COOPERATIVE EXTENSION
Washington State University

Agrichemical and Environmental News

A monthly report on pesticides and related environmental issues

In This Issue

For comments, please contact Catherine Daniels at the WSU Pesticide Information Center, 2710 University Drive, Richland, WA 99352-1671
Phone: 509-372-7495
Fax: 509-372-7460
E-mail: cdaniels@tricity.wsu.edu

The newsletter is on-line at www2.tricity.wsu.edu/aenews, or via the Pesticide Information Center (PICOL) Web page at http://picol.cahe.wsu.edu

Part 2: What if OPs and Carbamates Were Banned?

WSU's response to Washington State Farm Bureau

In last month's issue (December 1998, Issue No. 152), Dr. Doug Walsh (Agrichemical & Environmental Education Specialist, WSU Food & Environmental Quality Lab) described a letter written in October, 1998, by Steve Appel, President of the Washington State Farm Bureau (WSFB), and sent to James Zuiches, Dean of the College of Agriculture and Home Economics at Washington State University. The letter expressed concerns regarding potential regulatory actions that may stem from implementation of the Food Quality Protection Act of 1996 (FQPA) and the potential fallout for agricultural producers in Washington. Specifically, Appel asked if data had been compiled on the economic impact of banning organophosphate (OP) and carbamate insecticides.

Mr. Appel posed these questions:

❶ **What would a ban on organophosphate and carbamate insecticides do to the price of major food items in Washington State and across the country?**

❷ **What would happen to our international markets if Washington farmers were placed at a competitive disadvantage? What impact would this have on the U.S. trade deficit?**

❸ **What are the health risk tradeoffs associated with such a ban? Would the nutritional quality of food items change? Would diet changes induced by higher prices for fruits and vegetables be more or less healthy than the current situation?**

❹ **What are the risks associated with pesticides and pest management strategies that would be adopted in response to the ban?**

❺ **How much would aflatoxin increase?**

❻ **Is it possible that mycotoxins could become a problem under this scenario?**

❼ **What are the health risk tradeoffs for infants and children? Recently the press reported on a study indicating the average child is getting a large portion of his daily vitamin intake from breakfast cereal instead of from fresh fruits and vegetables. Would the ban cause an even greater impact on the diets of children?**

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Washington State University faculty

As Dr. Walsh explained, this letter prompted Dean Zuiches to appoint Associate Dean Jim Carlson to formulate a response to these questions. Dr. Carlson assembled a group of WSU faculty with expertise in the broad disciplines under which these questions fall.

While Mr. Appel's questions were quite specific, and data are not available to answer each of them in depth, WSU agreed that the points raised are extremely important and deserve attention. (Specialists in specific crop disciplines within the WSU entomology department have been asked to assess the effects of a complete ban. *AENews* will publish the results of this effort in an upcoming issue.) Dr. Walsh's response to Question 4 can be seen in our December issue (*What if OPs and Carbamates Were Banned?)*, or on-line at www2.tricity.wsu.edu/aenews. A summary of the answers to the other six questions follows.

What would a ban on organophosphate and carbamate insecticides do to the price of major food items in Washington State and across the country?
Dr. Carlson pointed out that WSU has not studied the effect of a ban on food prices, and this type of study would require a commodity-by-commodity analysis. To our knowledge, this information is not currently available.

In general terms, Dr. Walsh noted several possible reactions to such a ban, any of which could affect prices: insufficient controls could result in crop loss, driving up the price for the remaining, salable crop; substitute controls such as biopesticides or biologicals could be more expensive and less effective; alternative chemical controls could create extremely costly long-term consequences by disrupting the ecosystem; and financial and insurance institutions could raise the price of or deny their services due to increasing instability in bringing a salable crop to market.

What would happen to our international markets if Washington farmers were placed at a competitive disadvantage? What impact would this have on the U.S. trade deficit?
Dr. Desmond O'Rourke, Director of WSU's IMPACT (International Marketing Program for Agricultural Commodities & Trade) Center, indicated that no studies directly evaluating this competitive disadvantage are available. Any thorough answer to a question of this scope would require research at the national level. Not only would produce exportation be affected, countries from which we import could retaliate if the United States monitors and controls imports with the same standards.

What are the health risk trade-offs associated with such a ban? Would the nutritional quality of food items change? Would diet changes induced by higher prices for fruits and vegetables be more or less healthy than the current situation?
Dr. Vicki McCracken, an agricultural economist at WSU (now interim Associate Dean for Academic Programs), explained that, while studies have been done regarding small changes in supply and demand factors affecting food prices and consumption, a ban on major classes of pesticides presented a different challenge. She mentioned a study commissioned by the American Farm Bureau to analyze this situation on a national level, the results of which are not yet available. Based on past research, she was willing to speculate on some general impacts:

"Consumption of a food item (e.g., a fruit or vegetable) typically decreases as its price increases. Hence if the price of fruits and vegetables increases as a result of increased costs of production due to a pesticide ban…consumption of fruits and vegetables will decrease. It is not clear what consumers will purchase instead of the more costly fruits and vegetables; hence, it is not certain whether the diet change would be more or less healthy than the current situation."

The impact would likely be greater, she explained, on low-income consumers.

"A recent report from USDA (Lutz and Blaylock, 1995) emphasizes that income is a key factor affecting not only the amount Americans spend for food but also the types of food they buy. Low-income households consumed 21% less fresh fruits and 13% less fresh vegetables (other than potatoes) than the national average. In terms of expenditures, these low-income households spent 25% less on fruits and 30% less on fresh vegetables than the national average. They also bought lower cost produce items, paying less per pound for their purchases. They used about 11% more canned fruits and vegetables and 25% less frozen fruits and vegetables.

"This USDA study details the potential dietary implications of food spending of lower income households. The Federation of American Societies of Experimental Biology has identified low-income households as a group having a higher risk of developing nutrition-related health disorders."

Dr. McCracken also referred to a Washington State study (McCracken et al., 1995) regarding low-income consumers

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…OP & Carbamate Ban, cont.

Washington State University faculty

and food stamps, the results of which indicated, using statistical methods, that an increase in the price of fruits and vegetables generally decreased the nutrient availability for members of the low-income households studied.

How much would aflatoxin increase? Is it possible that mycotoxins could become a problem under this scenario?
Dr. Allan Felsot, Environmental Toxicologist at the WSU Food and Environmental Quality Lab, offered the following comments on these two questions:

"Regarding mycotoxin (including aflatoxin among others) risks, a quick search of the Internet turned up numerous sites dealing with the health hazards but little regarding incidence of mycotoxin producing fungi on commodities other than grains. Many of the sites point to factors like temperature and moisture as important to control. The USDA has several laboratories working on control of mycotoxins, as well as the basic biology of mycotoxin production, but I have found little regarding possible increases in incidence due to failure to control pests in the field or in storage."

What are the health risk trade-offs for infants and children? Recently the press reported on a study indicating the average child is getting a large portion of his daily vitamin intake from breakfast cereal instead of from fresh fruits and vegetables. Would the ban cause an even greater impact on the diets of children?
This ties in with Dr. McCracken's answer to Question 3, above. If, indeed, prices increased, it would follow that children of low-income families would receive greater impact. Dr. McCracken also points out that, in addition to containing the nutrients such as folate, Vitamin A, and Vitamin C, fresh fruit and vegetables are excellent sources of fiber and antioxidants, and provide nutrients at low energy consumption. These aspects of fresh fruit and vegetable consumption would have to be taken into consideration, suggests Dr. McCracken, when comparing the overall nutritional impact of eating a vitamin-source alternative (such as breakfast cereal).

Dr. Felsot offered the following observations:
"The trade-off for infants and children…is unknown. First, one has to consider whether growers will even be able to pass on increased costs imposed by new label restrictions. If children were truly eating less fresh fruit, then intuitively the loss of supply would not be as great as if fresh fruit were an important dietary source. However, it seems that juice products are more consumed than fresh fruit. Thus, the question becomes one about the supply line to the processing plant. In the event that supplies drop, the processor would then have the opportunity to raise prices, affecting affordability. If juices are also a source of biochemical antioxidants like fresh fruit, then children's health could ultimately be affected, especially with regard to cancer prevention. The answer to this question depends on the quality of the food acceptable to processors vs. the fresh market.

Finally, WSU poses a question of its own: What if it's all a moot point?
A great deal of evidence seems to suggest that the wholesale banning of organophosphate and carbamate insecticides is unlikely. Dr. Felsot, in reviewing preliminary Environmental Protection Agency (EPA) findings, points out that "important apple pesticides like azinphos-methyl and dimethoate…showed no problem with enhanced susceptibility to infants."

Those attending the conference "Explaining the Science Behind FQPA" on October 29 in Yakima, Washington (see related article, p. 10), heard Steve Johnson, Deputy Director of the EPA's Office of Pesticide Programs, say that EPA is not planning any OP or carbamate cancellations at this time. Use restrictions are far more likely.

WSFB posed a set of serious questions that demanded and received serious consideration. The impact of FQPA on pest control affects everyone connected with agriculture. A ban on OPs and carbamates would have effects more far-reaching than current research can explain. A far more likely outcome of the OP/carbamate brouhaha is a set of label changes that restrict use (e.g., lengthen harvest intervals, reduce number of applications per season, restrict application methodologies) of these agents. As such restrictions evolve, readers can count on seeing them discussed in the pages of this newsletter.

For questions regarding this article, contact WSU Pesticide Coordinator Dr. Catherine Daniels at (509) 372-7495 or ***cdaniels@tricity.wsu.edu****.*

References

Lutz, S. M. and J. R. Blaylock. 1995. Limited financial resources constrain food choices. Food Review 18(1):13-17.

McCracken, V. A. et al. 1995. The effects of a food stamp program cashout on household food allocation and nutrient consumption: The case of Washington State. Submitted to USDA.

Pesticide Training Courses Scheduled

Pesticide pre-licensing and recertification courses will be conducted on the following dates. The registration fee for either type of course is $30 early (postmarked 14 days prior to the program), otherwise $45 per day. For information contact: Cooperative Extension Conferences: (509) 335-2830 or pest@cahe.wsu.edu. Information is also available on-line at http://pep.wsu.edu. WSU Recertification Courses offer 6 credits per day.

1999 Recertification Programs

Eastern Washington		Western Washington	
Spokane	January 13 & 14	Vancouver & PCO Workshop	January 6 & 7
Yakima	January 21 & 22	Tacoma	January 13 & 14
Pasco	January 26 & 27	Edmonds	January 21 & 22
Moses Lake	January 28 & 29	Port Orchard	January 28 & 29
Pullman	February 3 & 4	Olympia	February 1 & 2
Wenatchee	February 17 & 18	Highline	February 4 & 5
Spokane (Agriculture)	February 19	Mt. Vernon	February 10 & 11
		Tacoma	February 24 & 25
		Seattle	March 4 & 5
		Bellingham Insect Workshop	March 12

Washington State University annually conducts pre-license training for pesticide applicators, consultants, and dealers. Washington State Department of Agriculture offers all exam categories at the end of the training. Anyone preparing for pesticide licensing exams will benefit from the training programs offered; however, this training will be most useful to those preparing for the following license exams: Weed Control (Agric., Turf & Ornamental, Rights-of-way); Private Applicator Exam; Insect and Disease Control (Agric., Turf & Ornamental); Dealer Manager Exam; Aquatic (January 26 in Pasco only); and Laws & Safety.

1999 Pre-License Programs

Eastern Washington		Western Washington	
Spokane	January 12, 13, 14	Vancouver	January 5, 6, 7
Yakima	January 20, 21, 22	Tacoma	January 12, 13, 14
Pasco	January 25, 26, 27	Mt. Vernon	February 9, 10, 11
Pullman	February 2, 3, 4	Tacoma	February 23, 24, 25
Wenatchee	February 16, 17, 18	Puyallup	March 23, 24, 25

New Dealer/Manager Training Programs Recognized in 1998 by Governor Gary Locke

1999 Dealer/Manager Programs

Richland	February 22	Wenatchee	February 24
Yakima	February 23	Spokane	February 25

1999 Specialty Workshops

PCO Workshop Vancouver	January 7	Landscape Insect Workshop Bellingham	March 12

Washington State IR-4 Residue Trials Planned for 1999

Dr. Doug Walsh, Washington State IR-4 Liaison

The Interregional Research Project No. 4 (IR-4) program is a cooperative endeavor that conducts research to obtain pesticide registrations for use on minor crops. Field projects for 1999 were prioritized this past September at the IR-4 Food and Ornamental Use Workshop in Orlando, Florida. All IR-4 projects are conducted employing Good Laboratory Practices (GLP).

Three laboratories were approved to conduct IR-4 field trials in Washington State in 1999. Most of the trials will be conducted at the U. S. Department of Agriculture's Agricultural Research Science (USDA-ARS) lab at WSU-Prosser, the WSU Food & Environmental Quality Laboratory (FEQL), or the USDA-ARS Yakima Research Laboratory in Wapato. Specific trials may be conducted at private grower-cooperator locations.

Lyle Birch, a USDA-ARS Weed Scientist at WSU-Prosser, and his technical staff will be responsible for the majority of the herbicide studies conducted.

Ron Wight and I, also at WSU-Prosser, are affiliated with the Food & Environmental Quality Laboratory (FEQL) at WSU-Tri-Cities. We will be responsible for conducting insecticide, fungicide, and herbicide trials. We will also be working cooperatively with Ann George from the Washington Hop Commission on several projects.

Thomas Treat is a USDA-ARS Entomologist at the Yakima Research Laboratory in Wapato. He and his technical staff will be responsible for conducting insecticide/acaricide studies on both food and ornamental crops.

The table at right shows the tentative list of approved Washington projects for 1999.

For further information regarding the IR-4 program or if you have specific crop/ pest control concerns, contact Dr. Doug Walsh, Washington State's IR-4 Liaison, at ***dwalsh@tricity.wsu.edu*** *or (509) 786-9287.*

CROP	CHEMICAL	ACTIVITY	RESEARCHER
Asparagus	Azoxystrobin	Fungicide	Walsh/Wight
Asparagus	Sulfentrazone	Herbicide	Birch
Azalea	Clofentezine	Acaricide	Treat
Azalea	Carbaryl	Insecticide	Treat
Azalea	Deltamethrin	Insecticide	Treat
Barley	Azoxystrobin	Fungicide	Walsh/Wight
Basil	Imidacloprid	Insecticide	Treat
Basil	Spinosad	Insecticide	Treat
Bean (Dry)	Abamectin	Acaricide/Insecticide	Treat
Bean (Dry)	Halosulfuron	Herbicide	Birch
Bean (Dry)	Sulfentrazone	Herbicide	Birch
Bean (Lima)	Abamectin	Acaricide/Insecticide	Treat
Bean (Lima)	Sulfentrazone	Herbicide	Birch
Beet (Garden)	Clopyralid	Herbicide	Birch
Broccoli	Carfentrazone	Herbicide	Birch
Carrot	Ethofumesate	Herbicide	Walsh/Wight
Carrot	Trifloxystrobin	Fungicide	Walsh/Wight
Carrot	Ethofumesate	Herbicide	Birch
Cherry	Fenhexamid	Fungicide	Walsh/Wight
Cherry	Imidacloprid	Insecticide	Walsh/Wight
Chives	Imidacloprid	Insecticide	Treat
Chives	Abamectin	Acaricide/Insecticide	Treat
Chives	Spinosad	Insecticide	Treat
Chrysanthemum	Carbaryl	Insecticide	Treat
Chrysanthemum	Deltamethrin	Insecticide	Treat
Clover seed	Pyridate	Herbicide	Walsh/Wight
Clover seed	Pyridate	Herbicide	Birch
Corn (Sweet)	Glufosinate	Herbicide	Birch
Dahlia	Clofentezine	Acaricide	Treat
Geranium	Chlorpyrifos	Insecticide	Treat
Geranium	Deltamethrin	Insecticide	Treat
Grape	Propiconazole	Fungicide	Walsh/Wight
Grape	Quinoxyfen	Fungicide	Walsh/Wight
Grape	Spinosad	Insecticide	Walsh/Wight
Grasses (Pasture)	Pronamide	Herbicide	Birch
Hops	Quinoxyfen	Fungicide	Walsh/Wight
Hops	Oxyfluorfen	Herbicide	Walsh/Wight
Juniper	Carbaryl	Insecticide	Treat
Mint	Spinosad	Insecticide	Walsh/Wight
Mint	Glufosinate	Herbicide	Birch
Onion (dry)	Tebuconazole	Fungicide	Walsh/Wight
Onion (dry)	Spinosad	Insecticide	Treat
Onion (dry)	Cyromazine	Insecticide	Treat
Pea (Dry)	Spinosad	Insecticide	Treat
Pear	Sodium Tetrathiocarbonate	Soil Fumigant	Walsh/Wight
Potato	Ethalfluralin	Herbicide	Birch
Rhododendron	Chlorpyrifos	Insecticide	Treat
Rhubarb	Dichlobenil	Herbicide	Walsh/Wight
Spinach	Phenmedipham	Herbicide	Birch
Swiss Chard	Cycloate	Herbicide	Birch
Transvaal Daisy	Diazinon	Insecticide	Treat
Transvaal Daisy	Clofentezine	Acaricide	Treat

Pesticides, Children, and the FQPA:

Where Are We After Fifty Years of Exposure?

Dr. Allan S. Felsot, Environmental Toxicologist, WSU

Politicians and policy makers proudly declare the United States' food supply the safest in the world. But just when you thought we had a safe food supply, and nearly fifty years after passage of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA, 1947), Congress decided to pass the Food Quality Protection Act (FQPA) in 1996. The ritual of passing laws to make a safe food supply even safer was made irresistible when protection of infants and children became the FQPA policy centerpiece. After nearly fifty years of ignoring kids, who would dare vote against protecting infants and children? Thus, the FQPA passed with nary a dissenter.

The FQPA radically altered the focus of risk assessment, especially with regard to children. The desire to protect kids doesn't mean they have been harmed in the past, nor that they are at greater risk now. But the question of whether children are being harmed by pesticide residues bears critical examination.

FQPA Inspirations and Misconceptions

The FQPA turned out to be a faithful implementation of the National Academy of Science's (NAS) recommendations in its 1993 report, *Pesticides in the Diets of Infants and Children*. Although the popular press may have misconstrued the NAS report as concluding that pesticide residues were unsafe to kids, the report authors professed otherwise. In the first paragraph, the NAS declared that the application of pesticides "has improved crop yields and has increased the quantity of fresh fruits and vegetables in the diet, thereby contributing to improvements in public health."

The NAS report explicitly stated its purpose was to examine the adequacy of pesticide risk assessment policies and methods with respect to safeguarding children, not to assess the overall safety of the food supply. Nevertheless subsequent interpretations of the report and the resulting FQPA seem to proceed as if infants and children were actually more sensitive than adults to pesticides. Perhaps this notion has been fostered by the second paragraph of the report: "And depending on dose, some pesticides can cause a range of adverse effects on human health, including cancer, acute and chronic injury to the nervous system, lung damage, reproductive dysfunction, and possibly dysfunction of the endocrine and immune systems."

To declare in one place that pesticides have contributed to improvements in public health and in another that they can cause adverse effects on humans may at first glance seem contradictory. The key to understanding this conundrum is the phrase "depending on dose." The NAS recognized that the old toxicological paradigm of "dose makes the poison" was as applicable to infants and children as to adults.

We might conclude, then, that safeguarding infants and children is simply a matter of assessing their exposure and ensuring that it is well below levels considered safe. But this is where the current conflict resides. What is safe for children and what is their real exposure?

The FQPA laid the guidelines for deciding safety and exposure issues, but interpreting the data and applying the appropriate risk assessment methods is still up to the Environmental Protection Agency (EPA). The FQPA, for example, states that EPA will "ensure that there is a reasonable certainty that no harm will result to infants and children from aggregate exposure" to pesticide residues. The definition of "reasonable certainty" is left to the regulatory agency, where the question quickly turns to risk management rather than to risk assessment. The latter is where the science occurs while the former is based primarily on politics and economics.

Children Are Not Little Adults

Sound scientific principles do support special consideration of infants and children. Pediatricians have long known that the physiologies of infants, children, and adults differ, and that these differences could influence the therapeutic doses of medicines as well as the doses that are hazardous. Differences in surface-area-to-body-mass and brain-size-to-body mass, brain development and ventilation (breathing) rate, and kidney function are among factors that may influence susceptibility to toxins.

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Pesticides & Kids, cont.

Dr. Allan S. Felsot, Environmental Toxicologist, WSU

But different susceptibility does not necessarily mean greater risk. Some chemicals may cause greater toxicity in children than in adults, but the reverse could also be true. Any actual effect will depend on the biochemical mechanism of toxicity, and thus on the specific chemical.

Are Children More Sensitive to Pesticide Residues Than Adults?

Organophosphate insecticides (OPs) are currently the subject of much scrutiny under the FQPA. Acute (single high dose) exposure studies have generally shown that immature rats are more susceptible than adult rats, but the direction of toxicity is not universal and depends on the specific OP. Furthermore, studies with lethal doses are not predictive of exposure to the extremely minuscule residues found in food.

A more complex concern than lethality is possible adverse effects of OPs on development, especially of the brain, and reproduction. The FQPA specifically states that the EPA shall assess risk of pesticide residues based on "available information concerning the special susceptibility of infants and children… including neurological differences between infants and children and adults, and effects of in utero [during pregnancy] exposure to pesticide chemicals."

To address this mandate, EPA has been concentrating on reassessing the risks of OPs by examining old and new toxicological studies. Doses used in these studies must be sufficiently low so that the newborn test animals live. Indeed, the objective of these studies is to find a dose that causes no observed effect (the NOEL), whether it be weight loss, organ disease, or simple biochemical changes.

Once the NOEL is established, a Reference Dose (RfD) is estimated by dividing the NOEL by a safety factor of 100. With respect to children, the FQPA mandates an extra tenfold safety factor over and above the routine 100-fold. If data were available to indicate that infants and children were not at greater risk than adults, than this extra tenfold safety factor could be lowered or waived, effectively raising the RfD or tolerable level of exposure. Several months ago, the EPA released its preliminary decisions regarding the application of this extra factor, also known as the FQPA 10X factor. Their decisions, although still preliminary, serve as guides to answer the question of whether children are more sensitive to pesticides.

Based on the weight of the evidence from neurotoxicological, developmental, and reproductive tests examining immature rats, EPA decided that for at least eighteen OPs, an extra 10X factor was unnecessary to ensure safety because the sensitivity of the young and the adults was similar. An extra 3X safety factor would be needed for another ten OPs because although enhanced sensitivity was not found, testing was not complete. For twelve OPs, an extra 10X factor was still going to be required because data were too incomplete to make an assessment or data from the scientific literature suggested enhanced sensitivity. Chlorpyrifos and methyl parathion fell into this latter category.

The conclusions that immature animals are more sensitive than adults to chlorpyrifos and methyl parathion rest largely on the ability of these compounds to inhibit the enzyme cholinesterase in the blood. Inhibition of blood cholinesterase is the most sensitive toxicological endpoint used in the neurotoxicity studies of OPs, and often it is used to determine the NOEL. Although the function of this enzyme in the blood is not well understood, it is important for normal transmission of nerve impulses in the brain. Several published studies have shown that the levels of chlorpyrifos required to significantly inhibit blood cholinesterase increase with age. However, no observable nervous system effects have been associated with the lowest levels of chlorpyrifos.

Although young rats seem more susceptible to some OP insecticides than adults, the mechanism of toxicity, i.e., inhibition of cholinesterase, is identical. Indeed, the NAS concluded that even if immature animals, including humans, were more sensitive to lower doses of drugs and toxicants, the toxic mechanisms were usually the same. Thus, assessing children's risk from pesticide residues requires a

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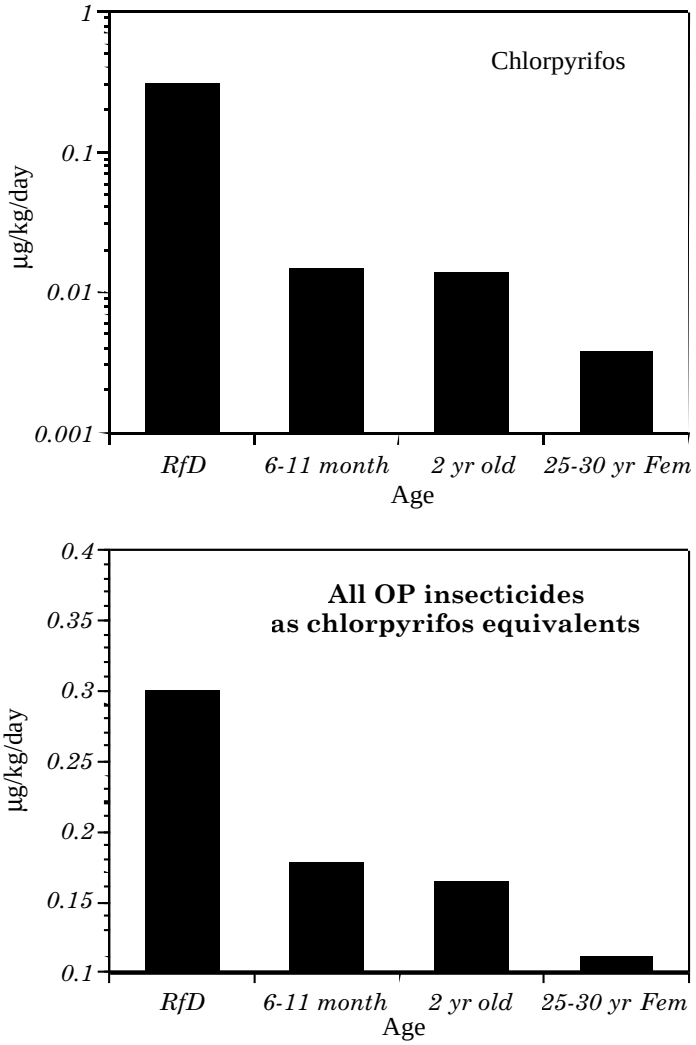
determination of the exposure relative to the levels determined to cause no harm.

Are Children More Exposed to Pesticide Residues in Food Than Adults?

The FQPA addresses exposure by mandating that EPA assess risk based on "available information about consumption patterns among infants and children that are likely to result in disproportionately high consumption of foods ... in comparison to the general population." In other words, Congress recognized that food consumption patterns change as one ages and could therefore contribute to different degrees of exposure.

But amount of food consumed is only part of exposure. The magnitude of the residue is just as important. Congress directed EPA when considering tolerances to "consider available data and information on the anticipated residue levels of the pesticide chemical ... and the actual residue levels of the pesticide chemical that have been measured in food." The anticipated residue has been interpreted to be the residues remaining after the registrant-sponsored field trials. Because the field trials tend to use minimal pre-harvest intervals and maximum rates of application, residues are generally higher than those found by government monitoring studies. Congress also directed EPA to consider the percentage of food actually treated, but only when assessing chronic (daily) dietary risk.

To assess whether or not children are more exposed to pesticide residues than adults, one needs to know the daily dietary intake. The Food & Drug Administration over the last decade has been collecting samples of food from grocery stores around the United States, preparing them as we would in our homes, and then analyzing them. The residue levels from these total diet studies are combined with the amounts and kinds of food eaten by different age groups and expressed as the micrograms (µg) of pesticide consumed per kilogram (kg) of body weight per day. I've used the data to compare children's dietary exposure with that for adults. The first graph compares average daily chlorpyrifos intake of infants six to eleven months and children two years old to females twenty-five to thirty years old.



Average daily dietary intake of chlorpyrifos (top graph) and all OP insecticides (expressed as chlorpyrifos equivalents, bottom graph). Note that infants and children consume more pesticide residues than an adult female, but the exposure levels are well below the levels considered safe (the RfD). Analysis was based on data given in Gunderson 1995 (Journal of the Association of Analytical Chemists International, vol. 78, p. 1353).

In the second graph, I've combined dietary intakes for all OP insecticides found by the FDA, after first adjusting for the different toxicities using a toxicity equivalence factor (TEF) as recommended by the NAS. (This method for cumulating exposure to compounds

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Pesticides & Kids, cont.

Dr. Allan S. Felsot, Environmental Toxicologist, WSU

with the same mechanisms of toxicities has not been validated, but remains the recommended way to account for exposure to multiple compounds.)

The results of my analysis for chlorpyrifos alone and for cumulated OP exposure show that indeed infants have a higher daily intake of pesticide residues than adult females. But to say that daily intake is higher for one age category compared to another still doesn't tell us about the risk of adverse effects.

Are Children More At Risk of Harm from Pesticide Residue Exposures?

To determine whether kids' exposure to OP insecticides actually puts them at risk, we must compare their total dietary consumption to levels that EPA defines as safe—the RfD. In the case of chlorpyrifos, the RfD is actually based on human exposure studies but does incorporate the extra FQPA 10X factor. The graph shows that infants' and children's average daily chlorpyrifos exposure is at least ten times lower than the RfD. For cumulated exposure to all OPs, exposure was two to three times lower than the RfD. Thus, while daily exposure of kids to pesticide residues may be slightly higher than to adults, it is significantly below the EPA's safe level.

An Acute Storm Is Brewing

The data concerning safety of daily exposures to OP residues may look convincing, and in preliminary risk assessments for sixteen OPs EPA has said there is no concern over chronic exposure. On the other hand, acute exposure, i.e., exposure to a single dose of OP, is of great concern. It may seem paradoxical that daily exposures over a lifetime could be safe but not exposure in a single serving.

The FQPA gave EPA no directions for assessing single exposures as it did for chronic exposures. EPA has been taking a very conservative approach to assessing acute dietary risk by assuming that all residues are at the tolerance level and that 100% of all acres for registered uses are treated. Furthermore, EPA wants to look at the 99.9th percentile of acute exposure by considering the maximum amount of food that could be consumed. Note that the calculated estimates of exposure using even these extremely conservative methods, while higher than the RfDs, do not exceed the NOELs.

EPA has invited registrants to submit dietary analyses using real residue levels, but thus far the agency does not seem inclined to conduct the analyses themselves.

Have We Learned Anything After Fifty Years?

We should be concerned about exposure of children to pesticides. The physiologies of infants, children, and adults are different. But the variations in physiology do not obviate the fundamental scientific principle that effects are dependent on dose. Thus, well designed studies to determine levels of no effect combined with exposure assessment allow us to say with confidence that a pesticide is reasonably certain to be safe. And we are getting better at this risk assessment game. So the goals of the FQPA are not in question. We're just haggling over the meaning of the results from the experiments.

The first organophosphate insecticides were commercialized in the early 1950s. I recall standing in front of my house in southern Florida one day in the late 1950s, looking skyward as an airplane sprayed malathion over the city for the control of Mediterranean fruit flies. I recall in third grade how we were told not to pick up any used containers of a pesticide called parathion when gallivanting around the crop fields; it seems there were a number of reports of kids getting sick from that stuff. I admit we have been guinea pigs for nearly fifty years. But given the NAS conclusion that pesticides have contributed to public health, and the fact that our average lifespan has increased by about 20 years over this period along with our ability to invent amazing new technologies, I have a hard time concluding the experiment has been a failure.

Dr. Allan Felsot is an Environmental Toxicologist at WSU. He can be reached at (509) 372-7365 or ***afelsot@tricity.wsu.edu****.*

Third PNW Pesticide Issues Conference:

Explaining the Science Behind FQPA

Dr. Carol Weisskopf, Analytical Chemist, WSU

The desire to discuss the science behind the Food Quality Protection Act brought 145 attendees and 10 speakers to this year's Pesticide Issues Conference in Yakima, Washington, on October 29, 1998. The conference was ably organized by WSU's Pesticide Education Coordinator **Carol Ramsay**, with minor assistance from those of us at the Pesticide Information Center and the Food and Environmental Quality Laboratory.

The day started with keynote speaker **Mike Hooper**, a faculty member in the Institute of Environmental & Human Health at Texas Tech University. The subject of his presentation was *Organophosphates and Neuro-Development Effects*, pertinent to the additional tenfold safety factor that may be incorporated into acceptable exposures for some of these pesticides. Hooper described organophosphate insecticide mode of action and the physiological, biochemical, and developmental factors that can account for increased sensitivity in children.

Carl Winter, Director of the FoodSafe Program of the Department of Food Science and Technology at the University of California, Davis, began the discussion on residues and tolerances with *FQPA Basics: Residue, Reference Dose, and ADI*. He described how toxicological thresholds, no observed effect levels (NOELs), extrapolation uncertainties, and other factors enter into the risk assessment process and the determination of the reference dose (RfD, the maximum exposure considered to present no harm; a concept also referred to as ADI, Acceptable Daily Intake). A discussion followed on estimating dietary exposure from available residue data or from tolerances when residue data are lacking.

Focus on the development of dietary exposure estimates from food residue data continued as I took the podium to discuss *Detection Levels vs. Tolerances*. I defined tolerances and analytical detection limits, and explained the manner in which each is used in dietary exposure estimates. Pesticide residues found in food were compared to current tolerances and detection limits.

Presenter **Wally Ewart** of the Northwest Horticultural Council rounded out the tolerance trio by speaking about *Global Harmonization of Tolerances*. Ewart pointed out the substantial trade barrier posed by variable tolerances, and discussed progress toward establishment of uniform tolerances.

The next panel topic took the colloquial "is" rather than the pedantic "are" in its title, *Where is the Data?* Washington State Department of Agriculture (WSDA) Assistant Director **Candace Jacobs** presented *WSDA/FDA's Monitoring Program,* a description of the WSDA and U.S. Food & Drug Administration's food monitoring programs. She gave the proportion of conventionally and organically grown commodities found to contain pesticide residues, as well as the number of tolerance violations found in each category. **David Miller**, of the U.S. Environmental Protection Agency (EPA) Office of Pesticide Programs, described additional monitoring efforts that provide pesticide residue data, particularly the *Pesticide Data Program* of the U.S. Department of Agriculture (USDA). The USDA program selects commodities and pesticides and sets detection limits designed to provide high-quality data for use in EPA's dietary risk assessments.

Allan Felsot of the WSU Food and Environmental Quality Laboratory presented the final data-related topic. *Pesticide Use Statistics* are increasingly important in determining risk. Where percent-of-crop-treated data are unavailable, for example, EPA defaults to "100% use," thereby unrealistically inflating the exposure calculation and resultant risk assessment. Aggregate statistics can also be used (and misused) to indicate and evaluate trends in overall pesticide use. Felsot described available data sources, emphasizing those on the Internet.

Discussions of modeling and risk assessment followed lunch. Although *Probabilistic Risk Assessments and Monte-Carlo Methods: A Brief Introduction* would seem tailor-made for a post-lunch nap, **David Miller** provided a brilliant description of this difficult topic in his second talk of the day. Statistical methods provide a more accurate, and substantially lower, estimate of dietary exposure than the assumption that all crops are treated and contain residues at the tolerance level. **Markus Flury** of the WSU Crop and Soil Sciences Department discussed the use of models for pesticide risk assessments in *Residues in Water: 10% of the Cup?* Model predictions of groundwater pesticide concentrations are no more accurate than our understanding of the real-world mechanisms of pesticide movement. When transport phenomena are misunderstood, model predictions can be inaccurate. This has been proven by comparison to observed concentrations.

Craig Bernard from the University of California, Riverside discussed *Residential Exposures: 10% of the Cup?* It is

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Third Pesticide Issues Conference, cont.

Dr. Carol Weisskopf, Analytical Chemist, WSU

difficult, he pointed out, to design studies that accurately assess exposures from residential pesticide applications. While it is relatively simple to arrive at pesticide distribution and concentrations, the extent of occupant interaction with treated areas varies widely. Bernard described one current research effort and its preliminary data.

Carl Winter reoccupied the podium to discuss *Consumer Safety/Brochure Outreach.* Winter described several iterations of the as-yet hypothetical consumer brochure mandated by the FQPA. The advent of the brochure is anticipated to result in substantial interactions between members of the public and agency or extension personnel. Winter led the conference participants through exercises demonstrating that one's perception of hazard depends on whether a risk is the result of personal choice, the amount of personal control over the circumstances, and the category into which the risk falls. Many consumers perceive pesticide residues in food as a high level of hazard over which they have no control.

The final speaker of the day was **Steve Johnson**, Deputy Director of the EPA Office of Pesticide Programs, with a frank discussion of EPA's activities as FQPA implementation progresses. Although pesticide registrations were suspended during the 1996–97 fiscal year, Section 18 emergency exemptions continued to be granted. Registrations resumed in 1997–98, and the agency is making headway in reducing backlogs. Priorities include minor use registrations and the completion of preliminary risk assessments for organophosphate insecticides. Tolerance and registration review may proceed within a crop-based, rather than pesticide-based, framework. This would minimize the potential for one crop to lose all registrations against a particular pest.

Questions about the conference may be directed to Carol Ramsay, WSU Pesticide Education Program, P.O. Box 646382, Pullman, WA 99164-6382. She may be contacted at ***ramsay@wsu.edu*** *or (509) 335-9222.*

Dear Aggie

Providing answers to the questions you didn't know you wanted to ask

In contrast to the usually more sober contributors to the Agrichemical and Environmental News, Dear Aggie deals lightheartedly with the peculiarities that cross our paths and helps decipher the enigmatic and clarify the obscure. Questions may be e-mailed to Dear Aggie at dearaggy@tricity.wsu.edu. Opinions are Aggie's and do not reflect those of WSU.

Dear Aggie:
While buying groceries at Fred Meyer, I noticed a sign on the carrots that said they had no pesticide residues. These weren't in the organic food section. What's the scoop?

Dear Aggie hopes regular readers understand by now (since frequent *AENews* contributor Carol Weisskopf has been endlessly ranting about this subject) that such a claim is only as good as the detection limits and variety of pesticides included in the analysis. Aggie checked out Fred Meyer, and found that much of their produce has been tested and certified through the NutriClean folks located in Oakland, California. These are not organic, but conventionally grown crops tested for pesticide residues. NutriClean-certified produce bears a sign that states there were 'No Detected Pesticide Residues®' and gives a pesticide detection limit of 0.05 ppm. Fred Meyer also had a display with brochures from NutriClean describing the program. Aggie awards kudos to Fred Meyer for providing information to help the consumer understand the signs, and to NutriClean for providing the detection limit. The brochure itself is an entirely different matter, requiring a discussion that would occupy more space than our stingy new editor deigns to allow me. Aggie is passing the brochure along to one of the other newsletter pundits for slicing and dicing in the next issue.

News You Can Use…

Section 18, Section 24(c) Information Available

Washington State Department of Agriculture (WSDA) Pesticide Management Division has prepared booklets addressing the application process for Section 18 (Emergency Exemption) and Section 24(c) (Special Local Need) registrations. These booklets, which contain contact information, guidance, a list of approved exemptions, and example applications and approval correspondence, can be obtained by contacting:

Reola Loomis
Pesticide Registration Program
Washington State Dept. of Ag.
P.O. Box 42589
Olympia, WA 98504-2589
(360) 902-2030
pestreg@agr.wa.gov

WDOE Offers Online Permit Assistance

Washington State Department of Ecology (WDOE) now offers a quick way to cross-reference, research, and consolidate information on federal, state, and local environmental and land-use laws and procedures.

The Online Permit Assistance System (OPAS) can be reached by typing

http://www.wa.gov/ecology/sea/pac/index.html

on your Internet browser. Upon entering the answers to a series of questions about your proposed project, you are rewarded with a list of the required permits and the names and phone numbers of the agencies you will need to contact.

PNN Update

Jane M. Thomas, Pesticide Notification Network Coordinator, WSU

The PNN is operated by WSU's Pesticide Information Center for the Washington State Commission on Pesticide Registration. The PNN system is designed to distribute pesticide registration and label change information to Washington's pesticide users. The material below is a summary of the information distributed on the PNN in the past month.

Our office operates a web page called PICOL (Pesticide Information Center On-Line). This provides a label database, status on registrations and other related information. PICOL can be accessed on URL **http://picol.cahe.wsu.edu** or call our office, (509) 372-7492, for more information.

State Issues

New Registrations

WSDA has registered American Cyanamid's herbicide Scepter 70 DG. While the product's main label only covers use on soybeans grown in the eastern half of the US, the company has also issued a supplemental label that allows for use of Scepter 70 DG on cottonwood/poplar tree plantations in specific states, including Washington.

WSDA has issued a registration to Abbott Labs for its insecticide Biobit HP. This product is registered for use on the following PNN-related sites: alfalfa, alfalfa

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…PNN Update, cont.

Jane M. Thomas, Pesticide Notification Network Coordinator, WSU

seed crop, apple, asparagus, barley, bean, beet, blackberry, broccoli, Brussels sprout, buckwheat, cabbage, carrot, cauliflower, celery, cherry, Chinese cabbage, collard, corn, cranberry, cucumber, deciduous/shade tree, dill, dry bean, dry bulb onion, dry pea, eggplant, endive, field corn, filbert, flower, forest, garlic, grape, green bean, green onion, green pea, greenhouse endive, greenhouse lettuce, greenhouse nursery, greenhouse watercress, hop, kale, kiwifruits, kohlrabi, leek, lentil, lettuce, melon, millet, mint, mustard, nectarine, oat, onion, ornamental, ornamental tree, parsnip, pea, peach, pear, pepper, plum, potato, prune, rape, rye, safflower, sorghum, soybean, spinach, squash, strawberry, sugarbeet, summer squash, sunflower, sweet corn, tomato, triticale, turf, walnut, watercress, wheat, and winter squash.

WSDA has registered Agrevo's product Remove Herbicide for use. The product is labeled for use on both corn and soybean seed crops.

WSDA has registered two Appropriate Technology LTD products for use. The products are Sincocin and Agrispon. Sincocin is a nematicide labeled for use on all crop land, golf courses, orchard floors, and ornamentals. Agrispon is a biostimulant labeled for use on all crop land, deciduous shade trees, evergreens, ornamental trees, and greenhouses.

WSDA has registered four Agrevo deltamethrin insecticides for use. The products and their labeled usage sites are:

Deltagard GC 5SC: evergreen tree, nursery, ornamental, ornamental tree, shrub, and turf.

Deltagard GC Granular: building adjacent area, flower, ornamental, shrub, and turf.

Deltagard T&O 5SC: deciduous shade tree, evergreen tree, lawn, ornamental, ornamental tree, shrub, and turf.

Deltagard T&O Granular: building adjacent area, flower, indoor landscape plant, lawn, ornamental, shrub, and turf.

WSDA has registered Agrevo's Finale VM Herbicide for use. Finale VM is labeled for use on the following sites: Christmas tree plantation, forest conifer release/site preparation, industrial site, ornamental, recreations area, and right-of-way.

WSDA has registered Agrevo's insecticide Aqua-Reslin for use. This product is labeled for use on mosquito breeding sites.

WSDA has registered Albaugh's D-638 Broadleaf Herbicide for use. The product is labeled for use on the following sites: barley, bluegrass seed crop, conservation reserve program, ditch bank, fallow land, fencerow, field corn, golf course, grass seed crop, noncrop non-agricultural area, pasture, popcorn, railroad right-of-way, rangeland, roadside right-of-way, sorghum, soybean, turf, utility right-of-way, and wheat.

Section 24c Cancellations

On November 13, 1998, WSDA issued a letter canceling two SLN's for the use of Hopkins Zinc Phosphide Bait. The cancellations were requested by the registrant, Haco, Inc because this product is no longer being distributed in Washington, the registrant has been told that the use pattern in bait boxes in timothy and alfalfa is too cumbersome, and use for pocket gopher control has now been added to two of their Section 3 labels. The SLN's had previously been issued for control of meadow voles in alfalfa and timothy hay (WA-910003) and for control of pocket gophers in alfalfa seed (WA-910018).

On November 12, 1998, WSDA issued a letter canceling SLN WA-950017. This SLN had previously been issued to FMC for the use of its insecticide Furadan CR-10 to control canola flea beetles on canola. (It should be noted that wording contained in the SLN itself had prohibited use of this product on canola after 9/30/97.)

On November 13, 1998, WSDA issued a letter canceling SLN WA-900026. This SLN had previously been issued to West Shore Acres for the use of Vinco Formaldehyde Solution to control nematodes in bulbs.

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…PNN Update, cont.

Jane M. Thomas, Pesticide Notification Network Coordinator, WSU

Section 24c Revisions

On October 22, 1998, WSDA issued a revision to SLN WA-980008. This SLN had previously been issued to Uniroyal for the use of its product Harvard 5F for defoliation of non-bearing apple nursery stock. The revision removes the expiration date.

On October 22, 1998, WSDA issued a revision to SLN WA-980018. This SLN had previously been issued to Novartis for the use of its fungicide Tilt to control leaf and glume blotch disease in wheat. The revision removes the expiration date.

On October 22, 1998, WSDA issued a revision to SLN WA-980019. This SLN had previously been issued to Novartis for the use of its insecticide Agrimek 0.15EC to control spider mites on alfalfa seed crops. The revision removes the expiration date, adds a spray drift precaution, and changes the abamectin concentration given on the label to 2%.

On November 12, 1998, WSDA issued a revision to SLN WA-960019. The SLN had previously been issued to American Cyanamid for the use of its herbicide Prowl 3.3 EC to control weeds in first year non-bearing strawberries. The revisions include changing the expiration date from 12/31/98 to 12/31/00.

On November 12, 1998, WSDA issued a revision to SLN WA-920034. This SLN had previously been issued to American Cyanamid for the use of its herbicide Prowl 3.3 EC to control weeds in alfalfa seed crops. The revision changes the expiration date to 12/31/00.

Tolerance Information

Jane M. Thomas, Pesticide Notification Network Coordinator, WSU

Tolerance Information

Chemical (type)	Federal Register	Tolerance (ppm)	Commodity (raw)	Time-Limited		
				Yes/No	New/Extension	Expiration Date
azoxystrobin (fungicide)	11/25/98 page 65078	0.05	sugar beet, root	Yes	New	6/30/00
		0.20	sugar beet, top			
		0.70	sugar beet, molasses			
		1.00	sugar beet, dried pulp			
		0.70	sugar beet, refined sugar			
		1.00	soybean, hay			
		0.20	soybean, forage			
		2.00	soybean, hulls			
		0.10	soybean, seed			
		0.30	soybean, meal			
		2.00	soybean, oil			
		2.00	soybean, silage			
		10.00	aspirated soybean grain fractions			
		0.06	kidney of goats, hogs, and sheep grazed on sugar beets			

Comment: This time-limited tolerance is established in response to EPA granting Section 18's for the use of azoxystrobin on sugar beets for control of cercospora leafspots in Minnesota and on Arkansas soybeans for the control of aerial blight.

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…Tolerance Information, cont.

Jane M. Thomas, Pesticide Notification Network Coordinator, WSU

Tolerance Information

Chemical (type)	Federal Register	Tolerance (ppm)	Commodity (raw)	Time-Limited		
				Yes/No	New/Extension	Expiration Date
tebufenozide (insecticide)	11/25/98 page 65085	5.00	leafy vegetables (Crop Group 4)	Yes	Extension	8/31/00
		5.00	brassica leafy vegetables (Crop Group 5)			

Comment: This time-limited tolerance is extended in response to EPA granting Section 18's for the use of tebufenozide to control beet armyworms in leafy vegetable crops in Texas, California, Arizona, and Tennessee.

Miscellaneous Information

In the November 4, 1998, Federal Register, EPA announced approval with one minor change, of existing stock provisions for vinclozolin that were proposed in the July 30, 1998, Federal Register. These provisions became effective September 4, 1998. (11/4/98 page 59557)

In the November 5, 1998, Federal Register, EPA announced that it was soliciting comments on two draft FQPA-related science policy papers. The papers are: "Guidance for Submission of Probabilistic Exposure Assessments to the Office of Pesticide Programs" and "Office of Pesticide Program's Science Policy on the Use of Cholinesterase Inhibition for Risk Assessments of Organophosphate and Carbamate Pesticides." Both documents are available on the web at http://www.epa.gov/pesticides/whatsnew.htm Comments are due to EPA by January 4, 1998. (11/5/98 page 59780)