Insecticide Impairment of Urban Water Bodies

Regulatory Implications for Stormwater Agencies

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I live in the Stormwater World (i.e. Clean Water Act)

- Cities and Counties issued stormwater permits by State.
- NPDES or MS4 permit
MS4 Permit requires chemical and toxicity testing
If the water is dirty, we have to get it clean.
Why do Stormwater Programs care about pesticides?
Pesticides on impervious surfaces transport readily in runoff

Figure courtesy Dave Tamayo, Sacramento County Stormwater Program
Urban runoff carries pesticides to creeks.
1990s: Diazinon and Chlorpyrifos toxicity in most urban areas of California:

- San Diego
- Sacramento
- San Joaquin
- Orange
- Ventura
- San Francisco Bay Area (9 Counties)
Phase Out Reduced Diazinon Levels

Figure 1-2. Diazinon Concentrations at Chollas Creek MLS Site SD8(1)

Switch to pyrethroids created a new problem.

Estimated use of study list pyrethroids in the San Francisco Bay Area 2001-2004 (permethrin equivalents)
Pyrethroids: widespread toxicity in California urban waters

- Majority of tested creeks
- Multiple pyrethroids
- Mostly sediment, some water column
- Direct connection to urban runoff
- Urban>>Agricultural areas

Source: Weston et al., urban runoff program data and California Water Board data.
Weston 2005: Roseville

FIGURE 2. Distribution of sediment toxicity among the study sites. The numerical values at each site indicate the percent mortality of *H. azteca* in 10-d toxicity tests. Results are also illustrated by color coding (red = high toxicity with >70% mortality; yellow = moderate toxicity with mortality significantly greater than control but <70%; green = nontoxic with mortality not significantly different than control). Two stations (sites 5 and 6) not shown, but located on Pleasant Grove Creek 7 and 10 km, respectively, farther downstream of station 4 were also nontoxic.
State Monitoring Program (SWAMP)

- Pyrethroids are principal cause of toxicity. Holmes, 2008
Where’s it coming from?

Reported Urban Pyrethroid + Pyrethrin Use
(California 2007, pounds, active ingredient)
Urban Pyrethroid and Pyrethrins, California 2007
reported uses and unreported estimate (sales minus reported)

Source: CDPR PUR and sales
Why do stormwater programs care about ant control?
Argentine Ant Control: Most common outdoor application for residential customers

Photo: Klotz et al 2008

Vega and Rust, 2001
Field et al 2007,
Flint, 2003

Photo: Klotz et al 2008
Argentine Ant Control: problematic applications to impervious surfaces

Photo: Klotz et al 2008
Pyrethroid toxicity: Clean Water Act compliance issue for stormwater agencies

- Enforcement actions
- Citizen suits
- Compliance
  - Monitoring
  - Outreach
  - Regulatory initiatives

$$$$$$
Riverside Monitoring

<table>
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<tr>
<th>Item</th>
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<tr>
<td>Annualized Costs</td>
<td>$135,525</td>
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<tr>
<td>Toxicity Testing</td>
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<td>TIE</td>
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<td>Pyrethroids Monitoring</td>
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<tr>
<td>BMP Implementation – To Be Determined</td>
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BMPs + Monitoring costs = $250,000
Through 2008....$0.90 per person
State TMDL Costs

- “SWRCB estimates the development cost of an average TMDL to be approximately $600,000”
Ant control is even impacting mosquito control.

Photo: Alex Wild
Vector Control NPDES Permit: Impaired Water Bodies

- California NPDES Vector Control Permit:
  - “does not authorize the discharge of residual pyrethroids to the water bodies identified on the California 303(d) listing as impaired for pyrethroids.”
2008 Aerial Application

Source: SYMVCD, SWRCB
Regulatory Challenges for Stormwater Agencies

- Municipal stormwater programs are on the hook for pesticide *discharges*.

BUT …

- Authority to regulate pesticide *use* resides with:
  - U.S. Environmental Protection Agency
  - California Environmental Protection Agency
Up against a common belief:

- If EPA “approved” (registered) a pesticide, it must be OK for the environment, if used according to the label.
Clean Water Act issues are expanding...

Off with their heads!
A general trend of more CWA listings...

- as of 2010, only 14 pyrethroid listings

- 2012 list will include many more listings for pyrethroids (based on review of monitoring last few years).

Source: CASQA, SWRCB
Stormwater Permit restrictions will spread statewide
New toxicity will lead to more permit requirements

Fipronil in North CA Runoff

C. dubia LC$_{50}$ = 18 ppb
Los Angeles Heading toward Numerical limits?

- “A numerical water quality objective for pyrethroid insecticides would provide a specific value to ensure that waterbodies are protected from pyrethroid pesticide contamination”

– 2011 Los Angeles Basin Plan Triennial Review
MS4 permit requirements

- Sacramento Permit
  - County and cities must implement IPM.
  - If they contract out, must hire certified IPM vendors.
The BIG Problem: Clean Water Act *compliance* may not be attainable without FIFRA help

Off with their heads!
Stormwater Strategy:
Use FIFRA to address the BIG part of the pie.

Urban Pyrethroid and Pyrethrins, California 2007
reported uses and unreported estimate (sales minus reported)
Regulatory relief sought:

- US EPA
  - Mitigation of urban water quality impacts
    - Urban pathway analysis
    - Aquatic toxicity data
    - Effective label restrictions
  - Focus on cause of WQ impairments.
  - Need to emphasize FIFRA regulation to reach WQ goals.
  - NPDES will not get us there without pesticide regulation.
EPA Actions

- Registration review schedule
- Bifenthrin labels
- CWA Harmonization
- Urban pathway analysis
EPA Bifenthrin Label changes

- No application to horizontal impervious surfaces (unless protected from runoff)
- Restricts applications to vertical surfaces
Applications to pervious areas not a big a problem for stormwater
Registration improvements needed

- Urban pathways to water
- Aquatic sediment fate and toxicity
- Data for water quality criteria
  - 8 species
  - Most sensitive
- Chemical-specific wash-off data for urban surfaces
- Commercially viable analytical methods for environmental samples
- Clear and rational data exemption criteria
CWA test species are often more sensitive than FIFRA species.

bifenthrin water exposures LC$_{50}$ values (from ECOTOX database)

*Daphnia magna* = 1.4 ug/L

*Ceriodaphnia dubia* = 0.107 ug/L

*Hyalella azteca* = 0.0093 ug/L
DPR plays an important role

Cal Dept of Pesticide Regulation

- Surface Water Protection Regulations:
  - pyrethroid applications by licensees

- Screening mechanisms for water body impacts

- Re-evaluation of pyrethroids to prevent WQ impacts

- IPM research and dissemination
Surface Water Protection Regulations

- Reduce pyrethroid applications to horizontal impervious surfaces
- Only applies to licensees
- Works in concert with bifenthrin labels
- UC Davis study predicts 85% reduction in stormwater (Jorgenson et al)
- In effect summer 2012?
DPR AI screening (draft)

stage 1 evaluation: initial screening

- Chemical properties
  - Runoff potential
  - Aquatic persistency
  - Aquatic toxicity
  - Support w/o conditions
  - Require additional evaluation

stage 2 evaluation: refined modeling

- Label information
- chemical properties
- LC50
- Use pattern
- Risk quotient
- Registration recommendations
- Watch-list
Indicator #4: use pattern

- Pesticide use patterns with high exposure potentials to surface water:
  - *Aquatic* and *rice* pesticides
  - *Urban/residential* uses
  - Crops with *gravity irrigation* (DWR irrigation survey)
  - Crops with *top acreages* in California (PUR database and DWR land use survey)
  - *Winter* rain season application
  - *Pre-emergent* application
FIFRA pesticide regulation can prevent and solve water quality problems.

BUT... if we’re not PROACTIVE...

replacement products recreate the problem.

Estimated use of study list pyrethroids in the San Francisco Bay Area 2001-2004 (permethrin equivalents)
And the future is here:

Fipronil, Structural Applications in California

Pounds, Active Ingredient

Let’s get ahead of the curve!

This is where we want to be.

Diazinon 1990s
Pyrethroids 2000s
Fipronil 2010s
DDT 1960s
It’s not all about regulation...

- IPM Certification programs can help reduce stormwater pollution
Working together, we can solve sticky problems.

Photo courtesy D. Choe
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