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January 30, 2017

OPP Docket
Environmental Protection Agency
Docket Center (EPA/DC), (28221T),
1200 Pennsylvania Ave. NW.,
Washington, DC 20460-0001

Re: Registration Reviews: Human Health and Ecological Risk Assessments Draft for Several Pyrethroid insecticides. Docket Numbers: EPA-HQ-OPP-2010-0384; EPA-HQ-OPP-2010-0684; EPA-HQ-OPP-2009-0842; EPA-HQ-OPP-2011-0539; EPA-HQ-OPP-2009-0637; EPA-HQ-OPP-2009-0301; EPA-HQ-OPP-2007-0804; EPA-HQ-OPP-2010-0422; EPA-HQ-OPP-2010-0479; EPA-HQ-OPP-2011-0692; EPA-HQ-OPP-2010-0480; EPA-HQ-OPP-2015-0752; EPA-HQ-OPP-2011-0039; EPA-HQ-OPP-2011-1009; EPA-HQ-OPP-2011-0885; EPA-HQ-OPP-2010-0915; EPA-HQ-OPP-2012-0501; EPA-HQ-OPP-2011-0907

Dear Sir/Madam,

We are submitting comments for the risk assessments for various pyrethroid insecticides. Currently, the registration review is ongoing for the pyrethroids: d-phenothrin, fenpropathrin, imiprothrin, momfluorothrin, prallethrin, tau-fluvalinate, tefluthrin, tetramethrin, and bifenthrin, cyfluthrins, cypermethrin, cyphenothrin, deltamethrin, esfenvalerate, etofenprox, flumethrin, gamma-cyhalothrin, lambda-cyhalothrin, permethrin, and pyrethrins.

Pyrethroids, as a class of insecticides, are one of the most widely used insecticides in the U.S., used on agricultural, residential, and other non-agricultural sites, as well as wide area mosquito control. Permethrin is used in impregnated clothing. These chemicals, 19 of them, are currently undergoing registration review of their human health and ecological risks by the U.S. Environmental Protection Agency (EPA). According to EPA, nine pyrethroids have a considerable amount of data generated as a result of being a part of the Pyrethroid Working Group (PWG). The data from these nine pyrethroids are used to bridge the gap for the other pyrethroids. The nine are: bifenthrin, cyfluthrins, cyhalothrins, cypermethrins, deltamethrin, esfenvalerate, fenpropathrin, permethrin, and the pyrethrins, and are the active ingredietns that inform the current assessment.[1] Further, for this comment period, EPA has released the human and ecological assessments for eight pyrethroids, and the ecological assessment only for bifenthrin, cyfluthrins, cypermethrin, cyphenothrins, deltamethrin, esfenvalerate, etofenprox, flumethrin,

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[1] USEPA. 2016. Ecological Risk Management Rationale for Pyrethroids in Registration Review. Office of Chemical Safety and Pollution Prevention. Washington DC.

permethrin, and pyrethrins. These comments will focus on the pyrethroids most widely used in agricultural and residential sites, as well as mosquito control that currently have ecological assessments: bifenthrin, cypermethrin, deltamethrin, esfenvalerate, permethrin, and pyrethrins.

Ecological Assessment

Overall, pyrethroid uses result in acute and chronic risks that exceed levels of concern (LOCs) for aquatic organisms, which account for the only update to these 2016 assessments. The agency indicates that previous assessments for other wildlife like birds and mammals have been conducted, and believes that "efforts to mitigate aquatic risks may benefit all taxa." EPA believes risk to mammals and birds are generally low. According to EPA's document, "Ecological Risk Management Rationale for Pyrethroids in Registration Review,"[2] aquatic LOCs were exceeded for numerous use patterns. The agency finds, "The overwhelming pattern through multiple assessments is consistent, clear risk to aquatic organisms."

- **'Down the Drain' Uses:** For these uses which result in indoor residues making way to wastewater treatment plants, acute LOCs are exceeded for freshwater and estuarine/marine invertebrates. Chronic LOCs are also exceeded for invertebrates for some pyrethroids. For bifenthrin, both acute and chronic risks are also exceeded for freshwater fish.
- **Residential, commercial and other non-Ag sites**: These uses, which include turf, ornamental/nursery uses, as well as structural applications exceed LOCs for both acute and chronic risks for freshwater and estuarine/marine invertebrates for certain pyrethroids and specific uses. Some other pyrethroids only exceed LOCs for acute or chronic only. For benthic invertebrates, acute and chronic LOCs are exceeded, except for pyrethrins and deltamethrin (for estuarine/marine invertebrates). Permethrin and bifenthrin pose risks to fish from these uses, while bifenthrin poses risks to fish only from certain non-agricultural uses.
- **Agriculture**: For various crops, certain pyrethroids pose acute and chronic risks for freshwater fish, estuarine/marine fish and invertebrates. For benthic organisms, certain pyrethroids exceed LOCs for various uses.

Endangered Species Act Considerations: EPA has identified several pyrethroid use patterns that pose risks to certain listed and endangered species. Pyrethroids threaten sensitive and listed species, like salmon, and measurable levels of pyrethroid residues have been documented in the Pacific Northwest.[3,4] Bifenthrin, deltamethrin, and permethrin, for instance, have already

[2] Ibid.
[3] Weston, D.P. et al. 2011. Pyrethroid insecticides in urban salmon streams of the Pacific Northwest. *Environ Pollut*. 159(10):3051-6.
[4] NMFS. Endangered Species Act Section 7 Consultation Biological Opinions. NOAA National Marine Fisheries Service.

been given a "*May Affect, and Likely to Adversely Affect*" determination for several species, and found to have "*potential for modification of designated critical habitat*."[5,6]

Pollinators: Pyrethroids are generally highly toxic to honey bees. However, EPA does not currently have the data, as detailed in the 2014 Guidance for Assessing Pesticide Risks to Bees,[7] to evaluate impacts on pollinators. EPA is planning to issue data call-ins to satisfy the updated data requirements, and assess pyrethroid toxicity to pollinators.

Important, is the need to evaluate the impact of mosquito adulticide applications on pollinators. Pyrethroids are frequently associated with bee kills and colony collapse disorder (CCD)-like symptoms.[8] Pennsylvania State University and the U.S. Department of Agriculture (USDA) researchers find that pyrethroids are quantitatively the most prevalent of pollen contaminants with up to ten different pyrethroid compounds per sample.[9] One study reports that after exposure to sublethal levels of permethrin (0.009micrograms/bee), worker bees failed to return to the hive at the end of day, and only 43% of these bees were eventually able to return to the hive because of disorientation due to treatment.[10] Pyrethroids have also been found to significantly reduce bee fecundity, decrease the rate at which bees develop to adulthood, and increase their immature periods.[11] One 2015 study finds that exposure to pyrethroids reduces bee movement and social interaction.[12] This study also found that pyrethroid-treated bees travel 30–71% less than unexposed bees, and those exposed to esfenvalerate and permethrin decrease social interaction time by 43% and 67%. Bifenthrin and deltamethrin have been found to significantly reduce bee fecundity, decrease the rate at which

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[5] USEPA. 2012. Risks of Bifenthrin Use to Federally Threatened Bay Checkerspot Butterfly (Euphydryas editha bayensis), Valley Elderberry Longhorn Beetle (Desmocerus californicus dimorphus), California Tiger Salamander (Ambystoma californiense), Central California Distinct Population Segment, and Delta Smelt (Hypomesus transpacificus), And the Federally Endangered California Clapper Rail (Rallus longirostris obsoletus), California Freshwater Shrimp (Syncaris pacifica), California Tiger Salamander (Ambystoma californiense) Sonoma County Distinct Population Segment and Santa Barbara County Distinct Population Segment, San Francisco Garter Snake (Thamnophis sirtalis tetrataenia), and Tidewater Goby (Eucyclogobius newberryi). Office of Pesticide Programs. Washington DC.

[6] USEPA. 2013. Effects Determinations for Deltamethrin (PC Code 097805) Relative to the Bay Checkerspot Butterfly (BCB), Valley Elderberry Longhorn Beetle (VELB), California Tiger Salamander (CTS) [Santa Barbara County, Sonoma County, and Central California Distinct Population Segments (DPS)], Delta Smelt (DS), California Clapper Rail (CCR), California Freshwater Shrimp (CFWS), San Francisco Garter Snake (SFGS), and Tidewater Goby (TG) and Designated Critical Habitat for the BCB, CTS-CC, CTS-SB, TG, DS and VELB. Office of Pesticide Programs. Washington DC.

[7] USEPA. 2014. Guidance for Assessing Pesticide Risks to Bees. https://www.epa.gov/pollinatorprotection/pollinator-risk-assessment-guidance.

[8] Mineau, P, Harding, KM, Whiteside, M et al. 2008. Using Reports of Bee Mortality in the Field to Calibrate Laboratory-Derived Pesticide Risk Indices. *Environ. Entomol*. 37, 546–554.

[9] Mullin CA, Frazier M, Frazier JL, Ashcraft S, Simonds R, vanEngelsdorp D, et al. 2010. High Levels of Miticides and Agrochemicals in North American Apiaries: Implications for Honey Bee Health. *PLoS ONE* 5(3): e9754.

[10] Mullin CA, Frazier M, Frazier JL, Ashcraft S, Simonds R, vanEngelsdorp D, et al. 2010. High Levels of Miticides and Agrochemicals in North American Apiaries: Implications for Honey Bee Health. *PLoS ONE* 5(3): e9754.

[11] Dai, PL, Wang, Q, Sun, JH, et al. 2010. Effects of sublethal concentrations of bifenthrin and deltamethrin on fecundity, growth, and development of the honeybee *Apis mellifera ligustica. EnvironTox*. 29(3): 644–649.

[12] Ingram EM, Agustin, J, Ellis, MD, Siegfried, BD. 2015. Evaluating sub-lethal effects of orchard-applied pyrethroids using video-tracking software to quantify honey bee behaviors. *Chemosphere,* 135: 272–277.

bees develop to adulthood, and increase their immature periods.[13] Several field and laboratory studies using deltamethrin have consistently documented decreases in foraging activity and activity at the hive entrance after exposure.[14,15,16]

Mosquito Control: The pyrethroids with mosquito uses are permethrin, d-phenothrin, deltamethrin, etofenprox, prallethrin, and pyrethrins, with data acquired and assessed for permethrin, deltametrin and pyrethrins (PWG members). According to EPA's assessment, for mosquito control uses (ground and aerial adulticide applications), LOCs are exceeded for endangered species of freshwater and estuarine/marine fish for permethrin and pyrethrin, while deltamethrin exceed acute LOCs for freshwater fish and listed estuarine/marine fish. Deltamethrin, permethrin and pyrethrin exceed acute and chronic LOCs for freshwater invertebrates. For benthic organisms LOC exceedances are also noted. Permethrin, deltamethrin, and pyrethrins consistently pose acute and chronic risks to aquatic invertebrates for urban and agricultural adulticide uses,[17] with permethrin>delamethrin>pyrethrins. Wide-spread mosquito control poses risk not only to aquatic organisms, but to other populations of beneficial insects.[18]

Target Insecticide Resistance: Pyrethroid resistance is a growing concern when it comes to mosquito control, and several species of mosquitoes have already demonstrated reduced mortality to the application of pyrethroid chemicals.[19] In particular, resistance to permethrin has been occurring in *Aedes aegypti* mosquitoes,[20] as well as resistance to deltamethrin. One study finds that the knock-down effect and mortality for these mosquitoes by deltamethrin and synergized pyrethrins when applied by thermal-fogging is greatly reduced.[21]

Synergisms and Mixtures: Pyrethroids are commonly formulated with the synergist piperonyl butoxide (PBO), and sometimes other synergists. EPA states that it is currently reviewing synergy data for pyrethrins with PBO, and therefore assessment is not available at this time.

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[13] Dai, P.L. et al. 2010. Effects of sublethal concentrations of bifenthrin and deltamethrin on fecundity, growth, and development of the honeybee Apis mellifera ligustica. *Environ Toxicol Chem*. 29(3):644-9.
[14] Decourtye A, et al. 2004. Effects of imidacloprid and deltamethrin on associative learning in honeybees under semi-field and laboratory conditions. *Ecotoxicol Environ Saf.* 57(3):410-9.
[15] Dechaume Moncharmont FX. et al. 2003. Statistical analysis of honeybee survival after chronic exposure to insecticides. Environ Toxicol Chem. 22(12):3088-94.
[16] Badiou A, and Belzunces LP. 2008. Is acetylcholinesterase a pertinent biomarker to detect exposure of pyrethroids? A study case with deltamethrin. *Chem Biol Interact*. 175(1-3):406-9.
[17] USEPA. 2016. Preliminary Comparative Environmental Fate & Ecological Risk Assessment for the Registration Review of Eight Synthetic Pyrethroids and Pyrethrins, Part IV. Assessing the Mosquito Adulticide Uses of Pyrethroids and Pyrethrins. Office of Chemical Safety and Pollution Prevention. Washington DC.
[18] USEPA. 2009. Reregistration Eligibility Decision (RED) for Permethrin. Office of Pesticide Programs. Washington DC.
[19] Nkya, T. E., Akhouayri, I., Kisinza, W., & David, J. P. 2013. Impact of environment on mosquito response to pyrethroid insecticides: facts, evidences and prospects. *Insect biochemistry and molecular biology*, *43*(4), 407-416.
[20] Ponce-García, G., Del Río-Galvan, S., Barrera, R., Saavedra-Rodriguez, K., Villanueva-Segura, K., Felix, G., & Flores, A. E. 2016. Knockdown Resistance Mutations in Aedes aegypti (Diptera: Culicidae) From Puerto Rico. *Journal of Medical Entomology*, tjw115.
[21] Marcombe, S. et al. 2009. Reduced Efficacy of Pyrethroid Space Sprays for Dengue Control in an Area of Martinique with Pyrethroid Resistance. *Am J Trop Med Hyg.* 80(5): 745-751.

However, the agency believes that including the impact of synergists "increases the level of exceedance, but does not appear to trigger any additionally exceedances."[22]

The scientific literature is finding evidence that pyrethroids can have an additive effect in combination with other active ingredients. Different pesticide combinations (especially with fungicides and insecticides like neonicotinoids) either applied as tank mixes or combined in the environment are of great concern, since the toxicity of the individual compounds on non-target organisms is already very high.[23] Azole fungicides, for instance, can function synergistically with pyrethroid insecticides,[24] and their toxicodynamic effects should be assessed. A recent report by the Center for Biological Diversity notes that EPA must take into account relevant patent data and other lines of evidence and fundamentally alter its approach to assessing pesticide mixtures, since pesticide synergy is not a rare occurrence and should no longer be treated as such.[25]

Recommendations for the Ongoing Pyrethroid Registration Review

In light of the above findings by EPA, it is appropriate to place restrictions on pyrethroid insecticides to protect sensitive species. With half-lives ranging from two weeks to over a year,[26] pyrethroids can persist in the environment. Monitoring studies carried out in California have found widespread contamination of both surface water/suspended sediment and stream bed sediment. Pyrethroids are toxic to aquatic organisms, even at low and environmentally relevant concentrations.[27] Pyrethroid exposure can reduce biological fitness in fish by reducing growth, impairing behavior and increasing susceptibility to predation, as well as inducing cell apoptosis and causing immune system disruption.[28] Based on the toxicological evidence provided in EPA's current ecological assessment, as well as the prevalence of pyrethroid contamination, uses of this class of chemicals should not be increased, but monitored and restricted.

The 2011 cumulative risk assessment for pyrethroids, the conclusion of which support new and increased uses of pyrethroids as a result of the agency finding "sufficient room in the pyrethroid cumulative risk cup," is flawed given the ecological hazards associated with their use. With current data gaps for pollinators, synergistic impacts, and risks to aquatic organisms

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[22] USEPA. 2016. Ecological Risk Management Rationale for Pyrethroids in Registration Review. Office of Chemical Safety and Pollution Prevention. Washington DC.

[23] Sanchez-Bayo, F and Goka, G. 2014. Pesticide Residues and Bees – A Risk Assessment. PLoS One. 9(4): e94482.

[24] Dalhoff K, Gottardi M, Kretschmann A, Cedergreen N. 2016.What causes the difference in synergistic potentials of propiconazole and prochloraz toward pyrethroids in Daphnia magna? Aquat Toxicol. 172:95-102.

[25] Donley, N. 2016. Toxic Concoctions: How the EPA Ignores the Dangers of Pesticide Cocktails Center for BIological Diversity. http://www.biologicaldiversity.org/campaigns/pesticides_reduction/pdfs/Toxic_concoctions.pdf

[26] CDPR. 2004. Study 224: A Preliminary Assessment of Pyrethroid Contamination of Surface Waters and Bed Sediments in High Pyrethroid-Use Regions of California. Environmental Monitoring Branch. CA Department of Pesticide Regulation.

[27] Brander, S. M., Werner, I., White, J. W. and Deanovic, L. A. 2009. Toxicity of a dissolved pyrethroid mixture to *Hyalella azteca* at environmentally relevant concentrations. *Environ Toxico Chem.* 28: 1493–1499.

[28] Floyd EY, et al. 2008. Acute, sublethal exposure to a pyrethroid insecticide alters behavior, growth, and predation risk in larvae of the fathead minnow (Pimephales promelas). *Environ Toxicol Chem.* 27(8):1780-87.

and threatened/listed species, we believe the agency must consider restrictions around pyrethroid uses as the agency continues with its registration review. We await the release of the human health review of the PWG pyrethroids, and urge the agency to find that pyrethroids pose unreasonable risks to the environment as defined under the *Federal Insecticide, Fungicide and Rodenticide Act* (FIFRA).

Respectfully,

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