



# MRLs and Michigan Apples & Cherries: The First Round!



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Cherry Report Expo 2013



# Consultations in DC UPDATE: What is Ahead for 2014?

Two older and One newly developing issues: 1) Invasives, 2) Bees & 3) **Chemical Mixtures**

## 1-USDA: Invasives, what is coming in 2014?

[Import of Fresh Fruit from China into the U.S. - USDA Animal and Plant Health Inspection Service \(APHIS\)... Studying Pathways of invasion... Conducting: Risk Analysis... Currently: 21 arthropod pests and one fungi targeted Introduction: Will Likely cause unacceptable consequences](#)

### Entomologists across the US Contributed to this evaluation: 2010-13

Whalon lab represented MI Cherries and participated in the Apple Assessment for the ...Upper Midwest— [Major Risks of new introductions](#)

## 2- Another Key Ongoing Issue 2014-

**Bee Kills & Neonics—**  
**Major Continuing Concern**

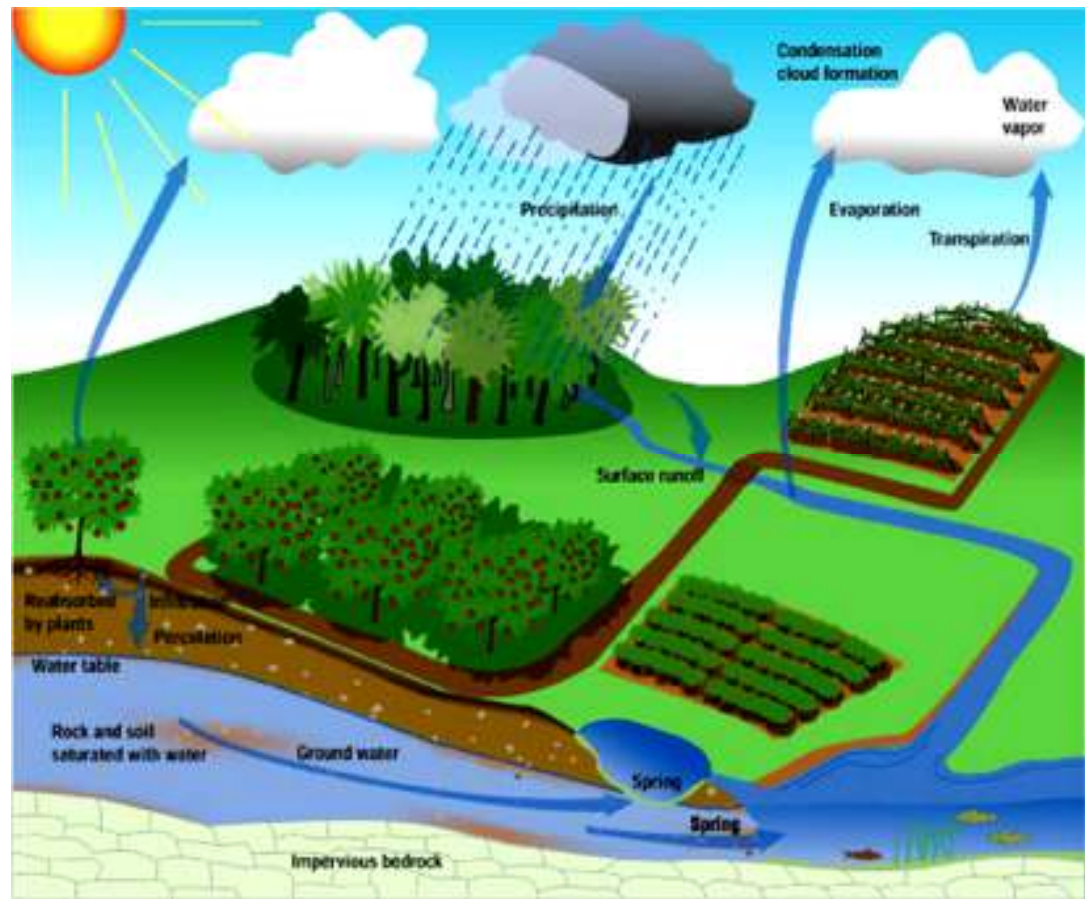
## 3- Chemical Mixtures: Emerging Major Issue?

**Human Health Risks of Exposure to Chemical Mixtures** - The French Agency for Food, Environmental and Occupational Health and Safety (ANSES), the National Food Institute, Technical University of Denmark (DTU) and Germany's Federal Institute of Risk Assessment (BfR) have scheduled a conference on December 10 and 11, 2013 in Paris, France to present "... an **overview of research on the effects of exposure to chemical mixtures and risk assessment practices ...**" - The conference will cover the following topics: "... recent and current knowledge on the **effects of chemical mixtures on human health**, taking into consideration the various classes of chemical substances, **different exposure routes and existing experimental data; risk assessment methods for chemical mixtures, ...**"

\* The December 2, 2013 ANSES News Release, titled "Exposure to chemical mixtures: challenges for research and risk assessment", is posted at <http://www.anses.fr/en/content/exposure-chemical-mixtures-challenges-research-and-risk-assessment>

# Residues from Pesticides Are Everywhere!

USEPA & USDA &  
Several other  
Agencies and  
Services In the  
Federal  
Government are  
**Tasked to Monitor  
and Limit Pesticide  
Impacts On People  
& the Environment**



# Anyone Can Detect Residues!

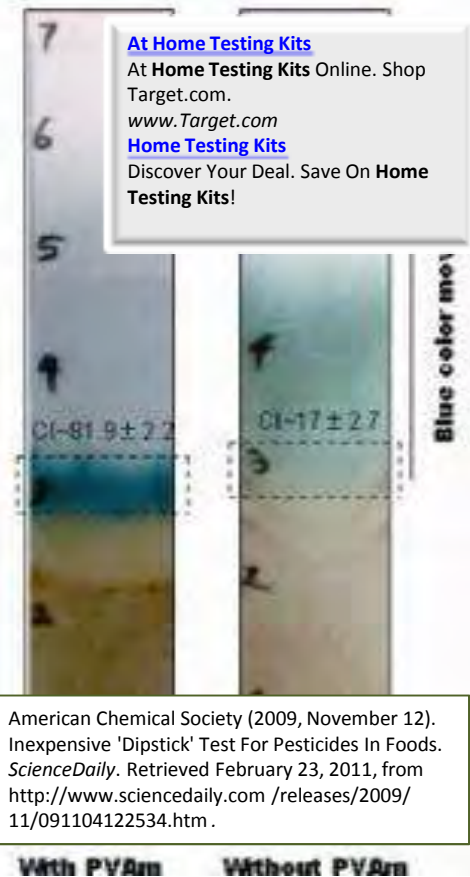
- Just Google: pesticide home testing kits for food
- ~\$15.00 for 10 test kits

## Inexpensive 'Dipstick' Test For Pesticides In Foods

ScienceDaily (Nov. 12, 2009) — Scientists in Canada are reporting the development of a fast, inexpensive "dipstick" test to identify small amounts of pesticides that may exist in foods and beverages. Their paper-strip test is more practical than conventional pesticide tests, producing results in minutes rather than hours by means of an easy-to-read color-change!

## High Pesticide Levels Found In Fruit-Based Drinks In Some Countries

(Dec. 16, 2008) — In the first worldwide study of pesticides in fruit-based drinks, researchers in Spain are reporting relatively high levels of pesticides in drinks in some countries, especially the United States... > [read more](#)



American Chemical Society (2009, November 12). Inexpensive 'Dipstick' Test For Pesticides In Foods. *ScienceDaily*. Retrieved February 23, 2011, from <http://www.sciencedaily.com/releases/2009/11/091104122534.htm>.

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## What is 1 Part Per Million (ppm)?

1 inch to 16 miles

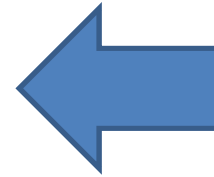
1 minute to 2 years

1 cent to \$10,000

1 ounce to 31 tons

**1 bad apple in 2,000 barrels**

## Residue Detection



**'Over the Counter'  
ELISA Kits Today**

## **1 Part Per Billion (ppb):**

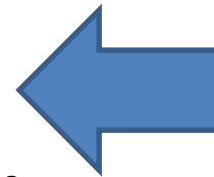
1 inch to 16,000 miles

1 second to 32 years

1 cent to \$10 million

1 pinch of salt to 10 tons of potato chips

**1 bad apple in 2 million barrels**



**High Pressure  
Liquid Chromatography**

## **1 Part Per Trillion (ppt):**

1 inch to 16 million miles

(A six-inch leap on a journey to the Sun)

1 second in 320 centuries

1 cent to \$10 billion

1 pinch of salt to 10,000 tons of potato chips

**1 bad apple in 2 billion barrels**

**It can and is done, but  
not for MRLs (too \$\$\$)**



# MRL setting process for chronic exposure

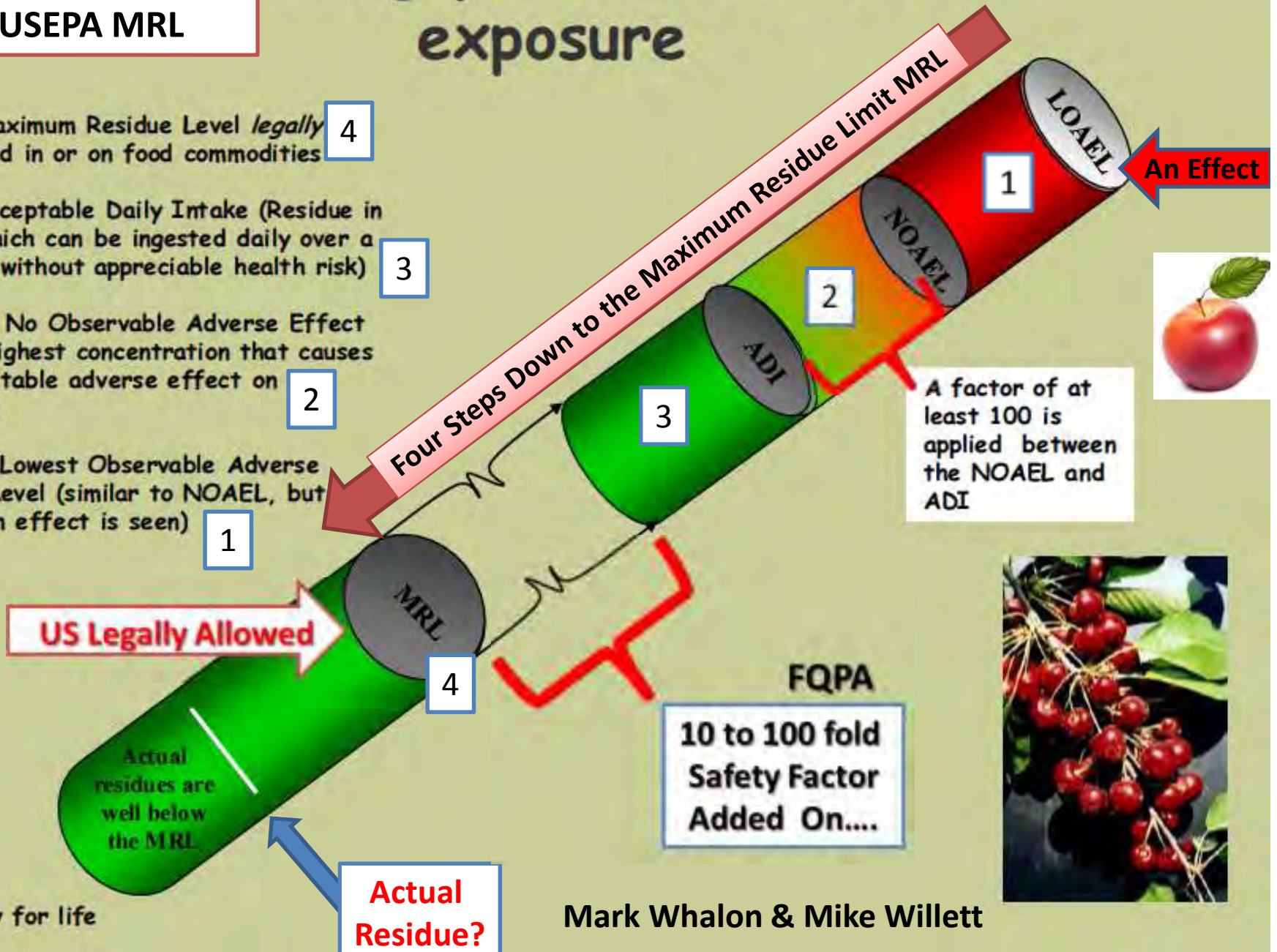
## A USEPA MRL

MRL: Maximum Residue Level *legally* permitted in or on food commodities **4**

ADI: Acceptable Daily Intake (Residue in food, which can be ingested daily over a lifetime without appreciable health risk) **3**

NOAEL: No Observable Adverse Effect Level (Highest concentration that causes no detectable adverse effect on lifespan) **2**

LOAEL: Lowest Observable Adverse Effect Level (similar to NOAEL, but where an effect is seen) **1**



\*per day for life

Mark Whalon & Mike Willett

# MRLs & MI Apples & Cherries

## Our Goals

- What is necessary to make MRLs work for us?
- What has been accomplished so far?
- Plans for 2014-6 MRL studies...
  - **Very Good News: MDARD & TASC Grants \$\$**
- Beyond 2014-6: an **'End Product'**?
  - **MRL Probability Chart** ...wherein Growers , Packer-Shippers, Processors, etc. can predict the risks of MRL detection in various domestic and international markets
  - **Risk-based on application rates, dates and handling...**

# MRL End Game: Develop a Tool for Growers

## Worst First Near Harvest Guidance

### – Late season pests

- SWD
- Cherry Fruit Fly
- OBLR
- Mites

### – Chemical Mixtures?

- Insecticides
- Drop Sprays
- Brown Rot
- Others

### – In time: Fungicides & Growth Regulators

Output = MRL Chart

**EUROPEAN PROGRAMME PHIs & RESIDUE LIKELIHOOD** (This guideline is by no means 'absolute' and was compiled from available residue programme data collected under commercial field use conditions. Actual use and climate may affect residues obtained)

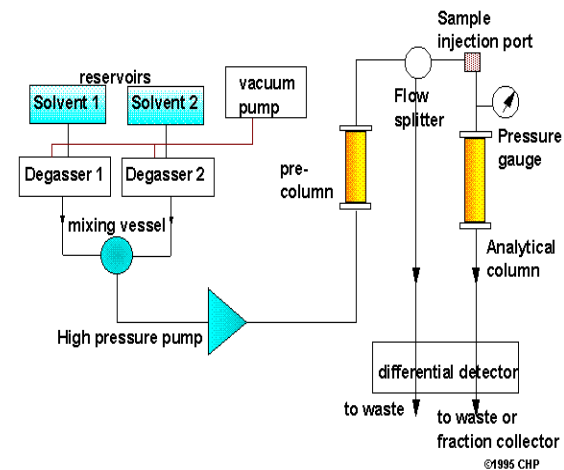
PRE-HARVEST INTERVAL	TRTICE NAME	ACTIVE INGREDIENTS	LIKELIHOOD OF A SINGLE APPLICATION AT INTENDED PHASES LEAVING A RESIDUE	LIKELIHOOD OF TWO APPLICATIONS AT INTENDED PHASES LEAVING A RESIDUE	LIKELIHOOD OF THREE APPLICATIONS AT INTENDED PHASES LEAVING A RESIDUE
<b>INSECTICIDES AND FUNGICIDES</b>					
PRE-BLOOM	APOLLONIC ACHELES	CI SPENTANIE	HL	HL	HL
PRE-BLOOM	APOLLONIC CIVI TORBANOLO FLUM MONTAN	EUPROFEN	HL	HL	HL
PRE-BLOOM	FAMON PIRET	PERMETHRIN	HL	HL	HL
15-18 NOV	SUPERION	IMIDACLOPRID	<HL		
10-1 DEC	PRODDY	ME THIOFENOSIDE	<HL		
15-1 DEC	COMAC MINE	TESPENOSIDE	<HL	HL	HL
15-1 DEC	AGROIT	IMIDACLOPRID	<HL	HL/2HL	
10-11 DEC	VENNATE	PERFENOSATE	<HL	HL/2HL	
10 DAYS	ALLIATOR	CHLORANTHRAILOLE	HL	HL/HL	<HL
8-10 DAYS	CHITRIS TURTAP	TRIAZOLIN	HL	HL	HL
8-10 DAYS	DANON	DANON	HL	HL/HL	
10-10 DAYS	MYTAMIC	MYTAMICIN	HL	HL	HL
10-10 DAYS	COMAC MINE	TESPENOSIDE	HL	HL	HL
10 DAYS	DELGATE	SPINETORAM	HL		
14 DAYS	AVIS BERDEL	FAMACIN	HL	HL	HL
14 DAYS	LUCCESI	SPINOSAD	HL	HL	HL/2HL
10 DAYS	PROCLAM	EMECTIN BENZOATE	HL	HL	HL
1 DAY	CIL SPINIS	IMAZALIL FLUORIN	HL	HL	HL
1 DAY	WAZO DIMPHOSURE WAZO	OSINON WITH DIMPHOSURE WAZO	HL	HL	HL
1 DAY	BACTOR BACTORIC OPE OF DELTA BACTORICIN	BACILLUS THURINGERIENSIS	HL	HL	HL
<b>INSECTICIDES AND FUNGICIDES</b>					
BEFORE FULL BLOOM	SPINER OF CARBENDAZIM MESSANO PROPE VOLUPIN MEX	CARBENDAZIM	<HL	HL	HL
10-10/Nov	CHOREL	CYPRODINIL	HL	HL	HL
10-10/Nov	SOGA	SPINETORAM	HL	HL	HL
10-10/Nov	FLUPTAN	FLUPTAN WITH SPINETORAM	HL	HL	HL
10-10/Nov	PROTINE	BOSCALID WITH PROTHIOCONAZOL	HL	<HL	
10-10/Nov	ALTO PROPE	SPINETORAM	HL	HL	
10-10 OCT	WAPORIN WIPARE	SPINETORAM	HL	HL	HL/2HL
10-10/Nov	DOORE (MS) EMERALD ONE	SPINETORAM	HL	HL	HL
10-10/Nov	DELAVIC ALANT	OTHADON	HL	<HL	<HL
10-10/Nov	WELKAR MICAL MINE	FLUCASIN	HL	HL	HL
10-10/Nov	PEROSSEIN CIVIA	PEROSSEIN	HL	HL	HL
10 DAYS	FLUP	TRIFLURADOXIN	HL	HL	HL
10 DAYS	SPINOP	SPINETORAM	HL	HL	HL
10 DAYS	ELIPARENELLE	TRIFLURADOXIN	HL	HL	HL
10 DAYS	OPINARE WAZO (MS) MEX	IMAZALIL FLUORIN	HL	HL	HL
10 DAYS	POLYRAM	IMAZALIL FLUORIN	HL	HL	HL
10 DAYS	REBOWIPLO	TRIFLURADOXIN	HL	HL	HL
10 DAYS	OPINARE WAZO (MS) MEX	IMAZALIL FLUORIN	HL	HL	HL
10 DAYS	WAZO DIMPHOSURE	OSINON (MS)	HL	HL	HL
10 DAYS	THIRANOP	THIRANOP (MS)	HL	HL	HL
10 DAYS	CAPIN DIMPHOSURE MEX	CAPIN	<HL	HL	HL
10 DAYS	DOORE MICAL SPINER	DOORE	<HL	<HL	HL
1 DAY	COPPER PRODUCTS, METHYLENEDIPYRIMIDINE SULPHUR	COPPER & SULPHUR BASED PRODUCTS	HL	HL	HL



# 2013 MRL Study Methods

Insecticides chosen based on: near harvest (short PHI), Pest Efficacy & MRL “Issues”

- 2013= **Altacor, Delegate, Imidan, Assail, and Mustang Max** = close to harvest **PHI MRL Picture**
- Plot design: 3-tree w 3 reps (9 trees), Isolate tmts w three rows unsprayed trees between
- Once the harvest date was set: treated @ respective PHI
- Sample: harvest, 7 & 11 days post-harvest
- Sample cherries: iced, cooler transport, frozen & then Analysis...
- High-performance liquid chromatography (HPLC)
- All Figure Results Are = ppm.



# Concerning Pesticides for Cherries

## Why Some Pesticides Can't Be Used Close To Harvest

Trade name	Active ingredient	Class (MOA*)	PHI (days)	MRL USA	Lowest export MRL	Global MRL disparity index**	Field Rate USA
Assail 30SG	Acetamiprid	Neonic	7	1.2	0.5	2.4	8 oz
Imidan 70W	Phosmet	Organophosphate	7	10	0.05	200	2.125 lb
Mustang Max .8EC	Zeta-Cypermethrin	Pyrethroid	14	1.0	1.0	1	4 oz
Delegate 25WG	Spinetoram	Spinosyn	7	0.2	0.1	2	7 oz
Admire 4.6F	Imidacloprid	Neonic	7	3.0	0.5	6	2.8 oz
Malathion ULV	Malathion	Organophosphate	1	8.0	0.02	400	16 fl oz
Entrust 2SC	Spinosad	Spinosyn	7	0.2	0.05	4	2.5 oz
Danitol 2.4 EC	Fenpropathrin	Pyrethroid	3	5	0.01	500	21.3 oz
Pounce 25 WG	Permethrin	Pyrethroids	3	4	.01	.04	12.8 oz
Renounce 20 WP	Cyfluthrin	Pyrethroid	7	0.3	0.2	1.5	3.5 oz
Proaxis	Gamma-Cyhalothrin	Pyrethroid	14	0.5	0.3	1.67	5.12 oz
Actara	Thiamethoxam	Neonicotinoid	14	0.5	0.5	1	5.5 oz
Altacor	“Rynazypyr” (Chlorantraniliprole)	Diamide	10	2	1	2	4.5 oz

\*Mode of Action

\*\*The Global MRL Disparity Index is calculated by dividing the US MRL by the lowest export MRL (US MRL/export MRL).

# **Worst First: Spotted Wing Drosophila Targeted Sprays** **MRL- Degradation Studies 2013**

- Data obtained from 1-NW Hort. Res., 2-Whalon-lab MSU, 3-University of California study, and 4-Washington State University study
- **Date** = Days post Treatment Sampling
  - **Whalon-Lab data sampling begin at the PHI for each pesticide**
- Residues are given in ppm
- SWD efficacy is given in percent mortality (CFF & OBLR eff. Data not presented)
- Written Report includes comparison (**Carol & Brooks Study CA**) 2 sweet cherry MRL Studies in an Arid climate.



# MRL Detection Methods

- Replicated Field Design
- Calculate, Measure & Mix
- Field Spray (wash/reload)
- Take Samples/label/cool
  - Transport
  - 0,7,14,21,28 days PH residues
  - Process Samples
- Freeze (-50<sup>0</sup>F) Samples
- Extract/HPLC (\$100/sample)
- Cherry samples = 5 insecticides, 3 tree Tmts, 3 Samples/tree, taken 7, 14, 21 days after spraying...
- Total samples cost **w/o labor, travel, expenses, freezers, etc.** = \$13,500 for a very conservative study
- Interpolate/analyze
- Report

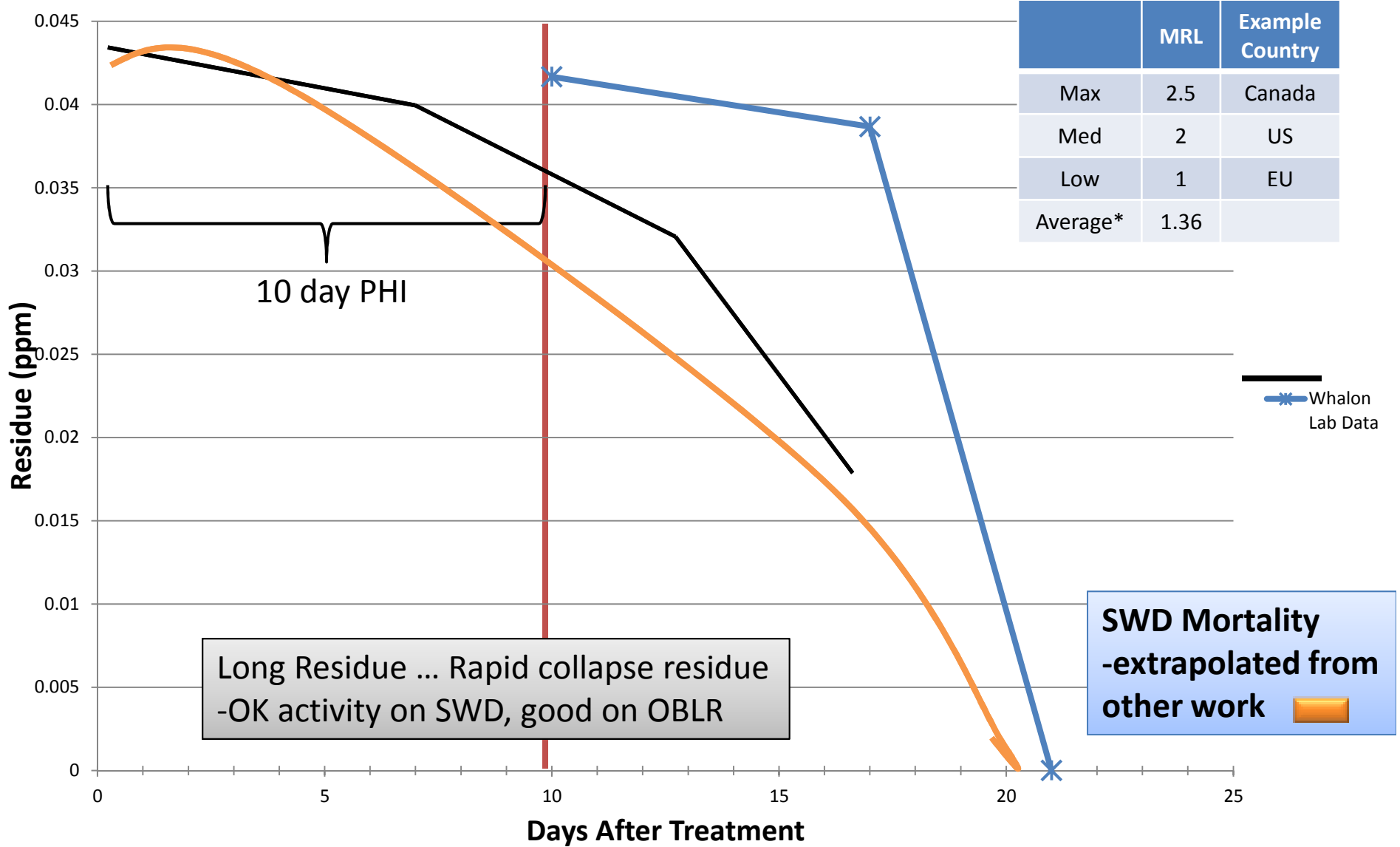






OBLR

# Altacor/ (chlorantraniliprole)

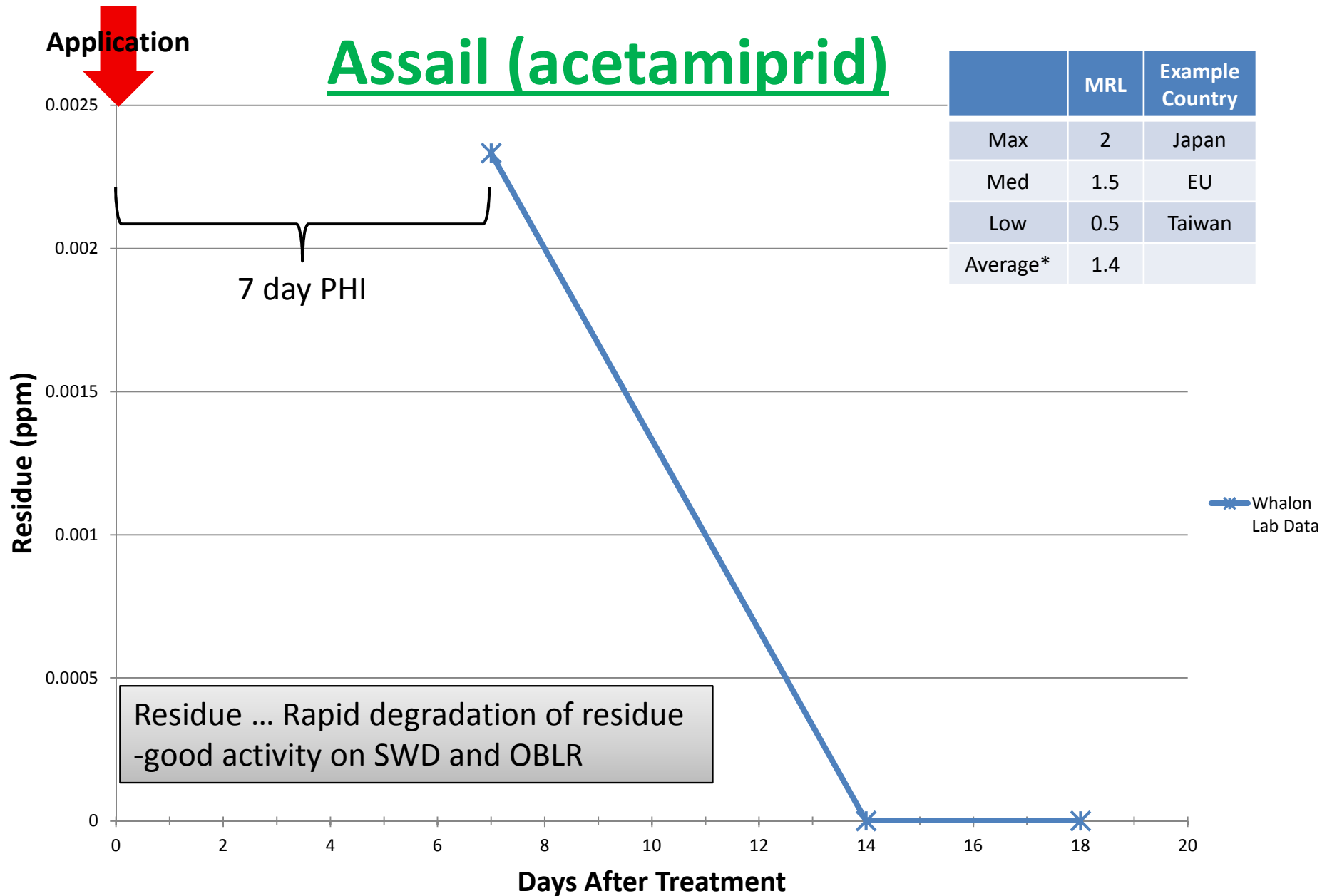


\*Average included the following units: US, Codex, EU, Canada, Japan, Korea, Taiwan

Rynaxypyr

# Assail (acetamiprid)

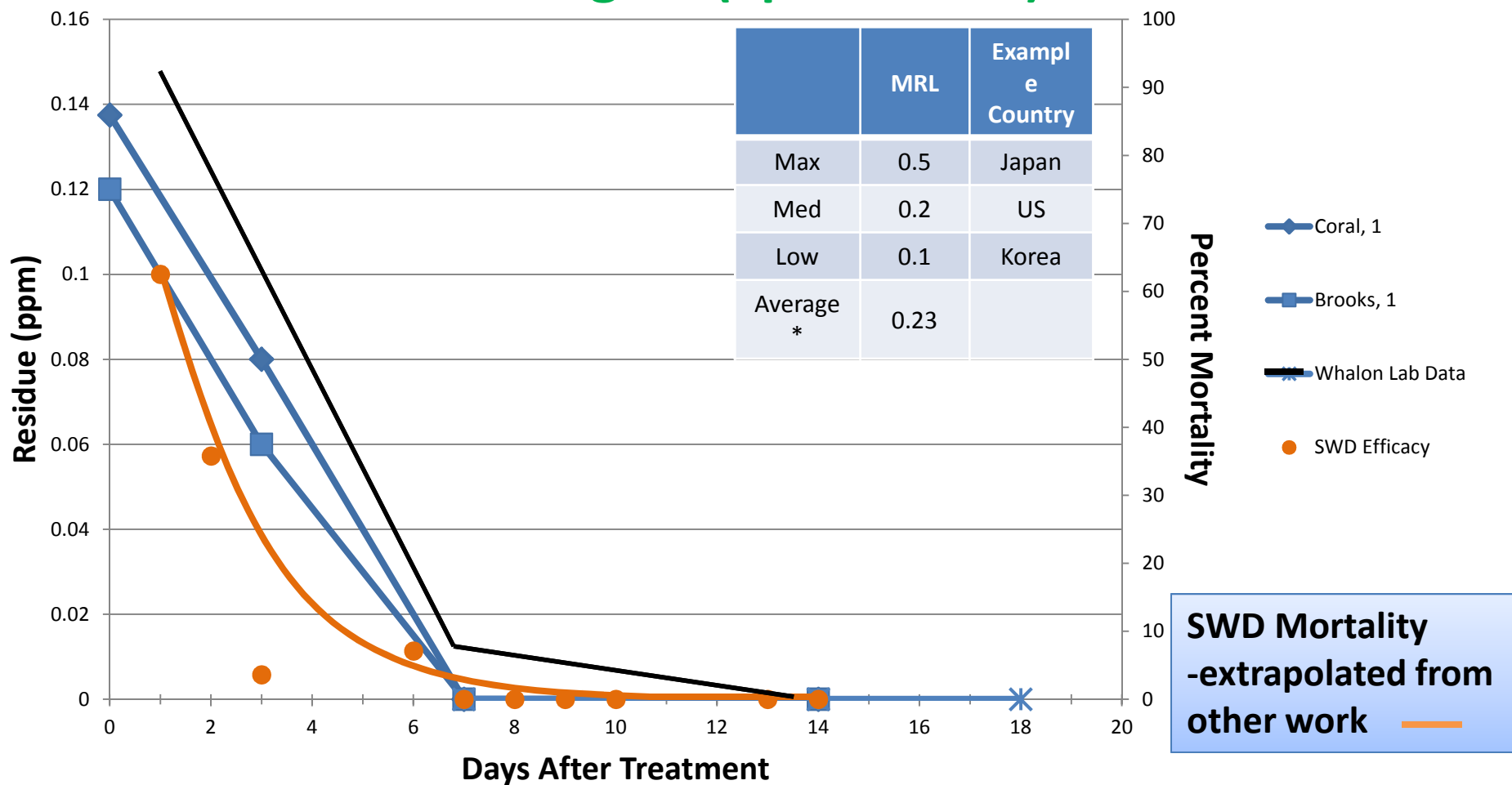
	MRL	Example Country
Max	2	Japan
Med	1.5	EU
Low	0.5	Taiwan
Average*	1.4	



\*Average included the following units: US, Codex, EU, Canada, Japan, Korea, Taiwan

**Spinetoram**  
**OBLR**  
**Bee Tox**

## Delegate (Spinetoram)



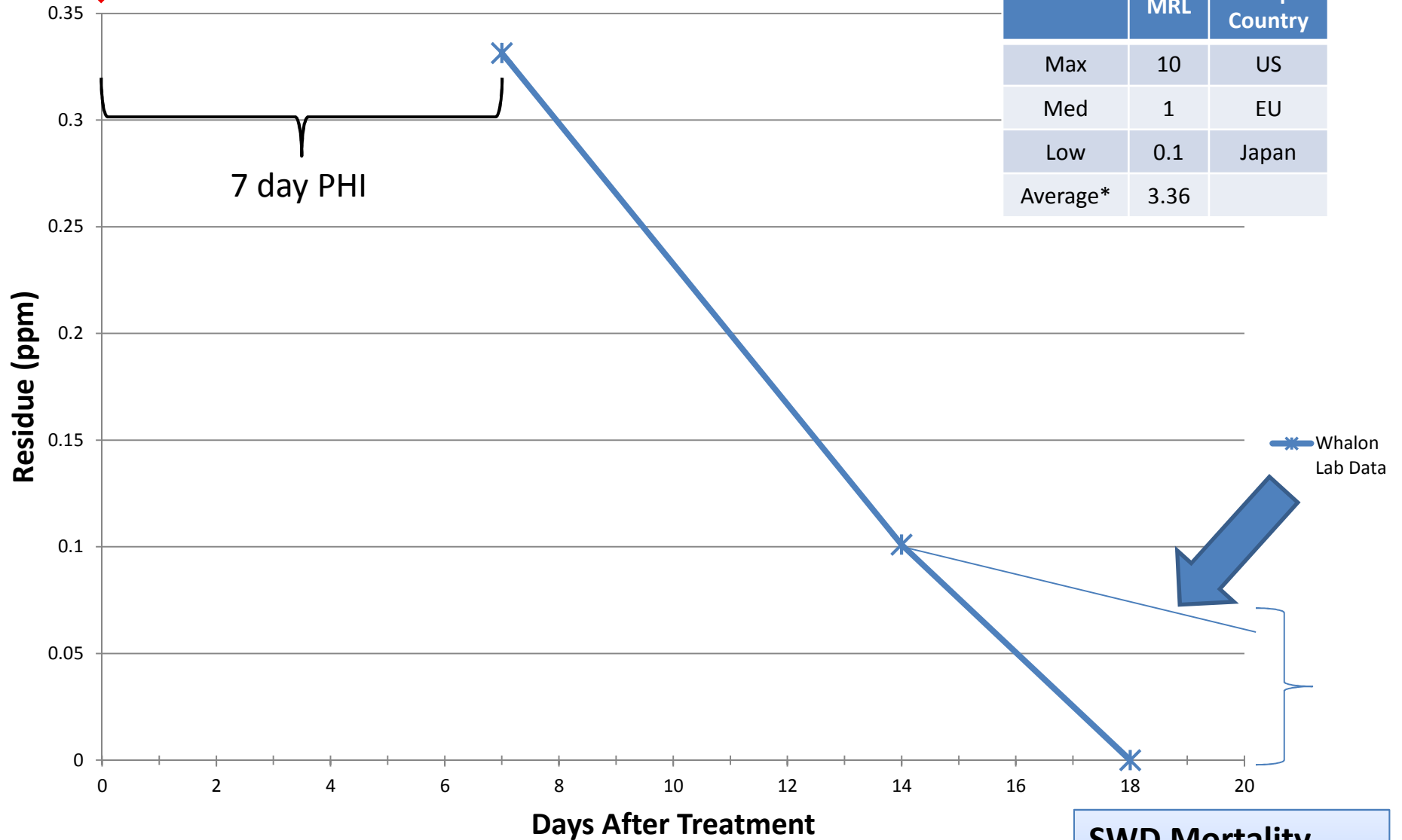
MW


**Application**



# Imidan (phosmet)

	MRL	Example Country
Max	10	US
Med	1	EU
Low	0.1	Japan
Average*	3.36	



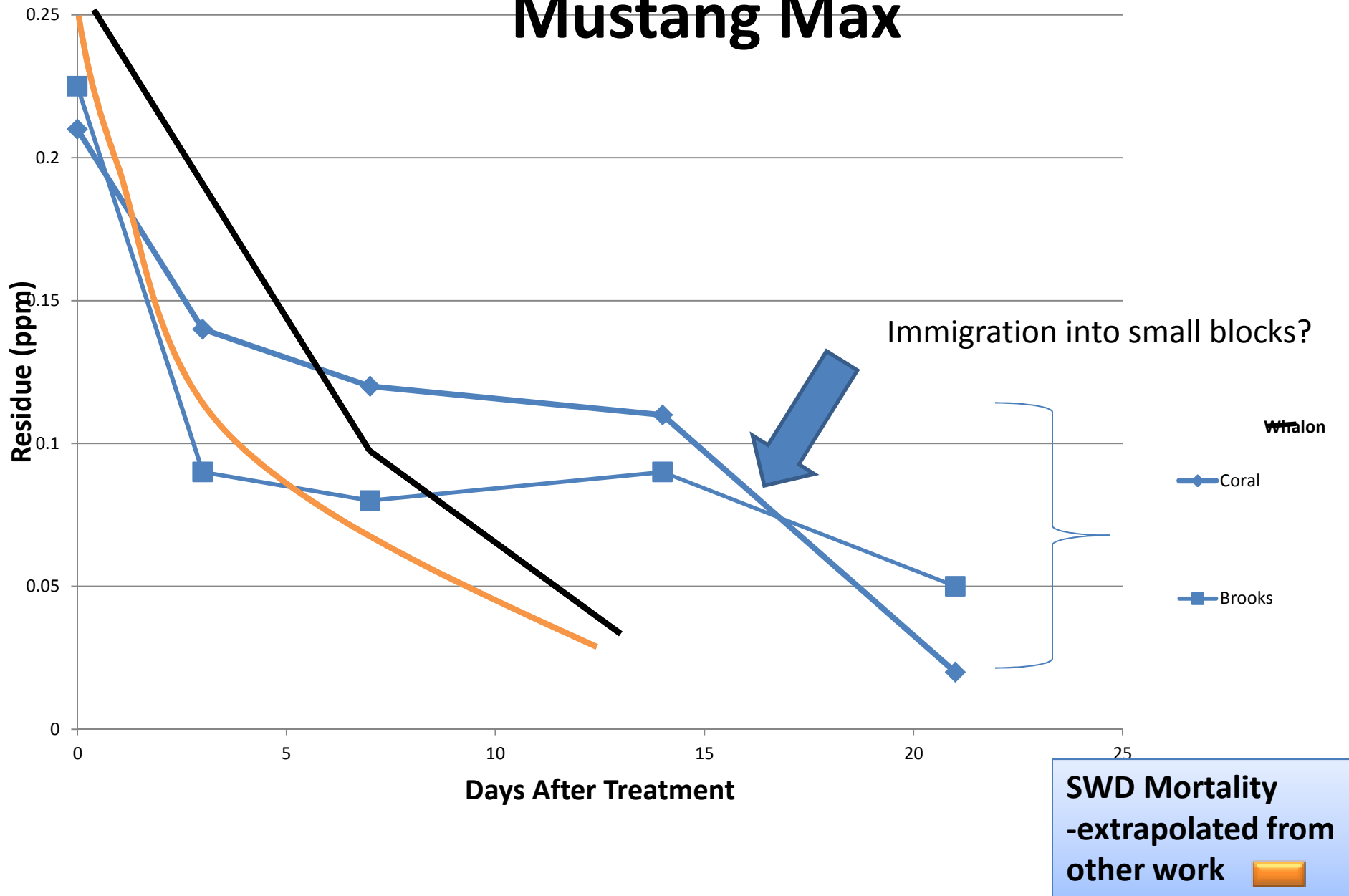
**SWD Mortality  
-extrapolated from  
other work** 

\*Average included the following units: US, Codex, EU, Canada, Japan, Korea, Taiwan



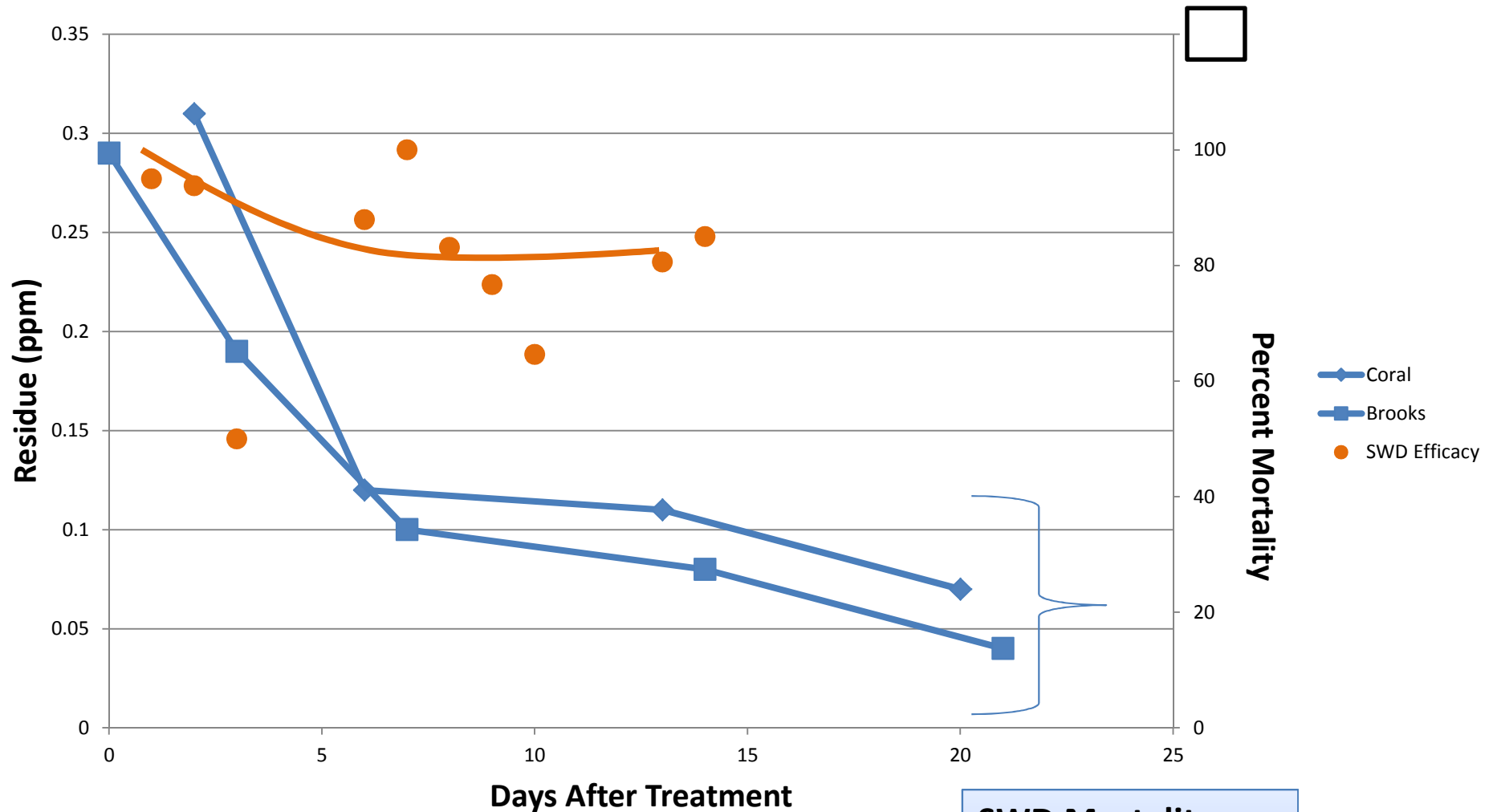
# Single Tree Small Plot Study

## Mustang Max



# Single Tree Small Plot Study

## Warrior II

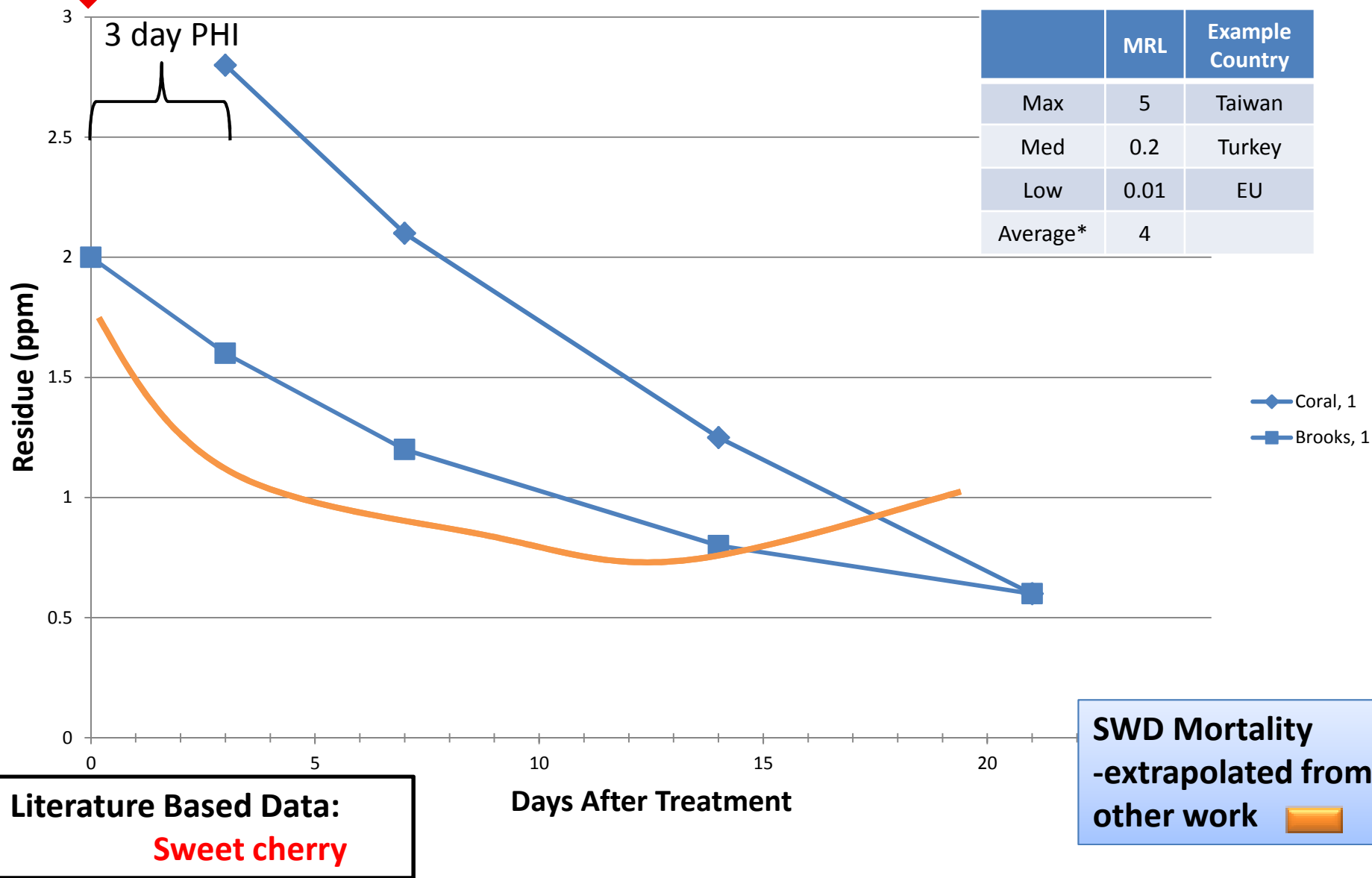


SWD Mortality  
-extrapolated from  
other work

MW

Application  
↓

# Danitol (fenpropathrin)



\*Average included the following units: US, Codex, EU, Canada, Japan, Korea, Taiwan

# MRL Management = We Can Do This!

- 2013 = **Study System Development** & 1<sup>st</sup> Data
  - 2013 Season: We Got our “feet wet” & are ready to roll...!
- Not just insecticides! Pathology, Growth Regulators, etc.
- ID & Evaluate Mid-Late Season Pesticide Candidates
- Understand Harvest & Post Harvest Tmts. & Effects
- Integrate Post Harvest Effects on Residues:
  - Efficacy...Pest Complex? SWD, OBLR, CFF, BMSB?, Mites, ??????
  - New Pesticidal Materials...
  - PHI?
  - Rain effects?
  - Cooling Tank/transport/holding?
  - Processing Issues: IQF, Dried, Canned, Fresh, etc....
  - Storage, transportation



# Questions