

# Loading of Pesticides to Wastewater Catchments from Flea and Tick Topical Products

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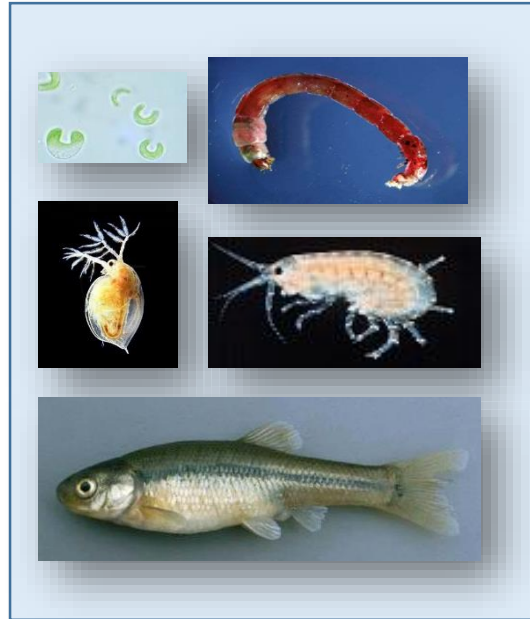
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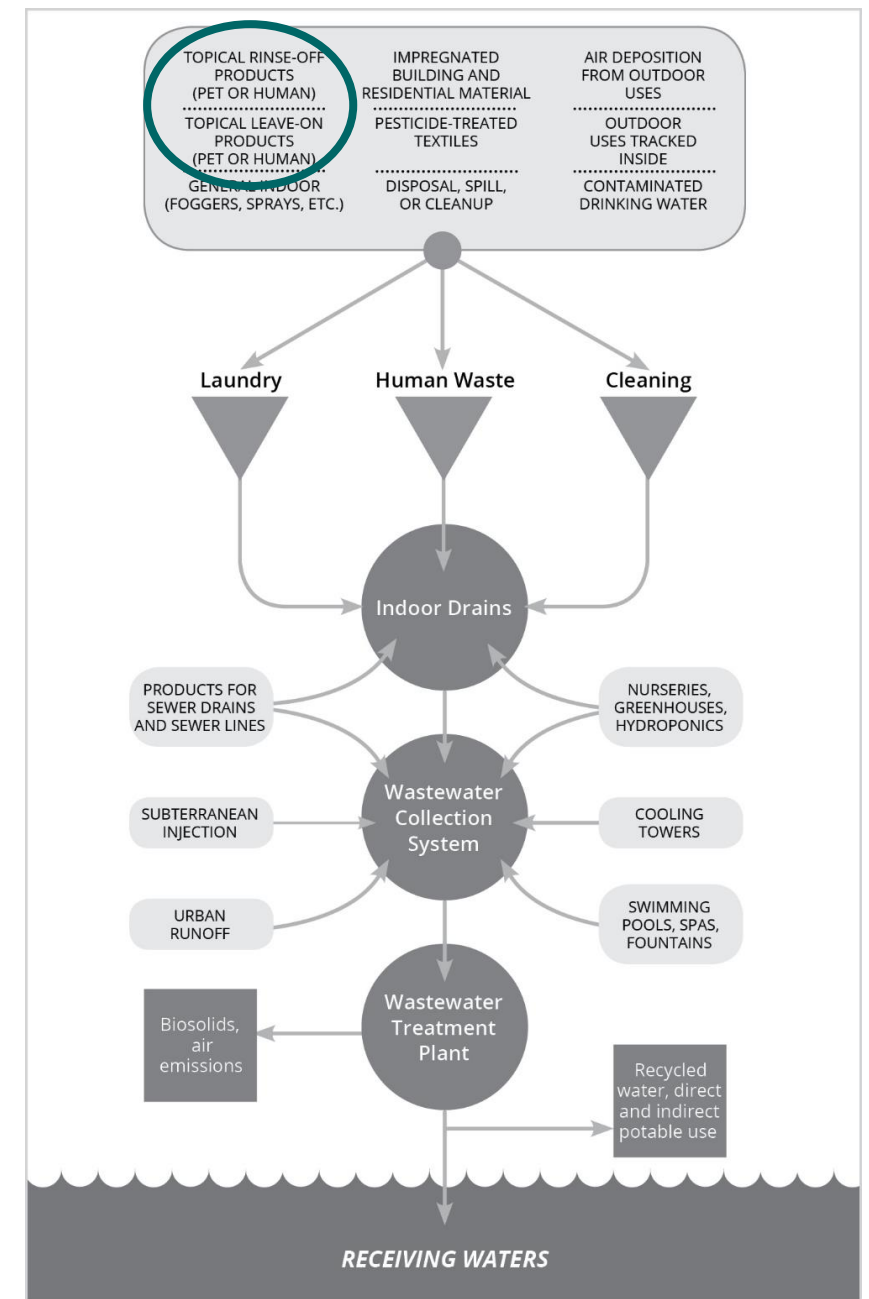
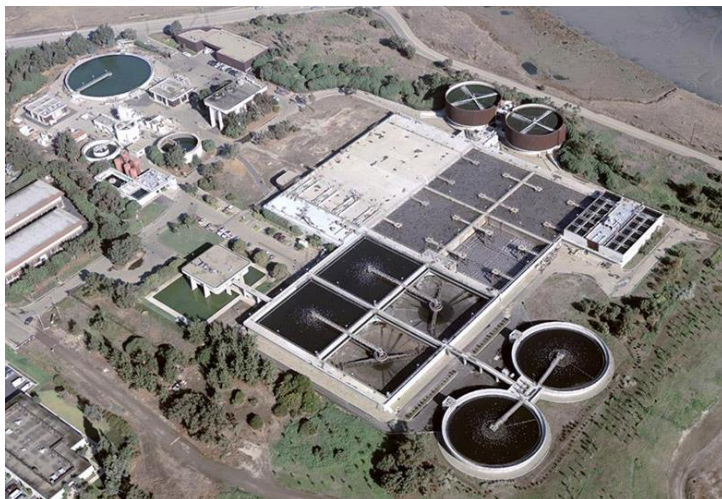


# Department of Pesticide Regulation Surface Water Protection Program

**Prevention**  
*Registration*



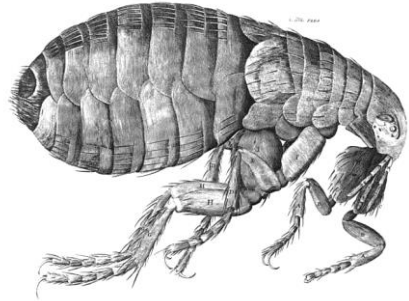
**Response**  
*Continuous Evaluation*



*Sutton et al., In ACS Symposium Series, vol. 1308, in press, 2018.*

# Flea and Tick Treatments

In California, 470 product registered for use on dogs and cats.



- Spot-on topical
- Shampoos and Sprays
- Collars
- Ingestible\*



Pesticide	# of Products	Max % Active Ingredient	USEPA Chronic Benchmark (ng/L)
S-Methoprene	127	11.8	51,000
Pyriproxyfen	125	45	15
Fipronil	105	9.8	11
Pyrethrins	98	0.97	860
Permethrin	75	50	1.4
Imidacloprid	60	10	10
Etofenprox	51	55	170

\*Regulated by Food and Drug Administration



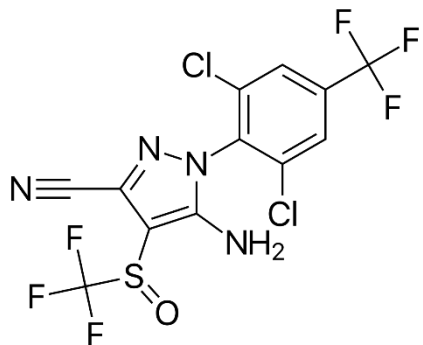
# What Fraction of Fipronil Spot-on Treatment Washes Off?



X 34

- 9.1% fipronil
- Four product sizes based on the dog's weight (0.067–0.402 grams fipronil)
- Recommended application every 30 days
- Most labels claim products are waterproof once dried, and none of the labels prohibit bathing or swimming post application.

2, 7, or 28 days ↓

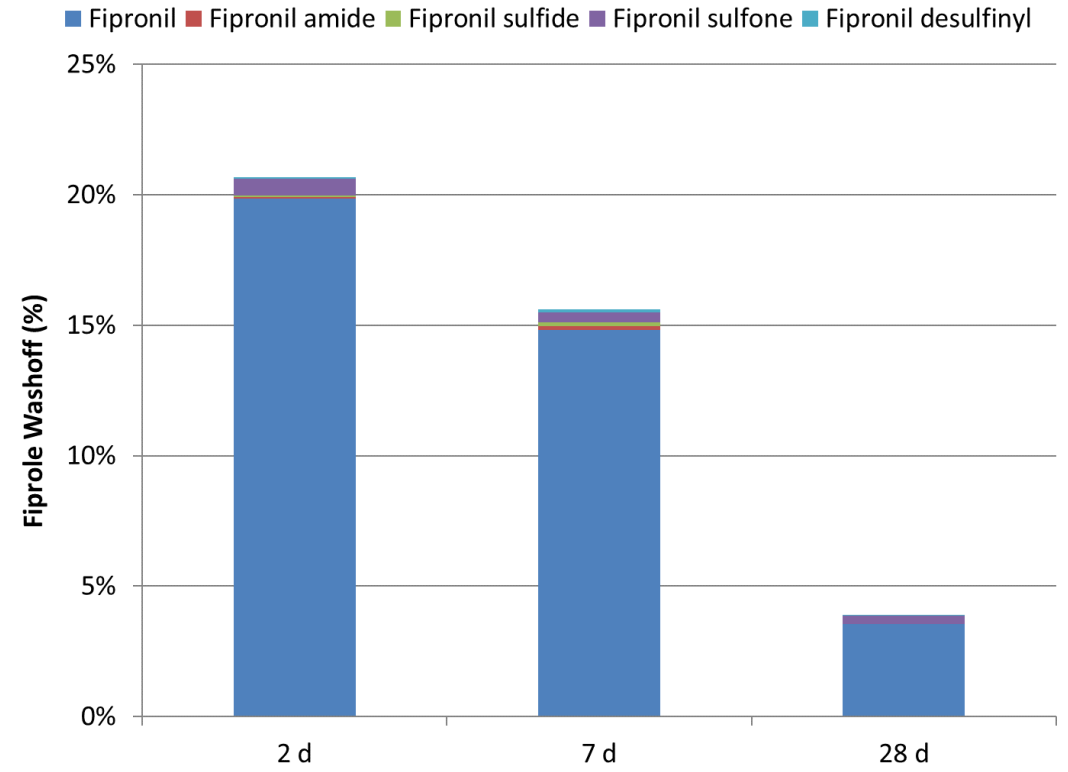
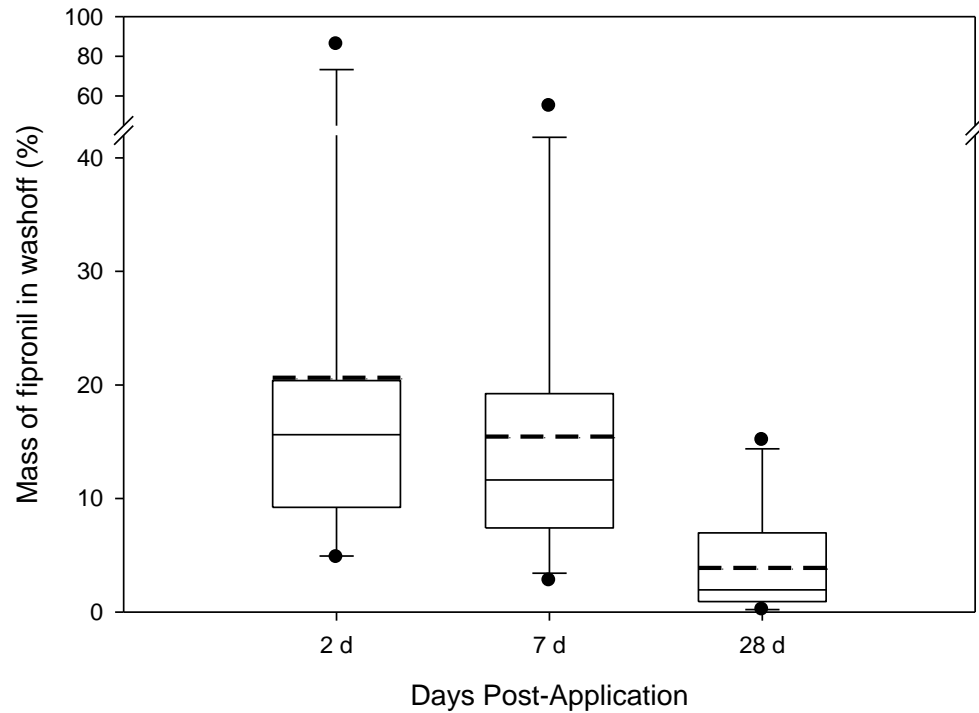


## LC-MS/MS

- Fipronil
- Fipronil amide
- Fipronil sulfide
- Fipronil sulfone
- Fipronil desufinyl



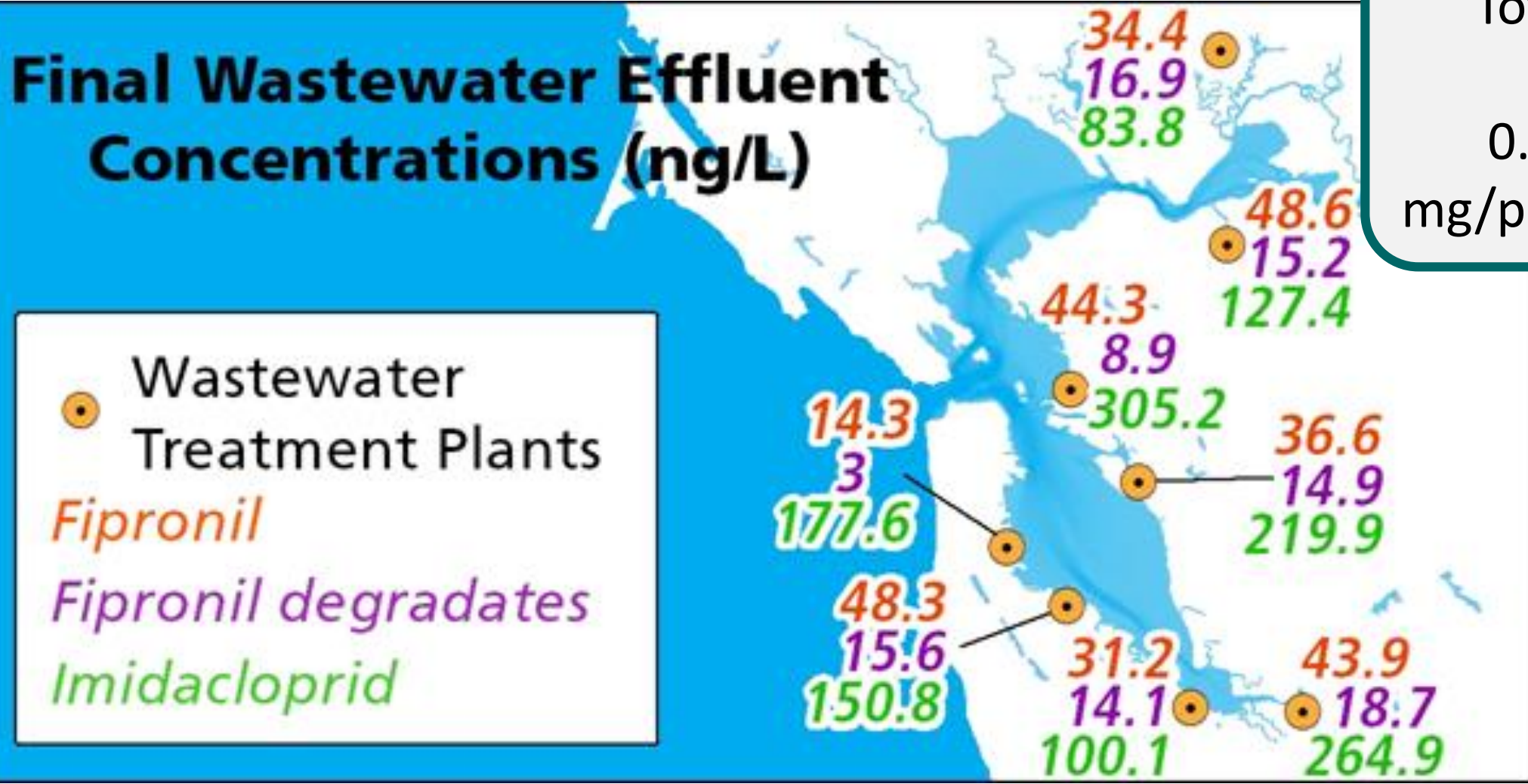
# Dog Wash-Off Results



- Fipronil in every sample
- Mass of total fiproles washed off ranged between 0.2–86.0% of total mass applied
- Degradates made up  $\leq 10\%$  of total mass, and largest fraction was in 28-day samples
- Total mass of fiproles washed off generally decreased with time post-application

# Final Wastewater Effluent Concentrations (ng/L)

 Wastewater Treatment Plants  
Fipronil  
Fipronil degradates  
Imidacloprid



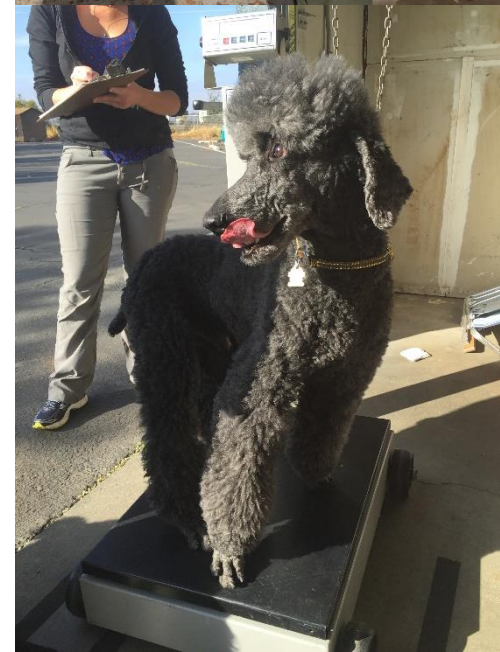
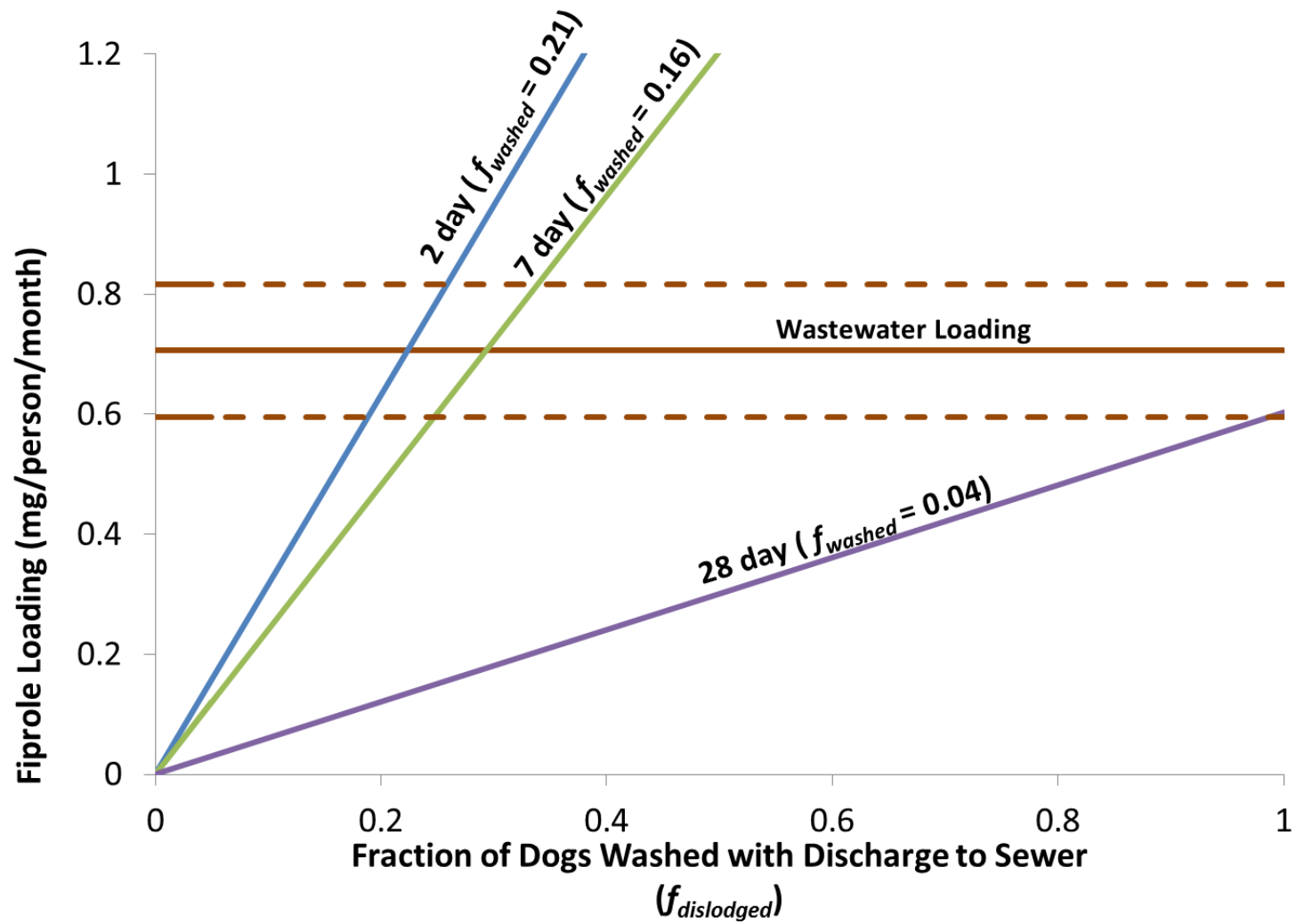
Total Fiprole Loading  
 $0.71 \pm 0.11$   
 mg/person/month

Sadaria, et al., 2017. *Environmental Toxicology & Chemistry*. 36 (6): 1473-1482.



TDC Environmental, LLC





Teerlink, et al., 2017. *Science of Total Environment*. 599-900: 960-966.



# Palo Alto Sewershed Sampling



- Routine Monthly Sampling

- 10 sub-sewershed laterals
- Influent 8 dates
- Effluent

- Specialty Sites

- Laundromat
- Pest Control Operator (PCO)
- Groomer ★ 4 dates

- 24-hour time-weighted composites



**Agilent LC-QTOF-MS**

ESI+ & ESI-

**Agilent GC-QTOF-MS**

NCI & EI

Quantitative Analysis 25

Compounds

Fipronil

Imidacloprid

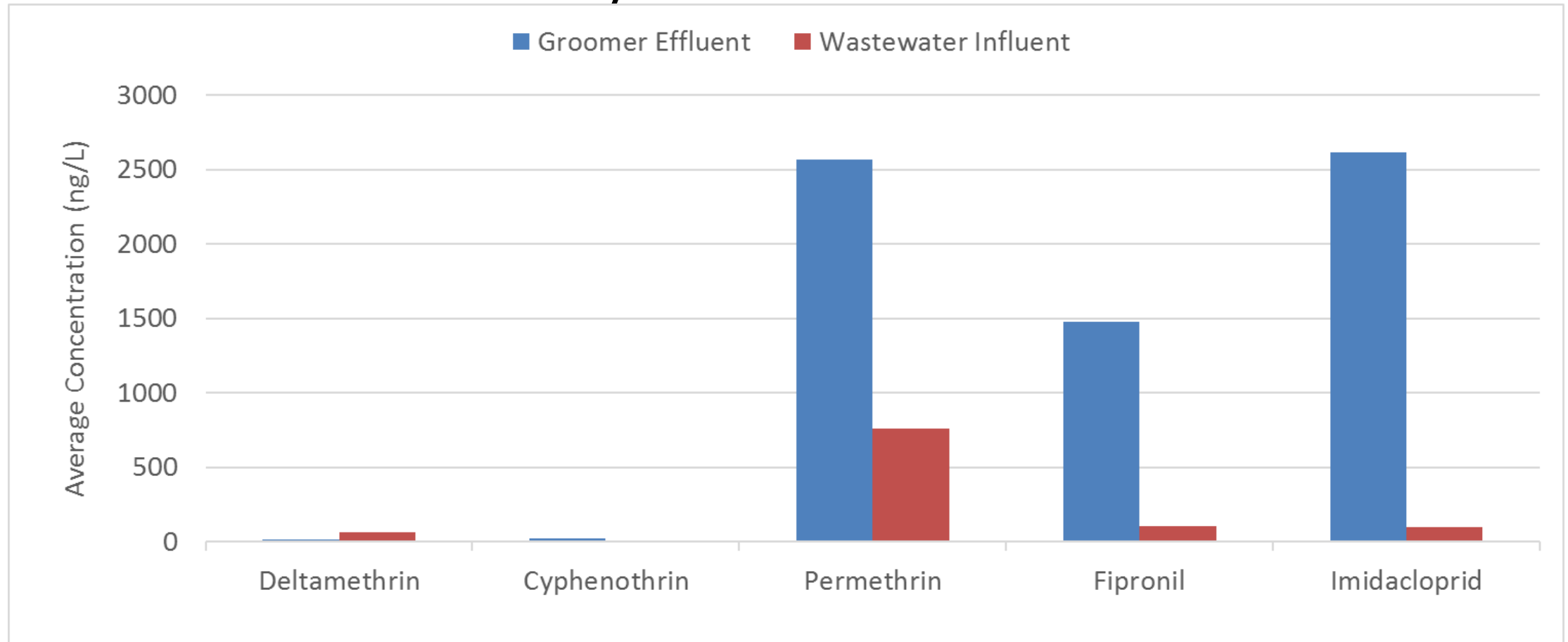
Pyrethroids

All-Ions Suspect Screening

Agilent Library



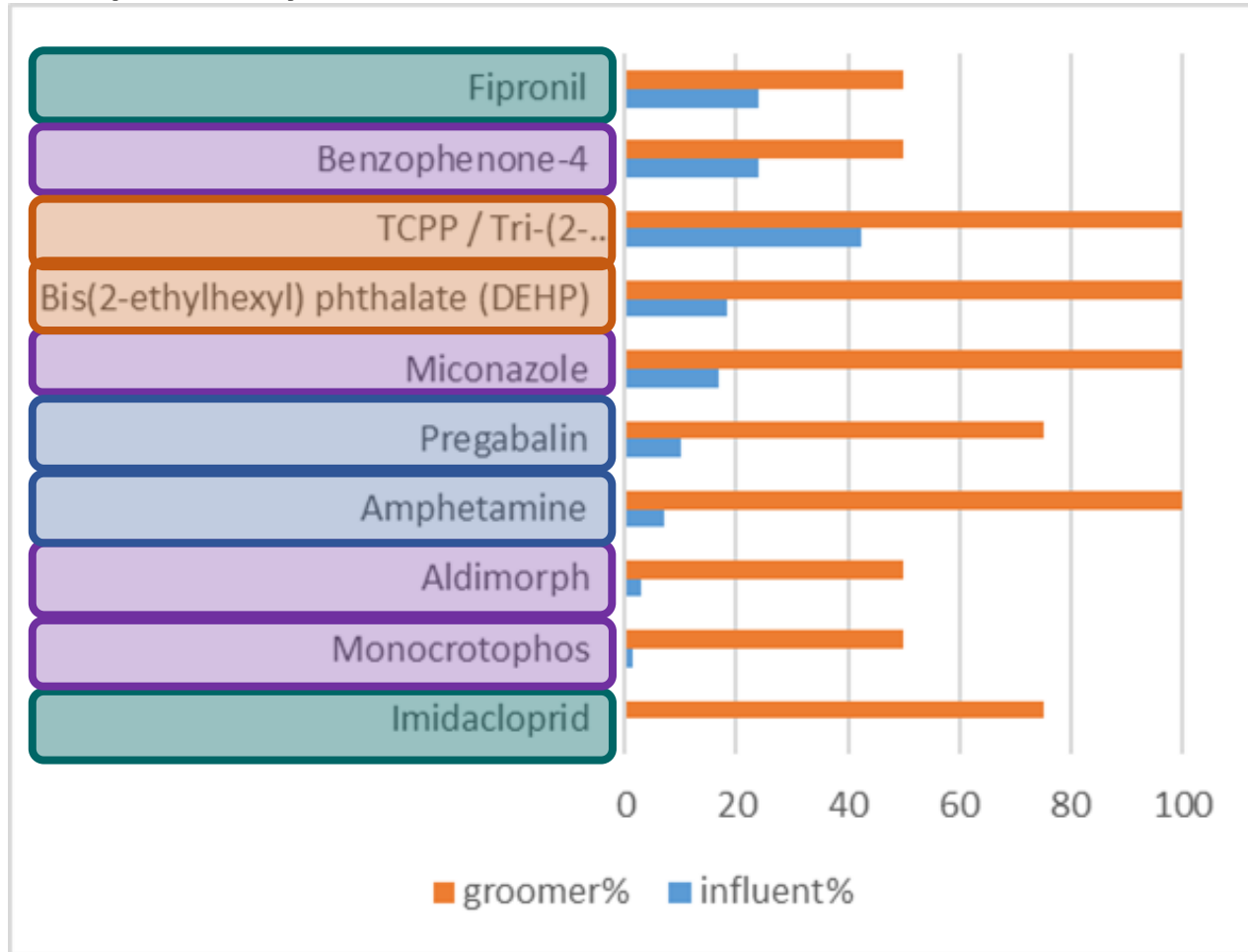
# Quantitative Analysis



- Four sampling days with 24 hour composites
- Results for 3 out 4 detections

# All-Ions Suspect Screening

Qualified suspects present in groomer samples more than twice as frequently as in influent and trunkline samples



Targeted Compounds

Other Topicals

Building Materials and PVC

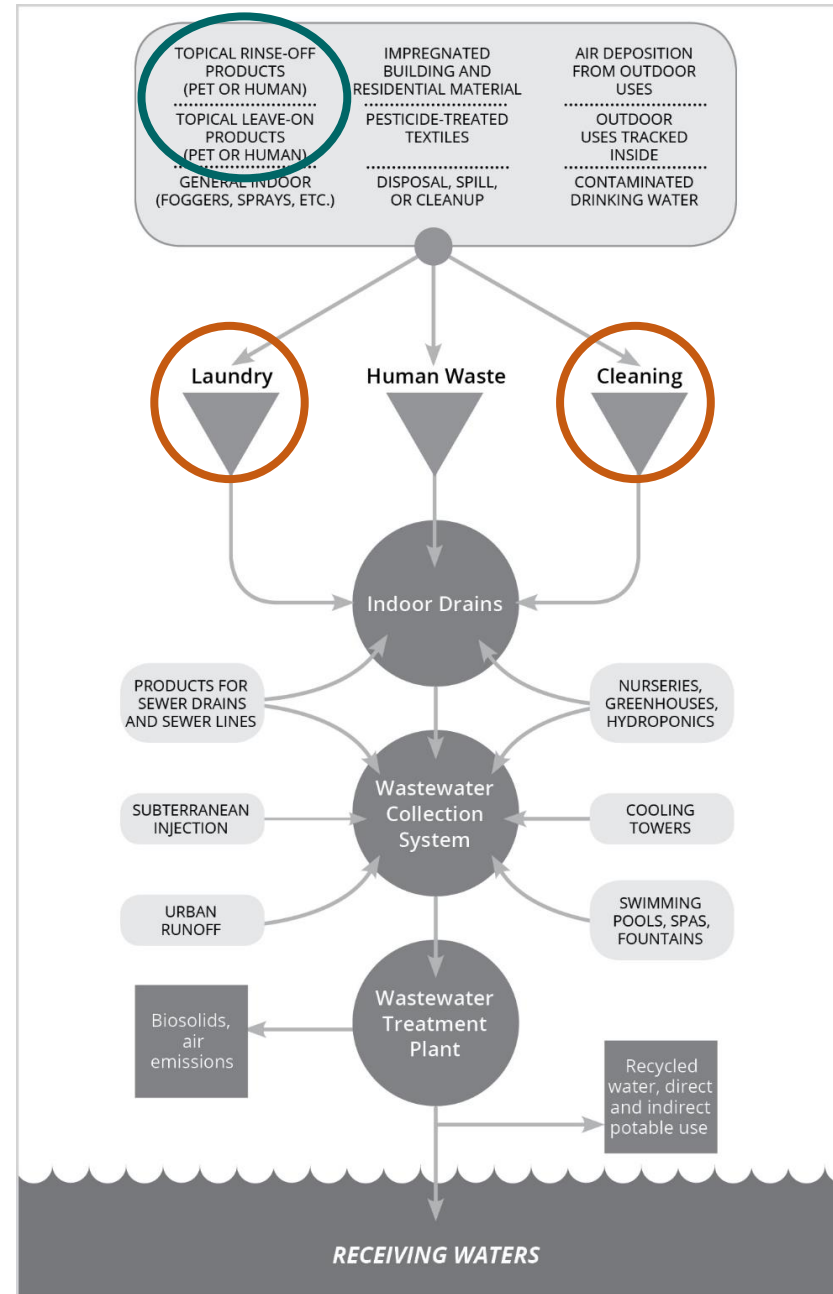
Pet ingestible

ADHD medication

Epilepsy medication

# Summary

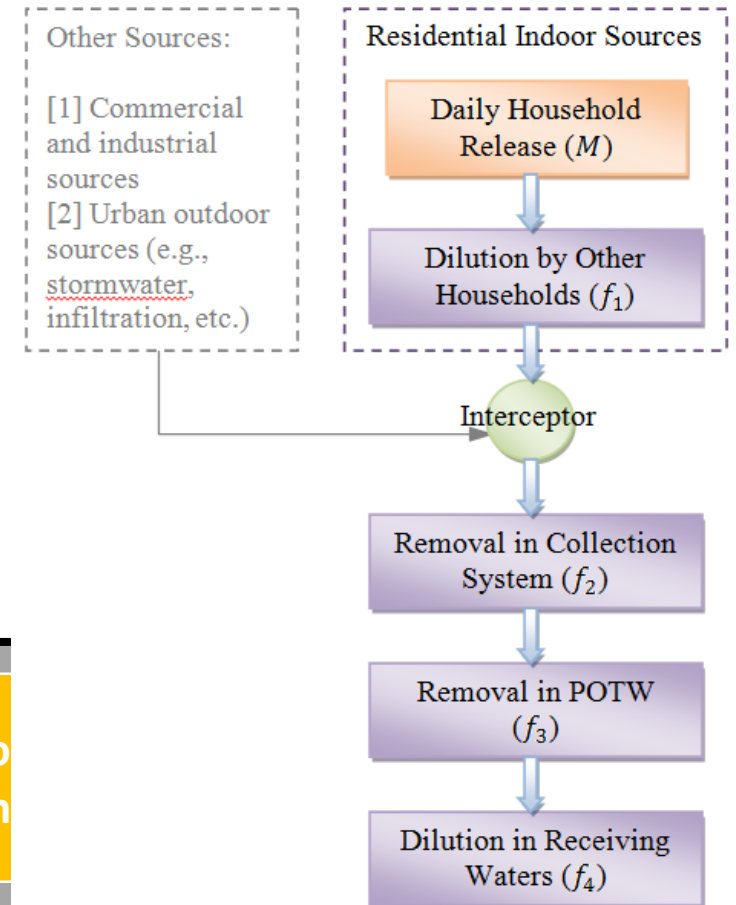
- Confirms pet use products enter wastewater catchment
- Additional residues may be introduced through:
  - Laundering pet bedding and human clothes
  - Human showering, hand washing, excretion
  - Cleaning indoor surfaces





# Implications for Preventative Work

- Develop Down-the-Drain Model to augment DPR's Pesticide Registration Evaluation Model (PREM)
- Allow for assessment of environmental impact of proposed indoor uses



# Acknowledgements

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