

# 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**

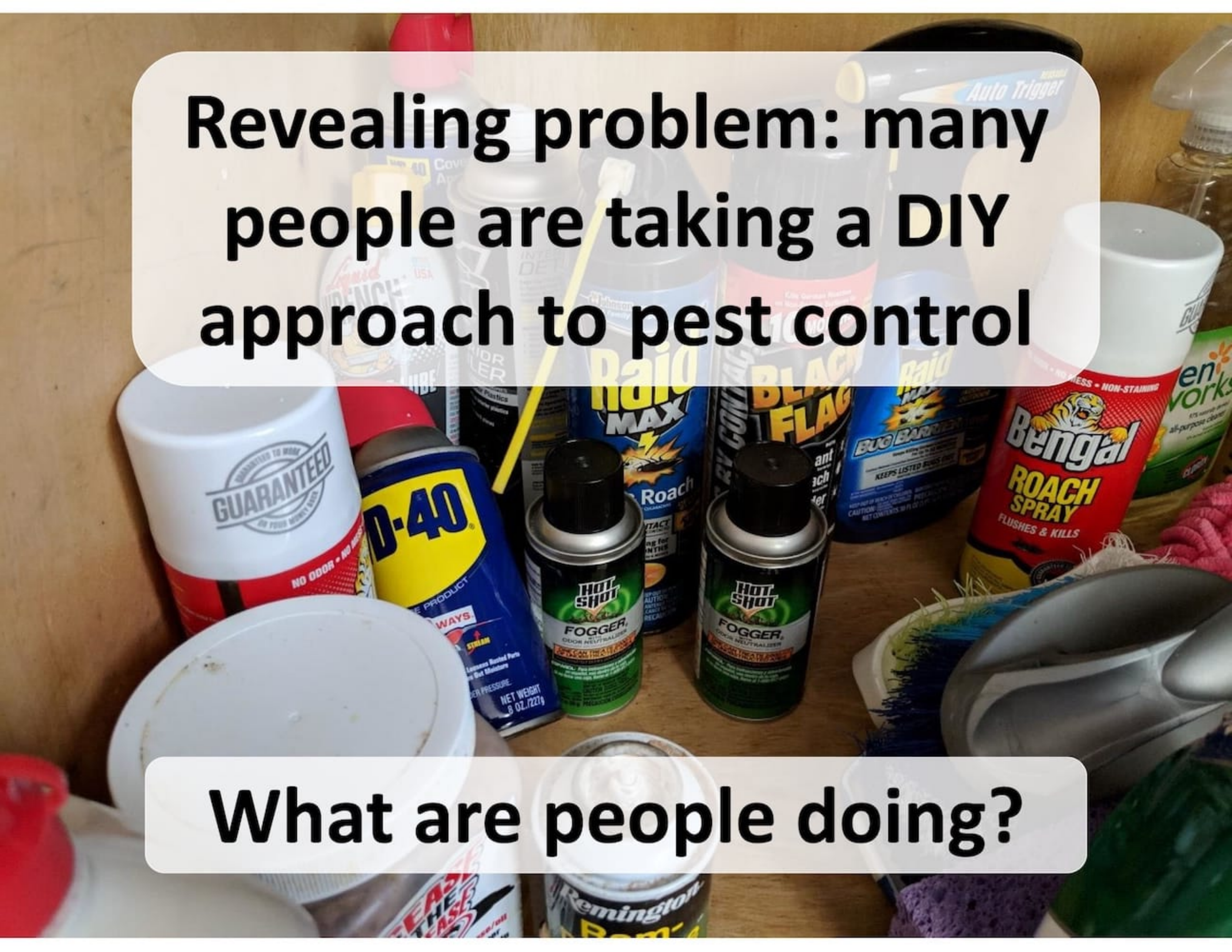




**82 million households used  
insecticides in 2012  
(only 127 million households total)**

**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
























18/10/2019 1

“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

A photograph showing a severe infestation of cockroaches on a light-colored concrete floor. The insects are densely packed in some areas, particularly near a corner and a small piece of blue and white debris. They are scattered across the entire visible surface, illustrating a significant pest problem in a housing unit.

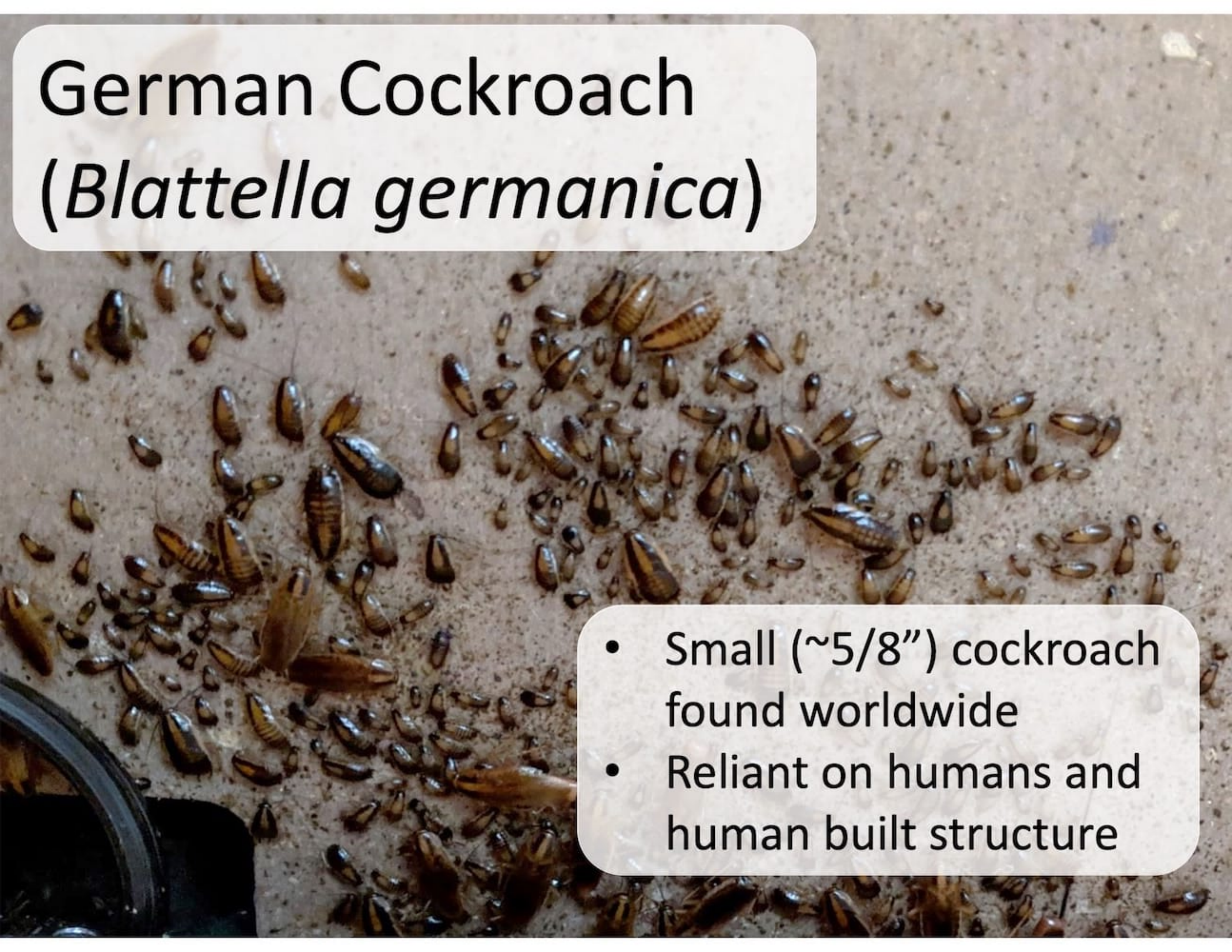
Pest problems can be profound!







# German Cockroach (*Blattella germanica*)

- 
- A photograph showing a large number of German cockroaches (Blattella germanica) on a light-colored, textured surface. The cockroaches are small, brown, and elongated, with some showing darker markings. They are scattered across the frame, with a higher concentration in the center and bottom. In the bottom left corner, a portion of a dark, curved object, possibly a wheel or a piece of machinery, is visible.
- 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?





7.49	4.19	4.19	4.19	4.19	4.19	7.89
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4.79	3.67	4.99	3.49
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8.39	9.89	11.49	7.89	7.99	5.19	5.99
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19.99	14.99	11.49	8.89	10.39	14.69	7.29	4.19	5.49
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How do residents determine what is a good product?





# 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

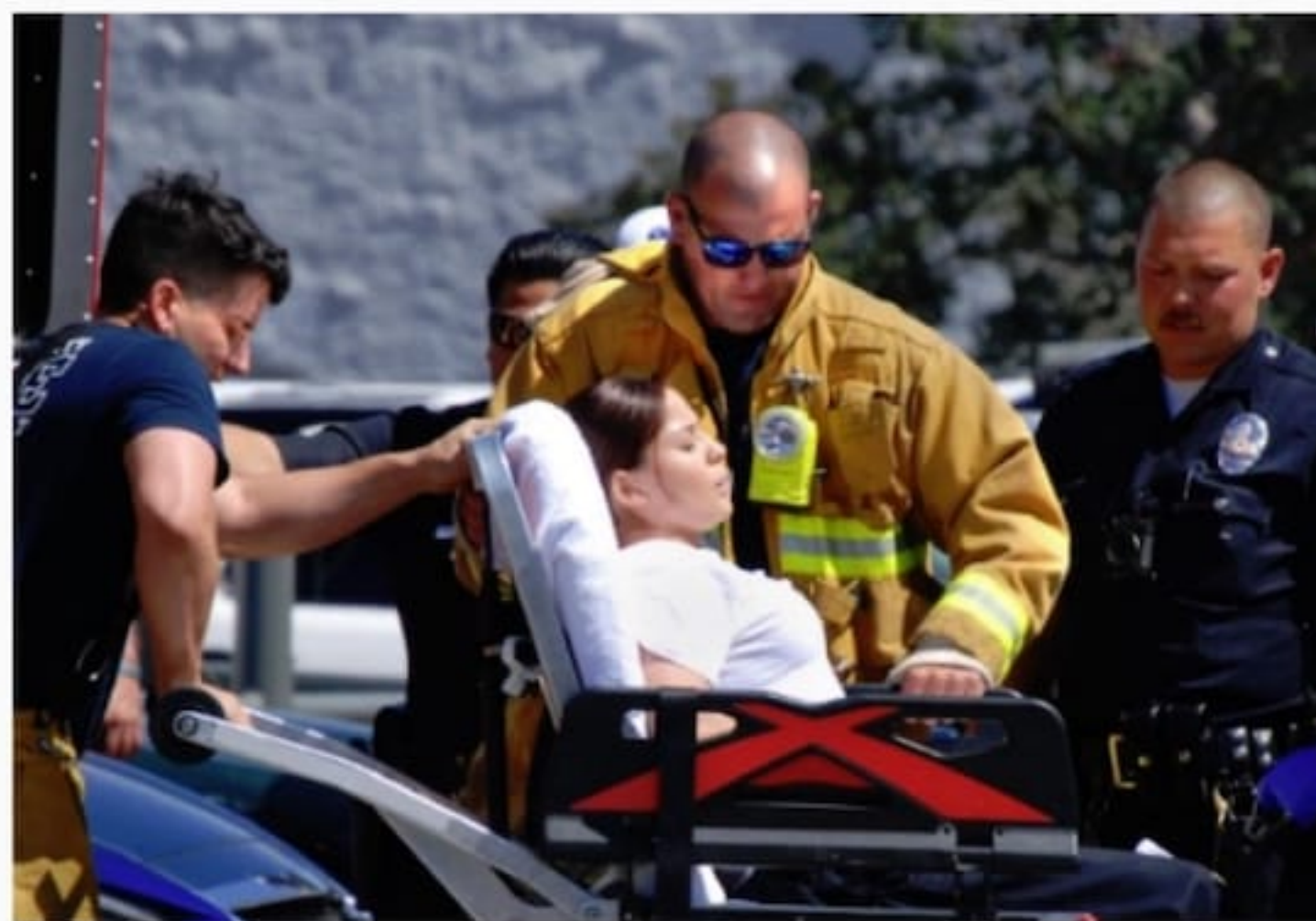
wood 'bug bomb'...



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

n. 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.

detection equipment and found no  
Urban Search and Rescue team was

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

Stewart said.



# Total Release Foggers



FROM THE CENTERS  
FOR DISEASE CONTROL  
AND PREVENTION



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

Illnesses  
Related  
Release  
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,

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are pro-  
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aged 38  
an emer-  
e, short-  
ps, burn-

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

CAUTION  
PRECAUCION

CAUTION  
PRECAUCION



HOUSEHOLD AND STRUCTURAL INSECTS

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

SUSAN C. JONES<sup>1</sup> AND JOSHUA L. BRYANT

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

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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 harborages





# 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:

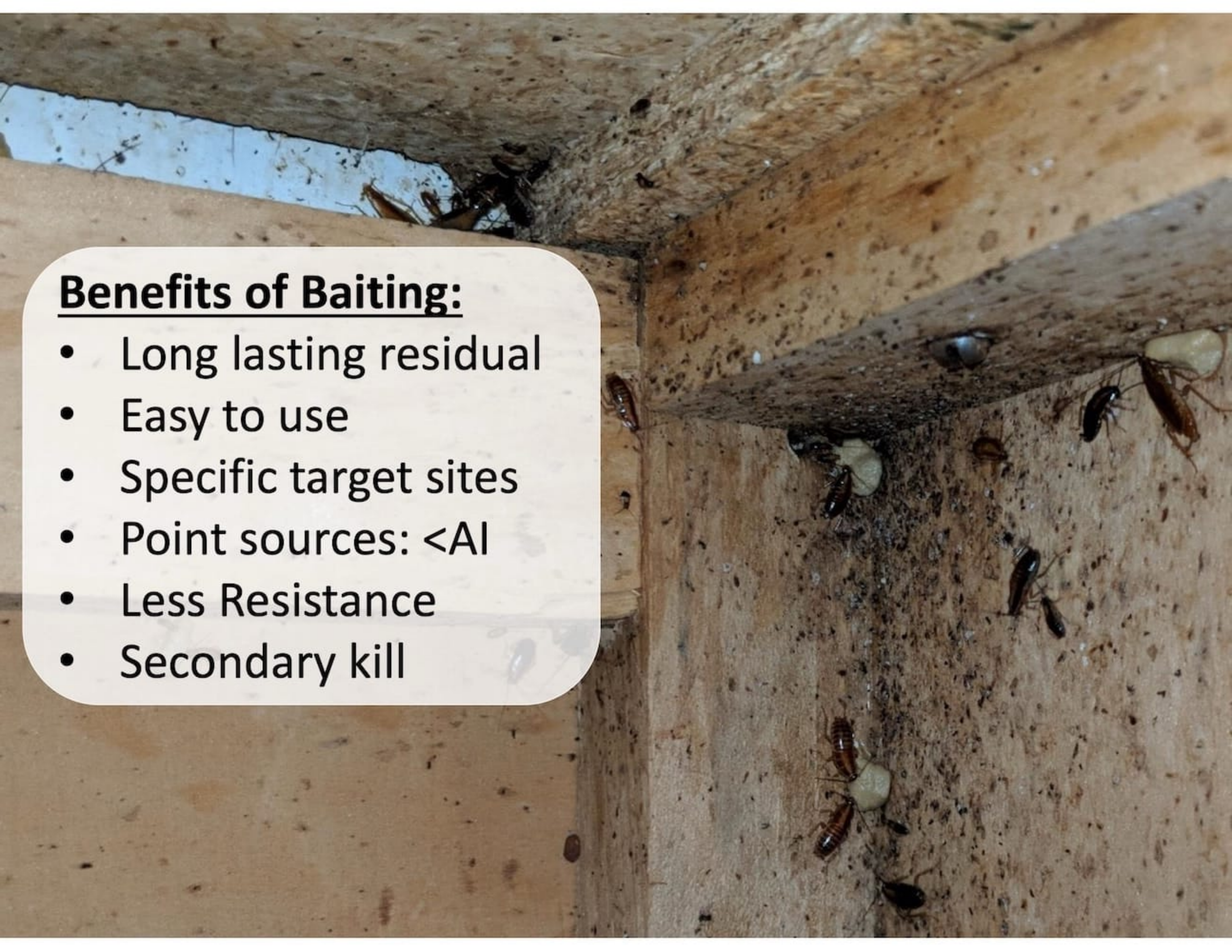
1. Combat (consumer grade)
  - AI: fipronil
2. MaxForce (professional grade)
  - AI: fipronil





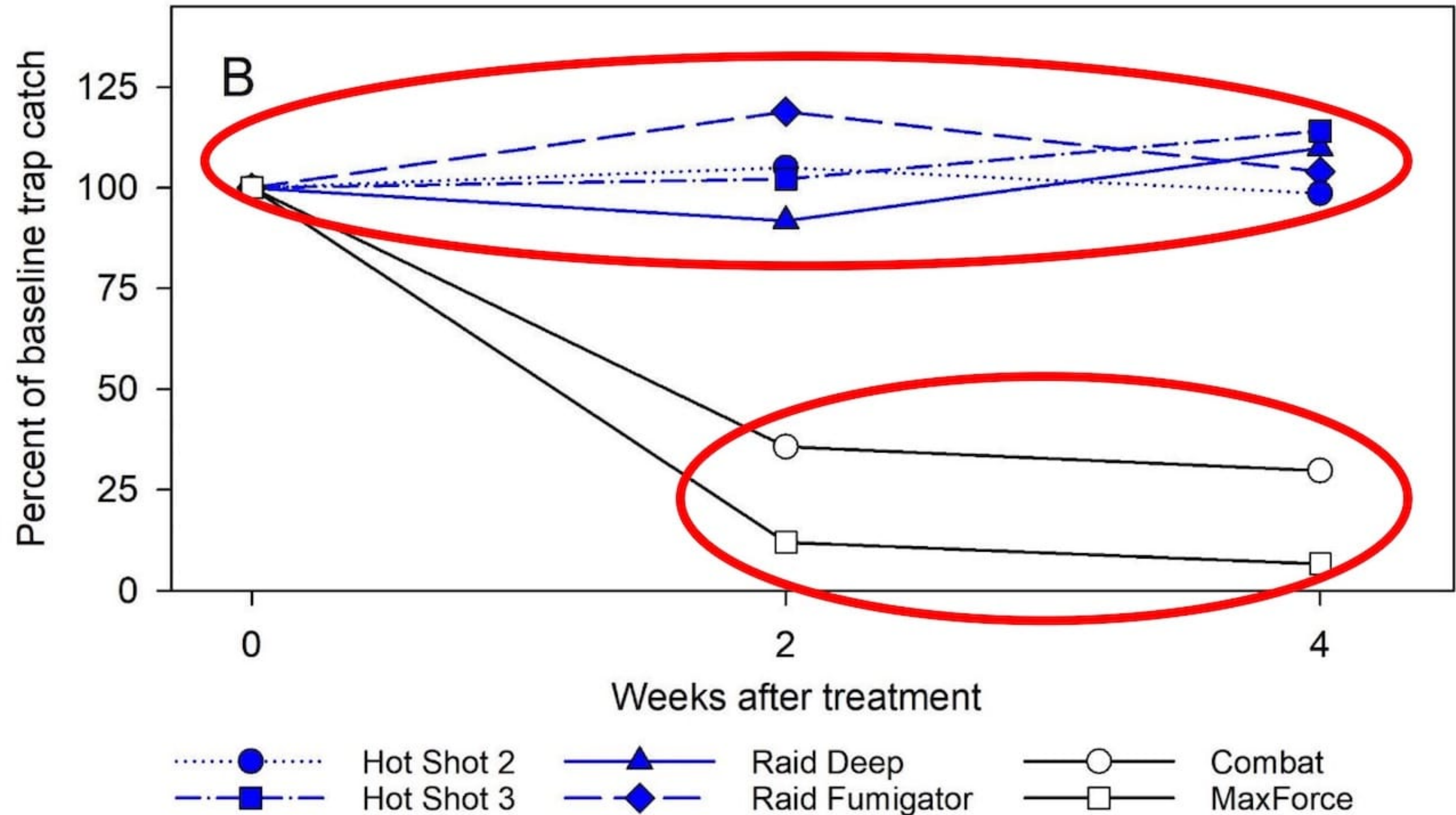
## **Benefits of Baiting:**

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





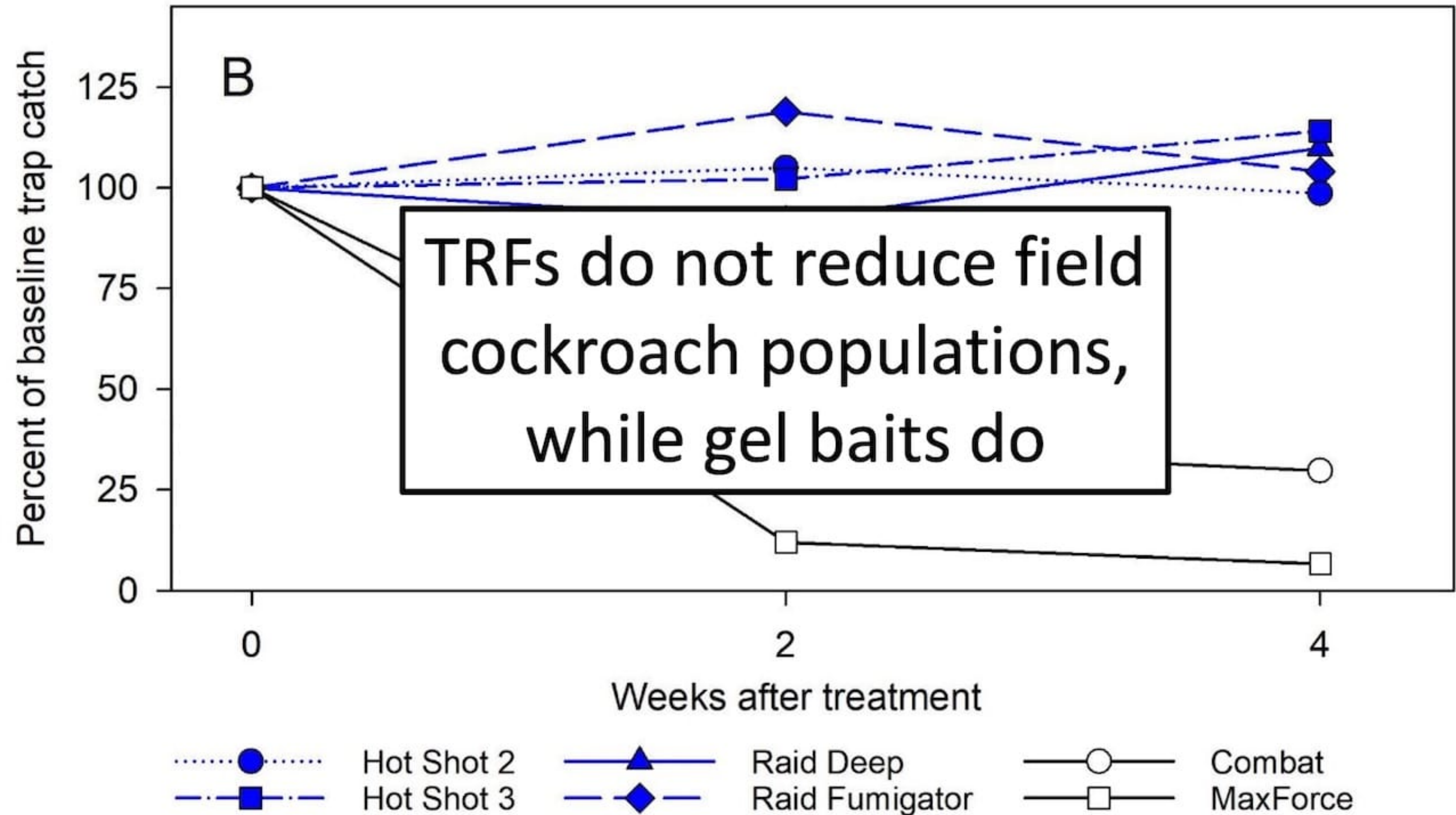
# Change in Cockroach Population Over Time



n = 5 homes per treatment group

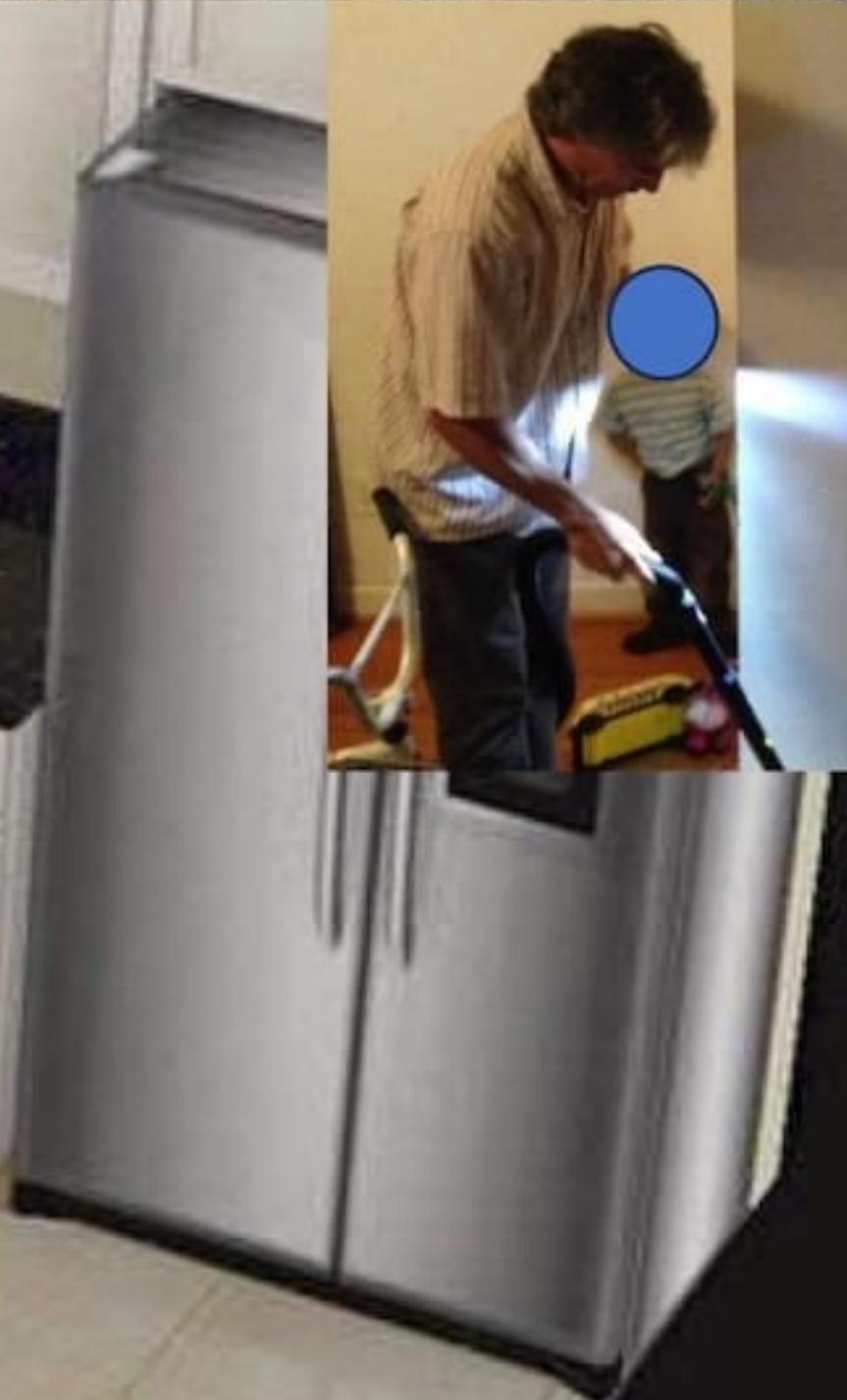


# Change in Cockroach Population Over Time



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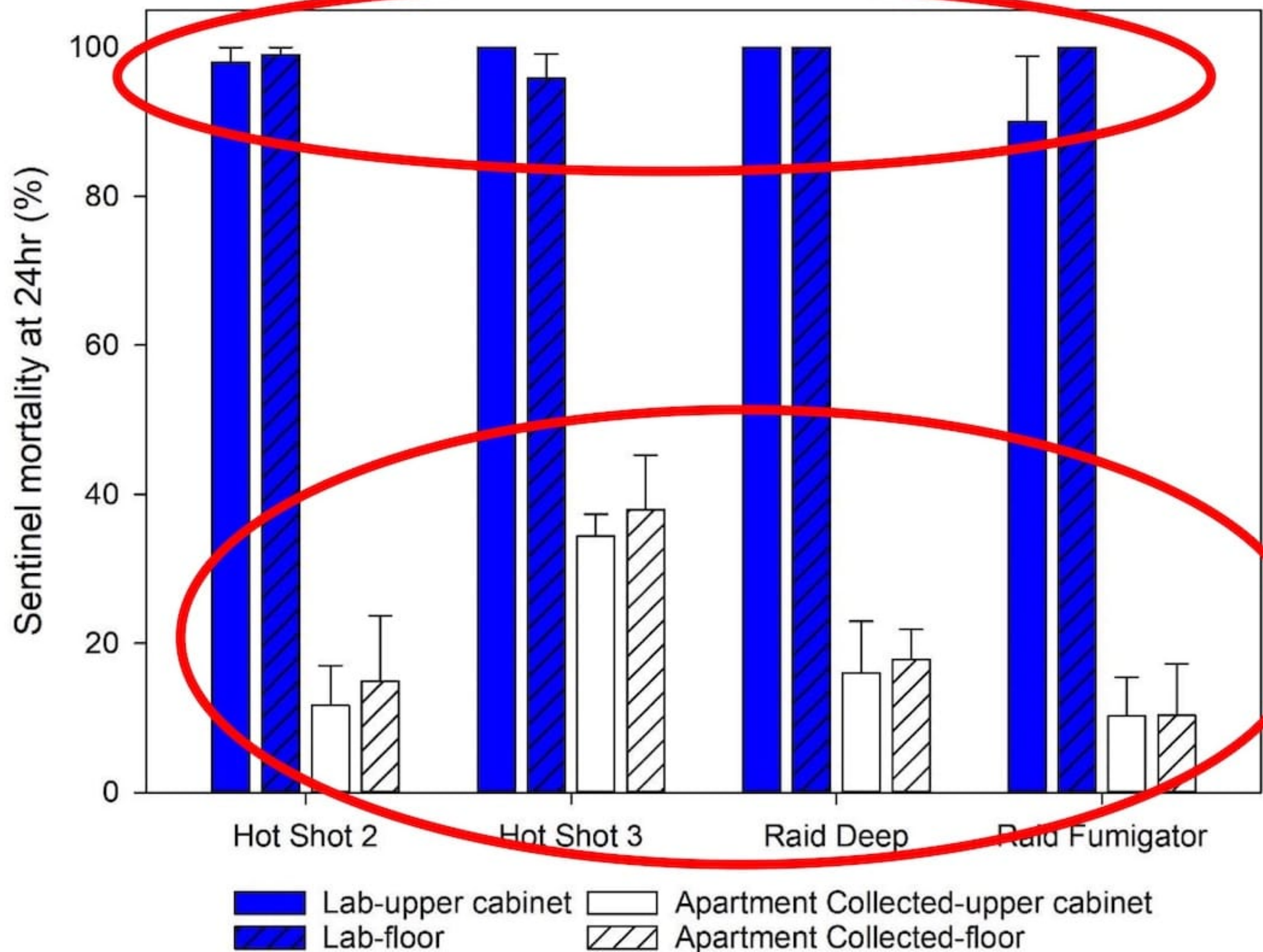






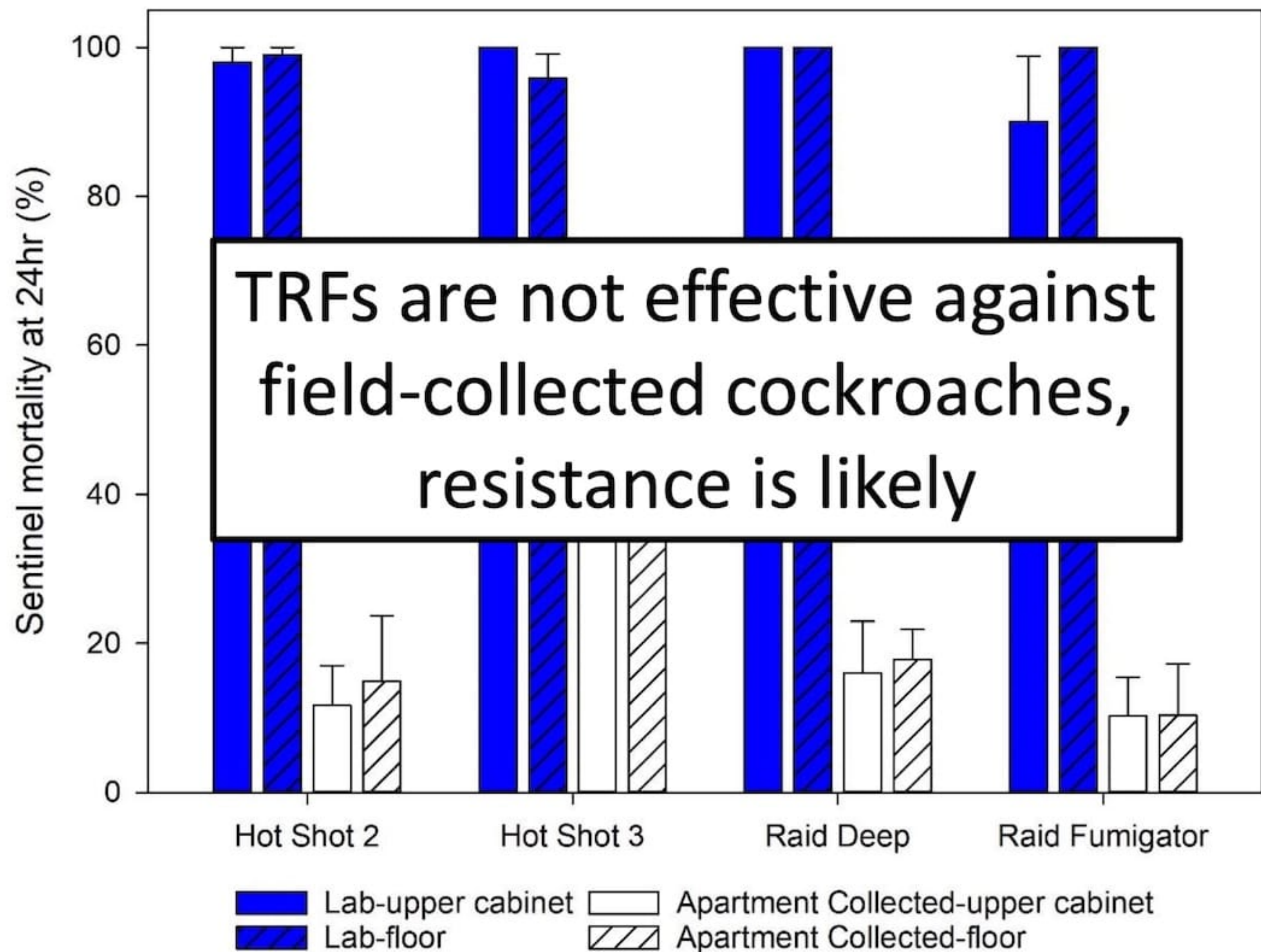


# Effect of TRFs on sentinel cockroaches





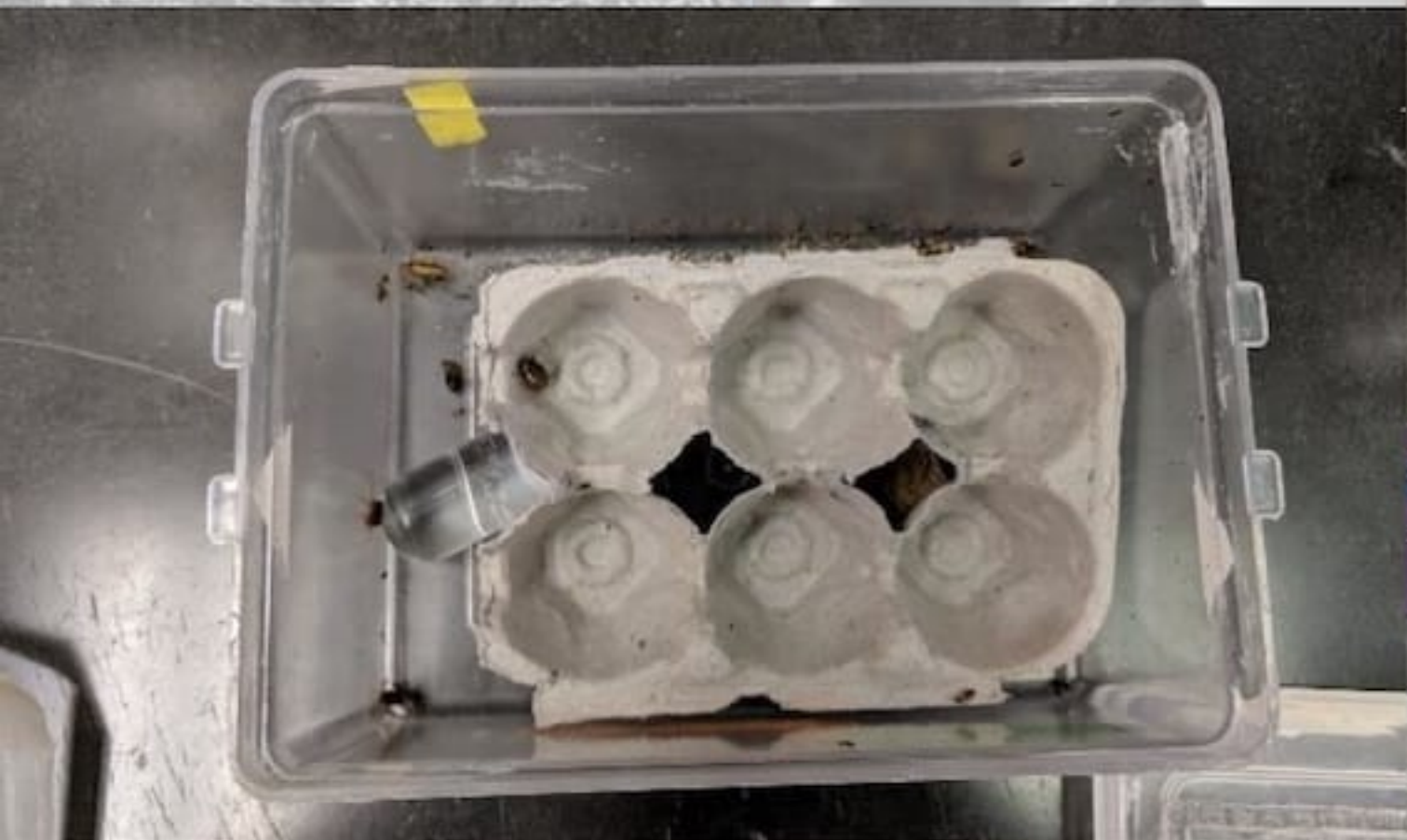
# Effect of TRFs on sentinel cockroaches



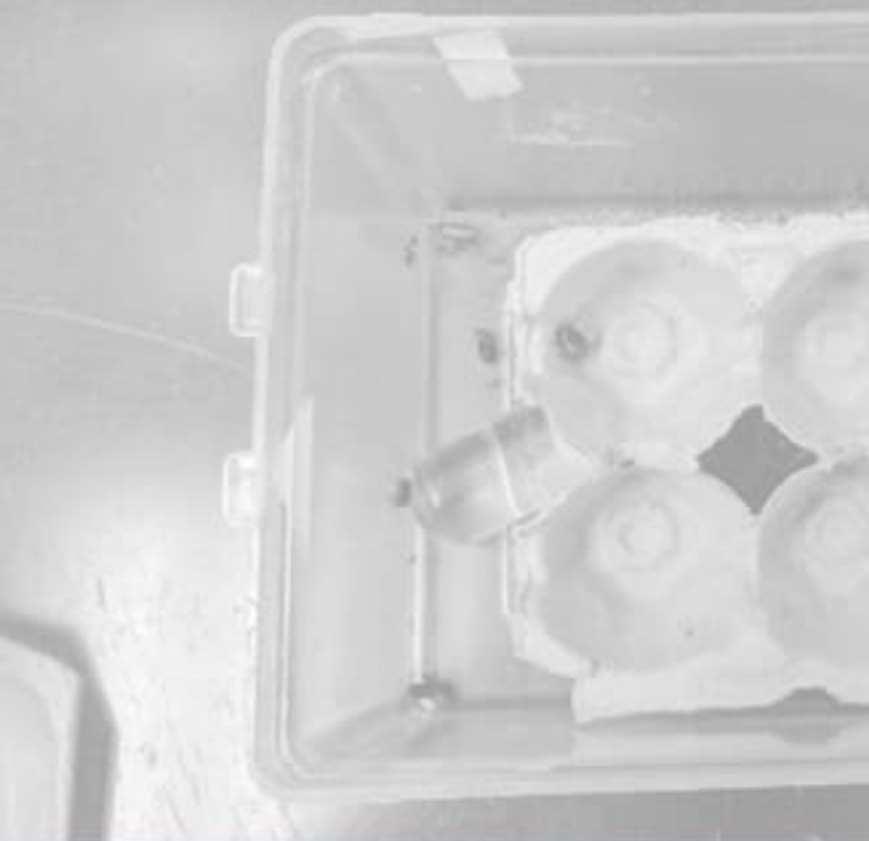






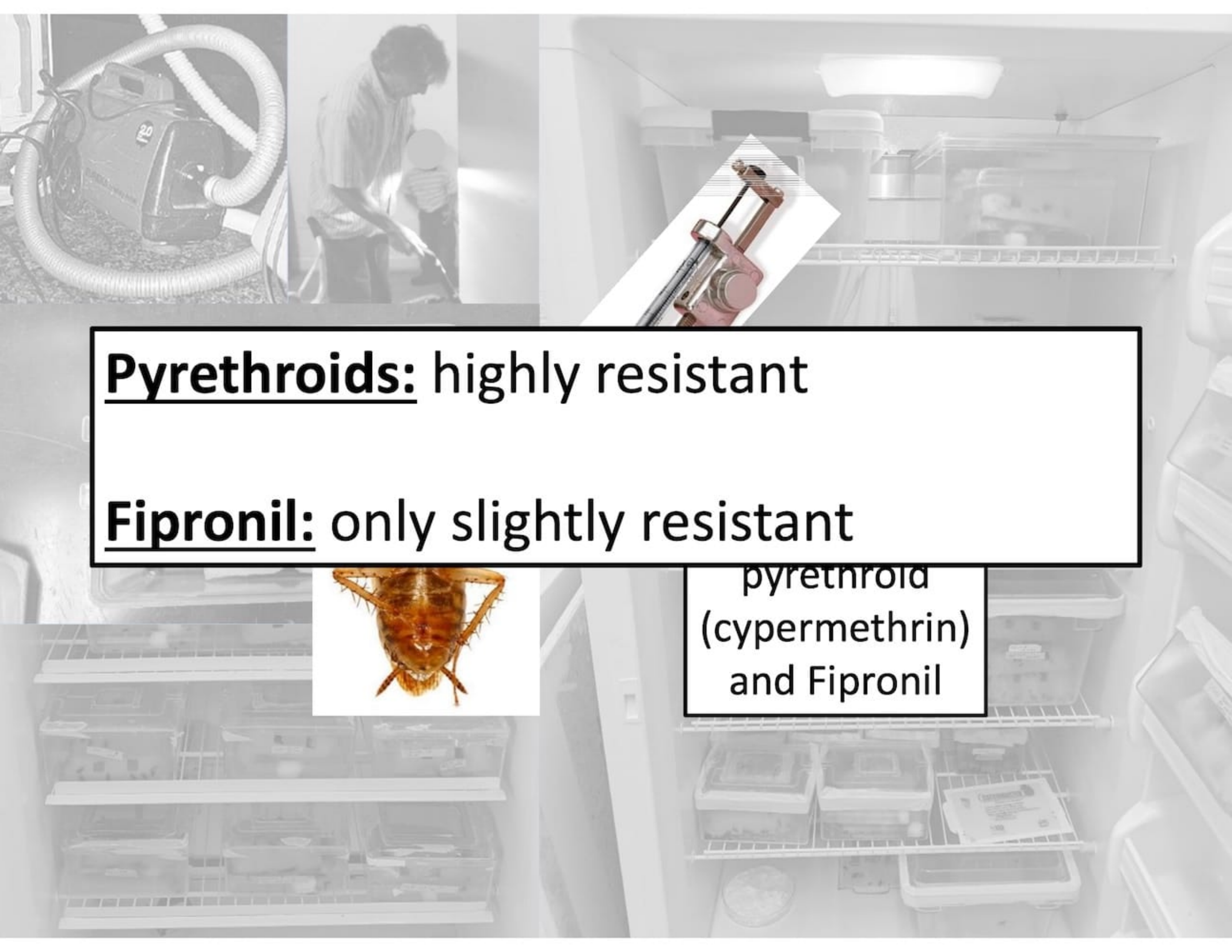






Topically  
tested with a  
pyrethroid  
(cypermethrin)  
and Fipronil





**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**



# /Aerosol Sprays



**Ant & Roach**

MATA HORMIGAS Y CUCARACHAS DE



**ANT, ROACH  
& SPIDER  
KILLER**

Insecticida para hormigas, cucarachas y arañas

ita, outside of what is





# **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)



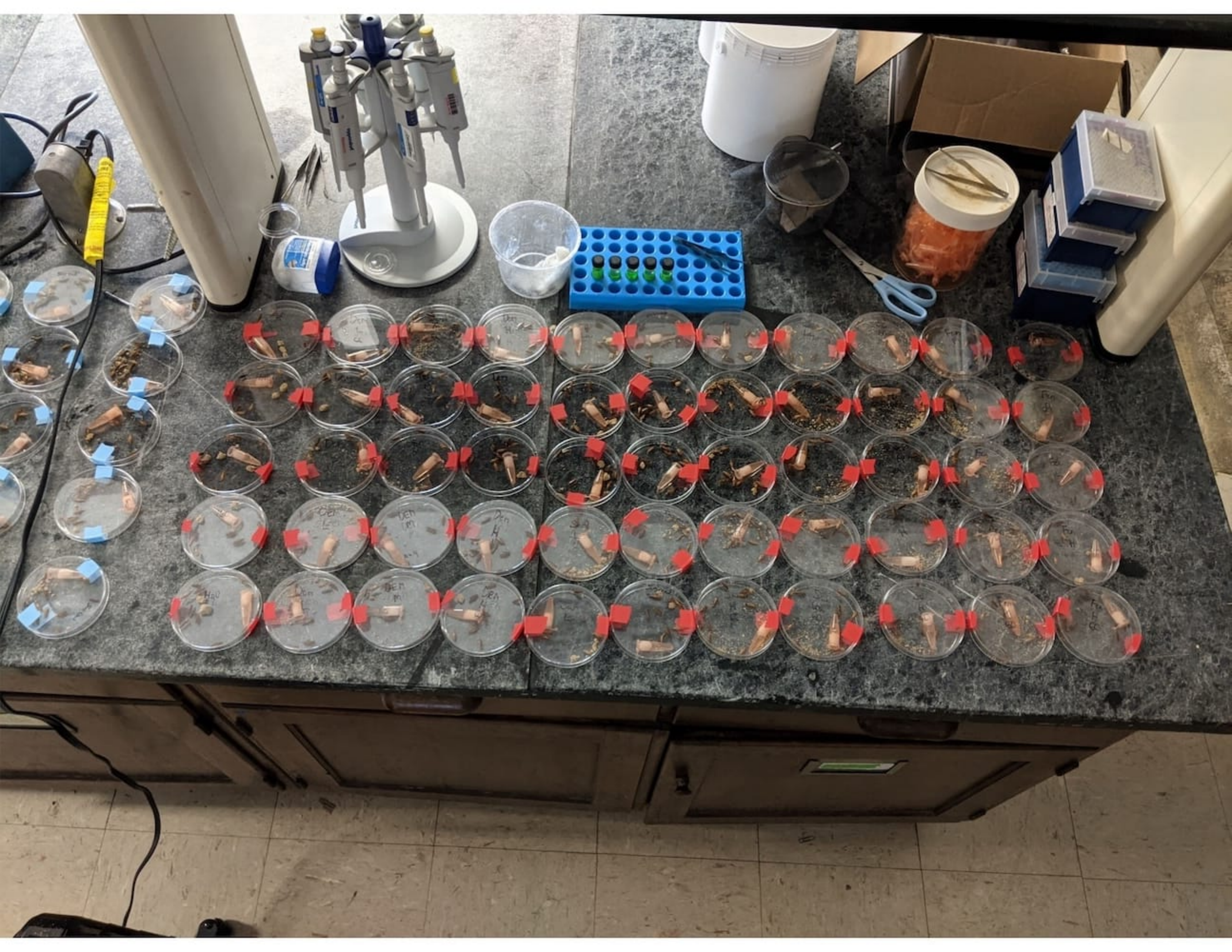




**Direct Exposure:** product applied directly to insect

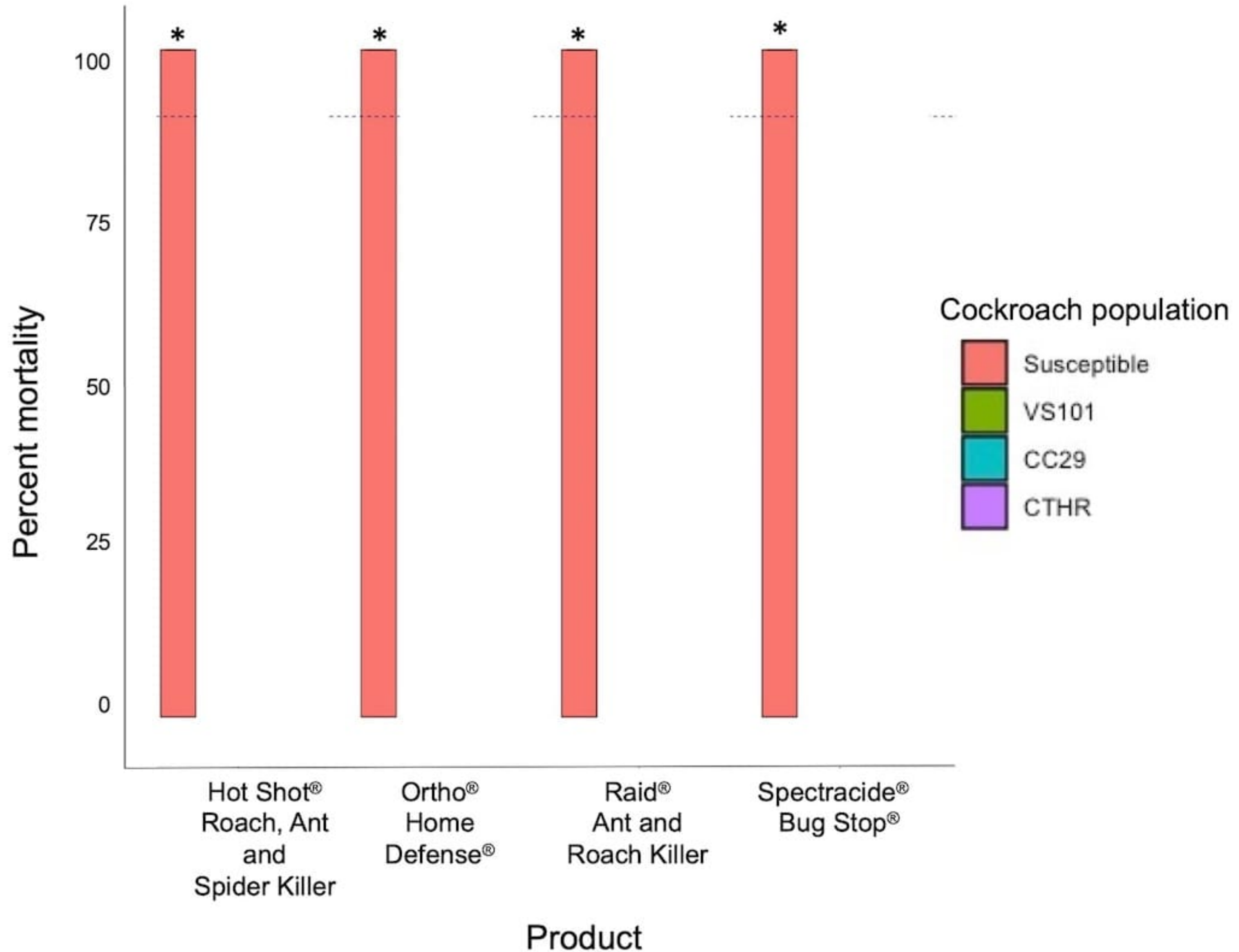
**Residual Exposure:** Cockroach exposed for 30 min to treated surface (product was dry)





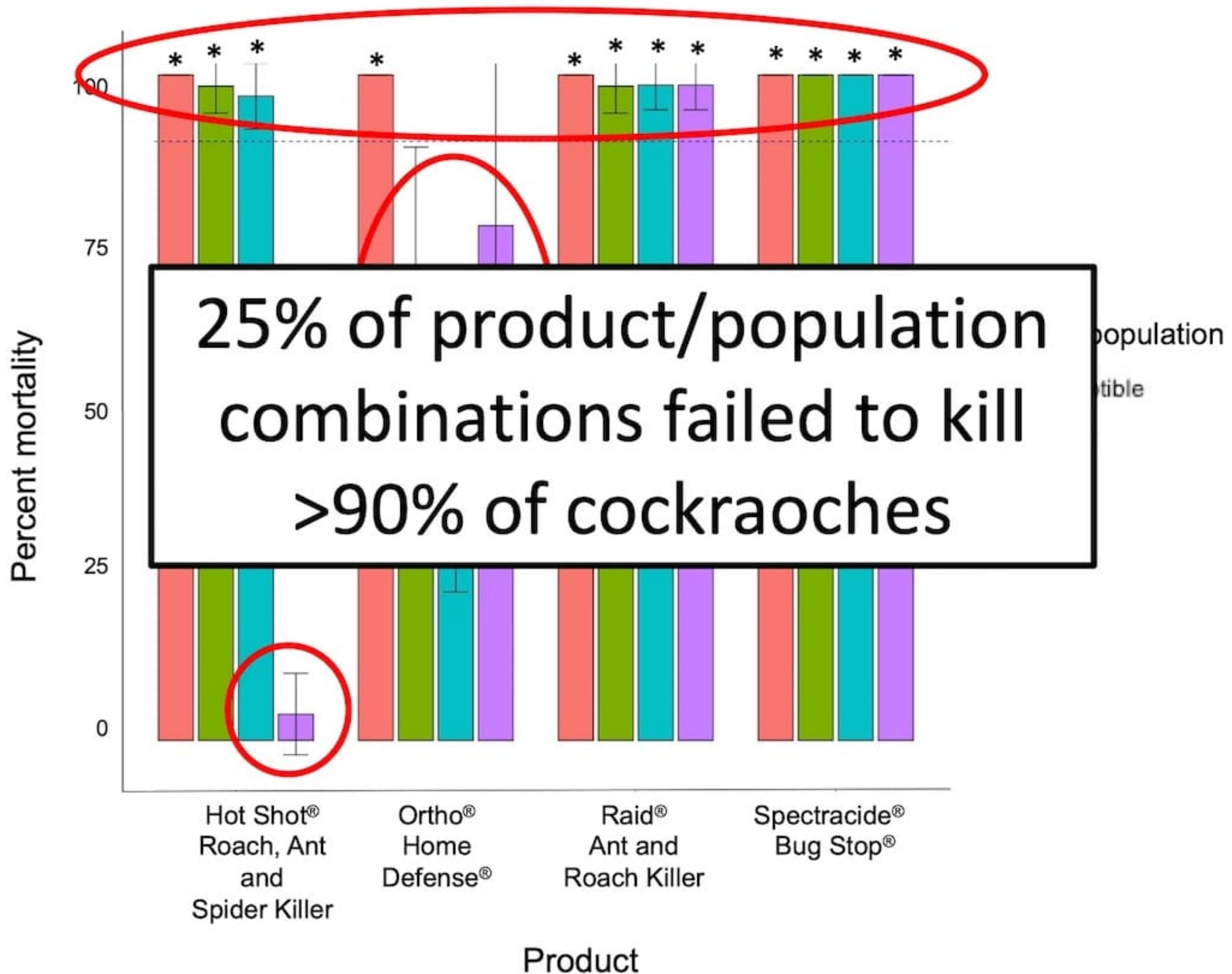


# Direct Exposure



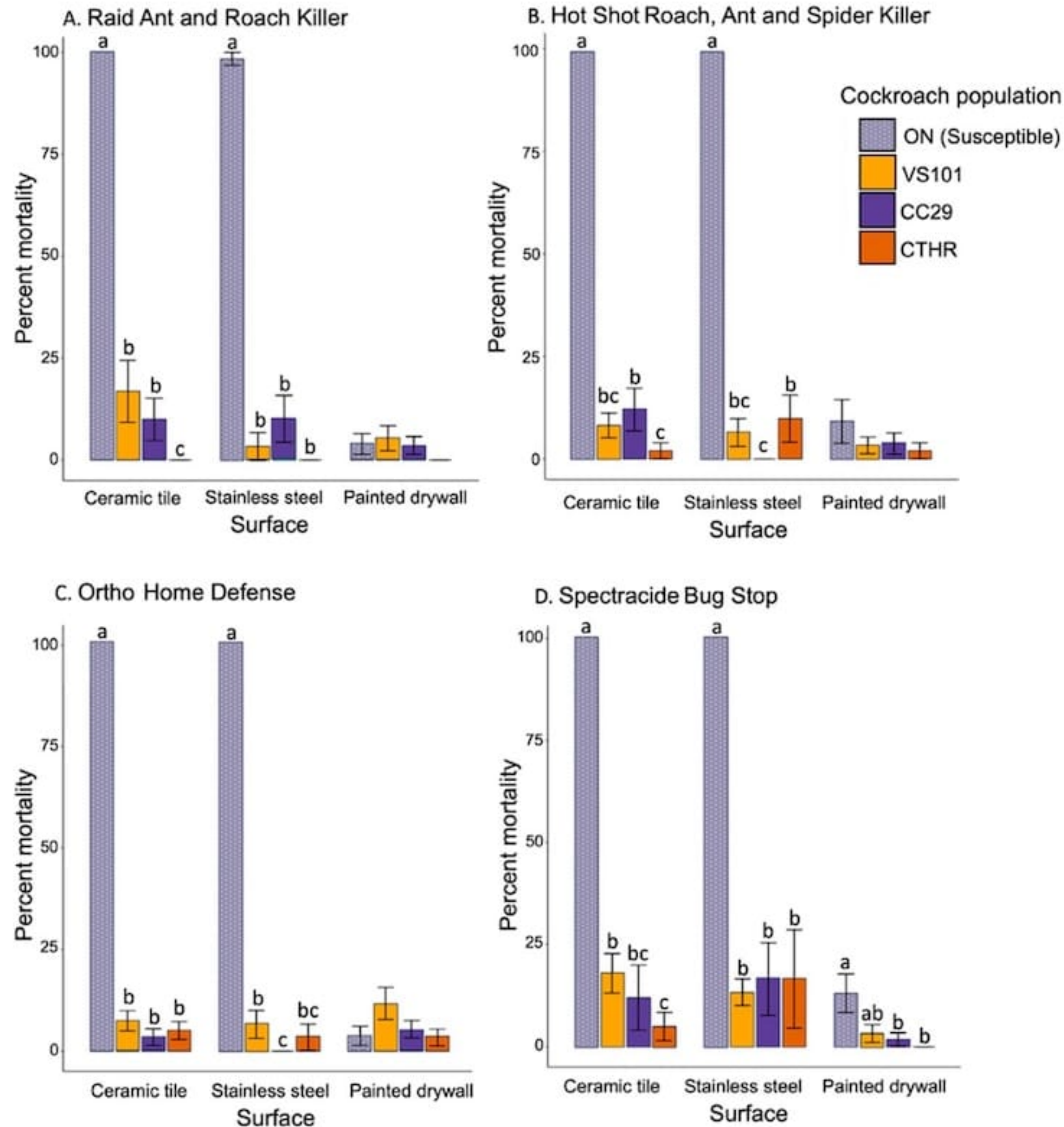


# Direct Exposure



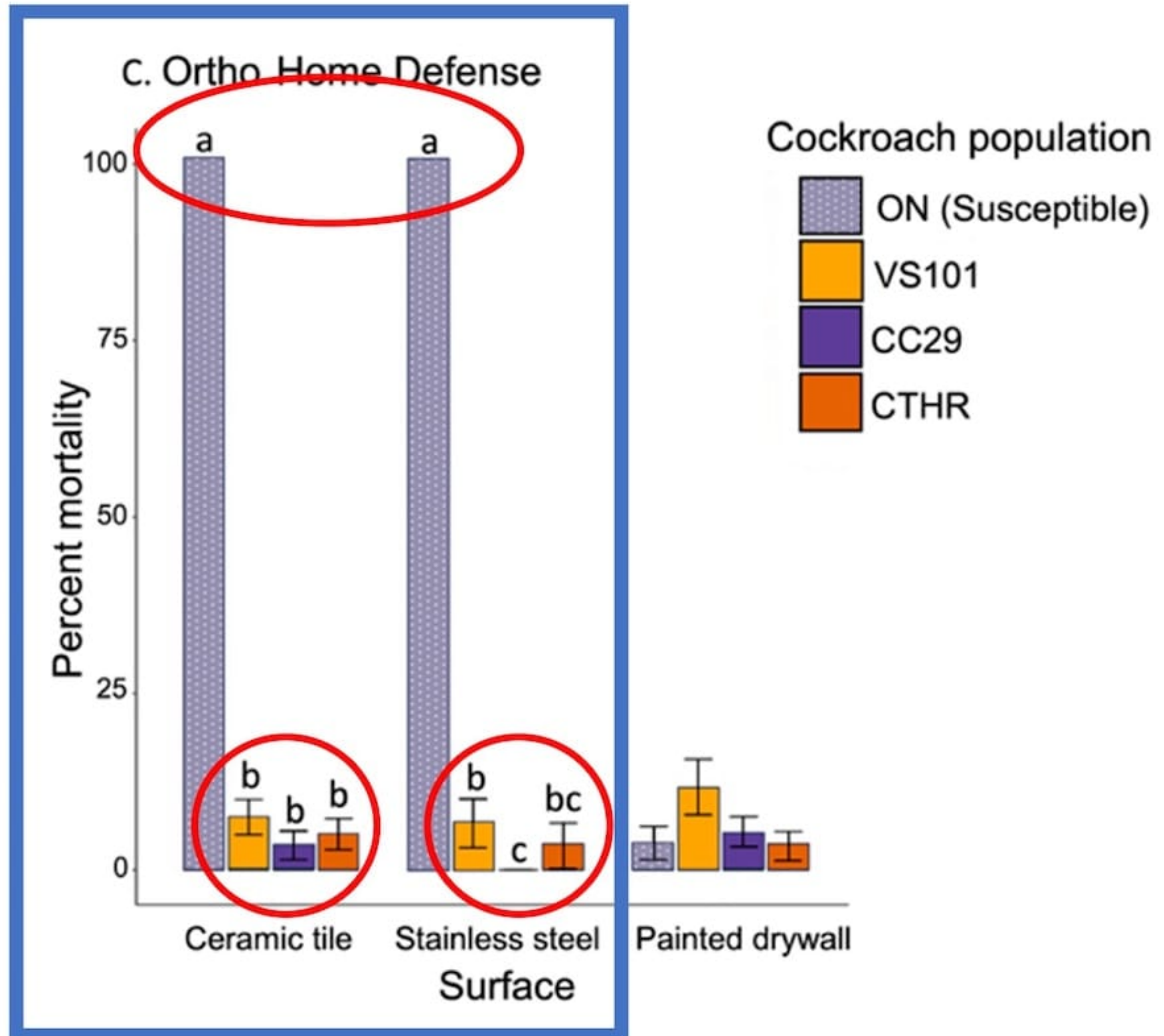


# Residual Exposure





# Residual Exposure





# Residual Exposure

C. Ortho Home Defense

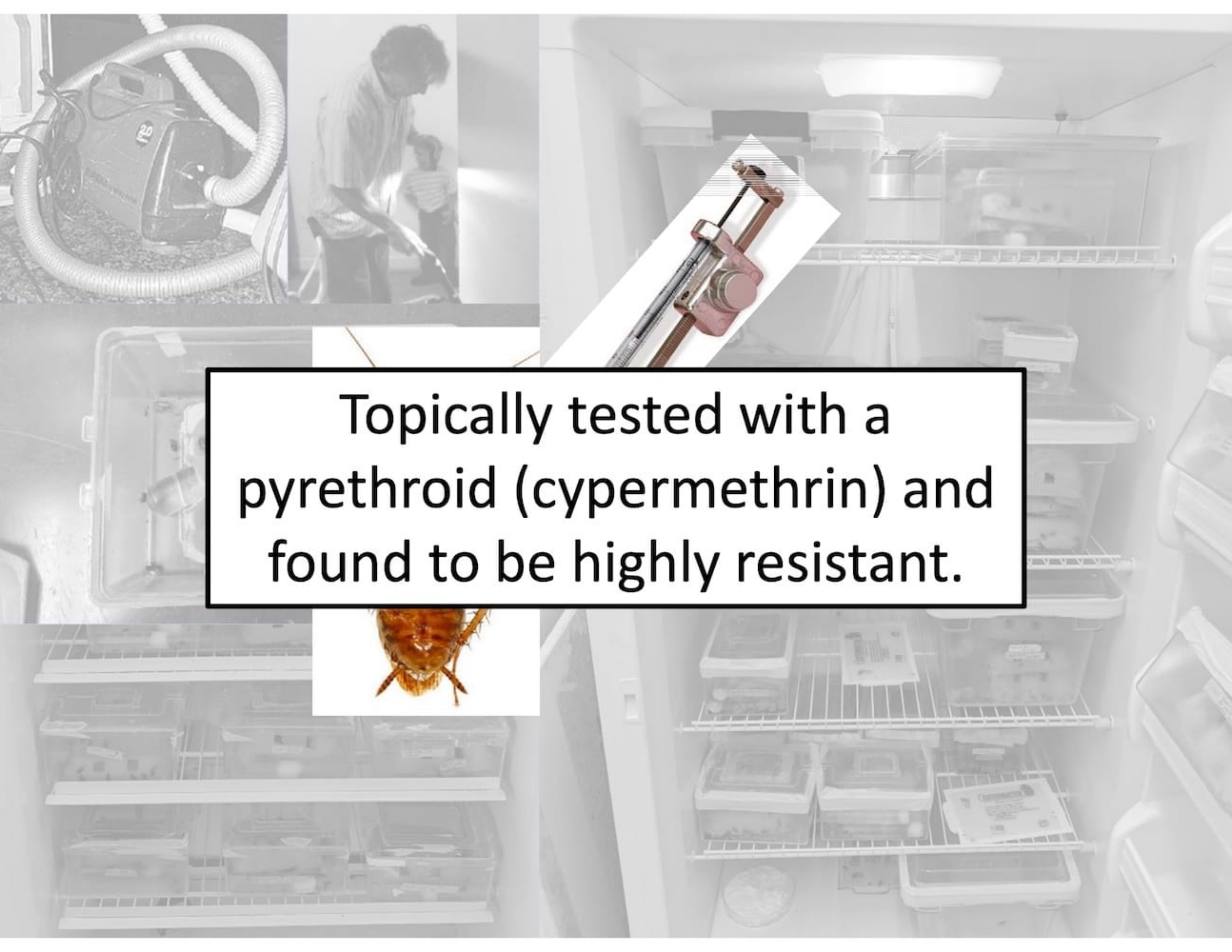
All products failed against  
field populations on all  
surfaces

population  
(Susceptible)

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

Surface



The background of the slide is a collage of images related to pest control. It includes a grey vacuum cleaner with a long white hose in the top left, a person in a white shirt using a tool in the top center, a red mechanical device on a white surface in the top right, a clear plastic storage bin in the middle left, and a detailed view of a refrigerator's interior shelves with various containers in the bottom half.

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?



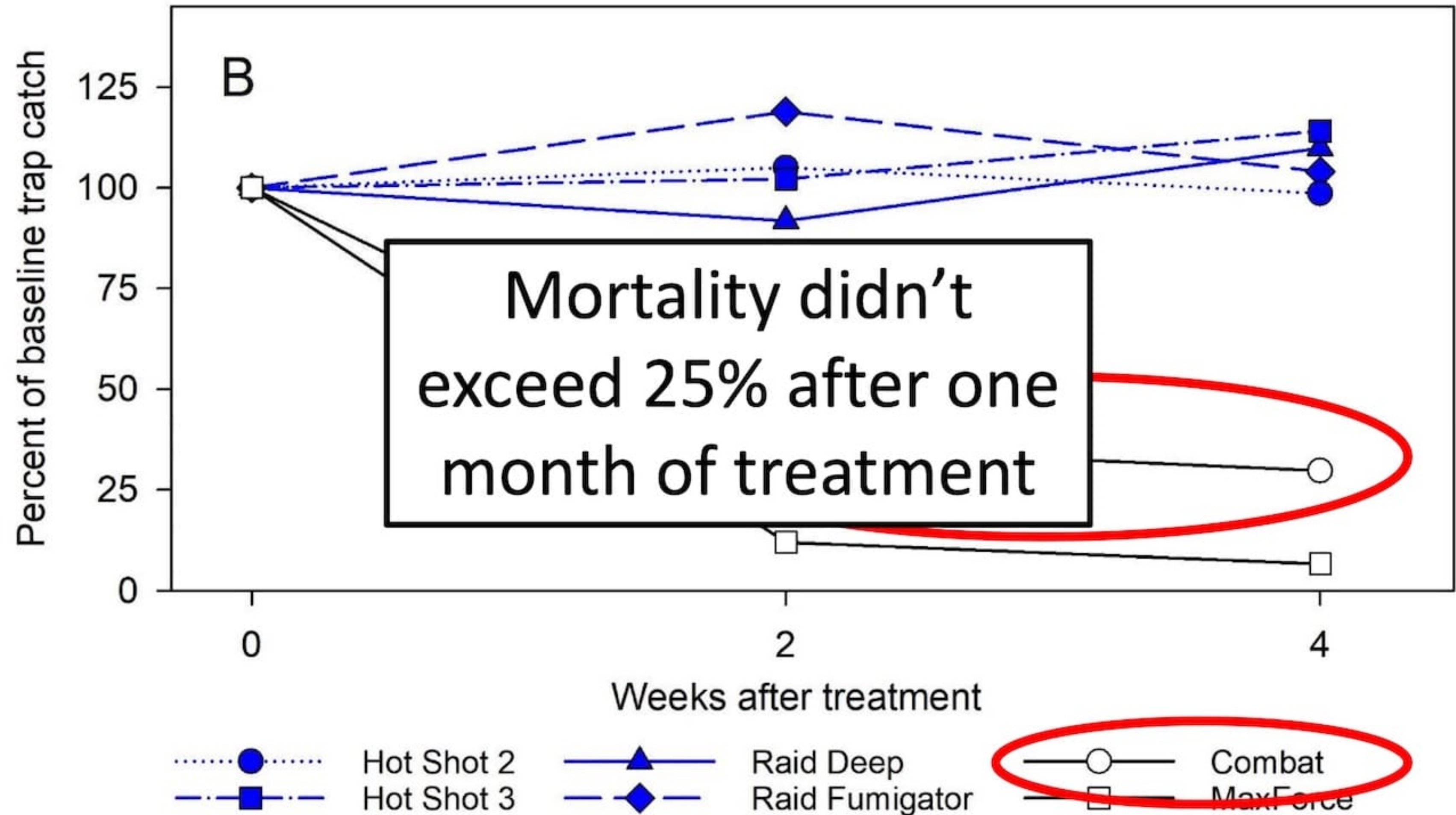


# DIY Baits

- **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)







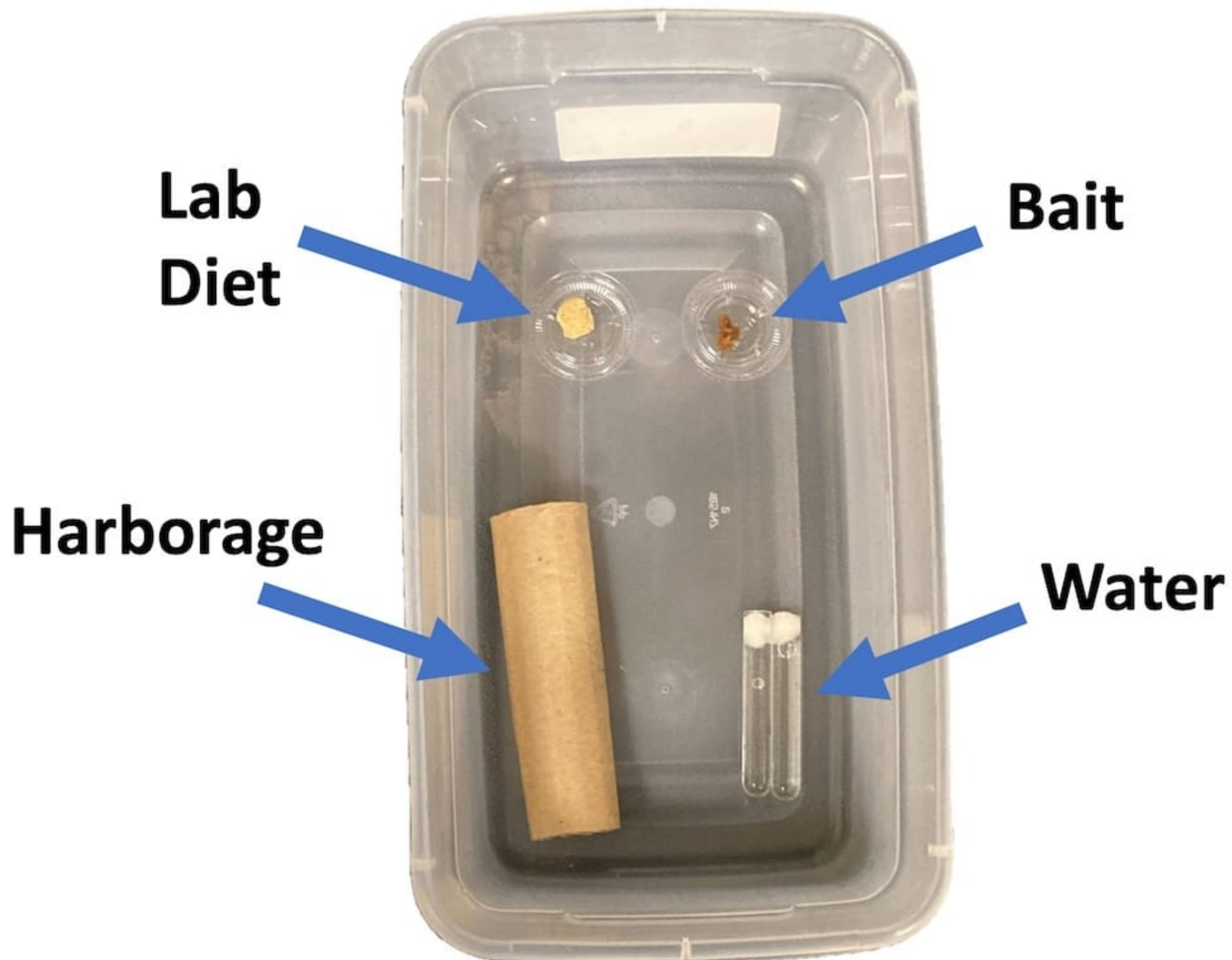
## Professional Baits Tested:

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





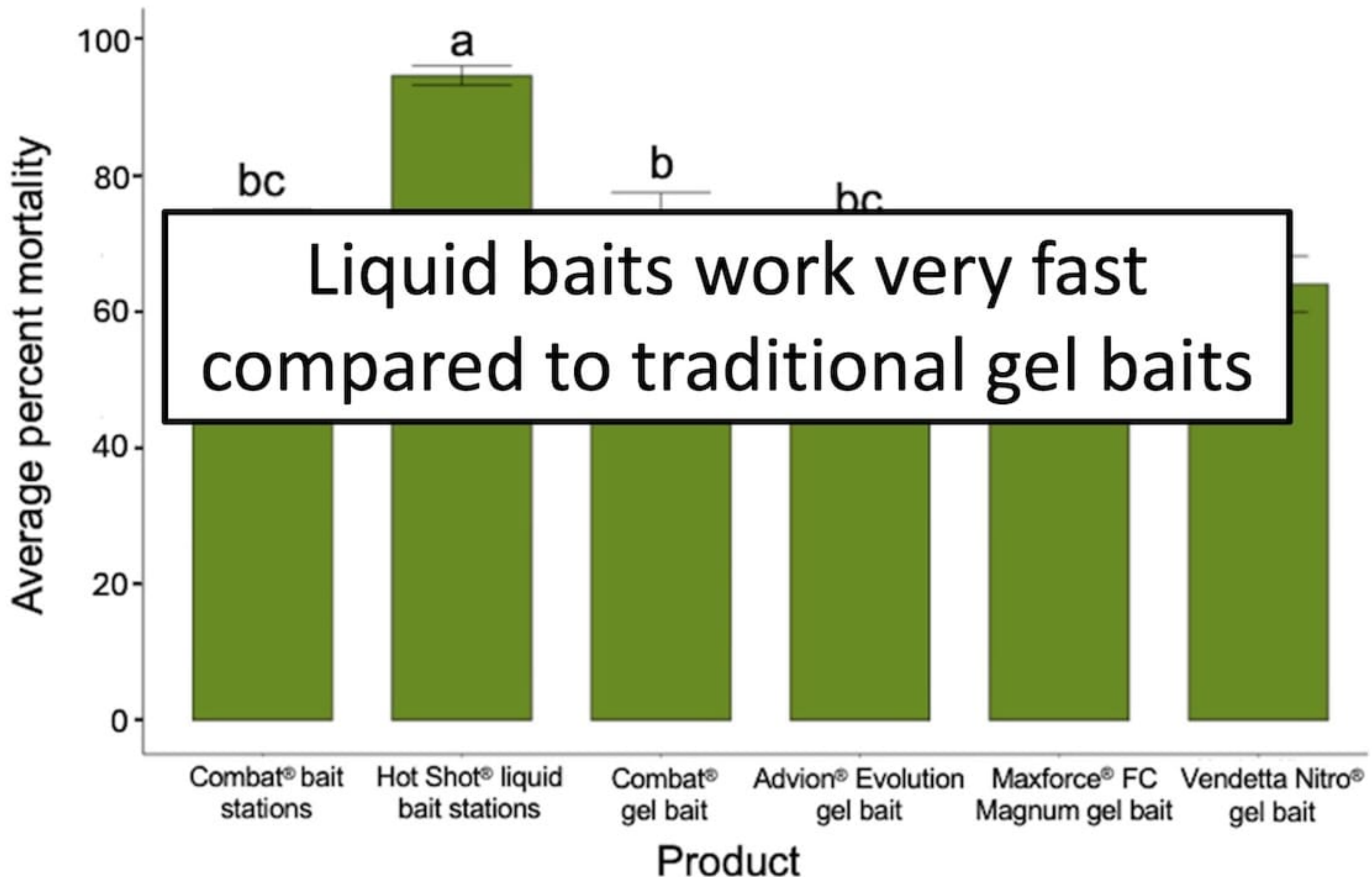
# Laboratory Testing





# Laboratory Testing

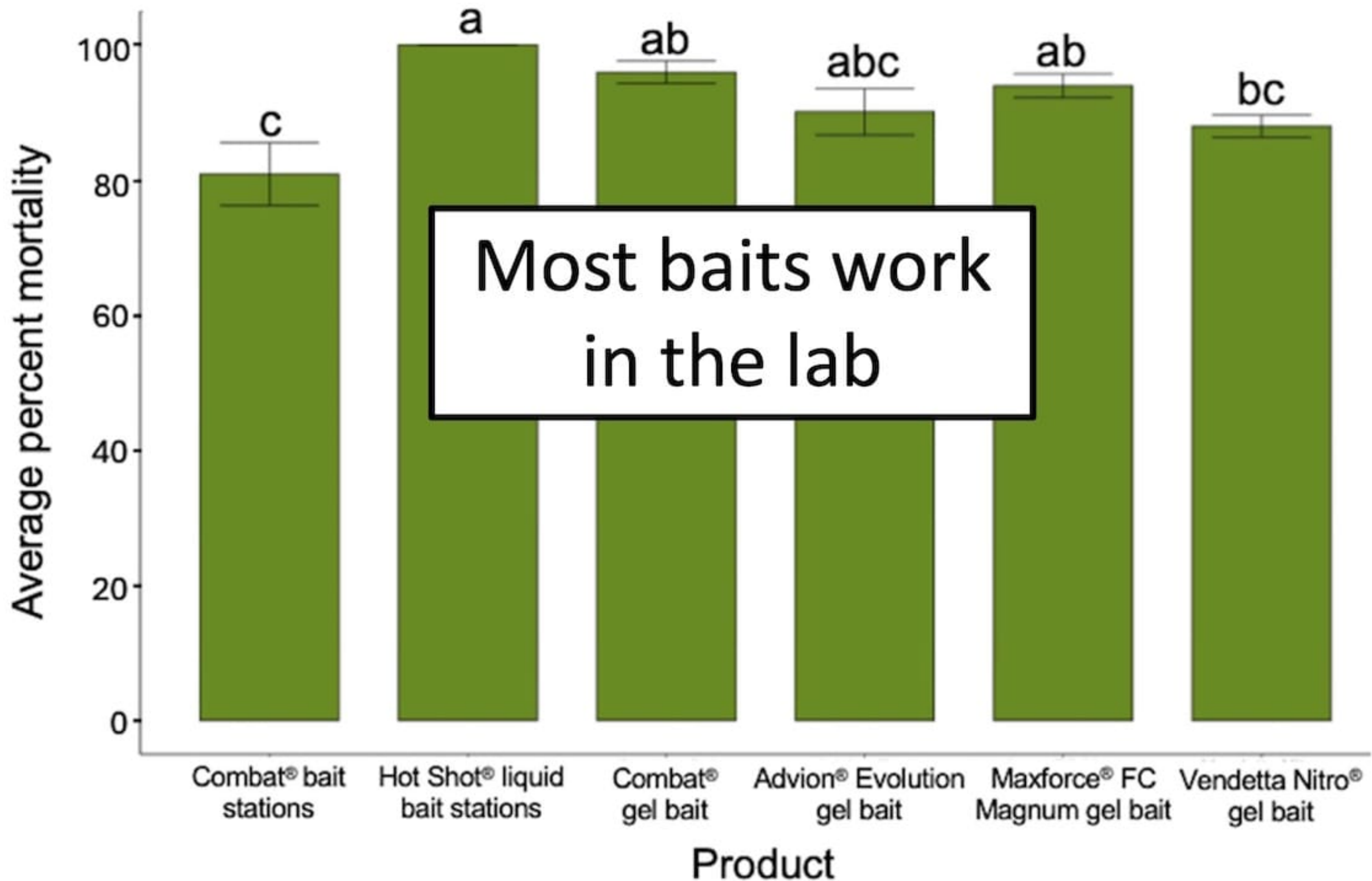
## A. Average percent mortality at 2 d





# Laboratory Testing

## B. Average percent mortality at 14 d

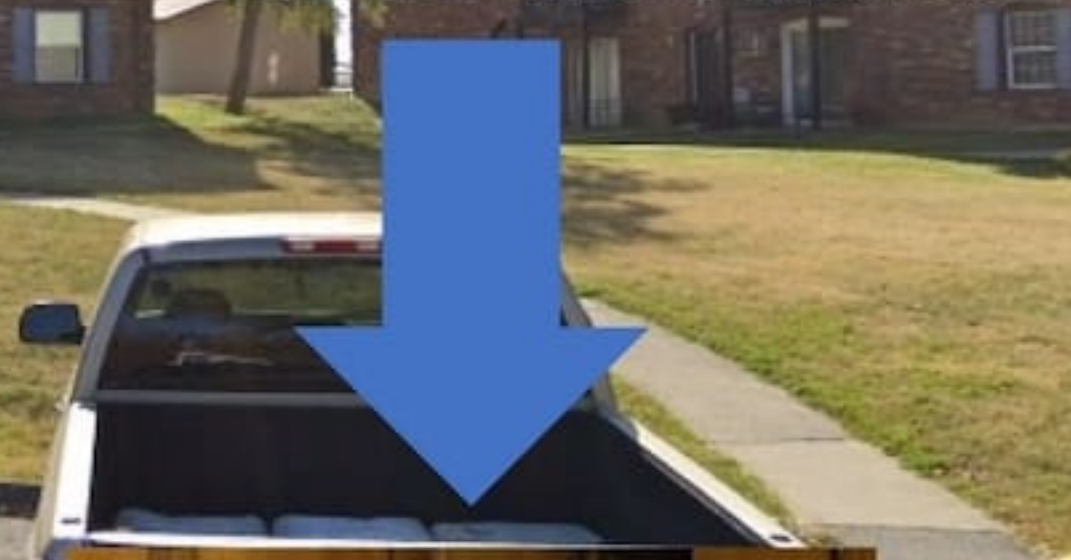




# In-Home Testing











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%

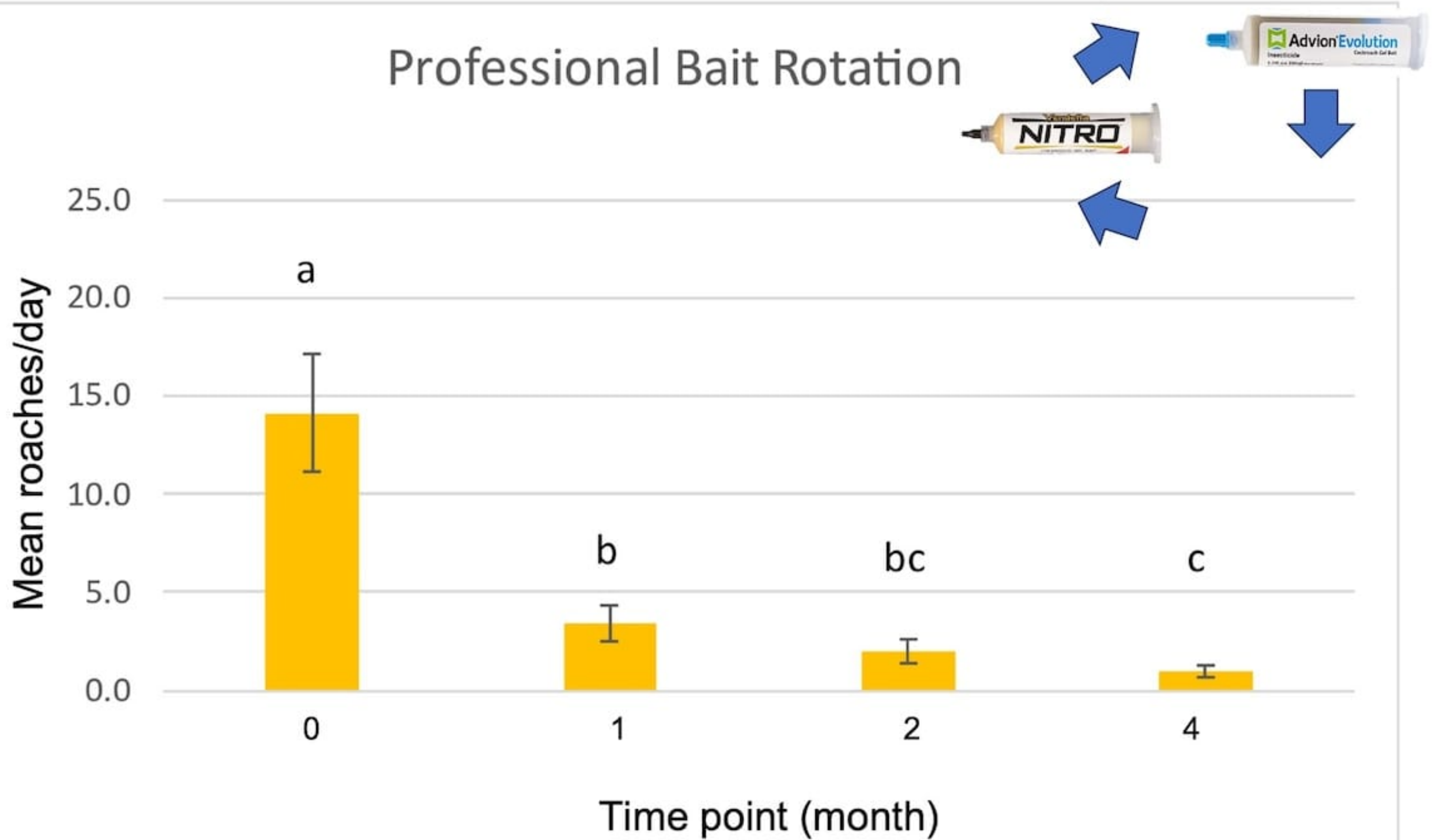
**Advion Evolution :**  
Indoxacarb 0.6%

**Maxforce FC Magnum:** Fipronil  
0.05%

professional grade bait rotation  
(positive control)

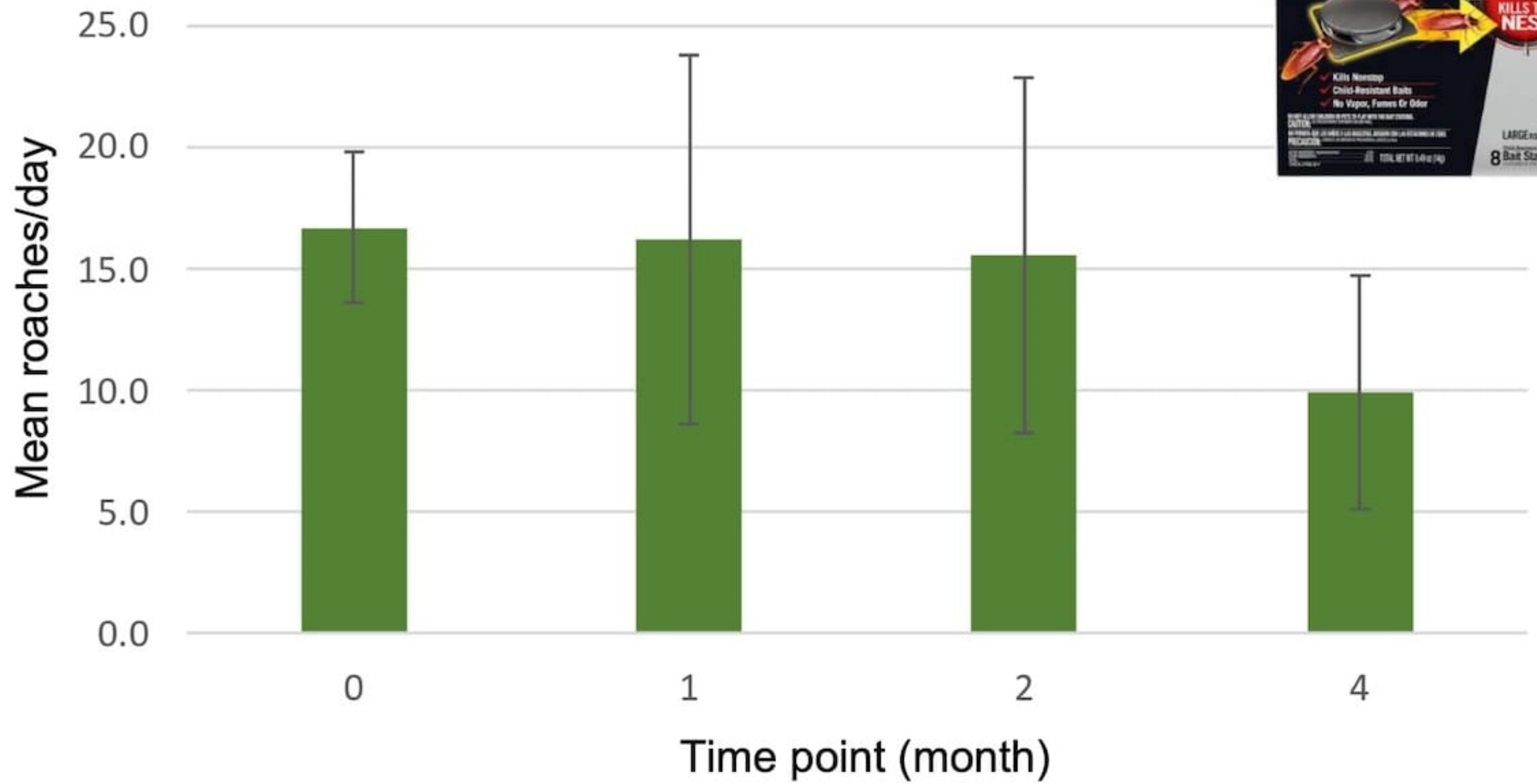


## Professional Bait Rotation



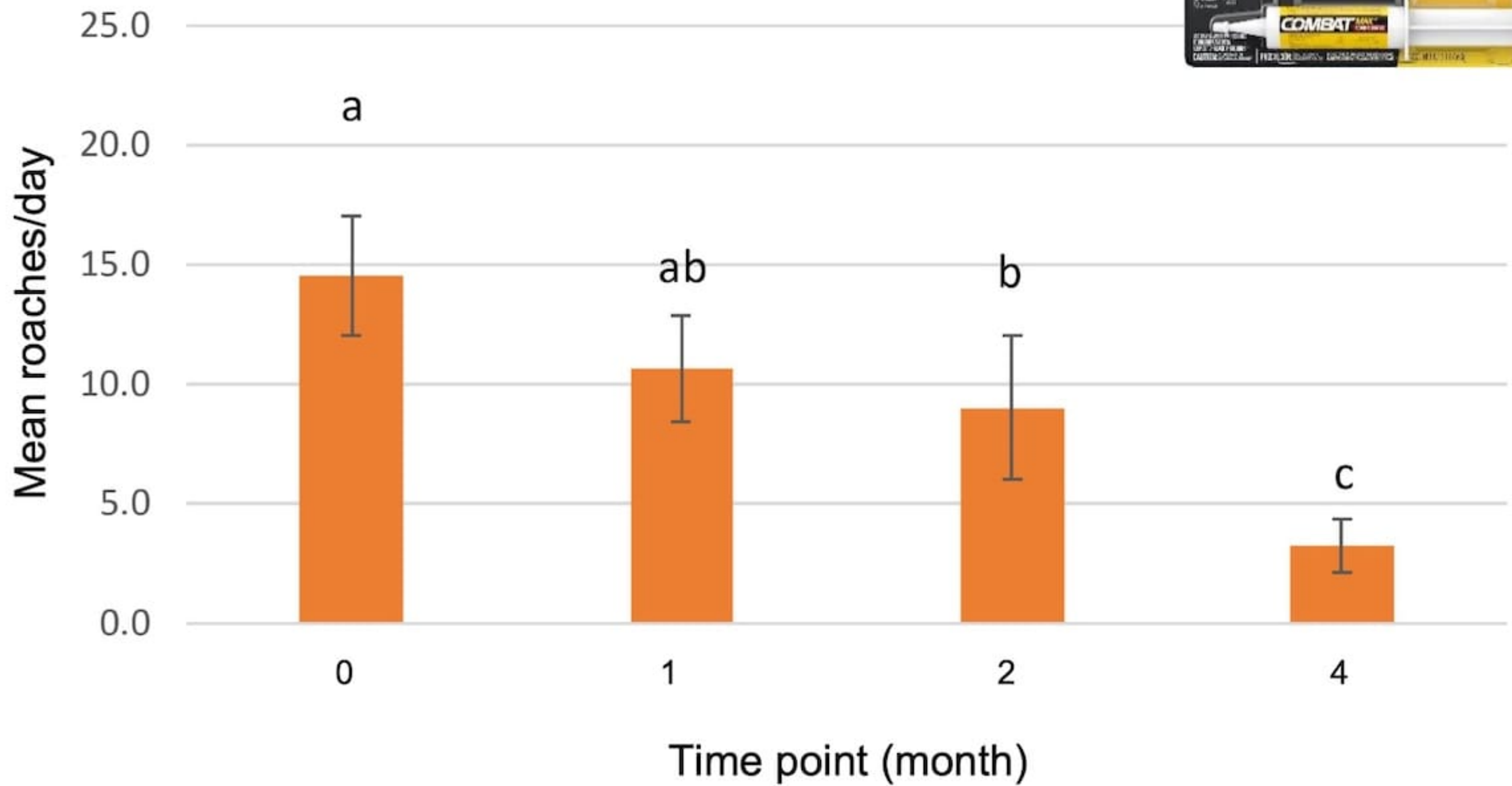


## Combat Bait Stations



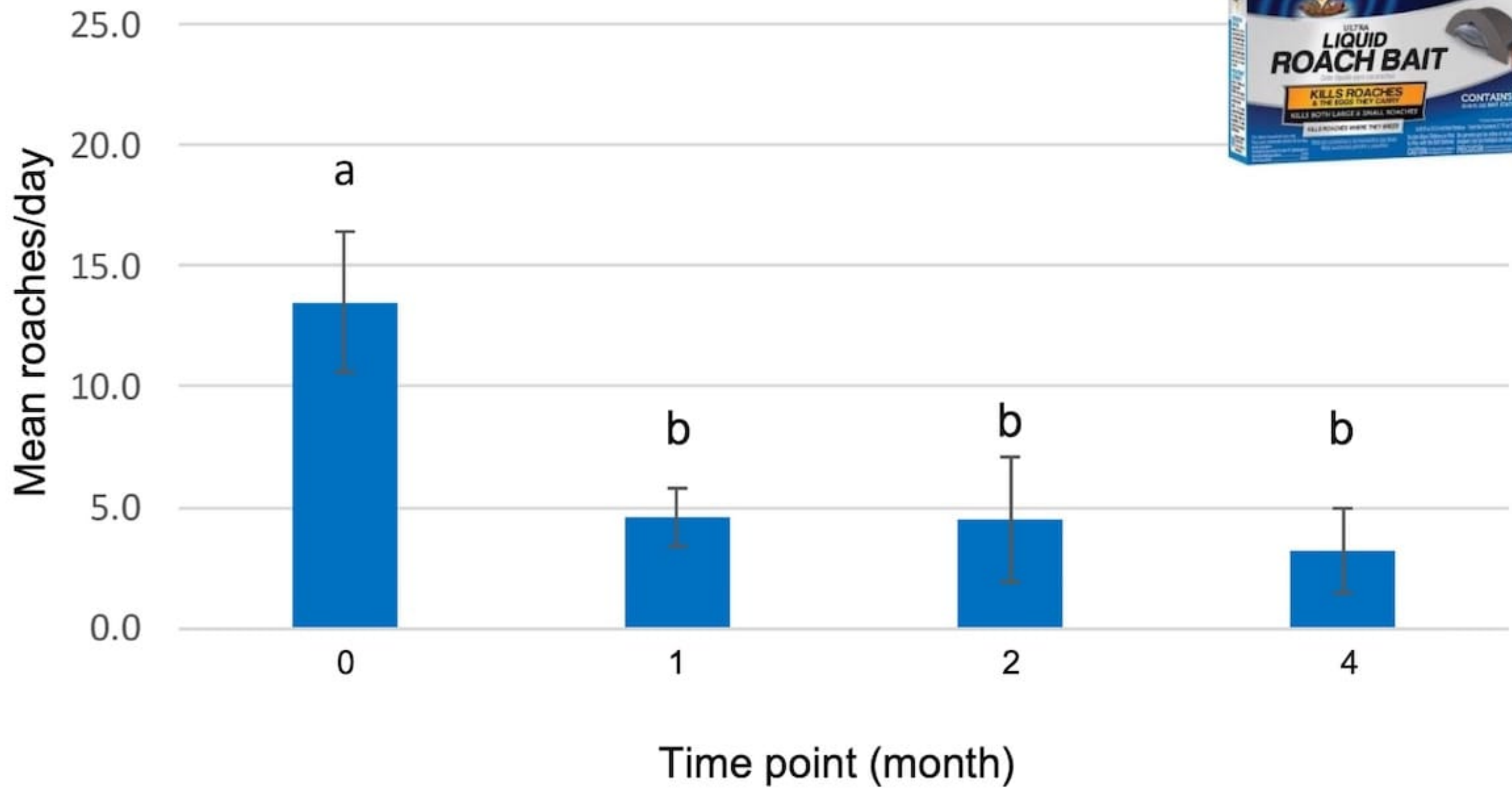


## Combat Gel Bait





## 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!



Washington State  
COMMISSION ON  
PESTICIDE REGISTRATION



NIH DIRECTOR'S  
EARLY  
INDEPENDENCE  
AWARD



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