The Link Between Consumer Flea and Tick Control and San Francisco Bay

Stephanie Hughes, PE

February 9, 2023

Dialogue with Pets in Need

This information is approved for 1.0 hour of continuing education credit via RACE.

REGIONAL WATER QUALITY CONTROL PLANT

BACWA BAY AREA CLEAN WATER AGENCIES

Introduction to Your Speaker

Stephanie Hughes is a registered professional Chemical Engineer with more than 25 years of experience in chemical fate and transport, water quality, and regulatory compliance.

Stephanie provides consulting services and technical support to California local government agencies and is a Senior Lecturer in Environmental Science at Santa Clara University.

She and her husband currently share their lives with two dogs and one cat. Stephanie was also a founding member and is an active volunteer at the Wildlife Center of Silicon Valley.

Stephanie's dog, Beau

Organizations Involved in This Project

- Bay Area Clean Water Agencies (BACWA)
- City of Palo Alto
- City of San Jose
- San Francisco Estuary Institute
- San Francisco Department of Environment
- San Francisco Public Utilities Commission

Today's Topics

- How wastewater treatment works
- Our concerns about flea and tick pesticidal products
- Alternatives to on-pet and in-home treatments
- Messages for consumers
- Resources for follow-up information
- Your feedback


Where Does Our Water Go?
Untreated Wastewater
Recycled Water
Treated Wastewater
Stormwater
PIZZERIA
SCHOOL
Wastewater Facility
San Francisco Bay
SOUTH BAY WATER RECYCLING
San José-Santa Clara Regional Wastewater Facility
CITY OF SAN JOSE
Environmental Services
The City would like to thank the Santa Clara Valley Urban Runoff Pollution Prevention Program for their assistance on this flier.

Your Wastewater Treatment Plant!

Clean Bay

https://cleanbay.org

ABOUT CITY HALL DEPARTMENTS RESIDENTS BUSINESS I WANT TO... English

CITY OF PALO ALTO

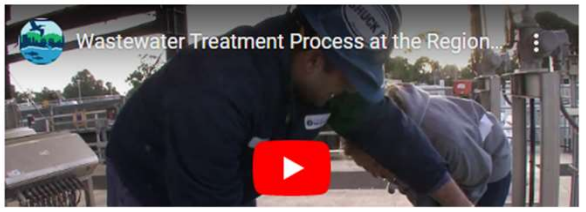
Search CleanBay.org

Report Spills/Illegal Dumping

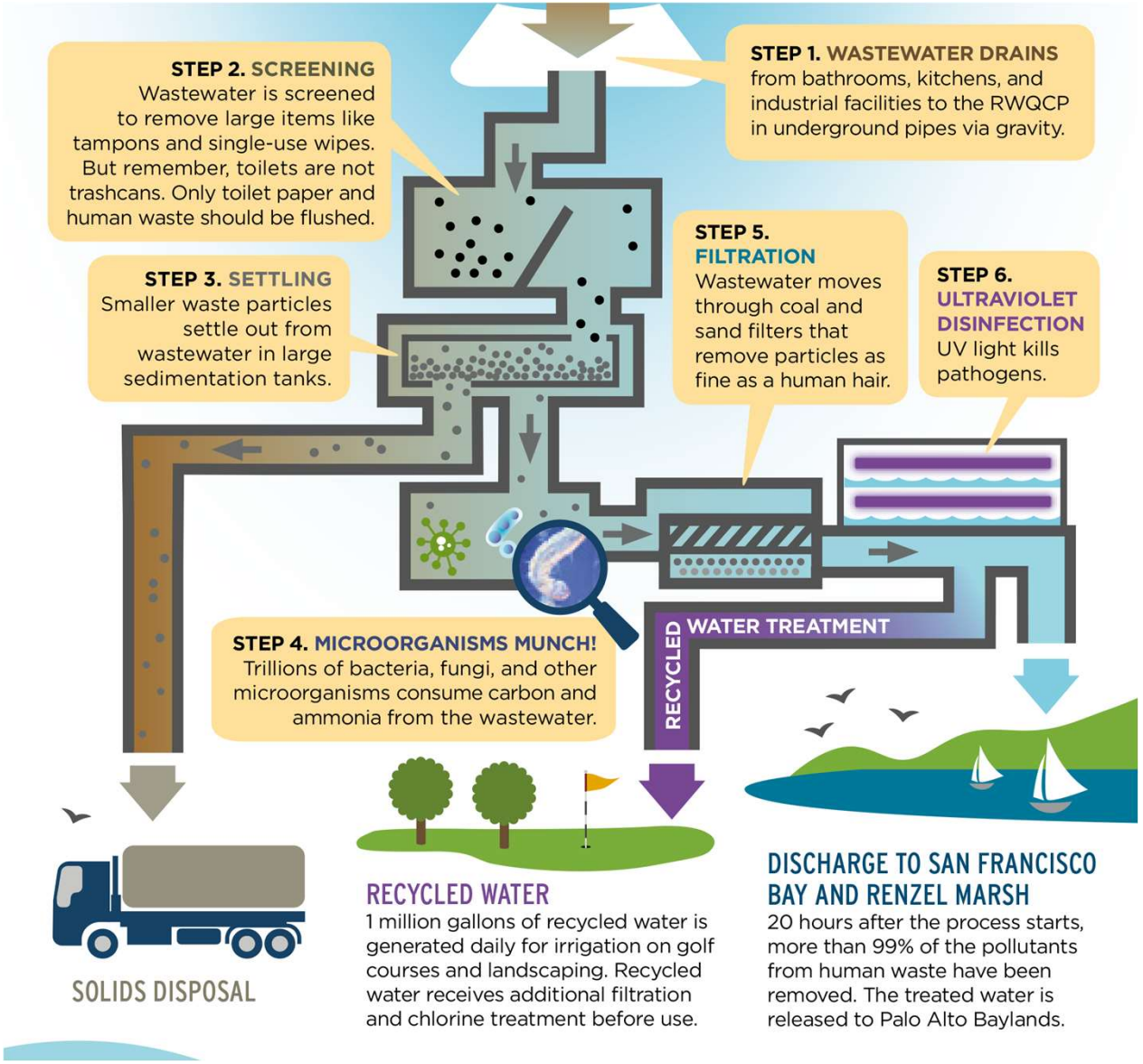
OUR PROGRAMS MY CREEKS & BAY PUBLICATIONS & PERMITS VIDEOS & FUN STUFF CONTACT & TOURS

ABOUT THE RWQCP

The mission of the Regional Water Quality Control Plant (RWQCP) is to protect San Francisco Bay by cleaning and treating wastewater before it is discharged to San Francisco Bay. Owned and operated by the City of Palo Alto, **the RWQCP treats wastewater for the communities of Los Altos, Los Altos Hills, Mountain View, Palo Alto, Stanford University and the East Palo Alto Sanitary District.**



The City of Palo Alto Regional Water Quality Control Plant cleans 20 Million gallons of wastewater every day to protect San Francisco Bay.



"Conventional ***wastewater treatment technologies are generally ineffective at removing pesticides from wastewater…"***

"seven compounds… were detected in treated wastewater effluent at ***levels exceeding*** *U.S. Environmental Protection Agency (US EPA)* ***aquatic life benchmarks for chronic exposure to invertebrates****."*

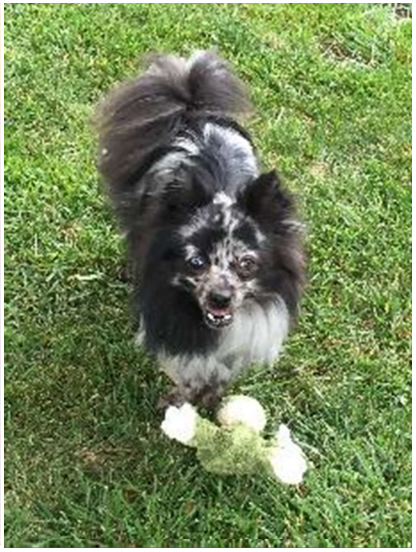
Sutton et al. (2019). "*Occurrence and Sources of Pesticides to Urban Wastewater and the Environment*" in Goh et al.; Pesticides in Surface Water: Monitoring, Modeling, Risk Assessment, and Management ACS Symposium Series; American Chemical Society: Washington, DC, 2019.

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
- Exposes cities to the potential for third party lawsuits under the Federal Clean Water Act (CWA)
- Degrades recycled water quality and/or ability to reuse biosolids

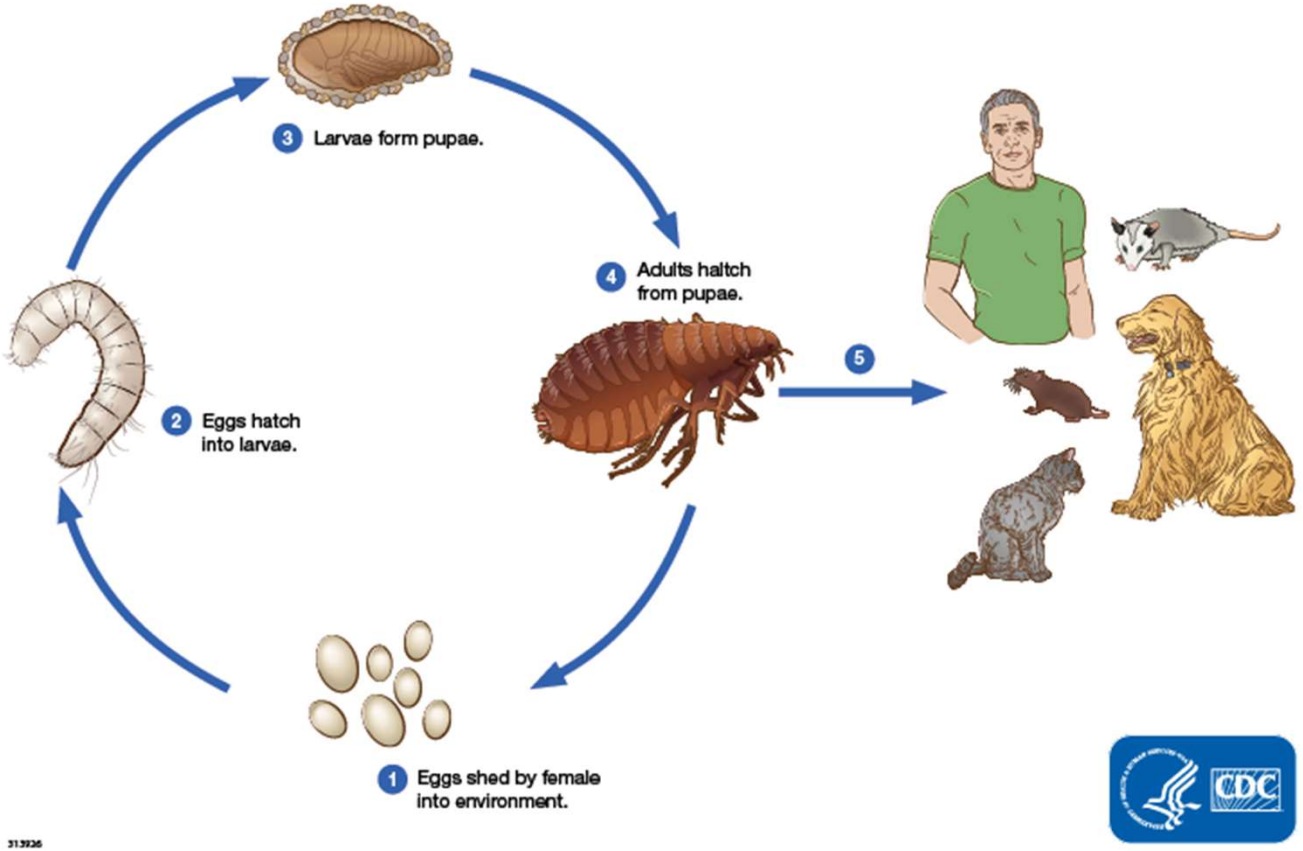
Questions?





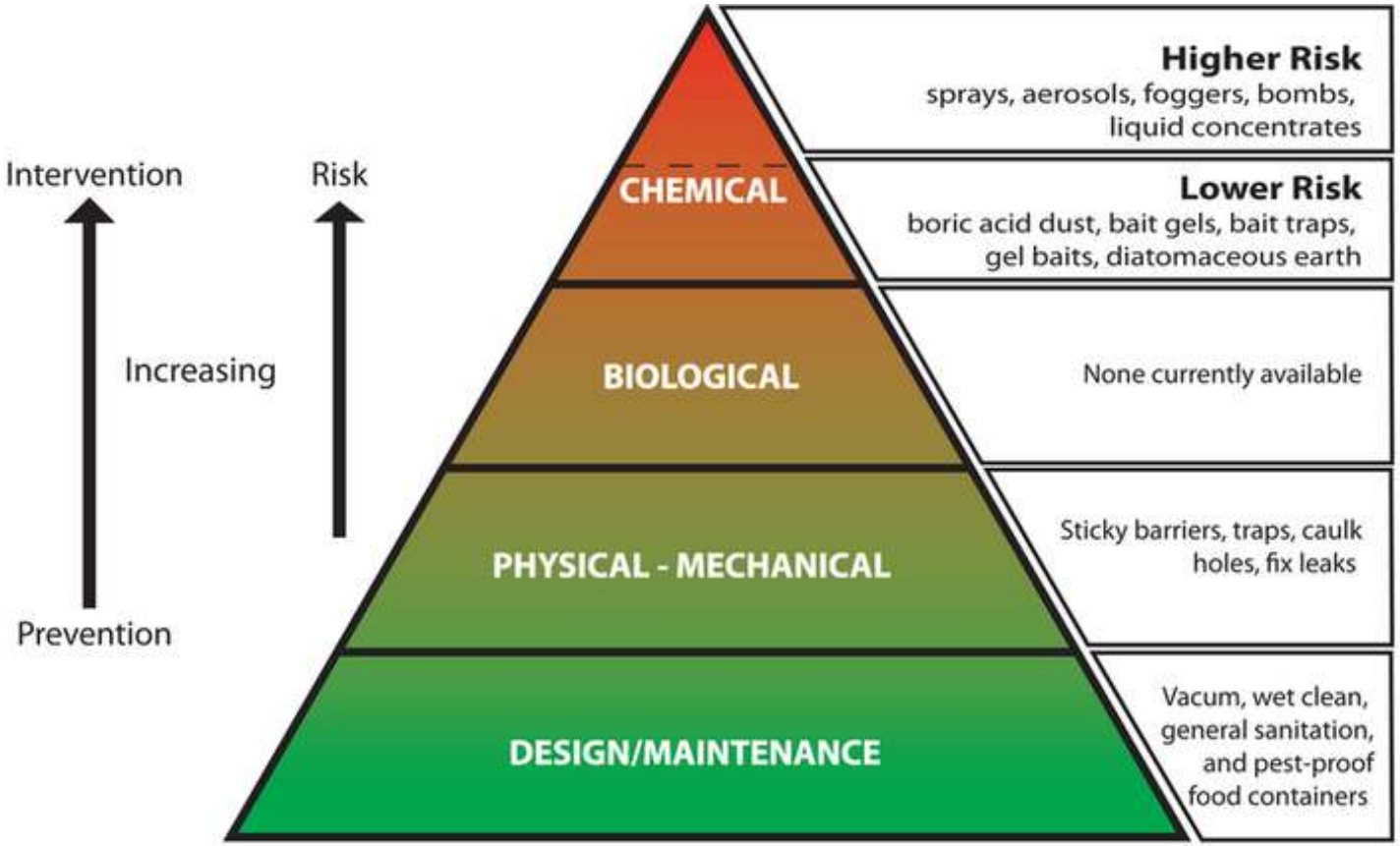
Then we'll return to protecting our pets!

Let's Focus on the Flea Cycle



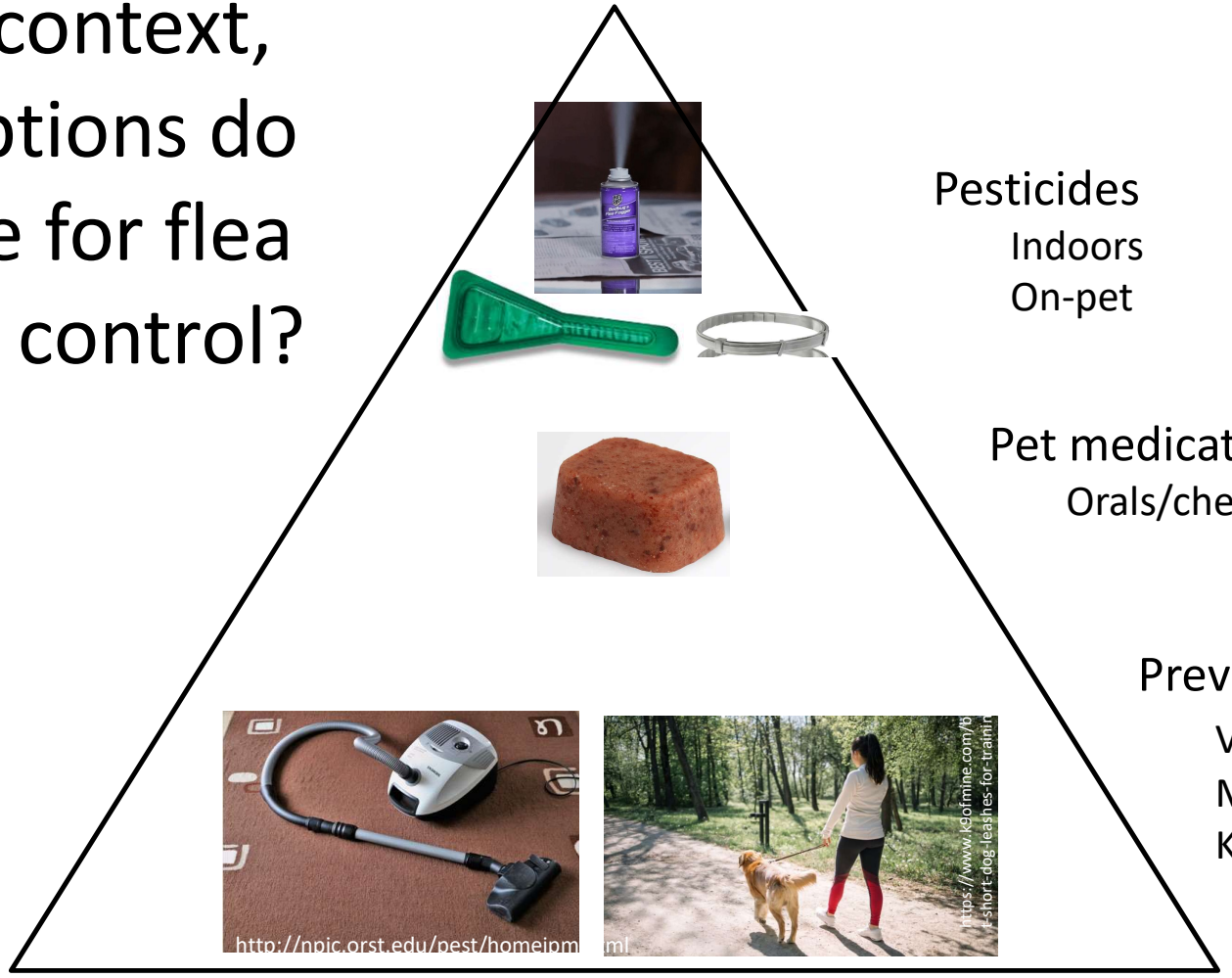
https://www.cdc.gov/fleas/life_cycle_and_hosts.html

There is a Powerful Concept for Indoor Pest Control: Integrated Pest Management (IPM)



https://ento.psu.edu/outreach/extension/ipm/english/about-1/what-is-ipm

In this context, what options do we have for flea and tick control?



Using Foggers Exposes People to Pesticide Residue

ELSEVIER

Chemosphere

Volume 20, Issues 3–4, 1990, Pages 349-360

Measuring potential dermal transfer of surface pesticide residue generated from indoor fogger use: An interim report

J. Ross*, T. Thongsinthusak, H.R. Fong, S. Margetich, R. Krieger

Journal of Exposure Analysis and Environmental Epidemiology (2003) 13, 112–119

www.nature.com/jea

Human exposure to indoor residential cyfluthrin residues during a structured activity program

RYAN L. WILLIAMS, CRAIG E. BERNARD, AND ROBERT I. KRIEGER

Personal Chemical Exposure Program, Department of Entomology, and Environmental Toxicology Graduate Program, University of California, Riverside, California, USA

Evidence for Fogger Residue Transfer to People

In 1990, the California Department of Food and Agriculture published a dermal contact study presenting findings regarding the transfer of residue to people and their clothing following a chlorpyrifos/allethrin fogger treatment in carpeted rooms.

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.

Evidence for Fogger Residue Transfer to People

METHODS:

- The rooms were all located in a new hotel so as to eliminate background pesticide residue and to provide repeatability from room to room.
- 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.

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.

Evidence for Fogger Residue Transfer to People

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 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

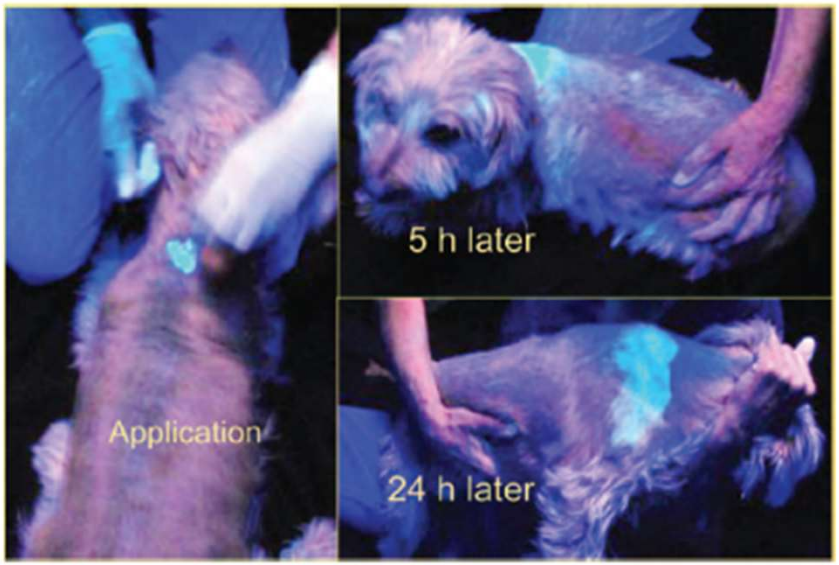
Deposition and spatial distribution of insecticides following fogger, perimeter sprays, spot sprays, and crack-and-crevice applications for treatment and control of indoor pests

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

[a] Personal Chemical Exposure Program, Department of Entomology, University of California, Riverside, CA 92521, United States
[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."

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.

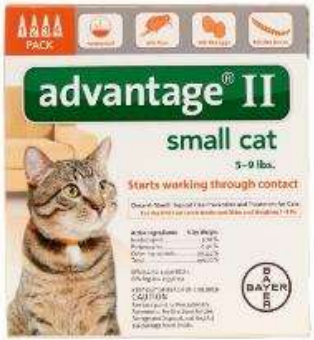
Collars Work Topically

- Work topically on the fur/skin
- Majority only include an “adulticide” as the active ingredient
- The 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) Topical Spot-Ons Work

- Work topically on the fur/skin (with one exception)
- 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” (but they do!)



Revolution is an Example of a Topical Treatment That Works Systemically

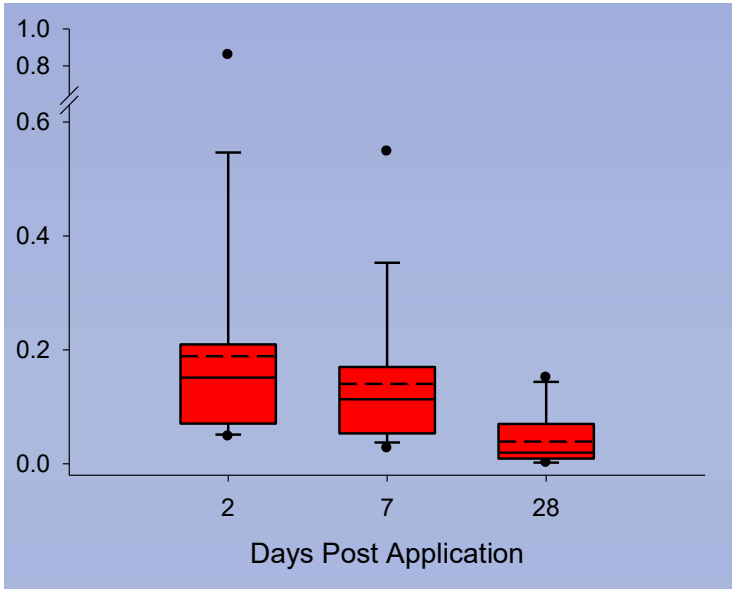
- It is **applied topically** but **works as a systemic** (like oral medications)
  - Also protects against some internal parasites
- Some of the active ingredient remains on the skin/ fur (and has topical / contact impact)

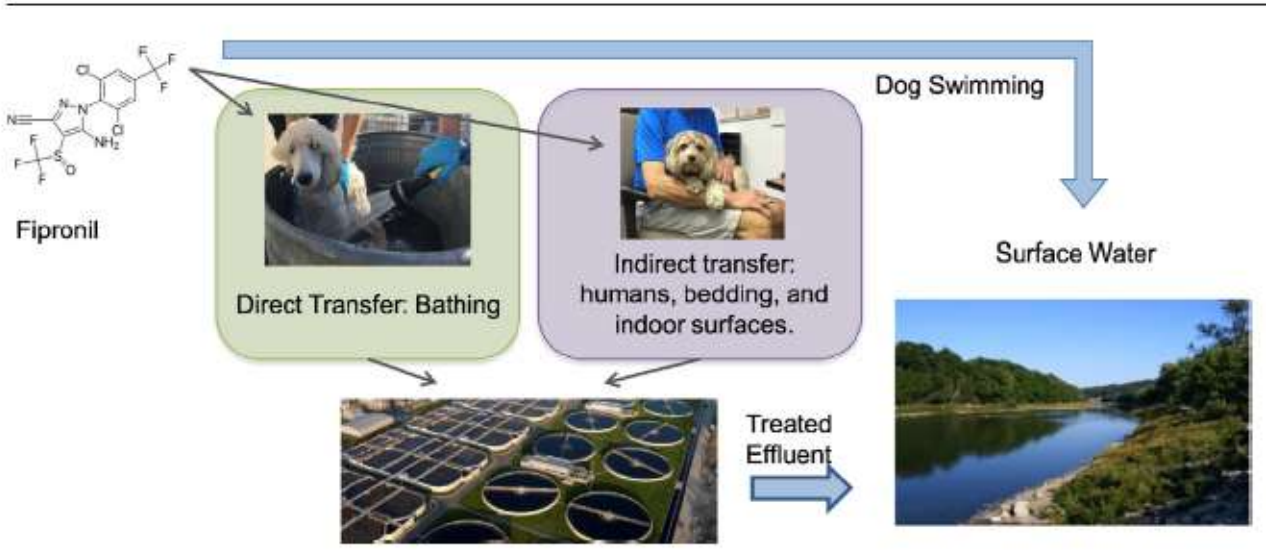
Spot-on Products Typically State That They are Waterproof Once Dry

Fipronil washoff to municipal wastewater from dogs treated with spot-on products

Jennifer Teerlink [a,*], Jorge Hernandez [b], Robert Budd [a]

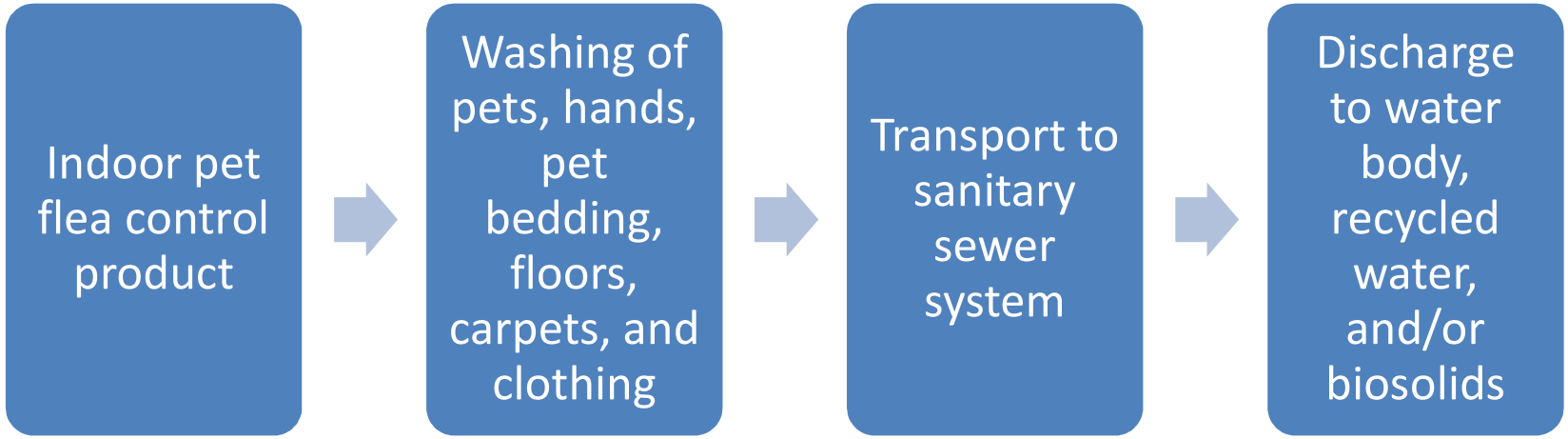
[a] Department of Pesticide Regulation, California Environmental Protection Agency, Sacramento, CA 95812, USA
[b] California Department of Food and Agriculture, Sacramento, CA 95812, USA





Source: 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.

How Pet Treatments Travel to Sewer Systems and San Francisco Bay

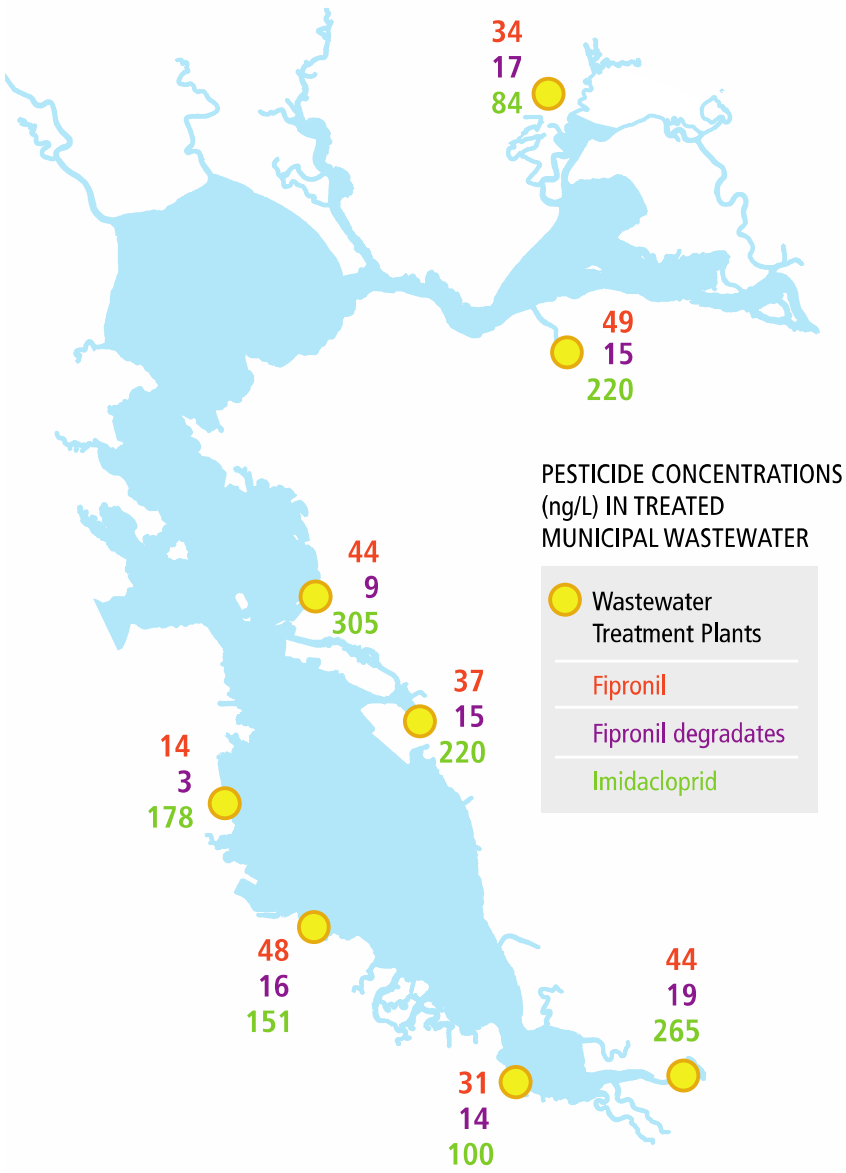


Pesticides of Concern are Those That Exhibit Aquatic Toxicity and Persist in the Environment

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

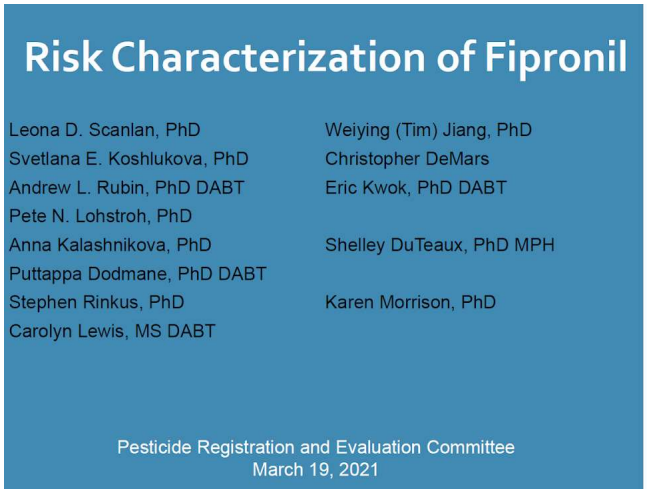
We have evidence that on-pet pesticides pass through wastewater treatment at **concentrations above toxicity thresholds** for sensitive organisms

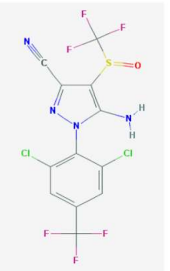
Aquatic toxicity thresholds:
11 ng/L for fipronil
10 ng/L for imidacloprid



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.

California's Department of Pesticide Regulation is Studying the Human Health Risks Associated with **Fipronil** Exposure





*"Scenarios that pose a **potential risk** to home users include:*

- *Acute **dermal exposure for users who apply pet spray** at home*

*Post-application **residential exposures for adults** considered to pose a **potential health risk** include:*

- *Seasonal **exposure to pet spray and pet spot-on products***

*Post-application residential exposure for **children** considered to pose a potential health risk include:*

- *Short-term oral exposure to turf granules*
- *Seasonal **oral exposure to pet products***
- *Seasonal **dermal exposure to pet products**"*

Fipronil Risk Characterization Document, Draft, Human Health Assessment Branch, Department of Pesticide Regulation, California Environmental Protection Agency. January 2021.

Concerns with Pesticides for Flea and Tick Control

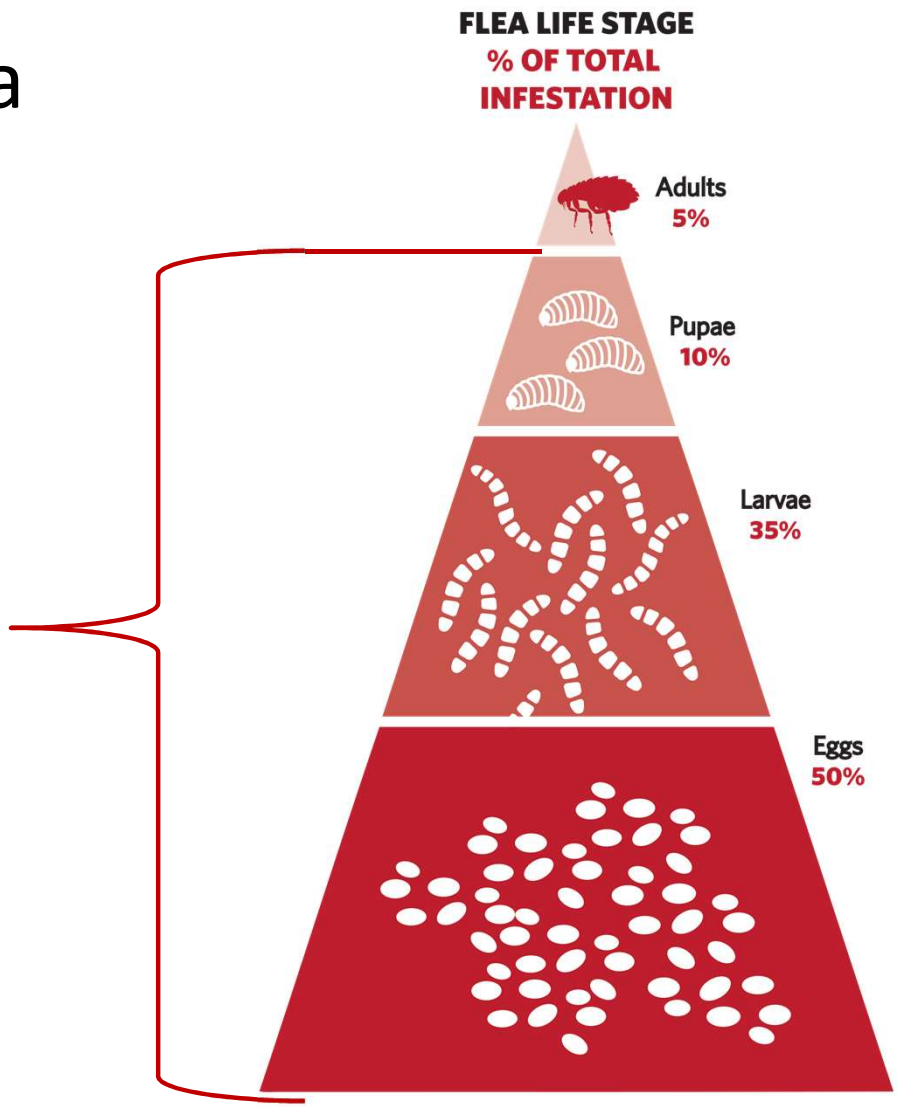
- Pesticides from common flea and tick control products are reaching sewer systems
- Pesticides subsequently discharged into San Francisco Bay can exceed toxicity thresholds for aquatic life
- CA's Dept of Pesticide Regulation has identified potential human health risks associated with fipronil, a common topical
- When vets, animal shelters and pet adoption agencies use these topicals, consumers view that as an endorsement


Questions?

What are the Alternatives?

Let's Look at the Flea Cycle Another Way

The majority of the flea cycle exists as an "environmental reservoir" within and throughout the home.

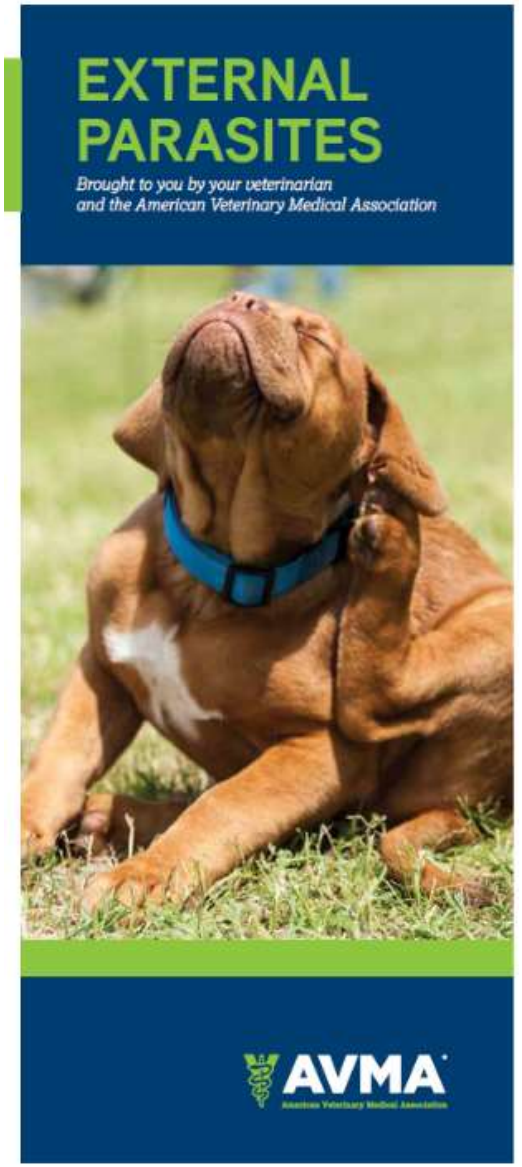


The American Veterinary Medical Association presents one solution

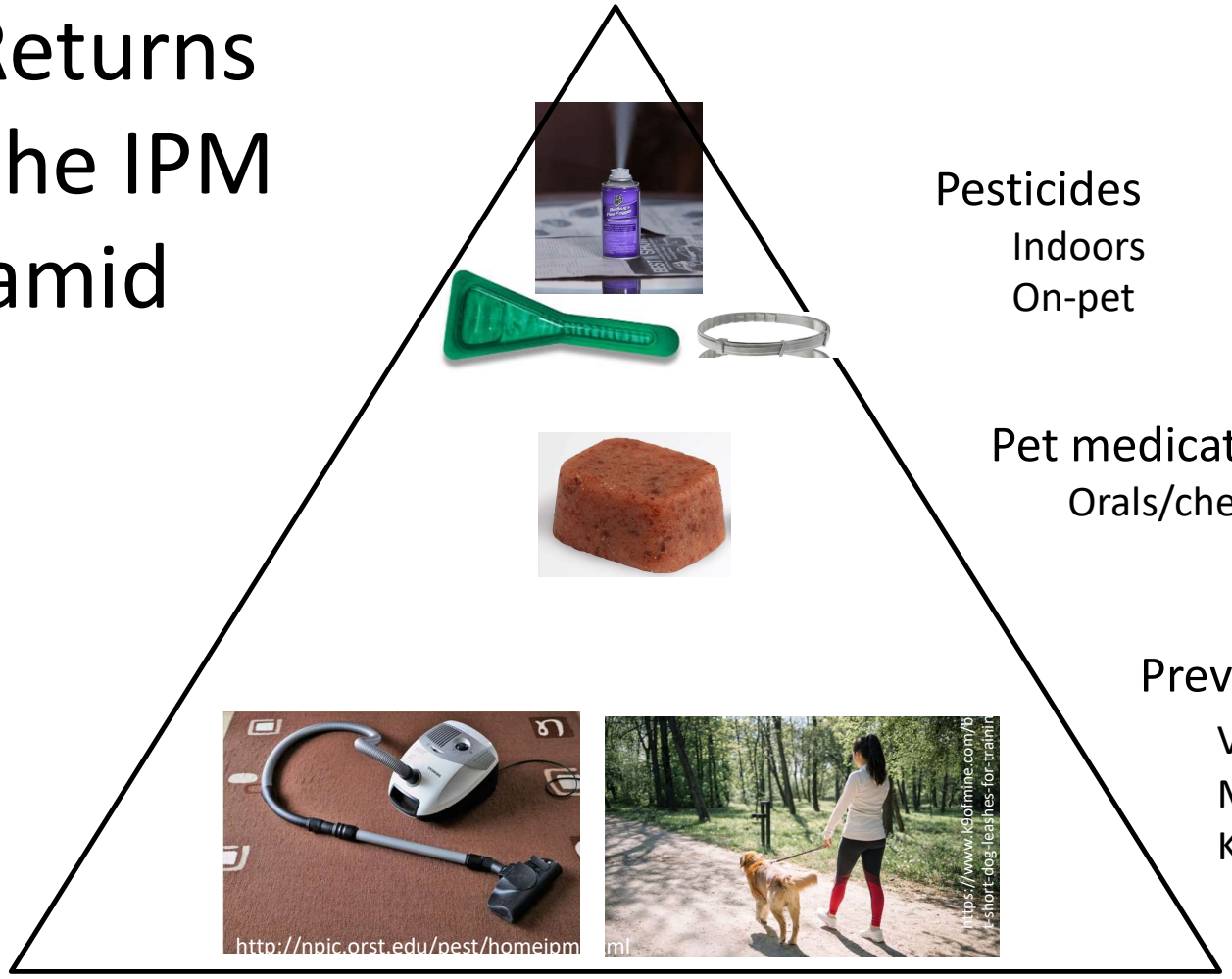
"Because much of the flea's life cycle is spent off of your pet, ***treating only your pet will not eliminate the problem****. ….*

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.



That Returns Us to the IPM Pyramid



Using IPM for Flea Control

1. **Prevent**: vacuum (everywhere and often!), wash bedding, steam clean
2. **Monitor:** flea combs, flea traps

https://www.preventivevet.com/pets/how-to-get-rid-of-fleas-in-your-home

https://www.ecats.vet/siteSearch/view/225302_Fleas.pml

https://www.instructables.com/Simple-Flea-Trap/

Similarly for Ticks…Our Consumer Message is That Prevention is the Key

1. If possible, **keep your dog's coat short**.
2. **Try to keep out of the brush.**
3. **Thoroughly inspect your pet** after walks. Pay particular attention to the nose, mouth, eyes, ears (inside too), around tails and under the collar.
4. **Seek to create a tick-free zone in your yard**, controlling brush or tall grass.

When Prevention and Monitoring are Not Enough, We Recommend Talking to One's Vet About Oral Medications

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
- Prescription rather than over the counter
- Some also protect against heartworm and/or other internal parasites
  - Reducing number of monthly medications

Evidence Suggests that Systemics May be More Effective Than Topicals

"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.

Why? Hypotheses include:

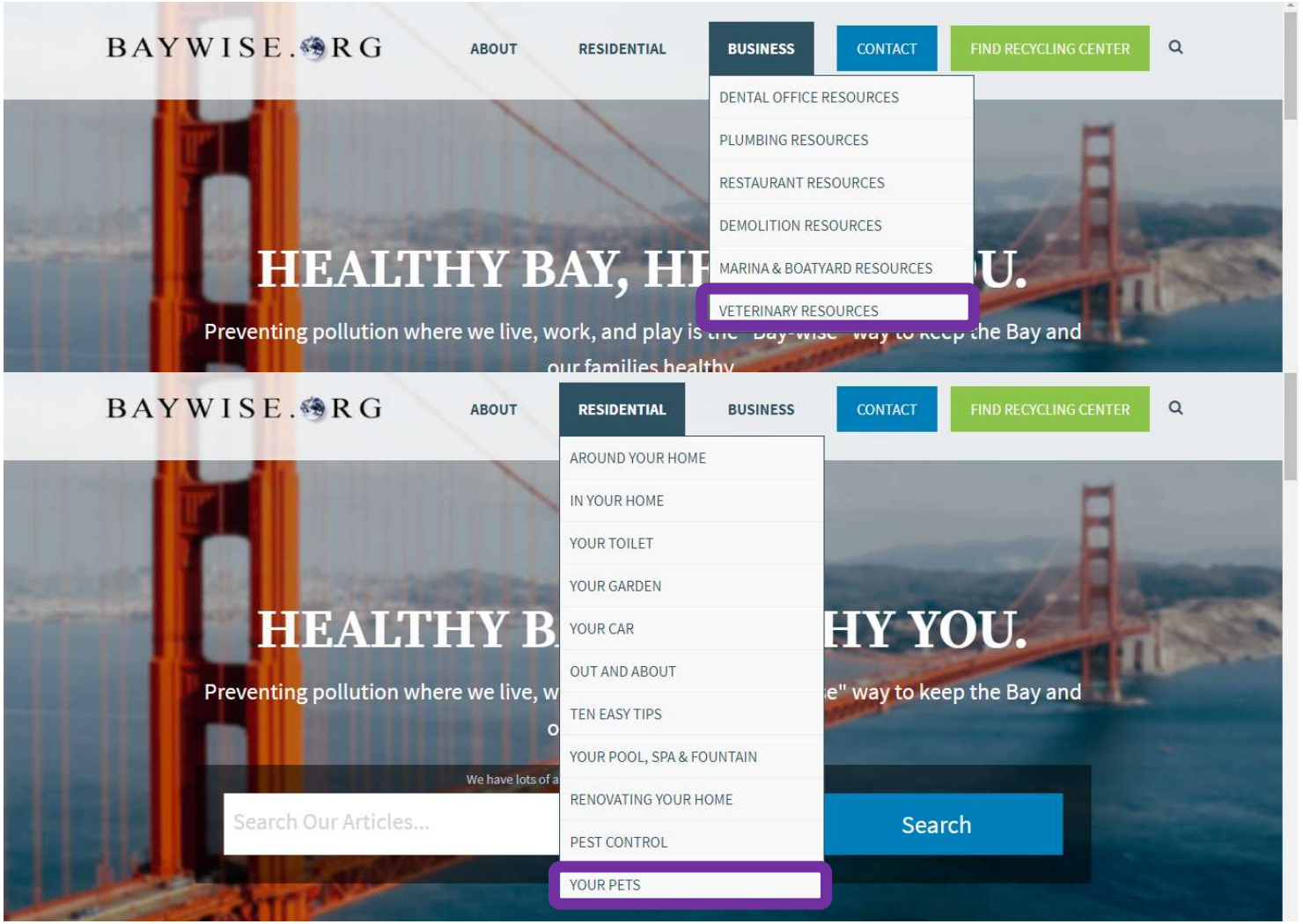
- More accurate application method
- More direct approach (pest bites animal rather than happens upon the topical on the skin or fur)
- The active ingredient is not being licked off or diluted around the home

Summary

- Scientific evidence shows that pesticides from indoor flea treatments transport around the home (and wash off)
- These pesticides travel through the sewer system and wastewater treatment plant
- These pesticides have been observed in wastewater effluent at concentrations that exceed EPA aquatic toxicity thresholds
- Indoor use of fipronil has been identified as a possible risk to human health
- Better options are to prevent and monitor fleas/ticks and consider chewables
- We are talking to veterinarians and shelter staff to ensure parallel messages

Website is www.baywise.org:

We Have Websites Tailored for Vets and Their Clients



We Have Websites Tailored for Vets and Their Clients

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

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"

REGIONAL WATER QUALITY CONTROL PLANT

BACWA BAY AREA CLEAN WATER AGENCIES

Thank You for Your Attention!

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