

Household Flea Management

Moving Beyond Pet-Only Treatments
to an IPM Approach



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BAPPG
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Today's Outline

- Context
- The Flea Cycle
- Management Options
 - The Case Against Topical Approaches
 - The Case for Oral Meds
 - The Case for IPM
- Audiences and Next Steps





Context - Imidacloprid

- A common “spot on” topical treatment for dogs and cats
- Found in urban runoff, POTW effluent, and waterbodies, sometimes at concentrations toxic to sensitive aquatic species.
- U.S. EPA’s Registration review environmental risk assessment anticipated in December 2016 (comments due February 2017)





Context - Fipronil

- A common “spot on” topical treatment for dogs and cats
- Fipronil and degradates found in urban runoff, POTW effluent, and waterbodies, sometimes at concentrations toxic to sensitive aquatic species.
- U.S. EPA registration review environmental risk assessment anticipated in December 2016 (comments due February 2017)

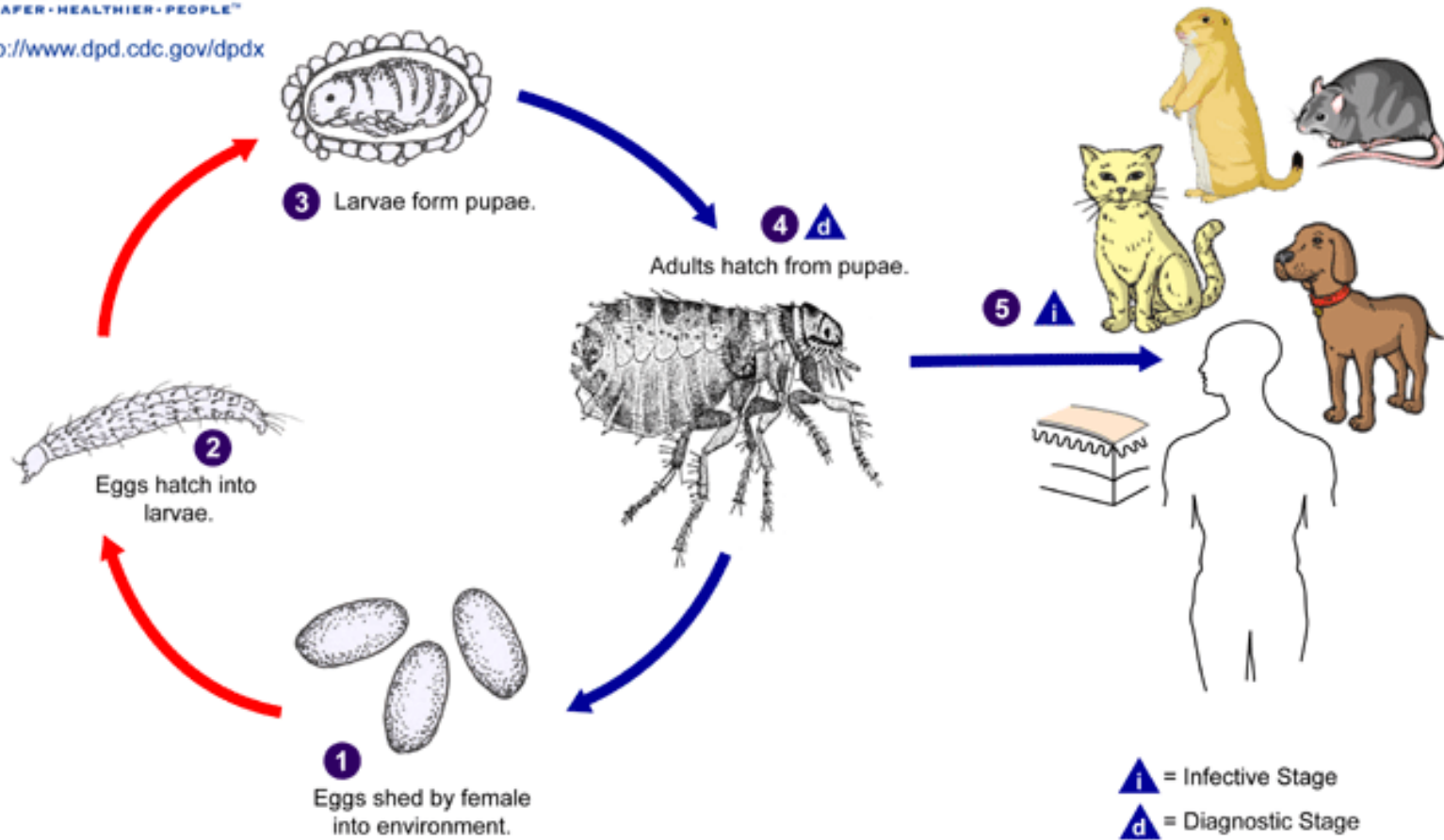
- DPR:
 - Is evaluating human exposure risk
 - Is considering **significant** mitigation measures to reduce consumer and child exposure
 - Findings anticipated **December 2016**



The Flea Cycle



<http://www.dpd.cdc.gov/dpdx>



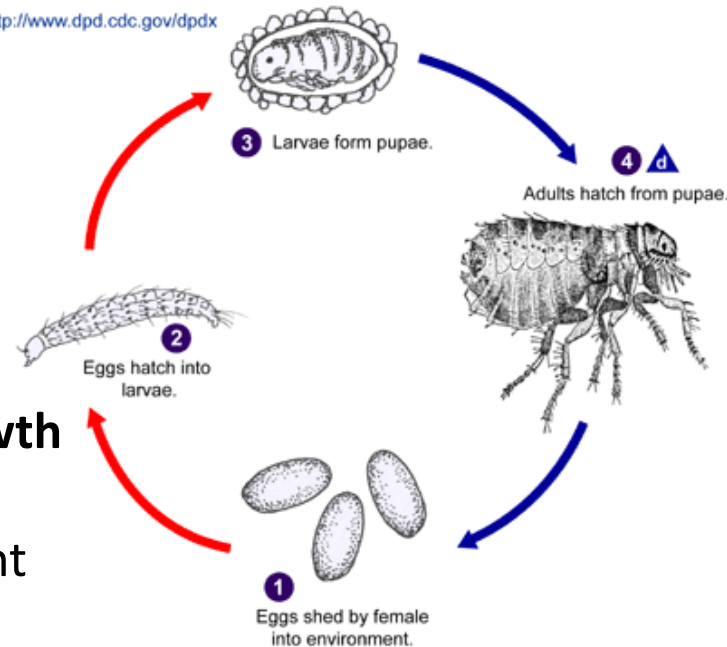
https://www.pesticideresearch.com/site/?page_id=2933

So if you were looking to kill the fleas in this cycle, you might seek...

To my knowledge, **no** active ingredients penetrate the shell and kill the pupae



<http://www.dpd.cdc.gov/dpdx>



An “insect growth regulator” – an active ingredient that minimizes number or viability of eggs or larvae

An “adulticide” – an active ingredient that kills the adults

What products in the marketplace contain those active ingredients?



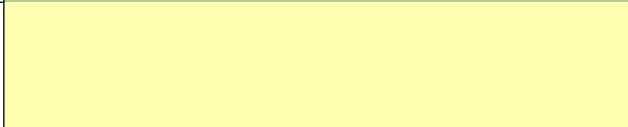

- Topicals
 - Collars
 - Spot treatments
- Oral medications
- Shampoos or dusts
- House/ yard sprays



I created an Excel database of pet treatments, to track:

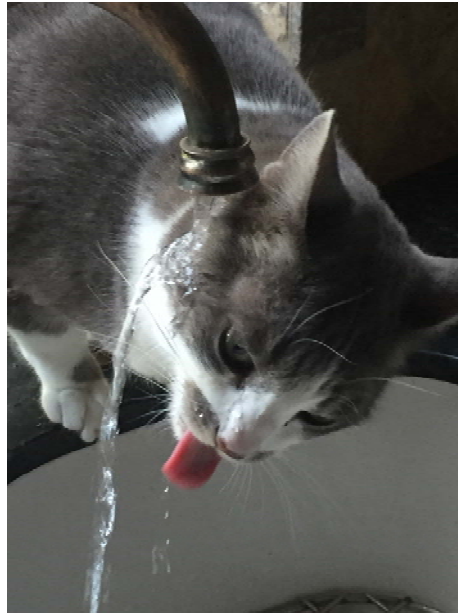
- Active ingredient(s)
- Example products
- Uses
 - Dogs, cats, or both?
 - Fleas, ticks, or both?
- Dosage and the duration between doses
- How it works
 - Adulticides and/or insect growth regulators?
 - Topically or systemically?
- Fed regulating body
 - EPA if over the counter (OTC)
 - FDA if prescription
- Literature findings
 - Efficacy
 - Water quality issues
 - Fate and transport
 - Pollinator impact

Database includes color-coding to indicate potential for environmental/ human impacts

No known hazard to water quality, human health or pet:	
Likely low hazard to water quality, human health or pet:	
Uncertain hazard to water quality, human health or pet:	
Hazard to water quality and/or human health:	

Let's briefly look at each:

- Collars
- Spot treatments
- Oral medications





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
- 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.

Color coding of the collars:

	Active Ingredient(s)	Example Product Names
Collars	Deltamethrin	Salvo, SCALIBOR, BandGuard, Sentry Long Lasting
	Imidacloprid and flumethrin	Seresto (Bayer)
	S-Methoprene + tetrachlorvinphos (TCVP)	Hartz Ultraguard Plus, Biospot Active Care (Wellmark/ Farnam)
	Tetrachlorvinphos (TCVP)	Hartz Ultraguard, Zodiac (Wellmark), and others

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 (and OWOW factsheets), 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 the oral medications)**
- Some % of the active ingredient remains on the skin/ fur (and has topical / contact impact)
- It is a prescription rather than OTC (and is regulated by FDA, not EPA)



Color-coding of the spot treatments:

	Active Ingredient(s)	Example Product Names
Spots	Cyphenothrin and pyriproxyfen (Nylar)	Sentry Pro XFT, Triforce for dogs
	Etofenprox and pyriproxyfen (Nylar)	Triforce for cats
	Fipronil	Frontline, PetArmor, Fiproguard (Sentry), EasySpot, Certifect, Spectra Sure, Effipro (Virbac), Flea3X, Sergeant's Pronyl, Hartz First Defense, Barricade, Fortress, Cat MD, Dog MD (and others). (<i>Frontline patent expired around 2012</i>)
	Fipronil and cyphenothrin	Fiproguard Max, Martin's Prefurred Plus
	Fipronil and S-methoprene	Frontline Plus, Fiproguard Plus (Sentry)
	Fipronil and S-methoprene and pyriproxyfen	Frontline Gold (new in 2016)
	Imidacloprid	Advantage (Bayer)
	Imidocloprid and pyriproxyfen (Nylar)	Advantage II (Bayer) and Advecta II (Bayer), K9 Advantix (Bayer)
	Indoxacarb	Activyl (Merck)
	Indoxacarb and permethrin	Activyl Tick Plus for Dogs (Merck)
	Selamectin	Revolution (Zoetis, a subsidiary of Pfizer)
Spinetoram	Cheristin (formerly Assurity) (Elanco)	

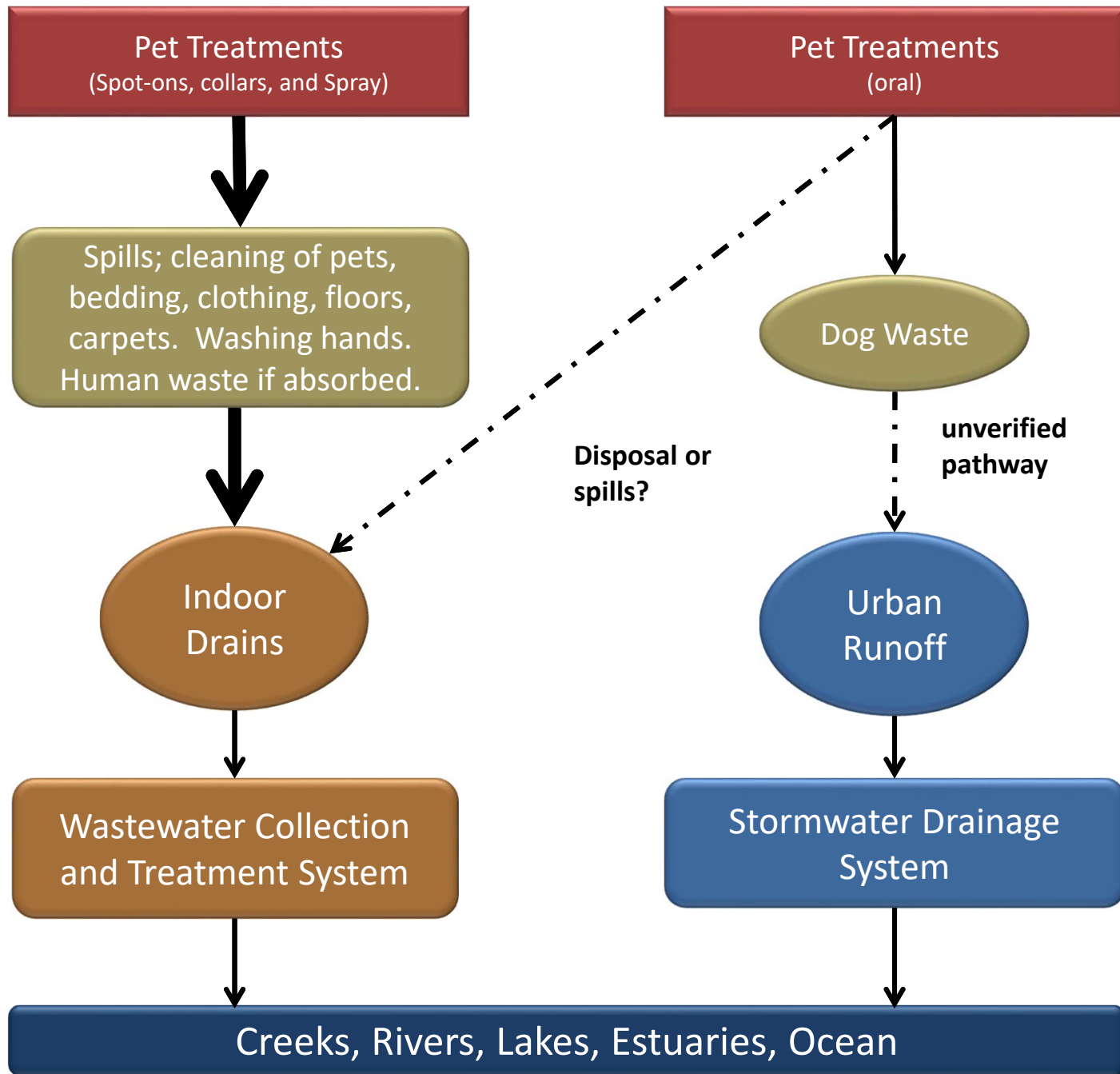
There is evidence that topical treatments (spot and collar) transport through a home

- Active ingredients DO wash off
- Active ingredients are transported around the home

Original talk included a photo of a dog treated with fipronil containing a fluorescent tracer to reveal the contamination onto hands and along a dog (from Reference #2, below). Photo removed from this document to avoid copyright infringements.

REFERENCES

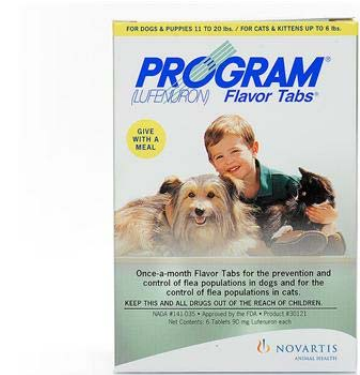
1. DPR dog washing study
2. "Fate and Distribution of Fipronil on Companion Animals and in Their Indoor Residences Following **Spot-On** Flea Treatments," Bigelow Dyk, M., et al., J. of Env Science and Health, Part B, 2012, Vol 47, pp 913-924.
3. "Assessing Intermittent Pesticide Exposure From Flea Control **Collars** Containing the Organophosphorus Insecticide Tetrachlorvinphos," Davis, M., et al., J. of Exposure Science and Environ. Epidemiology, 2008, Vol. 18, pp 564-570.



Thank you, Dr. Moran, for this graphic.

How Oral Medications Work

- Systemic
 - Requires adult flea to bite the animal
- Active ingredient in most are adulticides
 - The active ingredient in Program is an insect growth regulator
- Most are 30-day doses
 - Capstar is the exception (24 hours only) and may be prescribed in concert with Program
- Adverse reactions include vomiting, lethargy
- Prescription rather than OTC (therefore regulated by FDA, not EPA)



A family of new oral medications began in 2013

- New family of chemicals
 - Isoxazolines
- These are for dogs only
- Two of the three appear to have same type of adverse reactions as the others on the market
 - A third, Simparica (just out in 2016) may also cause abnormal neurologic signs (manuf. website)



Color-coding of the orals

Active Ingredient(s) Example Product Names

	Active Ingredient(s)	Example Product Names
Orals	Afoxolaner	Nexgard (Merial)
	Fluralaner	Bravecto (Merck)
	Lufenuron	Program (Novartis) and Sentinel (though that also includes a heartworm pharma)
	Nitenpyram	Capstar (Novartis), Capguard (Sentry)
	Sarolaner	Simparica (Zoetis, a subsidiary of Pfizer)
	Spinosad	Comfortis and Trifexis (Elanco)

What about effectiveness of systemics versus topicals?

- Systemics appear to 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.**"*

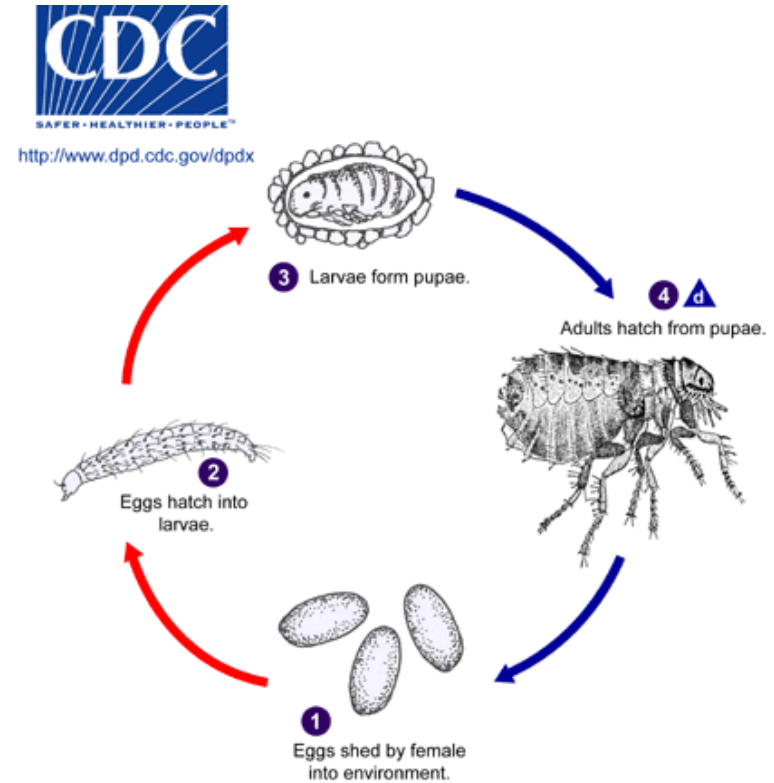
REF: "Flea blood feeding patterns in cats treated with oral nitenpyram and the topical insecticides imidacloprid, fipronil and selamectin," McCoy, c., et al., Veterinary Parasitology, Vol. 156, pp 293-301, 2008.

So where are we in the color-coding analysis?

No known hazard to water quality, human health or pet:	Green
Likely low hazard to water quality, human health or pet:	Light Green
Uncertain hazard to water quality, human health or pet:	Yellow
Hazard to water quality and/or human health:	Red

Let's look at the flea cycle another way...

Instead of a cycle, next I will show you the "flea pyramid"



The Flea Pyramid

- Adult fleas only account for **5%** of the total flea population.

- The other **95%** are the **eggs, larvae and pupae** that remain hidden in carpets, furniture, dog bedding and the garden, waiting to develop and jump onto the dog.



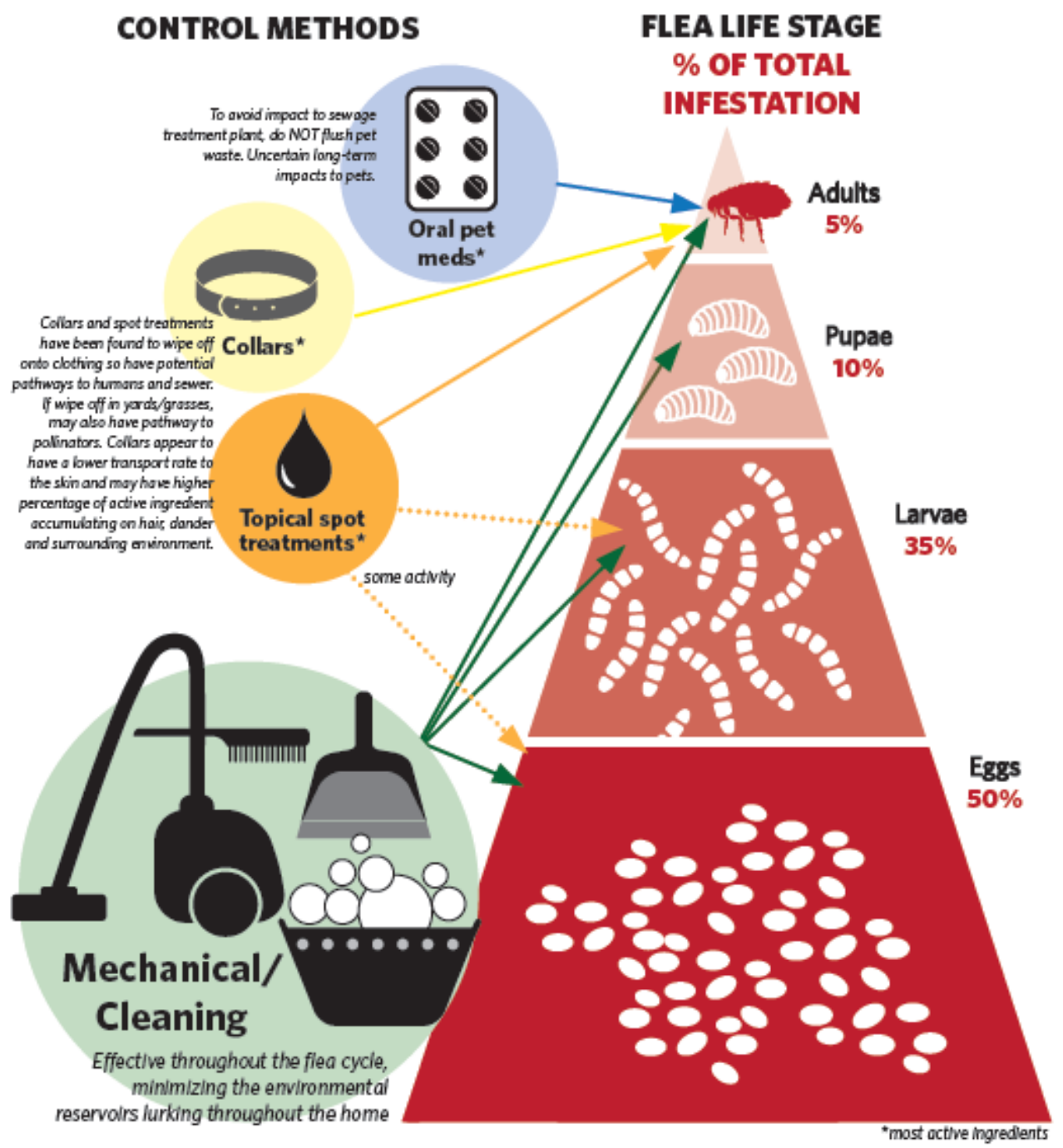
The Flea Pyramid

The majority of the flea cycle is the “environmental reservoir” within and throughout your home.



Once you look at fleas THAT way, what might you seek to do?

Integrated Pest Management is the Key



Draft graphic by
Jamie Hartshorn

American Veterinary Medical Association Brochure: Key Excerpts

- *treating only your pet will not eliminate the problem*
- *reduce the flea population in your house by thoroughly cleaning your pet's sleeping quarters and vacuuming floors and furniture*
- *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, last updated December 2009.



*Brought to you by your veterinarian and the
American Veterinary Medical Association*








This graphic is in "Flea Control Failure? Myths and Realities," Halos, L., et al., Trends in Parasitology, May 2014, Vol. 30, No. 5.

The primary author works for Merial (pharmaceutical company). The 6 co-authors represent veterinary universities throughout Europe

Original talk included a graphic that described (in detail) the steps of integrated pest management for flea control (from the reference at left). Graphic was removed from this document to avoid copyright infringements.

In order to solve a flea infestation, you must understand the flea cycle.

Less than 5% reside on your pet; the rest are in different stages spread throughout your home.

	eggs: 50% an adult flea  day 50 eggs each	larvae: 35% 	pupae: 10%  hard shell that pesticides do not penetrate	adults: 5%  	"red dirt"   adult feces; larval food
Mechanical / Cleaning Controls (Effective throughout the flea cycle, minimizing the environmental reservoirs lurking throughout the home.)					
Thoroughly vacuum floors, carpets, rugs, and under furniture. If infested, vacuum frequently; the vibration encourages cocooning adults to emerge from their protective pupa shell.	✓	<i>NOTE: If topicals or collars are used in the home, then these otherwise non-toxic cleaning efforts are expected to transport the active ingredient around the home and wash it into the sanitary sewer.</i>		✓	✓
Vacuum upholstery and under cushions.	✓			✓	✓
Proper disposal of vacuum waste to prevent it from becoming a source of reinfestation.	✓			✓	✓
Wash pet bedding. Wash other areas pets have access to, such as human bedding.	✓			✓	✓
Improve effectiveness of vacuuming and dusting by reducing clutter and/or replacing carpets with hard floors.	✓			✓	✓
Wash pet.				✓	✓
Flea comb and bowl of soapy water (also helps define the infestation).				✓	✓
Flea trap (also helps define the infestation).				✓	
ORAL MEDICATIONS FOR YOUR PET (To avoid impact to POTW, do NOT flush pet waste. Path to storm drains limited to pet waste on impervious surfaces.)					
Afoxolaner				✓	
Fluralaner				✓	
Lufenuron	✓	✓			
Nitenpyram				only 24 hours	
Sarolaner				✓	
Spinosad				✓	
SPOT TREATMENTS (Spot treatments have been found to wash off with shampooing, wipe off onto gloves and shirts and transport around the home creating pathways to humans and sanitary sewer. If wipe off in yards/grasses, may also have pathway to pollinators.)					
Etofenprox/Cyphenothrin and pyriproxyfen	✓	✓		✓	
Fipronil (with or without cyphenothrin)				✓	
Fipronil and S-methoprene (+/- pyriproxyfen)	✓	✓		✓	
Imidacloprid	some activity	some activity		✓	
Imidocloprid and pyriproxyfen	✓	✓		✓	
Indoxacarb	some activity	some activity		✓	
Indoxacarb and permethrin	some activity	some activity		✓	

NOTE: See the PDF attachment for the complete 2-sided document

Suggested Outreach Messages

- Mechanical controls (vacuuming, washing) are the most important step as they target the entire flea cycle and the environmental reservoirs throughout the home
 - This is the first step, not the last step, of flea IPM
- Discourage topical collars and spot products
 - Note the issue of transport around the home
 - The sewer collection system/ effluent issues may not be compelling to most audiences

[When using product names, note them as examples, rather than trying to compile a complete list]

Meanwhile Your Companion Animal is a Lucrative Market for Pharma

“many similarities between the human health and animal health industries.”

“The global companion animal market is an important segment of the animal health market. It has higher profitability, less price sensitivity and a higher growth rate than livestock. Unlike the livestock segment, it is not cyclical.”

The single MOST common companion animal pharmaceuticals are for fleas/ticks.

Source: Pharmaceutical challenges in veterinary product development, Imran Ahmed and Kasra Kasraian (Pfizer), *Advanced Drug Delivery Reviews* 54 (2002) 871–882.

The Pet Pharma Market

- As of 2015, this is a \$7 billion industry, growing at 6-7% a year in 2014 and 2015
 - 2013 was flat, perhaps due to weather conditions and the erosion of profits for Frontline after patent expired
 - 2014 and 2015 included introduction of 2 new oral products, thereby increasing profits

<http://www.prnewswire.com/news-releases/packaged-facts-pet-medications-market-returns-to-form-with-sales-forecast-to-reach-7-billion-in-2015-300163409.html>

Also, the AVMA is not the only source of educational materials for veterinarians





Companion Animal Parasitic Council

“The mission of the CAPC is ... by generating and disseminating ***credible, accurate*** and timely information for the diagnosis, treatment, prevention and control of parasitic infections.”

“CAPC, an ***independent council*** established to ***create guidelines for the optimal control*** of internal and external ***parasites*** that threaten the health of pets and people...”

“***best practices that better protect pets from parasitic infections*** while reducing the risk of zoonotic parasite transmission.”¹

¹ <http://www.capcvet.org/about-capc/>



Companion Animal Parasitic Council

These are
the CAPC
sponsors



† <http://www.capcvet.org/about-capc/>

These are CAPC's Best Practices for Flea Treatment and Prevention

TREATMENT

- ▶ Comprehensive flea-control programs should eliminate fleas on pets, eliminate existing environmental infestations, and prevent subsequent re-infestation.
 - ▶ Moderate to severe infestations may take several months to bring under control.
- ▶ Elimination of fleas on pets can be achieved through use of available flea adulticides that are highly effective for killing adult fleas, including: ... (followed by list of active ingredients)

CONTROL AND PREVENTION

- ▶ Administer preventive flea and/or tick products as soon after birth as possible (consistent with label claims) for the life of the pet. However, because substantial geographic differences occur in flea prevalence and seasonality, prevention programs should be tailored to needs of the individual pet.

<http://www.capcvet.org/capc-recommendations/fleas/>

Public Outreach Challenges

- Flea products change every year
 - Some products are pulled from the marketplace
 - New products emerge
- Our understanding improves regarding their toxicity and transport indoors
- Our IPM message appears to parallel that of the AVMA but not CAPC
 - Need to communicate with the vets to discuss the perceived bias of CAPC vs. AVMA and how that impacts veterinary advice

Audiences and Suggested Next Steps

- Our peers
 - Start the dialogue at your office
 - Share the IPM chart with colleagues
- Consumers / general public
 - O'Rourke to develop plan
- Veterinarians
 - Very parallel to our early work with dentists (2001-2006)
 - Both groups respond well to data / scientific studies
 - Both groups have local and state associations
 - Reach out NOW to their associations
 - seek representatives to have a discussion with us
 - Help us refine our messages
 - Support our messages and outreach campaign



Valerie Fenstermaker
Executive Director



Dan Segna, DVM
Assistant Executive Director



Kathy Van Booven
Director of Finance



Debbie Cary
Director of Membership &
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Della Yee
Director of Conferences &
Events



Grant Miller, DVM
Director of Regulatory
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Bernice Evans
Accountant



Jennifer Jacobs
Communications
Coordinator

Upcoming CVMA CE Programs

CVMA provides continuing education opportunities each year, which fulfill mandatory CE requirements for license renewal. Please see the listing below for event names and dates.

- California Licensing Curriculum – September 25-28, 2016
- Fall Seminar in Palm Springs – September 30-October 2, 2016
- Spring Seminar in Yosemite – March 9-12, 2017 (more information soon)
- Pacific Veterinary Conference – June 29 – July 2, 2017

<http://cvma.net/about-cvma/leadership-and-staff-information/cvma-staff/>

Local Chapters too!

- Alameda County: <http://acvma.com/>
- Contra Costa County: <http://www.ccvma.org/>
- Peninsula: <http://peninsulavma.org/web/>
- SF: <http://www.sfvma.net/>



Messages (to vets)



- Active ingredients from topicals and collars are transported around the home (and wash off)
- Topical ingredients such as fipronil and imidacloprid are seen throughout a POTW service area, as well as effluent, and waterways; they are toxic to aquatic organisms
- As they are aware, these chemicals only target about 5% of the flea cycle
- Their national association, the AVMA, already recognizes IPM
 - Pharma-backed group is far less clear on this matter
- Water agencies are seeking your partnership
 - Help us focus these messages
 - Support an IPM message that is easy for clients to understand

Will Vets Support our Messages?

Why they might be averse

- In-office sales



Why they might support it

- In-office sales are lagging due to OTC alternatives and low-cost prescription sales online
- Aligns with AVMA message
- Reduced liability if health/safety concerns arise in future
- Patients might appreciate insights re. flea reservoirs... rather than becoming exasperated when spot/oral treatments alone don't work

Recommended Next Steps

- Send introductory letter to Dr. Grant Miller, the CVMA Director of Regulatory Affairs
 - Lead: Stephanie
- Sit down with OWOW representatives re. the messages in the OWOW flea documents
 - Lead: BACWA Pesticide Committee
- Develop outreach material for consumers to time with DPR's press release about fipronil-containing products
 - Lead: O'Rourke

Thank you for your attention!



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