Food Source Impacts on Surface Treatments and Aerosols

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Integrated Pest Management

- We generally think of starting on a small scale, then becoming more broad
- Might see this as going from contact sprays, then to aerosols, and then fumigation
- Why this talk in a conference with sulfuryl fluoride?

Contact Insecticides

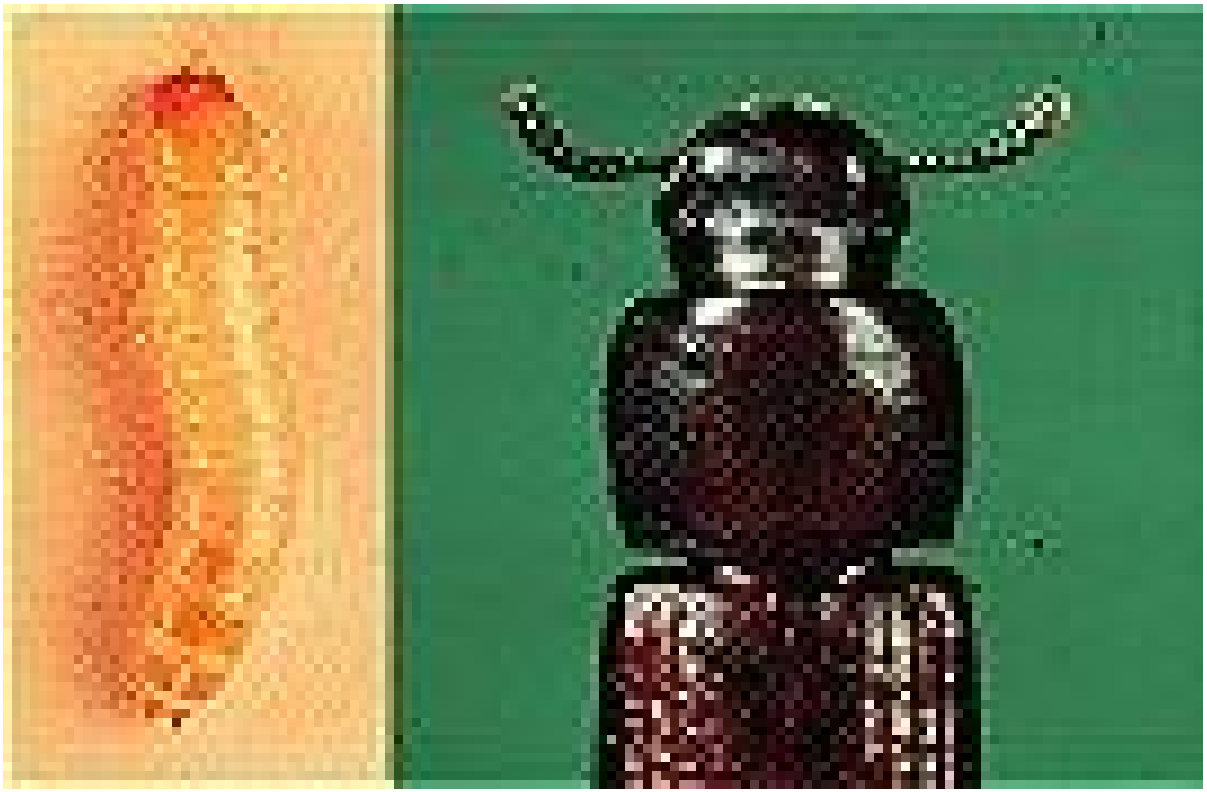
- General surface: can be used anywhere in the facility
- Crack & crevice: direct spray band into the opening
- Spot: usually defined as 2 ft^2 or less, restrictions on number of “spots”

Factors Affecting Performance

- Insect species vary in susceptibility, red and confused flour beetles fairly tolerant
- Some insecticides, and formulations, are better than others
- Perhaps the biggest factor is the presence of food during or after insecticide exposure

Red flour beetle (RFB)
Tribolium castaneum

Confused flour beetle (CFB)
Tribolium confusum



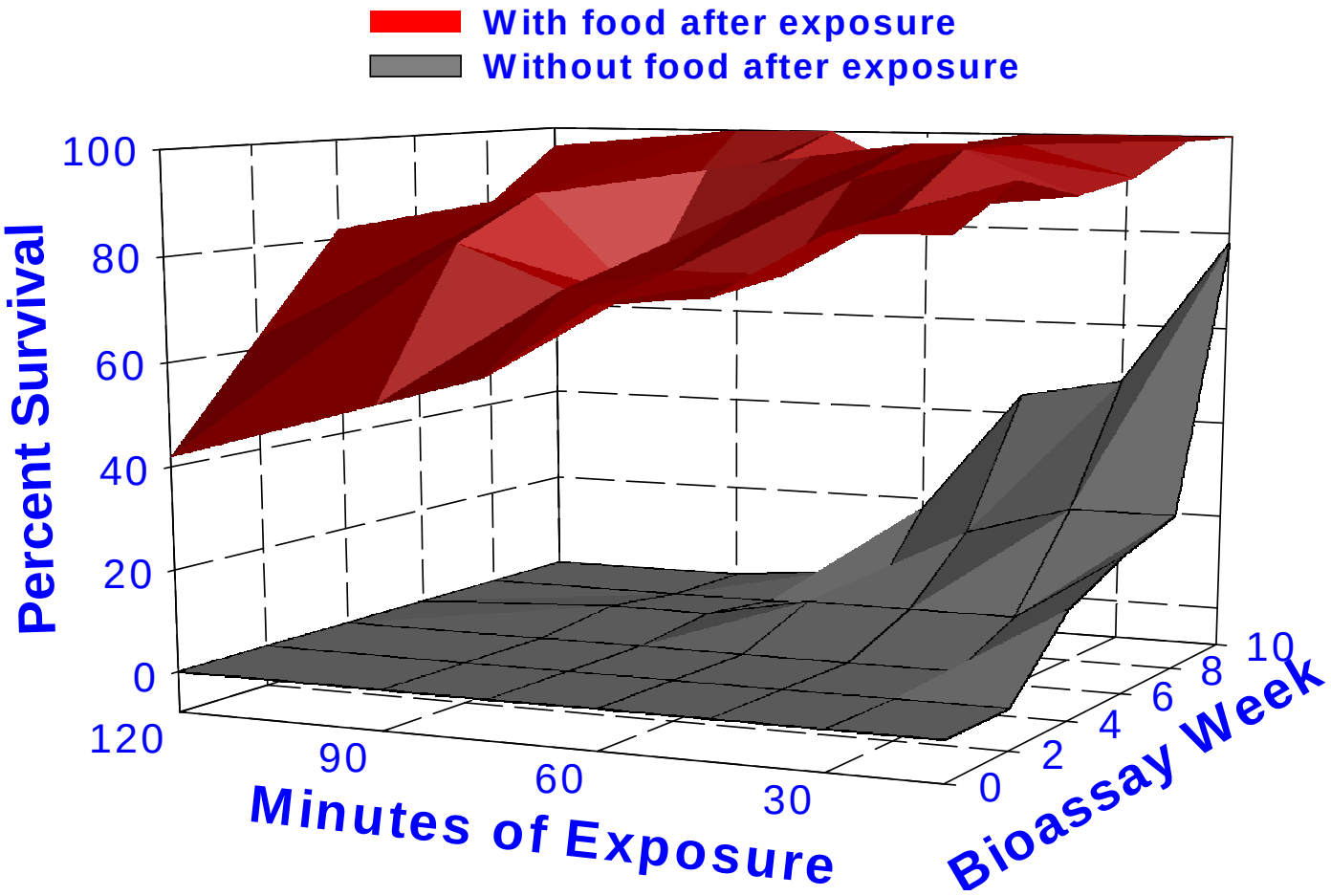
Why These Species?

- Common pests of stored food
- These species are generally more difficult to kill than smaller beetles
- CFB adults do not fly, RFB adults fly at ~80-85°F, minimizes escape into facility

Example 1

- Studies with cyfluthrin (Tempo) WP
- Adult red flour beetles exposed for 15 - 120 minutes on treated concrete
- Removed, held for 1 week, either given food or not given food
- Residual tests conducted for 0-10 weeks

Red flour beetle on concrete treated with cyfluthrin WP, 3.8 mg [AI]/ft^2



Example 2

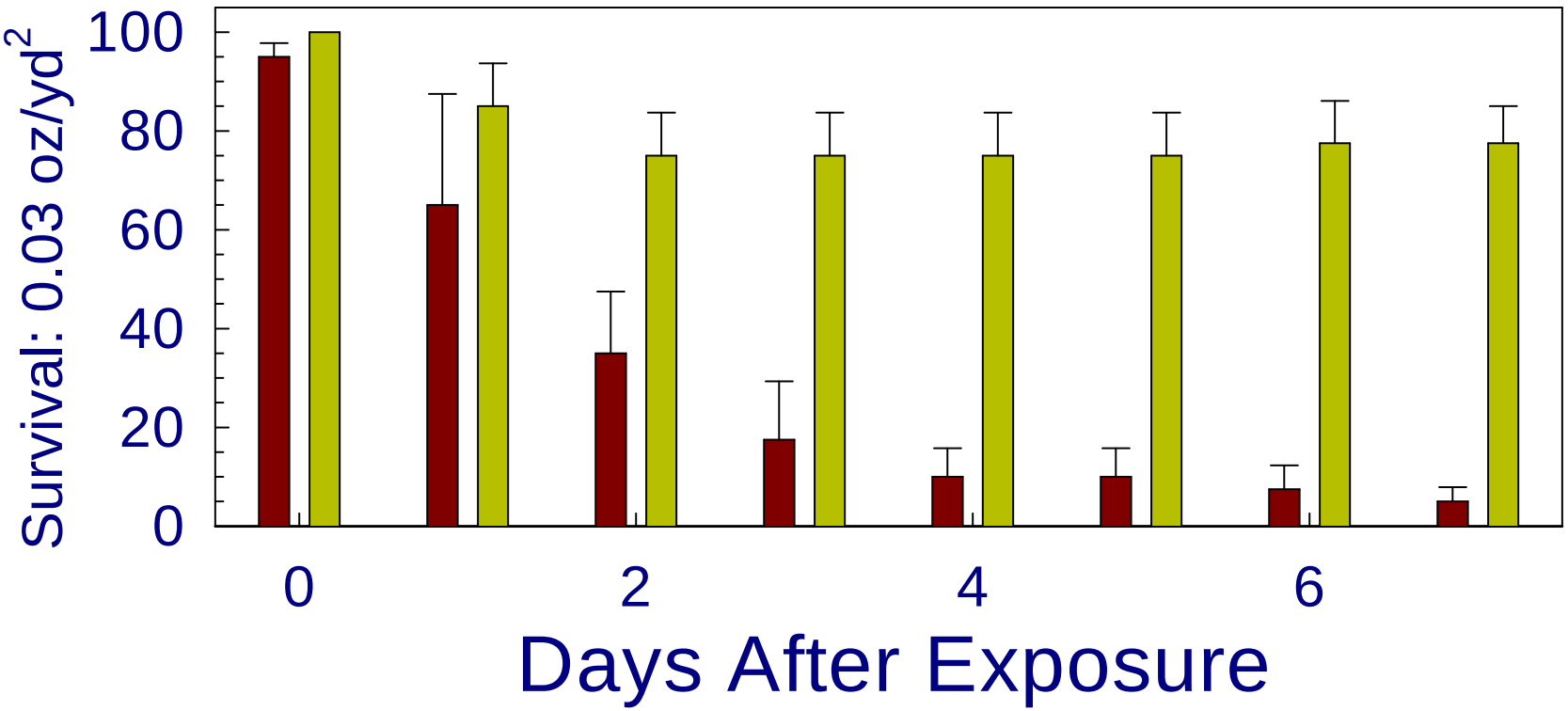
- Chlorfenapyr (Phantom)
- Termiticide, BASF sponsored studies to evaluate residual efficacy for stored-product insects
- Red flour beetle and confused flour beetle are now on the pesticide label

Presence of Food

- Red flour beetles exposed on concrete treated with Phantom (different rates and times)
- Either given a flour food source or not given food after exposure
- Increase in survival with food; example shown is maximum label rate, 8 hour exposure time

Concrete Exposure Arena

% RFB survival, 8-h exposure



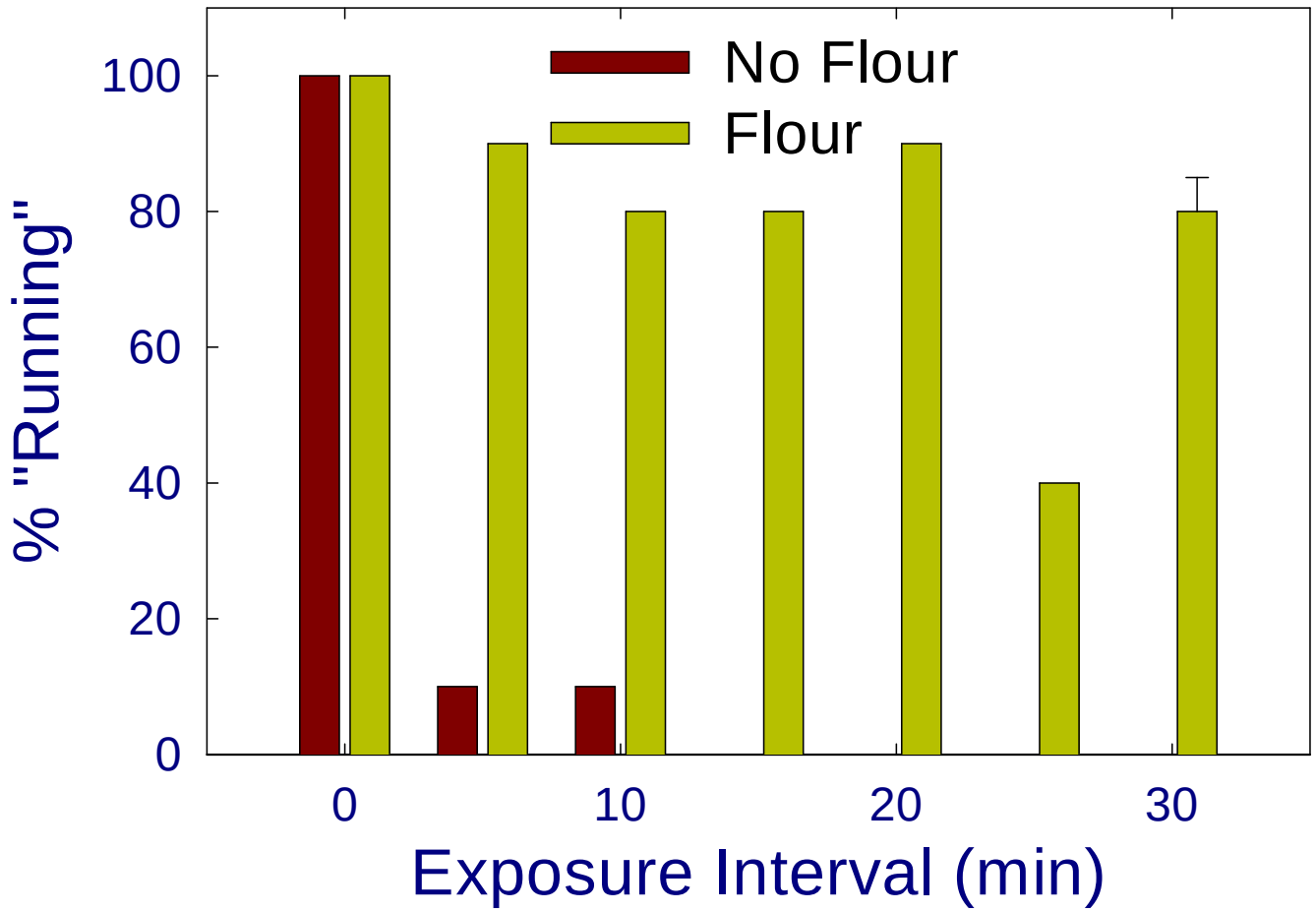
Example 3

- Residual studies beta-cyfluthrin (Tempo SC Ultra)
- Product is 1lb/gallon active ingredient, half the strength of the older formulation
- Low and high label rates, high label rate is about 1.8 mg AI/ft^2 (half that of old WP)

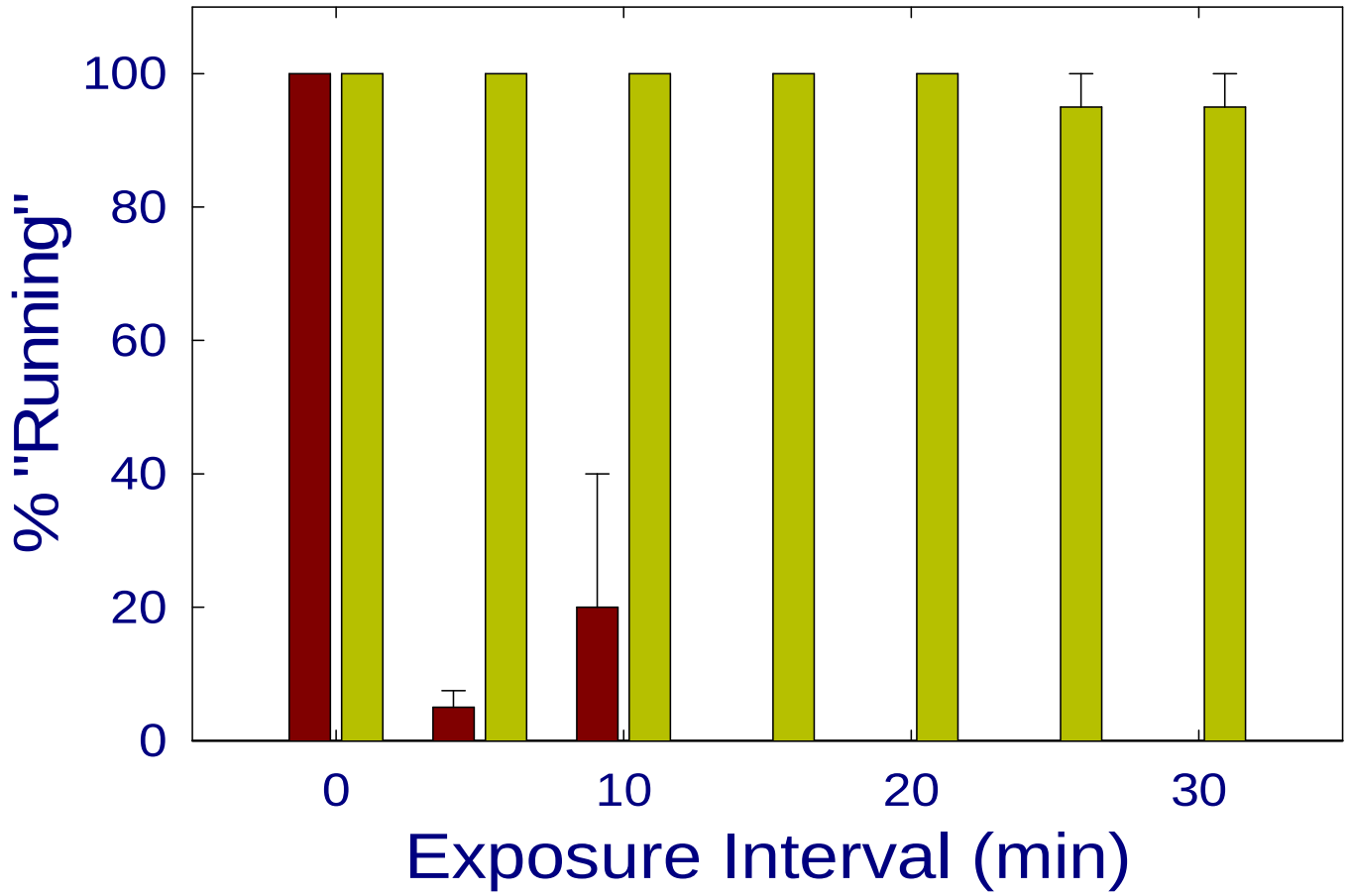
Tests With Red Flour Beetle

- Adults exposed on concrete treated with high label rate-5, 10, 15, 20, 25, and 30 minutes
- Knockdown assessed after exposure
- Beetles transferred to Petri dishes, held for 1 week with or without food
- Survival assessed at 2, 5 and 7 days

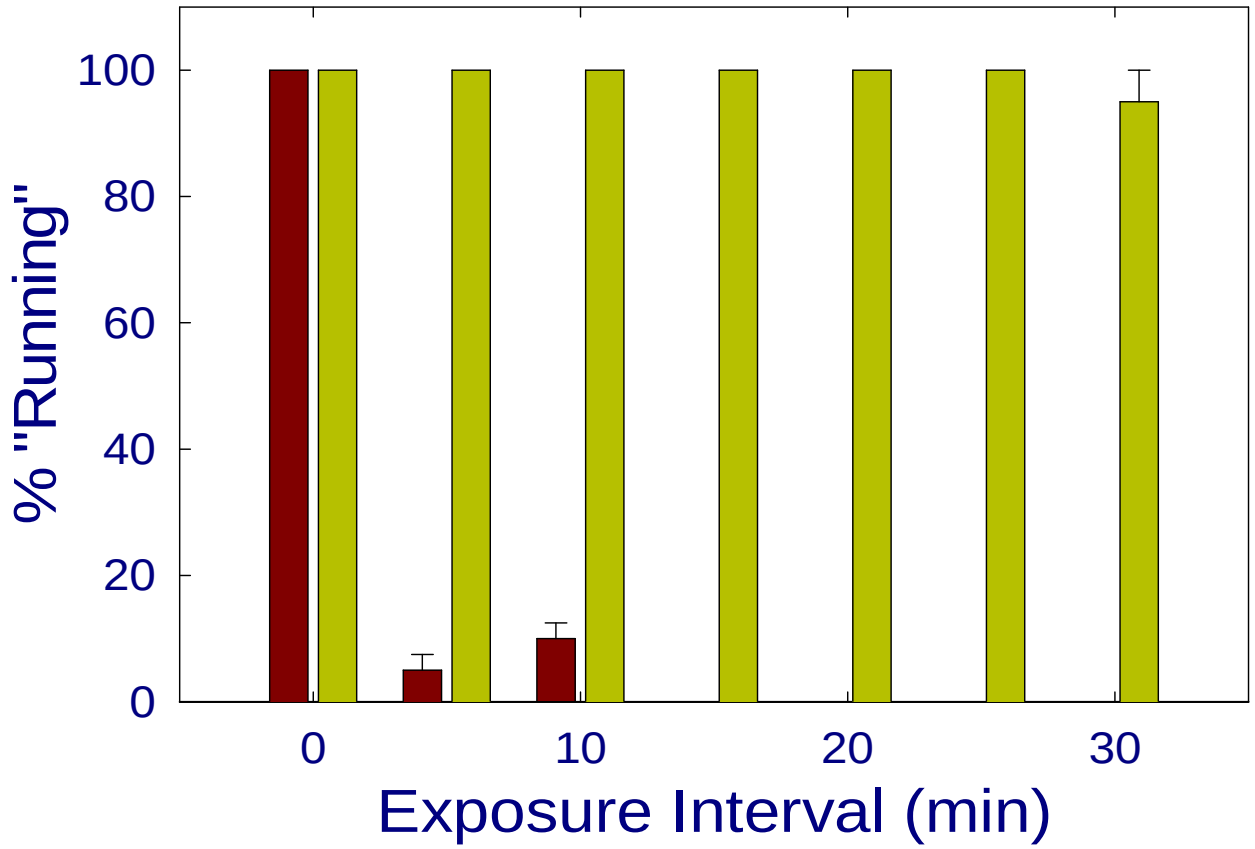
Red Flour Beetle-2 Days Later



Red Flour Beetle-5 Days Later



Red Flour Beetle-7 Days Later



Results For Tempo SC Ultra

- Similar results to Tempo WP and Phantom
- Presence of food increased survival at the identical exposure times
- What about residual control, longer times? Will see the same effects, consistent with different insecticide classes

Aerosols/Fogs/ULV Defined

- Aerosols (Fogs, ULVs) are liquid formulations, atomized and applied through a nozzle
- Kill exposed flying or crawling insects
- They do not penetrate food material, packaging, equipment, etc. (Not Fumigants)
- Aerosols and fumigants sometimes are used interchangeably

Field Trials

- Active commercial food storage facility
- Tests conducted in one room, approximately 225’L x 75’W x 35’H (600,000 ft^3)

Partial View of the Test Room

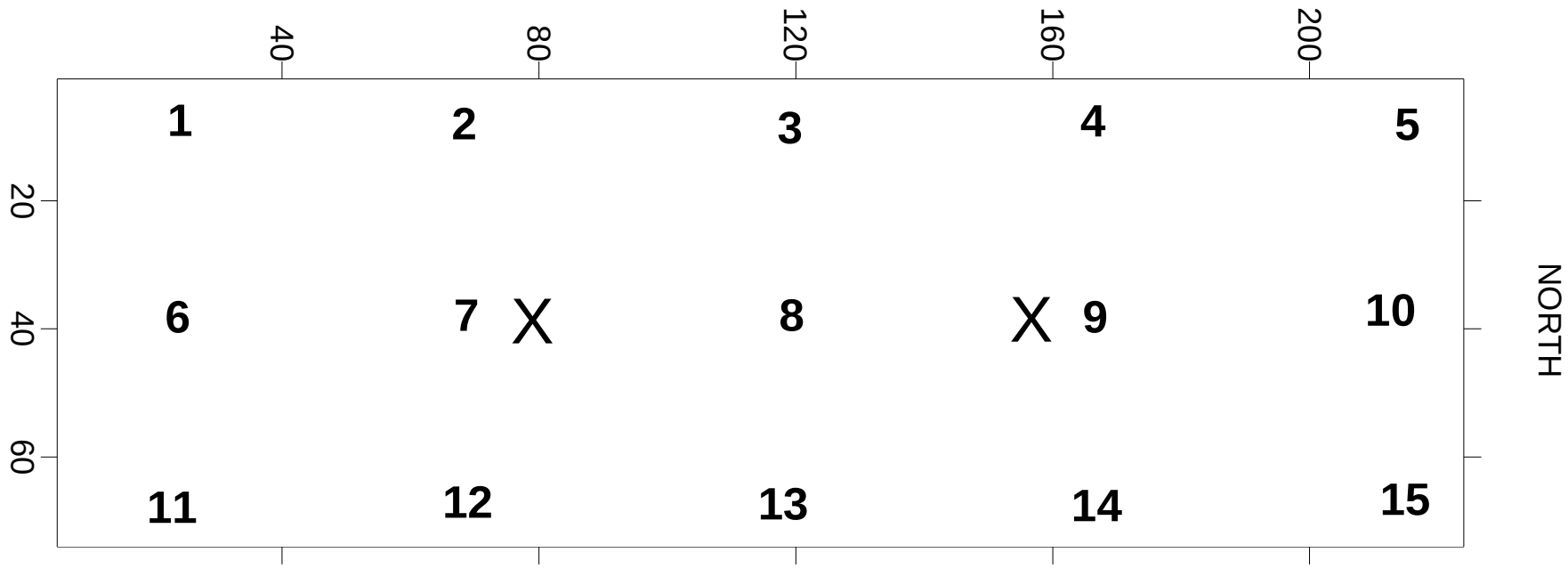
ULV System

- An installed ULV system on a timer, dispensed particle size about 15 microns
- Insecticide was a mixture of 1% pyrethrin+ synergists, applications were made according to label specifications for this formulation
- Trials conducted on 5 different dates with the red flour beetle and the confused flour beetle

Methods of Exposure

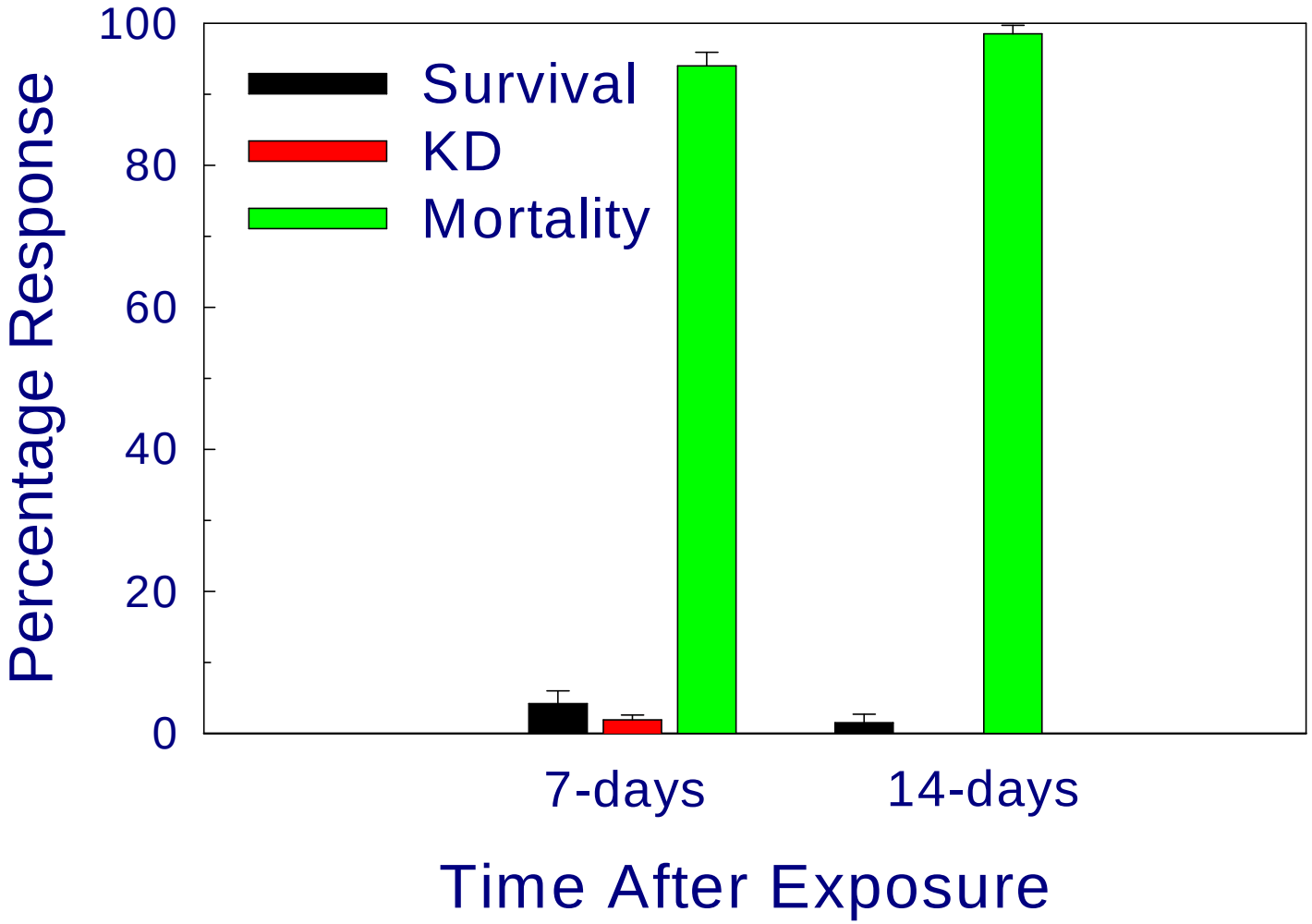
- 15 positions on the floor of the testing area (5 on side walls, 5 in center, all front to back)
- Ten adult CFB and RFB exposed in dishes (lined filter paper); w or w/o 250 mg of flour; 4-week old larvae and pupae with flour
- Dishes exposed to ULV fog for 2 hours, controls were held in a separate room

Position of Dishes, sets 1-5 and 11-15 between wall and pallets, X is nozzles

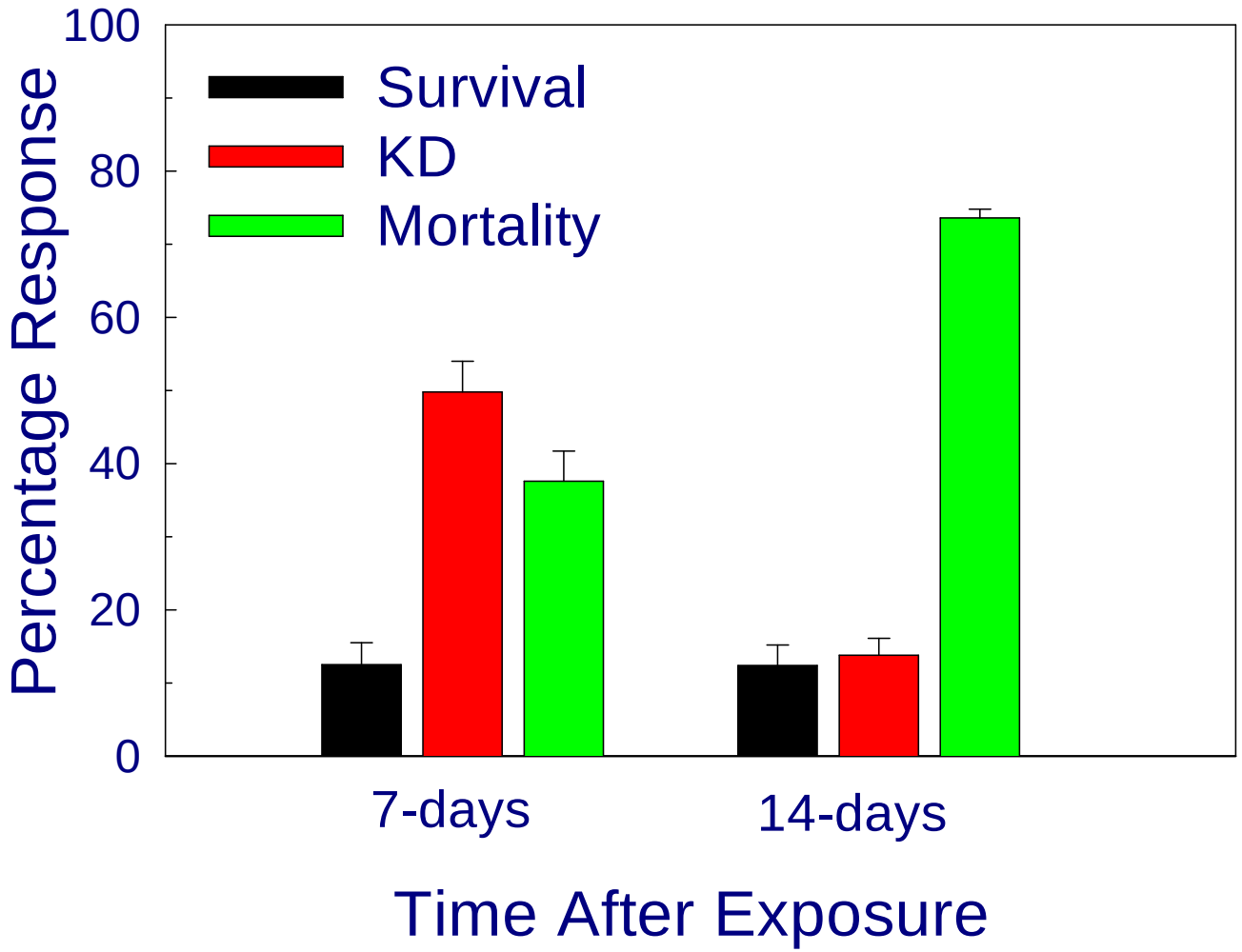


Fog distribution from 2 nozzles suspended from the ceiling

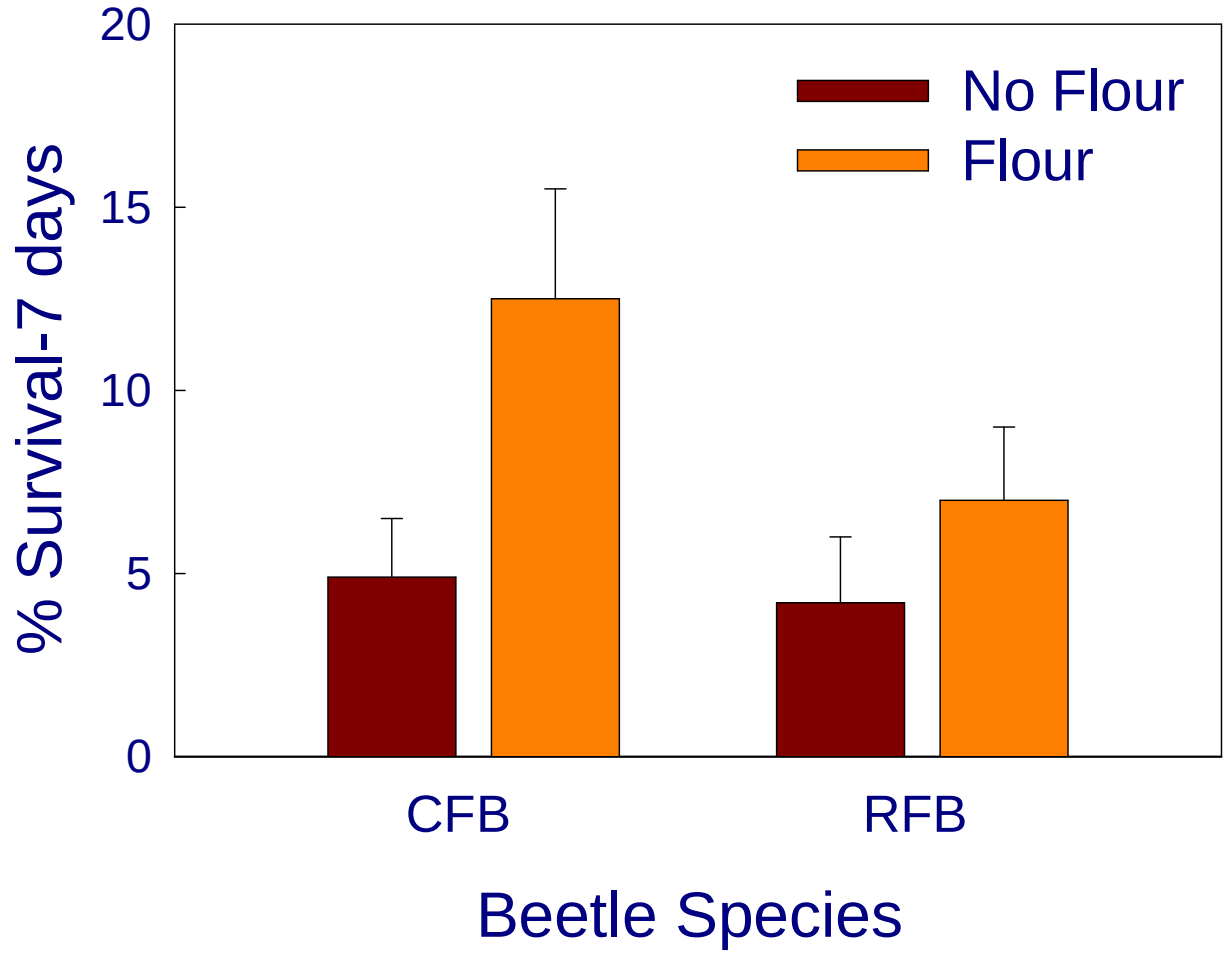
RFB Adults-No Flour



CFB Adults-No Flour



Adult Survival: Flour vs No Flour



Sanitation

- Hard to define, even harder to quantify
- However, we can show in laboratory studies the effects of a food source
- How can you clean an entire mill or food warehouse-you can’t!
- You can clean and monitor vulnerable areas

How do you Clean?

- Vacuum lines excellent harborages
- So is cleaning equipment, trash bags, dumpsters, etc.
- Problem on an industrial setting, especially during the warmer months
- Still, you can make a case for sanitation

Why This Talk in This Conference

- Do the concepts relate to fumigation?
- Fumigants penetrate, different from surface insecticides or aerosols-efficacy might be OK
- Does the presence of food material affect re-infestation or population rebound
- How about customer satisfaction?

Summary

- Food material has an obvious effect on insect survival for contact insecticides and aerosols
- Could affect overall performance of fumigants, particularly re-infestation
- We need much more research in actual field sites and commercial facilities

For More Information

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