



Agrichemical and Environmental News

A monthly report on pesticides and related environmental issues

*Agrichemical
& Environmental News*
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Based on instructions from WSU CAHE administration, information in this newsletter not originating from WSU is shaded (similarly to this note). This is to help ensure that readers can readily identify material obtained from a source outside WSU.

Payments due for subscriptions

As reported in the February issue, we are instituting an annual subscription charge of \$15 for the hard copy of the newsletter. Checks must be received by WSU on or before March 11, 1998, in order for subscribers to receive the April issue. Checks received after that date will be entered for receipt of the May issue. Please make checks payable to WSU and send to Catherine Daniels, Pesticide Information Center, WSU Tri-Cities, 2710 University Dr., Richland WA 99352-1671. Subscription charges cover only the costs of publishing and mailing the newsletter. The newsletter continues to be available free of charge on our web site at <http://picol.cahe.wsu.edu>. If you would like a free E-mail reminder when new issues are posted on the web, please contact Eric Bechtel at ebechtel@tricity.wsu.edu.

WSCPR to meet in Tri-Cities

The Washington State Commission on Pesticide Registration (WSCPR) will be meeting at the WSU Tri-Cities campus March 9, 1998. Agenda items include a

review of proposals. For more information on submitting proposals or attending the public meetings, please contact the WSCPR Administrator at (509) 543-9757.

EPA postpones reorganization

The February issue contained an article on the proposed EPA reorganization of the Office of Prevention, Pesticides, and Toxic Substances (OPPTS). The timeline for this proposed reorganization has been extended several years until a new building is constructed and ready for occupancy by the OPPTS staff.

Top 3-5 issues

Representatives of the state departments of agriculture, health, ecology, and labor and industries were each invited to submit an article of interest to our readers based upon the following question: What does your agency consider its top three to five issues during 1998? The Department of Ecology article is featured on page 3. Articles from the other agencies will be appearing in future issues.

Pesticide Registration and Section 18 Emergency Exemptions

Joel Kangiser, Washington State Department of Agriculture

If Section 18 requests received so far in 1998 by the Washington State Department of Agriculture (WSDA) indicate how many the department might expect during the remaining season, requests could far surpass even the record established in 1997. Prior to 1997, WSDA petitioned the EPA for 20 to 22 Section 18 requests annually. For various reasons, including implementation of the Food Quality Protection Act (FQPA), WSDA petitioned the EPA for a total of 30 requests in 1997. WSDA has received 16 requests already in 1998, and is anticipating many others. According to the EPA, Washington ranks second nationally for number of Section 18s requested; only California requests more.

To help with the increased workload, WSDA Pesticide Registration last year added two full-time staff members, funded through pesticide registration fee increases approved by the 1997 Legislature. Erik Johansen, a former compliance investigator and specialist in beneficial pollinators, and Clinton Campbell, an entomologist with a strong background in integrated pest management, join Steve Foss, a specialist in pesticide information and resources, and Joel Kangiser, Registration and Minor Crop Program coordinator. These four review and process SLN-24(c) registrations and Section 18 emergency exemptions from registration. Growers and industry will benefit from the increased staffing as early as this spring. Without the added personnel, this year's greater number of Section 18 requests stand little chance of being submitted on a timely basis to EPA. Earlier submission to EPA means more review time, which should result in the granting of specific exemptions on a timely basis.

Even with fast WSDA processing, Section 18 applicants must not delay submitting applications. WSDA this year has received some requests too close to the first use date. The EPA is allowed at least 50 days to review a Section 18 request, regardless of whether the request was granted previously. Particularly with new chemistry, or if the product hasn't been previously reviewed under FQPA, the EPA may be unable

to decide within 50 days. WSDA also needs time to review and compose a petition for the EPA. Generally, Section 18s previously reviewed and granted after FQPA implementation, should be submitted to WSDA at least 80 days prior to first anticipated use. Section 18 requests not previously granted under FQPA should be submitted to WSDA at least 120 days prior to first anticipated use. These times are minimums; more review time means a better chance of having emergency use when needed.

Robert Forrest, chief of the EPA Minor Use, Inerts, & Emergency Response Branch, recently issued a memo to state pesticide lead agencies, including WSDA, explaining that the 1997 Section 18 process was clearly slowed by FQPA requirements. Not only did EPA personnel have to evaluate the emergency situation, ecological effects, worker exposure, and progress toward registration, they now had to conduct a human health risk assessment and establish a time-limited tolerance. Forrest anticipates a shorter review period this year for Section 18s, at least for repeat Section 18s, than last year.

The Emergency Response Team at EPA, under team leader Meredith Johnson, reviews and evaluates Section 18 requests that the state of Washington submits to EPA. The team's handling of some requests has prevented devastating crop losses. One example would be the team's work with WSDA and the Washington Hop Commission to find a fungicide for use under a crisis exemption to combat powdery mildew in the 1997 hop crop. The use of fenarimol (Rubigan) was granted within just a few days. Even with this quick work, up to a thousand acres of hops were lost. One can only imagine the losses that would have occurred had the crisis exemption been delayed.

Within the boundaries of regulatory restrictions and limited finances and resources, Washington State Department of Agriculture personnel are doing their best to find pest control materials that will prevent the next disaster.

State ecology department to focus on agriculture and environment

David Rountry, Department of Ecology

The public and news media are increasingly focused on how agricultural practices affect human and environmental health. The Washington State Department of Ecology expects continued strong interest in this area this year, and will work with agribusinesses to address public concerns in four primary areas: improved management of stormwater runoff, greater safety in the use of pesticides, cleanup of contaminated sites, and growers' right to know about the content of fertilizers they use.

Stormwater runoff

Ecology will continue its watershed-based approach for systematically assessing water quality conditions and water availability. Proposed endangered species listings for salmon and other fish, plus ongoing concerns about water supply and quality statewide, are driving new approaches to watershed management. State agencies, led by Ecology, are working with the Legislature and a broad array of interest groups to build a watershed planning process that is locally based, yet responsive to regional human and environmental needs. Agricultural community participation is crucial to wise management of water quality and supply. Ecology plans a conference, Partnerships in Preventing Polluted Runoff, for March 31 through April 1 at the Wenatchee Convention Center in Wenatchee. More information is available from Bill Green, (360) 407-6795 TDD, (360) 407-6006 or from the DOE Web site at <http://www.wa.gov/ecology/calendar.html>.

Specifically on the water quality front, Ecology's Washington State Pesticide Monitoring Program and other work on the Interagency Groundwater Coordination Committee are helping to identify where water quality may be at risk from agrichemicals. This is the foundation for other group efforts that will focus on changes in farming activities or technology that can reduce human health and environmental risks.

Pesticide Safety

The 1996 Food Quality Protection Act (FQPA) provides unprecedented incentive for agencies and

industries to work more closely on practical pest-management strategies that reduce reliance on pesticides. The FQPA trend toward lowering tolerances will probably make it harder and more costly to use "riskier" chemicals. FQPA will motivate safer choices and new technologies that emphasize reducing the use of pesticides. Ecology will work with the industry as it pursues safer management approaches, including pest-management strategies that favor bio-intensive integrated pest management (IPM) and rely less on pesticide use. Ecology will also continue its collective work with agrichemical users, state and federal agencies, advisory groups, and WSU Cooperative Extension to evaluate and understand unsafe pesticide activities and focus on finding safer pest-management options in urban as well as agricultural settings.

Contaminated-Site Cleanups

Concern by the public and business community about possible health effects of pesticide contamination calls for more Ecology attention during 1998. In particular, lead-arsenate contamination of orchard lands is a growing issue because many of those properties are being considered for redevelopment into more-public uses like residential, commercial, and recreational sites. Lead arsenate was commonly applied as an insecticide through the mid-1940s. Between 80,000 and 120,000 acres of land in central Washington and other cropland in western Washington may be contaminated. Many locations are believed to be contaminated at concentrations greater than state cleanup levels in the Washington State Model Toxics Control Act. Ecology will work along with other agencies to set up a collaborative process driven by local landowners and others in the community to understand the nature and extent of contamination and to understand potential health exposures and risks. Group efforts will also evaluate possible farming practices that might reduce risk, and will communicate known risks to the affected landowners and community. Preliminary efforts are underway to find interested organizations and individuals to participate in this process.

...Focus on agriculture and environment

Fertilizer Safety

Ecology has been working with other agencies, agriculture and fertilizer industries, and citizen groups to understand and respond to concerns raised about heavy metals in fertilizers. There is no current evidence that fertilizers used on farmland in Washington threaten human health. Still, the broad-based workgroup wants to make sure that health is not compromised. Legislation has been introduced that would provide for tighter regulation of fertilizers, better standards for fertilizer ingredients, and improved research and analysis to better understand possible health risks. The group continues to focus particularly on the safety of fertilizers made from recycled materials. The tough question being asked is whether fertilizer manufacturing from waste materials (wastes containing heavy metals and other materials usually considered contaminants) is an "appropriate use."

Legislation and agency actions are focused on the following objectives:

1. Meet the farmers' and farmworkers' right to know what's in the fertilizer they're using (via labeling).
2. Encourage the cleanest source of materials used in making fertilizers and have a better screening process for fertilizers that are made from waste materials.
3. Increase sampling and testing of fertilizers to determine the presence and risk of contaminants like heavy metals and dioxins. Compare contaminant levels with reasonable safety standards and only allow marketing of fertilizers that meet those standards.
4. Do more research to understand plant uptake of heavy metals into food crops, and study the extent of dioxins in fertilizer products.

A series of fact sheets and news releases describe this issue in more detail. For more information, please contact Ron Langley at (425) 649-7009.

Position Announcement

Agrichemical and Environmental Specialist

Agrichemical and Environmental Specialist: Asst./Assoc. Prof. (Res.(25%)/Ext.75%); tenure track, 12-mo. Appt.). Starting date July 1, 1998. Location Central Washington (Prosser or Tricities Campus). Develop a recognized extension and research program in crop protection technologies. A PhD is required. Desired areas of expertise include a plant protection discipline or related specialty. An ability to communicate well, both orally and in writing, strong organizational skills, experience working with commodity groups, experience conducting field plot investigations involving agrichemicals, and an ability to effectively use electronic communications and computer applications is desired. Salary competitive and commensurate with training and experience. For add'l info. contact, John D. Stark, Search Committee Chair, Washington State University, Puyallup Research and Extension Center, Puyallup, WA 98371, starkj@wsu.edu, Phone (253) 445-4519, Fax (253) 445-4569. Send a letter expressing your qualifications and interest in the position and program, a CV, academic transcripts, and a list of the names, addresses, and telephone numbers of three references to Dr. John J. Brown, Chair, Department of Entomology, Washington State University, Pullman WA 99164-6382. Appl. accepted through April 1, 1998 or until position is filled.

Responses back from newsletter survey

Dr. Catherine Daniels, Pesticide Information Center

As of press time, we had received 411 readable responses from the December survey we sent to 1,371 subscribers. Unfortunately, a small number of survey responses were unreadable after being mangled at the post office; they arrived in pieces in little plastic bags. Our response rate was nearly 30%, which is good by survey standards.

The overwhelming favorite (71.7%) for most valuable section of the newsletter was Articles. Editorials followed at 46.7%. Then came Announcements at 38.3% and 24(c) registration notices at 35.8%. Winners in the least valuable category were Pesticide container recycling notifications (56.2%), Pesticide applicator training (51.8%), Tolerances (28.9%) and Meeting announcements (29.7%). It was interesting to note that 76.2% of the respondents said they would not wish their least favorite sections to be dropped. Comments pencilled in the margins typically read, "It is probably useful to other readers". We agree. The intent of the newsletter is to serve a broad sector of the agricultural community, in Washington state particularly. That means publishing some public service-type announcements.

An even 80% of respondents read either "most articles" of the newsletter or "cover to cover".

The newsletter is only one of the sources of pesticide regulatory information for 72.9% of you, and overwhelmingly (86.3% - 96.8%) readers said the articles are well balanced, accurate, and relevant to the areas of pesticide regulation important to them. The 1.5% of you who said the information is not generally timely, have been heard. Time warps in newsletter publications are difficult to avoid, but we will at least try to be more consistent with our publication schedule.

A large number (78.1%) of respondents said they were either unaware the publication was on the web or were aware but had never visited the site. We invite you to visit the address at <http://picol.cahe.wsu.edu>. The electronic version contains everything printed in the paper copy plus the Section 18, 24(c), and tolerance information. It is free of charge for anyone with Internet access.

Most respondents (73.9%) preferred a paper copy; 22.6% said they would like an E-mail reminder that a new edition is available on the web. The survey question regarding a subscription charge for paper copy resulted in 64% of respondents choosing either \$10 or \$20 as a "reasonable fee", and 25.3% choosing "no fee". A large majority (73%) indicated that they would keep the subscription

if a reasonable fee were charged.

While we learned a lot from the survey, we are waiting for the actual checks to arrive before deciding how readers really feel about the value of the newsletter. We have a counter installed on the web page to monitor readership by those who have web access to the newsletter.

We had high hopes for the comments section. We asked readers to be frank. They were, apparently feeling comfortable in telling us their opinions on everything from how we ran the newsletter, to how we dressed, to how bad (?) our penmanship was on the questionnaire cover page. Just for the record... the signatures were from Catherine Daniels, Allan Felsot, Carol Weisskopf, and Eric Bechtel. It was not our intent to hide our authorship; that is simply the way we scribble our names.

We are committed to continuing the current standard of quality for articles and editorials, and are expanding our list of invited contributors both in this issue and future issues to include perspectives from representatives of EPA, WSDA, and WDOE. If you haven't sent in your survey, please do so. We still want to hear your opinions.

Use recommendations & supplemental labels

Jane M. Thomas, Pesticide Information Center

Pesticide manufacturers use many tools to distribute product information not contained in a pesticide's Section 3 (main) label. Two such mechanisms are manufacturer's 2(ee) Use Recommendations and Supplemental Labels. While "supplemental label" is often used to refer to Special Local Needs (SLN) registrations, Experimental Use Permits, or Section 18 exemptions, it is used in the context of this article to refer to addenda to Section 3 main labels. In an effort to answer some of the questions surrounding these documents, the following is a short discussion of Use Recommendations and Supplemental Labels: What are they, what can and can't they do, and how are they regulated?

Use Recommendations

The 2(ee) Use Recommendations come from the definitions section (Section 2) of the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA). Subsection (ee) provides a definition for "Use of any Registered Pesticide in a Manner Inconsistent With Its Labeling". Here, FIFRA states that, unless specifically prohibited by the label, the following are not considered uses inconsistent with product labeling: (1) applying a pesticide at a lower dosage, concentration, or frequency, (2) applying a pesticide against any target pest not specified on the label, (3) employing any method of application (except chemigation), and (4) mixing a pesticide with a fertilizer.

Typically, manufacturers issue 2(ee) Use Recommendations in order to inform pesticide users of effective application rates less than those shown on the main label, or to suggest alternate application methods. Use Recommendations are required to be in keeping with what is already permitted by the main product label. They cannot provide direction for an application method or use prohibited by the label. For example, a 2(ee) Use Recommendation cannot recommend aerial application if the main label states that the product is to be applied by ground application methods only.

Another issue, with respect to application methods, concerns chemigation. In order to apply a pesticide via chemigation, the label must specifically allow the use and must provide instructions. Chemigation, according to Joel Kangiser of the Washington State Department of Agriculture (WSDA), is the exception to the exception. A Use Recommendation cannot be used to allow application via chemigation.

As stated above, FIFRA permits uses at lower rates or by alternate application methods; however, pesticide users may be reluctant to use lower application rates or an alternate method of application, not knowing the potential negative impact to their crops. A Use Recommendation constitutes a manufacturer endorsement for the specified use. These recommendations potentially leave manufacturers open to liability issues related to product use at a lower rate. Such issues do not exist when pesticide users choose on their own to use a lower rate.

The WSDA and the Environmental Protection Agency (EPA) neither review nor approve Use Recommendations. Further, regulators do not consider Use Recommendations part of the product labeling; pesticide users are not required to have a copy of the Use Recommendation when making an application per a Use Recommendation.

Supplemental Labels

Supplemental Labels are brief documents that add information to a product's Section 3 label. Typically, these supplements provide usage directions for crops or tank mixes not on the main product label. Manufacturers often issue Supplemental Labels in lieu of revising a product's main label. Unlike Use Recommendations, Supplemental Labels require EPA approval prior to being issued, and they carry the same applicator requirements as Section 3 labels. An applicator must have a copy of the Supplemental Label available when making an application.

Supplemental Labels, like Section 3 labels, are available from the dealer at the time of purchase. Dealers and distributors must make copies of these Supplemental Labels available for anyone purchasing a pesticide. Copies of Supplemental Labels are also available upon request from the WSDA.

Per Jim Downing of EPA headquarters, most of EPA's product managers have a policy requiring registrants to submit a revised label after two or three Supplemental Labels have been issued for a product. It appears, however, that this policy is not uniformly applied. A quick search of the Pesticide Information Center On-Line (PICOL) Label Database provides a notable example: Elf Atochem's insecticide Penncap-M currently has seven (7) Supplemental Labels in effect that provide information not contained in the current copy of the main product label.

Gambling, semantics, and risk assessment:

A review of the newest Environmental Working Group report

Dr. Allan S. Felsot, FEQL

When the Environmental Working Group (EWG) released its newest report (January 29, 1998), "Overexposed: Organophosphate Insecticides in Children's Food", a representative for the Alliance for Food and Fiber responded with a "There they go again." The EWG report, funded by grants from the Pew Charitable Trusts, the W. Alton Jones Foundation, the Joyce Foundation, and the Working Assets Funding Service, is another in a series of EWG "exposes" about the hazards of pesticides in children's food. The report's shocking conclusion that more than 1 million children 5 and younger are exposed in food each day to "unsafe" levels of organophosphate (OP) insecticide residues cannot be easily dismissed with ad hominem attacks. Because the minor crop industry requires access to the use of OP insecticides, the report deserves an objective review to determine how the conclusions were derived and whether alternative perspectives are equally valid.

What EWG Reported and Recommended

EWG concluded the following from government data for children's food consumption patterns and magnitude of pesticide residues in those foods:

- Of 39 registered OP insecticides, 13 were detected in the food supply; these 13 insecticides were found on 407 of the 3,695 foods reportedly eaten by children 5 years old and younger, according to a USDA food consumption survey;
- Each day, more than one million children 5 years old and younger (5% of this age group) eat an unsafe dose of OP insecticides;
- Commercial baby food is the major source of unsafe exposures to infants 6 to 12 months old;
- The foods exposing the most children to unsafe levels include apples, peaches, applesauce, popcorn, grapes, corn chips, and apple juice;

- Just three bites of an apple, peach, or pear and two grapes will expose a child to an unsafe dose of OP insecticide.

As expected, such startling revelations about children's consumption of unsafe levels of OP insecticides were followed by drastic recommendations.

- Ban all home and other structural uses of OP insecticides;
- Ban immediately for all agricultural use the five OP insecticides of highest risk-methyl parathion, dimethoate, chlorpyrifos, pirimiphos methyl, and azinphos-methyl;
- Ban all OP insecticides whose residues end up in commercial baby food;
- EPA must require developmental neurotoxicity studies for all OP insecticides that would remain registered and found in food;
- Lower food tolerances for all OP insecticides to levels that are safe for infants and children.

Following the Mandates of the Food Quality Protection Act (FQPA)

Two mandates from the FQPA enabled EWG to use its analysis to impugn the safety of food. First, the FQPA directs the EPA to consider cumulating exposures to pesticides with common mechanisms of toxicity. All OP insecticides bind to the enzyme acetylcholinesterase, preventing it from degrading excess amounts of the neurotransmitter acetylcholine in the nerve synapse. Certain foods are known to contain more than one type of OP insecticide residue, and a person may consume in one day multiple residues on different foods. Thus, EPA could combine exposures from all OP insecticides when validating the tolerance for any one insecticide.

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The second relevant provision of the FQPA mandates that EPA seek tolerances protective of infants and children. Some OP insecticides (for example, acephate, chlorpyrifos, methidathion, methyl parathion) are more acutely toxic to adult rats than to neonates (newborns about 1-8 days old). Although tolerances are legal standards rather than safety standards, they are developed from pesticide doses thought not to harm humans. Lowering tolerances could be one way to ensure that residues that might be okay for adults would not be provided to infants and children.

No Need to Reinvent the Wheel

EWG's methods and conclusions are not new nor unique. EWG borrowed the method for assessing cumulative exposure risk of OP insecticides from the 1993 National Academy of Science report, "Pesticides in the Diet of Infants and Children." The raw data needed for the analysis are the residues of any one of the 13 OP insecticides in foods, and data for amounts of specific foods consumed by children 5 and younger. EWG obtained residues in foods from either the Food & Drug Administration (FDA) Total Diet Study (TDS), the FDA Surveillance Monitoring Program, or the U. S. Department of Agriculture (USDA) Pesticide Data Program (PDP). Of the three studies, only the TDS includes residues on foods that are prepared as the consumer would eat them (washed, peeled, or cooked). The PDP data reportedly represent fresh fruits and vegetables prepared by washing and/or peeling. The Surveillance Monitoring data represent a variety of foods collected from wholesalers and warehouses; residue values were adjusted to account for losses that would occur if the food was washed and peeled. Altogether, EWG had 50,583 food samples tested for pesticide residues available for analysis.

EWG obtained data concerning kinds and total amounts of food eaten by an individual during one day from the USDA Continuing Survey of Food Intake by Individuals (CFSII). EWG studied more than 4,000 children of different age groups for several days to determine what they eat. The

amount and kinds of foods eaten by one child in one day was called a valid eating-day, and there were 8,302 such data points. About 3,700 types of foods were reported eaten by children. Many of these foods could be grouped together because they represented different forms of the same food. Of the foods recorded, 561 were reported in the pesticide residue databases. Of those foods, 407 had OP insecticide residues.

Gambling with the Numbers

EWG researchers loaded all food consumption and OP residue data into a computer for analysis by a statistical program called Monte Carlo Analysis, aptly named after the famous gambling capital of Europe. The objective was to predict the proportion of a population exposed to a cumulative dose of OP insecticides that exceeded a level connoted by the EPA as safe. Like dealing cards from a deck, the program randomly assigned to the foods eaten on a given day a level of a specific OP pesticide residue found in that food. All the OP residues of one kind that were consumed from all foods were summed, and the resulting number represented a person-day exposure to a specific OP. For example, the data base had a separate entry for the weight of apples, pears, grapes, peaches, etc. that a child eats in one day. Each of these commodities may also have an OP residue associated with it. By multiplying the randomly chosen residue in a commodity with the amount consumed in any one day by one of the children (the valid eating day), the computer generated the total amount of residue consumed for each OP insecticide. The mathematical calculation for one valid eating day was repeated 2,000 times, randomly assigning OP residue values to the amount of each specific food consumed. This method of repeatedly assigning residues to a single person generated a distribution of possible OP residues that a single individual could be exposed to on any one day.

The same process of randomly assigning residue exposures was repeated for a second individual until 8,302 such individuals (i.e., valid eating days) were

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assigned 2,000 possible combinations of residue exposure. All together, the Monte Carlo Analysis used a data set of more than 16 million person-day exposures (2,000 x 8,302) to determine the proportion of the population exposed to specific OP residues.

Not All OP Insecticides Are Created Equal

The toxicity of each of the 13 OP insecticides differed from one another, so cumulating the combined exposure was not as simple as adding together the person-day exposures to each OP residue. In other words, 5 micrograms of malathion per gram of apples (æg/g) is not equivalent to 5 æg/g of chlorpyrifos because malathion is less toxic. The residues of malathion had to be made equivalent (normalized) to the residues of chlorpyrifos.

The accepted method for normalizing the residues of different chemicals is to choose a reference compound and compare the doses that cause no toxic effects. The National Academy of Science chose the dose known as the No Observable Effect Level (NOEL). This dose, expressed as milligrams of pesticide per kilogram of body weight (mg/kg), was observed not to cause any effects, whether physical signs of illness or biochemical interactions with a key enzyme system (e.g., acetylcholinesterase inhibition by OP insecticides). The EWG chose to use the EPA safety benchmark known as the Reference Dose (RfD). The RfD represents the NOEL divided by a safety factor (SF) to account for extrapolation of results from animal tests to humans ($\times 10$ SF) and to account for variability in response in the human population ($\times 10$ SF).

In the table accompanying this article, the RfD for malathion is 0.04 mg/kg and for chlorpyrifos it is 0.0003 mg/kg. To normalize the malathion exposure to the chlorpyrifos exposure, a toxicity equivalence factor (TEF) is calculated as the RfD for chlorpyrifos divided by the RfD for malathion. Thus, the TEF for malathion is 0.0075. The TEF is multiplied with the exposure value for malathion to express the exposure as chlorpyrifos equivalents.

Then the total OP exposure is derived by adding together all the chlorpyrifos equivalents.

What Is Safe?

Because all calculated exposure data were based on chlorpyrifos toxicity equivalents, the RfD of chlorpyrifos was chosen as the safety guideline. Thus, whenever a person-day exposure exceeded 0.0003 mg/kg/day, EWG called this exposure unsafe. EWG concluded that more than one million children were exposed to levels above the chlorpyrifos RfD, and about 100,000 children were exposed to levels about 10 times greater than the chlorpyrifos RfD.

Playing With Semantics

EWG's conclusions are entirely based on the belief that the RfD represents some measure of absolute safety. Risk assessment, however, cannot determine safety but only the probability that adverse effects would occur at some exposure level. The RfD has been defined as the level of exposure to a specific pesticide that a person could receive every day over a 70-year period without experiencing appreciable risk of toxicity. Thus, if daily exposures to a pesticide residue are below the RfD, then the likelihood of an adverse health effect are considered nil. But exposures above the RfD are not unsafe, because large safety factors are applied to the NOEL to account for the use of animal data and differences in sensitivities among humans.

Often, the NOEL is determined from an actually measured dose that produced no adverse effect rather than a number mathematically extrapolated from a dose-response curve. Usually, large differences between dosing levels preclude a more exact determination of the NOEL. Thus, the NOEL used to calculate the RfD is actually a lower number than the real NOEL. This discrepancy adds a hidden safety factor to the usual 100X applied to the NOEL.

As discussed previously, a 10X safety factor accounts for extrapolation of the NOEL based on rat testing to humans, always assuming that humans

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are more sensitive. But human data are sometimes available, and the RfDs for chlorpyrifos, diazinon, and pirimiphos-methyl were based on the NOEL for cholinesterase enzyme depression in human volunteers. Thus, by accepted toxicological practice, no safety factor would be needed to account for animal to human extrapolations. However, a 10X safety factor to account for variable susceptibilities in the population, for example children versus adults, would still be needed. Thus, EPA made the RfD for the three OP insecticides tested on humans extraordinarily conservative.

Disharmonization?

One of the provisions of the FQPA directed EPA to seek a harmonization of U.S. pesticide residue tolerances with standards in the rest of the world. Outside of the United States, tolerances are called Maximum Residue Limits (MRLs) and are based on the World Health Organization's Acceptable Daily Intake (ADI). The ADI and RfD are similar in meaning, but the values of each safety criterion are very different (see table). When data were available from human studies, the WHO used a safety factor of only 10X. For OP insecticides, the WHO made its decisions about the ADI largely based on human

Comparison of RfD and ADI for OP Pesticides Assessed by EWG

Pesticide	EPA RfD	Test Animal*	WHO ADI	Test Animal*
acephate	0.00120	rat	0.03000	human
azinphos methyl	0.00150	dog	0.00500	rat*
chlorpyrifos	0.00030	human	0.01000	human
diazinon	0.00070	human	0.00200	human
dichlorvos	0.00017	dog	0.00400	human
dimethoate	0.00050	rat	0.01000	human
ethion	0.00050	human	0.00200	rat*
malathion	0.04000	rat	0.02000	human
methamidophos	0.00100	rat	0.00400	human
methidathion	0.00150	dog	0.00100	dog*
methyl parathion	0.00002	rat	0.02000	human
phosmet	0.00300	rat	0.02000	rat
pirimiphos methyl	0.00008	human	0.03000	human

*Unless otherwise noted, the RfD and ADI were based on the NOEL for cholinesterase enzyme inhibition. The ADI for chlorpyrifos, ethion, and methidathion were based on toxicological endpoints considered more sensitive than cholinesterase inhibition.

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data, whereas the EPA RfD relied mostly on animal tests. Because tolerances and MRLs are legal limits derived from consideration of the RfD and ADI, respectively, big discrepancies in how the EPA and WHO assess the toxicological data do not bode well for the future of harmonization.

WHO Is Right?

If EWG had chosen to use the higher exposure levels of the ADIs instead of the much lower RfDs, the organization's conclusions would likely have been that nearly all children are exposed to "safe" levels of pesticide residues. One argument propounded by EWG to justify use of the very low RfDs was that OP insecticides, in addition to being more lethal to the young than to adults, could affect neurodevelopment of fetuses and newborns. EWG cited studies showing adverse neurodevelopmental effects from compounds like diazinon and chlorpyrifos when tested on rat neonates (newborn pups) or when pregnant animals were exposed. Closer examination of these studies reveals that the leading hypothesis to explain these effects regards overproduction of the neurotransmitter acetylcholine due to inhibition of the enzyme acetylcholinesterase. Acetylcholine, in addition to being the messenger that chemically transmits the nerve impulse from one neuron to another, also directs the development and growth of neurons during late fetal development and in the newborn. Thus, cholinesterase depression can be a biomarker for possible adverse effects even in the absence of overt signs of toxicity in the pregnant rat or in the newborn.

Several studies have determined the dose of chlorpyrifos that causes no mortality to one-day-old rats (2 mg/kg). This dose, however, does produce measurable biochemical changes in the brain that could lead to adverse developmental affects. Another study of acetylcholinesterase in newborn rats indicated there would be extensive enzyme inhibition at the low levels being tested. Ironically, human acetylcholinesterase seems more sensitive than the enzyme in the rats, because based on human studies, a NOEL of 0.030 mg/kg has been deter-

mined for chlorpyrifos. Thus, any human data such as are available for cholinesterase inhibition would ensure negligible risks to human children better than the rat data. This analysis suggests the WHO ADIs that are largely based on human data are perfectly valid as safety benchmarks and are perhaps even more protective than RfDs based on animal studies.

Fresh Fruits and Vegetables Are Good for Children

The National Academy of Sciences has stated that pesticide use has increased the availability of fresh fruit and vegetables, leading to human health benefits. While exposure of infants and children to pesticide residues warrants concern, the levels in food are not considered to present any significant health risk. The ultimate goal of the FQPA, to ensure the health of our citizens, cannot be achieved without an abundant supply of low cost fresh fruit and vegetables. Meanwhile, the aggregate use of insecticides has declined precipitously in the United States during the last 15 years. After nearly 40 years of OP insecticide use, no credible evidence suggests widespread neurodevelopmental problems in children. Given the weight of the evidence, perhaps the EWG report finding that children are "overexposed" is "over the top."

Thank you!

As mentioned elsewhere in the newsletter, costs of future issues of the AENews will be covered through institution of paid subscriptions. This issue is coming to you free. We are able to do this because of the generous support of **Bryan Alford** of Alford Farms, Inc., and **Bud Mercer** of Mercer Ranches, Inc. The faculty, staff, and students of FEQL would like to take this opportunity to thank these donors, and we are pleased that they have graciously extended their assistance to help cover printing and mailing of this issue.

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Bits and Pieces

→ WSDA employs two separate mechanisms for issuing Special Local Needs (SLN) for the same or very similar products. “Me-Too” SLN registrations are used for products containing the same active ingredient. In this case, the SLN labels are different and may contain slightly different use directions. The EPA registration numbers are also different. WSDA assigns the SLNs each a unique number, and their registration status is independent of one another.

The situation is different when a third party has registered a product and an SLN is desired. Here, the labels being registered - called either dealer labels or sub-registrations - must be exactly the same except for the name and the EPA registrations number. WSDA assigns the SLNs the same number and adds a letter designator. The sub-registrations, assigned letters “B”, “C”, etc. are wholly dependant on the registration status of the main SLN registration (the “A” registration). If the “A” registration is cancelled, all the associated dealer registrations are, by definition, also cancelled.

→ Canola is a rape hybrid developed in Canada and grown for seed. Both rape and canola seed are processed to extract oil. Rape seed produces oil high in acid, which is typically used in industrial applications. Canola oil, which is low in acid, is used for cooking. Canola is actually an abbreviation for Canadian Oil - Low Acid.

Question: Is the rape seed grown in the Skagit Valley used for cooking or industrial use?

Answer: Neither. Rape seed grown in the Skagit Valley is grown as a seed crop. The seed is planted in other parts of the United States to produce a leafy vegetable similar to spinach.

