



Contributing to the Science of Pesticide Risk Assessments for Pollinators

Environmental Law Institute

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on behalf of the Pollinator Research Task Force

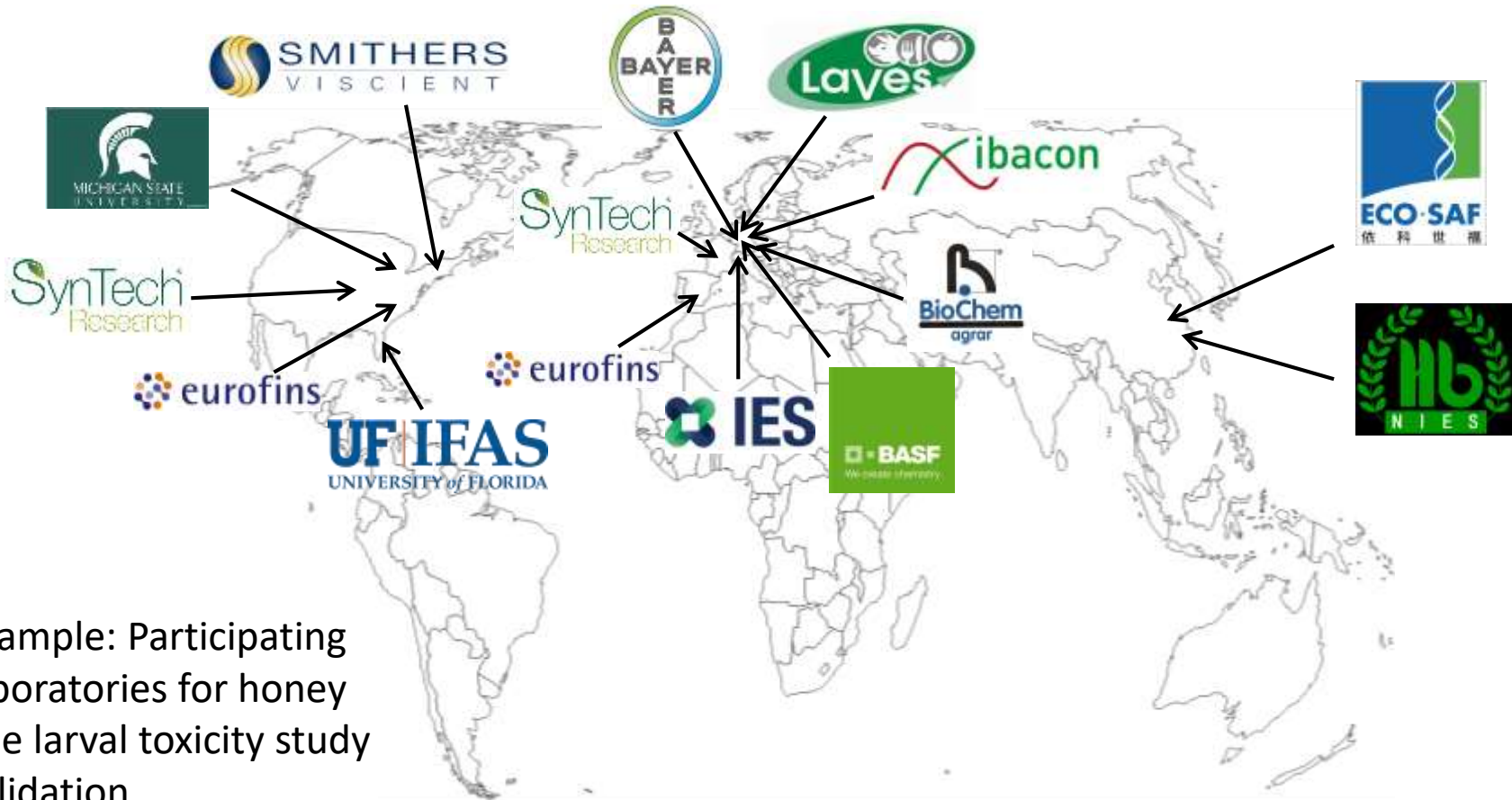
PRTF History and Purpose

- Established in 2015
- To further improve testing and pesticide risk assessment approaches for pollinators as the science continues to evolve
 - Review and summarize existing knowledge
 - Develop new data sets
 - Develop/improve/validate test methods and risk assessment tools
- Prioritize projects through consultation with US EPA and Health Canada PMRA

PRTF is comprised of 8 member companies

- BASF Corporation
- Bayer CropScience LP
- Corteva Agriscience
- FMC Corporation
- Mitsui Chemicals Agro, Inc.
- Syngenta Crop Protection, LLC
- UPL NA Inc.
- Valent U.S.A. LLC

Projects are highly collaborative among PRTF members and independent laboratories



Example: Participating laboratories for honey bee larval toxicity study validation

Many of the projects directly relate to the current EPA regulatory assessment framework

EPA BeeREX v.1.0

Table 1. User inputs (related to exposure)

Description	Value
Application rate	1
Units of app rate	lb a.i./A
Application method	foliar spray
Are empirical residue data available?	no

Table 5. Results (highest HQs)

Exposure	Adult	Larval
Acute contact	0.225	NA
Acute dietary	1.285	0.106
Chronic dietary (EPA)	2.142	0.589

Table 2. Toxicity data

Description	Value (µg a.i./bee)
Adult contact LD50	12
Adult oral LD50	15
Adult oral NOAEL (NOEDD)	193
Larval LD50	25
Larval NOAEL (NOEDD)	25

Table 3. Estimated concentration in pollen and nectar

Application method	P.C. (mg a.i./flg)	N.P. (µg a.i./mg)
foliar spray	0.11	0.11
soil application	NA	NA
seed treatment	NA	NA
tree trunk	NA	NA

Table 4. Daily consumption of food, pesticide dose and resulting dietary HQs for all bees

Life stage	Caste or task in hive	Average age (in days)	Jelly (mg/day)	Nectar	Pollen	Total dose (µg a.i./bee)	Acute HQ	Chronic HQ	
Larval	Worker	1	1.9	0	0	0.00333	2.09E-09	9E-09	
		2	9.4	0	0	0.00334	0.000003	0.0004	
		3	19	0	0	0.00334	0.000003	0.0008	
		4	0	60	10	6.781	0.06790	0.2719	
	Queen	5	0	128	3.6	13.696	0.136	0.5438	
		6+	0	139	3.6	14.696	0.14696	0.5870	
		1	1.3	0	0	0.00333	2.09E-09	9E-09	
		2	9.4	0	0	0.00334	0.000003	0.0004	
Adult	Worker (poll cleaning and capping)	3	2.3	0	0	0.00333	0.000003	0.001	
		4+	0	0	0	0.00333	0.000003	0.0002	
		Worker (nectar and queen tending, nectar)	6 to 17	0	140	3.6	16.456	0.000004	0.0017
		Worker (comb building, cleaning and food handling)	11 to 18	0	60	17	6.787	0.02748	0.4525
	Worker (foraging for pollen)	19	0	43.5	0.041	4.70503	0.01750	0.3133	
	Worker (foraging for nectar)	18	0	292	0.041	32.1491	1.29498	2.1416	
	Worker (housekeeping)	19	0	29	2	3.41	0.01364	0.2273	
	Queen (of hive in winter)	19	0	236	0.0002	26.890022	0.04001	1.7233	
	Queen (laying 1500 eggs/day)	Entire brood area	525	0	0	0.9775	0.0221	0.0385	

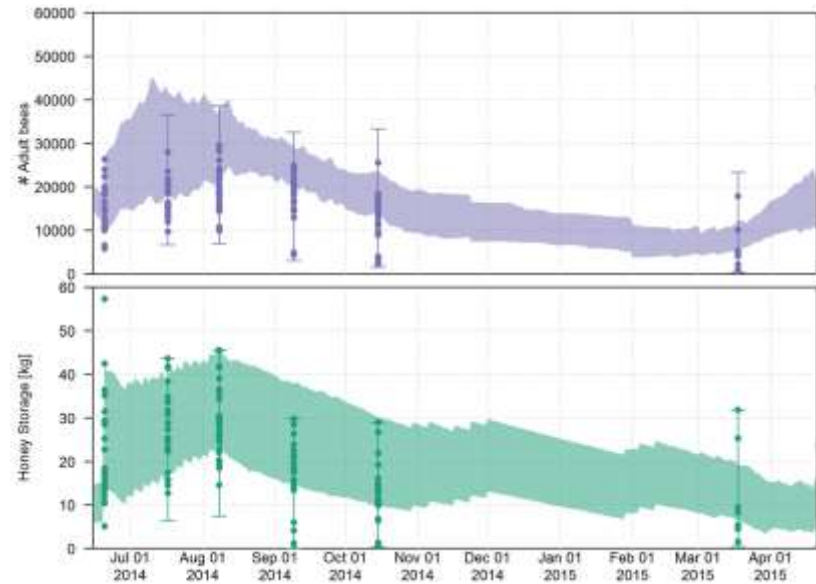
- Validation of honey bee larval toxicity bioassay
- Increase predictiveness of “residual toxicity of foliage” bioassay
- Contribution of guttation water as an exposure route
- Refinement of nectar consumption estimate of an adult forager
- Default residue estimates in nectar and pollen following a foliar or soil application

The PRTF has conducted diverse projects to fulfill our mission

- Laboratory Studies and Endpoints
 - Investigating alternative agents for chronic honey bee studies
 - Relevance of the weight of emerged bees as a regulatory endpoint in the chronic larval honey bee toxicity study
 - Comparison of larval acute and chronic endpoints for redundancy and relevance to risk assessment
 - Comparison of acute endpoints between formulated products and active ingredients

The PRTF has conducted diverse projects to fulfill our mission (cont.)

- Population Modeling
 - Conducted model simulations to improve predictions of overwintering colony survival



BEEHAVE model: Adaptation to North America and over-wintering

- Calibrated BEEHAVE model with North American specific data sets from field study controls
- Evaluated predictions of over-winter colony survival and strength
- Determined factors affecting predictability
- Considered role of modeling in pesticide risk assessment based on comparisons with field data sets
- Two papers accepted for publication in *Environmental Toxicology and Chemistry*

The PRTF has conducted diverse projects to fulfill our mission (cont.)

- Exposure Assessment
 - Whole colony consumption of nectar and pollen: lit review
 - Non-*Apis* and native bee exposure workshop



Characterizing how non-*Apis* bee exposure differs from the honey bee

- Workshop hosted by US EPA in January 2017
- PRTF was part of a multi-stakeholder organizing committee and participant
- Goal to understand and identify potential pesticide exposure to native or non-*Apis* bees vs. honey bees
- Six resulting publications
 - Environmental Entomology
 - Open Access, Dec. 2018
 - Identified research needs



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Summary and Conclusions

- The PRTF has successfully addressed several areas to improve the North American pesticide risk assessment process for pollinators.
- Consultation with the North American Regulatory Authorities and collaboration with external partners have been essential

Wisk, J. and D. Schmehl 2021. “Pollinator Research Task Force – Contributing to the Science of Pollinator Risk Assessment for Pesticides” in D. E. Barnekow and M. E. Krolski, Eds. Data Generation for Regulatory Agencies: a collaborative approach. ACS Publications.



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