Introducing the Link Between Consumer Flea and Tick Control and Water Quality

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Today's Agenda

- Introductions
- Impacts of pesticidal products to wastewater
  - relation to toxicity, permitting, costs, future potable use of wastewater
- Scientific evidence specific to flea and tick treatments
- Thoughts re alternatives to on-pet and in-home treatments
- Messages for consumers
- Resources for follow-up information
- Discussion

Today's Participants

- Bay Area Clean Water Agencies (BACWA)
  - Stephanie Hughes, PE, Santa Clara University and Consulting Engineer
  - Melody LaBella, PE, Central San
  - Kelly Moran, PhD, TDC Environmental
- San Francisco Bay Regional Water Quality Control Board (Regional Board)
  - Debbie Phan
  - James Parrish
- American Veterinary Medical Association (AVMA)
  - Camille Fischer, DVM, AVMA Committee on Environ. Issues
  - Warren J. Hess, DVM, Assistant Director, AVMA Division of Animal and Public Health
  - Judith Marteniuk, DVM, MS Professor Emeritus Large Animal Clinical Sciences, Michigan State University
  - Mike Murphy, DVM, Director of the AVMA division of Animal and Public Health
  - Tina Wismer, DVM, MS, DABVT, DABT, Senior Director, ASPCA Animal Poison Control Center

Organizations involved in this project

- Bay Area Clean Water Agencies (BACWA)
- City of Palo Alto
- San Francisco Estuary Institute
- San Francisco Dept of Environment
- San Francisco Public Utilities Commission
- TDC Environmental, LLC

Who is BACWA?

BACWA
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- A local government agency created by a joint powers agreement in 1984
- Includes 55 publicly owned wastewater treatment facilities ("POTWs") and sewer collection system agencies serving 7.1 million San Francisco Bay Area residents

*"Conventional **wastewater treatment technologies are generally ineffective at removing pesticides from wastewater**, with high removal efficiency only observed in the case of highly hydrophobic compounds, such as pyrethroids. **Aquatic life reference values can be exceeded in undiluted effluents**. For example, seven compounds, including three pyrethroids, carbaryl, fipronil and its sulfone degradate, and imidacloprid, were detected in treated wastewater effluent at levels exceeding U.S. Environmental Protection Agency (US EPA) aquatic life benchmarks for chronic exposure to invertebrates."*

Sutton et al. (2019). "*Occurrence and Sources of Pesticides to Urban Wastewater and the Environment*" in Goh et al.; Pesticides in Surface Water: Monitoring, Modeling, Risk Assessment, and Management ACS Symposium Series; American Chemical Society: Washington, DC, 2019.

Pesticide discharges to the sewer can harm the environment and be costly

- Potential for pesticides to cause or contribute to wastewater treatment process interference
- Adverse impacts to receiving waters
- Permit compliance issues
  - including new, more stringent effluent limits for effluent chronic toxicity
- Exposing POTWs to the potential for third party lawsuits under the Federal Clean Water Act (CWA)
- Pesticides in the byproduct of potable reuse treatment – reverse osmosis concentrate – may increase cost or – in the most difficult cases – entirely prevent potable reuse of municipal wastewater effluent.

Numerous Bay Area agencies are actively engaged in recycled water projects – for both non-potable and potable demands

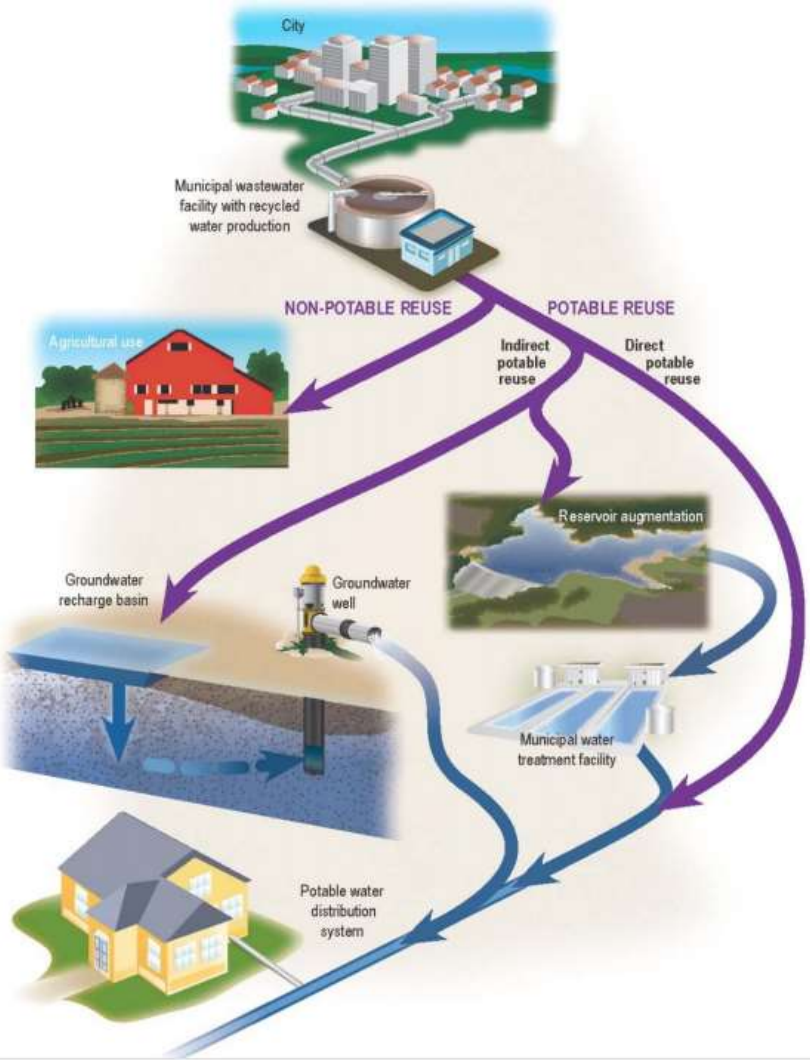
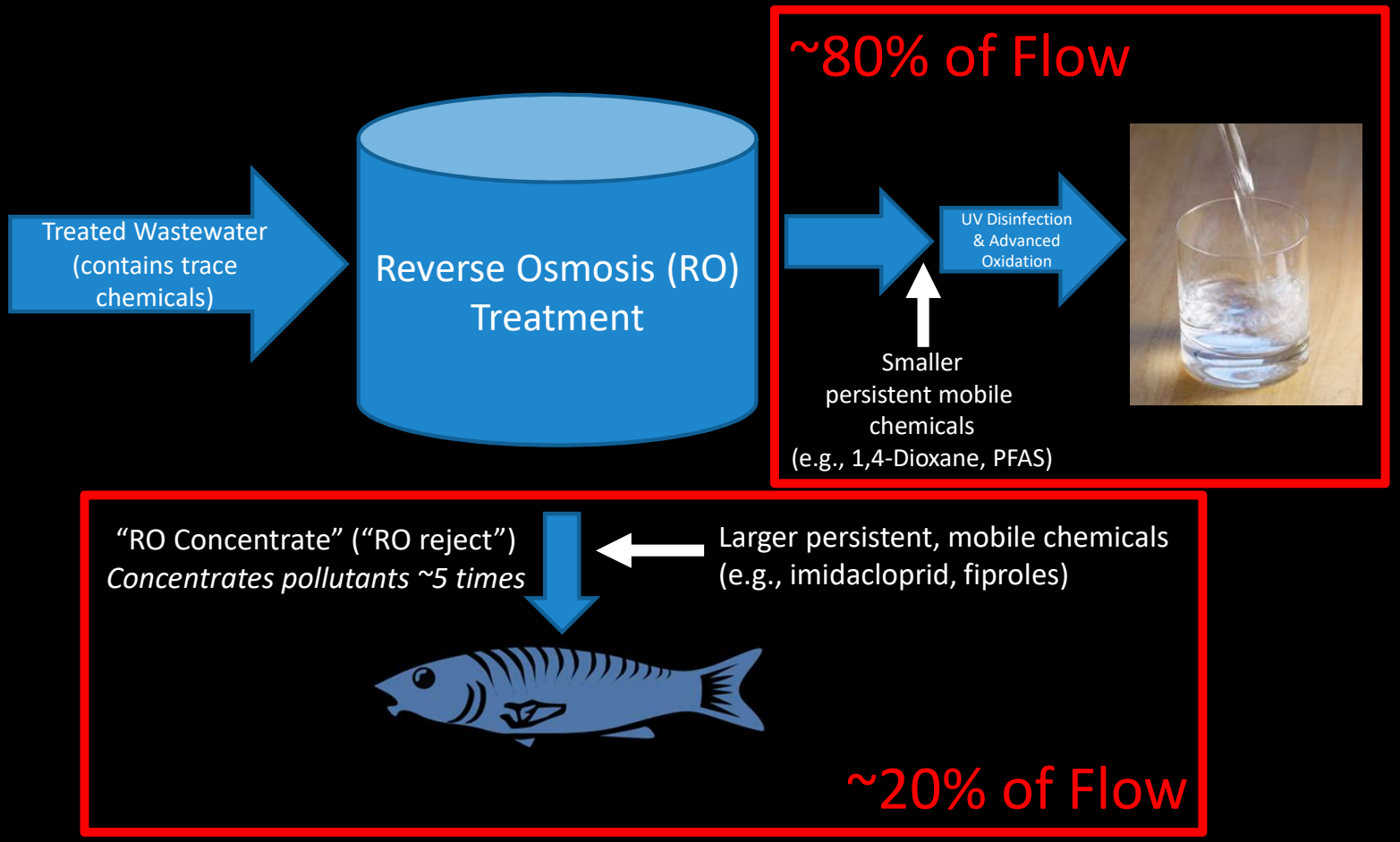
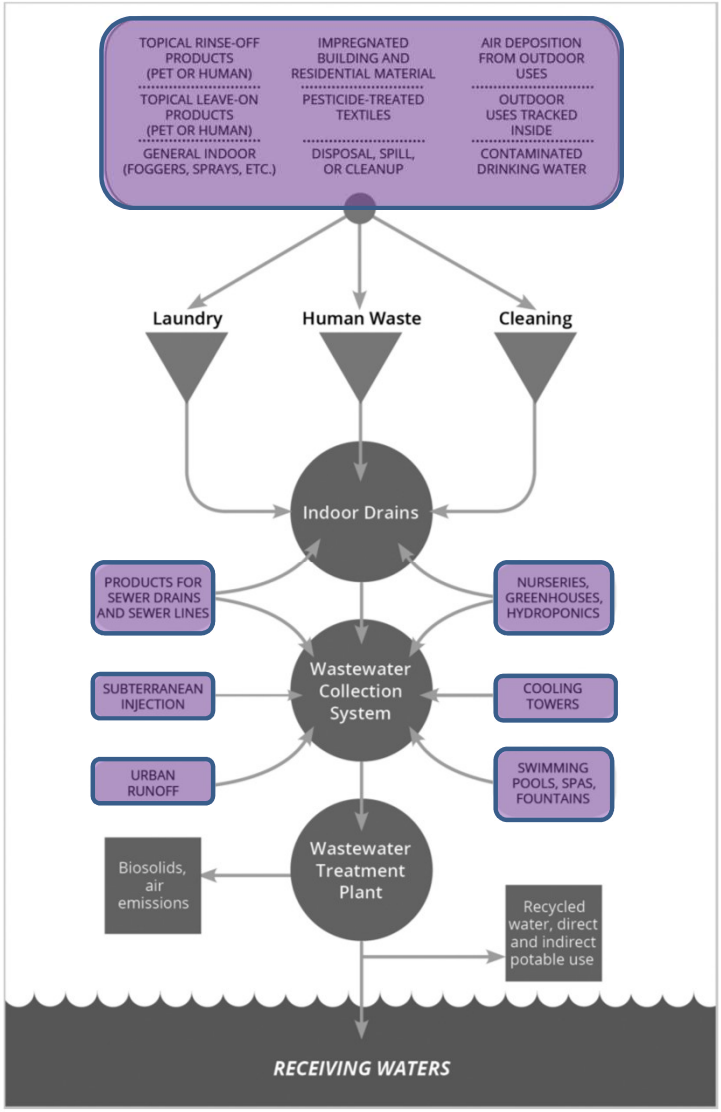


Image source:
http://bawsca.org/uploads/userfiles/files/WATER%20RECYCLING%20AND%20POTABLE%20REUSE_Final_7_12_17.pdf

Pesticides and advanced treatment of municipal wastewater for potable use





Sutton et al. (2019). "Occurrence and Sources of Pesticides to Urban Wastewater and the Environment" in Goh et al. *Pesticides in Surface Water: Monitoring, Modeling, Risk Assessment, and Management*. ACS Symposium Series; American Chemical Society: Washington, DC, 2019.

POTW Pesticides Conundrum

- 100s of pesticides used & discharged
- Many pass through POTWs
- Some toxic as low as ng/L
- Toxicity in CA surface waters usually linked to current pesticides
- POTW treatment changes unrealistic
  - So many pesticides, such low concentrations!
- State law prohibits local pesticide regulation

BACWA seeks to be proactive on pesticides

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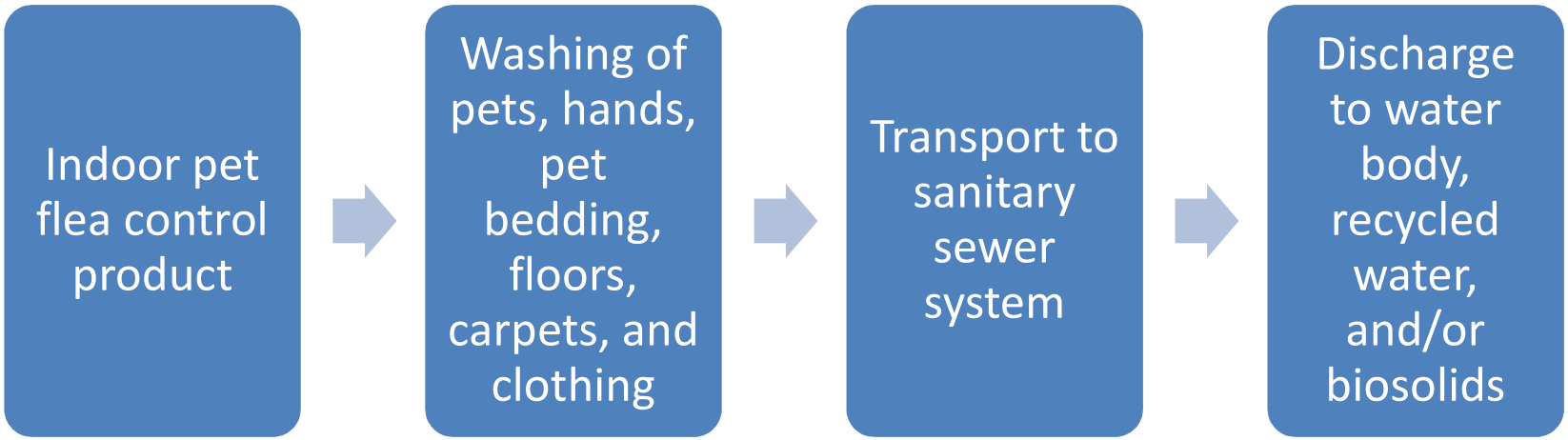
- Science & monitoring partnerships – collaborating with the San Francisco Estuary Institute and CA Department of Pesticide Regulation (DPR)
- Regulatory engagement – communicating with U.S. EPA and DPR as pesticides are registered or in review for re-registration
- Safer alternatives – identifying alternatives and communicating this to consumers, pest control operators, and other stakeholders

Our Concerns Specific to Flea and Tick Control

- *Pesticides from common flea and tick control products are reaching the sewer systems.*
- *Pesticide concentrations subsequently discharged into San Francisco Bay can exceed toxicity thresholds for aquatic invertebrates.*
- *Flea/tick control pesticides appear to be the biggest barrier to disposal of the byproduct of advanced wastewater treatment to create potable water supply*

How Pet Treatments Travel to Sewer Systems and San Francisco Bay



Pesticides of concern are those that exhibit aquatic toxicity and persist in the environment

- Bifenthrin
- Deltamethrin
- Fipronil *
- Imidacloprid *
- Indoxacarb
- Permethrin

*** Uses of fipronil and imidacloprid are currently under review by the California Department of Pesticide Regulation due to possible health risks posed to adults and children.**

Which indoor-use products contain pesticides of concern?

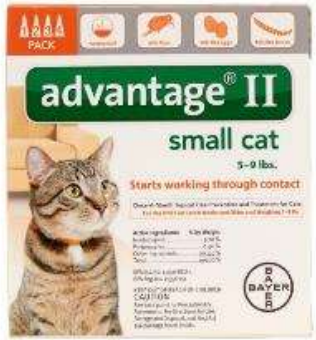
- Topicals
  - Collars
  - Spot treatments
- Shampoos and dusts
- House sprays and foggers

How Collars Work

- Work topically on the fur/skin
  - Requires direct contact with the adult flea, eggs or larvae
- Majority only include an “adulticide” as the active ingredient
  - Though some studies indicate that the pet dander is larvecidal
- Typically last 6-8 months as active ingredient permeates slowly out of the collar over time
- Collars may release the active ingredient during storage so that when it is first applied to the pet, it initially exposes the pet to a large initial dose of the active ingredient.
  - "Long-Acting Control of Ectoparasites: A Review of Collar Technologies for Companion Animals," Witchey-Lakshmanan, L., Advanced Drug Delivery Reviews, 1999, Vol 38, pp 113–122.

How (Most) Topicals Work

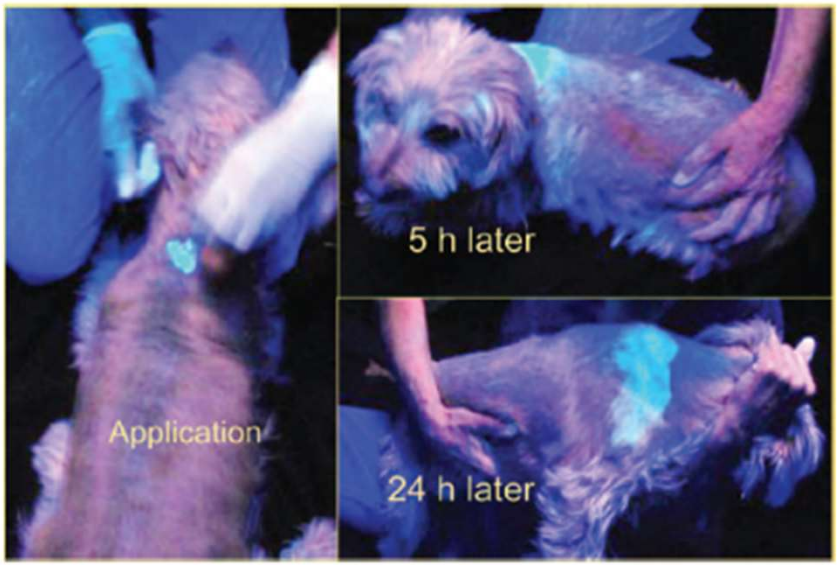
- Work topically on the fur/skin (with one exception)
  - Requires direct contact with the adult flea, eggs or larvae
- All include an adulticide
  - Many blend 2 or 3 active ingredients so as to also act as an insect growth regulator
- According to manufacturers they “don’t wash off”



Revolution is the one topical treatment that works systemically

- It is a product that is **applied topically** but breaks the skin/blood barrier and **works as a systemic (akin to oral medications)**
- Some % of the active ingredient remains on the skin/ fur (and has topical / contact impact)
- Because it is a systemic treatment it is considered a pharmaceutical rather than a pesticide and is regulated by FDA instead of EPA and requires a prescription

Topical treatments do not remain on the pet



Researchers incorporated a fluorescent dye into the spot treatment to photograph the spread.

Fig. 3. Handling of a dog treated with Frontline® containing 1% Tinopal® CBS-X fluorescent tracer revealed contamination of hands during routine application and handling of a treated dog (color figure available online).

"Fate and Distribution of Fipronil on Companion Animals and in Their Indoor Residences Following Spot-On Flea Treatments," Bigelow Dyk, M., et al., J. of Env Science and Health, Part B, 2012, Vol 47, pp 913-924.

Spot-on Products

- Product labels state “waterproof” once dry
- Common product includes 9.1% Fipronil
- Recommended frequency of application 30 days

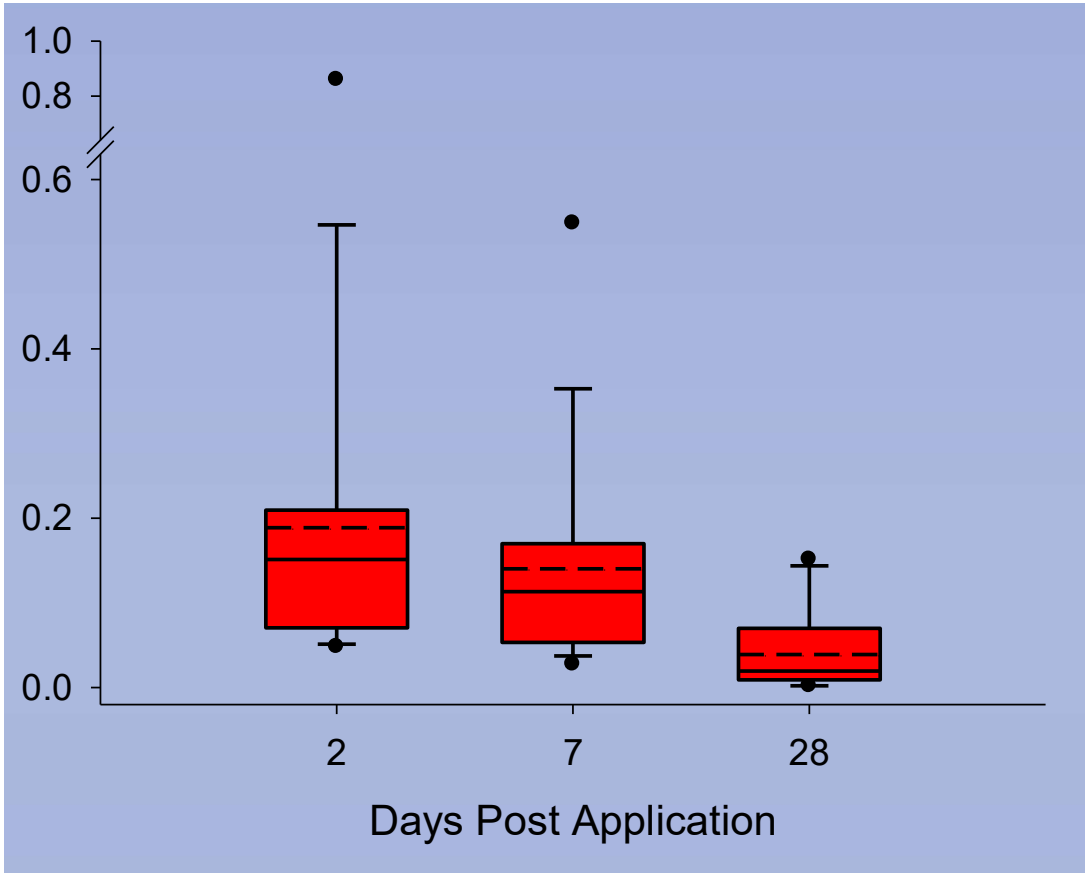
DPR conducted a study in which they washed volunteer dogs 2, 7, or 28 days post application.

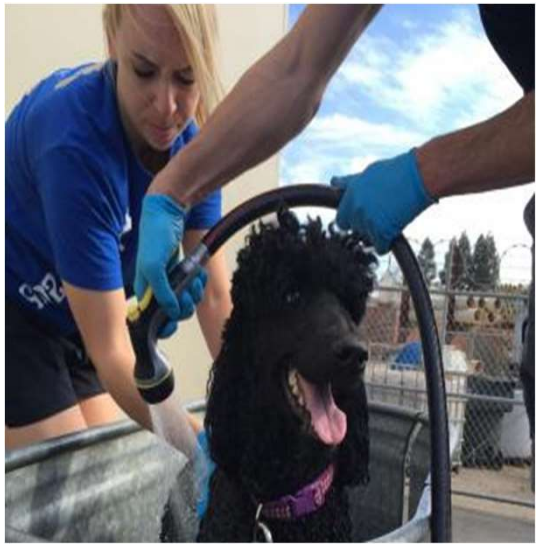
Teerlink, J., J Hernandez, R Budd. 2017. Fipronil washoff to municipal wastewater from dogs treated with spot-on products. Sci Total Environ 599-600: 960-966.

Slide source: California DPR

DPR Study: Fipronil Washes Off Pets

Wash-off continues for at least 28 days





Teerlink, J., J Hernandez, R Budd. 2017. Fipronil washoff to municipal wastewater from dogs treated with spot-on products. Sci Total Environ 599-600: 960-966.

Evidence for fogger residue transfer to people

Dermal contact study regarding the transfer of residue to people and their clothing following a chlorpyrifos/allethrin fogger treatment in carpeted rooms.

METHOD:

Foggers were set up per label instructions and activated for 2 hours followed by room ventilation. Participants later conducted a standardized exercise routine in specific locations in the room. Shirts, tights, gloves and socks were subsequently collected for analysis.

RESULTS:

- Both allethrin and chlorpyrifos were detected in <u>all</u> exposed clothing samples
- When the volunteer participants showered, the residue on their heads and other bare skin transferred to the sewer

Ross, J., T. Thongsinthusak, H.R. Fong, S. Margetich, R. Krieger, California Department of Food and Agriculture, "Measuring Potential Dermal Transfer of Surface Pesticide Residue Generated from Indoor Fogger Use: An Interim Report," Chemosphere, Vol.20, Nos.3/4, pp 349-360, 1990.

In-House Foggers vs. Crack-and-Crevice Sprays

- UC Riverside study sought to understand human health consequences of indoor insecticidal treatments, comparing a fogger, a perimeter spray, crack-and-crevice sprays, and spot sprays.
- Each application type produced a surface residue
- Fogger applications resulted in highest chemical residue
- Crack-and-crevice and spot applications deposited high levels of pesticide directly at the target site

Regulatory Toxicology and Pharmacology 58 (2010) 189–195

Contents lists available at ScienceDirect

Regulatory Toxicology and Pharmacology

journal homepage: www.elsevier.com/locate/yrtph

Deposition and spatial distribution of insecticides following fogger, perimeter sprays, spot sprays, and crack-and-crevice applications for treatment and control of indoor pests

James J. Keenan [a], John H. Ross [b], Vincent Sell [c], Helen M. Vega [a], Robert I. Krieger [a,*]

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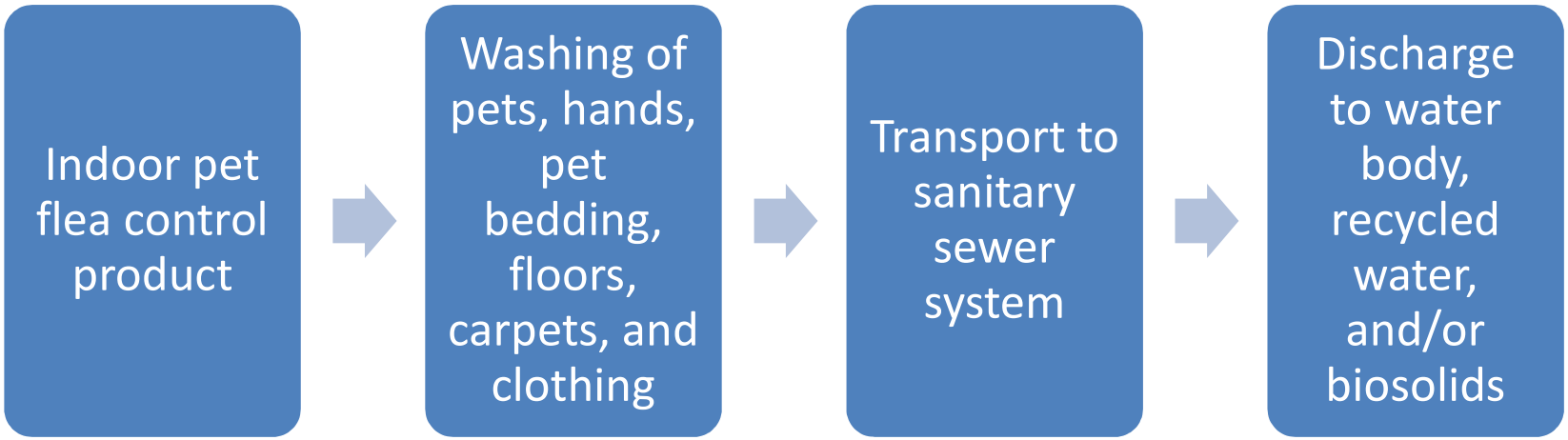
[b] Gem Quality Risk, Inc. 5233 Marimore, Carmichael, CA 95608, United States
[c] Washburn & Sons, 807 Center Street, Riverside, CA 92507, United States

"Crack-and-crevice application…appears to be the most effective application type when one is trying to decrease potential exposure and maintain efficacy of treatment."

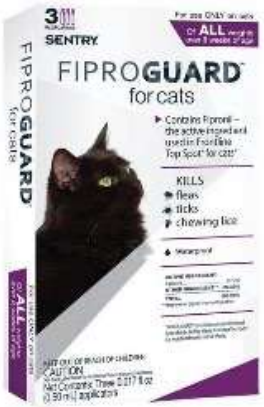
Additional research is underway to better understand sources of pesticides to sewer systems

- Evaluation of California pesticide sales data
  - Comparing indoor and outdoor use
  - Further parsing indoor uses such as on-pet, foggers, and clothing
- Studying pesticide concentrations throughout urban “sewersheds” (collection systems)
  - Including specific assessments of commercial laundries, groomers, and cannabis operations
  - Preliminary results: pet use products enter throughout the entire sewer system and observe higher concentrations at groomer sites
- Fogger study
  - To estimate the amount of pesticide that reaches the sewer
- Ongoing POTW monitoring (influent, effluent, biosolids)
  - To better understand which pesticides warrant addition investigation

How Pet Treatments Travel to Sewer Systems and San Francisco Bay



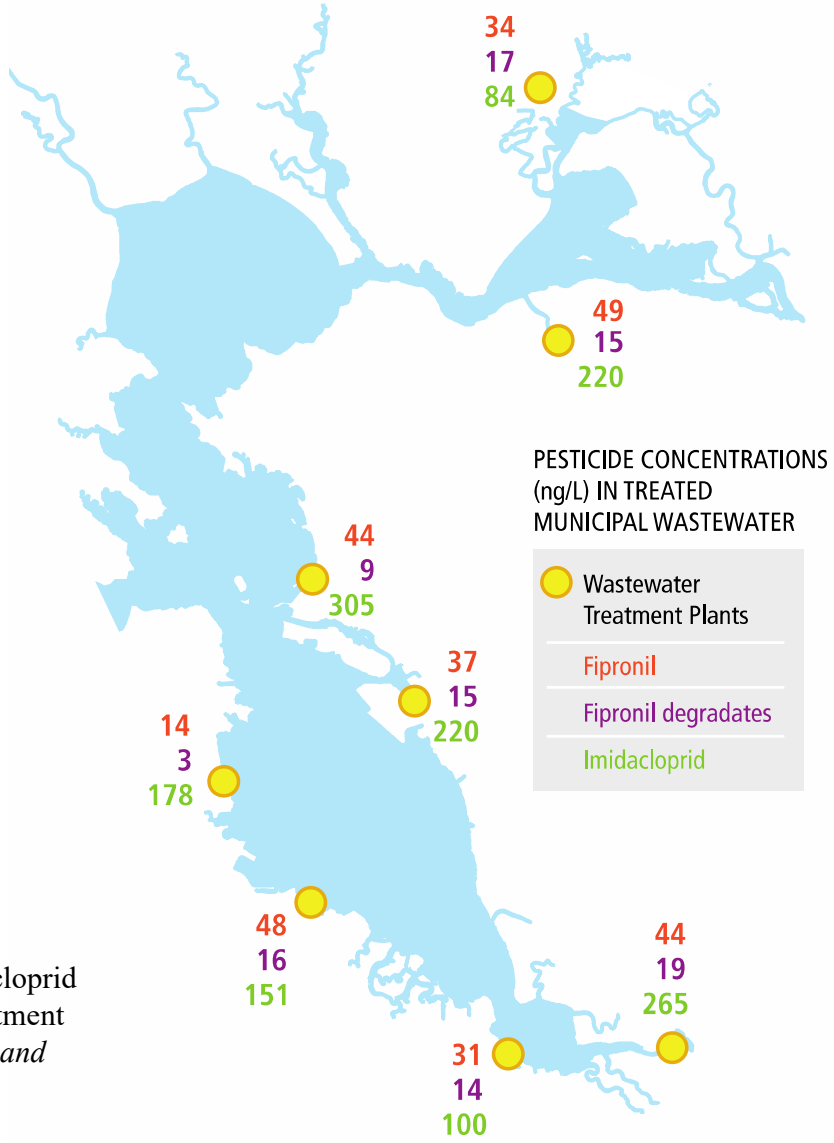
Focus on Imidacloprid and Fipronil



Focus on Imidacloprid and Fipronil

- Common “spot on” topical treatments
- Imidacloprid, fipronil and degradates found in wastewater effluent sometimes at concentrations exceeding toxicity thresholds for sensitive aquatic organisms.
- California’s Dept of Pesticide Regulation is:
  - Evaluating exposure risk in the home
  - Considering **significant** mitigation measures to reduce consumer and child exposure

We have evidence that pyrethroids, fipronil and imidacloprid pass through wastewater treatment at concentrations > toxicity thresholds for sensitive organisms



Sadaria, A.M. et al. 2017. Passage of Fiproles and Imidacloprid from Urban Pest Control Uses Through Wastewater Treatment Plants in Northern California. *Environmental Toxicology and Chemistry*. 36 (6), 1473-1482.

Summary of Our Concerns

- Pesticide active ingredients:
  - transport around the home
  - wash off (contrary to product labels)
  - observed in wastewater effluent and waterbodies
    - sometimes at concentrations toxic to sensitive aquatic species

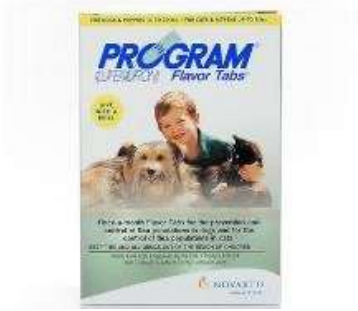
- Many active ingredients exhibit aquatic toxicity and persist in the environment, such as:
  - Bifenthrin
  - Deltamethrin
  - Fipronil *
  - Imidacloprid *
  - Indoxacarb
  - Permethrin

* DPR is evaluating public health impact

What about alternatives for flea control?

On-Pet Controls: Oral Medications

- Systemic
  - Requires adult flea to bite the animal
- Active ingredient in most are adulticides
  - The active ingredient in Program is an insect growth regulator
- Typically monthly or quarterly doses
- Although rare, adverse reactions can include vomiting, lethargy
- Prescription rather than OTC (therefore regulated by FDA, not EPA)



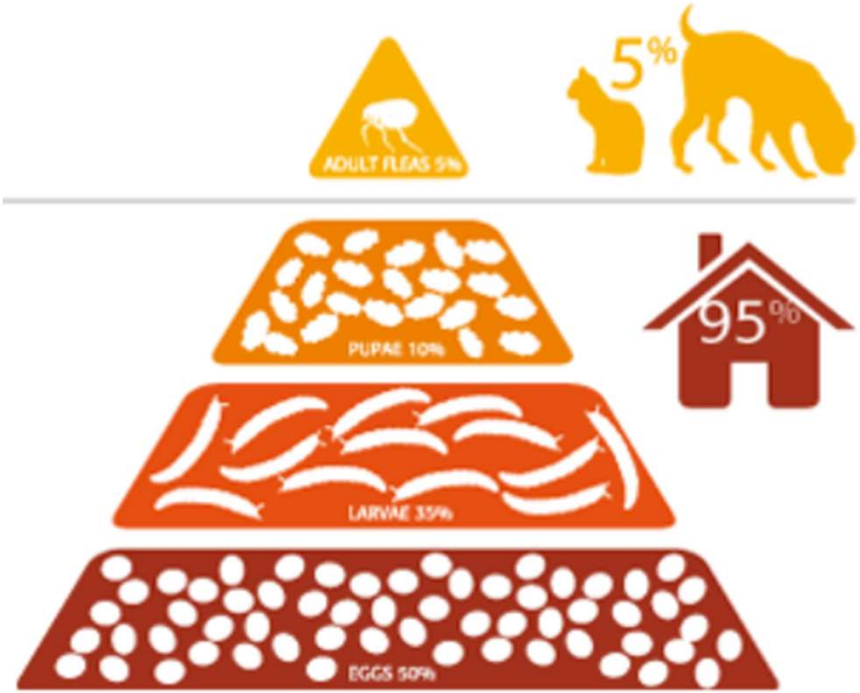
What about effectiveness of systemics versus topicals?

- Might systemics be more effective?
  - More accurate application method
  - More direct approach (flea bites animal rather than happens upon the topical application)
  - The active ingredient is within the pet's bloodstream rather than being licked off or diluted around the home

"In this study systemically acting insecticides such as nitenpyram, and the topically applied but systemically active insecticide selamectin, were ***more effective*** *in interfering with flea blood feeding* ***than were imidacloprid and fipronil.****"*

"Flea blood feeding patterns in cats treated with oral nitenpyram and the topical insecticides imidacloprid, fipronil and selamectin," McCoy, c., et al., Veterinary Parasitology, Vol. 156, pp 293-301, 2008.

Of course, the flea pyramid suggests that relying on on-pet treatments may not be most effective

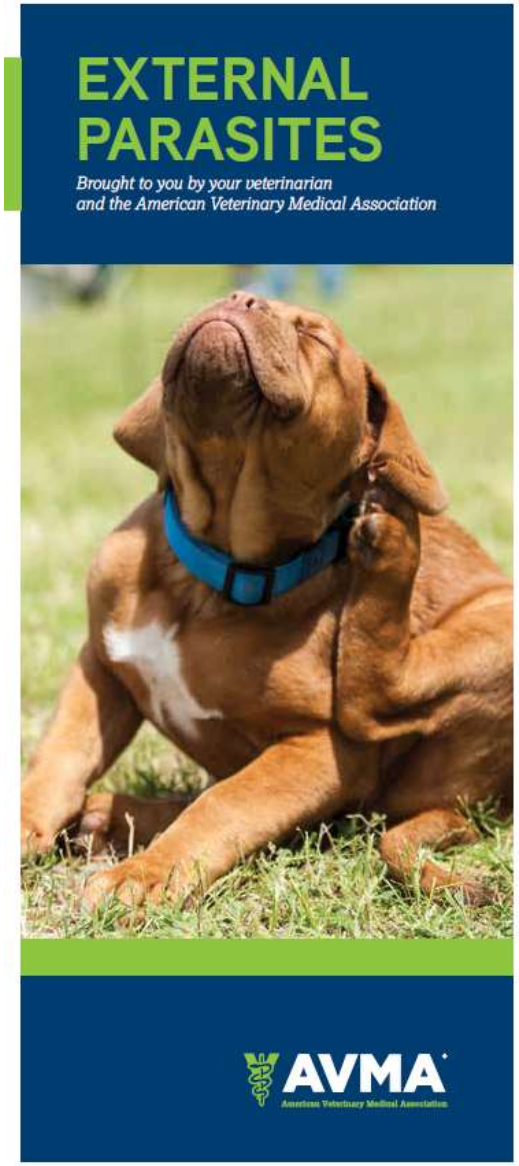


"Flea Control Failure? Myths and Realities," Halos, L., et al., Trends in Parasitology, May 2014.

AVMA outreach materials highlight this issue

"Because much of the flea's life cycle is spent off of your pet, ***treating only your pet will not eliminate the problem****. If you kill the adult fleas and do not kill the eggs, larvae and pupae, your pet will become reinfested when these fleas become adults and the cycle will start all over again. Therefore, in addition to treating your pet,* ***reduce the flea population in your house by thoroughly cleaning your pet's sleeping quarters and vacuuming floors and furniture that your pet comes in contact with frequently. Careful and regular vacuuming/ cleaning of the pet's living area helps to remove and kill flea eggs, larvae, and pupae****."*

American Veterinary Medical Association, "External Parasites" brochure from AVMA web site, January 2016.



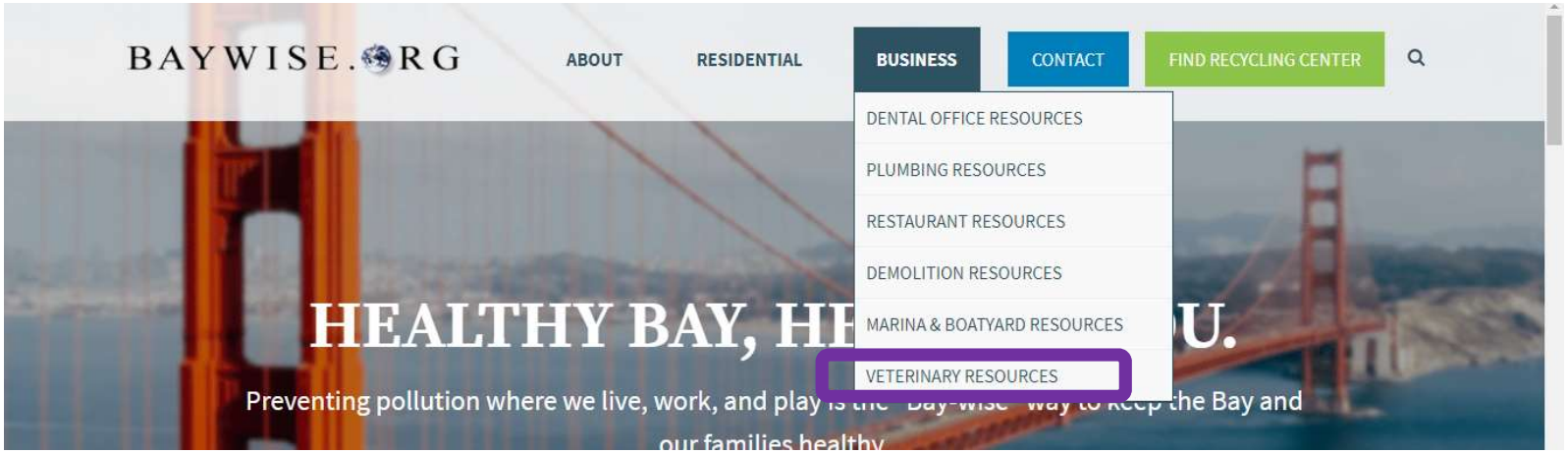
BACWA's Outreach Messages

Most Important: mechanical controls (vacuuming, bed washing)
Avoid: topical collars and spot products
Avoid: fipronil, indoxacarb, imidacloprid, bifenthrin, deltamethrin, and permethrin
Consider: talking to your vet about oral medication

BACWA Outreach Efforts

- Communication with CVMA
- Outreach to local VMAs
  - Provide newsletter articles
  - Speak at monthly meetings
- Social media campaigns
- Educational web pages

Web site is www.baywise.org: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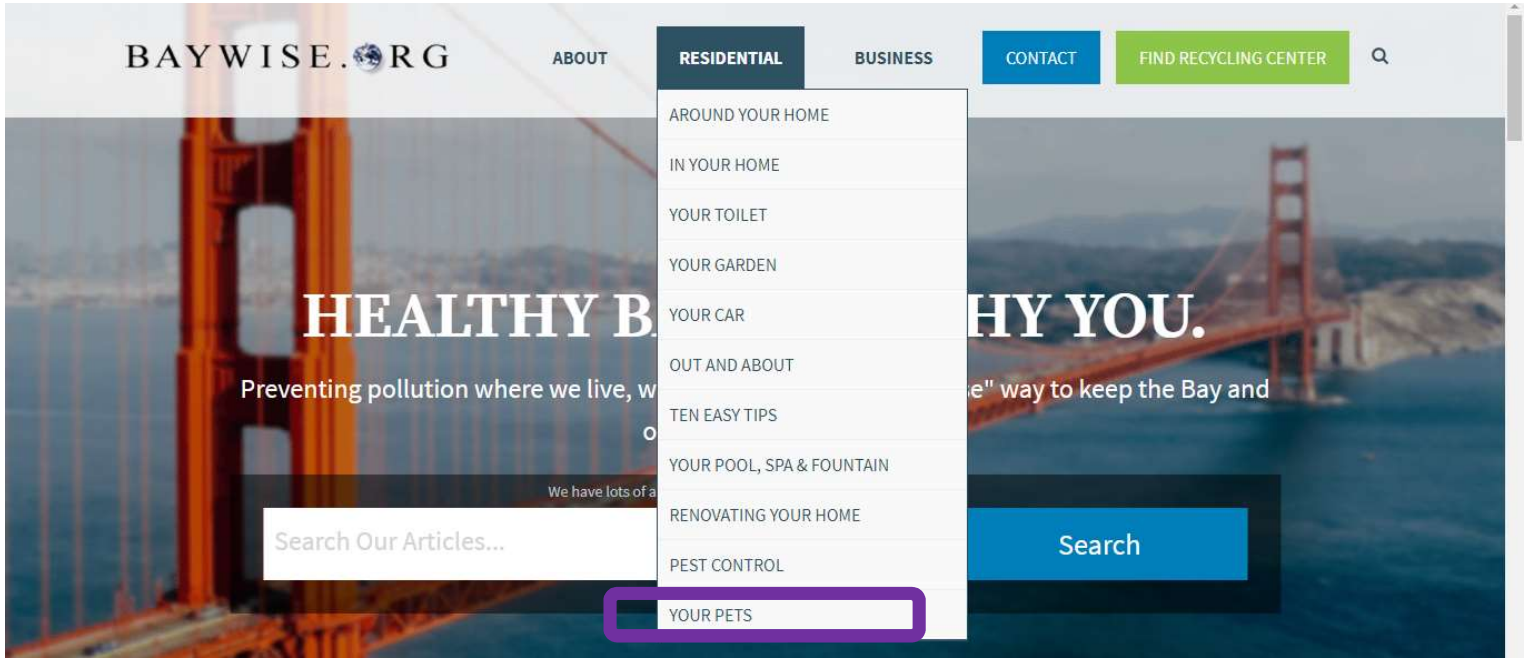
VETERINARY RESOURCES
HEALTHY BAY, HE
U.
Preventing pollution where we live, work, and play is the "Bay-Wise" way to keep the Bay and
our families healthy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IN YOUR HOME
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YOUR GARDEN
YOUR CAR
OUT AND ABOUT
TEN EASY TIPS
YOUR POOL, SPA & FOUNTAIN
RENOVATING YOUR HOME
PEST CONTROL
YOUR PETS
HEALTHY B
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Preventing pollution where we live, w
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VETERINARY RESOURCES

Help Pet Owners Avoid Exposure to Toxic Chemicals in Topical Flea & Tick Control Products

Indoor Pet Flea and Tick Treatments Leading to Environmental and Public Health Concerns

To avoid exposing pets, their owners and Bay Area waterways to toxic pesticides, members of the Bay Area Clean Water Agencies (BACWA) are encouraging professionals to recommend their clients to use oral medications to control fleas and ticks, and to discourage the use of topical treatments.

There is increasing evidence that pesticides from external flea and tick control products including spot-on treatments, collars, indoor foggers and sprays are finding their way into our local waterways, sometimes at concentrations above toxicity thresholds for aquatic species. The California Department of Pesticide Regulation (DPR) is also currently reviewing uses of fipronil and imidacloprid, the active ingredients in most spot-on topical treatments, due to possible human health risks.

"Dog and cat flea treatments

Web pages for pet owners:

YOUR PETS

Flea and Tick Control

Products commonly used to treat fleas and ticks, including spot-on treatments, collars, sprays, and foggers, contain toxic pesticides that can easily spread around your home. Toxic pesticides from these treatments can also end up in our local waterways when you: wash your pet; wash bedding, clothing, floors, carpets or upholstery that comes into contact with your pet; and neglect to dispose of pet waste in the trash.

To avoid exposing your pets, family and Bay Area waterways to toxic pesticides, **please speak to your vet about using oral medications to control fleas and ticks**, and review our recommendations for keeping your pets safe.

- **How to Keep Your Pets Free of Fleas and Ticks**
- **Important Facts about Toxic Chemicals in Certain Flea and Tick Control Products**

"Dog and cat flea treatments suspected of polluting San Francisco Bay" by Paul Rogers, San Jose Mercury News, published November 7, 2017"

Summary

- Scientific evidence shows that ingredients from indoor flea treatments are transported around the home (and wash off)
- Fipronil and imidacloprid are seen throughout a wastewater service area, as well as the final treated effluent, and waterways; they are toxic to aquatic organisms
  - Are being evaluated by DPR due to human health risk
- On-pet products only target about 5% of the flea cycle
- Alternatives include thorough house cleaning and oral medications
- Water agencies are seeking your partnership

Discussion

Any qualms / concerns about our messages?

Might AVMA join in our messaging in some way?

How can BACWA serve as a resource?

Next steps?

Thank you for your attention!

For more information, contact
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