) One of the Agro Division's most prestigious awards, the International Award for Research in Agrochemicals. The program consists of 120 papers presented over 5 days.

The recipient of the International Award for Research in Agrochemicals is Dr. Stephen Duke. Dr. Duke is being honored for his outstanding work in weed management research, natural products research, target site identification and mode of action elucidation for both natural and synthetic herbicides. His Award Symposium will focus on "Herbicide Resistant Crops from Biotechnology". The International Award is sponsored by BASF Corporation. We congratulate and honor Dr. Duke on his exceptional achievements and contributions to agrichemicals.

Two special events to note: 1) The AGRO Governance and Business Meeting will be held from 5:00 – 10:00 PM on Sunday, March 28, 2004. The meeting is open to current and prospective members. Please bring along a colleague to the meeting to share your interests and talents with the group. 2) The AGRO Social Mixer will again be held along with our Ag & Food Division (AGFD) colleagues on Tuesday evening, March 30. Come along and see old friends and meet new friends as we eat, drink and laugh together. The location of the meetings will be listed in the ACS Final Program.

Finally, I want to Thank each one of you for making and keeping the Agrochemical Division strong and vibrant! Although we shall continue to change and evolve over the years, it is the dedication of the membership that is the true "Magic" that keeps our division alive!

Have a Great 2004 and Hope to see you in Anaheim!

Rodney M. Bennett, AGRO Chair 2004

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INTERNATIONAL AWARD
FOR RESEARCH IN AGROCHEMICALS
PRESENTED BY THE AGROCHEMICAL DIVISION OF ACS
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Dr. Stephen Duke has been active for many years in the field of agrochemicals and has made many outstanding scientific contributions. His Ph.D. from Duke University was in Plant Physiology and Biochemistry He spent almost 20 years in weed management-oriented research at Stoneville, Mississippi with the Agricultural Research Service (ARS), U.S. Department of Agriculture. Currently he is Research Leader of the Natural Products Utilization Research Unit (also ARS) located at the National Center for Natural Products Research on the campus of the University of Mississippi in Oxford. While his earlier research focused on herbicides, his recent activities have expanded to include all chemicals associated with pest management, with emphasis on naturally occurring compounds.

His research teams have discovered the molecular target sites of several natural and synthetic phytotoxins and herbicides. These include cinmethylin and the fungal metabolites AAL-toxin, cornexistin, and 2,4-anhydro-d-glucitol. Several methods for understanding physiological and biochemical mechanisms of action of phytotoxins were developed. These methods, which included *in vivo* spectrophotometric analysis for cyt. *f* oxidation/reduction, for pigment analysis and for photophosphorylation effects, provided researchers with rapid and direct methods that were less prone to experimental artifacts. He has developed key information on the mechanisms and effects of herbicides which block the terpenoid pathway. The determination that clomazone inhibits the terpenoid pathway at a previously unexploited site has led to further work in industry to find other terpenoid pathway inhibitors that act prior to phytoene desaturase.

Dr. Duke's laboratory led the way in determining the mode of action of protoporphyrinogen-oxidase (Protox)-inhibiting herbicides. It was found that these herbicides act by causing the buildup of photodynamic porphyrins. Steve found the unique and complicated mechanism by which this category of herbicides cause the toxic product of the inhibited enzyme to accumulate. With computational chemistry, these herbicides were shown to be structural analogues of one half of the protoporphyrinogen IX molecule. This work has led to a better understanding of the porphyrin pathway and to the evolutionary origins of plant and animal protoporphyrinogen oxidases.

Current activities include development of gene expression profiling of agricultural fungicides and herbicides as a tool in determining and probing modes of action. Also, examinations of the molecular biology of crop allelopathy are underway with the goal to ultimately produce crops that will fight weeds with natural phytotoxins.

Steve has been very active in professional organizations, editorial boards of journals, and grant review panels. He has made substantial contributions to ARS through his leadership and strategic planning. Steve played a key role when ARS established its Office of Scientific Quality Review (OSQR) in 1999. OSQR serves as a review mechanism using primarily outside reviewers to ensure the scientific quality and integrity of ARS research. Steve was instrumental in developing OSQR policies and procedures and served as its first Scientific Quality Review Officer. Some interesting side information - Steve's graduate training was interrupted by two years in the U.S. Army, one of which was spent as a Medical Service Corps officer in Vietnam. Steve has a twin brother, Dr. Stanley H. Duke, who is Professor and Chair of the Department of Agronomy at the University of Wisconsin.

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YOUNG SCIENTIST PRE- & POST-DOCTORAL RESEARCH AWARD & SYMPOSIUM

The Agrochemicals Division organizes an annual competition for the Young Scientist Pre- and Post-doctoral Research Awards. The purpose of the awards, which are open to both graduate students and post-doctoral research associates, is to recognize outstanding young agrochemical researchers and to encourage their participation in the Division. The Year 2004 awardees listed below will present their work during a special Young Scientists Recognition Symposium at the 227th ACS National Meetings in Anaheim, CA.

Their awards will be presented to them during the Agrochemicals Division social hour on Tuesday evening. The symposium will also feature presentations by three other outstanding graduate students and post-doctoral associates on Monday morning starting at 8:00 AM. The speakers (and affiliations) include Christopher Aaron (Minot State University), Jason Krutz (Texas A&M University), Yelena Sapozhnikova (University of California-Riverside), Keri Henderson (Iowa State University), and Wei Zheng (University of California-Riverside). Please attend the symposium and take an opportunity to hear presentations on subjects ranging from environmental chemistry to biochemistry and toxicology.

Keri Henderson, runner-up winner for 2004, entered the paper *Mass Balance of Atrazine and Metolachlor in Phytoremediated Soil Systems.* Keri conducted her research in the laboratory of Dr. Joel Coats in the Department of Entomology at Iowa State University. Congratulations to Keri and Dr. Coats for important research that elucidates a more mechanistic understanding of phytoremediation potential of herbicide-contaminated soils.

Wei Zhang is the 2004 first-place winner with his entry *Influence of Combined Application of Fumigants on their Transformation and Persistence in the Environment*. Jason conducted his research in the lab of Dr. Scott Yates at the USDA-ARS unit associated with the University of California-Riverside. Congratulations to Wei and Dr. Yates for discovering a unique interaction of fumigants in soil that could potentially affect their efficacy against soil-borne pests.

Awardees will receive a cash award, award plaques, and travel reimbursements to the Anaheim meetings. All other presenters will receive a travel stipend from AGRO. The Agrochemicals Division would greatly appreciate your efforts to encourage students and post-doctoral research associates to apply for future award competitions.

Further information about the Young Scientist Pre- and Post-Doctoral Research Award and application information for next year can be obtained from Dr. Allan Felsot at Washington State University (phone: 509-372-7365; fax: 372-7460; email: afelsot@tricity.wsu.edu). Applications will be accepted until November 1, 2004 for consideration of the year 2005 award to be presented at the spring meeting of the American Chemical Society.

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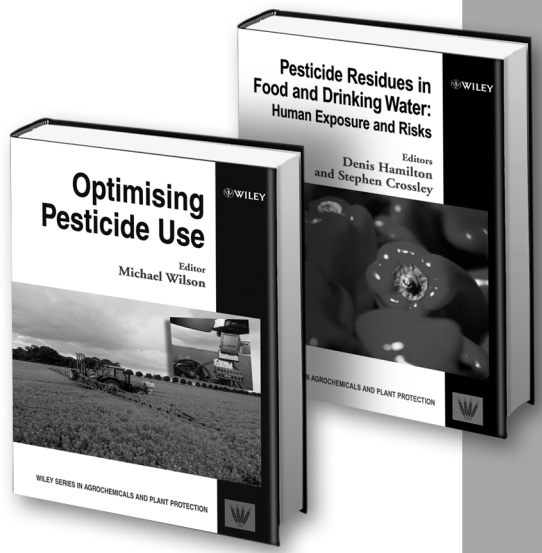

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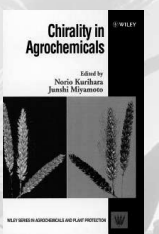

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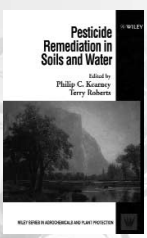

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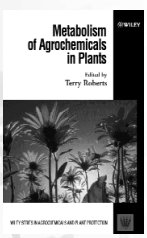

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2003 GRADUATE STUDENT POSTER COMPETITION WINNER

STEVEN SYMINGTON

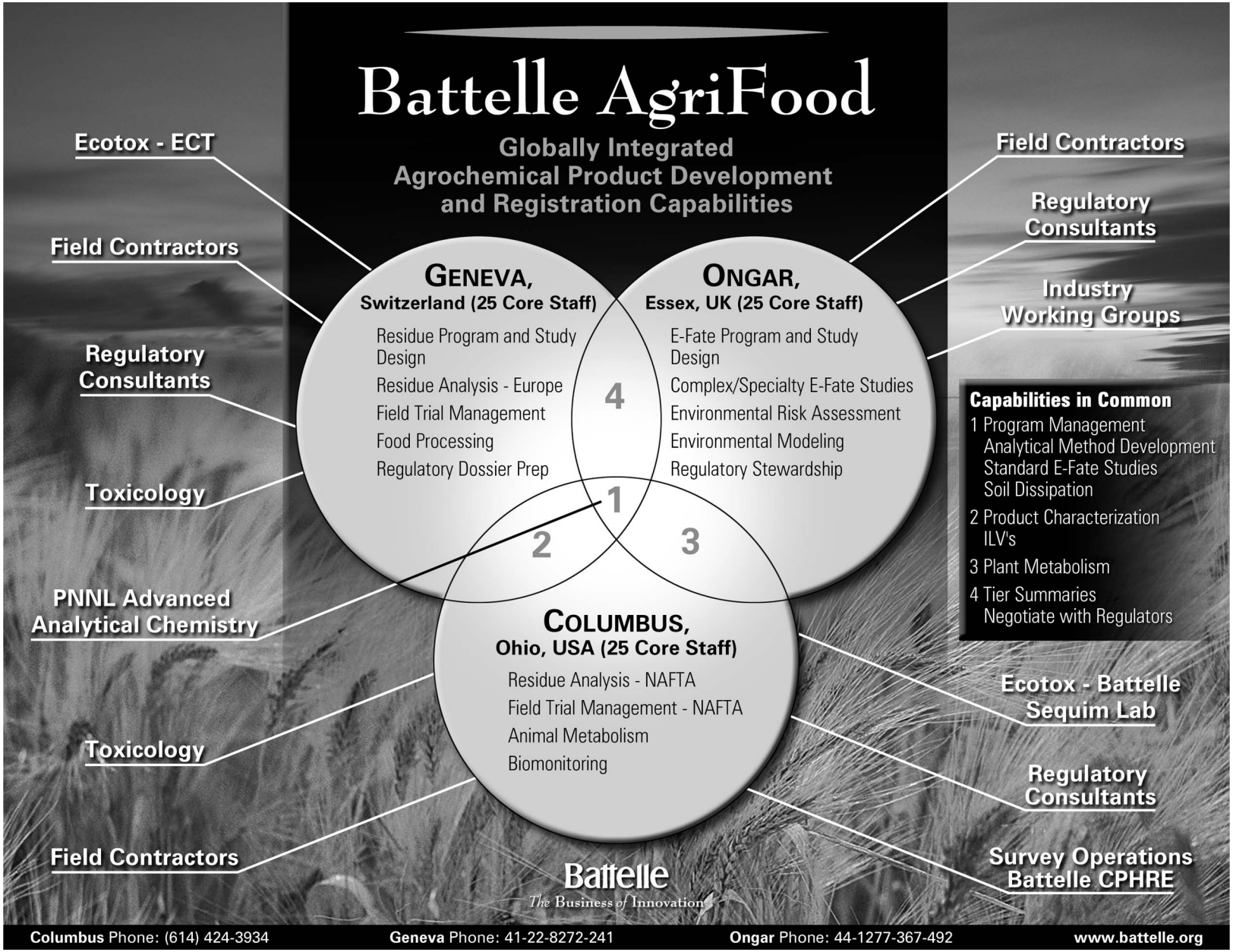
Agrochemical graduate student research was well represented at the 2002 ACS meeting in Boston. Nine students received $600 educational grants to help defray the costs of presenting their research posters at this meeting. The quality of the presentations was excellent, making the judging of the posters extremely difficult. However, the judges (David Smith, Terry Spittler, John Johnston) persevered in picking the top three posters.

2003 Graduate Student Research Poster Competition Winners

First Place - **Steven B. Symington** **Comparative toxicity of pyrethroids on voltage-sensitive calcium channels at rat brain presynaptic nerve terminals**. S. Symington, R. Frisbie, J. Clark. Molecular and Cellular Biology Program, Department of Entomology, University of Massachusetts, Amherst, MA.

Runner Up - **Keri Henderson** **Fate of ^{14}C-atrazine and ^{14}C-metolachlor in vegetated and unvegetated soil systems.** K. Henderson, J. Belden, J. Coats. Department of Entomology, Iowa State University, Ames, IA.

Runner Up - . **Louis Avila** **Acetolactate synthase (ALS) activity in red rice ecotypes (Oryza spp.) and imidazolinone tolerant/resistant rice cultivars (Oryza sativa) in response to imazethapyr treatments**. L. Avila, D. Lee, S. Senseman, G. McCauley, M. Chandler, J. Cothren. Texas A&M University, UFSM/CAPES/Brazil; Texas Agricultural Experiment Station, College Station, TX.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AWARD ANNOUNCEMENT

UC Riverside's Thomas Miller Awarded Prestigious Medal from Academy of Sciences of the Czech Republic

On September 26, 2003, Prof. Thomas Albert Miller of the University of California, Riverside received in Prague, Czech Republic, the Golden Medal of Johan Gregor Mendel. The Medal is given to outstanding biologists by the Academy of Sciences of the Czech Republic, and was forwarded to T. A. Miller by Academy President Helena Illnerova. Other officials of the Academy, including those from the Institute of Entomology that submitted Prof. Miller's candidacy, and representatives of Charles University and the Czech Ministry of the Environment participated at the ceremony. The presence of the US Ambassador to the Czech Republic, Mr. Craig Roberts Stapleton, accentuated the importance and international dimensions of the event.

Prof. Miller received the Medal for his ability to link excellent basic research in insect physiology with practical crop protection. Over the years he worked on insect diapause and its monitoring in the field, physiological regulation of insect heart beat and implications for insecticide action, biochemical mechanisms of insecticide resistance, and, lately, on genetically modified organisms. His current interests include use of transgenic insects in place of radiation in the "sterile male technique" for control of the pink bollworm. He has also developed the idea of using microbial insect symbionts to regulate the transmission of plant pathogens – a concept that is being applied to the control of Pierce's disease that is spread by a leafhopper (glassy-winged sharpshooter) and threatens to destroy Californian vineyards.

The work of Prof. Miller has greatly contributed to the commercialized applications of scientific findings in modern agriculture, namely the wise use of chemical pesticides and transgenic crops. His current research on transgenic insects and symbionts opens new vistas in the never ending fight with insect pests and vectors of disease. The career of Prof. Miller demonstrates that new tools can be brought to the struggle using modern scientific knowledge.

NOMINATION FORM

ACS INTERNATIONAL AWARD FOR RESEARCH IN AGROCHEMICALS

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Complete the following for your candidate:

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   c. Nominations often include one or two letters of support, but this is optional.

Submitted by:_____ Date: _____

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Deadline: Nominations should be received by the committee chair by December 31 of each year. Balloting will be conducted in January/February and results will be announced at the spring meeting of ACS.

The nominating official(s) should be prepared to assist in organizing a symposium and dinner at the National ACS meeting in honor of the awardee.

Please, return this completed form to:

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CALL FOR APPLICANTS
AGROCHEMICAL EDUCATION AWARDS

SUPPORT FOR GRADUATE STUDENT POSTER PRESENTATIONS AT THE 2004 FALL MEETING

The Division of Agrochemicals has established an endowment fund that will be used to promote an understanding of the role of chemistry in agriculture as embraced in the following areas related to pest management chemistry: synthesis, metabolism, regulatory, biotechnology, delivery, risk assessment, resistance, residues, mode of action, and fate/behavior. To address this mission, awards will be made through the Division's Education Committee.

Proposals are sought for the 2004 awards. Graduate students will be awarded up to $600 each to help defray costs of attendance to give poster or oral presentations at the ACS 2004 Fall Meeting, which will be held August 22-26 in Philadelphia, PA. Posters will be displayed in a special section of the Division of Agrochemicals' poster session as well as the ACS Sci-Mix. A winner and two runners up will be selected for display at the Division's Social. The winner will receive an additional cash award of $500. The subject of the presentation should fall within the areas listed in the introductory sentence. **To apply, a graduate student should submit the following, to be received no later than May 1, 2004**:

1. An abstract formatted according to the directions given on the ACS website. Be sure to include name (of applicant), address, and e-mail address.

2. A 2-page extended abstract giving more detail of the research/presentation.

3. A letter of nomination from the faculty advisor.

***Please submit the above electronically with the three items as attachments in either Word or Word Perfect to Dr. John J. Johnston at* john.j.johnston@aphis.usda.gov. If there are any questions, please contact Dr. Johnston at USDA/APHIS/National Wildlife Research Center, 4101 LaPorte Ave., Fort Collins, CO 80521, (970)-266-6082.**

Abstracts will be reviewed by the Education Committee and submitters notified of their selection status in May 2004.

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Applicant _____

Major Professor/Supervisor _____

Will you present this paper even if you do not receive an award: YES_____ NO_____

WITH THIS APPLICATION FORM INCLUDE THE FOLLOWING:

1. An extended abstract of your presentation (4 pages maximum including figures and tables) that clearly describes the nature of the work (hypothesis, methods, results), its relationship to previous research, and its significance for the field of agrochemicals.
2. An abstract of 150 words (submit directly to http://oasys.acs.org/oasys.htm); this short abstract will be printed in the Agrochemicals Division biannual publication, PICOGRAM.

MAIL OR FAX THIS SIGNED APPLICATION, & FAX OR EMAIL EXTENDED ABSTRACT TO:
Dr. Allan Felsot, Washington State University, FEQL, 2710 University Dr., Richland, WA 99352
(Phone: 509-372-7365; Fax: 509-372-7460; email: afelsot@tricity.wsu.edu)

****Deadline for submittal of application materials: November 1, 2004.**

NOTE: Two awards will be made based on the merits of the submitted applications. Applicants not winning the awards will be invited to present their research in the Young Scientist's Recognition Symposium and will be eligible to receive a small travel grant.

Analytical Chemistry

ILV
Residue Chemistry
FDA Multi-Residue Methods
Certification of Analysis
Sample Storage Stability
Dislodgeable Residue
Worker Exposure
Metabolite Characterization
Fumigant Residue Analysis
Methods Development

Plant Sciences and Field Research

Project Management
Worker Exposure
Dislodgeable Residue
Import Tolerance
Efficacy - Field & Greenhouse
Confined Crop Rotation
Magnitude of Residue
Soil Dissipation

Microbiology

Raw Material/Product Testing
Environmental Monitoring
Bioburden
Antimicrobial Feed Testing
Pharmaceutical Mfg. Support
Disinfectant Testing

Product Chemistry

Certified Limits
Preliminary Analysis
Identity & Composition
Solubility Studies
Vapor Pressure
Octanol/Water Partition Coefficient
Product Storage Stability
Physical/Chemical Properties
Release Rate of Biocides

Environmental Effects

Fish and Invertebrate Testing
Fish Bioconcentration
Marine & Fresh Water Organisms
Aquatic & Terrestrial Phytotoxicity
Sediment Toxicity Studies
Non-Target Insect Tests
Shellfish Residue Studies
Terrestrial Organisms

Environmental Fate/Metabolism

Photodegradation
Hydrolysis
Aquatic/Soil Metabolism
Aerobic/Anaerobic Metabolism
Plant & Animal Metabolism
AD/DE & Leaching
Field Lysimeter Studies
Biodegradation Studies
Carbon/Nitrogen Transformation

ABC Laboratories, Inc.
7200 E. ABC Lane, Columbia, MO 65202
Contact Eric J. Lorenz, Ph.D. @ (573) 443-9016
Additional Information at: www.abclabs.com

MESSAGE FROM THE PROGRAM CHAIR

Allan Felsot

Like a puzzle, the spring AGRO program at the national meetings fit together piece by piece as waves of abstracts poured in to meet the deadline for finalizing the agenda. I'm pleased to report that we have a jam-packed program covering interests ranging from environmental chemistry to toxicology, conventional pest control to biotechnology, and synthesis to analytical chemistry.

Our program starts early Sunday at 9:00 AM with the symposium, "New Approaches in HPLC Method Development" that was organized by Ken Norris (Pfizer, Inc). The symposium continues in the afternoon. Also on Sunday, we have a morning and afternoon session of General Papers. The morning session, which also starts at 9:00 AM, will concentrate on natural products and biopesticides for pest control. The afternoon session (starting time at 1:30 PM) covers pesticide environmental chemistry in soils and water.

The annual Young Scientists Research Recognition Award Symposium kicks off first thing Monday morning at 8:00 AM with papers on synthesis, environmental chemistry and toxicology. The Poster Session follows at 10:00 am in the Convention Center with a wide diversity of subjects covered by 29 posters. The posters will be displayed again Monday night at 8:00 PM as part of the traditional Sci-Mix in which posters from every Division along with complementary beer will be available to whet your intellectual appetites.

The International Award for Research in Agrochemicals sponsored by BASF will be presented Monday afternoon (1:30 PM) to Stephen Duke from the Natural Products Utilization Research Unit of the USDA-ARS in Mississippi. The award presentation marks the beginning of a 1.5-day symposium organized by Nancy Ragsdale (USDA) and Steve called "Herbicide-Resistant Crops form Biotechnology". The symposium will continue in a morning and afternoon session on Tuesday.

If biotechnology is not your cup of tea and would rather be out golfing in the warm spring weather of Anaheim, stop by the "Agrochemical Issues in Urban Environments" symposium that kicks off a four session run on Monday afternoon. John Clark (Univ. Massachusetts), Chris Peterson (USDA-ARS), and I beat the bushes as well as the links to put together a collection of papers that explored many of the issues in urban environments that involve environmental chemistry, toxicology, public health, residential structures, and best management practices. The symposium is an update to an urban issues oriented symposium held about a decade ago. The first session covers agrochemical issues in turf for you duffers out there. Tuesday morning (9:00 AM) follows with issues related to exposure and risk assessment for residential settings. Tuesday afternoon (2:00 PM) continues the urban theme with best management practices at the level of the garden and landscape. Wednesday morning (9:00 AM) wraps up with issues related to pest control for structures and the protection of public health. You won't want to miss the talks on the future of termite and cockroach control and an update on the West Nile virus.

Aldos Barefoot (DuPont) and Don Wauchope (USDA-ARS) organized a three-session symposium called "Pesticide Risk Assessment: From a Conceptual to a Quantitative Exposure Model". The symposium starts Wednesday morning (9:00 AM) and continues through Thursday morning. Papers will cover the ins and outs of terrestrial field dissipation studies and the relationships between laboratory and field results.

Perchlorate has entered the realm of "contaminant of the month" with detections above the EPA-defined reference dose in numerous ground and surface water supplies. Bill Hall (IMC Global), Kevin Mayer (EPA Region 9), and Larry Shull (MWH Global) have organized a three-session symposium called "Perchlorate Uptake in Plants—Interaction of Soils, Nutrients, Ground and Irrigation Water". Topics will range from

analytical detection and environmental chemistry to toxicological considerations. The symposium starts Wednesday afternoon at 2:00 PM and runs through Thursday afternoon.

This spring's program puzzle is complete and I want to think all of the symposia organizers and paper presenters for submitting their pieces. The diversity of the program continues to make AGRO unique among divisions. The quality as well as diversity of our program this spring will complement well Anaheim's reputation for warm sunny weather and Disneyland.

Program Summary

Program	Sun	Mon	Tues	Wed	Thur
General Papers	AM PM				
New Approaches in HPLC Method Development	AM PM				
Young Scientists Research Recognition Award		AM			
General Posters		AM			
SciMix		PM			
Herbicide Resistant Crops from Biotechnology		PM	AM PM		
Agrochemical Issues in Urban Environments		PM	AM PM	AM	
Pesticide Risk Assessment: From a Conceptual to a Quantitative Exposure Model				AM PM	AM
Perchlorate Uptake in Plants—Interactions of Soils, Nutrients, Ground & Irrigation Water				PM	AM PM

AGRO CALL FOR PAPERS

228TH ACS NATIONAL MEETING
AUGUST 22-26, 2004, PHILADELHIA, PA

Listed below are symposia and other program sessions that are planned by the Division of Agrochemicals at the fall ACS meetings in Philadelphia, PA. The ACS On-line Abstract Submittal System (OASYS) opens for submittals in mid-February, 2004 and closes on May 3, 2004. Please limit your abstract to 200 words or less. Symposia organizers will have access to the system through May 12, 2004. If you have any questions about the planned sessions or need help with OASYS, please contact the respective symposia organizers listed below or the program chair:

Allan S. Felsot, AGRO Program Chair—2004
Washington State University, 2710 University Drive, Richland, WA 99352
Voice: 509-372-7365; FAX: 509-372-7460; email: afelsot@tricity.wsu.edu

GENERAL PAPERS, ORAL. Organizer: Allan Felsot, Washington State University, afelsot@tricity.wsu.edu

GENERAL POSTERS. Organizer: Allan Felsot, Washington State University, afelsot@tricity.wsu.edu

AGROCHEMICAL EDUCATION AWARDS FOR GRADUATE STUDENT TRAVEL—FALL 2004 POSTER PRESENTATIONS. Organizer: John Johnston, USDA/National Wildlife Research Center, 970-266-6082, John.J.Johnston@aphis.usda.gov

INTERNATIONAL AWARD FOR RESEARCH IN AGROCHEMICALS (Sponsored by DuPont Crop Protection): "The Ying and Yang of Pesticide Toxicology—A Symposium in Honor of John M. Clark (invited papers only)

STERLING B. HENDRICKS MEMORIAL LECTURESHIP AWARD (co-sponsorship with AGFD) (invited papers only)

AGROCHEMICAL RESIDUES AND METABOLISM. Organizers: David Smith, USDA-ARS, Biosciences Research Laboratory, 701-239-1238, smithd@fargo.ars.usda.gov; Teresa Wehner, Merial, 732-729-5713, teresa.wehner@merial.com; John Johnston, USDA/National Wildlife Research Center, 970-266-6082, John.J.Johnston@aphis.usda.gov

DEGRADATION AND METABOLIC FATE OF NEW CROP PROTECTION AND ANIMAL HEALTH PRODUCTS (Invited papers only). Organizers: Philip Lee, DuPont Crop Protection, 302-451-0804, philip.w.lee@usa.dupont.com; David Smith, USDA-ARS, 701-239-1238, smithd@fargo.ars.usda.gov; Hirosyasu Aizawa, Hiro Research Consultancy Inc., hiroaizawa0101@ybb.ne.jp

AGROCHEMICALS AND WATERSHED-SCALE MODELING: SOLUTIONS FOR WATER QUALITY MANAGEMENT. Organizers: Don Wauchope, USDA-ARS, Tifton, GA, 229-386-3892, don@tifton.usda.gov; Bill Hall, IMC Global Inc., 863-428-7161; whall@imcglobal.com; Aldos Barefoot, DuPont Crop Protection, 302-451-5856, aldos.c.barefoot@usa.dupont.com

IS ORGANIC FOOD BETTER THAN CONVENTIONAL FOOD? Organizer: Joe Rosen, Department of Food Science, Rutgers University,732-932-9611 ext 229**,** jrosen@aesop.rutgers.edu**;** Allan Felsot, Washington State University, 509-372-7365, afelsot@tricity.wsu.edu

ANTIOXIDANTS IN FOOD—RELATIONSHIP TO AGRONOMIC PRACTICES, PESTS, AND HEALTH; METHODS OF ANALYSIS. Organizer: Jim Seiber, USDA-ARS, Albany, CA, jseiber@pw.usda.gov; Allan Felsot, afelsot@tricity.wsu.edu

AGRICULTURE AND AIR MONITORING: INVESTIGATING TECHNOLOGIES FOR MEASUREMENT AND RESEARCH. Organizers: Wayne Robarge, North Carolina State University, Dept. of Soil Science, 919-515-1454, wayne_robarge@ncsu.edu; Bill Hall, IMC Global Operations, 863-428-7161, whall@imcglobal.com; Karen S. Harlan, NADP Central Analytical laboratory, Champaign, IL, 217-244-6413, k-harlin@uiuc.edu

METALS CONTAMINATION IN AGRICULTURAL PRODUCTS & SOILS: METHODOLOGY, MONITORING, REGULATION & REMEDIATION. Organizers: Peter Kane, Office of the Indiana State Chemist, Purdue Univ., 765-494-1560, kanep@purdue.edu; Wayne Robarge, North Carolina State University, Dept. of Soil Science, 919-515-1454, wayne_robarge@ncsu.edu; Bill Hall, IMC Global Operations, 863-428-7161, whall@imcglobal.com

MINERAL NUTRITION AND PLANT DISEASES—INTERACTIONS AND EFFECTS. Organizers: L. E. Datnoff, Univ. of Florida, Dept. of Plant Pathology, 561-993-1531, leda@mail.ifas.ufl.edu; Bill Hall, IMC Global Operations, 863-428-7161, whall@imcglobal.com; W. H. Elmer, Connecticut Agricultural Experiment Station, New Haven, CT, 203-974-8503, wade.elmer@po.state.ct

INNOVATIVE PRODUCTS, PRACTICES & TECHNOLOGIES IMPACTING NUTRIENT USE AND LABORATORY ANALYSIS IN THE 21ST CENTURY. Organizers: Bill Hall, IMC Global Operations, 863-428-7161, whall@imcglobal.com; Wayne Robarge, North Carolina State University, Dept. of Soil Science, 919-515-1454, wayne_robarge@ncsu.edu

WATER QUALITY PROTECTION AT THE WATERSHED SCALE: SCIENCE AND REGULATION. Organizers: W. C. Herz, The Fertilizer Institute, Washington, DC, 202-515-2706, wcherz@tfi.org; Bill Hall IMC Global Operations, 863-428-7161, whall@imcglobal.com; Wayne Robarge, North Carolina State University, Dept. of Soil Science, 919-515-1454, wayne_robarge@ncsu.edu

TRANSLATION OF PESTICIDAL ACTIVITY FROM LAB TO GREENHOUSE TO FIELD. Organizers: John Lyga, FMC Corp., Princeton, NJ, JOHN_LYGA@fmc.com; George Theodoridis, FMC Corp., GEORGE_THEODORIDIS@fmc.com

SYNTHESIS OF AGROCHEMICALS; GOOD IDEAS THAT NEVER MADE IT TO PRODUCTS. Organizers: John Lyga, FMC Corp., Princeton, NJ, JOHN_LYGA@fmc.com; George Theodoridis, FMC Corp., GEORGE_THEODORIDIS@fmc.com

In addition to the above programming, two additional possibilities exist for developing a symposium for the ACS national meetings in Philadelphia. ACS President Chuck Carey will be organizing a presidential symposium theme on the "future of graduate education". If anyone is interested in organizing and/or participating in a symposium regarding the theme of "How are we going to sustain education in the agrochemical technology field," please contact Allan Felsot, afelsot@tricity.wsu.edu. The Biotechnology Secretariat (BTEC) is developing a program theme on "Genomics and Proteomics for the Chemical, Pharmaceutical, and Food Industries". Anyone with interests in organizing and/or participating in a symposium appropriate to AGRO that is centered on the BTEC program theme should also contact Allan Felsot.

During March 13-17, 2005, we will be meeting in San Diego, CA, and during August 28-September 1, 2005 we will meet in Washington, DC. Please contact the future program chair Don Wauchope (don@tifton.usda.gov) or future division chair Allan Felsot (afelsot@tricity.wsu.edu) with suggestions and ideas for programming at the San Diego and Washington, DC meetings during 2005.

CALL FOR PAPERS

Agrochemicals and Watershed-Scale Modeling: Solutions for Water Quality Management

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004
Sponsored by the Agrochemicals Division

Purpose of Symposium: Fertilizer, nutrients, sediments and pesticides are potential "impairments" in stream reaches listed as part of the Clean Water Act Total Maximum Daily Load (TMDL) cleanup process and may trigger regulatory actions under FIFRA as well as CWA. Watershed-scale modeling is a rapidly-developing, key technology for analysis of the complex hydrologic, climatic, geologic, and chemical processes that determine the contribution of pollutants to water quality at the outflow. Models are expected to predict the magnitude, frequency, duration and spatial distributions of potential water body contamination and also to help evaluate options for mitigating transport from agricultural lands. This Symposium will provide a look at current progress in the development and use of watershed models, validation of models through monitoring and application of models in regulatory actions. Sponsorship by the AGRO division and FERT subdivision takes advantage of the unique ability of the division to examine pesticides and fertilizers simultaneously.

Possible Topics (although not limited to the following):

- *Watershed Models – spatial, field transport, hydrologic networks, sediment transport, chemical fate in watersheds*
- *Validation of watershed models with monitoring data*
- *Water Quality Improvement Programs and Case Studies*
- *Analytical methods including discussions of criteria for selecting limits of quantitation*
- *Sample Analysis and Interpretation of Data*
- *Regulatory programs and use of models in risk assessment*

Abstracts may be submitted through the ACS website. Deadlines will be published on the website. An ACS Symposium Series publication of the same title will be pursued. To facilitate the timely publication of the symposium proceedings, contributors are requested to provide manuscripts by August 20, 2004.

For additional information contact the organizers:

Don Wauchope USDA-Agricultural Research Service
1900 Moore Highway, POB 748 Tifton, GA 31704
Phone : (229) 386-3892 ; Email: don@tifton.usda.gov

Bill Hall IMC Global Inc, 3095 County Rd, Mulberry, FL 33860
Phone: (863) 428-7161; Email: whall@imcglobal.com

Aldos Barefoot DuPont Crop Protection, Stine-Haskell Research Center, Newark, DE 19714
Phone: (302) 451-5856 Email: aldos.c.barefoot@usa.dupont.com

CALL FOR PAPERS

Water Quality Protection at the Watershed Scale: Science and Regulation

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004
Sponsored by the Fertilizer and Soils Subdivision of the Agrochemicals Division

Purpose of Symposium: To provide a forum for the exchange of ideas and practices that will maximize nutrient efficiency while minimizing unintended nutrient releases to the environment. Watersheds are the primary means of dividing water bodies for management (and regulation) by implementation of TMDLs. These Total Maximum Daily Loads must be established by law in each State according to the Clean Water Act (CWA). There are many unanswered questions regarding the scientific and regulatory issues surrounding the development of TMDLs and the means set forth to attain the stated goals of the CWA. The science and various proposed regulatory structures will be discussed as they relate to agriculture in general and nutrients in particular.

Possible Topics (although not limited to the following):

- *New Data Impacting Regulatory Policy*
- *Involving Ag Stakeholders in the Policy Making Process at the Local, Watershed and State Level*
- *Water Monitoring Programs - How Reliable is the Data*
- *Trading Policies and TMDLs – Science and Economics*
- *Protecting American Production Agriculture and the Environment Simultaneously– Is this Possible?*

An ACS Symposium Series publication of the same title will be pursued. To facilitate the timely publication of the symposium proceedings, contributors are requested to provide manuscripts by August 20, 2004.

For additional information contact the organizers:

W. C. Herz — Director of Scientific Programs
The Fertilizer Institute
820 First Street, N.E. Washington, DC 20002
Phone: (202) 515-2706; Email: wcherz@tfi.org

Bill Hall — IMC Global Operations
3095 County Rd, Mulberry, FL 33860
Phone: (863) 428-7161; Email: whall@imcglobal.com

Wayne Robarge — Department of Soil Science, North Carolina State University
PO Box 7619 Raleigh, NC 27695-7619
Phone: (919) 515-1454; Email: wayne_robarge@ncsu.edu

CALL FOR PAPERS

Innovative Products, Practices & Technologies Impacting Nutrient Use and Laboratory Analysis in the 21st Century

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004
Sponsored by the Fertilizer and Soils Subsection of the Agrochemicals Division

Purpose of Symposium: To provide a forum for the exchange of innovative technologies that will allow more efficient and better use of fertilizer nutrients. Products may include slow release or enhanced efficiency fertilizers as well as other materials (such as manures or other recycled nutrients) that could positively impact crops, plant growth or nutrient utilization. These materials may also be more efficient in terms of controlling unintended nutrient releases to the environment. Other management, tillage or regulatory measures may be explored for their usefulness in maximizing efficiency while minimizing unintended nutrient release. New production and process advancements resulting in improvements in nutrient delivery will also be addressed.

Possible Topics (although not limited to the following):

- New Controlled or Designed Release Fertilizer Materials
- New Methodologies that Might Prove to be more Efficient, Faster, Precise and Less Expensive
- Products or Practices Enhancing Nutrient Efficiency or Minimizing Environmental Risk
- Production or Process Advances Resulting in Technological Advancements Within the Industry
- Use of Recycled Nutrients to Conserve Natural Resources and Minimize Waste
- Improved Management, Application or Tillage Practices Designed to Optimize Nutrient Utilization

An ACS Symposium Series publication of the same title will be pursued. To facilitate the timely publication of the symposium proceedings, contributors are requested to provide manuscripts by August 20, 2004.

For additional information contact the organizers:

Bill Hall — IMC Global Operations
3095 County Rd, Mulberry, FL 33860
Phone: (863) 428-7161; Email: whall@imcglobal.com

Wayne Robarge — Department of Soil Science, North Carolina State University
PO Box 7619 Raleigh, NC 27695-7619
Phone: (919) 515-1454; Email: wayne_robarge@ncsu.edu

CALL FOR PAPERS

Mineral Nutrition and Plant Diseases - Interactions and Effects

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004
Sponsored by the Fertilizer and Soils Subsection of the Agrochemicals Division

Purpose of Symposium: Mineral nutrients are involved in many physiological and biochemical processes as enzyme activators, structural components, metabolic regulators, substrates and osmotica. Mineral nutrients can be supplied to the plant in inorganic or organic forms, but their availability depends on soil texture, pH, moisture, temperature, mineral solubility, nutrient retention of the soil, microbial activity of the soil, and the ability of the plant to use each nutrient efficiently. The nutritional status of the plant, in turn, affects inherent disease resistance by affecting disease escapes, by altering pathogenesis, and by modifying the virulence of the pathogen and its ability to survive. Because nutrients influence the relationship between the plant and the pathogen, growers have a valuable method already in place to effectively reduce damage from plant diseases. In order to better understand this relationship, we will re-visit the important role that macro- and micro-nutrients play in protecting plants from destructive diseases. We will also highlight their interactions and effects, and prescribe nutritional regimes that will minimize crop loss to disease.

Possible Topics (although not limited to the following):

- *Value of mineral nutrition in suppressing plant diseases*
- *Identifying those situations in which crop health is limited by macro- or micro- nutrients*
- *When & how much macro- or micro- nutrients are needed for optimum disease suppression*
- *Improving and stimulating further research in the area of mineral nutrition and plant disease*

For additional information contact the organizers:

L. E. Datnoff — Professor of Plant Pathology, University of Florida-IFAS
1453 Fifield Hall
Gainesville, FL 32601
Phone: (352) 392-3631; Email leda@mail.ifas.ufl.edu

Bill Hall — IMC Global Operations
3095 County Rd
Mulberry, FL 33860
Phone: (863) 428-7161; Email: whall@imcglobal.com

W. H. Elmer — Connecticut Agricultural Experiment Station
123 Huntington Street, PO Box 1106
New Haven, CT 06504
Phone: (203) 974-8503; Email: Wade.Elmer@po.state.ct

CALL FOR PAPERS

Metals Contamination in Agricultural Products & Soils: Methodology, Monitoring, Regulation & Remediation

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004
Sponsored by the Fertilizer and Soils Subsection of the Agrochemicals Division

Purpose of Symposium: Investigation of currently used analytical methodology has resulted in the development of new methodologies for analysis of trace metals in fertilizer materials This along with other regulatory and legal initiatives is causing a flurry of activity within the regulatory and industrial communities. This symposium is designed to further the knowledge regarding methodology, monitoring, risk assessment, regulation, and remediation of trace metals in, of, and by fertilizer materials. Significant changes to methodology and the infusion of new data will influence future regulatory actions as well as risk analysis and management. Remediation efforts for contaminated sites using fertilizer materials will also be examined in this symposium.

Possible Topics (although not limited to the following):

- *The Latest Analytical Techniques Developments Regarding Metals in Complex Matrices*
- *Analysis and Review of State and Industry Metals Monitoring*
- *Regulatory Efforts Around the World and Impacts of Current and Proposed Standards*
- *Continuing Evaluation of Risk Assessments for Trace Metal Exposures in Agriculture*
- *Analytical Methods including discussions of criteria for selecting limits of quantitation*
- *Sample Analysis and Interpretation of Data*
- *Regulatory Programs and Use of Data in Risk Assessment*
- *Site Remediation Using Phosphate and Other Fertilizer Materials*

An ACS Symposium Series publication of the same title will be pursued. To facilitate the timely publication of the symposium proceedings, contributors are requested to provide manuscripts by August 20, 2004.

For additional information contact the organizers:

Peter Kane — Office of the Indiana State Chemist
175 S. University St. Purdue University
West Lafayette, IN 47907-2063
Phone: 765-494-1560; Email: kanep@purdue.edu

Wayne Robarge — Department of Soil Science, North Carolina State University
PO Box 7619 Raleigh, NC 27695-7619
Phone: (919) 515-1454; Email: wayne_robarge@ncsu.edu

Bill Hall — IMC Global Operations
3095 County Rd, Mulberry, FL 33860
Phone: (863) 428-7161; Email: whall@imcglobal.com

CALL FOR PAPERS

Agriculture and Air Monitoring: Investigating Technologies for Measurement and Research

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004
Sponsored by the Fertilizer and Soils Subsection of the Agrochemicals Division

Purpose of Symposium: Air quality issues relating to agricultural activity are at the forefront of many federal and state regulatory agendas. The goal of the symposium is to facilitate open discussion regarding development of accurate and reproducible analytical techniques for sampling and analysis of nutrients and contaminants in air. These discussions will include air emissions from animal feeding operations as well as ambient air and atmospheric deposition of analytes impacting agriculture.

Possible Topics (although not limited to the following):

- *Current Air Monitoring Programs*
- *Techniques for Monitoring Air Emissions from Lagoons and Confined Feeding Operations*
- *Impacts of Atmospheric Deposition on Watersheds and Models*
- *Techniques for Determination of Analytes from Air Particulate and Water Deposition*
- *Analytical methods including discussions of criteria for selecting limits of quantitation*
- *Sample Analysis and Interpretation of Data*
- *Air Monitoring of Emissions from Manure and Fertilizers Applied to Agricultural Fields*
- *Regulatory Programs and Use of Data in Risk Assessment*

An ACS Symposium Series publication of the same title will be pursued. To facilitate the timely publication of the symposium proceedings, contributors are requested to provide manuscripts by August 20, 2004.

For additional information contact the organizers:

Wayne Robarge — Department of Soil Science, North Carolina State University
PO Box 7619 Raleigh, NC 27695-7619
Phone: (919) 515-1454; Email: wayne_robarge@ncsu.edu

Bill Hall — IMC Global Operations
3095 County Rd, Mulberry, FL 33860
Phone: (863) 428-7161; Email: whall@imcglobal.com

Karen S. Harlan — NADP Central Analytical Laboratory
2204 Griffith Dr
Champaign, IL 61820-7495
Phone: (217) 244-6413; k-harlin@uiuc.edu

CALL FOR PAPERS

Agrochemical Residue & Metabolism Chemistry

228th ACS National Meeting, Philadelphia, PA, August 22-26, 2004

The Autumn 2004 Agrochemical Residue & Metabolism Chemistry Symposium will focus on the determination of agrochemicals (herbicides, insecticides, fertilizers, pheromones, livestock drugs, etc.), metabolites and degradation products in a wide variety of matrices. Presentations describing techniques, equipment, supplies, data analysis, etc. to improve method limits of detection, sample throughput, isolation, identification, etc. are especially welcome. Presentations describing the results of agrochemical metabolism, environmental fate or field residue studies are also encouraged. Oral presentations will be 20-25 minutes in length followed by a 5 to 10 minute period for questions, comments and discussion.

Abstracts should be submitted to the ACS website (acs.org) no later than **.** For additional information contact Dr. John J. Johnston, USDA National Wildlife Research Center (970) 266-6082 email: john.j.johnston@aphis.usda.gov , Dr. David Smith, USDA/ARS Biosciences Research Laboratory, (701) 239-1238 email: smithd@fargo.ars.usda.gov Dr. Teresa Wehner, Merial Ltd., (732) 729-5713 email: teresa.wehner@merial.com

THE FERTILIZER AND SOIL SCIENCE SUBDIVISION OF THE DIVISION OF AGROCHEMICALS

As we build on the strength of our members to make AGRO and the FERT subdivision more effective, the FERT subdivision is working on two fronts.

First we are rebuilding our membership. Through the help of a recent ACS mini-grant of $1000 we have begun a campaign titled "Creating & Communicating a New Message". We have set a goal of 300 members in the subdivision by the end of 2004. This is ambitious, but we have already started our efforts by having a presence and a booth at the recent Environmental Quality and Agriculture Conference. This will be followed by sponsorship of the upcoming "Metals Forum 2004" in February 2004. The plan to make this effort effective involves the following actions:

- Creating an identity and a message - "Finding Better Ways to Feed the World Safely"
- Providing content by developing effective programming and providing timely training
- Communicating a personal message by having FERT officers and members hitting the road

Secondly Wayne Robarge, and others are coordinating dynamic programs for future meetings. Developing quality programs will take time and effort. But the infusion of more diverse content, and the interests of new speakers will bring new ideas, energy and responsiveness to our programs. In the future we plan for FERT to work with AGRO, ENVIRO, ANYL, and others in cooperative efforts that will involve many organizers, speakers and supporters. We have planned a program for the spring meeting for the first time in the history of FERT. Please attend the perchlorate symposium outlined in this edition of the Picogram. We plan very strong programs for Philadelphia and beyond (see below).

228th - Philadelphia, PA, August 22-26, 2004
National/Regional Air & Water Quality Monitoring Programs
Water Quality Protection At The Watershed Scale: Science And Regulation
Contaminants In Agricultural Products & Soils: Methodology, Monitoring, Regulation & Remediation
Mineral Nutrition And Plant Disease – Interactions And Effects
Innovative Products, Practices & Technologies Impacting Nutrient Use In The 21st Century

229th - San Diego, CA, March 13-17, 2005
Modeling And Risk Assessment – Tools For Managing Agricultural Inputs And Food Safety
Organic Farming And Nutrients – Productivity, Value and Food Safety
Innovative Technologies For Production And Analysis Of Specialty Fertilizers And Pesticides

230th - Washington, DC, August 28 - September 1, 2005
Assessing Effectiveness Of Agricultural BMPs On Yields And The Environment
TMDLs & Plant Nutrients – Monitoring & Trading, Are They Working?
Agriculture and Adjacent Ecosystems - Can They Both Be Protected?
New Nutrient & Soil Amendment Products Impacting Agricultural Production & The Environment

Support the revitalization of the FERT subdivision by attending our upcoming programs. And please let me, or any of the FERT officers know how we can be more responsive to your needs.

Sincerely,
Bill Hall FERT subdivision chair 2003

AGROCHEMICAL PROGRAM PLANNING

An ad hoc Long Range Program Planning Group has been charged with identifying emerging issues and topics. Anyone having new programming ideas or recognizing significant areas not currently being addressed is urged to contact the group members:

- Herb Nigg (914) 956-1151, hnn@lal.ufl.edu
- Patrick Sabourin (614) 424-5986, sabourip@battelle.org
- Dave Barnekow (317) 337-3505, debarnekow@dow.com

Members of the standing Program Committee and other individuals listed below have been asked to provide ideas for program topics in their areas of interest and expertise, to develop programming for the next few years, and to assist and advise new members wishing to organize special symposia or participate in regular programming. Potential organizers of AGRO symposia should interface with the Long Range Group, the Program Committee and the Program Chair/Vice Chair as early as possible to avoid duplication within the division and between divisions with which we co-organize. **Guidelines for symposium organizers are available at the Agrochemicals website at http://agrochemical.org**.

Agrochemicals Division Programming Contacts

Program Chair:	A. Felsot	(509) 372-7365	Biotechnology:	J. Seiber	(702)-784-6460
				J. Nelson	(301)-405-3919
Vice Chair	D. Wauchope	(229) 386-3892		W.P. Ridley	(314)-694-8441
Synthesis-Special Topics	J. Fenyes	(901)-278-0330	Resistance:	T.M. Brown	(803)-656-5038
Standing Program:	D. Baker	(510)-231-1093		J. Nelson	(301)-405-3919
Residues-Special topics	J.J. Johnston	(970)-266-6082	Toxicology:	J.M. Clark	(413)-545-1052
Standing Program:	T.A. Wehner	(908)-594-6261		J. Coats	(515)-294-4776
Metabolism-Special Topics	H. Cutler	(770)-986-3240	Regulation	N. Ragsdale	(301)-504-4509
Standing Program:	D. Smith	(701)-239-1238	Special	J.M. Clark	(517)-545-1052
	M.G. Beconi-Barker	(616)-385-5597	Conferences		
Analytical:	R. Grazzini	(841)-231-8032	ACS Awards Symposia	J. Seiber	(510)-559-5600
Environmental	R. Honeycutt	(336)-294-5559			
	J. Seiber	(702)-784-6460	Young	A. Felsot	(509)-372-7365
	A. Felsot	(509)-375-9365	Scientists Award		
Mode of Action	R. Hollingworth	(517)-533-9430			
	J.M. Clark	(413)-545-1052			

OFFICERS AND COMMITTEES OF THE DIVISION AND SUBDIVISIONS OF AGROCHEMICALS

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Dr. Allan Felsot, **Program Chair**	(509) 372-7365	(509) 372-7460	afelsot@tricity.wsu.edu
Dr. Donald Wauchope, **V. Chair**	(229) 386-3892	(229)-386-7215	don@tifton.usda.gov
Dr. Aldos C. Barefoot, **Secretary**	(302)-451-5856	(302)-451-5941	aldos.c.barefoot@usa.dupont.com
Dr. Terry Spittler, **Treasurer**	(315) 787-2283	(315) 787-2320	tds2@cornell.edu

FERT Subdivision Officers

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Dr. Wayne Robarge, **Chair Elect**	(919) 515-1454	wayne_robarge@ncsu.edu
William Herz, **Vice Chair**	(202) 515-2706	wcherz@tfi.org
Herb MacKinnon, **Secretary**	(813)-989-2267	hmackin1@tampabay.rr.com

Executive Committee

2002-2004	**2003-2005**	**2004-2006**
Dr. Ellen Arthur	Dr. Todd Anderson	Dr. Randy Weintraub
Dr. John Johnston	Dr. Kevin Armbrust	Dr. Jeff Bloomquist
Dr. William Ridley	Dr. Jeff Jenkins	Dr. John Clark
Dr. Donald Wauchope	Dr. Laura McConnell	Dr. Kenneth Racke
Dr. Teresa Wehner	Dr. Scott Senseman	Dr. Pamela Rice
	Dr. Luis Ruzo	

Councilors

2002-2004	2004-2007
Dr. Joel Coats,	Barrington Cross
Dr. Judd Nelson (Alternate)	
Dr. Michele Radcliffe (Alternate)	

Division Committees

AGRO Program Committee

Dr. Rodney Bennett, **Chair**	(610) 878-6476	(610) 878-6475	rodney.bennett@cerexagri.com
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Dr. John M. Clark	Dr. Rick Grazzini		Dr. James R. Sanborn
Dr. Joel Coats	Dr. Robert Hollingworth		Dr. James Seiber
Dr. Barry Cross	Dr. David A. Hunt		Dr. David J. Smith
Dr. Allan Felsot	Dr. S. Mark Lee		

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Ms. Michelle Nutting		

Nominating Committee

Dr. Jeff Jenkins, **Chair**	(541)737-5993	(541) 737-5001	jeffrey.jenkins@orst.edu
Dr. Ann Lemley	Dr. Richard Honeycutt		Dr. Judd Nelson

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Dr. Leslie A. Hickle	Mr. Dan Schabacker		Dr. L. Somasundaram
Dr. Thomas R. Steinheimer			

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Dr. Don Baker	Dr. Willis Wheeler		Dr. Willa Garner

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Dr. Bruce Hammock	Dr. Jim Tumlinson	Dr. Nancy Ragsdale
	Dr. Willis Wheeler	Dr. Izuru Yamamoto

Publications Committee

Dr. Laura McConnell, **Chair**	(301)504-6298	(301)504-5048	mcconnel@ba.ars.usda.gov
Dr. Judd Nelson	Dr. Terry Spittler	Dr. John Clark	

Hospitality Committee

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Dr. Jeff Jenkins, **Social Hour**	(541)737-5993	(541) 737-5001	jeffrey.jenkins@orst.edu
Mr. Dan Schabacker, **Chair of Hospitality Table Committee**	(336) 632-2130		

Special Committees

By-laws Committee

Dr. Don Baker, **Chair**	(925) 254-108

Committee on Patron Relations

Dr. Luis Ruzo, **Chair**	(510) 741-3000	(510) 741-3030	lruzo@ptrlwest.com
Mr. Paul Giesler	Mr. Dan Schabacker		

Future Special Conference Committee

Dr. John M. Clark, **Chair**	(413) 545-1052
Dr. Robert Hollingworth	

Public Relations Committee

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Dr. James Seiber			

Education Committee

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Dr. Vincent Hebert	Dr. Ann Lemley		Dr. Glenn Miller
Dr. Judd O. Nelson	Dr. Jack R. Plimmer		Dr. Nancy Ragsdale
Dr. William Ridley	Dr. David Barnekow		Dr. J. Harold Falls

TREASURER'S REPORT

DIVISION OF AGROCHEMICALS - ACS
ANNUAL MEETING, SEPTEMBER 7, 2003
NEW YORK CITY

DATE	**7/31/02**	**12/31/02**	**7/31/03**
CHECKING ACCOUNT	$ 14,103	$ 30,001	$ 33,453
INVESTMENTS			
Spectrum Income (T. R. Price)	141,808	148,968	158,577
Prime Reserve (T. R. Price)	30,617	30,769	30,884
Educational Trust (Chase)	318.093	302,635*	345,783
ACS Investment Pool	16,180	15,584	17,141
TOTAL INVESTMENTS	**506,698**	**497,956**	**552,385**
TOTAL ASSETS	**520,801**	**527,956**	**585,838**

*$8900 transferred to checking 10/02

Upcoming Conference Announcements

EPRW 2004, 5th EUROPEAN PESTICIDE RESIDUE WORKSHOP "PESTICIDES IN FOOD AND DRINK" Stokholm, Sweden, June 13-16, 2004 www.slv.se/eprw2004 E-mail: aran@slv.se Chairman: Arne Andersson	**IUPAC** **11th International Congress of Pesticide Chemistry** **Evolution for Crop Protection, Public Health and Environmental Safety** Kobe Japan, August 6-11, 2006 http://www.iupac2006.jtbcom.co.jp/ Executive Committee Chairperson : Kenji Mori Organizing Committee Chairperson : Hideo Ohkawa

AWARDS COMMITTEE REPORT

Professor Hideo Ohkawa from Kobe University in Japan received the International Award for Research in Agrochemicals at the 2003 Fall Meeting of the ACS in New York City. The award is sponsored by DuPont Crop Protection, Wilmington, Delaware. Dr. Ohkawa was nominated by Morifusa Eto, John Casida, and Bruce Hammock. The Award Symposium has been organized for him around his career research contributions.

Prof. Judd Nelson, Department of Entomology, University of Maryland received the Fellow Award from the Agrochemicals Division to recognize his contributions to the AGRO Division and to the science of agrochemicals research. He was nominated by Nancy Ragsdale.

The Sterling B. Hendricks Memorial Lectureship Award was presented posthumously to Dr. Kriton Hatzios. Bob Hoagland and Nancy Ragsdale organized the Award Symposium. The co-sponsor of this award is the USDA-ARS.

Awards Committee balloting in 2003 produced the two International Award winners selected for 2004. Dr. Steve Duke of the USDA-ARS, Oxford, Mississippi will be honored at the Spring Meeting in Anaheim, California. His nomination was put forward by Nancy Ragsdale. An Award Symposium has been organized in his honor to highlight his contributions to herbicide modes of action and natural products chemistry. The award is sponsored BASF Corporation. At the fall meeting in Philadelphia, the International Award will be presented to Professor John Clark, Department of Entomology, University of Massachusetts, for his work on insecticide modes of action and insecticide resistance. He was nominated by Ralph Mumma. The award will be sponsored by DuPont Crop Protection. The AGRO Division is grateful for the continuing support of the sponsors of our international awards, BASF Corporation and DuPont Crop Protection.

I will be stepping down as Chair of the AGRO Awards Committee at the end of the year, after serving nine years in that capacity. I owe a special thanks to the other nine members of the committee, and I've also enjoyed working with the awardees, their nominators, and the officers of the AGRO Division. Next year the Awards Committee will be in the very capable hands of Jim Seiber, USDA-ARS, Albany, California.

The Awards Committee is accepting new awards nominations for the International Award for Research in Agrochemicals and for the Fellow Award. The nomination forms for both are found in the *Picogram*. Please consider nominating a deserving colleague. The deadline for the International Award is December 31, and for the Fellow Award is May 31.

Respectfully submitted,
Joel Coats, Chair
AGRO Awards Committee
September 7, 2003

MINUTES FROM THE AGROCHEMICAL DIVISION COMBINED GOVERNANCE MEETING

ACS 226th ACS Annual Meeting - New York City
Division of Agrochemicals Combined Governance Meeting
Sunday, September 7, 2003; 5:00 p.m.
Chair, Agrochemicals Division - Jeanette M. Van Emon

Program Planning

Jeanette Van Emon called the meeting to order at 5:00 pm. Volunteers are needed to represent AGRO, answer questions about the division, sell books, and seek new members. The Fertilizer subdivision will be represented at the Division table.

New York Update, Rodney Bennett - The International Award for Research in Agrochemicals will be presented to Hideo Ohkawa. A dinner for Dr. Ohkawa will be held Monday. The Sterling Hendricks Memorial Award will be a posthumous award to Kriton Hatzios. There are 29 posters, nine from graduate students. The Agro Social will be held Tuesday evening in the New Yorker Hotel, Gramercy Park Room. The Presidential event will be held on Thursday. Jeanette's symposium is part of the event. Don Baker noted that we usually schedule the International Award symposium for Monday, and the Sterling Hendricks symposium on Tuesday. This year the need to balance the program dictated the move of the International Award to Wednesday, while the Sterling Hendricks award symposium was scheduled to accommodate the availability of Dr. Hatzios' family.

Anaheim Program, March 28-April 1, 2004, Allan Felsot - Allan has planned a program with 9 Subject Sessions. Seven are AGRO only and two are co-sponsorships with AGFD & ANAL. Co-sponsorship with another division with programming on Thursday will count for our Thursday programming. ACS is insisting on even programming over the entire duration of the national meeting. OASYS opens to the public on Sept. 18, 2003 and closes to symposium organizers on December 1, 2003. Allan's deadline for the program is December 19, 2003.

Herbicide-Resistant Crops from Biotechnology - Current & Future Status, S.O. Duke and Nancy Ragsdale, International Award for Research in Agrochemicals, sponsored by BASF. Steve and Nancy have organized a two-day symposium with 15 speakers. They are seeking co-sponsorship arrangement with AGFD for a second Steve Duke symposium.

Agrochemical Issues in Urban Environments, John Clark, Allan Felsot, and Chris Peterson. Invited and contributed papers are planned for a 1.5-day symposium. There are 18 presentations invited at present. Possible topics include: Turf issues (Environ. Chem./Risk Assessment), School IPM/Disneyland IPM, Master Gardner Programs, West Nile Virus & Mosquito Control, Cockroaches/Termites, Roadside Vegetation Mgt Issues, Allan is looking for contacts at Disneyland for a presentation on IPM program and for contacts for the Master Gardener program.

Perchlorate Uptake in Plants--Interaction of Soils, Nutrients, Ground & Irrigation Water, Allan and Bill Hall. If interest is low, then this session will be combined with Agrochemical Issues in Urban Environments.

Natural Products for Pest Management, Co-sponsorship with AGFD, Steve Duke and Agnes Rimando
There are 28 invited speakers.

New Approaches for HPLC Method Development, Co-sponsored with ANAL, Ken Norris
Ken is looking for papers on any aspect of method development, use of novel stationary phases, LC-MS or other hyphenated systems, and success stories.

Terrestrial Field Dissipation, Pesticide Risk Assessment: From a Conceptual to a Quantitative Exposure Model, Don Wauchope and Al Barefoot. This symposium is a followup to a US EPA workshop. Topics to be covered include a report on the workshop, conceptual models for field dissipation, use of field dissipation studies in risk assessments, and technical issues in study design and conduct.

Philadelphia and Beyond, Allan Felsot and Bill Hall
Allan suggested that we use the email list to advertise sessions. We need to solicit papers, and we can use the email system to solicit papers regularly. We will now co-sponsor the Sterling Hendricks Memorial Lectureship with AGFD. Other possible co-sponsorships could be arranged.

For Philadelphia, Allan plans the following sessions: General Papers (contributed oral), Posters, Education Awards Competition, Sterling Hendricks Memorial Lectureship. The International Award for Research in Agrochemicals (sponsored by DuPont) will be presented to John Clark. Seventeen (17) speakers have been invited to participate in the award symposium. Ralph Mumma is organizing the symposium.

Is Organic Food Better than Conventional Food? Joe Rosen, Allan Felsot, focused on whether organic foods contain more anti-oxidants than food treated with non-organic pesticides. Joe proposes a point/counter point presentation in a debate format. Nancy Ragsdale suggested including meat and poultry in the symposium with some time spent on considering the meaning of "better" or "healthier" food.

Antioxidants in Food (Relationship to Agronomic Practices, Pests, & Health; Methods of Analysis, co-sponsor AGFD, John Finley, Jim Seiber, and Allan Felsot

Agrochemicals & Watershed Scale Models: Solutions for TMDL Analysis, Don Wauchope, Al Barefoot and Bill Hall. We may want to combine Bill's programming ideas on monitoring to produce a single symposium covering monitoring and modeling of pesticides and fertilizers.

National/Regional Air & Water Quality Monitoring Programs, Wayne Robarge, Aldos Barefoot, and Don Wauchope

Water Quality Protection at the Watershed Scale: Science & Regulations, W. Herz

Agrochemical Residue & Metabolism Symposium, standing symposium, David Smith, Teresa Wehner, and John Johnston

Other ideas for symposia in 2005 or later include:
Mineral Nutrition and Plant Disease
Innovative products

Spectroscopic methods – workshop in collaboration with Analytical. This would give good visibility to AGRO and also offers the possibility for raising funds through fees for attendance. Current plan is to have an open workshop.

Symposium on graduate student education, suggested by Chuck Carey. A Symposium on sustaining education in agricultural technology could generate enough ideas to justify a morning session and possibly gain $700 extra in funding. There is a USDA funded NAS study of agricultural science research. We don't have details on findings, but Bruce Hammock is on the panel and is a contact for information. Jim Seiber noted that there has been a slow down in approval for foreign students. This presents a significant problem for development of trained scientists, both in the US and elsewhere.
Women Chemists Committee would like to co-sponsor symposia. AGRO would need to organize the symposium.
Biotechnology secretariat – we get the credit for a symposium conducted under the umbrella title.

3rd Pan Pacific Conference on Pesticide Science 2003, Barry Cross and John Clark
The conference finally got underway with 179 attendees. The organizers faced many difficulties getting it off the ground. Thirty AGRO members attended. The huge drop in corporate sponsorship forced us to limit support to $500 for those who needed it. The conference itself was first rate. The Japanese committee worked very hard and is to be commended for the very well organized conference. The awarding of prizes for the best posters was very well received. The poster attendance was very good and saved the finances of the conference. Scientists presented a total of 68 posters from 4 countries (Japan 46, USA 15, Korea 5, and New Zealand 2). Six awards were made (1st ($1000), 2nd ($500) and 3rd ($250). The largest number of posters was presented in Topic A-5 New Chemistry/Green Chemistry (14, 21%) and Topic A-4 Natural Products (14, 21%), followed by Topic B-1 Environmental Chemistry/Residue Analysis (10, 15%) and Topic B-5 Resistance and Management (9, 13%). These four topics (4/12, 33%) had 70% of the presented posters. The remaining topics had 5-6 posters each. Barry estimated the financial loss at approximately $5000. The final financial position will depend on payment for remaining expenses and receipt of outstanding, pledged contributions.

The organizing committee proposed June 2008 as the date for the next conference with Hawaii as the best venue for the attendees. The ACS AGRO Division was asked to run the next conference but with the inclusion of the Chinese scientists on the organizing committee. Barry Cross can provide the name of a potential organizer and a list of Chinese scientists who were enthusiastic. John Clark and Barry Cross recommend the immediate appointment of a US Conference and Program Chair. The Pan Pacific conference is one of the most stimulating Agrochemical Conferences that our society can attend and is worth continuing in spite of the organizational headaches it consistently provides. Need ACS support if we decide to proceed with future Pan Pacific conferences. Rationale for separate meeting from PacChem is unclear. Combining the Pan Pacific with PacChem could increase ACS interest.

Long Range Program Planning, Herb Nigg, Dave Barnekow, Rod Bennett
Programming for Anaheim is in good shape despite no meeting of this committee. Dave Barnekow can't count on being here for meetings and is mainly working on providing funds for Dow sponsored awards. Rod is the only member of the committee who could attend this meeting, and he needs additional people to prepare long-range plans. Allan Felsot, Rod, Don Wauchope, Don Baker, Scott Senseman, and Bill Hall proposed a meeting before the social at the New Yorker on Tuesday evening.

Executive Committee and Business Meeting

Jeanette noted the ACS Committee on Relations with Divisions, Local Sections and Biotechnology Secretariat are looking for ways for local sections and divisions to work together.

Bob Hauserman, Acquisitions Editor for ACS (Phone-(202)-452-2120) is responsible for the ACS book publishing program. ACS publishes 30-35 books per year, and AGRO books are very important part of the program. ACS is interested in increasing the number of books in the program, and recognizes that publishing can be faster. Timeliness is the key to success. AGRO revenue from books is down. The book industry is flat across the board, and the decrease in our revenue could be part of the same trend, but the book industry is not dead. The industry is in transition, and publishers are looking for ways to reduce costs, such as print on command approaches or more reliance on paperbacks. ACS would welcome the opportunity to publish the Pan Pacific proceedings. ACS still publishes through Oxford. There are still some issues in the transition to the new system after the demise of a very large program that ACS ran. Oxford has a new marketing manager (Carrie Pedersen) dedicated to marketing ACS books. Ann Lemley commented that the cost of reprints ($492/100) seems high. An alternative to the typical reprint publishing is to publish reprints separately and inform publishers that copies are being prepared for the personal use of the author. Co-editors receive 5 copies of ACS symposium books. ACS is going to web- based publishing and within 2 years will move more to web-based format. Journals have been first to move, but books have been lower priority. Standardizing the format, as for journals, is on the priority list. Many books that are already published could be put on the web for additional revenues. ACS books will ship books to regional and local section meetings. For example, Terry Spittler and Kevin Armbrust registered as exhibitors at the Florida Pesticide Residue Workshop. ACS shipped books to the workshop. Participants requested order forms, but did not purchase any books at the workshop.

Elsevier recently published a comprehensive volume by Barton and Nakanishi. The book is on display in the exposition hall. Elsevier focuses on reference works that are 4-5 years in the making. Elsevier has acquired Academic Press where texts are published in San Francisco. Galileo published under Elsevier imprint. For symposium volumes, the sales potential is increased with preparation of books ahead of time rather than with a delay of 1-2 years. There is a dedicated editorial office in Amsterdam to work with guest editors in the symposia series. The business deal depends on the number and quality of books. Elsevier looks to sell 300-400 copies of each book. Typically editors would receive 1-2 copies of each book. Authors receive 50% discount on their books and a 30% discount on any Elsevier publication in the future.

Journal of Agricultural & Food Chemistry, Jim Seiber. J. Ag and Food Chemistry concluded its 50th anniversary this year. The Journal will continue its Perspectives on Science, and Willis Wheeler will organize a Perspective on Agrochemicals. There are two issues each month. The number of manuscripts continues to go up, 2300 in 2003, 10% increase over 2002, partly due to electronic submission. The Journal is publishing the same number of pages as in 2002, but the reject rate is up to 40% as the editors ratchet up quality. The primary rejection criteria are: subject is out of scope, for instance nutrition, agronomy, or manuscripts are poorly prepared, illegible, but editors go through peer review as much as possible. The Journal will add another associate editor in the food chemistry area. Publication is steady in other areas. They plan to add staff in associate editor's offices this year. Peer reviewers are overtaxed, and additional reviewers are needed. The Journal welcomes review papers and symposia proceedings if they are in an appropriate subject area and report scientific findings.

Secretary's Report, Aldos Barefoot. Al reported that he receives membership lists for AGRO and FERT and sends the reports to the membership chairs and FERT subdivision chair. Al scheduled the business meeting and social. He asked for reports in an electronic form prior to the meeting for display during the

business meeting and to facilitate preparation of the minutes after the meeting. The chair asked the Secretary to send a letter of appreciation to Carolyn Wallace for her work on and planning of the Agrochemicals business meeting and Agrochemicals social menus.

Treasurer's Report, Terry Spittler. Terry provided a summary of the AGRO financial position for 2002 and 2003. The value of our investments has increased with the improvement in the stock market. Our checking account balance is about 10% higher than at the same time in 2002. We seem to be managing our expenses within the guidelines developed in 2001.

Fertilizer Subdivision Report, Bill Hall & Herb MacKinnon. FERT held its business meeting on Sunday at 4:00 pm. There was good discussion on programming. FERT has requested $1000 for a booth at a conference on Environmental Quality and Agricultural Science. Two registrations are included with the payment for the booth. Officers nominated by the FERT executive committee in accordance with bylaws of the sub-division: Chairman: William L. Hall, Chair Elect: Wayne P. Robarge, Vice Chair: William Herz, Secretary: Herbert McKinnon. The FERT officers were elected unanimously. Bill has applied for mini-grant for FERT activities to increase membership involvement and stabilize membership.

Councilor's Report, Nancy Ragsdale, Joel Coats, Judd Nelson. Divisional Activities Committee expressed concerns over membership in the Division and difficulties in programming. In August 9, 2003, there were 1372 members in the Agrochemicals division. The decline in AGRO membership may cause the ACS Division Activities Committee to look at us in the near future for an evaluation of our programs and membership prospects. While there isn't a definite date for the review, we can expect some questions and we need to be prepared. AGRO will need a contingency plan that may be needed as early as next year. There are options for us, for example programming once per year, seeking subdivision status. General trend in division membership within ACS – applied divisions are decreasing, others such as Organic, Analytical are stable or growing. Because of a drop in membership, we lose a councilor. Nancy has chosen not to run. This now means we will be back on schedule for electing a councilor each year. All three AGRO councilors attended the Council meetings in 2003. Nancy asked Al to correct the Annual report, which indicated that only two councilors have attended the meetings. The ACS declined 400 papers due to multiple submissions in different divisions.

Membership Committee, Randy Weintraub & Chris Peterson. AGRO membership as of June 30, 2003 is 1371. This includes merged FERT members. Of these 87% are currently paid. Membership is down from December 2002 count of 1518 and December 2001 count of 1728. Since December 2002, AGRO roster lost 76 (6% of 1242) and FERT roster was down 71 (26% of 271). Membership recruitment and retention activity will continue. These will include mailings to key local sections and academic institutions, soliciting membership of prospective non-member authors of papers in *J Ag Fd Chem*, *Pest Manag Sci*, etc., soliciting non-renewing past members, and organizing involvement of membership committee members.

As a way to increase membership, John Johnston proposed that we provide ACS and division membership to spring and fall educational award winners. John made a formal motion, which was seconded by Jeanette Van Emon. In discussion, we debated several options such as making the award retroactive or allow multiple winners to receive membership for successive years, and John accepted an amendment to make the award retroactive to 2003. The cost of student membership is $58. On further discussion, the motion was amended again to begin providing membership for award winners in Spring, 2004. Motion to amend resolution - John, Don Baker second. The final motion was for spring and fall educational awards to include ACS and division membership in the awards beginning during spring, 2004. Motion passed.

Publications Committee, Laura McConnell. The PICOGRAM was successfully published for the Fall 2003 National Meeting with the benefactors now listed on the inside front cover across from the officer pictures. Seven full-page ads and 4 half-page ads were all successfully printed in this volume with no error or omissions. Drawing slips of paper from a "hat" determines the order of the ads in the PICOGRAM. The Oxford Press ad was included at no charge as discussed at previous business meetings since our books are being advertised. A complete list of ACS books sponsored by AGRO is also included with up-to-date pricing at the end of the PICOGRAM. Thanks again to Jeanette Van Emon and Barbara Queen for their help in proofreading the copy prior to submission. Thanks also to Terry Spittler for his work in getting a copy of the proofs sent from the printers. Interaction with staff at Sheridan was extremely helpful.

Updates were made to the AGRO webpage to include the latest award winners and program for the Fall meeting. The program currently being used to create the webpage is somewhat outdated and suggestions for new software would be appreciated. AGRO members are encouraged to send digital pictures taken at the meetings or at other AGRO-related activities during the year for inclusion in the PICOGRAM and the webpage. Members may also send in announcements for special symposia or information on special workshops or conferences related to Agrochemicals or Fertilizers. Ideas for new features for the website are welcome.

E-mail Communications System, Tim Ballard & Terry Spittler. Tim used the $1000 grant to set up the email system. Some money is left for additional work on the system. We will use the email system for ACS AGRO business. Only the system manager has access to the email addresses. Our by-laws allow electronic balloting, and we are now in a position to look into electronic balloting. We need ACS approval.

Directory proposal, Tim Ballard. Tim proposed setting up a searchable division membership directory on the Ag-List server. A link could be placed on the Agrochemicals website for easy access to the directory. Access could be restricted to one record at a time to prevent e-mail mining as a safeguard in reponse to concerns about general access to email addresses. Inclusion in the directory would require an opt-in. The directory would be promoted through advertisements in the Picogram, an announcement through the current Ag-List system and other division mailings. Tim asked for $1500 in one-time charges to set up the system and $300 in annual costs for maintenance and updates. Ann Lemley made a motion to approve up to $1500 for the electronic directory and seek ACS funding for a divisional enhancement grant. Don Wauchope provided a second to the motion. Jeanette called for further discussion and a vote. The motion carried.

Awards Committee, Joel Coats. International Award for Research in Agrochemicals. Professor Hideo Ohkawa, Kobe University, will receive the International Award for Research in Agrochemicals at the 2003 Fall ACS meeting in New York. Two awards are granted each year. BASF and DuPont sponsor the awards. Sponsors commit to a $3000 honorarium and travel expenses for the awardee. The Sterling B. Hendricks Memorial Lectureship Award will be presented posthumously to Dr. Kriton Hatzios. Bob Hoagland and Nancy Ragsdale have organized the Award Symposium. The co-sponsor of the award is USDA-ARS. The Awards committee selected two winners of the International Award for 2004. Dr. Steve Duke of USDA-ARS will be honored at the Spring Meeting in Anaheim. An award symposium has been organized to honor his contributions to herbicide modes of action and natural products chemistry. The award is sponsored by BASF. In the fall, the award will be presented to Professor John Clark, University of Massachusetts, for his work on insecticide mode of action and resistance. The Agrochemicals Division is grateful for the continuing support of BASF and DuPont. Judd Nelson was elected a Fellow of the Division. Joel is stepping down as chair of the committee after nine years as chair. Jim Seiber will take on chair responsibilities. Jeanette is looking for additional members for the award committee.

The Awards committee is accepting nominations for the International Award and Fellow Award. The deadline for the International Award is December 31, and for the Fellow Award, May 31.

Finance Committee, Terry Spittler for Barry Cross. Agrochemicals Division Investment Strategy: The 4th quarter should see significant growth in the economy and thus stocks. Rather than take money out of equities now, we should have a plan to take 50% of every 10,000 dollars that we get from capital appreciation and either invest in short term (definitely not long term) treasuries-most conservative or Money Market or into bonds. Now as interest rates rise bonds will lose money, but after appreciable market appreciation we should consider 50% bonds AT THE TOP of the market gain, but not yet. Barry's recommendation is do nothing at the moment but for every $10,000 increase in equities filter off $5000 into bonds. When we get to high interest rates in a declining interest rate market we should be 50% in bonds/interest bearing accounts.

Hospitality Committee, Terry Spittler & Jeff Jenkins. Coffee Fund. Fourteen companies have contributed twenty-five hundred fifty dollars in support of the Coffee Lounge in New York City. Please take note of the sponsors listed on the poster in the AGRO Desk area. Enjoy their generosity, check out their literature and thank their representatives. Division Social. All AGRO Division and FERT Subdivision members, speakers and spouses are invited to attend the Social Hour, Tuesday at 6:00 PM, in the Gramercy Park Room of the New Yorker Ramada Inn. Al Barefoot has put together a gala of food and drinks. Awards and door prizes may appear. AGFD expressed interest in a joint social at the Anaheim meeting and have proposed splitting costs rather than the previous arrangement where both divisions provided funding equal to what they would ordinarily spend separately. Hospitality Co-chairs Jeff Jenkins and Terry Spittler are delighted to welcome David J. Smith, USDA, Fargo ND, who will take over responsibilities for the Coffee Lounge. We would love a few new committee members to help with various Hospitality functions.

Nominating Committee, Terry Spittler (2004 election) and Jeanette Van Emon (2005 election)
Our tradition is that the past chair participates in nominations. Terry assembled a complete ballot that will be mailed this fall.
CANDIDATES FOR VICE-CHAIR, Don Wauchope, Ellen Arthur
CANDIDATES FOR COUNCILOR**,** Jack R. Plimmer, Barrington Cross
CANDIDATES FOR EXECUTIVE COMMITTEE, Randy Weintraub, Jeff Bloomquist, Ali Banijamali, Michael S. Young, Thomas Potter, John Clark, Tom Doran, Ken Racke, Matthew Brooks, Del A. Koch, Pamela Rice, Herbert Mckinnon

The FERT executive committee prepared a ballot in accordance with bylaws of the sub-division. The sub-division will hold its annual meeting Sunday, September 7 at 4:00 pm where the members will elect the officers: Chairman, William L. Hall; Chair Elect, Wayne P. Robarge; Vice Chair, William Herz; Secretary, Herbert McKinnon

Public Relations Committee, Jeff Jenkins. Jeff is looking for newsworthy items for our division and contributions for Public Relations. Any newsworthy presentations can be brought to Jeff's attention. For instance we can send award winners to the local press and mention the division in the press release. ACS runs a very good workshop on PR.

Education Committee, John Johnston. There are 9 entries for the Graduate Student Research Poster Competition. John expressed his thanks to the AGRO members who encouraged their students to submit posters. The judges for the New York competition are Terry Spittler and David Smith. John asked all of us to attend the poster session, since good attendance by members encourages students and helps to make the poster session a good experience for the students. The top three entries will be on display at the AGRO social on

Tuesday evening. John asked that we suggest names of departments or faculty members who might serve as sources for future posters. If you have ideas, please get in touch with John. The next Young Scientists Recognition Symposium, coordinated by Allan Felsot, will be held at the Spring Meeting in Anaheim. The next Graduate Research Poster Competition, coordinated by John Johnston, will be held at the Fall meeting in Philadelphia.

By-Laws Committee, Don Baker. No suggestions for by-law changes. Any proposed changes should be sent to Don with proposed text.

Old Business

AGRO Division Procedures Manual, Nancy Ragsdale for Willa Garner. Procedures Manual – Nancy needs comments on the draft. We really need the manual and need review. Nancy noted that some items in the draft procedure manual do not follow by-laws and some practices are not correct. Need to review by-laws and follow procedures. Vice chair, chair elect and chair turn over responsibilities at conclusion of annual meeting. Secretary and Treasurer turn over at end of the year. Don Baker will compare the procedures manual to by-laws and provide recommendations for changes to the manual. Officers, Ann Lemley, Joel Coats, Ralph Mumma and Don Baker will review the manual. Our by-laws are on the web site.

2005 – 35th year for AGRO Division. Allan is working with other divisions to create special events. Regional meetings and local sections are interested in Division sessions. Posters from national ACS meetings can be taken to local meetings or regional meetings and displayed.

New Business

Membership committee and chair will have to prepare for Division Activities committee. John Clark volunteered to work with student groups. A possible change in the Division name was suggested, since we are not attracting people with the Agrochemicals name. None of the proposed names caught the imagination of the group. Judd Nelson noted that programming two meetings a year is becoming more difficult and suggested we move to one meeting per year. There was some discussion of the advantages, and Nancy Ragsdale suggested we poll the membership to see if one meeting a year would be acceptable. By-laws state we must have an annual meeting, and it is the fall meeting.

National and Business Meeting Follow Up, Jeanette Van Emon. Jeanette has a Press conference scheduled on homeland security. Rod has requested C&EN coverage for award presentations and provided press releases to the ACS office.

"Gavel"

Jeanette passed the gavel to Rod Bennett who now takes over as Chair of the Division of Agrochemicals. Rod adjourned the meeting at 10:10 pm.

Respectfully submitted,
Aldos C. Barefoot, Secretary

APPLICATION FOR MEMBERSHIP/RENEWAL

Division of Agrochemicals

☐New Member ☐renewal ☐ Free Fertilizer & Soil Science Subdivision Membership

Date Applied:

Name (full name preferred) _____

Employer/Affiliation _____

Mailing Address (official ACS mailing address, E-mail address also)

_____

_____

Telephone Numbers: _____Business

_____Residence (optional)
(Please give area code)

National ACS members: Please renew your Divisional membership through ACS when you renew your ACS membership.

Non-ACS members: Complete this form and mail to the Membership Committee Chairman

Signature: _____

ACS Membership Number: _____

MEMBERSHIP DUES FOR CALENDAR YEAR (Mark appropriate category)

☐ ACS Member-$12.00 ☐Non-ACS Member-$14.00 ☐Student-$5.00

Please make checks payable to: DIVISION OF AGROCHEMICALS - ACS. Do not send cash. Checks must be in U.S. Dollars only. Foreign checks and money orders cannot be processed. Mail to: Chris Peterson, USDA Forest Service, Wood Products Insect Research Unit, 201 Lincoln Green, Starkville, MS 39759

INSTITUTION:
(Circle one)
A. Academic
B. Government
C. Industry
D. Other (specify)

TYPE OF EFFORT
(Circle Maximum of Three)
A. Research
B. Teaching
C. Regulatory Affairs
D. Management
E. Marketing
F. Development
G. Consulting
H. Independent Contract Lab
I. Patent Law
J. Other (specify)

MAJOR INTERESTS
(Circle Maximum of Six)
A. Insecticides
B. Insect Growth Regulators
C. Herbicides
D. Plant Growth Regulators
E. Fungicides
F. Other pesticides (specify)
G. Insect Behavioral Chemistry
H. Phytochemistry
I. Organic Chemistry
J. Physical Chemistry
K. Analytical Chemistry
L. Formulation Chemistry
M. Metabolism
N. Environmental Chemistry
O. Biochemistry
P. Toxicology
Q. Mode of Action
R. Biotechnology

American Chemical Society

DIVISION OF AGROCHEMICALS

ABSTRACTS

227th ACS National Meeting
Anaheim, CA
March 28-April 1, 2004

A. S. Felsot, *Program Chair*

OTHER SYMPOSIA OF INTEREST:
Chemistry and Safety of Acrylamide in Food
(see *AGFD*, Mon, Tue, Wed)
Natural Products for Pest Management
(see *AGFD*, Sun, Mon)
SOCIAL EVENT:
Social Hour: Tuesday Night 7:00PM

BUSINESS MEETING: Sunday Night 6:00PM

SUNDAY MORNING

General Papers I Section A
A. S. Felsot, *Presiding*

9:00 Introductory Remarks
9:05 **1.** Molinate degradation using nanoscale zero valent iron and its oxidative pathway. **S. H. Joo**, A. J. Feitz, T. D. Waite
9:30 **2. Fate of the fumigant [^{14}C] Furfural in soil**. **M. F. Kovacs Jr.**, W. E. Gledhill, G. J. Burger, A. C. Katz, J. A. Norton
9:55 **3.** Quantitative effect of chronic toxicity of different pesticides on immuno-haematological parameters in broiler chicks. U. K. Garg, A. K. Pal, G. J. Jha, **S. B. Jadhao**
10:20 Intermission.
10:35 **4.** Modified vetiver oil: Economic development of a biopesticide. **K. Chauhan**, A. Raina
11:00 **5.** Natural molluscicides against ram's horn and golden apple snails. **K. M. Meepagala**, G. Sturtz, C. A. Mischke, R. C. Joshi, S. O. Duke
11:25 **6.** Pheromone mating disruption: Assessment of commercial dispenser release systems. **V. Hebert**, J. Brunner, V. Jones, M. Doerr, E. Tomaszewska

New Approaches in HPLC Method Development
Section B
K. J. Norris Jr., *Organizer, Presiding*

9:00 Introductory Remarks.
9:05 **7.** Making the most of your HPLC separations: maximizing selectivity, peak capacity and speed. **D. M. Diehl**, E. S. Grumbach, J. R. Mazzeo, U. D. Neue
9:35 **8.** Fast separations by high temperature HPLC-replacing solvent gradient with temperature programming. **L. Tang**, Q. Zhang, A. Aubry
10:00 Intermission.
10:15 **9.** Using isoelueotropic mobile phases as part of an isocratic reversed-phase HPLC method development activity. **B. A. Bidlingmeyer**, A. D. Broske, W. D. Snyder
10:55 **10.** Pesticide analysis using HPLC with CD and fluorescence detection. **A. L. Jenkins**, **R. A. Larsen**, W. A. Hedgepeth

SUNDAY AFTERNOON

General Papers II Section A
A. S. Felsot, *Presiding*

1:30 Introductory Remarks.
1:35 **11.** Degradation of selected organophosphate and carbamate insecticides in waters from a coastal watershed. **S. Bondarenko**, **J. Gan**
2:00 **12.** Environmental behavior of synthetic pyrethroid stereoisomers. **W. Liu**, **J. Gan**, S. Lee
2:25 **13.** Aerobic aquatic metabolism of zeta-cypermethrin. S. J. Curry, **R. T. Morris**, J. F. Culligan Jr., D. J. Letinski, R. J. Jones, S. F. ElNaggar
2:50 Intermission.
3:05 **14.** On the relationship between sorption and degradation of molecules in soils, and the Walker moisture exponent. **R. D. Wauchope**
3:30 **15.** A proposed convention for representing acid-base behavior of pesticides in pesticide property databases designed for simulation modeling. **R. D. Wauchope**
3:55 **16.** Root Zone Water Quality Model predictions for runoff volume and nitrogen in runoff water from turfgrass. **L. Schwartz**, L. M. Shuman

New Approaches in HPLC Method Development - Part 2
Section B
K. J. Norris Jr., *Organizer, Presiding*

2:00 Introductory Remarks.
2:05 **17.** Evolution of analytical method development through early phase drug development. **S. E. Bandy**, **R. B. Scherer**

2:30 **18.** A rational approach to rapid HPLC methods development and optimization. **T. L. Chester**
3:10 Intermission.
3:25 **19.** Developing a strategy for the systematic development of reversed-phase HPLC separations. **T. Jupille**
4:05 **20.** Technologies and philosophies of automating the process of chromatographic method development. **M. McBrien**, A. Vazhentsev, E. Kolovanov, V. Tashlitsky
4:45 Concluding Remarks.

MONDAY MORNING

Young Scientists Research Recognition Award Symposium Section A
Cosponsored with WCC
A. S. Felsot, *Organizer, Presiding*
8:00 — Introductory Remarks.
8:05 —21. Optimization of Leuckart reaction for the synthesis of novel formamide fungicides. M. M. Bobylev, **C. L. Aaron**, M. A. Upton
8:25 —22. Potential transport of metolachlor, metolachlor ethanesulfonic acid, and metolachlor oxanilic acid in vegetative filter strip soil as a function of microbiological characteristics, sorption and mineralization. **L. J. Krutz**
8:45 —23. Accumulation of agricultural pesticides in bird eggs from the Colorado River Delta. **Y. Sapozhnikova**, J. Garcia-Hernandez, D. Schlenk
9:05 —24. Mass balance of atrazine and metolachlor in phytoremediated soil systems. **K. L. Henderson**, J. B. Belden, J. R. Coats
9:30 —25. Influence of Combined Application of Fumigants on their Transformation and Persistence in the Environment. **W. Zheng**, S. R. Yates, S. K. Papiernik, M. Guo

General Posters Section B
A. S. Felsot, *Organizer*
10:00 - 12:00
26. Synthesis of a Novel Isoxazole Derivative Containing Trifluoromethyl. Y. Wen, Z. Fang, **W. Liu**
27. Green chemistry: One pot synthesis of novel formamide fungicides. **M. M. Bobylev**, R. Gonzalez
28. Separation and aquatic toxicity of enantiomers of three organophosphorus insecticides. **W. Liu**, J. Gan
29. Synthetic Pyrethroids: Bioavailability in Surface Water. **J. Gan**, W. Yang, M. A. Irwin, W. Liu
30. Nucleophilic radical substitution reactions of triazine herbicides with polysulfides. **W. Yang**, S. Bondarenko, **W. Liu**, **J. Gan**
31. Transformation of halogenated organic compounds by polysulfides. **S. Bondarenko**, **J. Gan**
32. Design of a field soil dissipation study using chemigation as an application technique. **E. Zietz**, R. L. Warren, J. S. LeNoir
33. Normalization of field degradation data to reference soil temperature and moisture conditions. **R. L. Jones**, I. A. J. Hardy, R. Allen
34. Evaluating two different exposure modeling approaches for degradation products of crop protection substances. **P. Singh**
35. Use of field soil dissipation data in regulatory leaching modelling in Europe: A case study. **M. Dust**, A. Huber, H. Strek, E. Zietz
36. Probabilistic modeling for risk assessment of ground water contamination by pesticides. **M. Clayton**, F. Spurlock, J. Troiano
37. Calculation of temperature referenced field half-lives for prothioconazole and its major degradation product. J. M. Fisher, **M. Lenz**, R. Allen, T. S. Ramanarayanan
38. Reduction of wind erosion employing a novel, biodegradable, polysaccharide based solution. **S. D. Jensen**, J. H. Wynne, C. T. Lloyd
39. Herbicide retention in soil as affected by sugarcane mulch residue. **H. M. Selim**
40. Atrazine adsorption and desorption by sugarcane mulch residue. **H. M. Selim**, H. M. Zhu
41. Reconnaissance for selected herbicides and antibiotics in the Midwest, 2002. **E. A. Scribner**, W. A. Battaglin
42. Perchlorate in marine based fertilizers and food supplements. **G. J. Harvey**, J. R. O'Lear
43. A novel systemic insecticide, dinotefuran(MTI-446)-its characteristics and application for insect control. **S. Ooe**, **N. Yasui**, **K. Kodaka**
44. Metabolism and Disposition of F7967 in the Rat. **S. F. ElNaggar**, J. Zhang, R. W. Creekmore, D. Letinski, S. Curry, J. Goudar, G. Wang, D. Wu, Z. Gu
45. Metabolism and Pharmacokinetics of Carfentrazone-Ethyl in the Rat. **S. F. ElNaggar**, J. D. McCarty, L. W. Froelich, D. Wu, J. M. Chemidlin
46. Cytogenetic Effects of Malathion on the Meristematic Cells of the Roots of Pechay (Brassica chinensis Linn.). **A. L. Gundran**, F. L. Bognot, A. G. Lopez, M. C. Oronce, M. V. B. Quiroz, D. S. Munoz, R. S. Gonzales, E. D. Cayabyab, J. M. de Paz, L. L. Lasam, J. M. Lising, Z. F. Mergal, M. R. Sampang, **R. D. Vitug**
47. DNA adduct formation from pesticides. **D. W. Boerth**, J. R. Stanks, E. Eder
48. Distinct effects of organophosphorous acid triesters (OP) on homeostasis of nicotinamide adenine dinucleotide (NAD+) in chicken embryos, chicks and mice. **J. Seifert**
49. Development of immunoassays to evaluate human exposure to permethrin. **K. C. Ahn**, S. Ma, S. J. Gee, B. D. Hammock
50. Application of europium oxide nanoparticles as a fluorescent reporter for immunoassay. **K. C. Ahn**, M. E. Koivunen, S. Gee, I. Kennedy, B. D. Hammock
51. Release of PBO and permethrin from synergized insecticidal cattle eartags (1). **J. A. Klavons**, J. A. Miller, A. Y. Li
52. The very-long-chain fatty acid synthase is inhibited by chloroacetamides. **T. Gotz**, P. Boger
53. Wine grape injury from the regional movement of 2,4-D: 2003 Pacific Northwest monitoring program. **K. Holshue**, J. LePage, C. Sanford, V. Hebert

54. Within canopy movement and deposition of insecticide residues in orchards during spray operations. **A. S. Felsot**, Q. Macdonald, J. R. Ruppert

MONDAY AFTERNOON Section A

Herbicide-Resistant Crops from Biotechnology-Current & Future Status, International Award for Research in Agrochemicals Honoring Dr. Stephen O. Duke Sponsored by BASF
S. O. Duke and N. Ragsdale, *Organizers*
N. Ragsdale, *Presiding*
1:30 Award Presentation.
1:45 **55.** Taking stock of herbicide-resistant crops ten years after introduction. **S. O. Duke**
2:25 **56.** Glyphosate-resistant crops: History, current status, and future. **G. Dill**
2:55 Intermission.
3:15 **57.** Technical concerns with some commercial glyphosate-resistant crops. **W. Pline-Srnic**
3:45 **58.** Properties of a microbial acetyltransferase evolved for detoxification of glyphosate. **D. L. Siehl**, L. A. Castle, R. J. Keenan, R. Gorton, M. Lassner
4:15 **59.** Economic and herbicide use impacts of glyphosate-resistant crops. **L. P. Gianessi**, S. Sankula

Agrochemical Issues in Urban Environments
Section B
Turf Issues
J. M. Clark, A. S. Felsot, and C. J. Peterson, *Organizers*
J. M. Clark, *Presiding*
1:30 Introductory Remarks.
1:35 **60.** Environmental stewardship of golf courses. **M. P. Kenna**
2:05 **61.** The Turf Umbrella Project: A cooperative initiative for improved pesticide exposure assessment in turf. **M. Nett**
2:35 **62.** Best management practices to reduce pesticide runoff from turf. **B. E. Branham**, J. H. Mueller, F. A. Kandil
3:05 Intermission.
3:25 **63.** Nitrogen fate in a mature Kentucky bluegrass stand. **K. Frank**
3:55 **64.** Herbicide residues from turf can enter compost waste stream in potentially phytotoxic amounts. **P. H. Gosselin**
4:25 **65.** Golfer exposure to turfgrass pesticides. **R. A. Putnam**, J. M. Clark

MONDAY EVENING

Division of Agrochemicals Sci-Mix
A. S. Felsot, *Organizer*
8:00 - 10:00
26-29, 31, 33-37, 39-42, 44, 46-47, 49-54. See previous listings.

TUESDAY MORNING

Herbicide-Resistant Crops from Biotechnology-Current & Future Status Section A
Current and Potential Products
S. O. Duke and N. Ragsdale, *Organizers*
M. D. Devine, *Presiding*
8:30 Introductory Remarks.
8:35 **66.** Glufosinate-resistant crops (history, current status, and future). **J. N. Botterman**
9:05 **67.** Imidazolinone-resistant crops: History, current status, and future. **S. Tan**, R. R. Evans, M. L. Dahmer, B. K. Singh, D. L. Shaner
9:35 **68.** Resistance to phytoene desaturase-inhibiting herbicides: From noxious weeds to improved crops. **F. E. Dayan**, R. S. Arias, A. Michel, B. Scheffler, M. Netherland
10:05 Intermission.
10:25 **69.** Development of Protoporphyrinogen Oxidase as an efficient Herbicide Selection Marker for Transgenic Crop Plants. **S. Warner**, X. Li, S. Volrath, D. Nicholl, C. Chilcott, M. Johnson, E. Ward, M. Law
10:55 **70.** p-Hydroxyphenylpyruvate dioxygenase inhibitor-resistant plants with high vitamin E content. **M. Matringe**
11:25 **71.** Herbicide resistance in transgenic plants with mammalian P450 monooxygenases. **H. Inui**, H. Ohkawa

Agrochemical Issues in Urban Environments
Section B
Residential Risk Assessment
J. M. Clark, A. S. Felsot, and C. J. Peterson, *Organizers*
J. M. Clark, *Presiding*
9:00 Introductory Remarks.
9:05 **72.** Development and management of pesticides for urban uses: An agrochemical industry perspective. **K. D. Racke**
9:35 **73.** Exposure and risk considerations for termiticide products. **J. Zabik**, D. E. Barnekow, F. Selman, K. D. Racke
10:05 **74.** Exposure assessment for residential pesticide exposure: First tier environmental measures and human biomonitoring. **R. I. Krieger**
10:35 Intermission.
10:55 **75.** Risk assessment of residential pesticide exposure: Contrasting first tier assessment with actual measurement. **J. H. Ross**, J. H. Driver, R. I. Krieger
11:25 **76.** Human health effects of non-agricultural pesticide exposure: A report from the California Pesticide Illness Surveillance Program. **L. Mehler**

TUESDAY AFTERNOON

Herbicide-Resistant Crops from Biotechnology-Current & Future Status Section A
Other Aspects
S. O. Duke and N. Ragsdale, *Organizers*
S. O. Duke, *Presiding*
2:00 Introductory Remarks.
2:05 **77.** Gene flow from herbicide-resistant crops: risks and consequences. **A. Légère**
2:35 **78.** Herbicide-resistant crops and weed resistance to herbicides. **M. D. K. Owen**
3:05 **79.** Herbicide-resistant crops: Why are there not more? **M. D. Devine**
3:35 Intermission.
3:55 **80.** Ethical considerations of HRCs. **K. H. Madsen**, P. Sandoee
4:25 **81.** Panel discussion: Herbicides - issues and future directions. **N. N. Ragsdale**

Agrochemical Issues in Urban Environments Section B
Garden and Landscape Management
J. M. Clark, A. S. Felsot, and C. J. Peterson, *Organizers*
C. J. Peterson, *Presiding*
2:00 Introductory Remarks.
2:05 **82.** Pesticides and TMDLs in an ag/urban interface. **J. N. Kabashima**
2:35 **83.** Management practices for mitigating pesticide runoff from nurseries. **J. Gan**, J. N. Kabashima, D. L. Haver, L. Wu
3:05 **84.** Mitigation efforts to protect natural environments in highly urbanized watersheds. **D. L. Haver**
3:35 Intermission.
3:55 **85.** No-Spray buffer zones for the ag/urban interface: Derivation using drift modeling and toxicologically relevant benchmarks. **A. S. Felsot**
4:25 **86.** IPM and pesticide safety education for urban clientele. **C. Ramsay**

WEDNESDAY MORNING
Pesticide Risk Assessment: From a Conceptual to a Quantitative Exposure Model Section A
I. Background, Introduction, and Review
A. C. Barefoot and R. D. Wauchope, *Organizers*
A. C. Barefoot, *Presiding*
9:00 Introductory Remarks.
9:15 **87.** Terrestrial field dissipation guidance document: Background and status. **M. Corbin**, **D. S. Spatz**, N. C. Thurman, W. P. Eckel, M. Ruhman, R. Gangaraju, I. K. Nicholson, T. C. Kuchnicki, R. Mathew
9:50 **88.** Problem formulation: Using a conceptual model to determine terrestrial field dissipation study components. **I. K. Nicholson**, **W. P. Eckel**, N. C. Thurman, D. S. Spatz, T. C. Kuchnicki, M. Corbin, R. Mathew, R. Gangaraju, M. Ruhman
10:25 Intermission.
10:40 **89.** Comparison of a 'modular' study design to validate the conceptual model of the dissipation of a volatile soil fumigant and a non-volatile herbicide. **I. van Wesenbeeck**
11:15 **90.** Elaborating the conceptual model with non-standard studies to bridge lab and field results. **W. Phelps**
11:50 Discussion.

Agrochemical Issues in Urban Environments Section B
Protecting Structures and Public Health
J. M. Clark, A. S. Felsot, and C. J. Peterson, *Organizers*
A. S. Felsot, *Presiding*
8:30 Introductory Remarks.
8:35 **91.** Termite control for the 21st Century: old dogs and new tricks. **C. J. Peterson**
9:05 **92.** Wood preservation: Where are we heading? **H. M. Barnes**
9:35 **93.** Trends in cockroach control in urban and agricultural environments: infestations, insecticides, and allergens in homes, schools, and farms. **C. Schal**
10:05 Intermission.
10:25 **94.** California's Healthy Schools Act of 2000. **L. Ross**
10:55 **95.** North American invasion, epidemic spread and control of West Nile Virus. **J. D. Edman**
11:25 **96.** Occupational illness among flight attendants due to aircraft disinsection. P. Sutton, **X. Vergara**, J. Beckman, R. Das

WEDNESDAY AFTERNOON
Pesticide Risk Assessment: From a Conceptual to a Quantitative Exposure Model Section A
II. Technical Issues
A. C. Barefoot and R. D. Wauchope, *Organizers*
R. D. Wauchope, *Presiding*
1:30 Introductory Remarks.
1:35 **97.** Outstanding technical issues from the 2002 workshop on revising terrestrial field dissipation guidance. **M. Ruhman**, **R. Gangaraju**, **R. Mathew**, I. K. Nicholson, W. P. Eckel, N. C. Thurman, T. C. Kuchnicki, D. S. Spatz, M. Corbin
2:10 **98.** Comparison of lab and field DT50 PDFs and PRZM-3 soil and water concentration predictions. **I. van Wesenbeeck**
2:45 **99.** Implications of multiple applications on cropped plots to terrestrial field dissipation study design. **T. L. Potter**, T. Strickland, A. K. Culbreath
3:20 Intermission.
3:40 **100.** Use of PRZM-3 to validate a laboratory to field degradation conceptual model. **S. H. Jackson**
4:15 **101.** Suitability of field data for determining degradation rates in environmental risk assessments. **R. L. Jones**, A. C. Barefoot, M. Belyk, P. Francis, P. Hendley, S. Jackson, M. Lenz, J. Purdy, I. van Wesenbeeck
4:50 Discussion.

Perchlorate Uptake in Plants--Interaction of Soils, Nutrients, Ground & Irrigation Water Section B
B. Hall, K. Mayer, and L. Shull, *Organizers*
B. Hall, *Presiding*
2:00 Introductory Remarks.
2:05 **102.** Perchlorate in the environment: History, occurrence and regulatory response. **K. Mayer**
2:35 **103.** Detection of perchlorate in arid regions of the southwestern US. **G. J. Orris**, G. J. Harvey
3:05 **104.** Fate and transport of perchlorate in the subsurface. **S. Cullen**
3:35 Intermission.
3:55 **105.** Perchlorate uptake in plant. **W. A. Jackson**, T. A. Anderson, P. Smith, K. Tan, L. Yu, P. Joseph, P. Laxman
4:25 **106.** Hybrid IC/biological perchlorate water remediation systems. **J. R. Batista**, T. Gingras, T. Mulkey

THURSDAY MORNING
Pesticide Risk Assessment: From a Conceptual to a Quantitative Exposure Model
Section A
III. Use of Study Results and Relationships to Models
A. C. Barefoot and R. D. Wauchope, *Organizers*
A. C. Barefoot, *Presiding*
9:00 Introductory Remarks.
9:05 **107.** Conceptual models for agrochemical field fate: terrestrial field soil dissipation (TFSD) studies as a tool to help refine higher tier exposure assessments. **P. Hendley**
9:40 **108.** Use of field degradation data in European environmental risk assessments. **R. Allen**, R. L. Jones
10:15 Intermission.
10:35 **109.** Using results of pesticide terrestrial field dissipation studies in risk assessments. **N. C. Thurman**, **T. C. Kuchnicki**, M. Ruhman, M. Corbin, R. Gangaraju, W. P. Eckel, D. S. Spatz, R. Mathew, I. K. Nicholson
11:10 **110.** Symposium wrap up: From qualitative to quantitative prediction modeling--how to move forward? **R. D. Wauchope**
11:45 Discussion.

Perchlorate Uptake in Plants--Interaction of Soils, Nutrients, Ground & Irrigation Water II
Section B
B. Hall, K. Mayer, and L. Shull, *Organizers*
L. Shull, *Presiding*
9:00 Introductory Remarks.
9:05 **111.** Perchlorate uptake, accumulation, and distribution in lettuce irrigated with Colorado River water. **K. E. Potts**, C. A. Sanchez, R. I. Krieger
9:35 **112.** A discussion of the Hill Iowa perchlorate site. **K. Buchholz**
10:05 **113.** Clarification on the origins of perchlorate reported in earlier sample exchanges and presentations. **W. C. Herz**, W. P. Robarge, G. Rameriz, W. L. Hall
10:35 Intermission.
10:55 **114.** Ion chromatography and perchlorate in complex matrices: A closer Look at Sources of False Positives. **W. P. Robarge**, G. Ramirez
11:25 **115.** Fertilizer industry monitoring of materials and ore for perchlorate ion. **W. L. Hall**, D. Averitt, L. Weber

THURSDAY AFTERNOON
Perchlorate Uptake in Plants--Interaction of Soils, Nutrients, Ground & Irrigation Water III
Section A
B. Hall, K. Mayer, and L. Shull, *Organizers*
K. Mayer, *Presiding*
1:30 Introductory Remarks.
1:35 **116.** Perchlorate dose-response relationship: Evidence from human studies. **R. C. Pleus**
2:05 **117.** Economic and policy considerations of perchlorate regulation in California. **H. Giclas**
2:35 **118.** Comparative anti-thyroid effects of dietary nitrate and environmental perchlorate. **R. B. Belzer**
3:05 Intermission.
3:25 **119.** Challenges in assessing human and ecological risks of perchlorate associated with the food chain pathway. **L. Shull**, M. Jones, S. Dittmar, K. Kiefer
3:55 **120.** Panel discussion on the impact of the perchlorate issue on California and U.S. agriculture. **W. L. Hall**

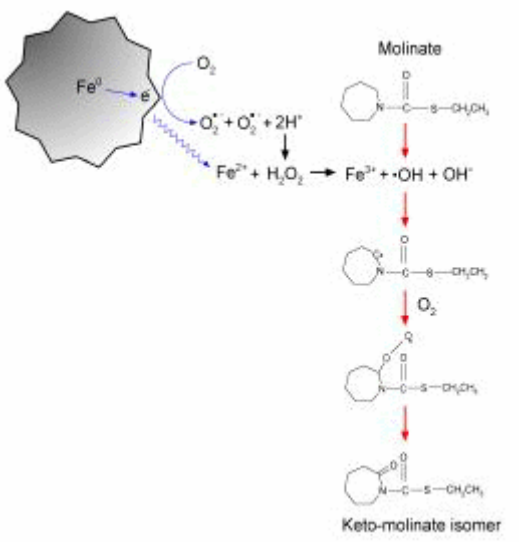
ABSTRACTS

1.

MOLINATE DEGRADATION USING NANOSCALE ZERO VALENT IRON AND ITS OXIDATIVE PATHWAY

Sung Hee Joo[1]*, Andrew J. Feitz*[2]*, and T. David Waite*[1]*. (1) School of Civil and Environmental Engineering, University of New South Wales, Sydney 2052, Australia, sunghee@civeng.unsw.edu.au, (2) Center for Water and Waste Technology, School of Civil and Environmental Engineering, The University of New South Wales*

We have investigated the application of nanosized zero valent iron (ZVI) particles to degradation of agrochemicals and report the results of molinate studies here. Molinate (a carbothioate herbicide), which is widely used in rice production in Australia, was effectively degraded in oxic solutions containing ZVI particles. The nature of the reaction end product, a keto-molinate isomer indicates that ZVI is initiating an oxidation rather than a reduction process. The evolution of both Fe(II) and H_2O_2 during the ZVI experiments strongly suggests that the Fenton reaction is the prevailing oxidation mechanism. The relative simplicity of this technique and the potential ready availability of key reactants suggest that this method could find widespread use in degradation of agrochemical contaminants.



2.

FATE OF THE FUMIGANT [^{14}C] FURFURAL IN SOIL

Martin F. Kovacs Jr.[1]*, William E. Gledhill*[2]*, Greg J. Burger*[3]*, Alan C. Katz*[1]*, and Jack A. Norton*[4]*. (1) ToXcel, LLC, 7545 Presidential Lane, Manassas, VA 20109, marty@toxcel.com, (2) Springborn Smithers Laboratories, (3) Agriguard Company LLC, (4) IR-4 MBA Programs*

Furfural, Generally Recognized as Safe (GRAS) as a food flavorant, also demonstrates novel uses with significant environmental benefits as a nematicide, fungicide and herbicide. Furfural shows strong potential as an alternative to methyl bromide for soil treatment. Metabolism of furfural was studied for 63 days in 4 soils (with 2.1-11.7% organic matter) at application rates up to 150 mg/kg (600 lbs/acre), under aerobic conditions at 25°, 20° and 10° C. Furfural was rapidly metabolized to CO_2 under all conditions studied. Half-life ranged from 0.6 hours - 1.2 days and 0.6 - 4.8 days for extractable radioactivity at all 3 temperatures. Mineralization of furfural to $^{14}CO_2$ in all soils ranged from 78% -100% of theoretical. Extractable radioactivity, with multiple HPLC peaks, represented transient metabolites of furfural. Bound residues, found primarily in the soil humin fraction by day 10, declined throughout the study representing 6.5% -18% of applied radioactivity at study termination.

3.

QUANTITATIVE EFFECT OF CHRONIC TOXICITY OF DIFFERENT PESTICIDES ON IMMUNO-HAEMATOLOGICAL PARAMETERS IN BROILER CHICKS

U. K. Garg[1]*, A. K. Pal*[2]*, G. J. Jha*[1]*, and* ***S. B. Jadhao***[2]*. (1) Ranchi Veterinary College, Ranchi 834007, India, Fax: +91-22-6361573, saket_polo@yahoo.co.in, (2) Central Institute of Fisheries Education, Agricultural Research Service, 7 Bungalows, Versova, Mumbai 400 061, India, Fax: +91-22-6361573, jsanju@hotmail.com*

Chronic toxicities of chickens with pesticide not only affect birds but also pose danger to human health. This experiment evaluated effects of chronic toxicity with 20 ppm fenvalerate (synthetic pyrethroid), 2 ppm monocrotophos (organophosphate) and 2 ppm endosulfan (chlorinated hydrocarbon) on immunophysiology of broiler chicks. A total of 120 broiler chicks were divided equally into four groups and were fed mash without (control) or mixed with these pesticides for eight weeks. Total erythrocyte count, PCV, haemoglobin, eosinophils and monocytes count did not showed any changes. Significant ($P<0.05$ and $P<0.01$) but differential deleterious effects of pesticides were noted with regard to immunophysiological parameters such as various cell counts (leucocytes, heterophils, T and B lymphocytes), Mean 2-4-Dinitrofluorobenzene score, splenic indices, nitro-blue tetrazolium positive cells, relative weight of spleen and thymus. Microscopically, these organs revealed atrophy/ hypoplasia, decreased size of the lymphoid follicles with depleted lymphocytes and hemorrhages in thymus.

4.

MODIFIED VETIVER OIL: ECONOMIC DEVELOPMENT OF A BIOPESTICIDE

Kamles Chauhan*, Chemicals Affecting Insect Behavior Laboratories, USDA-ARS, Natural Product Utilization Research Unit, 10300 Baltimore Avenue, Beltsville, MD 20705, chauhank@ba.ars.usda.gov, and Ashok Raina, Formosan Subterranean Termite Research Unit, USDA-ARS*

Vetiver oil is obtained from Vetiveria zinzanoides L., a grass that can be found in both tropical and subtropical parts of the world. The roots of this grass yield an essential oil on steam distillation, mainly consisting of sesquiterpenes (3-4 %), sesquiterpenols (15-20 %) and sesquiterpenones (7-8%). In this report we demonstrate that, tetrahydro sesquiterpenones and structurally related compounds exhibiting potent insecticidal activities can be enriched (35-50%) by simple chemical modification of vetiver oil. Initial studies and results utilizing modified vetiver oil for antifeedant and repellency against Formosan subterranean termite will be discussed.

5.

NATURAL MOLLUSCICIDES AGINST RAM'S HORN AND GOLDEN APPLE SNAILS

***Kumudini M. Meepagala**, National Center for Natural Products Research, USDA-ARS, Natural Product Utilization Research Unit, University of Mississippi, University, MS 38677, Fax: 662-915-1035, kmeepaga@olemiss.edu, George Sturtz, Aromagen, Charles A. Mischke, Thad Cochran National Warm Water Aquaculture Research Center, Mississippi State University, Ravindra C. Joshi, Philippine Rice Research Institute, and Stephen O. Duke, USDA, ARS, Natural Products Utilization Research Unit*

The ram's horn snail (Planorbdella trivolvis) is an intermediate host for a digenetic trematode (Bolbophorus confusus) that has recently been discovered to be a significant problem in commercial channel catfish (Ictalurus punctatus) production ponds in the Mississippi Delta region. One approach to eradicate this problem is to disrupt the life cycle of the parasitic trematodes by eliminating the snails. Golden apple snail (Pomacea canliculata) is an introduced pest mainly in the rice producing countries in Asia. 2Z, 8Z-matricaria methyl ester, isolated from Erigerone speciouses and vulgarone B isolated from Artemisia douglasiana were found to be active against ram's horn snails with LC 50 at 50 µM. and 24 µM respectively. Laboratory bioassays indicated that Vulgarone B had comparable activity to that of the commercial molluscicide 'Meta' with LC50 of 29.5 µM for golden apple snails, compared to that for the commercial molluscicide, 'Meta' with LC50 of 25.1 µM.

6.

PHEROMONE MATING DISRUPTION: ASSESSMENT OF COMMERCIAL DISPENSER RELEASE SYSTEMS

***Vincent Hebert**[1], Jay Brunner[2], Vincent Jones[2], Mike Doerr[2], and Elizabeth Tomaszewska[1]. (1) Entomology Department, Food and Environmental Quality Laboratory, Washington State University, 2710 University Drive, Richland, WA 99352, Fax: 509-372-7460, vhebert@tricity.wsu.edu, (2) Entomology Department, Tree Fruit Research Extension Center, Washington State University*

Pheromone mating disruption has become an important management tool for controlling codling moth (CM) injury in pome fruit. CM mating can be interrupted when there is a sufficient amount of pheromone introduced into the orchard air confusing the male's capability to locate female scent trails. Inconsistent season-long pheromone release from commercial solid matrix dispensers has been suspected for recent failures to control injury in the Pacific Northwest. In this 3-year orchard assessment, pheromone release characteristics of different commercial dispensers were compared as they aged throughout the growing season. Evaluations using 1) a laboratory chamber volatile trapping system and, 2) residual field-aged dispenser analysis were performed. The two above dissimilar approaches provide a basis for comparatively estimating actual commercial dispenser release throughout the CM mating season. Ambient orchard air concentrations were also measured. Results to date indicate that not all of the commercial products tested provide constant release adequate for season-long mating suppression.

7.

MAKING THE MOST OF YOUR HPLC SEPARATIONS: MAXIMIZING SELECTIVITY, PEAK CAPACITY AND SPEED

***Diane M Diehl**, Eric S. Grumbach, Jeffrey R. Mazzeo, and Uwe D. Neue, Waters Corporation, 34 Maple St., Milford, MA 01757, Diane_Diehl@waters.com*

Developing HPLC methods is often a time-consuming and daunting task. Many chromatographers have their own unique approach to method development. Some try a particular column at one pH, while others use a bank of columns with a variety of mobile phases. No universal approach to method development exists. To address the needs of current chromatographers for a more systematic approach to method development, we have examined how pH, stationary phase and solvent choice influence the selectivity of a separation. By far, the mobile phase pH has the most influence on selectivity. From these data, we have developed an approach to selecting the column and mobile phase for a particular separation. As chromatographers move towards faster method development, we discuss how peak capacity can be used to measure the separation power of a column. Combining the factors that control selectivity with peak capacity measurements, we can develop robust methods faster. Additionally, new advances in HPLC instrumentation and column technology that enable faster method development will be discussed.

8.

FAST SEPARATIONS BY HIGH TEMPERATURE HPLC-REPLACING SOLVENT GRADIENT WITH TEMPERATURE PROGRAMMING

***Liya Tang**, Qin Zhang, and Anne Aubry, Analytical Research and Development, Bristol-Myers Squibb, New Brunswick, NJ 08830*

Column temperature has long been recognized as one of the key factors for successful HPLC separations. However, column temperature in routine HPLC method development has been limited to a narrow range due to the oven and column technology. Recent improvements in HPLC instrumentation introduced the possibility of separations at elevated temperature with a programmable temperature gradient. In the present study, we have explored the application of high temperature HPLC and demonstrated its advantages over a conventional solvent gradient method. A graphitic carbon column was used to separate a NNRT inhibitor and its impurities using temperature programming. Compared to the results obtained from solvent gradient, the analysis time was reduced from 30 to 8 minutes. Temperature programming was also used in the separation of a synthetic drug intermediate and its impurities on a polydentate silica column with an ion-pairing reagent. Temperature programming using isocratic mobile phase conditions reduced the baseline noise while preserving peak separation. The temperature limits and the stability of the two different stationary phases were also evaluated in the study.

9.

USING ISOELUEOTROPIC MOBILE PHASES AS PART OF AN ISOCRATIC REVERSED-PHASE HPLC METHOD DEVELOPMENT ACTIVITY

***Brian A. Bidlingmeyer**, Alan D. Broske, and W. Dale Snyder, Agilent Technologies, 2850 Centerville Rd., Wilmington, DE 19808, Fax: 302-633-8200, Brian_Bidlingmeyer@agilent.com*

Often, choosing a single C18 column and optimizing only the mobile phase composition accomplishes the development of an HPLC method. However, this approach is somewhat limited because of the narrow scope of looking only at the single column. The strategy used in this paper takes advantage of different stationary phase chemistries and optimizes the best column/mobile phase combination. By using a straightforward, experiential and logical approach with column/solvent switching, it is possible to automate most of the activity in a nine-step scouting or method development process. Columns were chosen to represent the range of selectivity currently available. Combining column selectivity differences with variations in solvent strength, offers a broad

scope when developing new or updating older methods giving the operator several possible choices. Further, this approach can easily be automated with the use of a suitable switching valves and software control of these valves. In this system, it is possible to equilibrate the columns prior to use, to rinse the columns with a new mobile phase and to prepare the column for the next set of injections. A benefit of this automated process is that conveniently collected overnight data enables rapid assembly of a "selectivity survey;" thus, reducing the method development process to typically two working days or less. Interestingly, while the most popular column is the C18 phase, it was not the best column for the optimized method in the cases studied.

10.

PESTICIDE ANALYSIS USING HPLC WITH CD AND FLUORESCENCE DETECTION

***Amanda L Jenkins**, **Richard A. Larsen**, and William A. Hedgepeth, Applications Development, Jasco Inc, 8649 Commerce Drive, Easton, MD 21601, Fax: 410-822-7526, jenkins@jascoinc.com, larsen@jascoinc.com*

U.S. demand for pesticides is projected to be $10 billion in 2006, with almost 25% being chiral molecules. Most chiral pesticides are manufactured as a 50/50 mixture of the two enantiomers. Recent developments have forced the agrochemical industry to consider enantioselectivity. For example, the (R)-(+)-enantiomer of the herbicide dichlorprop is the active enantiomer which kills the weeds, while the (S)-(-)-enantiomer is inactive. Thus there are advantages to using the pure enantiomers rather than the racemate. Enantiomeric agrochemicals, where one enantiomer is significantly more active than the other, are likely to cost less to produce, require smaller quantities and cause less environmental damage. To make more accurate determinations of chiral pesticides, it is necessary to understand the effects of their enantiomers. Jasco offers the only commercially available CD detector for HPLC. This paper will demonstrate detection of the enantiomers of selected chiral pesticides using HPLC with fluorescence and CD detectors.

11.

DEGRADATION OF SELECTED ORGANOPHOSPHATE AND CARBAMATE INSECTICIDES IN WATERS FROM A COASTAL WATERSHED

***Svetlana Bondarenko**, and **Jay Gan**, Department of Environmental Sciences, University of California, Riverside, CA 92521, Fax: 909-787-3993, sbond@mail.ucr.edu, jgan@mail.ucr.edu*

Organophosphate and carbamate insecticides have been widely used in both agricultural and urban settings for insect control. The insecticides such as diazinon, carbaryl, malathion and chlorpyrifos are most frequently detected in urban streams across the United States exceeding criteria for protection of aquatic life in water. Contamination of surface water by these compounds is of concern due to acute and chronic toxicity to fish and aquatic organisms. In this study we evaluated the persistence of diazinon, chlorpyrifos, malathion, and carbaryl in waters from various sites in the Newport Bay/San Diego Creek Watershed in Southern California. The persistence of diazinon and chlorpyrifos was much longer than that of malathion or carbaryl, and was further prolonged in seawater. Microbial degradation contributed significantly to the dissipation of diazinon and chlorpyrifos in freshwater, but was inhibited in seawater, leading to increased persistence. In contrast, degradation of malathion and carbaryl was rapid and primarily abiotic. A greater temperature dependence was observed for carbaryl degradation in all waters and for diazinon degradation in freshwater. The interactions of pesticide persistence with water location, temperature, and type of pesticides suggest that site and compound-specific information is needed when evaluating the overall ecotoxicological risks of pesticide pollution in a watershed. As the persistence of diazinon and chlorpyrifos may increase significantly in seawater, mitigation should occur before the pesticides reach seawater. The relatively short persistence of these compounds in freshwater suggests that practices aimed at extending residence time, e.g., diversion to wetlands, may effectively reduce pesticide output to downstream waterbodies.

12.

ENVIRONMENTAL BEHAVIOR OF SYNTHETIC PYRETHROID STEREOISOMERS

***Weiping Liu**, **Jay Gan**, and Sangjin Lee, Department of Environmental Sciences, University of California, Riverside, Riverside, CA 92521, Fax: 909-787-3993, wliu@mail.ucr.edu, jgan@mail.ucr.edu*

Synthetic pyrethroids (SPs) are of environmental concern due to their acute toxicity to many aquatic species and their relatively long persistence in aquatic systems. They are chiral compounds with multiple stereoisomers. In this study, we developed GC methods for separation and identification of enantiomers of bifenthrin, permethrin, cypermethrin, and cyfluthrin. Good separation was consistently obtained for enantiomers from the cis structure on a beta-cyclodextrin based capillary column. We further evaluated preferential degradation of pyrethroid enantiomers by microbial isolates and in sediments under field or laboratory conditions. Significant selectivity was observed for all test compounds during biodegradation by bacterial isolates in aqueous solutions or slurry mixtures, and in sediments under either field or laboratory conditions. Degradation of cis isomers was consistently faster than that of trans isomers. Among the cis enantiomers, more rapid degradation was observed for the S enantiomers than for the R enantiomers. Since ecotoxicological effects are likely caused only by the biologically active enantiomers, isomer selectivity in the fate and transport of SPs should be better understood in their risk assessment.

13.

AEROBIC AQUATIC METABOLISM OF ZETA-CYPERMETHRIN

*Scott J. Curry, **Robert T. Morris**, John F. Culligan Jr., David J. Letinski, Rocco J. Jones, and Shaaban F ElNaggar, Environmental Sciences, FMC Corporation, P.O. Box 8, Princeton, NJ 08543, Fax: 609-951-3670, scott_curry@fmc.com, robert_morris@fmc.com*

The metabolism of zeta-cypermethrin, an FMC pyrethroid insecticide, was studied in a California sediment/water system to determine the rate and degree of metabolism of ^{14}C zeta-cypermethrin under aerobic aquatic conditions. The partitioning of the compound into water and sediment at various time-points and the evolution of ^{14}C-volatile gases were evaluated to obtain experimental mass balance for two radio-labeled forms of the zeta-cypermethrin molecule. Compound identification was performed by High Performance Liquid Chromatography (HPLC) with confirmation by normal phase Thin Layer Chromatography (TLC). The study rationale and experimental design along with the observed metabolic pathway and kinetic results will be presented. Overall, zeta-cypermethrin degraded rapidly from the total water/sediment system with calculated half lives ranging from 9 to 10 days.

14.

ON THE RELATIONSHIP BETWEEN SORPTION AND DEGRADATION OF MOLECULES IN SOILS, AND THE WALKER MOISTURE EXPONENT

***R. Don Wauchope**, Southeast Watershed Research Laboratory, U.S.*

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Molecules which are strongly sorbed to the solid phase of geosolids are typically persistent in the environment, and it is usually assumed that degradation processes take place exclusively in the aqueous phase of soil. A simple relationship between soil sorption equilibrium constant K_d ($ml.g^{-1}$) and the degradation rate for chemicals in soil may be developed (Paris et al., 1978; Guo et al., 2000):

where C_T is the total chemical concentration per mass moist soil at time t (d), is the initial concentration (at $t=0$), k_w (d^{-1}) is the degradation rate constant for nonabsorbed molecules, and ρ ($g.cm^{-3}$) and θ ($cm^3.cm^{-3}$) are soil bulk density and volumetric soil moisture fraction. This equation can be transformed into a half-life form:

where H (d) is the half-life of the total residue. This equation indicates that a plot of half-lives measured in soil at various moisture contents will give a straight line when plotted *vs.* $1/\theta$, with an intercept equal to $\ln 2/k_w$ and a slope equal to the intercept times ρK_d. We will explore the application of this equation to laboratory data.

15.

A PROPOSED CONVENTION FOR REPRESENTING ACID-BASE BEHAVIOR OF PESTICIDES IN PESTICIDE PROPERTY DATABASES DESIGNED FOR SIMULATION MODELING

***R. Don Wauchope**, Southeast Watershed Research Laboratory, U.S. Department of Agriculture - Agricultural Research Service, PO Box 946, 2316 Rainwater Road, Tifton, GA 31794, Fax: 912-386-7215, don@tifton.usda.gov*

A reported "*pKa*" or "*pKb*" for a pesticide provides ambiguous information unless the specific way of expressing the equilibrium equation for the reaction is defined. If the dependence of environmental properties of a pesticide on its' ionization state are to be incorporated into a computer-readable database, the fields must also be unambiguous. An example is proposed, using a four-parameter database structure to describe any pesticide's soil organic matter sorption coefficient as a function of soil pH. The parameters can be unambiguously interpreted by a computer without additional input, whether the pesticide is acidic or basic or multifunctional. The four parameters are surface acidity α, pesticide *pKa*, and organic matter sorption coefficients for the two molecular species P^{q-1} and P^q, the reactant and product in the equilibrium expression. This approach will be demonstrated for acidic and basic pesticides.

16.

ROOT ZONE WATER QUALITY MODEL PREDICTIONS FOR RUNOFF VOLUME AND NITROGEN IN RUNOFF WATER FROM TURFGRASS

***Liliana Schwartz**, and Larry M. Shuman, College of Agricultural & Environmental Sciences, University of Georgia, 1109 Experiment Street, Griffin, GA 30223, Fax: 770-229-3215, schwartz@griffin.uga.edu*

The one-dimensional process based Root Zone Water Quality Model (RZWQM) is used to simulate water, nutrient and pesticide transport from both agricultural and urban fields. Because information on nutrient transport from turfgrass areas are limited and nutrient transport to surface waters is a current environmental concern, in this study we calibrated and validated the latest version of RZWQM using data from a four-year study of nutrient transport from a Cecil sandy loam (fine, kaolinitic, thermic Typic Kanhapludult). The N fertilizer treatments included typical agricultural granular fertilizer and three different controlled-release fertilizers applied at different rates. Experiments were conducted on twelve sloped (5%) plots of "Tiftway" bermudagrass [*Cynodon dactylon (L.) Pers.*] exposed to the natural rainfall and managed as golf course fairways. Surface runoff volume and nitrate-N loads were monitored after applying simulated rainfall at different rates. We found that the RZWQM modeling has good promise for predicting both runoff and nitrate-N loss from turfgrass, in a scenario that simulated golf course fairways.

17.

EVOLUTION OF ANALYTICAL METHOD DEVELOPMENT THROUGH EARLY PHASE DRUG DEVELOPMENT

***Steven E. Bandy**, and **R. Brian Scherer**, Lilly Research Laboratories, LILLY CORPORATE CENTER, Indianapolis, IN 46285-0001*

Increased method development and validation rigor is required to support a product as it progresses through the product development timeline from Phase I through Phase III. This presentation will discuss the approach to HPLC potency and purity method development in support of synthetic route and chemical process development for a new drug candidate as it progresses through the various stages of pharmaceutical product development. Highlighted in this presentation will be discussions surrounding HPLC stationary phase and mobile phase selection; use of alternate detection techniques, including evaporative light scattering detection (ELSD); and challenges related to diluent selection

18.

A RATIONAL APPROACH TO RAPID HPLC METHODS DEVELOPMENT AND OPTIMIZATION

***Thomas L. Chester**, Miami Valley Laboratories, The Procter & Gamble Company, P.O. Box 538707, Cincinnati, OH 45253-8707, Fax: 513-627-1233, chester.tl@pg.com*

Traditional experimental development and optimization of HPLC methods is inefficient. Even an experienced chemist requires some degree of experimental screening to select a column and mobile phase combination providing adequate selectivity for the problem at hand. Once column and mobile phase components are selected, the operational parameters can be changed and tested in an attempt to shorten the analysis time. The resulting method may be suitable to solve the problem. However, the solution is often far from optimal, and the chemist has no means of recognizing what the ultimate performance might actually be (or how to get there). The opposite approach would involve doing all the work virtually from a combination of information in databases and structures of the solutes. Although progress is being made, the predictive accuracy of this approach is not yet good enough to calculate the parameter values of the optimized methods that are sought, and would require knowledge in advance of the structure of every solute in the sample. The rational approach involves using existing information to select conditions for experimental screening of columns and mobile phases, followed by the development and use of a robust model to complete the optimization virtually. Thus, prior information guides the process, data are rapidly collected to accomplish the tasks that cannot be done virtually with sufficient accuracy or to manage solutes of unknown identity, and those tasks that can be modeled accurately are handled virtually and very rapidly. Our approach experimentally screens up to six columns with two mobile phase modifiers, selects the top candidate, experimentally develops a robust model, and then optimizes against the business needs of the analysis. The entire process runs in about 24 hours and requires about 5 person-hours of effort.

19.

DEVELOPING A STRATEGY FOR THE SYSTEMATIC DEVELOPMENT OF REVERSED-PHASE HPLC SEPARATIONS

***Thomas Jupille**, LC Resources Group, Rheodyne LLC, 1295-F Boulevard Way, Walnut Creek, CA 94595, Fax: 925-977-9375, tjupille@sepsci.com*

HPLC method development has typically been carried out using an "inspired guesswork" approach. While this can be emotionally satisfying (when it works!), it usually results in a significant amount of wasted time and effort, an inefficiency which we can no longer afford in today's environment. This inefficiency can be significantly reduced by planning the method development strategy in advance and designing a series of experiments to which will provide the required information with a minimal investment in experimental time and effort. For most problems, this means using a reversed-phase column and focusing attention on the parameters which control selectivity:mobile phase strength (%B or gradient steepness);mobile phase type (the familiar ACN/MeOH/THF triangle); temperature; column chemistry; pH; additives

This presentation will explore the criteria involved in ranking the effectiveness of these parameters and designing the experiments which will measure their effects for a particular separation. The amount of experimental effort required can be minimized by using computer modeling techniques which allow chromatographic results to be predicted on the basis of a small set of initial calibration experiments.

20.

Technologies and philosophies of automating the process of chromatographic method development

***Michael McBrien**, Andrey Vazhentsev, Eduard Kolovanov, and Vadim Tashlitsky, Advanced Chemistry Development, 90 Adelaide St., W, Suite 702, Toronto, ON M8Z 5B1, Canada*

The development of chromatographic methods can be a very time-consuming undertaking, particularly for complex samples. Computer-assisted method development has helped to lessen this problem, enabling chromatographers to typically create more effective methods in less time. However, there is still an onus on the researcher to interpret the output of the optimizations, and to input subsequent experimental parameters to the instrument. Particularly, data interpretation can prove to be a serious bottleneck. The next logical step in chromatographic method development is to connect method optimization software directly to instrument software, enabling the system to investigate the experimental "surface" without the necessity for manual intervention at regular intervals. Advanced Chemistry Development has worked to connect ACD/AutoChrom directly with the instrument control/data acquisition software. The instrument software transfers MS and/or UV-Vis information to ACD/AutoChrom, which tracks peaks unequivocally, enabling prediction of the next logical experiment. These instructions are then passed back to the instrument for execution, and the process continues. The session is considered complete when all of the user criteria are met, or when the system cannot be further optimized. Effectively addressing the challenges associated with automation of method development has required the introduction of new technologies. For example, the detection and tracking of unknown components can be problematic. In addition, new approaches to interpretation of chromatographic "quality" have been required. This presentation will detail some recent advances in the technology and theory of chromatographic method development related to complete and partial automation.

21.

OPTIMIZATION OF LEUCKART REACTION FOR THE SYNTHESIS OF NOVEL FORMAMIDE FUNGICIDES

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Formamides are a novel group of fungicides discovered by Bobylev et al. Some of these novel fungicides were obtained by reductive amination via Leuckart reaction, where formamide was used both as a reagent and solvent. During the early development stage it was discovered that the reaction proceeded faster and produced better quality products with low grade technical formamide than with highly purified reagent grade formamide. Since technical grade formamide may contain rather substantial amounts of water, ammonia, and formic acid, it was assumed that a certain amount of ether of these components should be used as an additive to the reagent grade formamide to facilitate the reaction. In this work the optimal concentrations of the additives were determined and the reaction procedure was made suitable for the preparation of a structurally diverse series of analogs, and for the production of large quantities of the samples necessary for further testing.

22.

POTENTIAL TRANSPORT OF METOLACHLOR, METOLACHLOR ETHANESULFONIC ACID, AND METOLACHLOR OXANILIC ACID IN VEGETATIVE FILTER STRIP SOIL AS A FUNCTION OF MICROBIOLOGICAL CHARACTERISTICS, SORPTION AND MINERALIZATION

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Vegetated filter strips (VFS) are narrow strips of permanent vegetation planted adjacent to cultivated soils (CS) and are intended to reduce herbicide transport from agricultural application zones. These narrow strips of vegetated soil accumulate greater above- and below-ground organic matter compared to adjacent cultivated soils. Greater levels of organic matter could enhance sorption and degradation of herbicides in VFS, thus reducing their transport to surface and groundwater. Experiments were conducted to compare the sorption and mineralization of metolachlor and its metabolites ESA (metolachlor ethanesulfonic acid) and OA (metolachlor oxanilic acid) in VFS and CS. Kd values for metolachlor were greater in VFS soils than in CS soils, but sorption potential was the same for metolachlor metabolites. Calculated half-lives of metolachlor and its metabolites were lower in VFS than in CS. The results suggested that vegetated filter strips altered chemical and biological properties of soil in a manner conducive to reducing the subsequent transport of metolachlor and its metabolites.

23.

ACCUMULATION OF AGRICULTURAL PESTICIDES IN BIRD EGGS FROM THE COLORADO RIVER DELTA

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The concentration levels of agricultural pesticides were detected in 35 egg samples from mourning dove (*Zenaida macroura*) and burrowing owl (*Athene cunicularia*) collected in the Colorado River delta. Egg samples were analyzed for 17 pesticides, including DDT isomers and derivates utilizing gas chromatographic technique. 15 pesticides were detected in 75-100% of samples. DDT pesticides were observed in elevated concentrations in both species (48-59 ng/g), which is in good correlation with DDT concentrations for aquatic biota (32-340 ng/g) from this area found in a previous study. The DDT/DDE ratio exceeded 1 indicating recent DDT exposure. Other pesticides such as lindane, hexachlorobenzene, chlorothalonil and malathion were detected in bird eggs in comparatively high concentrations (reaching up to 33 ng/g). Therefore, additional studies should be carried out to determine the source of recent DDT input and to establish trends between agrichemical concentrations in local environment and accumulation by birds and in food web.

24.

MASS BALANCE OF ATRAZINE AND METOLACHLOR IN PHYTOREMEDIATED SOIL SYSTEMS

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Atrazine and metolachlor have been implicated in point-source pollution at agrochemical dealerships in the Midwest. Prairie grasses have been used in filter strips for agricultural runoff and are also useful for phytoremediation, however little is known about the fate of contaminants and their metabolites within a grassed system. In this study, soil was treated with 25 µg/g ^{14}C-labeled herbicide and aged. Systems were amended with a mixture of prairie grasses to determine the fate of the parent compound and its metabolites in soil, plant, and air. Dissipation and distribution of parent compound and metabolites was recorded for 21 days for ^{14}C-atrazine and 97 days for ^{14}C-metolachlor. Vegetation significantly decreased metolachlor concentrations by 15%, compared to only 4% for unvegetated systems. Grasses sequestered 7.2% of the total applied ^{14}C -metolachlor in their root and leaf tissues. No significant differences were noted in atrazine dissipation between vegetated and unvegetated systems, and plant uptake was limited to less than 0.5%.

25.

Influence of Combined Application of Fumigants on their Transformation and Persistence in the Environment

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Combined application of fumigants is a potential strategy to replace methyl bromide (MeBr) in the control of soil-borne pests. Unfortunately, abiotic and biotic interactions among fumigants restrict some combined application approaches. In the study, the kinetics and mechanisms of reaction between metam sodium and the halogenated fumigants chloropicrin and 1,3-dichloropropene (1,3-D) were investigated in aqueous solution. For chloropicrin, an extremely rapid oxidation-reduction process occurred in the presence of metam sodium. Transformation of 1,3-D by metam sodium was via an aliphatic SN2 nucleophilic substitution process. The reaction and incompatibility of chloropicrin and 1,3-D with metam sodium was also examined in soil under different application scenarios. Simultaneous application of metam sodium with chloropicrin or 1,3-D accelerated the transformation of the two halogenated fumigants, reducing their concentration in soil. Two sequential application approaches were developed, which may provide effective alternatives to MeBr in terms of pest control and eco-environmental protection. The influence of the major breakdown product of metam sodium, MITC, on the transformation and persistence of chloropicrin and 1,3-D was further assessed.

26.

Synthesis of a Novel Isoxazole Derivative Containing Trifluoromethyl

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The concept of bioisosterism has been widely utilized as one such strategy for lead optimization in the discovery of new agrochemicals. (4-Chloro-2-methanesulfonyl-3-methylsulfanyl-phenyl)-(5-cyclopropyl-isoxazol-4-yl)-methanone is a novel herbicidally active isoxazole derivative, which belongs to a class of herbicides acting on 4-hydroxyphenylpyruvate dioxygenase (HPPD). According to bioisosterism, a novel isoxazole containing trifluoromethyl, i.e. (4,4,5,8-trtramethyl ¨C thiochroman ¨C 6 ¨C yl) - (5 ¨C trifluoromethyl ¨C isoxazol ¨C 4 ¨C yl) - methanone is designed and synthesized from a improved economic synthetic route, in which ethyl trifluoroacete was used as intermediate, not expensive ethyl trifluoroacetoacetate. Compared to previous synthesis route, the react steps were reduced from 9 steps to 6 steps. The key step is the condensation between ethyl trifluoroacete and 6-acetyl-5,8-dimethyl-4,4-dimethylthiochroman to form 4,4,4-trifluoro-1-(4,4,5,8-tetramethyl-thiochroman -6-yl)-butane-1,3-dione in good yield. The structure of new compound was confirmed by 1H-NMR, 19F-NMR and MS.

27.

GREEN CHEMISTRY: ONE POT SYNTHESIS OF NOVEL FORMAMIDE FUNGICIDES

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Formamides are a novel group of fungicides discovered by Bobylev et al at the All-Union Research Institute of Plant Protection Chemicals, Moscow, Russia. One of the leading candidates among novel formamide fungicides appeared N-[1-t-butyl-3-(2,4-dichlorophenyl)-2-propenyl-1]-formamide (I). The method of obtaining I comprised a two-step process that included aldol condensation followed by reductive amination via Leuckart reaction. In this work a new low waste one pot process for the synthesis of I is developed. In this process aldol condensation is carried out without solvent, and the reaction mixture is immediately subjected to Leuckart reaction. The new one pot process produced significantly higher yield of I compared to the two step process. The process can be used for the production of large quantities of I necessary for biological tests, and is suitable for the preparation of a structurally diverse series of analogs.

28.

SEPARATION AND AQUATIC TOXICITY OF ENANTIOMERS OF THREE ORGANOPHOSPHORUS INSECTICIDES

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Chirality in pesticides has great implications as ecotoxicity and biodegradation are commonly enantioselective. Enantiomers of three

organophosphorus (OP) insecticides were separated by high-performance liquid chromatography with a CHERALCEL@ OJ column using 0-10% denatured ethanol (with 5% methanol and 5% 2-propanol) in n-hexane as the mobile phase. Excellent resolution was obtained for all three OP insecticides with chiral center either on carbon (crotoxyphos) or phosphorus (fonofos and profenofos). Toxicity tests (96 h) were performed using the separated enantiomers and the racemate for *Ceriodaphnia dubia* under static conditions. The LC50 of fonofos racemate, (+), and (-) isomer was 0.25, 1.50, and 0.14 ppb, respectively, suggesting that the majority of toxicity derived from the (-) enantiomer. The respective LC50 values were 0.175, 2.25, and 0.125 ppb for profenofos, and 1.15, 3.85, and 0.35 ppb for crotoxyphos. These results consistently implies that only the (-) enantiomer of the tested OP insecticides has aquatic toxicity. Given that most chiral pesticides are used in a racemic form, knowledge of the environmental behavior of individual enantiomers will be of great importance for improving our understanding of the associated ecotoxicological risks.

29.

SYNTHETIC PYRETHROIDS: BIOAVAILABILITY IN SURFACE WATER

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Synthetic pyrethroids are widely used in both agricultural and urban settings. Recent monitoring showed occurrence of pyrethroid residues in runoff from nurseries and orchards, and in sediments that came into contact with the runoff. Pyrethroids are known for their acute aquatic toxicity. On the other hand, pyrethroids typically exhibit strong sorption to solids and organic matter in aquatic environments. In this study, we investigated sorption of pyrethroids to suspended solids and dissolved organic matter (DOM) in surface water and its inhibitory effect on bioaccumulation and toxicity to *Ceriodaphnia dubia* and *Daphnia magna*. Presence of small quantities of sediment particles resulted in significant decreases in dissolved pesticide concentration and increases in LC50 values. The effect of suspended solids and DOM on the bioavailability of pyrethroids in surface water can be predicted from a simplistic model accounting for sorption removal. These results suggest that suspended solids and DOM in surface water can negate pyrethroid toxicity, and the actual toxicity must be interpreted by considering the role of suspended solids and DOM.

30.

NUCLEOPHILIC RADICAL SUBSTITUTION REACTIONS OF TRIAZINE HERBICIDES WITH POLYSULFIDES

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Triazine herbicides are widely used herbicides in the world and they had become prominent contaminants in the hydrologic system. It was reported recently that the triazine herbicides were rapidly dechlorinated in water solution by polysulfide and the reaction mechanism was suggested to be nucleophilic aromatic substitution (SNAr) reaction. In this report, the kinetics and mechanism of reaction between polysulfide and triazine herbicides were investigated. Common inhibitors, oxygen and benzoquinone, remarkably decreased the reaction rate. Compared with the reaction rate constant of Kobs (0.0953 mM-1h-1) in air, the reaction rate constant increased more than 2 times (0.2144 mM-1h-1) in nitrogen atmosphere. The Kobs decreased about 50% compared to the control in 360 uM benzoquinone solution. The inhibition by radical inhibitors suggests that free radicals are directly involved in the reaction. From the ESR spectra, it was found that the polysulfide radical concentration decreased about 85% after reacting with the triazine herbicides. Therefore, we propose that the reaction between polysulfides and triazines may occur by a radical nucleophilic substitution (SRN1) reaction in which the herbicide undergoes a free radical chain reaction that dechlorinates herbicide.

31.

TRANSFORMATION OF HALOGENATED ORGANIC COMPOUNDS BY POLYSULFIDES

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Halogenated organic compounds (HOCs) have a multitude of uses in modern society. They have been widely used for industrial and agricultural purposes as solvents, degreasing agents and pesticides. Recently, we discovered that polysulfides such as sodium tetrasulfide were highly efficient in dehalogenating some HOCs. The reaction was extremely rapid between tetrasulfide and soil fumigants including 1,3-dichloropropene, chloropicrin, and methyl iodide, as well as chlorinated solvents carbon tetrachloride, 1,1,2,2-tetrachloroethane, and 1,3-dichloropropane. Reaction between tetrasulfide and fumigants was many times faster than what was previously observed for thiosulfate salts. For instance, reaction rate constants of 1,3-dichloropropene and methyl iodide was increased to 0.100 and 0.010 $M^{-1}s^{-1}$ under air atmosphere, and to 0.240 and 0.132 $M^{-1}s^{-1}$under nitrogen atmosphere, respectively. Under similar conditions, reaction with thiosulfate under air atmosphere resulted in rate constants of 0.002 and 0.019 $M^{-1}s^{-1}$, respectively. Under comparable conditions, chloropicrin reacted even more efficiently with polysulfide, and 92.9% dissipation occurred in 1 h. The overall reactivity of tetrasulfide toward these halogenated fumigants was 3-1425 times as strong as for thiosulfate. Our preliminary observations strongly suggest that polysulfides may effectively transform a great number of environmentally significant HOCs, and this reaction may hold a great promise to be used for decontamination and detoxification of these HOCs in the environment.

32.

DESIGN OF A FIELD SOIL DISSIPATION STUDY USING CHEMIGATION AS AN APPLICATION TECHNIQUE

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Drip irrigation is widely used in Europe in both greenhouse and outdoor field settings. The advantage of this technique is not only to irrigate efficiently with a minimum of water, but also to deliver fertilizers and crop protection products (CPP) in a convenient and highly specific manner through the drip system (chemigation). Chemigation essentially results in a line source input of CPP directly to soil along each plant row. Behaviour of a CPP applied in this way could differ compared to more typical broadcast spray conditions. To investigate the dissipation behaviour of a water soluble nematicide in greenhouses following chemigation, field soil dissipation studies were conducted in Southern Europe for a period of one year. The experimental set up, technique and precautions to ensure precise and uniform application, and the soil

sampling principles required to investigate the vertical and horizontal distribution of the test item over time will be presented.

33.

NORMALIZATION OF FIELD DEGRADATION DATA TO REFERENCE SOIL TEMPERATURE AND MOISTURE CONDITIONS

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Normalizing field data to a reference soil moisture and temperature before or during the determination of a degradation rate allows for more accurate extrapolation of field data to other conditions. Three approaches have been examined: 1) normalizing each day to an appropriate length based on the measured or predicted temperature and soil moisture and then determining the kinetics using normal procedures; 2) including the corrections for temperature and soil moisture in the regression procedure; and 3) setting the reference conditions to the average study conditions. The first two approaches are preferred and give essentially equivalent results. The third approach is acceptable only for studies conducted for a short period of time with little change in climate conditions. The first approach has been illustrated using the results of field studies performed in the U.S. and Europe with isoxaflutole, a Q10 factor of 2.2, and a moisture exponent of 0.7 for the Walker equation.

34.

EVALUATING TWO DIFFERENT EXPOSURE MODELING APPROACHES FOR DEGRADATION PRODUCTS OF CROP PROTECTION SUBSTANCES

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Exposure modeling of degradation products of crop protection substances presents a challenging situation as the formation and decline of degradation products is influenced by climatic factors, soil properties, and study conditions (controlled environment versus natural field conditions). For the purpose of regulatory exposure modeling, degradation products can be simulated as individual compounds (a simplified approach) or as components of the entire kinetic pathway of active substance (more scientific but complex approach). This poster-presentation evaluates both simulation approaches using a test compound under FOCUS-Hamburg scenario. The simulations are based on FOCUS-PELMO model and the selection of major chemical properties follows the FOCUS input guidance.

35.

USE OF FIELD SOIL DISSIPATION DATA IN REGULATORY LEACHING MODELLING IN EUROPE: A CASE STUDY

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The experimental design of field soil dissipation studies conducted for investigating the environmental fate of parent and metabolites under typical field conditions will be presented. The results will be compared to findings obtained from experiments conducted under static conditions in the laboratory. The use of laboratory degradation data in European regulatory leaching modelling requires normalisation of results to reference soil temperature and soil moisture conditions. The concept of normalisation will be applied to field soil dissipation data to allow the use of such field data in the whole range of European regulatory leaching scenarios. Four methods of normalising soil residue data to reference conditions will be compared (average condition normalisation, monthly average condition normalisation, time-step normalisation and rate-constant normalisation). The impact of the selected method of normalisation on the predicted leaching will be assessed.

36.

PROBABILISTIC MODELING FOR RISK ASSESSMENT OF GROUND WATER CONTAMINATION BY PESTICIDES

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We developed a probabilistic Monte Carlo approach to derive and then compare potential leaching between a candidate pesticide and known ground water contaminants in California. The LEACHP model developed by Hutson and Wagenet was first calibrated to data generated from a field study that determined the effect of method and amount of irrigation water application on atrazine movement in a coarse, loamy-sand soil in Fresno County. Then, a probabilistic Monte Carlo analysis was conducted to produce leaching distributions based on combined terrestrial field dissipation (TFD) and Koc data for atrazine, bromacil, diuron, hexazinone, norflurazon, and simazine; the analysis was based on 52 values for TFD and 56 values for Koc. Leaching potential was determined by comparing the amount, or lack of, overlap between distributions for the candidate pesticide and for the known ground water contaminants. Potential effects of irrigation mitigation measures can also be evaluated by varying the amount and frequency of water applications.

37.

CALCULATION OF TEMPERATURE REFERENCED FIELD HALF-LIVES FOR PROTHIOCONAZOLE AND ITS MAJOR DEGRADATION PRODUCT

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Five terrestrial field dissipation studies in the US and Canada were used to estimate temperature referenced half-lives for a broad spectrum fungicide and its major degradation product. A first-order temperature-dependent kinetic model was developed to describe the experimental system. ModelMaker 4.0 software was used to optimize the appropriate model parameters (degradation/transformation rates) against the available experimental residue and daily air temperature data. All studies were modeled from the last application to the final sampling day. Therefore, simulation periods varied and were different for each study. This method resulted in statistically significant half-life estimates at a reference temperature of 20°C for all studies. This method was successful in providing a less variable range of half-lives, than reported in the original studies.

38.

REDUCTION OF WIND EROSION EMPLOYING A NOVEL, BIODEGRADABLE, POLYSACCHARIDE BASED SOLUTION

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Wind erosion is a serious environmental concern and continuously threatens agricultural production by silting streams, rivers, water reservoirs, and reducing crop productivity. Synthetic soil conditioners have been studied for decades for a variety of agricultural and environmental purposes. Controlling the air transport of dust, which minimizes pollutants and airborne allergenic particulates, are additional reasons for the necessity of novel dust palliatives. Soil erosion degrades soil productivity especially during irrigation in arid environments, because of the loss of fertile layers that can cause up to forty percent loss of sustained production in the U.S. alone. A variety of methods have been used to combat this problem. Vegetative mulches such as wheat straw, prairie hay, and feedlot manure are commonly used for controlling wind erosion in some regions. We present an environmentally friendly biodegradable solution with strong binding properties to reduce the upheaval of fertile soil layers.

39.

HERBICIDE RETENTION IN SOIL AS AFFECTED BY SUGARCANE MULCH RESIDUE

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This study evaluated the effectiveness of sugarcane residue (mulch cover) in reducing nonpoint source contamination of applied herbicides from sugarcane fields. Two main treatments were investigated: a no-till treatment and no- mulch treatment. The amounts of extractable atrazine, metribuzin, and pendimethalin from the mulch residue and the surface soil layer were quantified during two growing seasons. Significant amounts of applied herbicides were intercepted by the mulch residue. Extractable concentrations were one order of magnitude higher for the residue compared with that retained by the soil. When the residue was not removed, a reduction in runoff-effluent concentrations, as much as 50%, for atrazine and pendimethalin was realized. Moreover, the presence of mulch residue resulted in consistently lower estimates for rates of decay or disappearance of atrazine and pendimethalin in the surface soil. The presence of residue on the sugarcane rows was highly beneficial in minimizing runoff losses of the herbicides applied.

40.

ATRAZINE ADSORPTION AND DESORPTION BY SUGARCANE MULCH RESIDUE

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We investigated atrazine retention by sugarcane mulch residue. Adsorption kinetic batch method was used to quantify atrazine adsorption with time and for a wide range of concentrations. Desorption was carried out using successive dilutions which was followed by methanol extraction. Atrazine retention was well described using a linear model where the partitioning coefficient (Kd) increased with time and were an order of magnitude higher than Commerce soil where the sugarcane crop was grown. A kinetic multireaction model was successful in describing adsorption behavior with time. The model was equally successful in describing observed hysteretic atrazine behavior during desorption for all input concentrations. The model was concentration-independent where one set of model parameters was valid for the entire atrazine concentration range. Atrazine recovery following desorption was 63.67% of that sorbed. Strong atrazine retention by the residue is beneficial in minimizing potential runoff losses and downward movement in the soil.

41.

RECONNAISSANCE FOR SELECTED HERBICIDES AND ANTIBIOTICS IN THE MIDWEST, 2002

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Since 1989, the U.S. Geological Survey has conducted periodic reconnaissance studies of streams in nine Midwestern States to determine the geographic and seasonal distribution of agricultural compounds, including herbicides and antibiotics. These studies documented that large amounts of alachlor, atrazine, cyanazine, and metolachlor are flushed into streams during post-herbicide-application runoff and that the highest herbicide concentrations for the year often occur during the first runoff after herbicide application. Several substantial changes in herbicide use have occurred recently. The most significant change is the rapid increase in glyphosate use (Roundup ™). Between 1997 and 2001, glyphosate use in the Midwest more than tripled from 10.3 to 36.1 million pounds. During this same time period, use of acetochlor, atrazine, alachlor, and cyanazine was almost constant. The samples collected in the most-recent reconnaissance (2002) are being analyzed for 21 herbicides and 28 degradation products. The recent report of pharmaceuticals, hormones, and other organic wastewater contaminants in streams across the United States has raised the awareness and need for monitoring of antibiotics in the agricultural environment. Samples collected in the 2002 reconnaissance are being analyzed for five classes of antibiotics. These data will be useful in studying herbicide and antibiotic concentrations of agricultural compounds in the environment.

42.

PERCHLORATE IN MARINE BASED FERTILIZERS AND FOOD SUPPLEMENTS

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Kelp and fish such as menhaden are harvested on industrial scales on Western North Atlantic continental shelves. These kelp and fish have found many agricultural, nutritional, and industrial uses. Just as iodine can accumulate in kelp, perchlorate can bioaccumulate in terrestrial, fresh water, and marine plants. Commercially available kelp fertilizer, kelp food supplements, alginates, fishmeal, fish emulsions, fish by-products, and seabird guano from diverse locations were purchased, prepped and analyzed by ion chromatography for perchlorate. Perchlorate was detected in dry kelp meal fertilizer and powdered food supplements but was not detected in liquid kelp or fish emulsion fertilizers. The presence of perchlorate in marine biota and/or by-products may be an alternative natural source of exposure that warrants further investigation.

43.

A NOVEL SYSTEMIC INSECTICIDE, DINOTEFURAN(MTI-446)-ITS CHARACTERISTICS AND APPLICATION FOR INSECT CONTROL

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Dinotefuran (MTI-446; (RS)-1-methyl-2-nitro-3-(tetrahydro-3-furylmethyl)guanidine) is a new neonicotinoid commercialized in Japan in 2002 and is now being developed in the U.S.A (1). It has a favorable toxicological profile and excellent insecticidal properties. We have proposed calling it a third-generation neonicotinoid (sub-class: furanicotinyl) because of its characteristic chemical structure. The biological performance of this compound differs from that of other neonicotinoids. The differences in the insecticidal properties among them will be presented on our poster.

(1) Wakita T, Kinoshita K, Yamada E, Yasui N, Kawahara N, Naoi A, Nakaya M, Ebihara K, Matsuno H, Kodaka K, The discovery of dinotefuran: a novel neonicotinoid. Pest Manag Sci 59:1016-1022 (2003)

44.

METABOLISM AND DISPOSITION OF F7967 IN THE RAT

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F7967, a new FMC herbicide is being evaluated for development. Its metabolism and disposition in the rat was studied following oral administration of ^{14}C-F7967 at a rate of 2 mg/kg of rat weight. Approximately 98%+ of the administered dose was eliminated with a high percent of ^{14}C-residues being excreted within 48 hours. The majority of recovered radioactive residues were in the urine ranging 78%-94% of the applied dose. Exhaled $^{14}CO_2$, ^{14}C-residues in the tissues and carcass were minimal and ranged between 0.2-1% of the dose. Identified metabolites were desmethyl-F7967, dihydro-F7967, hydroxy-dihydro-F7967, despyrimidino-F7967-methyl urea, in addition to parent F7967. Residues in fat were near zero suggesting that F7967 would not bioaccumulate in animal fat or tissues.

45.

METABOLISM AND PHARMACOKINETICS OF CARFENTRAZONE-ETHYL IN THE RAT

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The metabolism and pharmacokinetics (PK) of carfentrazone-ethyl, an FMC aryl triazolinone herbicide was studied in Sprague Dawley rats following oral doses of 5-, 250-, 1000-mg/kg of rat body weight. Approximately 85% of the administered doses were eliminated within 24 hr of dosing. PK parameters were evaluated using the Model Independent method and WinNonlin calculations. T_{Max} for plasma and red blood cells (RBCs) were 0.8-2.5 hr and 0.8-4.0 hr respectively. $T_{1/2}$ (elim) was 4-6.3 hr and 8.0-16.2 for plasma and RBCs respectively. Overall F8426 was absorbed and quickly eliminated from all dose levels. Metabolites included F8426-chloropropionic acid, 3-OH-methyl-F8426-chloropropionic acid, F8426-propionic acid, and 3-OH-methyl-F8426-propionic acid.

46.

CYTOGENETIC EFFECTS OF MALATHION ON THE MERISTEMATIC CELLS OF THE ROOTS OF PECHAY (BRASSICA CHINENSIS LINN.)

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One of the most interesting features of our planet is the presence of a great number of plants exhibiting a tremendous variety of forms. The Philippines abounds with different plant species that are proven to have economic importance. Some of these plants are consumed by people as vegetables, and one of them is pechay (*Brassica chinensis* Linn.).

Pechay is grown all throughout the year. Some fanners make use of pesticides to produce better crop of pechay since pests that hinder the growth of the plants are eradicated.

However, excessive use of pesticides was found to cause mutations in plants. These mutations are results of the reaction of chemicals to the chromosomes of the plants.

Malathion is one of the most widely used pesticides throughout the world. It is used to control pests of agricultural crops, ornamentals, greenhouse, livestock, stored grain, forests, buildings, households, and gardens. Malathion is an organophosphate insecticide that is highly toxic to vertebrates and is chemically related to nerve gases. It kills insects and other animals, including humans, through its effect on the nervous system. It inhibits an enzyme acetylcholinesterase (AChE) that breaks down acetylcholine, a chemical essential in transmitting nerve impulses across functions between nerves. Without functioning AChE, acetylcholine accumulates, producing rapid twitching of voluntary muscles, convulsion, paralysis and ultimately death.

Based on the above-mentioned information, the researchers determined the cytogenetic effects of malathion on the meristematic cells of the roots of pechay. The study determined the number of chromosomal aberrations formed in the meristematic cells of the roots of pechay seedlings treated with different concentrations of malathion. It is hoped that the results of this study will serve as a basis in determining the lethal effects of malathion in pechay and right concentration of malathion that will produce quality crop of pechay plant.

47.

DNA ADDUCT FORMATION FROM PESTICIDES

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Experimental and theoretical modeling investigations have been carried out to identify the nature, degree, and site(s) of interactions between

DNA bases and a preliminary group of pesticide molecules. DNA extracted from crop plants after pesticide treatment has yielded evidence of adduct formation. The extent of DNA modification has been established by 32P post-labeling studies. The radiochromatograms from 32P post-labeling of our isolated plant DNA from grapes, bush beans, soybeans, tomatoes, and cucumbers show elevated adduct levels in treated vegetable plants compared with untreated controls. A number of different adduct spots appear, indicating adduct formation with pesticide molecules or their metabolites. The DNA adduct from 4-hydroxy-2-nonenal (HNE) was clearly observed, indicating oxidative stress and lipid peroxidation in the plant. In addition, on-going theoretical molecular modeling studies were undertaken in parallel with the experimental studies. This modeling approach was applied to determine and quantify potential interactions between pesticide molecules and nucleotide bases.

48.

DISTINCT EFFECTS OF ORGANOPHOSPHOROUS ACID TRIESTERS (OP) ON HOMEOSTASIS OF NICOTINAMIDE ADENINE DINUCLEOTIDE (NAD+) IN CHICKEN EMBRYOS, CHICKS AND MICE

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The unique structure-activity relationship between kynurenine formamidase (EC 3.5.1.9) inhibition by OP teratogens, blockade of NAD+ biosynthesis and severity of the resulting malformations has been the major evidence for the key role of this enzyme in OP teratogenesis in chicken embryos. Our recent work has shown that the cause-and-effect relationship between kynurenine formamidase inhibition and diminished NAD+ biosynthesis seems to be a phenomenon specific only for chicken embryos. First, pellagra induced in chicks deprived of niacin and treated with a potent OP teratogen and kynurenine formamidase inhibitor, diazinon, was alleviated by L-tryptophan. Second, diazinon administered to mice at doses that almost completely inhibited liver kynurenine formamidase did not alter NAD+ biosynthesis in livers. A close examination of L-kynurenine and N-formyl-L-kynurenine biosyntheses by yolk sac membrane and liver slices prepared from chicken embryos treated with a potent OP teratogen, dicrotophos, or with a nonteratogen, methyl parathion, revealed the specific features of the alteration of NAD+ biosynthesis by the teratogen.

49.

DEVELOPMENT OF IMMUNOASSAYS TO EVALUATE HUMAN EXPOSURE TO PERMETHRIN

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The insecticide permethrin is one of the most commonly employed pyrethroids in agriculture and public health. For assessment of human exposure to permethrin, we have developed competitive indirect enzyme-linked immunosorbent assays (ELISAs) based on polyclonal antibodies for the detection of its possible major human urinary metabolites. The target analytes, 3-phenoxybenzoic acid (3-PBA), cis/trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropane-1-carboxylic acid (DCCA), glycine conjugates of 3-PBA and DCCA and a glucuronide conjugate of 3-phenoxybenzyl alcohol (3-PBalc) are proposed as permethrin biomarkers in human urine. The ELISAs developed with the processes of synthesis of haptens, production of antibodies, screening of antibodies against haptens in the ELISA development, and optimization and validation of ELISA showed good sensitivity, with the low IC50 values of 1.65 µg/L for 3-PBA, 0.40 µg/L for 3-PBA-glycine and 2.06 µg/L for DCCA-glycine, respectively. Currently, ELISAs for DCCA and 3-PBalc-glucuronide conjugate are being developed. The immunoassays with simple dilution and combined with solid phase extraction (SPE) which were used to reduce the matrix effect from human urine samples provided the analysis of each target analyte at ppb levels in the samples. This assay may be a useful monitoring tool for evaluating human exposure to the insecticide in terms of rapidity, sensitivity and practicality.

50.

APPLICATION OF EUROPIUM OXIDE NANOPARTICLES AS A FLUORESCENT REPORTER FOR IMMUNOASSAY

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Europium oxide has been used as a reporter for immunoassay when complexed in a chelate. In this work, europium oxide (Eu2O3) nanoparticles were developed as a novel fluorescent reporter in immunoassay. Eu2O3 nanoparticles are ideal fluorphores because of their large Stoke's shift, sharp emission peak, emission at a wavelength generally free of interference from natural biological fluorescence and the ability to be measured in time resolved mode, further increasing the signal to noise ratio. The surface of the particles was silanized with aminopropyl silatrane under aqueous condition. The coated nanoparticles were coupled to an organic hapten (3-phenoxybenzoic acid) for a competitive immunoassay. The Eu2O3-fluorescent immunoassay combined with a magnetic separation remarkably improved the sensitivity about 10000 times, compared to that (IC50=2 µg/L) of the conventional microplate ELISA for the pyrethroid insecticide metabolite, 3-phenoxybenzoic acid. The fluorescence immunoassay is simple and rapid requiring no washing steps and no enzyme conjugates.

51.

RELEASE OF PBO AND PERMETHRIN FROM SYNERGIZED INSECTICIDAL CATTLE EARTAGS (1)

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The development of the insecticidal cattle ear tag provided an important tool for the control of both horn flies and ear ticks on cattle. This technology enabled the treatment of cattle only one time during the fly or tick season and eliminated the labor of frequent gathering. Moreover, control was achieved with only 1-2 gms of insecticide representing a reduction of over 98% of the conventional spray treatments. This significant reduction of pesticide use is important both from the standpoint of environmental contamination and decreased potential of pesticide residue in animal tissue. Despite these multiple advantages, the sustained release concept upon which the insecticidal ear tags is based resulted in rapid development of resistance of horn flies to the pesticides in the tags. The continuous exposure of multiple generations resulted in rapid genetic selection pressures that soon rendered the tags less effective. To compensate for resistance, ear tags containing insecticides with different modes of action were developed or pesticide

synergists were added to the formulation. Piperonyl butoxide (PBO) is a common synergist used in ear tags delivering permethrin. Synergists are usually optimally effective at a particular ratio of synergist to pesticide. However, if the rate of release of synergist and pesticide from the polyvinyl chloride ear tags differ, then the ratio of delivery of PBO : permethrin is constantly changing over time on the animal. In this study, we characterized the delivery of both PBO and permethrin from ear tags and quantitated the ratio of PBO: permethrin over time in both a winter and summer season. The change in this ratio will be discussed as well as it implications for the horn fly resistance problem.

1 This paper reports the results of research only. Mention of a commercial or a proprietary product in this paper does not constitute an endorsement by the U.S. Department of Agriculture.

52.

THE VERY-LONG-CHAIN FATTY ACID SYNTHASE IS INHIBITED BY CHLOROACETAMIDES

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We could show recently that chloroacetamide herbicides interfere with the formation of very-long-chain fatty acids (VLCFAs, C-number >18) produced in the endoplasmic reticulum of the cytosol. Elongation of a fatty acid requires four consecutive steps. As was shown with recombinant enzyme the first step, catalyzed by the VLCFA-synthase, elongates the CoA-activated form of a fatty acid (C18, C20 etc.) with CoA-activated malonate, a reaction which is specifically inhibited by these agrochemicals. The inhibition is alleviated when the inhibitor (e.g. metazachlor) is incubated together with the substrate (e.g. oleoyl-CoA). Malonyl-CoA has no influence. Only inhibitor and substrate, not malonyl-CoA, compete for the same binding site. Once a chloroacetamide has been bound to the enzyme it cannot be displaced by the substrate due to covalent binding of the inhibitor. Labeled oleoyl-CoA, however, is easily removed from the synthase by metazachlor. The irreversible binding of the chloroacetamides and their competition with the substrate explains the very low I50-values obtained with the enzyme assay (10-8M and lower). Chiral chloroacetamides like metolachlor or dimethenamid give identical results. However, only the S-enantiomers are active. Refs.: Pest Manag. Sci. 56, 497 (2000); J. Pestic. Sci. (Japan) 28, 324 (2003).

53.

WINE GRAPE INJURY FROM THE REGIONAL MOVEMENT OF 2,4-D: 2003 PACIFIC NORTHWEST MONITORING PROGRAM

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High-volume air samplers routinely collected airborne 2,4-D residues over a 24-hour interval at 6 vineyard locations in Walla Walla WA in the spring of 2003. Wet/dry deposition samples were routinely collected during this period. Deposition and air samples were analyzed for 2,4-D free acids by base-hydrolysis followed by derivatization and determination using gas chromatography with electron capture detection. A leaf injury rating system was developed using representative cultivars from vineyard locations. The visual leaf position information was ranked 0 to 5 to index the severity of vine injury from exposure and to approximate the day of 2,4-D airborne exposure. Vine inter-nodal distance was also evaluated in this injury index. 2,4-D-type injury ranged from light to severe in vineyards. The combined 2003 air residue and plant index data indicates that vineyard injury remains a chronic exposure concern and will require proactive grower-community involvement for minimizing off-target 2,4-D movement to wine grapes.

54.

WITHIN CANOPY MOVEMENT AND DEPOSITION OF INSECTICIDE RESIDUES IN ORCHARDS DURING SPRAY OPERATIONS

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In pome fruit orchards, insecticides are commonly applied by airblast sprayers. New alternative sprayers receiving increasing attention include the Proptec tower sprayer. The latter sprayer is a reduced volume sprayer that may allow for more directed application of insecticides and lower rates. To determine the within canopy movement and deposition of residues during spray operations, we ran an airblast sprayer and a Proptec by spraying according to several different row patterns: every row, alternate row, and skip row. Leaves were collected at different intervals after application, and leaf disks were bioassayed with neonate codling moth (CM) larvae and analyzed for residues of azinphos-methyl and acetamiprid. Bioassays showed nearly 100% mortality of CM even when rows were skipped (i.e., not sprayed). Detected residues were above the LC50. Thus, we hypothesized that the total load of insecticide required for adequate insect control may be reduced by consideration of the substantial within canopy movement of residues from one row to the next during the operation of airblast and Proptec sprayers.

55.

TAKING STOCK OF HERBICIDE-RESISTANT CROPS TEN YEARS AFTER INTRODUCTION

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Since the introduction of transgenic, bromoxynil-resistant cotton in 1995, the use of herbicide-resistant crops (HRCs) has grown substantially. Before 1995, several HRCs were produced through selection for resistance in tissue culture; however, non-transgenic HRCs had little commercial impact. The advent of transgene technology ushered in glyphosate- and glufosinate-resistant crops. Since the introduction of glyphosate-resistant soybean in 1996, and the subsequent introduction of other glyphosate-resistant crops (GRCs), GRCs have taken a commanding share of the HRC market in countries where they have been approved, especially in soybean, cotton, and canola. The high level of adoption of GRCs by North American farmers has significantly reduced the value of the remaining herbicide market. The rapid adoption of GRCs in the Americas contrasts sharply with the lack of acceptance in Europe. The shift to HRCs, along, with corporate mergers, has reduced the introduction of new herbicides. Therefore, the future trends for ?classical? herbicide use are unclear. Furthermore, the introduction and adoption of other HRCs that can be used with other broad-spectrum herbicides has been hindered by the great success of GRCs. Evolution of glyphosate-resistant weeds and movement of naturally-resistant weed species into GRC fields will require increases in the use of other herbicides, but the speed with which these processes compromise the use of glyphosate alone is uncertain. The consequences of the current situation on herbicide discovery and development of other strategies for weed management will be discussed.

56.

GLYPHOSATE-RESISTANT CROPS: HISTORY, CURRENT STATUS, AND FUTURE

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The commercial launch of Roundup Ready soybeans in 1996 signaled the beginning of a new era of weed management in row crops. Today, over 80% of the soybeans grown in the US are Roundup Ready. Since that time many crops have been transformed that have enabled in crop applications of multiple classes of herbicide chemistries. Glyphosate, glufosinate, sulfonylureas and imidazolinone tolerant crop species are currently under production in multiple countries. Crops currently under production include corn, soybean, cotton, sugarbeet, canola and sunflower. Plans are in place to launch herbicide tolerance in wheat, rice, alfalfa, selected vegetables and even turf species. Transformation technology and selection methods have improved and the rate of development as well as the breadth of crops being considered as commercial targets has increased. This presentation will describe a brief history of the technologies currently marketed as well as the changes in crop production agriculture that have resulted.

57.

TECHNICAL CONCERNS WITH SOME COMMERICAL GLYPHOSATE-RESISTANT CROPS

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Glyphosate-resistant crops have been sold commercially since the mid-1990's. Despite their overwhelming success, technical concerns have surfaced from time to time as growers adopt these crops for use on their farms. The types of concerns raised by growers vary from year to year depending on the crop and the environment, but range from perceived increased sensitivity to diseases, increased fruit abortion, and reduced pollination efficiency, and increased sensitivity to water deficits. Differences in yield and agronomic characteristics between transgenic and sister conventional varieties have also been studied in depth. Because the EPSPS enzyme (the target of glyphosate) catalyses the production of precursors to aromatic amino acids, which are then incorporated into proteins, or are further modified to produce a myriad of compounds ranging from plant hormones to plant defense compounds, disruption of this pathway by glyphosate can affect the production of numerous downstream processes. Although several glyphosate-resistant crops are commercially available, maize, soybean and cotton constitute the largest cultivated acreage, and have likewise been associated with the highest number of technical concerns. Resistance in these crops is dependent upon sufficient expression of a highly active transgene in the correct tissue, at the correct developmental stage to resist the effects of glyphosate. When any of these conditions are compromised, the crop or tissue may become more sensitive to the herbicidal effects of glyphosate. Because glyphosate is rapidly translocated to and accumulates in metabolic sink tissues, reproductive tissues and roots are particularly vulnerable. Increased sensitivity to glyphosate in reproductive tissues has been documented in both glyphosate-resistant cotton and maize, and results in reduced pollen production and viability, or increased fruit abortion. Glyphosate treatments also have the potential to affect relationships between the glyphosate-resistant crop and both phytotoxic and symbiotic microorganisms, although management practices can also have a large impact. Despite the technical concerns raised by growers and researchers surrounding the commercial production of glyphosate resistant crops, this technology remains highly popular with growers.

58.

PROPERTIES OF A MICROBIAL ACETYLTRANSFERASE EVOLVED FOR DETOXIFICATION OF GLYPHOSATE

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N-acetylation is a mechanism for detoxification of glyphosate that could be used in transgenic crops given a suitable acetyltransferase. Weak enzymatic activity for N-acetylation of glyphosate was discovered in strains of Bacillus by screening a library for their ability to acetylate glyphosate, using a novel mass spectrometry assay. Genes encoding three glyphosate acetyltransferase enzymes sharing 92-95% DNA sequence identity were isolated from separate strains of *Bacillus licheniformis*. The enzymes had similar kinetic parameters (kcat=1.2 to 1.8 min-1; Km gly=4.0 to 4.7 mM), which were inadequate for conferring glyphosate tolerance to transgenic organisms. Nine iterations of DNA shuffling resulted in a 3000-fold improvement in catalytic efficiency (kcat/KM), sufficient for conferring tolerance to field rates of glyphosate in transgenic tobacco and maize.

59.

ECONOMIC AND HERBICIDE USE IMPACTS OF GLYPHOSATE-RESISTANT CROPS

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Glyphosate-resistant varieties have been widely-planted on US acreage of soybeans, cotton, corn and canola. Farmers have planted these varieties because of savings in weed control costs. One to two applications of glyphosate have substituted for the application of 3-4 active ingredients used with conventional varieties. Farmers have reduced their use of tillage and reductions have been made in the use of labor for hand hoeing. The low-cost of glyphosate has facilitated the accelerated adoption of no-till practices in soybean and cotton which has resulted in large reductions in erosion. Glyphosate has substituted for other herbicides which are typically used at higher rates per acre. The use of glyphosate-resistant crop varieties has enabled growers in parts of the US to significantly expand acreage due to the control of certain weed species which had been particularly difficult to control previously including soybean acreage in New York and Kansas and canola acreage in North Dakota.

60.

ENVIRONMENTAL STEWARDSHIP OF GOLF COURSES

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In response to public concerns about the effects of golf courses on the environment, the US Golf Association (USGA) funded programs to examine the impact of golf courses on the environment. The research program examines the effects of turfgrass pest management and fertilization on water quality. The research is conducted on university experiment stations and participating golf courses. A second program is the Audubon Cooperative Sanctuary System (ACSP). A cooperative effort between the USGA and Audubon International, this program promotes ecologically sound land management and the conservation of

natural resources. Since its inception in 1991, the ACSP has enrolled more than 3,800 golf properties. Last, Wildlife Links is a cooperative program through the National Fish and Wildlife Foundation (NFWF) and the USGA that funds innovative research, management, and education projects on golf courses. Since the program began in 1996, 13 projects have been funded to enhance wildlife conservation on golf courses.

61.

THE TURF UMBRELLA PROJECT: A COOPERATIVE INITIATIVE FOR IMPROVED PESTICIDE EXPOSURE ASSESSMENT IN TURF

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The USGS NAWQA National Water Quality Survey indicated that pesticide runoff from urban and suburban areas contributes significant amounts of pesticide pollution to water resources. This finding raised significant risk management issues for anyone concerned with pest management on grasslands, rights-of-way, turf farms, lawns, recreational turf areas and golf courses. The “Turf Umbrella” for the first time brings together the expertise and institutions needed to develop and implement a better turf pesticide risk assessment process. Through collaboration and funded projects, the Turf Umbrella has developed a specific protocol for assessing the runoff potential of turfgrass pesticides using small-scale rainfall/runoff studies, is evaluating and collating research on pesticide fate and behavior in turf, and will evaluate and validate early-tier exposure assessment models for turf pesticide use scenarios. One common goal is the development of improved, scientifically credible procedures for assessment of non-point pollution and potential exposure of aquatic and drinking waters.

62.

BEST MANAGEMENT PRACTICES TO REDUCE PESTICIDE RUNOFF FROM TURF

***Bruce E. Branham**, J. H. Mueller, and F.A. Kandil, Department of Natural Resources and Environmental Sciences, University of Illinois, 1102 S. Goodwin Ave., Urbana, IL 61801, bbranham@uiuc.edu*

Pesticide runoff from highly maintained turf surfaces can be a significant environmental concern. This research examined several management practices that may be effective in reducing the potential for runoff from turfgrass. Ten 3.1 and 9.3 m plots were constructed on a silty clay loam soil with a uniform 5% slope. The area was established to creeping bentgrass and maintained at 1.2 cm cut to simulate a golf course fairway. Following establishment a series of experiments were preformed to determine which management practices can best reduce pesticide runoff. A light, post-application irrigation prior to the runoff event was ineffective in reducing pesticide runoff. Lengthening the period between pesticide application and runoff event reduced overall pesticide runoff, but the reduction was less as the water solubility of the pesticides increased. Removing clippings the first mowing following a pesticide application was the most effective means of reducing pesticide runoff.

63.

NITROGEN FATE IN A MATURE KENTUCKY BLUEGRASS STAND

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Extensive research on nitrate-nitrogen (NO_3-N) leaching in turfgrass systems indicates that in most cases leaching poses little risk to the environment. Most of the research was conducted on research sites that were recently established. The fate of nitrogen (N) was examined for a 10-year old Kentucky bluegrass (*Poa pratensis* L.) turf using monolith lysimeters and microplots. Two nitrogen rates were analyzed: 245 kg N ha^{-1} (49 kg N ha^{-1} $application^{-1}$) and 98 kg N ha^{-1} (24.5 kg N ha^{-1} $application^{-1}$). The average total N recovery for the low and high N rates was 78 and 74%, respectively. NO_3-N concentrations in leachate for the low N rate were typically below 5 mg L^{-1}. For the high N rate, NO_3-N concentrations in leachate were often greater than 20 mg L^{-1}. Over approximately two years, 1 and 11% of labeled fertilizer-N was recovered in leachate for the low and high N rates, respectively.

64.

HERBICIDE RESIDUES FROM TURF CAN ENTER COMPOST WASTE STREAM IN POTENTIALLY PHYTOTOXIC AMOUNTS

***Paul H. Gosselin**, California Department of Pesticide Regulation, 1001 I Street, Sacramento, CA 95814, Fax: 916-324-1452`, pgosselin@cdpr.ca.gov*

Herbicide residues from turf can enter compost waste streams in potentially phytotoxic amounts. In 1999 state investigators discovered phytotoxic symptoms in plants grown in compost resulting from low levels of a herbicide called clopyralid. Preliminary information indicated clopyralid degrades slowly during composting and could remain at phytotoxic levels beyond one year. This discovery created liability concerns for the composting industry. Similarly, these concerns impacted the mandated diversion of green waste from municipal landfills. The compost industry and municipal landfills faced a crisis. Investigations were undertaken to create standard test methods to characterize the fate of clopyralid during composting. As a result, regulatory agencies and state Legislatures have banned some uses of clopyralid. Questions remain about adequate test methods for other phytotoxic contaminants in compost and environmental data requirements in general. The situation illustrates that scientific limitations exist even with the extensive environmental fate data requirements for pesticides.

65.

GOLFER EXPOSURE TO TURFGRASS PESTICIDES

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This ongoing study seeks best management practices for reduced golfer exposure to turfgrass pesticides. We have evaluated exposure in over 100 rounds of golf following the application of chlorpyrifos (organophosphate), cyfluthrin (pyrethroid) and carbaryl (carbamate) utilizing dosimetry (residues on cotton suits, gloves and air samplers) and biomonitoring (urinary metabolites) to determine transfer and penetration factors in conjunction with environmental monitoring (dislodgeable foliar and volatile residues). The optimal use of post-application irrigation, reentry intervals, application of less toxic pesticides, and application strategies that result in less than full coverage have all reduced exposures to values that are significantly less than establishes ADI and Reference doses. This data has allowed us to develop two unique golfer exposure models based on biomonitoring and/or dosimetry. Using the total pesticide dose derived from dosimetry or biomonitoring data, these models accurately predict golfer exposure based solely on dislodgeable foliar residues.

66.

GLUFOSINATE-RESISTANT CROPS (HISTORY, CURRENT STATUS, AND FUTURE)

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Several crop species have been made resistant to glufosinate by introduction of either the bar or pat gene that encodes an enzyme which acylates glufosinate, thus inactivating it as a herbicide. Through this technology, glufosinate-resistant crops became available to North American farmers in 1997. This paper will summarize the history, current status, and potential future of glufosinate-resistant crops.

67.

IMIDAZOLINONE-RESISTANT CROPS: HISTORY, CURRENT STATUS, AND FUTURE

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Imidazolinone herbicides, which include imazamox, imazethapyr, imazapyr, imazapic, imazaquin, and imazamethabenz, control weeds by inhibiting acetolactate synthase/acetohydroxyacid synthase (AHAS), a critical enzyme for biosynthesis of branched chain amino acids in plants. Several mutated AHAS genes conferring imidazolinone resistance were discovered in crops through mutagenesis and selection, and used to create imidazolinone-resistant corn, wheat, rice, canola, and sunflower. These crops were developed using conventional breeding methods and commercialized as CLEARFIELD* crops from 1992 to 2003. Imidazolinone-resistant AHAS genes are also found in other crops and have a potential for developing more CLEARFIELD* crops. Research continues to obtain greater imidazolinone resistance to improve the current CLEARFIELD* crops and to create new imidazolinone-resistant crops. Similar to other herbicide resistant crops, avoiding gene flow from a crop to weeds is critical to the success of imidazolinone-resistant crops. To prevent weeds from developing resistance, extensive stewardship programs have been developed for all CLEARFIELD* crops.

68.

RESISTANCE TO PHYTOENE DESATURASE-INHIBITING HERBICIDES: FROM NOXIOUS WEEDS TO IMPROVED CROPS

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Engineering carotenoid biosynthesis for herbicide resistance is particularly attractive because inhibitors of this pathway are lethal to plants, while being harmless to animals. Phytoene desaturase (PDS) is the most common herbicide target site in this pathway. PDS catalyzes the formation of ζ-carotene by reducing phytoene and transferring those electrons to plastoquinone, an essential co-factor for this enzyme. Several herbicide classes (e.g. pyridazinones, aryloxypicolinamide, and phenoxybutanamide) inhibit the catalytic activity of PDS by competing for the binding site of plastoquinone. The subsequent accumulation of phytoene and more importantly the depletion of carotenoids in thylakoid membranes destabilizes the photosynthetic apparatus, and results in the photobleaching of green plant tissues. PDS inhibitors account for a relatively small portion of the herbicide market partly because these compounds lack sufficient species selectivity. While plants do not readily evolve resistance to PDS in nature, it has occurred recently in the aquatic weed hydrilla, where several independent single-point mutations on the same codon created herbicide-resistant forms of PDS. The herbicide-resistant biotypes appear to have no fitness penalty. Arabidopsis plants expressing the mutated hydrilla genes are significantly more resistant to PDS inhibitors than wild type plants. Therefore, the use of hydrilla genes encoding herbicide-resistant PDS in transgenic crops may resolve the selectivity problem for PDS-inhibiting herbicides by increasing safety margins, thus expanding the marketability of these herbicides.

69.

DEVELOPMENT OF PROTOPORPHYRINOGEN OXIDASE AS AN EFFICIENT HERBICIDE SELECTION MARKER FOR TRANSGENIC CROP PLANTS

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Butafenacil is an inhibitor of plant protoporphyrinogen oxidase (PPO) enzymes. Overexpression of naturally herbicide resistant PPO genes, or PPO genes that have been mutated to become herbicide resistant, is a strategy that has been reported to give resistance to diphenyl ether herbicides (Lee et al, Plant Cell Physiol 41:743-749 (2000)). The work of Marc Law, Xiaggan Li and co-workers at Syngenta, focused on the use and adaptation by mutagenesis of plant PPO genes to confer resistance to Butafenacil. Transgenic Arabidopsis and maize plants were produced that express a double mutant version of an Arabidopsis PPO coding sequence. Butafenacil has been used successfully as a selection agent in transformation experiments to kill plants or plant materials resulting from the transformation process, which are not transgenic or do not express the PPO transgene. Butafenacil selection in *A. tumefaciens* mediated transformation show that butafenacil is a good selection agent allowing transformation efficiencies in maize of around 20-40%. Selected maize lines containing the PPO transgene are resistant to an application of 400g ai/ha (3x effective field rate) with little or no detectable damage.

70.

P-HYDROXYPHENYLPYRUVATE DIOXYGENASE INHIBITOR-RESISTANT PLANTS WITH HIGH VITAMIN E CONTENT

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The enzyme, p-hydroxyphenyl pyruvate dioxygenase (HPPD), catalyzes the formation of homogentisic acid, the aromatic precursor of plastoquinone and vitamin E. HPPD is the specific target of several herbicide families: isoxazoles, triketones and pyroxazoles. Its inhibition results in the depletion of the plant plastoquinone and vitamin E pools, leading to bleaching symptoms. These herbicides are very potent for the selective pre- and in some cases post-emergence control of a wide range of broadleaf and grass weeds in corn. Increase of their selectivity for corn and soybean was first achieved by overexpression of a bacterial HPPD in crop plants. Increased level of resistance was further obtained using mutant enzyme. Recently, we have developed a new strategy of resistance based on the increase of p-hydroxyphenyl pyruvate flux. This was achieved by the introduction of the yeast prephenate dehydrogenase gene (PDH) in transgenic plants already overexpressing HPPD. Interestingly, a massive accumulation of vitamin

E, mainly tocotrienols, was observed in leaves of the transgenic HPPD-PDH plants.

71.

HERBICIDE RESISTANCE IN TRANSGENIC PLANTS WITH MAMMALIAN P450 MONOOXYGENASES

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Cytochrome P450(P450 or CYP) monooxygenases play an important role in Phase I reactions in metabolism of xenobiotics including herbicides. The drug-metabolizing P450 enzymes show a broad and overlapping substrate specificity each other. Particularly human 11 P450 species were reported to cover more than 90% of P450-dependent drug metabolism in human liver. Of those, CYP1A1, CYP1A2, CYP2B6, CYP2C9 and CYP2C19 were important for metabolism of herbicides and environmental contaminants. The transgenic potato plants co-expressing human CYP1A1, CYP2B6 and CYP2C19 metabolized several herbicides with different structures and modes of action to show high cross-tolerance toward these herbicides. The transgenic rice plants expressing CYP2C9 and CYP2C19 also metabolized sulfonylureas and a number of herbicides to show tolerance towards these herbicides, respectively. The transgenic plants carrying these P450 genes appear to contribute to reduce residues of environmental contaminants in crop plants.

72.

DEVELOPMENT AND MANAGEMENT OF PESTICIDES FOR URBAN USES: AN AGROCHEMICAL INDUSTRY PERSPECTIVE

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Although the R&D-based agrochemical manufacturers have been strongly oriented towards product needs related to agricultural pest management, considerable efforts have also been devoted to introduction of new active ingredients and management of existing products for non-agricultural, urban uses. The development and introduction of a new active ingredient is a resource- and time-intensive process, and current estimates are that it requires at least 7 years and more than $60MM in R&D efforts between discovery and launch. In a few instances, new active ingredients have been exclusively developed for urban uses (e.g., dithiopyr, halofenozide, noviflumuron), whereas in most cases products primarily developed for agricultural uses have been co-developed or subsequently developed for urban uses. Several case studies concerning development of new pesticide products for urban uses will be highlighted. Management of existing products for urban use involves a high level of product stewardship support and also a high degree of responsiveness to regulatory data call-ins and reevaluation initiatives. Regulatory considerations of particular interest with respect to urban pesticide use include applicator and bystander reentry exposure, food handling residues, wildlife safety, efficacy (for public health and structural pests), and water quality. The need for more highly refined residential exposure estimates has instigated development of a significant quantity of new exposure information, some of which has been developed through collaborative industry efforts (e.g.,. Outdoor Residential Exposure Task Force, Non-Dietary Exposure Task Force). Maintaining the availability of urban uses for important products has grown more challenging during the past decade due to increased regulatory challenges (e.g., Food Quality Protection Act) and the very high public profile associated with residential use. Nonetheless, responsible product management by manufacturers, distributors, and end-users, implementation of science-based regulatory approaches, and cultivation of accuracy and integrity with respect to risk communication will enable continued availability of quality products for urban uses.

73.

EXPOSURE AND RISK CONSIDERATIONS FOR TERMITICIDE PRODUCTS

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Termites threaten the structural stability of homes across the United States and in doing so cost US home owners roughly 1.5 billion dollars a year in repair and treatment costs. Termites are found throughout the US with the exception of Alaska. Three types of termites are typically found in the US, Formosan subterranean termite, dry wood termites, or damp wood termites. Depending on the type of infestation there are three basic chemical means of protecting homes against termite damage; chemical barrier and spot treatments, baits, and fumigation. Chemical barrier treatments can be used as either preventative or curative treatments. Preventative treatments are applied pre-construction of the home while curative treatments are typically injected into the ground surrounding the home after an infestation has been identified. Bait systems can be used to monitor for termite infestations and then treatment of infestations. Fumigation is typically used for treatments of existing infestations. There are exposure and risk considerations unique to each type of termite prevention products. These considerations include the toxicity of the chemical used, opportunity for exposure, type and level of exposure, and exposure duration. The exposure and risk of these different types of termite control techniques will be discussed.

74.

Exposure assessment for residential pesticide exposure: First tier environmental measures and human biomonitoring

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Protection of residences using insecticides, rodenticides, disinfectants and occasionally other products creates opportunities for accidental, unintentional, and unavoidable human exposure. Mortality and morbidity are associated with accidental access of children to pesticides as well as other classes of products, prominently medicines. In indoor environments there is increasingly more and more concern about less and less. Products dispersed in small amounts in pursuit of pests create the opportunity for skin contact, inhalation, and ingestion during normal indoor activities. Environmental measures of potential exposure usually are inflated by default assumptions related to contact and absorption. Biomonitoring includes numerous critical pharmacokinetic and pharmacodynamic assumptions that may be subject to experimental study to reduce uncertainty of exposure estimates. Biomonitoring strategies provide estimates of exposure that may ultimately be more useful for risk assessment than estimates derived from residential monitoring.

75.

RISK ASSESSMENT OF RESIDENTIAL PESTICIDE EXPOSURE: CONTRASTING FIRST TIER ASSESSMENT WITH ACTUAL MEASUREMENT

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Residential exposure includes all routes for commonly used pesticides including dietary from home or agricultural use, dermal exposure from surface residues or during the course of application in or around the home, hand to mouth exposure that occurs as a consequence of surface residues transferred to hands and then mouth and inhalation exposure. For all but the most volatile pesticides, the primary route of exposure is dermal in conjunction with any secondary hand to mouth exposure. Since early attempts by Berteau et al. (1989) to estimate residential exposure entirely on the basis of deposition rates and assumed transferability, numerous refinements in estimating residential exposure have occurred. There are three primary sources of these refinements which include choreographed human reentry exposure monitoring studies in which volunteers perform scripted activities on a surface treated at a known deposition rate, situational exposure in which individuals conduct normal daily activities following an application of a known amount of pesticide (either self-applied or professionally-applied) and random ambient biomonitoring of a large population whose pesticide exposure history is unknown. Each of these methods contributes to our knowledge of and ability to more accurately estimate true exposure. As more residential exposure studies become available it has been possible to compare the estimates for choreographed routines that are the basis for EPA's Standard Operating Procedures with situational and ambient exposure that more closely mimic true exposure. Results suggest that for the dermal route alone, choreographed exposure data typically overestimates total exposure from all routes by >30-fold for either turf or carpet application. Possible sources of overestimation will be explored including assumptions about clothing worn and activity rates.

76.

HUMAN HEALTH EFFECTS OF NON-AGRICULTURAL PESTICIDE EXPOSURE: A REPORT FROM THE CALIFORNIA PESTICIDE ILLNESS SURVEILLANCE PROGRAM

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The California Pesticide Illness Surveillance Program is an important source of information about adverse effects of pesticides. It collects reports on any type of human health effect attributed to any component or property of a pesticide product, refers all reports for investigation, and maintains a computer-searchable database of results dating back to 1982. The program includes cases related to antimicrobial pesticides (sanitizers and disinfectants), which are among the few category I pesticides available to the public. It also includes effects unrelated to pharmacologic properties, for instance, injuries from explosions caused by the ignition of insecticides' hydrocarbon carriers or by combination of incompatible antimicrobials. In the twenty years from 1982 through 2001, the program assigned 45,639 cases for investigation, of which 28,540 were subsequently evaluated as definitely, probably, or possibly related to pesticide exposure. Non-agricultural exposures accounted for 16,408 (57%) of the 28,540, including 69 of the 76 deaths.

77.

GENE FLOW FROM HERBICIDE-RESISTANT CROPS: RISKS AND CONSEQUENCES

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The advent of genetically modified crops has provoked debates concerning the possible flow of transgenes from crop to weedy, wild or crop relatives. Research data repeatedly confirm that genes and transgenes will flow and hybrids will form if certain conditions are met. In the case of herbicide resistance (HR), new carriers of the HR trait will be advantaged when the herbicide is used, thus, mostly in managed systems. Only pleiotropic effects potentially associated with the HR transgene (of which none have been recognized to date) could provide advantages to hybrids and their progeny in wild or unmanaged habitats where no herbicides are used. Alternatively, plants of the same species (nontransgenic or with a different HR transgene) in neighboring fields may inherit the new HR gene, potentially generating plants with multiple HR. The success of weedy hybrids with novel HR transgene(s) will depend on the weed control strategy in current and subsequent crops. Alternatively, weediness could be reduced if crop characters were also expressed.

78.

HERBICIDE-RESISTANT CROPS AND WEED RESISTANCE TO HERBICIDES

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The utilization of genetically modified (GM) crops has increased dramatically during the last three years and currently over 52 million hectares of GM crops are planted worldwide. Approximately 41 million hectares of GM crops planted are herbicide resistant (HR) crops. Most of the HR crop adoption reflects the use of HR soybean that represents an estimated 33.3 million hectares. Herbicide resistant maize, canola, cotton and soybean accounted for 77% or the GM crop hectares in 2001 although HR sugarbeet (*Beta vulgaris*), HR wheat (*Triticum aestivum*), and as many as 14 other crops have transgenic HR cultivars. There are a number of risks associated with the production of GM and HR crops including problems with trait contamination/segregation, trait introgression, marketplace acceptance, and an increased reliance on herbicides for weed control. The latter issue is represented in the occurrence of weed population shifts, the evolution of herbicide resistant weed populations, and HR crops becoming volunteer weeds. There is good evidence the HR trait will introgress into weed populations that are closely related to the HR crop. Documented examples of HR trait introgression into weeds include annual sunflower (*Helianthus annuus*) and wild mustard (*Brassica* spp.). Another issue is the ecological impact that simple weed management programs based on HR corn have on weed communities. Asiatic dayflower (*Commelina cumminus*), common lambsquarters (*Chenopodium album*) and wild buckwheat (*Polygonum convolvulus*) are reported to be increasing in prominence in some agroecosystems due to the simple and significant selection pressure brought to bare by HR crops and the concomitant use of the herbicide. Finally, the evolution of HR weed populations attributable to the HR crop/herbicide program is widespread. Examples of HR weeds include populations of horseweed (*Conyza canadensis*) resistant to glyphosate. An important question is whether or not these problems represent significant economic issues for future agriculture.

79.

HERBICIDE-RESISTANT CROPS: WHY ARE THERE NOT MORE?
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Herbicide resistance (HR) genes have been inserted into or selected for in many species, including almost all major crop species in the world and many minor crops. In some cases this has been done specifically to introduce the HR trait, whereas in others the HR gene was used as a selectable marker (e.g. the BAR gene, conferring glufosinate-ammonium tolerance). However, in very few cases have HR crops been commercialized, despite the weed control advantages that many such crops would offer. There are several reasons for this, including: the R&D costs associated with developing the new HR cultivars; inadequate characterization of the HR plants generated; high cost of obtaining regulatory clearance for the HR crops; cost of extending the herbicide registration for the new use; and impact of adding a new crop use on the existing registration status of the herbicide. These issues, and their implications, will be discussed in the presentation.

80.

ETHICAL CONSIDERATIONS OF HRCS
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The introduction of GM crops has caused a fierce public debate in Europe. Some are concerned that risks are not outweighed by usefulness of the GM crops; others see GM crops as a symptom of an unwanted general trend in agriculture characterized by extensive use of agrochemicals and driven by large companies. A lot of controversy centers around possible risks to the environment. A specific problem here is the diverging perception of risk between the scientific community and the public. In particular herbicide resistant crops are troublesome in this respect, as these crops are associated with two technologies, which are both being perceived as risky by the general public. In the presentation a more systematic account of the various ethical considerations will be presented in light of the on-going public debate.

81.

PANEL DISCUSSION: HERBICIDES - ISSUES AND FUTURE DIRECTIONS
***Nancy N. Ragsdale**, National Program Staff, USDA, ARS, 5601 Sunnyside Ave., Beltsville, MD 20705-5140, Fax: 301-504-6231, nnr@ars.usda.gov*
A moderated panel discussion will address herbicide-related issues associated with crop pest management. Audience participation will provide insights into points raised by speakers during the symposium. Future directions will be discussed from a number of perspectives. These include examination of potential target sites for new herbicides, need for weed management tools in specialty crop production, potential consequences of losing methyl bromide for weed management, and the role of economics in development and use of herbicides.

82.

PESTICIDES AND TMDLS IN AN AG/URBAN INTERFACE
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The agriculture, nursery, and urban landscape industries are economically important industries in California. To maintain plant vigor and yield, meet quarantine requirements, and maintain aesthetically pleasing landscapes, pesticides are used heavily in all three industries. These uses, when coupled with frequent irrigation, often lead to runoff and offsite movement of pesticides. Because of increased urbanization, nurseries, agriculture and large landscapes are situated adjacent to each other in urban or suburban environments such as the Newport Bay/San Diego Creek Watershed. Dry weather and storm runoff generally enter nearby urban streams and eventually enter large creeks or ocean estuaries. A California Department of Pesticide Regulation (CDPR) monitoring study showed a number of insecticides, including both organophosphate insecticides and synthetic pyrethroids, in urban, agriculture, and nursery runoff in Orange County. Due to the high toxicity of organophosphate and synthetic pyrethroid insecticides to fish and aquatic invertebrates, regulatory agencies are imposing stringent limits for pesticides in surface water. Nursery, agriculture and urban landscape runoff is also expected to contribute to the overall pesticide load in urban streams. For instance, diazinon and chlorpyrifos, both organophosphate insecticides, were detected in the Newport Bay Watershed in Orange County at concentrations that were well above target organism toxicity levels. Consequently, EPA recently adopted several Total Maximum Daily Loads (TMDLs) for diazinon and chlorpyrifos in the Newport Bay Watershed. TMDL implementation requires adoption of management practices for load reduction. Nursery, agriculture, and urban landscape runoff problems in California are not confined to Orange County. Due to runoff concerns, nursery, greenhouse, agriculture and urban landscapes in many other regions in California are also under great public pressure. Pesticide runoff has also been observed in orchards, golf courses, and other agricultural systems. Therefore, controlling runoff to meet water quality standards is a challenge faced by many sectors of urban and agricultural developments.

83.

MANAGEMENT PRACTICES FOR MITIGATING PESTICIDE RUNOFF FROM NURSERIES
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Commercial nurseries are intensive users of pesticides. Due to heavy irrigation, many nurseries also generate large amounts of surface runoff that contains relatively high levels of pesticides. If not controlled, nursery runoff may enter adjacent urban streams and cause acute or chronic toxicity to aquatic organisms. We have carried out a series of studies at a 100-acre nursery site located near Irvine, CA, to understand pesticide fate and transport in nursery runoff and evaluate the efficiency of different management practices for mitigating pesticide off-site movement. Our studies showed that pesticides entered runoff when spilled planting media (containing pesticides) was mixed into the runoff water by surface erosion, traffic, and other physical forces. In the runoff flow, pesticides such as synthetic pyrethroids were predominantly associated with suspended solids because of their strong sorption capacity. Best management practices (BMPs) including polyacrylamide (PAM), sediment traps, sedimentation ponds, and vegetative strips were implemented at the site and tested for their effectiveness in

reducing pesticide loads in the runoff. Monitoring for pesticide concentrations in the runoff path showed that these BMPs were extremely effective in reducing levels of pyrethroids in the runoff. These BMPs are of low cost and maintenance, and may easily be adapted for other settings to prevent pesticides from entering urban waterways.

84.

MITIGATION EFFORTS TO PROTECT NATURAL ENVIRONMENTS IN HIGHLY URBANIZED WATERSHEDS

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Urbanized environments generate a wide variety of pollutants that enter water bodies through storm and landscape irrigation events. The implementation of structural and/or non-structural BMPs is the approach often taken by regulatory agencies and the entities being regulated. Agencies, developers, homeowners associations, and individuals wanting to implement BMPs in urban landscapes would like to make science-based decisions as well as actually observe these BMPs in a functioning environment. Funds have been secured to establish an 'Urban Runoff Mitigation Center' in a highly urbanized watershed in Southern California to provide a location for the testing and demonstration of structural and non-structural BMPs that address pesticide and fertilizer movement into urban streams, rivers, estuaries, and eventually bays and the ocean. The project seeks to not only implement outreach activities in an urban watershed, but to develop a unique hands-on best management practice (BMP) demonstration site that will provide education to residential homeowners, professional gardeners, pest control applicators, and public agencies. The Center will initially consist of three parallel landscape settings constructed on similar slopes to simulate three individual single-family home landscapes. Each setting will be integrated with different degrees of BMP implementation. One of the landscapes will include no BMP implementation and shall serve as the 'traditional' control. The second landscape will include BMPs directed at existing landscapes while the third will demonstrate BMPs more appropriate for new construction. Pesticide and nutrient loads in irrigation and storm runoff will be continuously monitored from each setting with the effectiveness of each BMP used for demonstration, education, and evaluation. By securing additional support, new BMPs or improvements to existing technology or strategies will be incorporated into the design.

85.

NO-SPRAY BUFFER ZONES FOR THE AG/URBAN INTERFACE: DERIVATION USING DRIFT MODELING AND TOXICOLOGICALLY RELEVANT BENCHMARKS

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As urbanization overtakes former agricultural lands, potential conflicts may arise between remaining farms and homeowners. One proposed mechanism for protecting both bystanders as well as water bodies from direct exposure to sprays is the use of no-spray buffer zones. Depending on the non-target receptor requiring protection, no-spray zones can encompass an area adjacent to the last tree row or one or more unsprayed tree rows within the orchard. The interests of efficient farming and environmental protection must be balanced, so the size of the no-spray zone needs to be protective enough without being so large that farming operations are hindered. One way to achieve this balance is to use drift modeling and integrate the results with toxicologically relevant benchmarks. We have used the model AgDRIFT to model downwind deposition of an organophosphorus (OP) insecticide during an orchard application. We have also directly measured deposition during experimental spray trials and compared the resulting drift-deposition function to model output. Deposition on a surface area basis was changed to a whole body dose, assuming a 10-kg child as the receptor. We then used both the No Observable Adverse Effects Level (NOAEL) for cholinesterase inhibition and the EPA-defined acute Reference Dose (RfD) as toxicologically relevant benchmarks for defining a very conservative no-spray buffer zone to protect bystanders from an acutely hazardous exposure.

86.

IPM AND PESTICIDE SAFETY EDUCATION FOR URBAN CLIENTELE

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Washington State University (WSU) conducts an active Urban IPM & Pesticide Safety Education Program (UIPM&PSEP) for consumers, Master Gardeners, and landscape professionals. UIPM&PSEP runs the gamut from developing basic resources (magnets, fact sheets, videos, web information) to lecture style courses and hands-on workshops. With declining travel budgets, UIPM&PSEP produced two videos and label exercises for training Master Gardener volunteers (>3,000). To alleviate historical problems with pest control recommendations, UIPM&PSEP developed Hortsense (web database, companion CD) as a Master Gardener reference tool that provides plant problem information and specific pest control recommendations (non chemical control and pesticide). Policies for WSU Master Gardeners who provide pest control recommendations to homeowners are in place. IPM&PSEP has an ongoing IPM Certification Program for Turf and Landscape Professionals that provides education above and beyond pesticide safety and requires participation in hands-on workshops. Lastly, UIPM&PSEP serves the professional urban pesticide applicator through recertification programs.

87.

TERRESTRIAL FIELD DISSIPATION GUIDANCE DOCUMENT: BACKGROUND AND STATUS

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Under the North American Free Trade Agreement (NAFTA), the U.S. Environmental Protection Agency (EPA) and Canada's Pest Management Regulatory Agency (PMRA) are working to develop a coordinated pesticides framework that will harmonize regulatory and scientific capacity. As part of this effort, EPA and PMRA initiated a project to revise and harmonize terrestrial field dissipation (TFD) studies. The revised guidance, which addresses the evolving nature of risk assessment, has shifted from a simple assessment that describes how fast a pesticide dissipates to one which also includes identification of major routes of dissipation. After presenting the revised guidance to EPA's Scientific Advisory Panel in 1998, EPA and PMRA hosted a workshop in 2002 to reach consensus on the purpose of the TFD studies and to chart a course for finalizing the document in 2004. This paper will identify the few remaining outstanding technical issues and draft positions for each issue.

88.

PROBLEM FORMULATION: USING A CONCEPTUAL MODEL TO DETERMINE TERRESTRIAL FIELD DISSIPATION STUDY COMPONENTS

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A conceptual model of overall pesticide dissipation in the field, based on physico-chemical properties, laboratory environmental chemistry and fate studies, and intended use, can aid in the design and subsequent interpretation of terrestrial field dissipation (TFD) studies. This conceptual model, which is a working hypothesis regarding the relative importance of each transformation and transport process, can be used to determine which dissipation routes are likely to be most active in the field. Using this flexible approach, one can identify which dissipation processes need to be addressed in TFD studies. Results of the TFD studies can be used to validate and/or refine the conceptual model or working hypothesis. In this paper, case studies will be presented to illustrate the conceptual model approach.

89.

COMPARISON OF A 'MODULAR' STUDY DESIGN TO VALIDATE THE CONCEPTUAL MODEL OF THE DISSIPATION OF A VOLATILE SOIL FUMIGANT AND A NON-VOLATILE HERBICIDE

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Industry has proposed the concept of a modular approach to validate the conceptual model of dissipation of a compound under real-world field situations. Using a modular approach, registrants could incorporate various additional measurements to assess potentially significant routes of dissipation in the environment that are relevant to a particular chemistry, based on the conceptual model. A modular approach would not only ensure that all major environmental routes of dissipation, where practical, are accounted for in the soil dissipation study, but would also ensure efficient use of resources. The success of a modular approach is dependent on the appropriate selection of triggers and a transparency of the regulatory decision making process and outcomes if certain triggers are met. This paper will compare and contrast how a modular approach could be applied to test or validate the conceptual model of the dissipation of two very different compounds, a non-volatile low use rate herbicide, and a volatile soil fumigant.

90.

ELABORATING THE CONCEPTUAL MODEL WITH NON-STANDARD STUDIES TO BRIDGE LAB AND FIELD RESULTS

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A key part of bridging lab and field results to reach a quantitative exposure model is to examine how the model outputs based on pre-assumed mechanisms and laboratory measured input parameters compare to their respective actual field observations. This is true whether the field result is a dissipation value or data from a runoff study. Model inputs include soil binding, application rate, product use prevalence, percent crop area, soil, photolysis, and possibly aquatic half-lives. For this discussion the key focus is on soil binding, which is often presented as a constant (Kd), when in reality it often is a variable dependent on concentration, soil type, and most importantly time. This is frequently summarized generically as “allowing for aged adsorption/desorption.” Attempting to create a quantitative exposure model without considering temporal changes in soil binding is likely to increase the model error significantly. Examples of significant improvements in quantitative modeling when the temporal aspects of binding are considered have been observed and will be presented and discussed.

91.

TERMITE CONTROL FOR THE 21ST CENTURY: OLD DOGS AND NEW TRICKS

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Protection of structures from subterranean termites continues to be an area of active research. Although many repellent pyrethroids continue to be available for soil application, delayed-acting, non-repellent compounds represent the first in the next generation of soil-applied termiticides. Several new active ingredients are currently undergoing field trials. Termiticidal bait is a concept that was first examined in the 1960s, with the first major product launch in the 1990s. The active ingredients are slow-acting insect growth regulators or metabolic poisons that are spread throughout a termite colony. Physical barriers, such as stainless steel mesh or “termite proof” sand are designed to exclude termites from a structure. Recently, a chemically-impregnated physical barrier has been registered for use in the United States, and other products are available abroad. Biological control of termites with fungi or nematodes has so far met with only limited success for a number of reasons.

92.

WOOD PRESERVATION: WHERE ARE WE HEADING?

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This paper discusses the current trends in wood preservation. Following a brief history of preservation processes and preservatives, alternative systems to CCA for residential uses are discussed. Included are copper xyligen, copper azole, ammoniacal copper quats, and organic systems such as PXTS and copper naphthenate among others. New processing techniques are also covered. Critical issues such as mold, the Formosan subterranean termite, perception vs. science, and the need for public education are also discussed.

93.

TRENDS IN COCKROACH CONTROL IN URBAN AND AGRICULTURAL ENVIRONMENTS: INFESTATIONS, INSECTICIDES, AND ALLERGENS IN HOMES, SCHOOLS, AND FARMS

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The German cockroach is a major structural pest that causes allergic disease in residential settings. The confined swine production

environment often supports large cockroach infestations, which expose workers and animals to high levels of allergens. Of equal concern is the cockroach's ability to acquire and transfer pathogens, and its potential as an agent of transmission for antibiotic resistant microbes. A variety of pesticides are being used to control this pest. I will summarize our recent research, including (a.) the biology of cockroach-derived allergenic proteins, (b.) attempts to reduce cockroach allergen in inner-city homes, (c.) a comparison of conventional pest control practices and integrated pest management programs in school environments, and (d.) studies of cockroaches, allergens, and mitigation strategies in confinement swine production. Our results show that intensive, targeted cockroach control with reduced-risk pesticides leads to dramatic reductions in cockroaches and clinically relevant declines in cockroach-produced allergens. Moreover, in IPM-serviced schools, average acephate, chlorpyrifos, fipronil, and propetamphos residues were significantly lower than in conventionally-treated schools.

94.

CALIFORNIA'S HEALTHY SCHOOLS ACT OF 2000

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Concern in California about the exposure of children to pesticides in schools led to the passage of the Healthy Schools Act in 2000. The act contains a number of requirements for schools and the Department of Pesticide Regulation (DPR). Among other things, schools are required to use effective, least-hazardous pest management practices consistent with integrated pest management (IPM). As defined in the Healthy Schools Act, IPM means "a pest management strategy that focuses on long-term prevention or suppression of pest problems through a combination of techniques such as monitoring for pest presence and establishing treatment threshold levels, using non-chemical practices to make the habitat less conducive to pest development, improving sanitation, and employing mechanical and physical controls. Pesticides that pose the least possible hazard and are effective in a manner that minimizes risks to people, property, and the environment, are used only after careful monitoring indicates they are needed according to pre-established guidelines and treatment thresholds." DPR is required to maintain a web site that provides information about pesticides and IPM, establish a training program on IPM practices in schools, and develop criteria for identifying least-hazardous pest control practices. The role DPR plays in implementing the Healthy Schools Act will be described with a demonstration of our web site and pesticide information provided.

95.

NORTH AMERICAN INVASION, EPIDEMIC SPREAD AND CONTROL OF WEST NILE VIRUS

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An African pathogen, West Nile virus (WNV), cryptically appeared in New York City in the summer of 1999. After successfully over-wintering in native mosquitoes, it began its subsequent spread throughout North America. It reached Florida Louisiana, Canada and the Midwest by 2001 and California and Mexico by 2003. Over 4000 human cases with nearly 300 deaths were documented in 2002 and nearly 9000 cases were reported in 2003. Thirty percent of infected horses died and many thousands of birds, including threatened species, have perished. This new invader replicates to higher viremias than its American counterpart (St. Louis encephalitis virus), and is more pathogenic than most old world WNV strains. The genetic basis of this pathogenicity is being investigated along with the capacity of North American mosquitoes to replicate, over-winter and transmit the virus. Newly developed surveillance efforts have led to the discovery of many new features in the life cycle of this virus. WN represents an important new health threat in the Americas and efforts to prevent human cases through mosquito control have had mixed results.

96.

OCCUPATIONAL ILLNESS AMONG FLIGHT ATTENDANTS DUE TO AIRCRAFT DISINSECTION

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The California Department of Health Services (CDHS) conducts statewide surveillance of acute pesticide illness among workers. CDHS investigated physician reports of six illness incidents involving 17 flight attendants who reported exposure to pesticides used during aircraft disinsection. Disinsection involves applying pyrethroids inside an aircraft to kill insects that may be on board and may be a threat to public health. CDHS identified 12 cases of pesticide illness related to this procedure. CDHS found that the conditions of use significantly contributed to the hazard. CDHS recommended that governmental agencies should conduct research to assess the relative efficacy of disinsection and identify sustainable, non-toxic alternatives. Airline industry employers should: educate all exposed workers; notify passengers; restrict entry to the aircraft cabin after disinsection; implement and enforce maximal ventilation; institute quality control; cease spraying pesticides in the crew rest area; schedule flights to minimize the number of treated aircraft; and initiate illness surveillance.

97.

OUTSTANDING TECHNICAL ISSUES FROM THE 2002 WORKSHOP ON REVISING TERRESTRIAL FIELD DISSIPATION GUIDANCE

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In July 2002, the U.S. Environmental Protection Agency (EPA), Canada's Pest Management Regulatory Agency (PMRA), industry, and other interested parties held a workshop to discuss revisions to the proposed EPA/PMRA terrestrial field dissipation (TFD) guidance document. The workshop identified a number of areas of agreement among EPA, PMRA, and industry, as well as a few outstanding issues. Outstanding technical issues included accounting for multiple applications, number of samples and cores, time zero sampling, and cropped versus bare ground sites. Using a case study analyzing nearly fifty TFD studies, EPA and PMRA will examine these outstanding issues and recommend options for improving the existing TFD guidance document.

98.

COMPARISON OF LAB AND FIELD DT50 PDFS AND PRZM-3 SOIL AND WATER CONCENTRATION PREDICTIONS

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Research has shown that DT50 values generated from laboratory studies often vary significantly from those generated in field studies, with more rapid degradation typically occurring in the field. Causes of this are the result of the inadequacy of laboratory studies to simulate the dynamics of nutrient, moisture and temperature fluctuations in the field environment that control biodegradation. Additionally, the use of lab DT50 values in leaching models such as PRZM have been shown to overestimate soil and shallow ground water concentrations of some pesticides. This points to the inadequacy of using only single values, whether field or lab derived, for the purpose of exposure and risk assessment. One approach to overcome these inconsistencies is to consider the probability distribution function (PDF) of both field and laboratory DT50s to account for the uncertainty in input parameters. This study examines a number of compounds for which a comprehensive dataset of laboratory and field DT50s have been generated and compares PDFs of soil and shallow groundwater concentrations predicted by PRZM-3 model to field results.

99.

IMPLICATIONS OF MULTIPLE APPLICATIONS ON CROPPED PLOTS TO TERRESTRIAL FIELD DISSIPATION STUDY DESIGN

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Determining the dissipation rate of parent compounds (and some metabolites) under actual use conditions is a primary objective of terrestrial field dissipation (TFD) studies. Row-crop preemergence herbicides provide the simplest case. Traditional TFD study guidelines which involve a single application to bare soil appear well suited to address this use scenario. This is not the case for most insecticides and fungicides. Multiple applications on or within plant canopies during the growing season are common. Effective simulation of use scenarios of this type requires that foliar inception and foliar processes such as wash-off and direct volatilization and photochemical transformation be taken into account. An assessment of impacts of repeated as opposed to single applications on processes such as soil degradation also appears necessary. Data obtained in a recently completed study involving triazole fungicide use on peanuts in Georgia will be discussed. Canopy and soil loading rates after 7 sprays spaced 2 weeks apart starting at emergence to 2 weeks prior to digging were made. This was combined with a series of aerobic laboratory soil incubations. Results provide a quantitative assessment of canopy inception as function of crop growth stage and demonstrated relatively rapid adaptation of the soil microbial community to active ingredient degradation. There was a 2 to 3X decrease in 1st order half-lives. The implications of these results for TFD study design and guideline development will be addressed.

100.

USE OF PRZM-3 TO VALIDATE A LABORATORY TO FIELD DEGRADATION CONCEPTUAL MODEL

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The test substance, boscalid, was applied at two field sites, but, depending on how kinetic calculations were performed, the time required for 50% of the initial compound concentration to dissipate (half-life) ranged from 27 to 200 days. Laboratory aerobic soil studies indicated that the DT50 for the compound was about 108 days, and since compound dissipation rates are typically shorter in the field than those observed in the laboratory, confidence in the field half-life calculations was questioned. Researchers have asked whether exposure models might be useful for relating laboratory to field behavior, especially when results are difficult to reconcile between the two systems. In order to determine how realistic field dissipation-time kinetic calculations were, a 60-day DT50 (some masked data), 150-day DT50 and a 196-day rate constant (t1/2)kinetic result were entered into the Pesticide Root Zone Model (PRZM-3) for a California site. A 27-day DT50, and a 200 day t1/2 kinetic result were also entered into the model for a Florida site. Results indicate that using the shortest DT50 solution in PRZM-3 provided the best fit to actual field data.

101.

SUITABILITY OF FIELD DATA FOR DETERMINING DEGRADATION RATES IN ENVIRONMENTAL RISK ASSESSMENTS

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Terrestrial field dissipation studies conducted as part of the registration process in the United States and Canada are a source of realistic degradation rates under actual use conditions when degradation is the primary mechanism of dissipation or when other removal mechanisms can be quantified. Although residue data from field studies are more variable than data from laboratory studies, the greater number of samples collected partially compensates for the increasing variability. Uncertainty assessment using Crystal Ball shows that the variability in estimated degradation rates is about a factor of 2 to 10 less than the variability in means of the replicate points, with the effect of variability being greatest when degradation rates are slow. These results show that the variability in mean residue concentrations resulting from field dissipation studies collecting 15-20 cores per sampling interval round are adequate for generating reliable half-lives for compounds.

102.

PERCHLORATE IN THE ENVIRONMENT: HISTORY, OCCURRENCE AND REGULATORY RESPONSE

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Perchlorate, a soluble and stable component of some rocket propellants and pyrotechnics, has been discovered nationwide since analytical improvements in 1997. As of 2004, perchlorate had been detected in the environment at more than 100 sites in 30 states, primarily in groundwater. Contamination of groundwater and of the Colorado River impacts important drinking water and irrigation water supplies. EPA's 2002 draft assessment of perchlorate toxicity identified the principle effect as disruption of iodide uptake into the thyroid gland, which regulates metabolism and development, and noted that infants and

young children may be particularly sensitive. This assessment has been referred to the National Research Council for review. Consideration of a federal standard for perchlorate is pending this review and additional data gathering. At least 8 states have non-enforceable advisory levels for perchlorate in drinking water. California may establish an enforceable drinking water standard for perchlorate in 2004.

103.

DETECTION OF PERCHLORATE IN ARID REGIONS OF THE SOUTHWESTERN US

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The geochemistry and climatic conditions of desert regions can lead to the formation of numerous compounds of commercial and scientific interest. Naturally occurring perchlorates are known from the nitrate deposits of Chile's Atacama Desert. Arid areas of the southwestern US have many climatologic and geologic factors similar to those of the Atacama Desert, including natural nitrate occurrences and numerous playas. Recently, the USGS and USAF sampled playas and nitrate occurrences in California, Nevada, and New Mexico for the presence of perchlorate. Perchlorate was found in at least one playa in all three states and ranged from 17-112 µg/kg (ppb). These initial results are awaiting IC/MS/MS confirmation. These preliminary findings suggest that the natural formation of perchlorate may not be limited to the extreme conditions of the Atacama Desert and that other desert regions may have conditions conducive to the formation of natural perchlorate.

104.

FATE AND TRANSPORT OF PERCHLORATE IN THE SUBSURFACE

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Perchlorate salts are highly soluble and recalcitrant to degradation. The anion perchlorate (ClO4-) is very mobile in the subsurface. Subsurface flow of water in agricultural systems presents a complex environment of saturated and unsaturated flow regimes wherein the flux of water, and thus perchlorate, can vary by orders of magnitude over relatively short periods of time. The resulting dynamic hydrologic regime presents unique challenges to sampling and quantifying the presence of perchlorate. Factors affecting flow and transport of perchlorate are evaluated in the context of how perchlorate can be concentrated in the near subsurface. Saturated/unsaturated flow regimes that affect perchlorate transport are presented. Sampling strategies and techniques to detect and monitor the presence of perchlorate under conditions of variable water content are reviewed, and a summary of current groundwater remediation approaches is presented.

105.

PERCHLORATE UPTAKE IN PLANT

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The number of sites reporting the presence of perchlorate in groundwater and surface media is rapidly increasing. Recently, in a draft report by the EPA, a reference dose was published which would lead to an eventual perchlorate drinking water standard of 1 ppb. In addition, a number of reports have recently documented the ability of perchlorate to concentrate in vegetation. This exposure route is relatively unstudied. Little information is available on (1) the uptake of perchlorate in plants, and (2) relationships between concentrations of perchlorate in water and concentration of perchlorate in plants. The objective of this research was to determine the influence of nitrogen source and concentration on the uptake of perchlorate by a variety of forage and vegetable crops. Studies included field samples from agricultural operations, sand and soil lab studies, as well as hydroponic studies. These data have important implications concerning the evaluation of perchlorate exposure from vegetation irrigated with water containing low-levels of perchlorate.

106.

HYBRID IC/BIOLOGICAL PERCHLORATE WATER REMEDIATION SYSTEMS

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Despite the success ion exchange technology has demonstrated in removing perchlorate from waters, the perchlorate-laden resins resulting from this process are a growing concern. Some are not easily regenerated due to the high affinity perchlorate has for these resins. Conversely, resins that can be effectively regenerated produce a waste stream containing high levels of perchlorate and other anions, and the saline and caustic components used in the regenerant solution. The contaminant perchlorate is concentrated elsewhere only to be dealt with later. To eliminate perchlorate not only from water but also from the environment, a hybrid technology is proposed integrating the use of ion exchange resins for contaminant separation and biological reduction for the elimination of perchlorate from the waste solutions. The proposed hybrid system will be introduced, outlining specific research challenges. The preliminary experimental data gathered and costs associated with implementing such a system will be presented.

107.

CONCEPTUAL MODELS FOR AGROCHEMICAL FIELD FATE: TERRESTRIAL FIELD SOIL DISSIPATION (TFSD) STUDIES AS A TOOL TO HELP REFINE HIGHER TIER EXPOSURE ASSESSMENTS

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Laboratory study findings on a new active ingredient should be used to construct an evolving conceptual model of significant drivers of its fate in the environment using agreed frameworks of the potentially significant processes that impact key exposure assessment endpoints. Unfortunately, current exposure assessment models do not consider all fate pathways by default and thus model outputs typically underestimate field dissipation rates. Properly designed TFSD studies integrate field processes and provide a reality check on model output. Significant discrepancies between predicted and measured field dissipation behavior coupled with model sensitivity analyses and the compound specific conceptual model indicate how best to refine the exposure assessment (e.g. refine the model or conduct new lab / field studies). Once model output is congruent with TFSD data, meaningful decisions can be made about whether complex field transport/monitoring studies (e.g. groundwater / runoff) may be useful to further refine exposure estimates.

108.

USE OF FIELD DEGRADATION DATA IN EUROPEAN ENVIRONMENTAL RISK ASSESSMENTS

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The use of field degradation data as part of the European Union assessment procedure for the active ingredient to obtain Annex 1 listing has been defined in the EU/industry sponsored FOCUS process (FOrum for the Co-ordination of pesticide fate models and their USe). In the EU process only data from field studies which meet certain quality criteria can be used to provide estimates of degradation rates. This is to ensure that degradation rates from such studies represent actual degradation and not other dissipation processes such as volatilization, runoff, or leaching below the sampled depth. The advice in the surface water and ground water work groups was that the modeler must justify the choice of either field or laboratory data. The work group on degradation kinetics has recommended that field data be normalized to a reference temperature and soil moisture content as a part of the process of obtaining degradation rates.

109.

USING RESULTS OF PESTICIDE TERRESTRIAL FIELD DISSIPATION STUDIES IN RISK ASSESSMENTS

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In addition to their value in characterizing the dissipation of pesticide residues in the field under representative actual use conditions, terrestrial field dissipation (TFD) study results have potential uses as field data to evaluate environmental fate modeling, inputs to fate models under certain conditions, and as a source for potential refinement in risk assessments. The utility of TFD results in quantitative assessments is subject to how well the study is able to delineate all possible routes of dissipation. Applicability beyond the study site depends upon the extent to which the study can distinguish the site-specific influences on pesticide dissipation. Additionally, the utility of TFD results in quantitative assessments is improved as biases from error in the experimental design, sampling methods, and analytical methods are minimized. This paper illustrates ways in which properly conducted TFD studies may be used both qualitatively and quantitatively in environmental risk assessments.

110.

SYMPOSIUM WRAPUP: FROM QUALITATIVE TO QUANTITATIVE PREDICTION MODELING--HOW TO MOVE FORWARD?

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The US EPA and the Canadian PMRA have used the term "conceptual model" (CM) to mean an organizing principle--a way of keeping perspective while assessing the environmental impact of a pesticide. The CM is an attempt to help risk assessors at the start, by predicting the important dissipative/degradative processes that control the persistence and transport of a pesticide, and the resultant exposure of biota in each compartment of the environment. When EPA/PMRA began considering the CM as a guide to required field study design, however, the resulting possible bulge in study costs led to vigorous discussions with Registrants. This ultimately led to an extraordinarily constructive workshop on "Field Dissipation Studies" held in July of 2002. The current Symposium is an attempt to build on the consensus and clarification that was obtained at that workshop, and to help maintain momentum towards a quantitative (i.e., computer simulation) version of the CM. This presentation will attempt to evaluate the success of the Symposium.

111.

PERCHLORATE UPTAKE, ACCUMULATION, AND DISTRIBUTION IN LETTUCE IRRIGATED WITH COLORADO RIVER WATER

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The Colorado River is contaminated with part per billion levels of perchlorate; a chemical experimentally linked to thyroid dysfunction and considered a health threat to humans. Greenhouse studies have shown that lettuce (*Lactuca sativia* L) has potential to bioaccumulate perchlorate. Over 95% of the lettuce consumed in the United States from November through March each year is produced in the lower Colorado River region of Arizona and California and there is concern that this lettuce may accumulate perchlorate and become a source of consumer exposure. Surveys conducted from 2002 through 2004 were aimed at evaluating perchlorate accumulation in lettuce and experiments were aimed at evaluating factors affecting perchlorate uptake. Samples were prepared by freeze drying, grinding, hot water extraction, and analyzed for perchlorate by ion chromatography. For iceberg lettuce most of the perchlorate was in the frame and wrapper leaves, which are discarded. Perchlorate in the edible heads was near or below limits of quantitation. Perchlorate concentrations of romaine and leaf lettuce ranged from near detection to 90 µg/kg fresh weight. The effects of management variables, such as irrigation and fertilization, on perchlorate uptake by lettuce will be discussed. Preliminary estimates of exposure and risks relative to daily consumption of water at 1 µg/L perchlorate will also be presented.

112.

A DISCUSSION OF THE HILL IOWA PERCHLORATE SITE

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In 2001 initial site assessment activities were performed as part of US EPA Region 7's evaluation of former U.S. Department of Agriculture grain bin storage locations. At that time Perchlorate was detected at 29.7 parts per billion (ppb) in a drinking water well at a facility in Hills, Iowa. The population of Hills, Iowa is 679 and most drinking water in the area comes from shallow sandpoint wells (at or about 20 feet deep). In 2002 another sampling effort detected perchlorate at 26.0 ppb in the same well. To date the Hills, IA groundwater sampling has included 178 residential locations sampled; 148 with detects for perchlorate. The highest level detected in a private drinking water well was 63 ppb. Of these 148 detects, 64 residences and businesses had levels above 4 ppb. Monitoring continues, as does the speculation regarding the source of the perchlorate.

113.

CLARIFICATION ON THE ORIGINS OF PERCHLORATE REPORTED IN EARLIER SAMPLE EXCHANGES AND PRESENTATIONS

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A brief history and detailed expose' will be reviewed on perchlorate salts apparently added to samples used in sample exchanges and ultimately reported as positive detections for perchlorate in fertilizer materials. Pictures and analyses of these early samples will be presented. Others have used this data, these samples, and their extracts in several papers giving the impression large numbers of samples have been found to contain perchlorate. It is believed that these samples were purposefully adulterated for the purposes of the study and that continued reference to the samples and the data should state explicitly that these samples were purposefully altered.

114.

ION CHROMATOGRAPHY AND PERCHLORATE IN COMPLEX MATRICES: A CLOSER LOOK AT SOURCES OF FALSE POSITIVES

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Recently improved ion chromatography methodology (EPA # 314, 1999) for perchlorate in water has prompted considerable activity in the environmental, defense and regulatory communities. Early attempts to adapt the water methodology to water extracts of more complex matrices and materials lead to a number of false positive results causing considerable controversy. As a result of this controversy, an ad hoc group of regulatory, university and industry scientists combined to develop a perchlorate method specific to fertilizers and related materials (EPA/600/R-01/026, 2001). However, this method must be carried out with the utmost care to avoid inconsistent or false positive results. A discussion of the specific equipment, techniques and solution preparations required to perform accurate and consistent perchlorate analysis is discussed by one of the method authors. Data will be presented to demonstrate how and why erroneous results can occur.

115.

FERTILIZER INDUSTRY MONITORING OF MATERIALS AND ORE FOR PERCHLORATE ION

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Recent publications regarding the possible presence of the perchlorate ion in commercial fertilizers and ore have prompted the industry in general and IMC in particular, to undertake long term monitoring of its fertilizer ores and products. Over the last four years IMC has monitored its products as well as other industry fertilizer materials for the presence of perchlorate. This process has involved sampling a wide variety of materials including potash ore and products as well as industry check samples. Over 100 materials were sampled and analyzed by ion chromatography for the presence of perchlorate. The sample set included potash, phosphate, langbeinite, sylvinite and other materials and ores that have been the subjects of speculation. This effort included establishing a MDL and LLQ for each sample set. Results of the monitoring program and the analytical issues surrounding fertilizer analysis by ion chromatography will be discussed.

116.

PERCHLORATE DOSE-RESPONSE RELATIONSHIP: EVIDENCE FROM HUMAN STUDIES

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The ability to reliably detect perchlorate at levels as low as 4 ppb in water has revealed widespread low-level contamination due to human and possible natural causes. Recently, perchlorate has been detected in produce and some agricultural commodities such as wheat. Human studies demonstrate the dose-response relationship between perchlorate exposure and biochemical and health effect endpoints. A competitive inhibitor of iodide uptake into the thyroid, perchlorate can result in reduced production of thyroid hormones at sufficiently high doses. However, inhibition of iodide uptake itself is a common biochemical event, the threshold of which is several orders of magnitude below the lowest level that could cause human health effects. The levels at which perchlorate is present in drinking water or food are orders of magnitude below levels that would affect thyroid hormones, a precursor to other potential effects.

117.

ECONOMIC AND POLICY CONSIDERATIONS OF PERCHLORATE REGULATION IN CALIFORNIA

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Due to continued detection of perchlorate in well and irrigation water, concerns have arisen regarding the levels of perchlorate in foods grown with water that might contain perchlorate. This possibility has brought about calls for regulatory action in CA and other states. This presentation will include a discussion of the scope of the proposed regulatory standards for perchlorate under consideration in California. The agricultural industry reaction to the California proposals will also be discussed. Additionally, the economic ramifications for proposed regulations and media treatment for California fruit and vegetable producers will be highlighted.

118.

COMPARATIVE ANTI-THYROID EFFECTS OF DIETARY NITRATE AND ENVIRONMENTAL PERCHLORATE

Richard B. Belzer*, Regulatory Checkbook, 819 7th Street NW Suite 305, Washington DC, DC 20001, belzer@regulatorycheckbook.org*

Comparative risk assessment (CRA) is used as an innovative tool for testing the plausibility of a recent low-dose human health risk assessment (HRA) of perchlorate. Drinking water perchlorate is compared with dietary nitrate, which also causes iodide uptake inhibition (IUI). Natural dietary nitrate is estimated to cause much more IUI than perchlorate. If the perchlorate HRA is plausible the EPA's existing nitrate HRA is not, and management decisions based on it are not protective. If the nitrate HRA is plausible, the perchlorate risk assessment is not and would lead to hyper-precautionary risk management. This discrepancy is shown to be EPA's policy decision in the perchlorate HRA deeming IUI as "adverse". IUI is mundane, reversible, and arises at exposure levels hundreds to thousands of times below a true adverse effect. CRA provides a cost-effective way to evaluate the merits of an HRA whose predictions are otherwise difficult to test.

119.

CHALLENGES IN ASSESSING HUMAN AND ECOLOGICAL RISKS OF PERCHLORATE ASSOCIATED WITH THE FOOD CHAIN PATHWAY

***Lee Shull**, Mark Jones, Sandra Dittmar, and Ken Kiefer, MWH Global, 777 Campus Commons Suite 250, Sacramento, CA 95825-8308, Fax: 916-569-3258, Lee.R.Shull@mwhglobal.com*

Quantitative risk assessment of food chain exposures, both human and ecological, presents many scientific challenges, and assessment of perchlorate translocation through the food chain is no exception. Because perchlorate is a relatively recent environmental contaminant of concern, especially as related to agriculture, essential data relied upon by risk assessors for generating reasonable estimates of risk associated with perchlorate exposures via the food chain are generally lacking. This paper will review and assess the perchlorate state-of-the-science associated with key elements of the quantitative risk assessment process, including inter-media fate and transfer (e.g., soil-to-plant transfer, plant-to-animal transfer), intra-media fate and transfer (e.g., metabolic fate within plants, toxicokinetics in food animals), toxicology issues (e.g., status of human and ecological toxicity criteria available for risk assessment), and risk characterization (e.g., cumulative risk issues). For each of these key risk assessment components, data gaps and relative importance to risk-based decision making will be reviewed and summarized.

120.

PANEL DISCUSSION ON THE IMPACT OF THE PERCHLORATE ISSUE ON CALIFORNIA AND U.S. AGRICULTURE

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