



THE BUZZ



UC RIVERSIDE – DEPARTMENT OF ENTOMOLOGY
NEWSLETTER

Fall 2001

EXPOSED! PEOPLE AND PESTS LIVE IN A CHEMICAL WORLD

By Bob Krieger

Exposure means many things. It may signify making risky investments, climbing a challenging rock face at Yosemite, or the indecent act of a flasher in a public park or shopping mall. In the Personal Chemical Exposure Program [PCEP] *exposure* indicates scientific determination of the extent and duration of human chemical absorption resulting from normal pest management. The data are essential to effective and responsible risk management at the local, state, national, and international levels. Exposure is the chemical part of risk.

Risk Characterization is the scientific component of the regulatory process. The toxicology part includes hazard identification and dose-response studies. The perception of members of the public, activists with myriad issues, many regulators, and some scientists that pesticide exposure *per se* is harmful is derived from hazard identification studies. Dosages used in hazard identification studies are intended to demonstrate the spectrum of adverse biological effects. The dosages do not necessarily have any relation to expected human exposures. Responses are not adequate to define toxicity thresholds, low-observed-adverse-effect dosages (LOAEL), or no-observed-adverse-effect dosages (NOAEL) for Risk Characterization.

Dose-response relations are next established to determine LOAELs and NOAELs for Risk Characterization. Heavy reliance is placed upon animal responses. Uncertainty factors (UF) of 1/10 each are applied for species-to-species extrapolations and individual-to-individual variability (NOAEL/10/10). If toxicity testing reveals any special hazard to children, an additional UF of 10x is applied to the no effect level (NOAEL/10/10/10).

When the NOAEL is factored by default UFs, acceptable absorbed dosage can be calculated, but its relationship to any reality remains uncertain. PCEP methods and techniques are used to determine and evaluate the relationship between the [NOAEL/UFs] and the measured absorbed daily dosage of persons unintentionally or unavoidably exposed to chemicals. The following notes represent some PCEP studies and provide examples of current research in exposure assessment.

Foundation. At the molecular level, people and pests thrive and die in an extremely complex chemical milieu. Over

20,000,000 chemicals are cited in Chemical Abstracts and new ones are discovered every day. Miniscule numbers of those chemicals are components of our everyday chemical technologies, classed by use as food constituents, medicines, industrial chemicals, household products, and pesticides. Active ingredients used in pest management account for about 800 of the 20 million chemicals. When products containing these active ingredients are used, people are unintentionally or unavoidably exposed, i.e., they have chemical contact via ingestion, inhalation, or skin contact and each contact carries the potential for absorption (and excretion).



Juan Ortis thins apples to promote fruit growth. Pesticide exposures monitored during a normal work week in California and Washington were well below levels of health concern.

One of the ways people differ from their pestiferous competitors is in the naming, measuring, toxicity testing, and, ultimately, the regulation of chemicals. Those chemicals that are synthetic, receive inordinate attention relative to ubiquitous, untested (and mostly unknown) natural products to

which we are continually exposed to an even greater extent. Naming, measuring, and toxicity testing of chemicals used in pest management represents a long-standing scientific processes founded upon validated analytical chemistry, clearly established toxicity testing, and a robust literature. Pesticides are the best-tested chemical technology with respect to toxicity, health and environmental quality. Chemicals used as pesticides have received special attention, particularly from fear-mongering “activists,” since under special conditions they are used to kill other living things, even though the overwhelming majority of exposures are benign.

Research and Extension activities of the Personal Chemical Exposure Program are intended to define direct and indirect human pesticide exposures in agricultural and residential settings and to help clarify their health significance. Environmental, pesticide handler (mixer/loader/applicator), and farm worker (harvester) studies have been done in agriculture. Residential and turf studies have also been reported supplying data on family pesticide exposures resulting from indoor pest management.

Environmental studies have included measurement of regional fumigant levels in the San Joaquin Valley and drift resulting from use of airblast sprayers in orchards. SRA Travis Dinoff established an air sampling network in the Bakersfield area where metam sodium use yielded low-level air levels of

methyl isothiocyanate. The results are central to current California and national regulatory activity. **Ryan Williams**, a Ph. D. candidate in Environmental Toxicology, modeled off-site airblast spray drift for risk assessment. Ryan developed an innovative sampling scheme using a child-like manikin to account for differential particle deposition on body contours. The results have significant potential for the way drift measurements are used in risk management

Worker exposures during mixing, loading, and applying of insecticides to row crops and tree fruits have been studied using a variety of materials. Urine biomonitoring has repeatedly demonstrated that workers who wear standard clothing plus gloves have substantially less exposure than others without hand protection. Studies of the exposure of fungicide applicators in greenhouses have shown that biomonitoring studies may be compromised when both the parent pesticide and environmental breakdown product (non-toxic) are absorbed.

Harvesters of treated crops are also exposed to low levels of pesticides relative to toxic levels when they contact treated surfaces. [Note: It is of interest that PCEP work follows pioneering worker reentry studies during the 1970s by **Tak Iwata, Francis Gunther, and Glenn Carmen** of this Department.] More recently PCEP has performed measurements of worker pesticide exposure in strawberry, date, apple, and cherry harvesters. Strawberry harvesters picking following malathion use (vs. lygus bugs) absorbed low amounts of the insecticide and registered no effects on blood cholinesterases, other indicators of exposure. Clinical chemistry and urine biomonitoring both indicated that the harvesters had insignificant exposure relative to any health endpoint. This study and others of PCEP have contributed substantially to the evaluation of safe worker field reentry intervals. **Ryan Williams** and **Marcella Oliver** have conducted recent biomonitoring studies of apple thinners and cherry harvesters in California and Washington. Results being prepared with the assistance of **Xiaofei Zhang** will substantially reduce the uncertainty about the magnitude of tree fruit harvester pesticide exposures.

Residential pesticide use is also associated with exposure. Skin exposures are substantially more important than inhalation, long

assumed to be a critical pathway. **Craig Bernard**, Ph. D., recently filed his dissertation, “Measuring Indoor Human pesticide Exposures and Use of Environmental Data to Generate a Predictive Model of Exposure.” This includes the first measured levels of indoor human pesticide exposure—about 1/1000th of the estimates offered in 1989 by California regulators and later used to marshal support for efforts to restrict or eliminate indoor pesticide use. Important findings include long term (weeks-months) availability of indoor pesticide residues, low exposure relative to toxic levels, and higher exposures among children than their parents. These monitoring studies have been complemented with experimental studies [Jazzercise™ led by Kelly Tyson and participated in by many Departmental students and staff] that have clarified the nature of surface residues. [If any of those participants are reading this—Thanks again!]

We are continually reminded by the perceptions of others and numerous regulatory actions, that exposure is only the chemical part of risk. How people feel about exposure has often played more loudly than its magnitude during recent times. PCEP seeks to contribute scientific measurements of human pesticide exposure to the database used for pesticide regulation. Clarification of the exposure potential of various work tasks that are critically important to an even-handed description and management of risk is essential. This is particularly so since many persons continue to regard chemical exposure as a disease rather than as a normal, unintended, or unavoidable consequence of chemical use.

These snapshots of PCEP work are necessarily incomplete. They serve to show aspects of PCEP work of which most persons are probably unaware, and perhaps they remind of an important adage—we live in a chemical world!

Footnote: “BOT toxin” used cosmetically to remove facial wrinkles, glycoalkaloids in French fries and other potatoes, and organophosphate insecticide residues in foods are safe even though botulinus toxin, solanine and chaconine, and organophosphate oxons share the same hazard, neurotoxicity resulting from acetylcholinesterase inhibition. Dose makes the poison!

ALUMNUS FEATURE

Dr. Larry Larson is Crops Advisor for the Insect Management Group of Dow AgroSciences and currently lives just outside Indianapolis, Indiana in Carmel (pronounced like the candy), Indiana. His fascination with insects has taken him far, to the top leadership role in the world’s largest organization for professional entomologists and to a 26-year career with global agribusiness. Larry is the current president of the 6,000-member Entomological Society of America (ESA) and an insect management researcher with Dow AgroSciences LLC.

Larry is a San Diego native who received his BS in Biology from San Diego State College in 1972. In the fall of 1972, Larry traveled all the way to UCR to study insect toxicology under Dr. T. Roy Fukuto, a name that had figured prominently in a Senior Project on selective insecticides finished the year before. At the suggestion of Dr. Hal Reynolds, chair of the Department at the time, Larry



went on what was supposed to be a practice interview early in 1975 at the Agricultural Products Department of Dow Research facility at Walnut Creek, California, and was offered a job! The entire summer of 1975 was spent writing his dissertation in time to join Dow in 1975 after earning his doctorate in insect toxicology from UCR. Larry started in the company’s Walnut Creek laboratories and focused on soil and fruit insects. In 1980 he was finally lured away from California to a technical service and development job out of Omaha, Nebraska. After 3 years of responsibility for all of Dow’s agricultural products in the state of Nebraska, Larry made the move into Headquarters in Midland, Michigan, to head up the “Big-Foot” Lorsban 15G team. In his 7 years in Midland, Larry was Product Development Manager for all of Dow’s arthropod management materials including Lorsban Row Crop and Horticulture, Reldan, Plictran Miticide, and hexaflumeron insect growth regulator. Eleven years ago, he moved with the Worldwide Headquarters of the DowElanco joint

venture to Indianapolis and back to Discovery. Back in the laboratory, Larry participated in the discovery and development of fenazaquin acaricide, and the spinosad Naturalyte™ Insect Control System. Currently he is the Crops Advisor for the insect management group of Dow AgroSciences' Discovery Research Department. In this position, Larry is responsible for developing, evaluating, and expanding new control technologies for arthropod pests of the world's major commercial agricultural plants.

Larry's professional accomplishments include helping Dow AgroSciences introduce two new methods for pest management that won Presidential Green Chemistry Challenge Awards, given by the Environmental Protection Agency on behalf of the White House Administration. Sentricon, honored in 2000, is a termite control system that uses milligram quantities of hexaflumuron, an insect growth regulator, in its baiting material. Spinosad, marketed under the brand name Conserve, was the 1999 Green Chemistry award recipient. It controls several different insect species using a mixture of two metabolites extracted from a fermented, naturally-occurring organism, the soil actinomycete *Saccharopolyspora spinosa*. While working in Nebraska, Larry also helped create a new delivery system for Lorsban, enabling the insecticide to be delivered through sprinkler irrigation systems rather than the less efficient spraying method traditionally used in agriculture.

Another contribution Larry considers significant is participating as a part of the Governing Board of the ESA for 5 years. During this time the ESA has come into the 21st Century. Larry is preparing to step down as the top officer at the group's annual meeting in San Diego in December. However, he will remain part of the executive group for another year. His participation in that group and its scientific conferences keeps him in close contact with UCR entomologists, especially Dr. Richard Redak, who represents the Pacific Branch on the Governing Board.

When not busy with his career and professional group, he and his wife, Marian, are involved in Bible study and Sunday school with the Lutheran church they attend and are raising two daughters now in high school, Dana and Roxanne, both of whom

plan on pursuing science careers. During his rare spare time, Larry spends time gardening and collecting cacti and other succulents, a hobby he has taken with him from his days in California. Larry is continually amazed by the diversity to be found studying insects. He finds there is never a dull moment around the Dow AgroSciences Laboratories as he finds new ways to manage insect pests and preserve the environment.

HONORS AND AWARDS

Karl Haagsma won the Entomological Society of America Jeffrey La Fage Award. This award goes to students interested in urban entomology specializing in wood-destroying organisms. He will receive the award at the National Meetings in San Diego.

Andrea Joyce (Labs of Dr. Paine and Dr. Millar) received the Robert van den Bosch Memorial Scholarship in Biological Control at the University of California, Berkeley. The grant includes a \$6,000 stipend for Andrea's research on the acoustic parasitoid-host interaction in the Eucalyptus system. **Danel Vickerman** received the Graduate Dean's Dissertation Research Grant April 2000 –April 2001, and was also recently nominated to a full member of Sigma Xi The Scientific Research Society. **Jocelyn Millar** was awarded the 2001 Pacific Branch "Recognition Award in Entomology" at the Pacific Branch meeting of the Entomological Society of America in Park City, Utah. The stated purpose of the award is "to recognize entomologists who have made or are making significant contributions to agriculture."

Tom Miller was awarded \$633,000 by the USDA-APHIS for a two-year project to develop paratransgenesis for control of the spread of Pierce's disease by the glassy-winged sharpshooter. Other participants in this project include: **Don Cooksey**, Plant Pathology, UCR; **John Peloquin**, Entomology, UCR; **David Lampe**, Duquesne University, Pittsburgh PA; and **Carol Lauzon**, Cal State University, Hayward, CA. **Mike Rust** has been elected Fellow of the Entomological Society of America. **Nick Toscano** is currently on a Fulbright Scholarship working with scientists at the University of Lleida in northern Spain to develop a comprehensive program to alleviate insecticide resistance in pear psylla.

Peter B. Goodell, Integrated Pest Management (IPM) Entomologist, (MS in 1979 and Ph.D. in 1986 from Department of Entomology at UCR) has received the 2001 Award for Excellence in IPM from the Pacific Branch of the Entomological Society of America at their annual meeting in Park City, Utah. The Pacific Branch will forward his name as a nominee for the National Award for Excellence in IPM. He is located at the Kearney Ag Center working in the Central Valley Region. He is the IPM Extension Coordinator for the UC Statewide IPM Project. In October 2001 **Tom Miller** and **Robert Staten** (Entomology Department alumnus) were issued the first permit in the world to do field studies on a transgenic insect, the pink bollworm. Studies are being conducted in Arizona.

ENTOMOLOGY DEPARTMENT WELCOMES NEW STUDENTS

By Tom Perring

We are excited to welcome 13 new graduate students, and 3 new under-graduates to the Department this quarter. Ph.D. student **Jeremy Allison** comes to the department from Simon Fraser University, B.C., and he will be working with Dr. Ring Carde. **Jeremiah George** is a graduate of our own department, and he will be working on his M.S. degree under the direction of Dr. John Pinto. **Robert Kirkwood**, a UCR biology graduate, will be in the M.S. program with Dr. Dick Goeden. **Lisa Mill**, comes to UCR from New York (M.S. in Public Health from Columbia University), and she will work on a Ph.D. degree with Dr. Peter Atkinson. Another student in Dr. Atkinson's lab is **Christina Stosic**, a California native, who earned her B.S. from California State University, Northridge. **David Tanner**, a UCR biology graduate will work on his M.S. degree with Dr. Kirk Visscher.

There are 7 additional students who are in the process of selecting their major advisors. **Glen Bagwell**, a graduate of the University of Nevada, Reno (B.A. in biology) will work on his M.S. degree in insect ecology. **Peter Jensen**, Ph.D. student from Montana State University, has interests in viticulture and is leaning toward a project with sharpshooters. **Seokyoung Kang** comes here with an M.S. degree in Horticultural Biology from Korea University. He will be in the Ph.D. program, working on insect ecology. **Shannon Kirshner** recently arrived at UCR from UC Santa Barbara (B.S. Biology), and she will work on a Ph.D. degree, with emphasis in ecology and biological control. **Deguang Liu** recently graduated from Zhongshon University in China, and will pursue a Ph.D. degree related to pest management. **Andrew Soepron**, M.S. student, is a UCR graduate from Philosophy, and he is interested in insect

behavior. **David Popko**, also a UCR graduate (B.S. Biology) will work toward an M.S. degree in biological control and pest management.

We also have 3 new undergraduate students in the Department this fall. Transferring here from Butte College in Chico is **Emily Symmes**. She enters the program as a Junior. Also, there are two freshman students starting the program this year: **Joceyln Holt** is a local Riversidian, graduating from Notre Dame High School, and **Mark Darby** comes to UCR from Centennial High School in Corona.

We welcome all of these new students to the Department and wish them the best during their tenure at UCR.

8TH ANNUAL STUDENT SEMINAR DAY

The Department hosted the 8th Annual Student Seminar Day on September 21, 2001. There were 27 excellent presentations from

M.S. and Ph.D. students that provided a wonderful glimpse into the various research programs of the Department. Drs. **Tom Miller, Mike Rust and Greg Walker** served as judges for the presentations, and determined runner-up and best papers among the M.S. and

Ph.D. students. Runner-up recognitions were awarded to M.S. student, **Gilly Sherman** and to Ph.D. student, **James Barry**. The best paper presented by an M.S. student was "Hot pursuit: the use of heat as an orientation cue by the northern fowl mite" by **Jeb Owen**. In the

Ph.D. category, **Tuen Dekker** gave the best paper titled, "Weak trails or slow bloodhounds: orientation of *Aedes aegypti* to skin odors in comparison with CO₂." The day concluded with a welcome-back social at Dr. Miller's home.

CHAIR'S MESSAGE



By Tim Paine, Department Chair

We have started a new academic quarter in what promises to be one of the most dynamic and eventful years in memory. The final walkthrough for Campus acceptance of the new Insectary and Quarantine building is scheduled in the next few weeks, so we will be in the process of state and federal certification shortly thereafter. The new Entomology laboratory and office building is in the final finishing stages and should be available for occupancy just before the first of the year. The framing is being erected on a site adjacent to the Compounding Building at Agricultural Operations on the West Campus for 10,000 square feet of new greenhouse space. All at once, we should have some of the newest and most state of the art facilities of any place in the country. The old buildings contain many memories and a tremendous legacy of excellence. The new spaces will enable us to carry that legacy well into the future.

In addition to new spaces, we have many new faces joining the Department. Thirteen new graduate students entered this quarter, one of the largest entering classes in several years. Dr. Richard Stouthamer is now part of the faculty, Dr. Alexander Raikhel will join us in January, and Dr. Marshall Johnson will

join the Department as a Cooperative Extension specialist located at the Kearney Agricultural Center in Parlier in April. For the first time in many years, the Campus has supported recruitments of senior faculty and we have made the most of this rare opportunity. We are justifiable very pleased with these new additions to our faculty. On the downside, Dr. Nancy Hinkle left for the University of Georgia last spring. We appreciate all she brought to our Department and wish her continued success in her new position. Fortunately, we have been given authorization to recruit her replacement as well as a new position in the area of the molecular basis of perception/ behavior. The advertisements for these two positions will be out in a few weeks. Hopefully, the recently announced freeze in state hiring will not become an issue.

As many of you are aware, the national meeting for the Entomological Society of America will be held in San Diego in early December. If you have some extra time, please drop by the campus and the Department. For many, the changes to UC Riverside and to the Department will be very striking. We welcome you to come visit with some familiar faces in what are likely to be unfamiliar spaces.

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ADDRESS CORRECTION REQUESTED

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