

Improvements in Prevention and Control Techniques

Using Heat for Best Effect

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Presentation Outline

1. Temperature Extremes and Insects
2. Use of Dry Heat
3. Use of Steam

Temperature Extremes and Insects

Above 120 °F



Death in minutes

Cell walls and genetic materials melt
Proteins denature (cooked eggs)
Desiccation from water loss

Challenges

- Obtaining acceptable temperatures
- Efficient delivery of temperatures
- Making decisions about what is important?
- What are the challenges?

Unit 4



Dry Heat: Chamber Treatments



Whole Room Heat Treatments

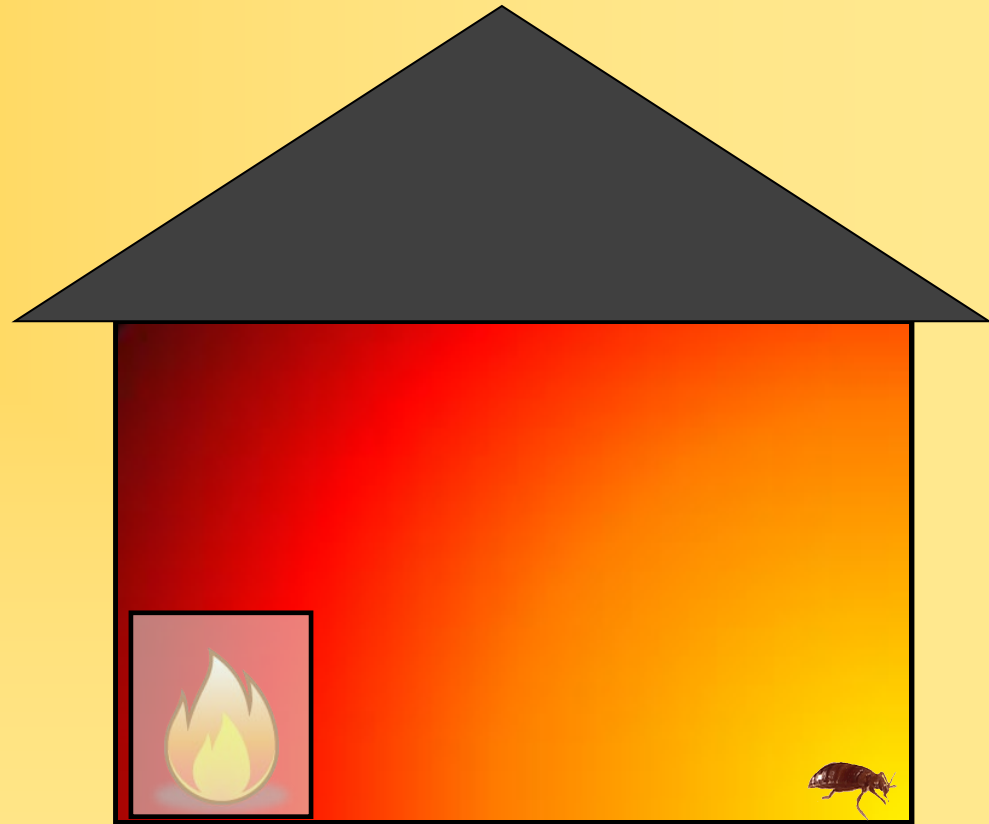


Critical Temperature?

Behavioral Responses?



113 °F



? °F

Critical Temperatures

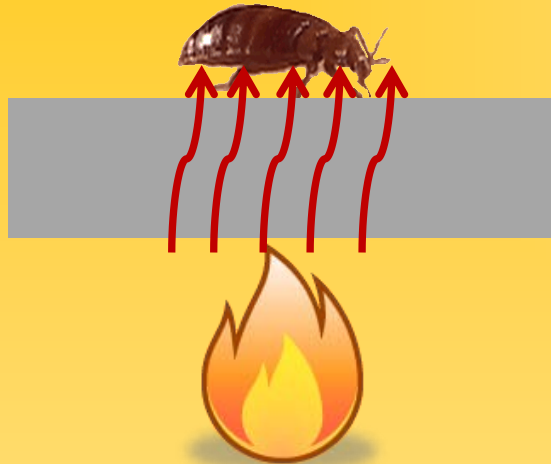
- Immediately lethal: **Adults 118 °F**
Eggs 122 °F
- Below IL temperatures,
time becomes important

Temperature	Adults	Eggs
113 °F	90 mins	7 hours!
118 °F	20 mins	90 mins

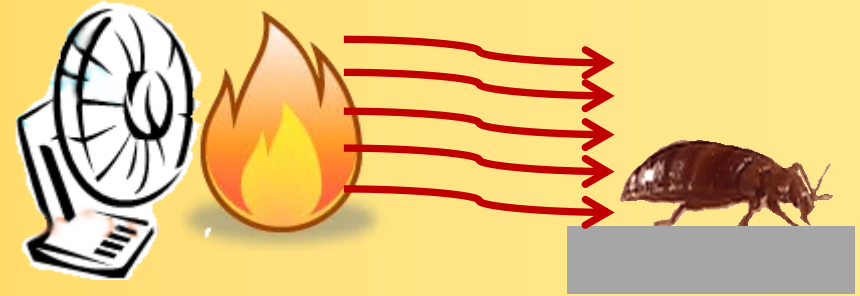
“Delivery” temperatures approx. 130 – 145 °F



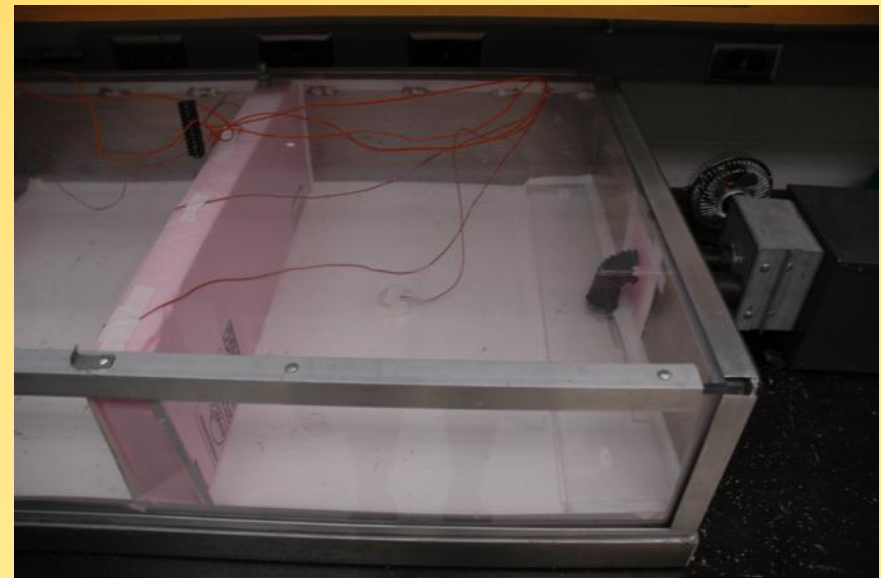
Behavioral Response to Bed Bugs



Conduction



Convection





Conduction

80 °F

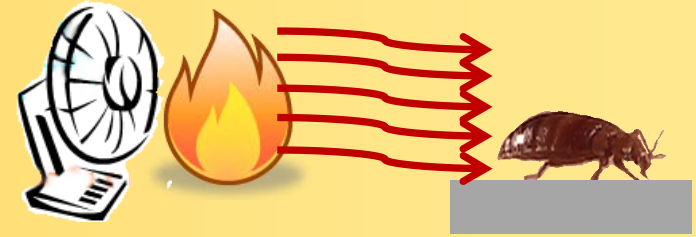
Movement Threshold

95 °F

Feeding Threshold

105 °F

**Escape
Temperature**



Convection

n/d

n/d

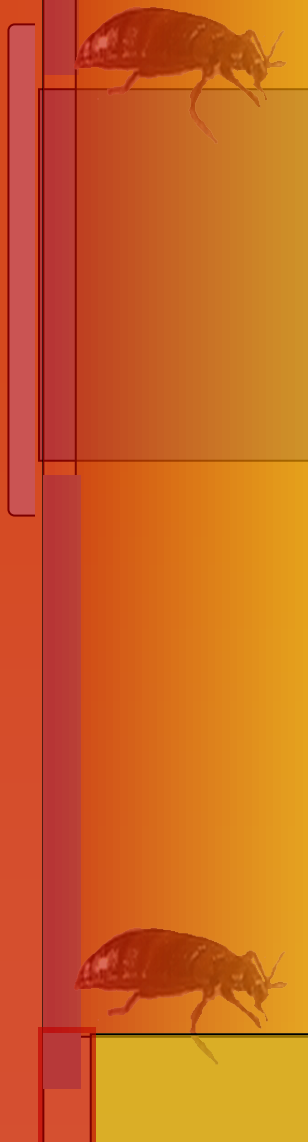
118 °F

***Assuming
Conduction
ONLY***

Room

(120 °F)

**Inside
Wall**



***Assuming
Convection***

Room

(120 °F)

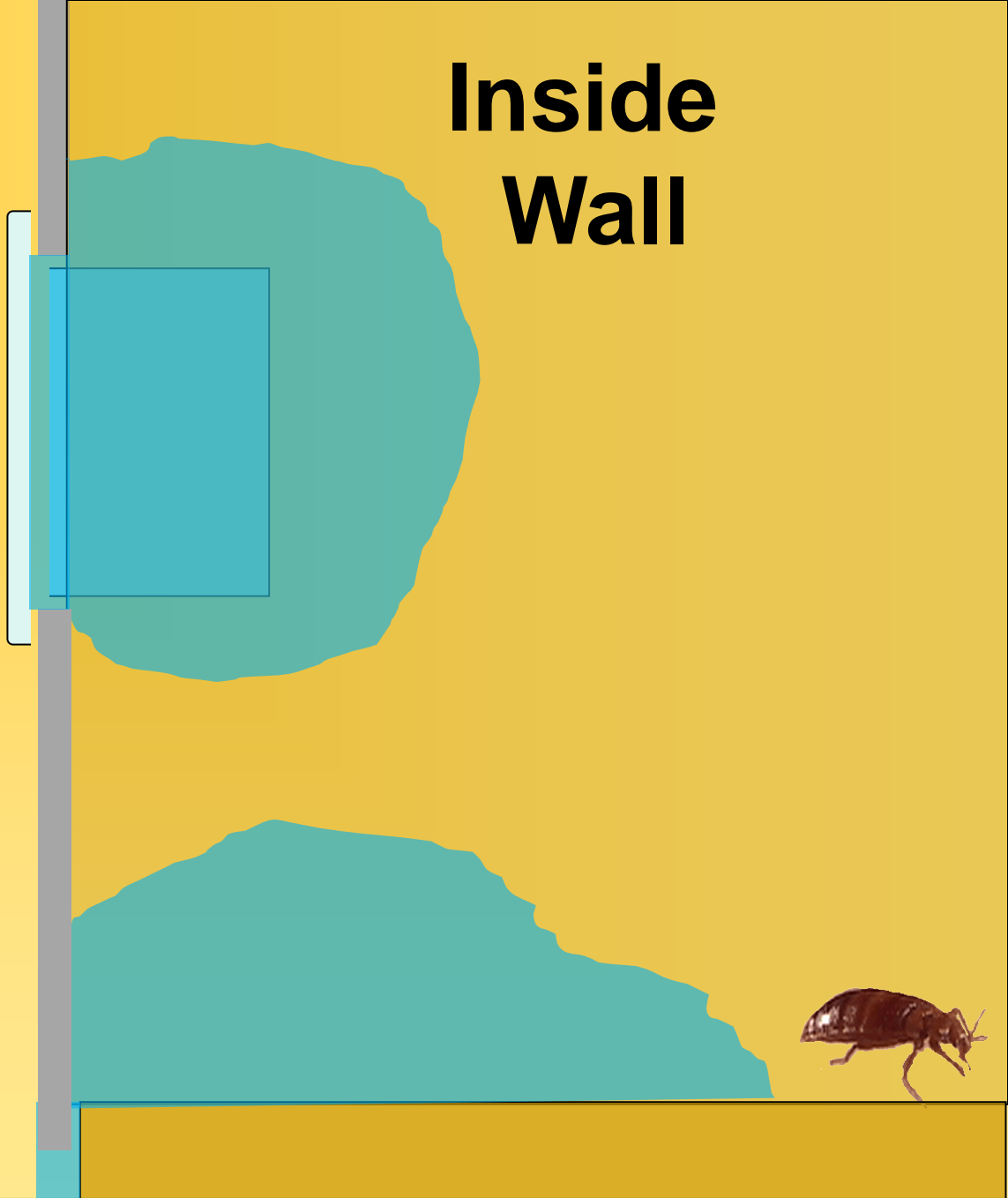
**Inside
Wall**



*Add
Insecticides*

**Inside
Wall**

Room



Steam Treatments



- A problem of bed bug resistance!
Effective in eliminating call backs
- But what are its limitations?
- Other considerations?



Reaching Target Temperatures

160 – 180 °F immediately after steam unit has treated area.



Steamers and penetration of heat

Steam penetration depends on

Fabric, fill density, Stitch holes

Reasonable penetration is up to

$\frac{3}{4}$ " for fabric

$2\text{-}\frac{3}{8}$ " for gaps

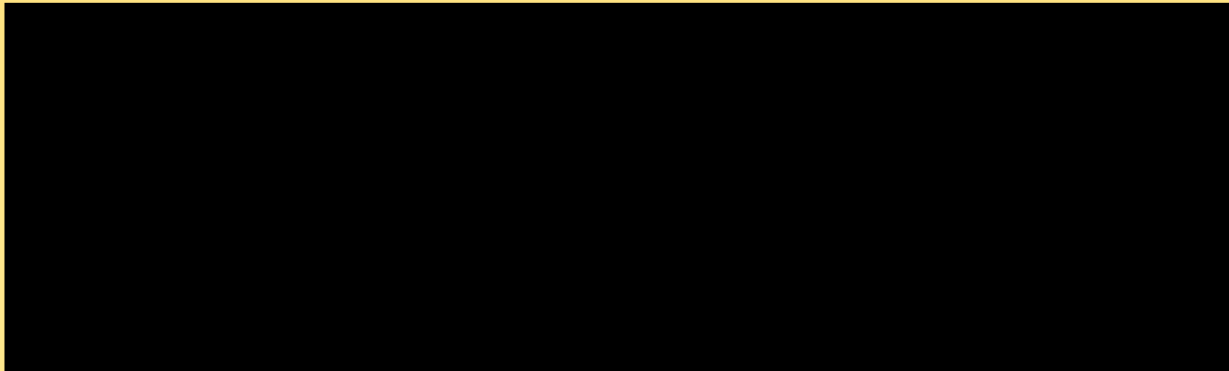
Towels over nozzle reduces penetration

Nozzle Shapes

Triangle



Floor Brush



2"



**No difference
in penetration**

**Difference with
nozzle velocity
and
area covered!!!**



Steam Generators



The Work Continues.....

- Improving critical temperature estimates
- Insecticide efficacy, substrates and heat
- Low critical temperatures for effective control

Thank you!

www.bedbugs.umn.edu

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NC Temp 500 Collaborators

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