

The Challenges and Dangers of Do-It-Yourself Pest Control



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Outline

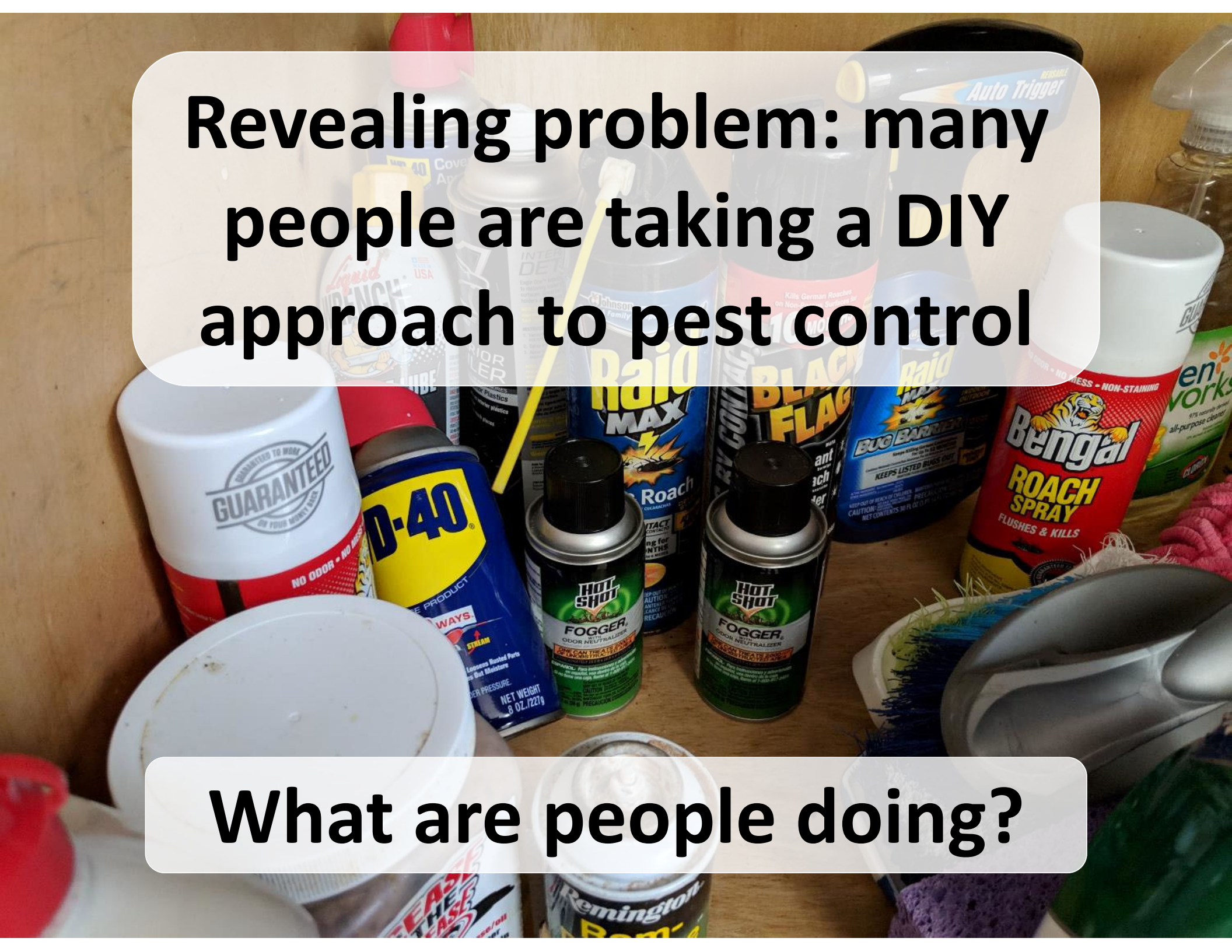
1. DIY Pest Control
2. Cockroach Basics
3. Recent Research
4. What's Next?

In 2012 \$2.65 billion were spent in the “home and garden sector”, representing 50% of all expenditures on insecticides

A collection of various household insecticide products is shown. In the foreground, there are several cans: a white can with a 'GUARANTEED TO WORK' logo, a blue and yellow 'D-40' can, two green 'HOT SHOT FOGGER' cans, a blue 'Raid MAX' can, a black and yellow 'BLACK FLAG' can, and a red 'Bengal ROACH SPRAY' can. In the background, there are more products like 'FRONTIER' and 'enworks'. The products are arranged on a wooden surface.

**82 million households used
insecticides in 2012
(only 127 million households total)**

**ONLY ~9 million residential
accounts being serviced**



Revealing problem: many people are taking a DIY approach to pest control

What are people doing?





Pull the whole thing up, using the "handle" on the left. Flip it over, and put a glob of peanut butter in the middle of the sticky side.



You now have a very effective cricket trap.
Check it every day, and squish the stuck ones.
Replace when it gets full.



ULTRASONIC PEST REPELLER









NO WATERING IN!
TREATS UP TO 162 MOUNDS


FOR OUTDOOR HOME USE ONLY
KEEP OUT OF REACH OF CHILDREN
CAUTION See back panel for additional
precautionary statements.
MANTENER FUERA DEL ALCANCE DE LOS NIÑOS
PRECAUCION Consulte el panel posterior para conocer
los avisos de precaución adicionales.

ACTIVE INGREDIENT:	By Wt.
Acephate	50.00%
OTHER INGREDIENTS:	50.00%
Total	100.00%

NET WT 12 oz / 340 g





A person wearing a white shirt is seen from behind, working in a garden. The person is holding a long-handled tool, possibly a shovel or a hoe, and appears to be digging or tilling the soil. The garden is enclosed by a fence, and there are some plants and structures visible in the background. The date '18/10/2019' is printed in the top right corner of the image. A large, semi-transparent text box is overlaid on the center of the image, containing a quote.

“My wife complained that there was a lot of roaches invading our garden,” he told the outlet. “She is scared of them and begged me to destroy their nest under the ground once and for all.”

ATRAS

Do-it-Yourself (DIY) Harm

- Often occurs when residents over- or incorrectly use pesticides (ex. TRFs)
- Most recently, trying to conduct heat treatments on their own

9 ON YOUR SIDE AT NOON

FD: FIRE STARTED WHEN TEEN TRIED TO BURN BEDBUGS
HAWAIIAN TERRACE IN MOUNT AIRY



12:01 55°

Why is DIY so popular?



More research needed to
guide future PMP strategies

DIY Pest Control in Affordable Housing



Pest problems can be profound!



German Cockroach (*Blattella germanica*)

- Small (~5/8") cockroach found worldwide
- Reliant on humans and human built structure



- Egg to adult in ~3 months
- 160 offspring/female
- Can eat almost anything

- Resistant to most spray-based formulations (pyrethroids)
- Significant effects on human health



Cockroaches, allergens and allergic disease

- Number of people currently affected with asthma in the United States
>25 million (>7 million children)
- Estimated cost in the United States
\$82 billion annually
- Percentage of US population allergic to cockroaches
>26% (44-81% for inner-city children with asthma)

Resident with pests: What to do?

- **Hire a professional**
 - Only if you have the resources
- **Live with the problem**
 - Bad idea, major health consequences
- **Turn to over-the-counter products**
 - Cheap and affordable, but what to use?

TERRO
Ant Killer,
Liquid Ant Baits
Mata hormigas, Cebos líquidos para hormigas

Kills all common household ants
Pre-filled & Ready-to-use

6 Bait Stations

TERRO
Ant Killer,
Liquid Ant Baits
Mata hormigas, Cebos líquidos para hormigas

Kills all common household ants
Pre-filled & Ready-to-use

6 Bait Stations

TERRO
Ant Killer,
Liquid Ant Baits
Mata hormigas, Cebos líquidos para hormigas

Kills all common household ants
Contains Borax

The LIQUID
Ant Killer

How do residents determine what is a good product?

Raid
DEFENSE SYSTEM
Fogger
KILLS Small Roaches & Fleas
Keeps Killing Roaches for up to 2 Months
NET WEIGHT 3 x 1.5 OZ (3 x 43 g)
TOTAL 4.5 OZ (128 g)

RAID FOGGER CONCT 3PK/1.050
8.39

Raid
Double Control
Small Roach Baits
NET WT. .63 OZ (17.86 g)

RAID DBL CNTRL RCH BAITS 12
9.89

COMBAT MAX
12 MONTH ROACH KILLING BAIT
18 CHILD-RESISTANT BAIT STATIONS
KILLS THE NEST

COMBAT 18CT 12 MTH ROACH BAIT
11.49

Total Release Foggers

- “TRFs” or “Bug Bombs”
- Common Do-It-Yourself (“DIY”) product
- Used for a variety of pests (cockroaches, fleas, bed bugs, etc.)
- Pose a risk for users and bystanders



North Hollywood 'bug bomb' explosion breaks windows, knocks doors off hinges

wood 'bug bomb'...



Day, July 10, 2019, at this apartment on the 6400 block of Denny Avenue in North Hollywood, blowing out windows and knocking doors off hinges. (Photo by Mike Meadows/Special to the Los Angeles Daily News)

Firefighters went to the 6400 block of Denny Avenue about 10:15 a.m. on a report of an explosion, said Margaret Stewart of the Los Angeles Fire Department.

No injuries were reported, but a Los Angeles police officer who responded to the scene was taken to a hospital in fair condition for treatment of a "medical complaint, likely respiratory irritation," Stewart said.



1 of 4

An officer was affected by fumes from the "bug bomb" explosion on Wednesday, July 10, 2019, in North Hollywood. (Photo by Mike Meadows/Special to the Los Angeles Daily News)



An LAFD hazardous materials squad "used sensitive odor detection equipment and found no existing life hazard in the structure," she said, adding that an Urban Search and Rescue team was summoned to evaluate the structural integrity of the building.

"While there does not appear to be any significant damage to the building as a whole ... they are 'yellow-tagging' the two-story apartment building — denying entry — while awaiting L.A. Building and Safety for their complete evaluation and determination," Stewart said.



Bug Bombs Hospitalize Three WA Firefighters

Firehouse.com (press release) (blog) - Jan 17, 2019

Three Spokane Valley firefighters were hospitalized Wednesday afternoon after being exposed to chemicals from a **bug bomb**. The firefighters ...

doors off

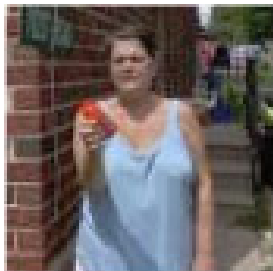
m. on a report of an explosion,



Bug bomb mishap hurts 4, blows out windows in Brooklyn

KTRK-TV - Dec 8, 2017

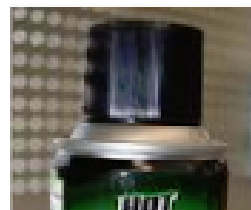
Bug bomb mishap hurts 4, blows out windows in Brooklyn ... of Buildings, Office of Emergency Management and **fire** marshals were on scene.



Bug bomb blamed for explosion inside Philadelphia home

6abc.com - Jun 25, 2019

Barbera said police, fire, paramedics and the **bomb** squad came to her home after the explosion. She felt short of breath and was checked out ...



'Bug bomb' causes Putney house fire

The Albany Herald - Apr 12, 2016

ALBANY — After a **fire** Monday night tore through a house in Putney, officials with the Albany Fire Department said the blaze was caused by ...



Explosion in Apartment Highlights Risks of Using Chemical Foggers to ...

New York Times - Jul 12, 2013

"These **bug bombs** are very flammable," Mr. Byrnes said. ... Besides the risk of explosions and fires, he said, there is also the risk of **poisoning**.

etection equipment and found no
n Urban Search and Rescue team was

to the building as a whole ... they are
entry — while awaiting L.A. Building

and Safety for their complete evaluation and determination," Stewart said.

Total Release Foggers



FROM THE CENTERS
FOR DISEASE CONTROL
AND PREVENTION

MMWR
Morbidity and Mortality Weekly Report

“TRFs can reduce pest populations and often are used by consumers as a low cost alternative to professional pest control services”

Illness
Relat
Relea
Eight
2001

MMWR.
3 tables

TOTAL RELEASE FOGGERS (TRFs), sometimes called “bug bombs,” are pesticide products designed to fill an area with insecticide and often are used in homes and workplaces to kill cockroaches, fleas, and flying insects. Most

son Control Center (NYCPCC) has access to data on pesticide poisoning. No other states or cities conduct pesticide poisoning surveillance. Cases of acute TRF-related illness or injury consistent with the national case definition for

ing eyes, cough, and weakness after she was exposed to fumes from three TRFs (in 6-ounce cans) deployed nearly simultaneously by a downstairs apartment neighbor. One TRF each was set off in the crawlspace beneath the house,

tors that
e expo-
are pro-
erns ob-
.

aged 38
an emer-
e, short-
bs, burn-

Loosens Roaches
es Out Moisture
DER PRESSURE
NET WEIGHT
8 OZ./227g

ESPAÑOL: Para instrucciones y advertencias
en español, vea dentro de la caja.
Do not use unless you see a box, flame or 1-800-917-3434.
KEEP OUT OF REACH OF CHILDREN.
CAUTION
No use unless you see a box, flame or 1-800-917-3434.
PRECAUCION

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NET WEIGHT
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HOUSEHOLD AND STRUCTURAL INSECTS

Ineffectiveness of Over-the-Counter Total-Release Foggers Against the Bed Bug (Heteroptera: Cimicidae)

SUSAN C. JONES¹ AND JOSHUA L. BRYANT

Department of Entomology, The Ohio State University, 2501 Carmack Road, Columbus, OH 43210-1065

J. Econ. Entomol. 105(3): 957-963 (2012); DOI: <http://dx.doi.org/10.1603/EC12037>

- TRFs were completely ineffective against field populations of bed bugs
- TRFs were ineffective against all bed bugs that were in harborage



What about cockroaches?

1. Are TRFs efficacious at controlling German cockroaches?
2. Do TRFs pose a pesticide exposure risk to residents?
3. What is the comparative cost of using TRFs as opposed to insecticidal baits?

TRF Efficacy



TRFs Tested:

1. Hot Shot No-Mess Fogger 2
 - Als: tetramethrin, permethrin, PBO
2. Hot Shot No-Mess Fogger 3
 - Als: tetramethrin, cypermethrin, PBO
3. Raid Concentrated Deep Reach Fogger
 - Al: cypermethrin
4. Raid Fumigator
 - Al: permethrin



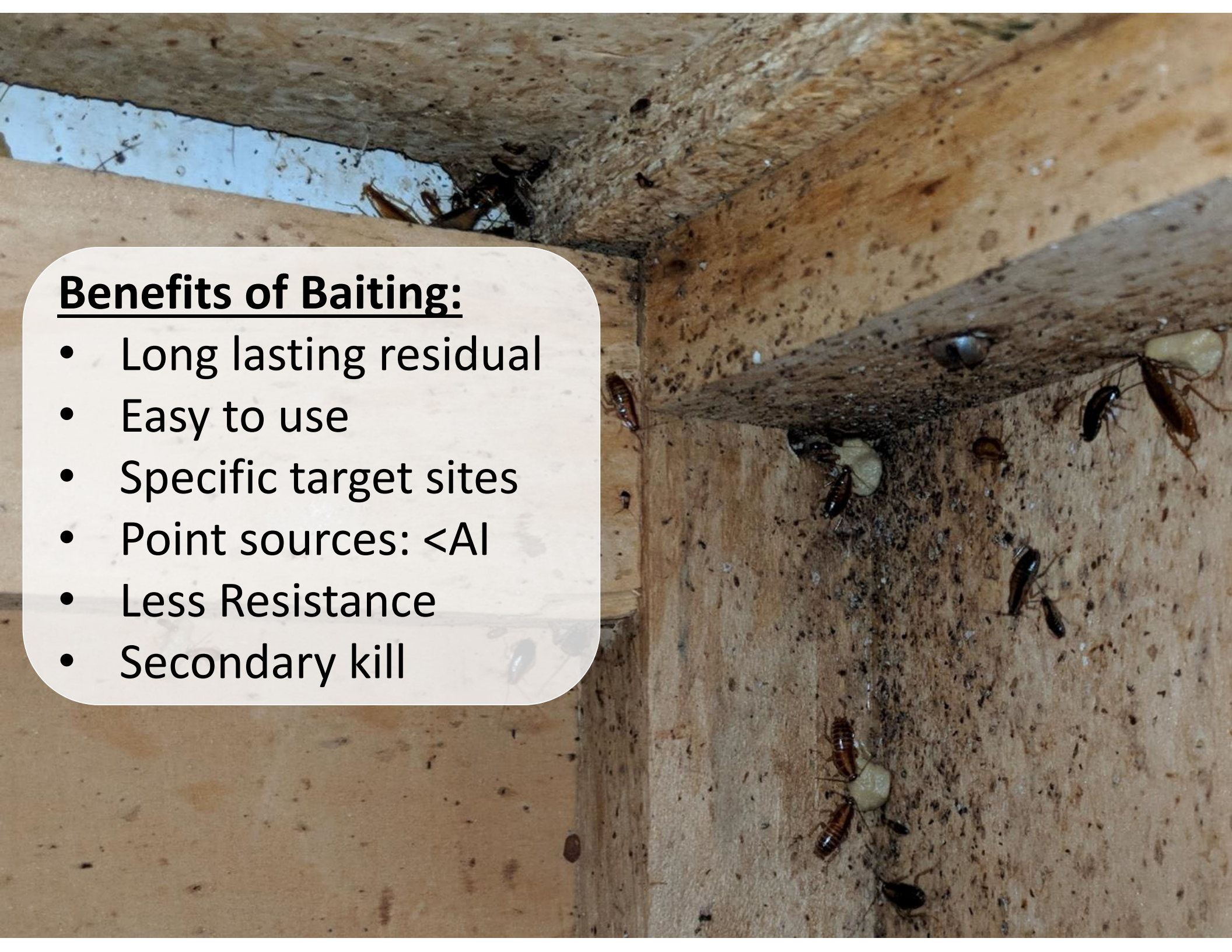
Baits Tested:

1. Combat (consumer grade)
 - AI: fipronil
2. MaxForce (professional grade)
 - AI: fipronil

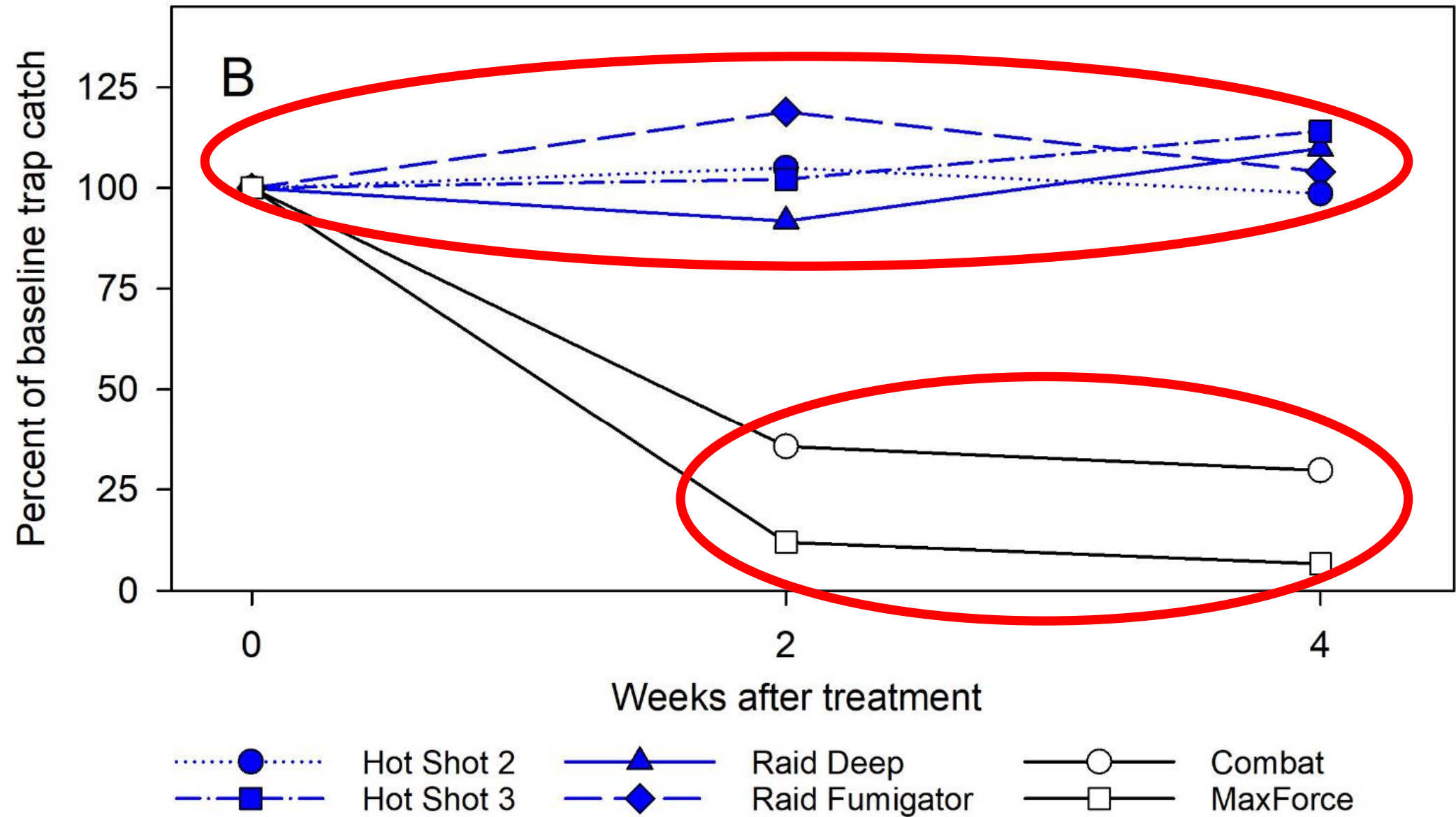


Benefits of Baiting:

- Long lasting residual
- Easy to use
- Specific target sites
- Point sources: <AI
- Less Resistance
- Secondary kill

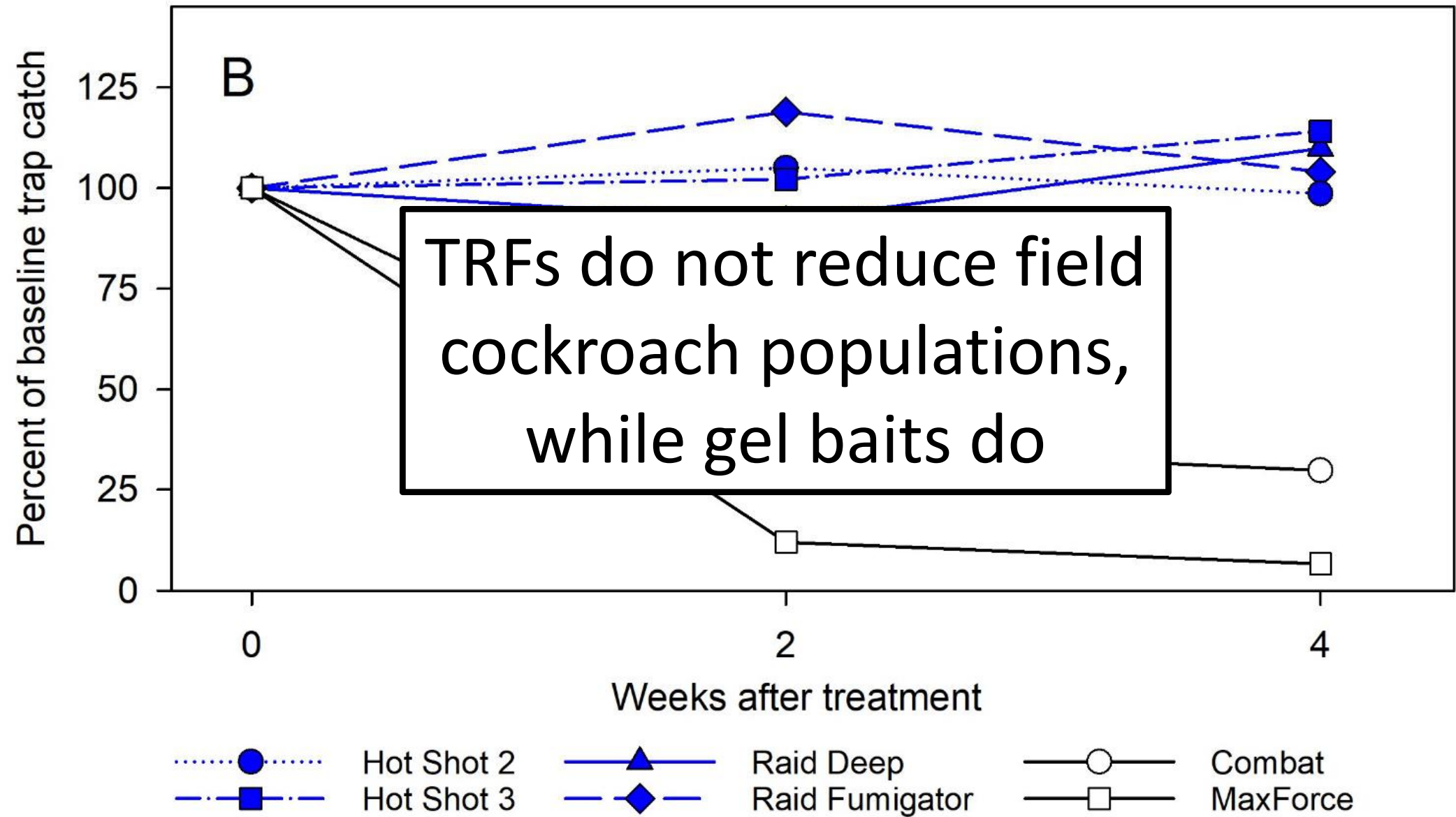


Change in Cockroach Population Over Time



n = 5 homes per treatment group

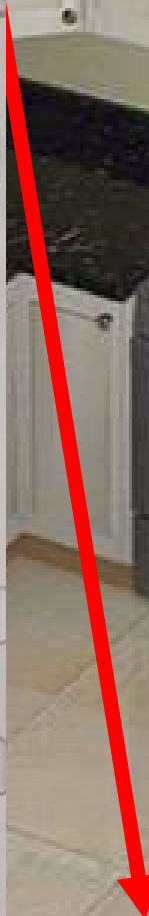
Change in Cockroach Population Over Time



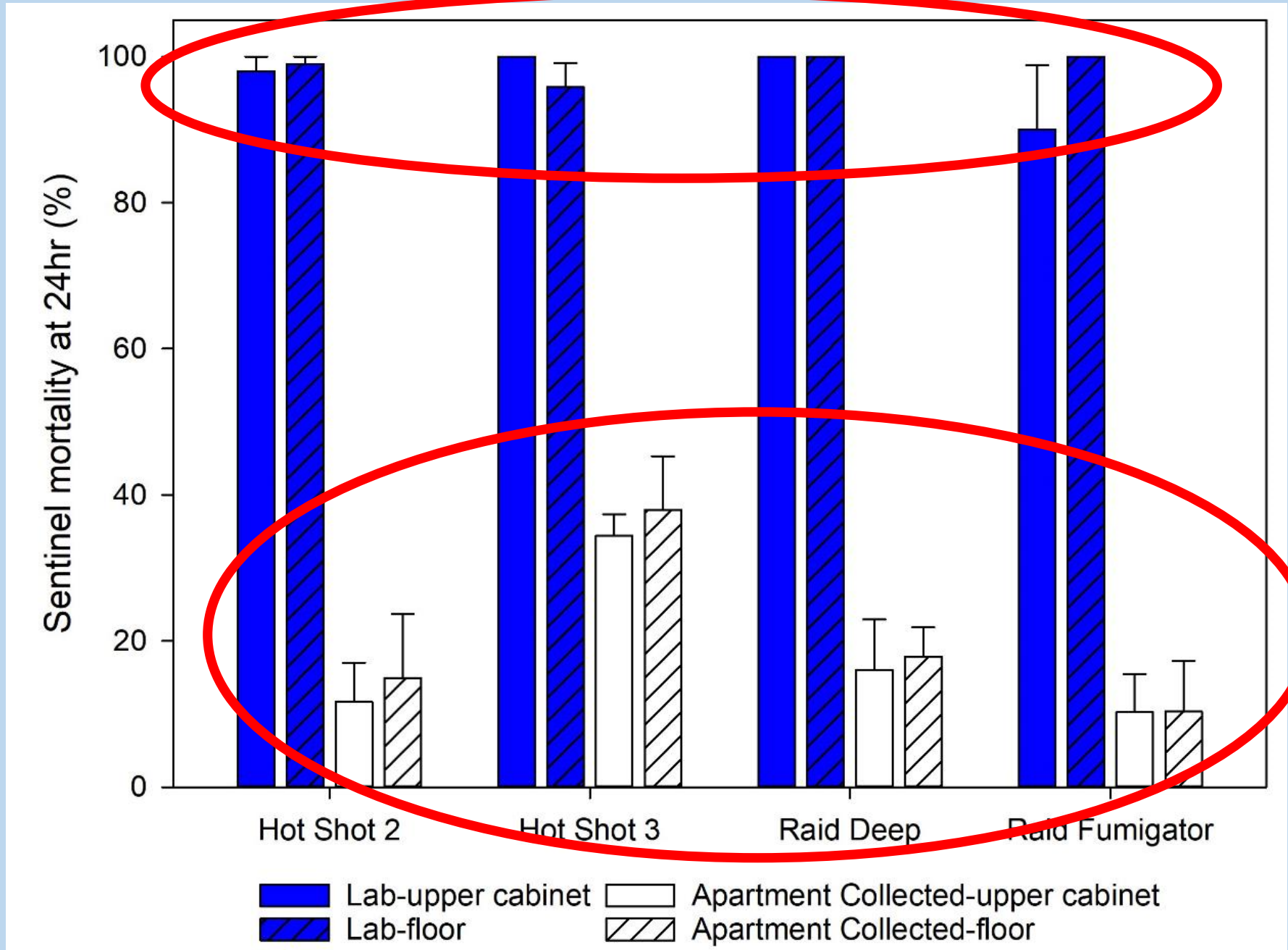
n = 5 homes per treatment group



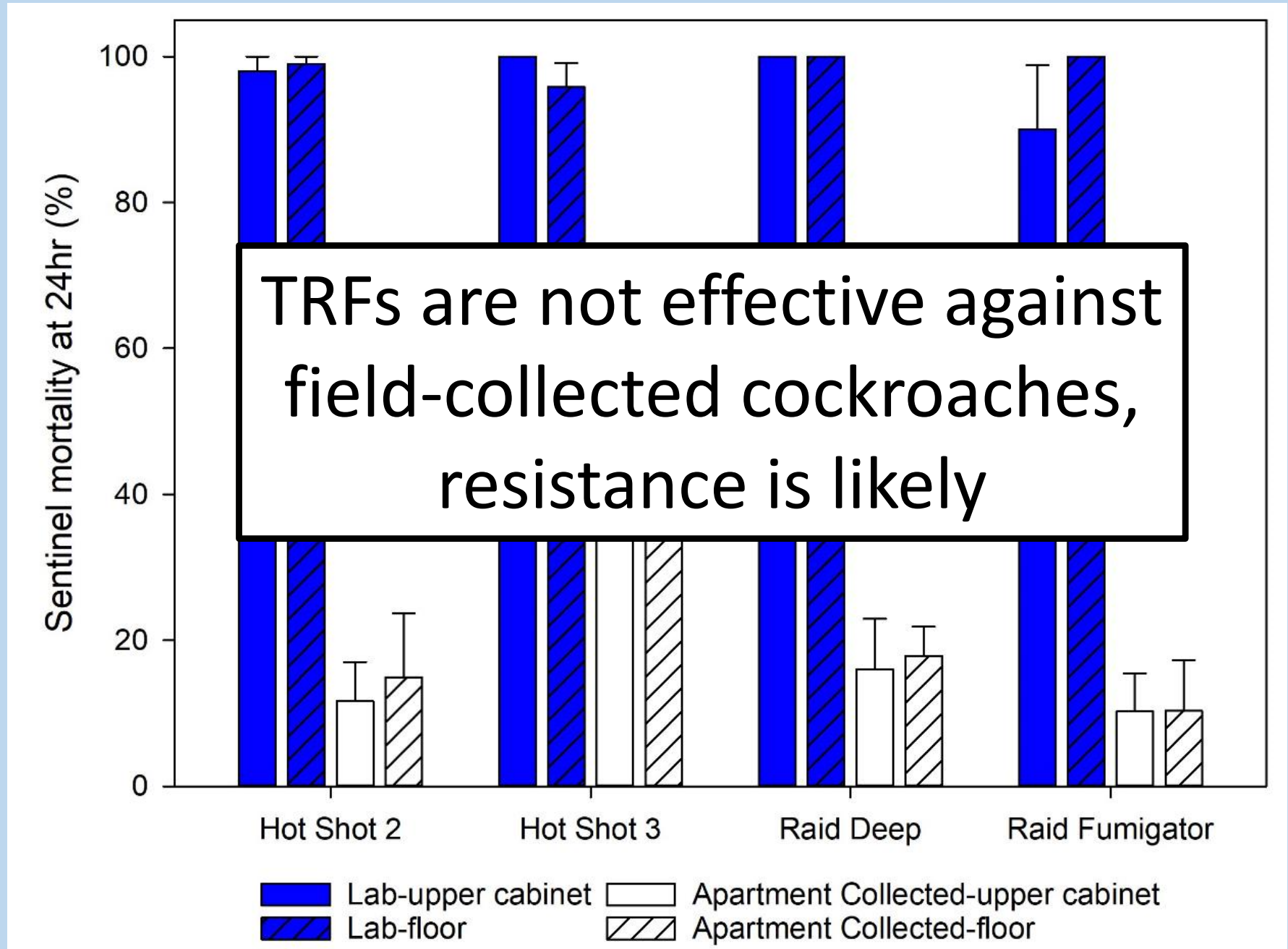




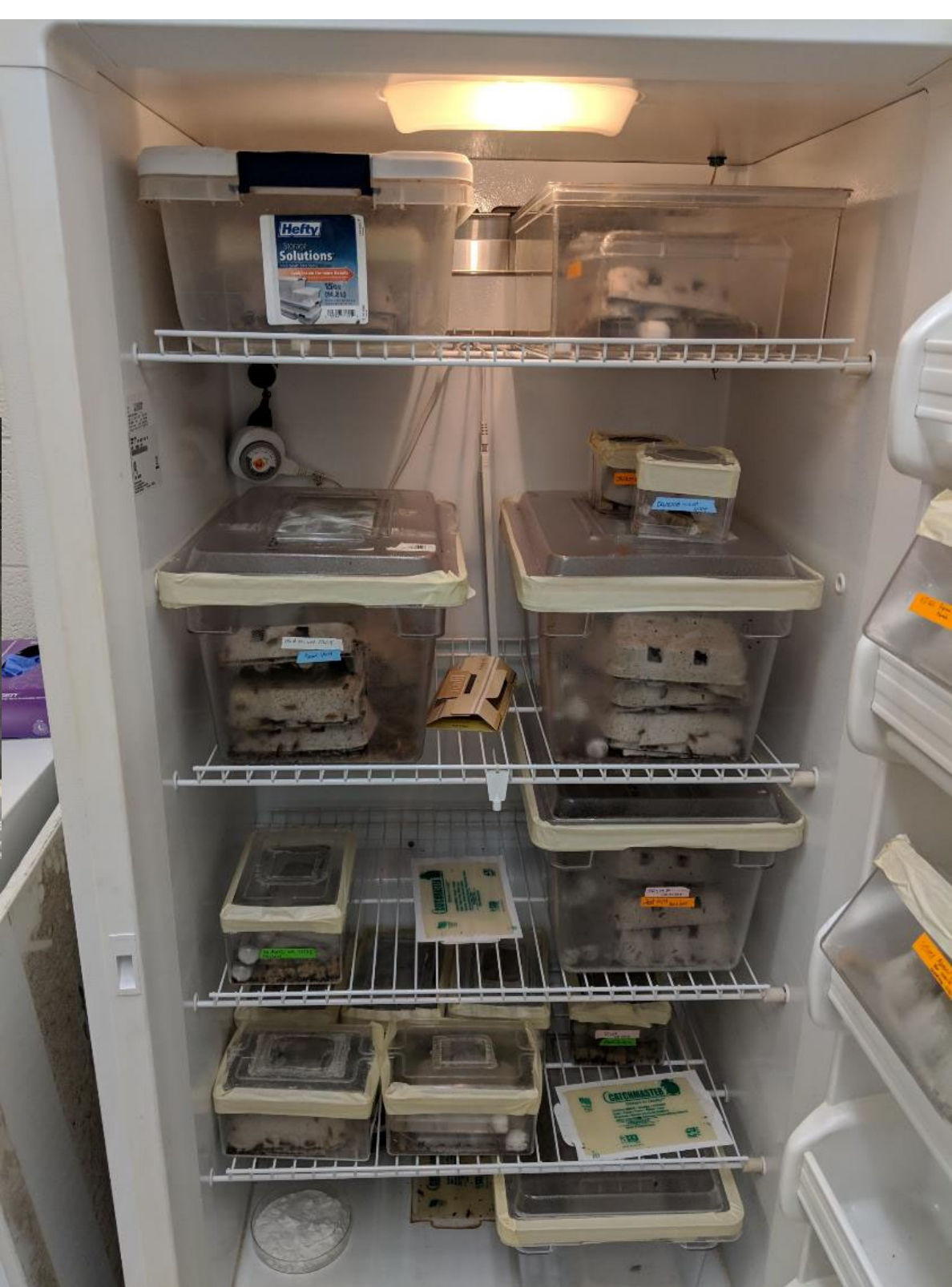
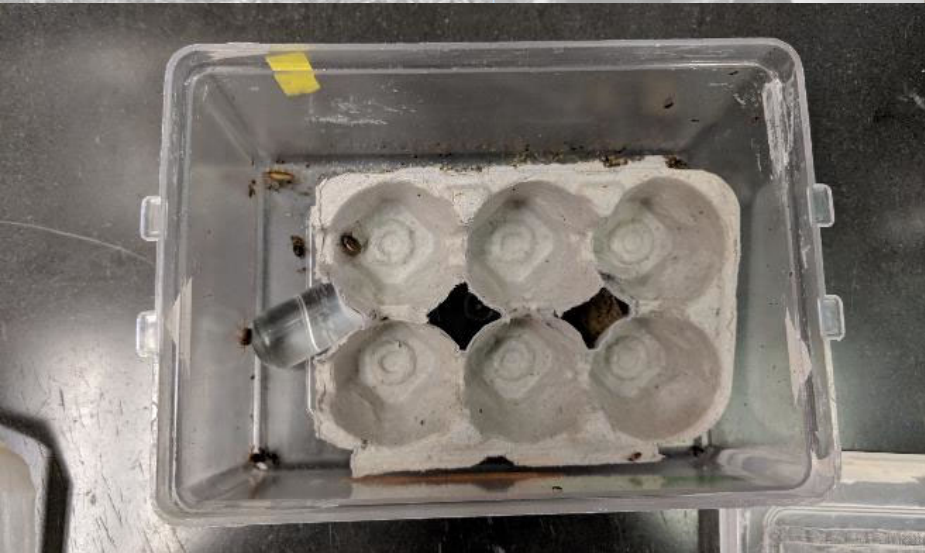
Effect of TRFs on sentinel cockroaches

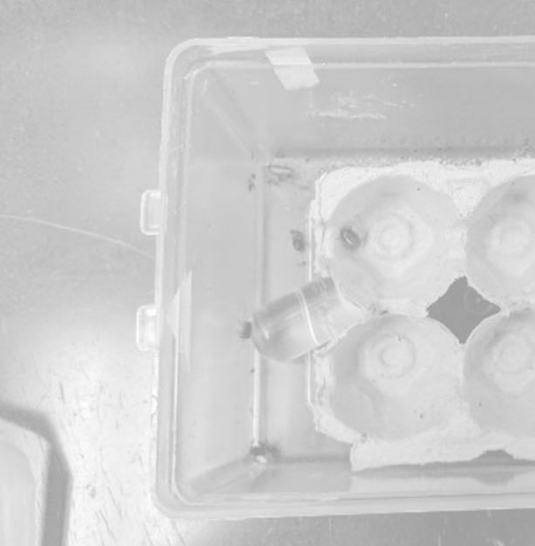


Effect of TRFs on sentinel cockroaches









Typically tested with a pyrethroid (cypermethrin) and Fipronil



Pyrethroids: highly resistant

Fipronil: only slightly resistant



pyrethroid
(cypermethrin)
and Fipronil



TRFs and Pesticide Exposure

- TRFs leave behind high levels of pesticide residues
- These residue are often in areas where people can contact them, but cockroaches won't.

TRF Conclusions

- **TRFs are ineffective and should not be used for cockroach control**
 - Global problem because pyrethroid resistance is extensive and pervasive
- **Baits are highly effective and are similarly priced to TRFs**
- **Unclear why TRFs are still being used**

Resident with pests: What to do?

- **Hire a professional**
 - Only if you have the resources
- **Live with the problem**
 - Bad idea, major health consequences
- **Turn to over-the-counter products**
 - Cheap and affordable, but what to use?



What about other DIY products?



Residual Liquid/Aerosol Sprays

- Incredibly common, especially in cockroach-infested homes
- Limited efficacy data, outside of what is assumed to be provided to EPA during registration
- Broad label, but often emphasize cockroaches

1/Aerosol Sprays



Residual Liquid/Aerosol Sprays

- Incredibly common, especially in cockroach-infested homes
- Limited efficacy data, outside of what is assumed to be provided to EPA during registration
- Broad label, but often emphasize cockroaches

Do these products actually work?

Spray Products Tested- Aerosols:

- Raid Ant & Roach Killer
(Imiprothrin 0.060%,
Cypermethrin 0.100%)
- Hot Shot Spray
(Imiprothrin 0.075%,
Lambda-Cyhalothrin
0.025%)



Spray Products Tested-RTU Liquids

- Spectracide Spray (Gamma-Cyhalothrin 0.025%)
- Ortho Home Defense (bifenthrin 0.05%, Zeta-cypermethrin 0.0125)

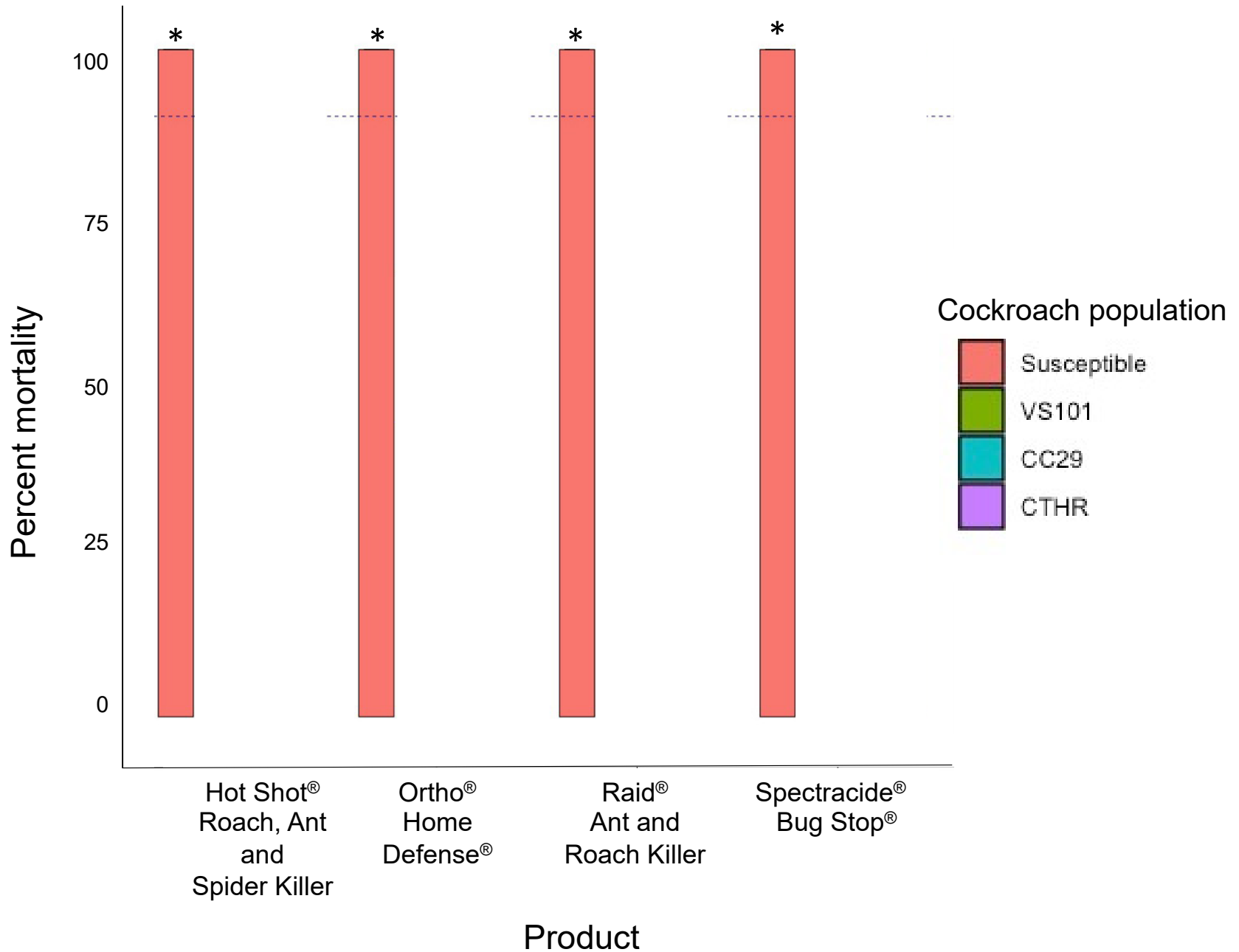




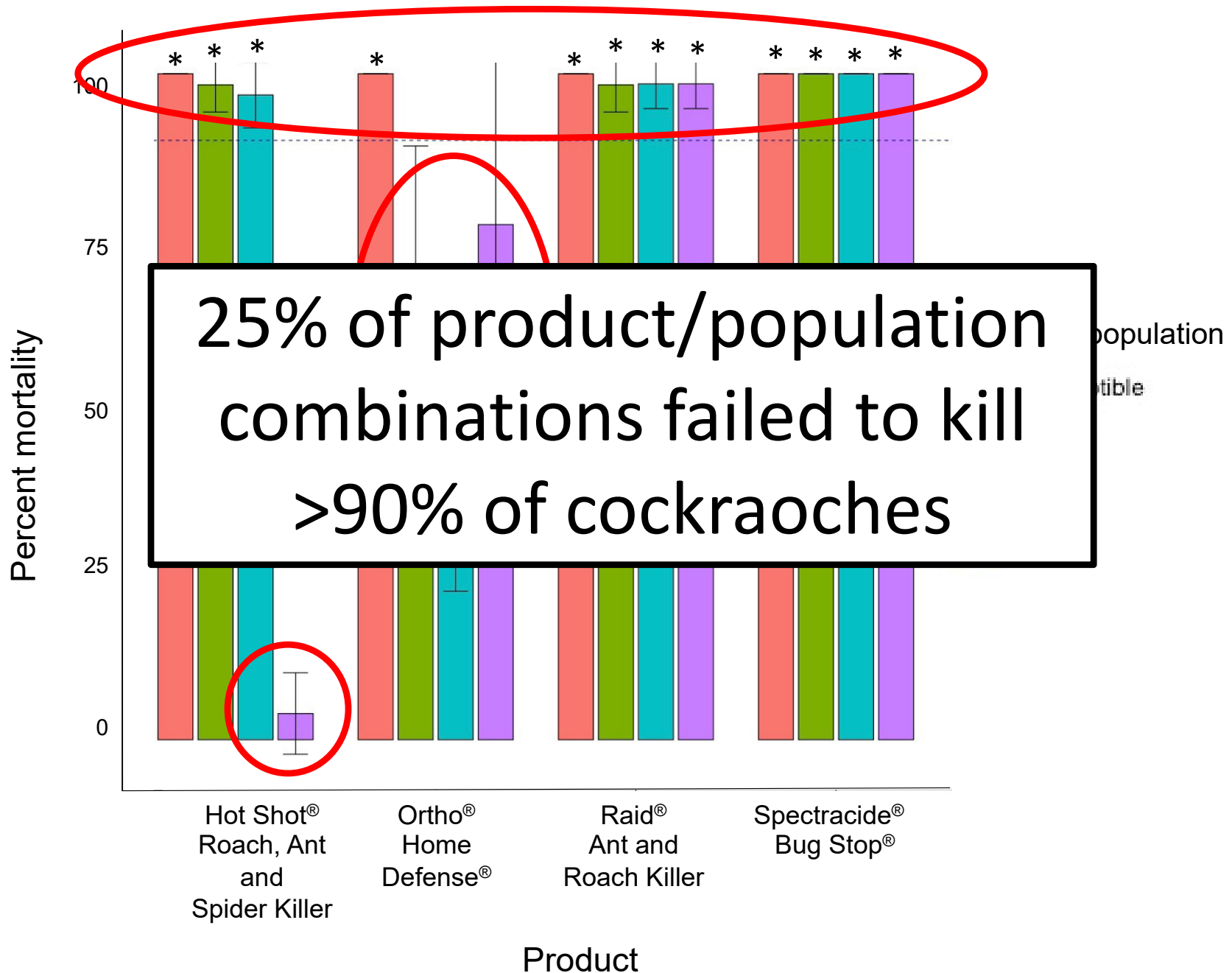
Direct Exposure: product applied directly to insect

Residual Exposure: Cockroach exposed for 30 min to treated surface (product was dry)

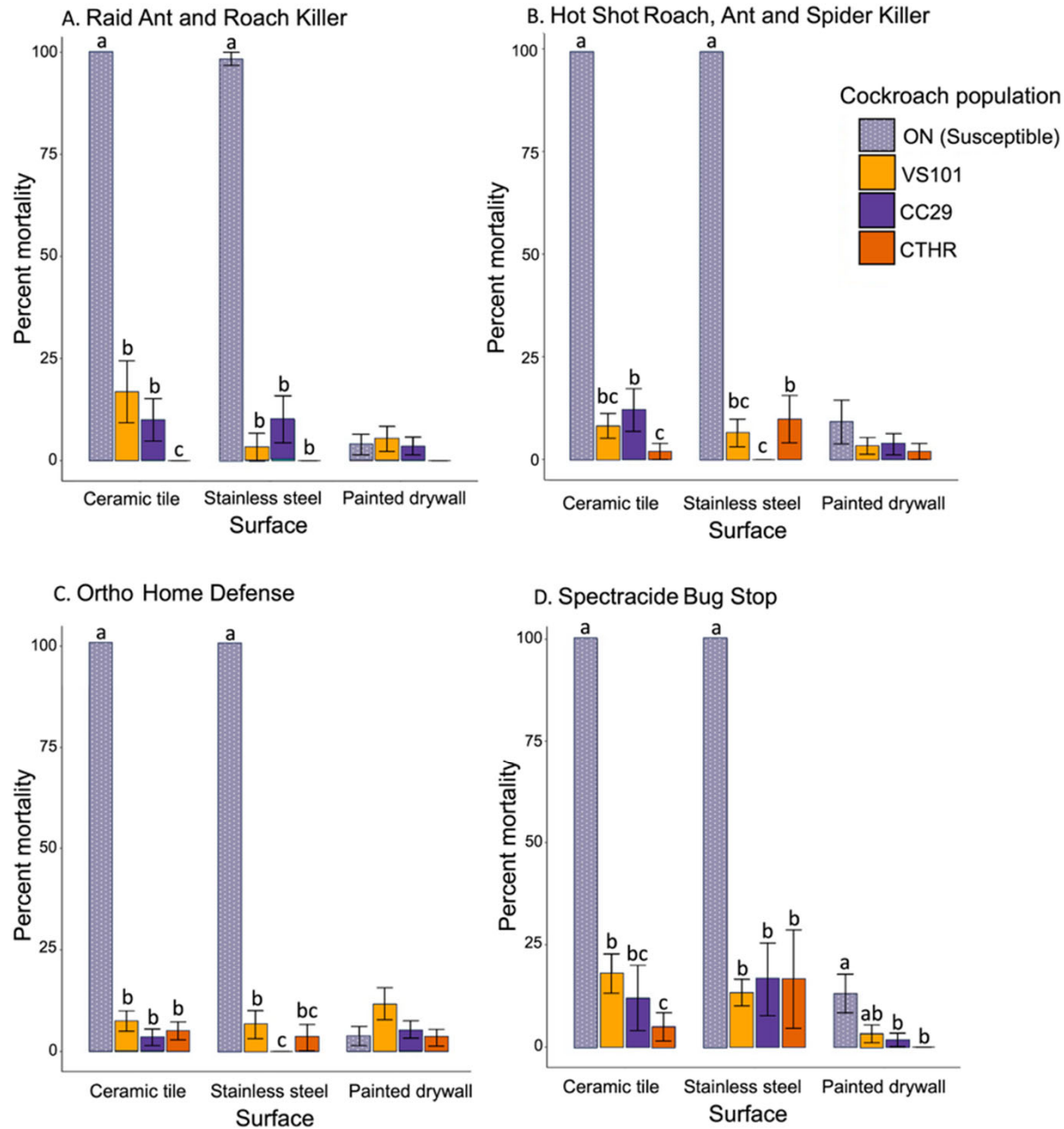
Direct Exposure



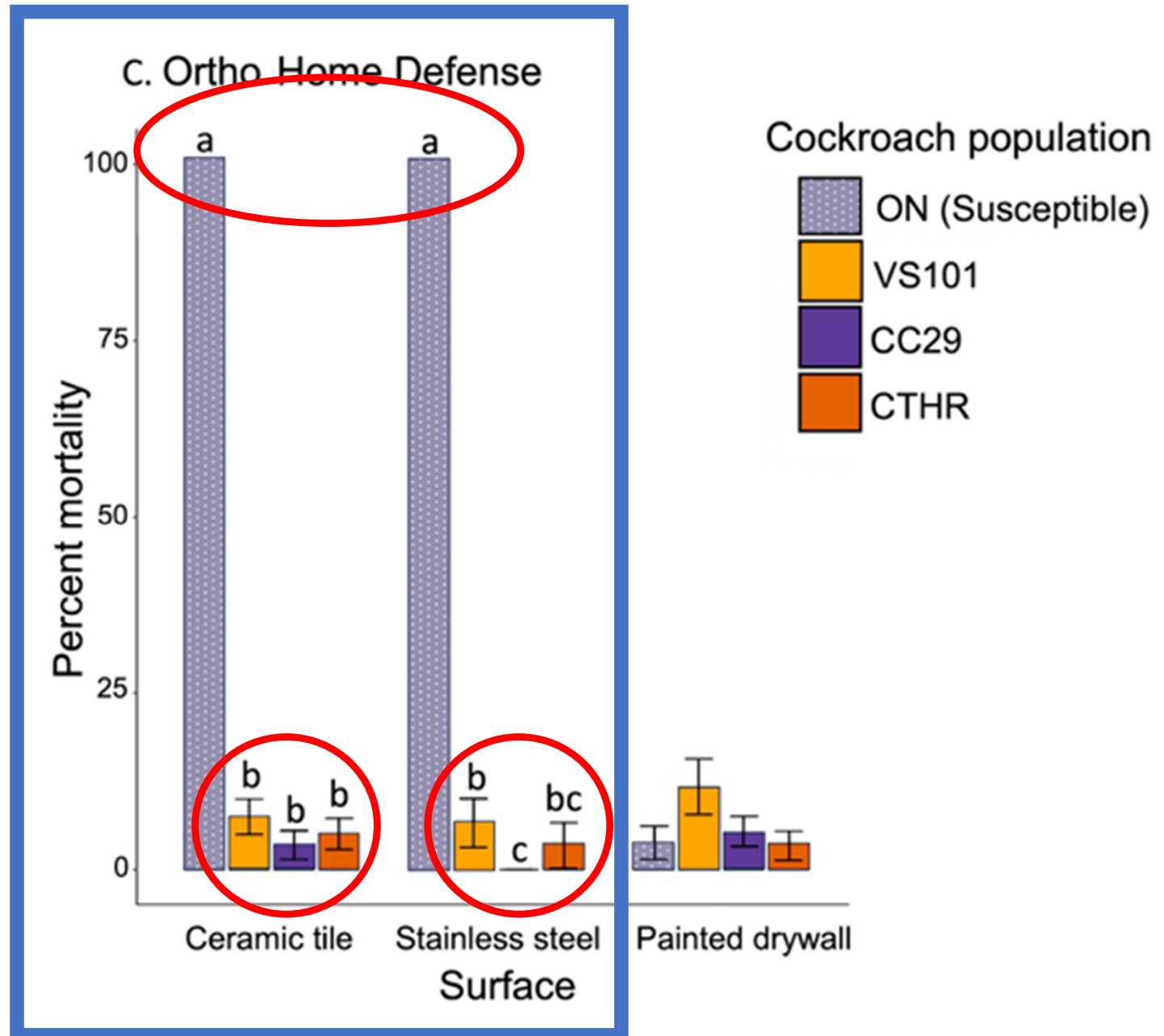
Direct Exposure



Residual Exposure



Residual Exposure



Residual Exposure

c. Ortho Home Defense

All products failed against field populations on all surfaces

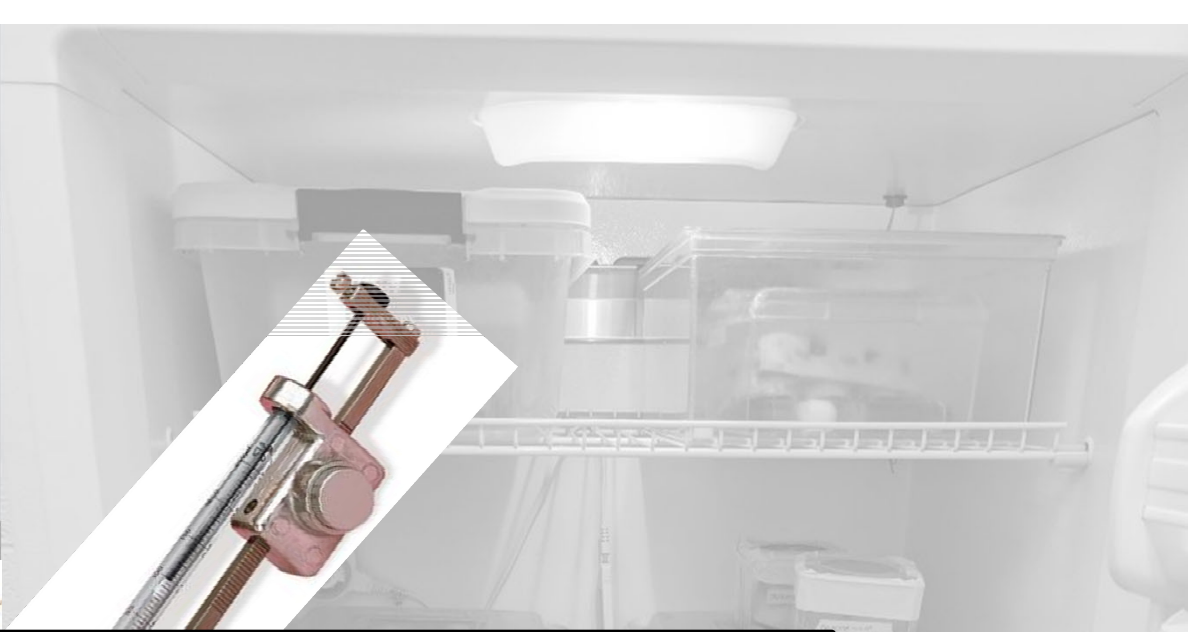
Products took >8 hours, and in some cases, up to 5 days to cause 100% mortality in continuous exposure assays

Surface

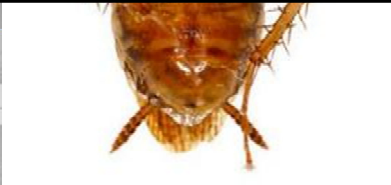
population
(Susceptible)

morta

50



Typically tested with a pyrethroid (cypermethrin) and found to be highly resistant.



DIY Residual Spray Conclusions

- **DIY sprays provide little to no residual control of cockroaches**
 - Global problem because pyrethroid resistance is extensive and pervasive
- **Given their poor efficacy, registration regulatory guidelines must be reevaluated**
- **Products won't leave the market since poor performance doesn't appear to alter consumer purchasing**

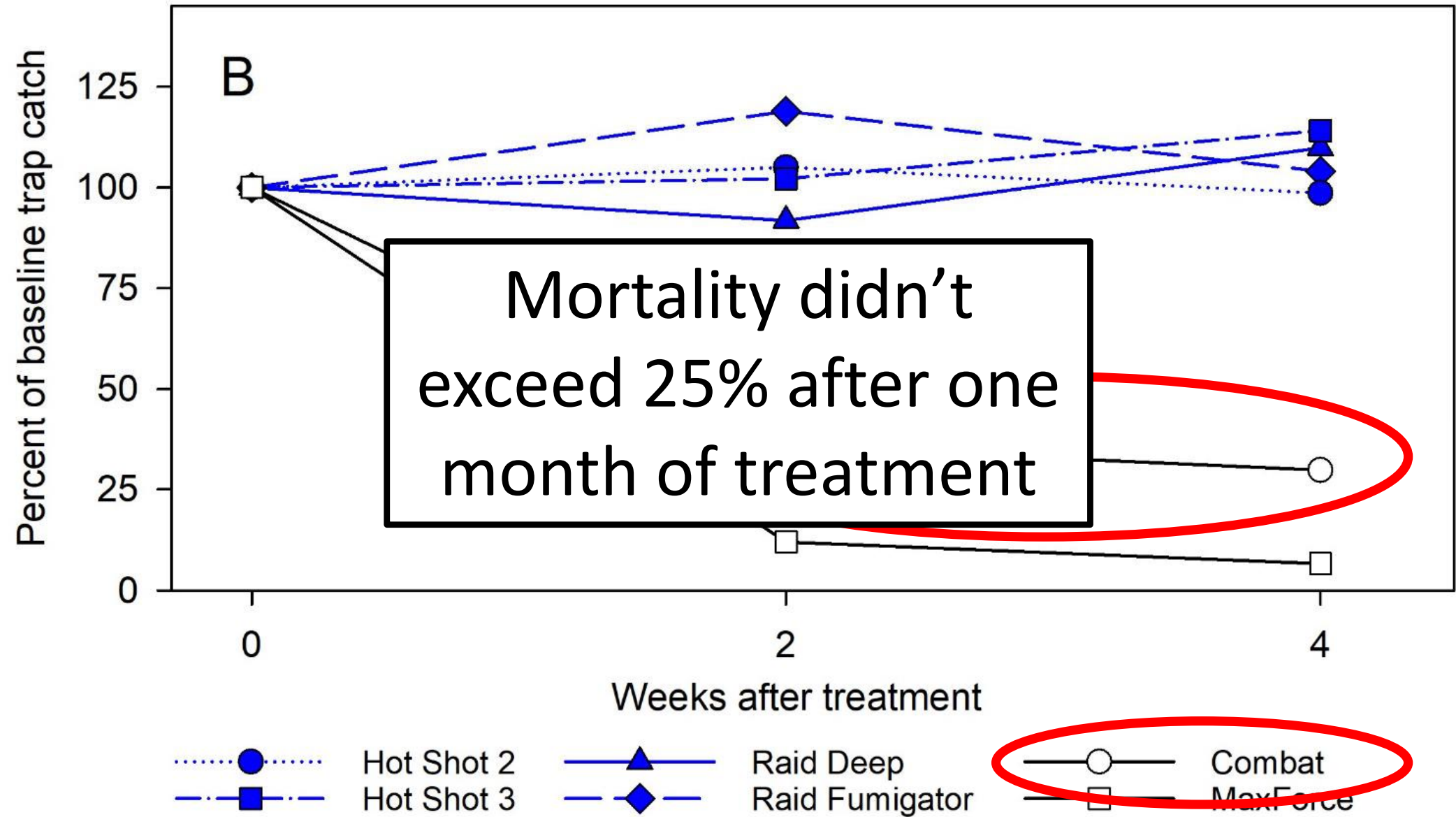
What about other DIY products?



DIY Baits

- **Not as commonly used by consumers, but presumed to be effective**
- **Limited efficacy data, despite being commonly recommended to all consumers in place of residual sprays**

Change in Cockroach Population Over Time



n = 5 homes per treatment group

DIY Baits

- Not as commonly used by consumers, but presumed to be effective
- Limited efficacy data, despite being commonly recommended to all consumers in place of residual sprays

Do these products actually work?



DIY Baits Tested:

- Combat Max Roach Killing Gel (0.01% Fipronil)
- Combat Roach Killing Bait Stations (0.01% Fipronil)
- Hot Shot Liquid Roach Bait stations (0.05% Dinotefuran)



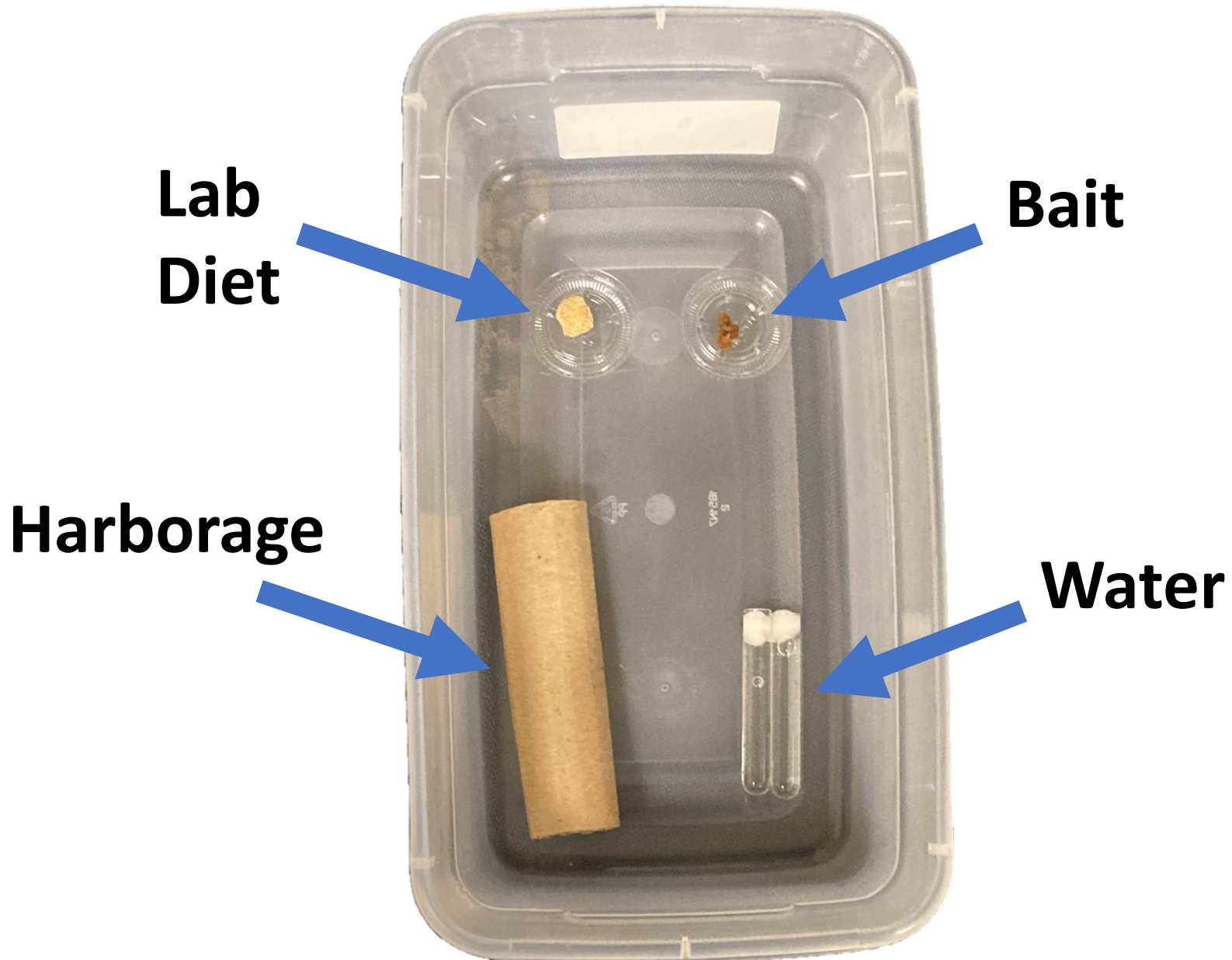


Professional Baits Tested:

- Vendetta Nitro (0.50% Clothianidin, 0.50% Pyriproxyfen)
- Advion Evolution (0.60% Indoxacarb)
- Maxforce FC Magnum (0.05% Fipronil)

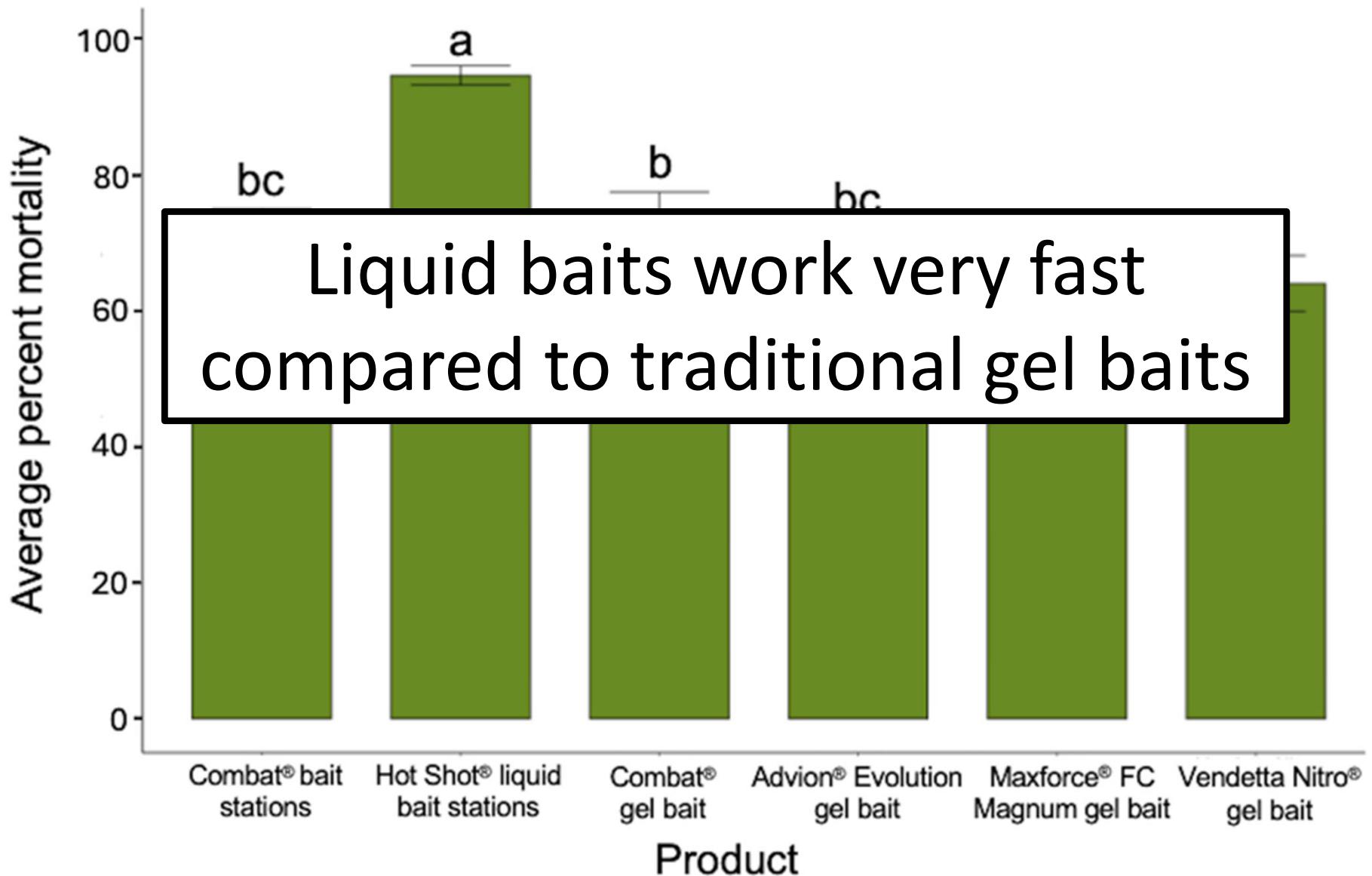


Laboratory Testing



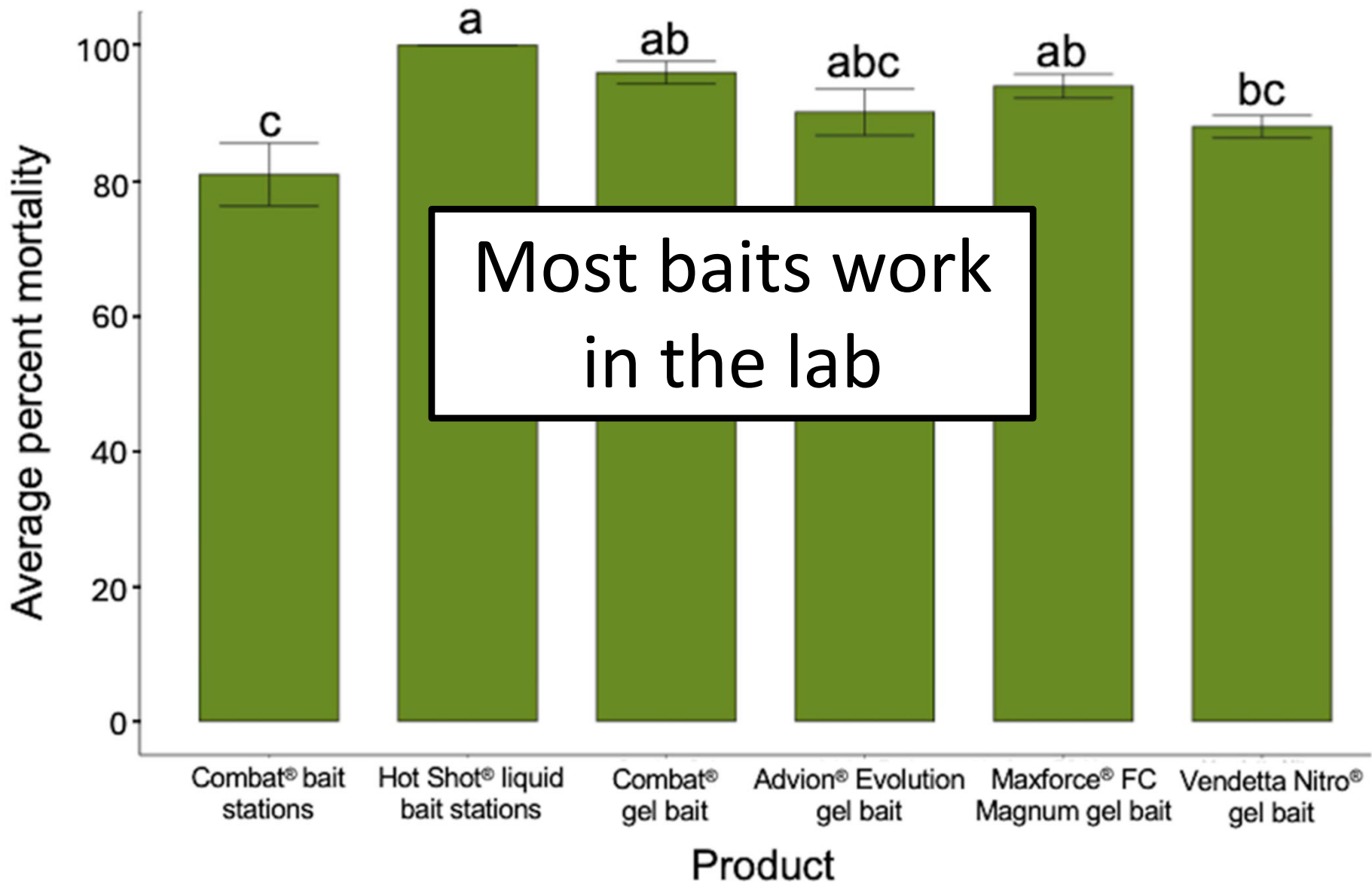
Laboratory Testing

A. Average percent mortality at 2 d



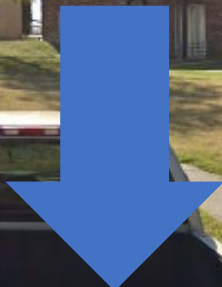
Laboratory Testing

B. Average percent mortality at 14 d



In-Home Testing







Fipronil 0.01%

consumer-grade
bait product



Fipronil 0.01%

consumer-grade
bait product



Dinotefuran
0.05%

consumer-grade
bait product



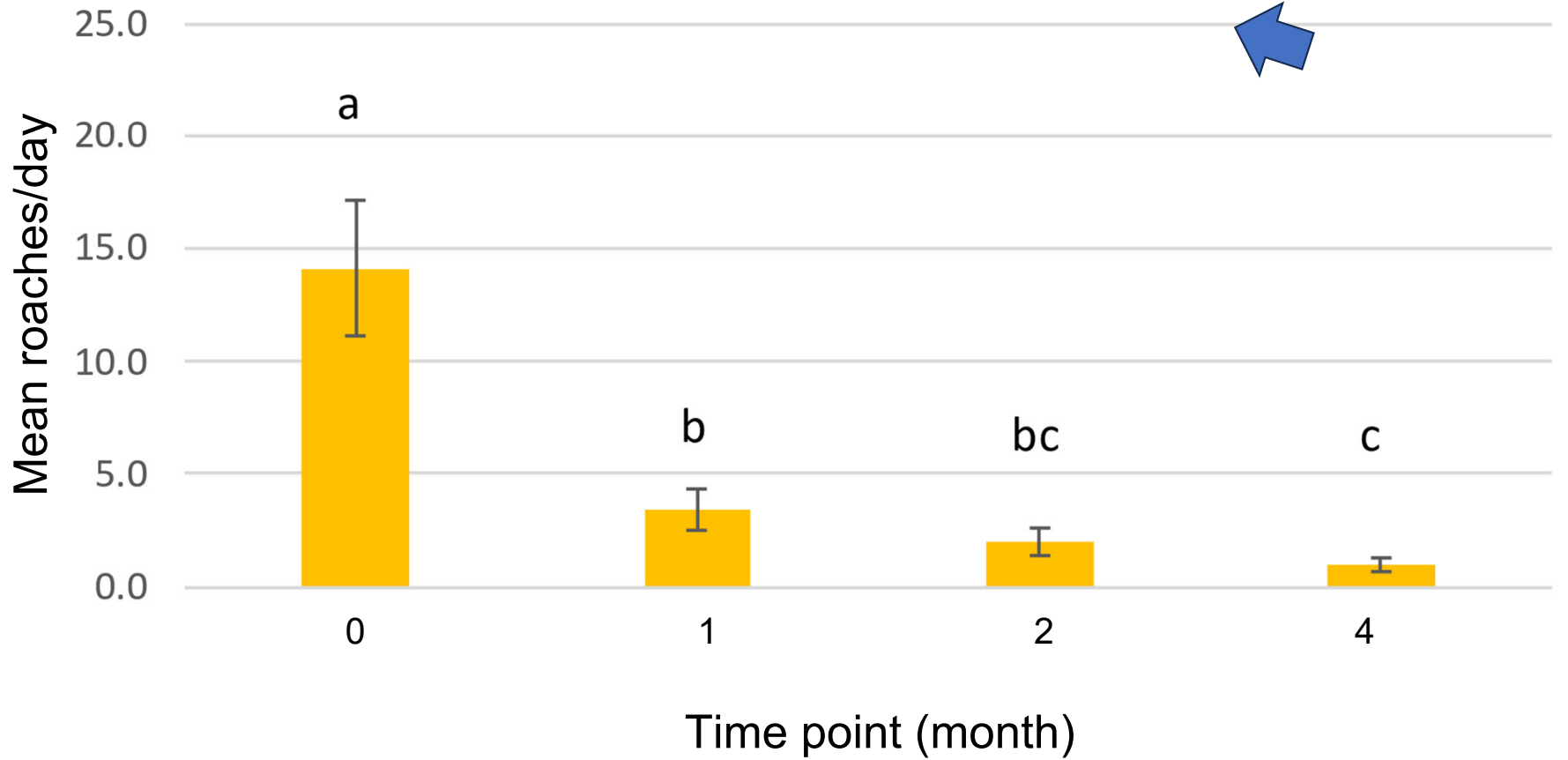
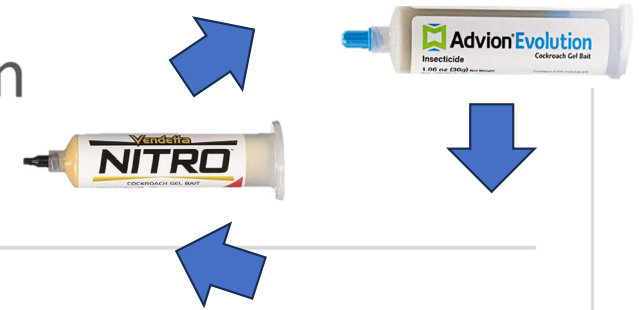
Vendetta Nitro: Clothianidin 0.50%,
Pyriproxyfen 0.5%

Advion Evolution :
Indoxacarb 0.6%

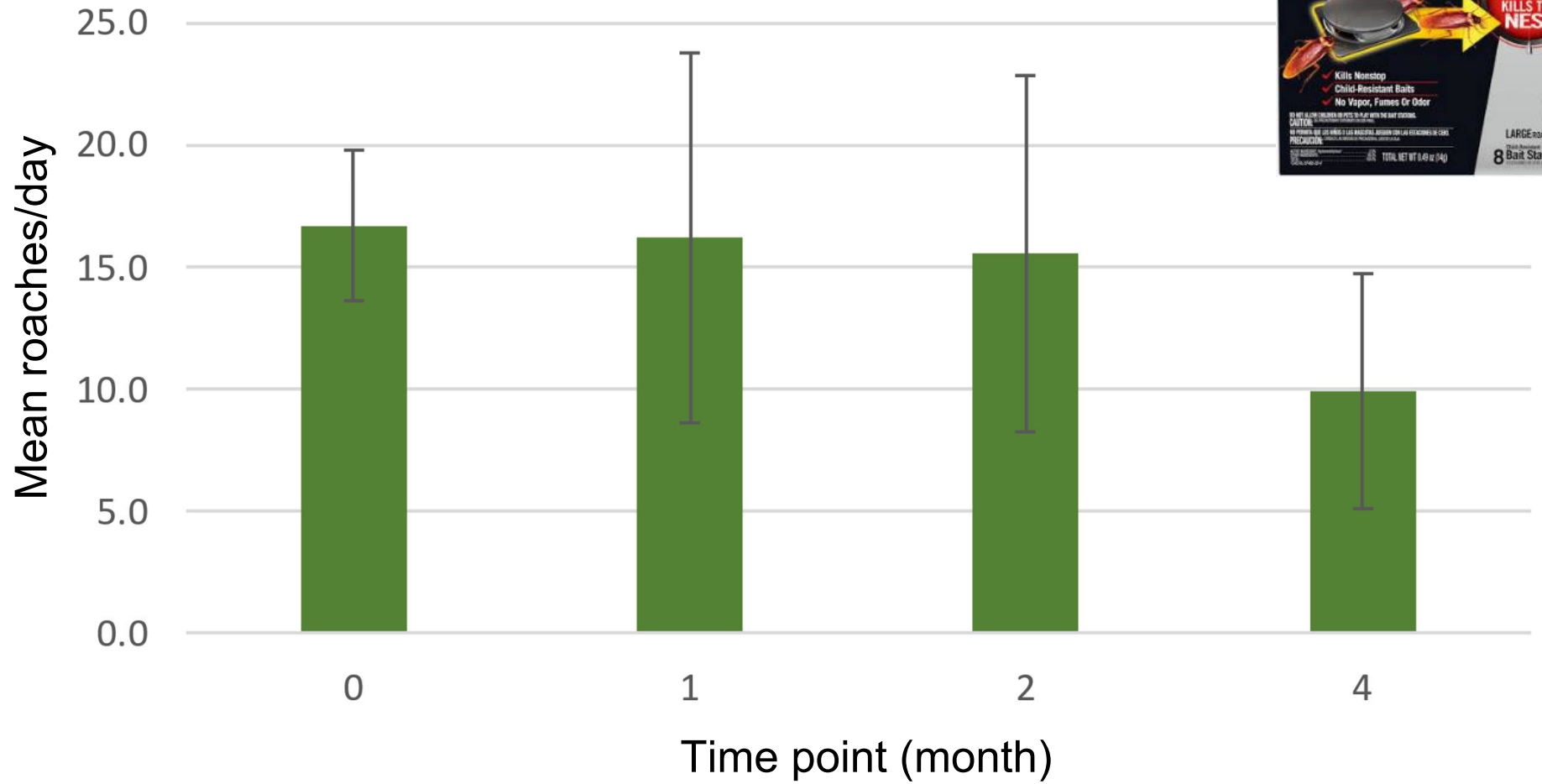
Maxforce FC Magnum: Fipronil
0.05%

professional grade bait rotation
(positive control)

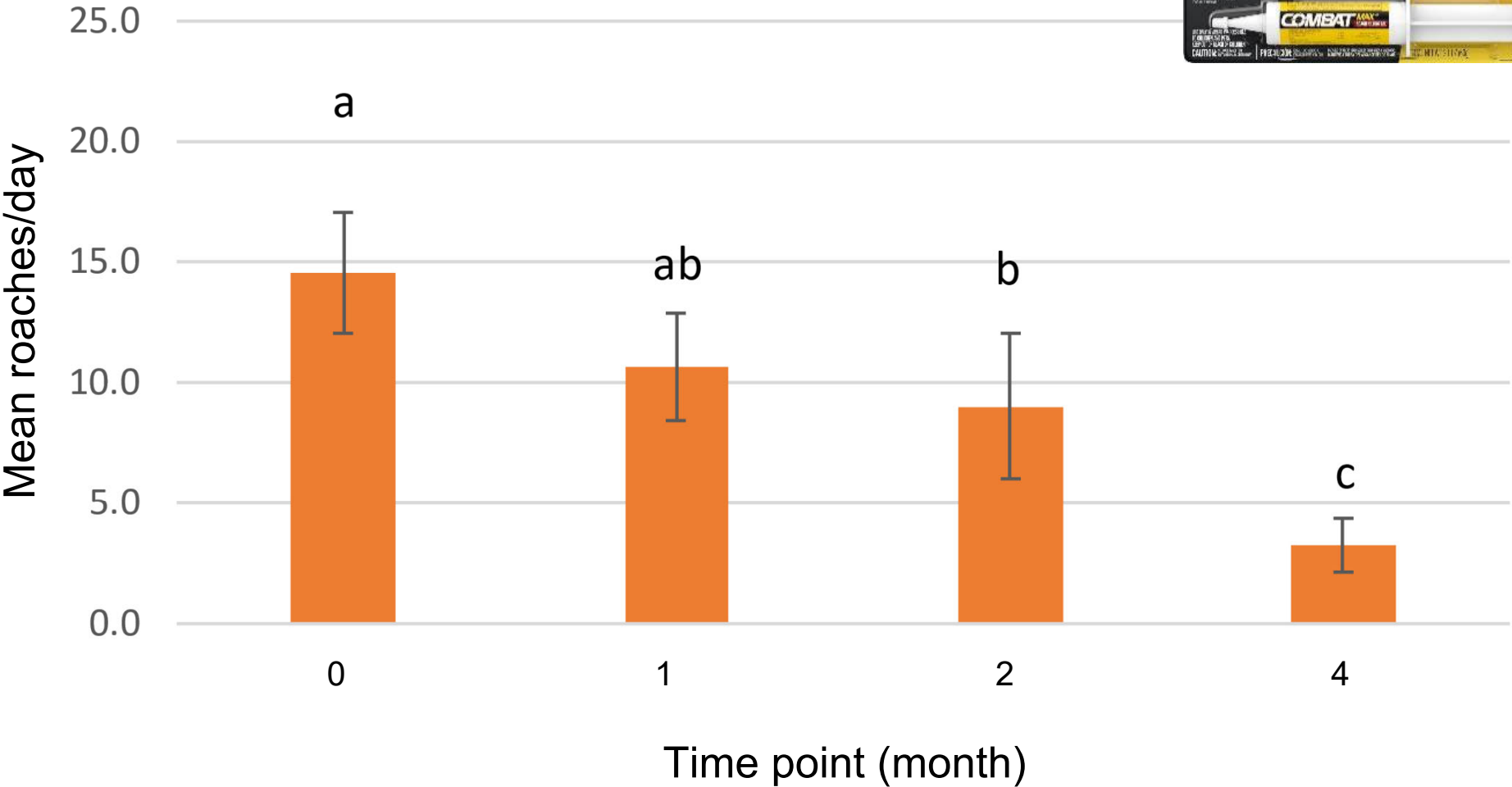
Professional Bait Rotation



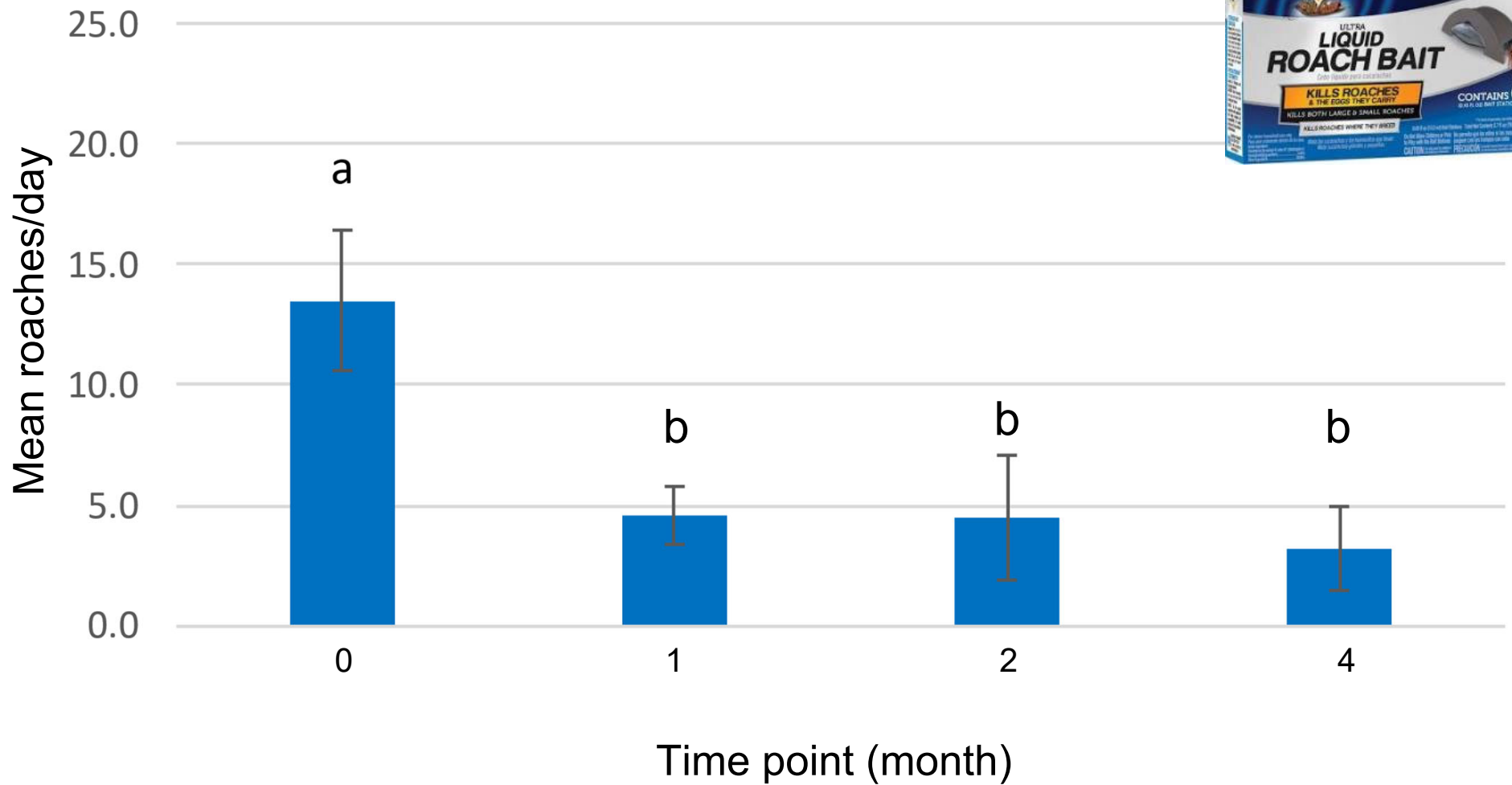
Combat Bait Stations



Combat Gel Bait



Hotshot Liquid Bait Stations



DIY Bait Conclusions

- **Consumer grade baits struggled to control German cockroach infestations**
 - **Combat Bait Stations do not work at all**
 - **Combat gel bait takes time**
 - **Liquid Bait Stations work, but stalled after 1 month**
- **These results challenge our current recommendation**
- **We need better options!**

DIY Conclusions

- Most DIY products (TRFs, residual sprays, baits) failed to control cockroaches
- For TRFs and sprays, resistance is a key factor in product failure; for baits, the cause of failure is unknown
- Efficacy claims must be held accountable

Where do we go from here?

- Review registration guidelines for cockroaches
- Develop programs to ensure accountability for DIY products
- Expand independent testing to ensure claimed efficacy matches reality



Thank You!



NIH DIRECTOR'S
EARLY
INDEPENDENCE
AWARD



Washington State
COMMISSION ON
PESTICIDE REGISTRATION



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