Dr. Harris's Presentation 2009 AALAS

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Dry Heat Sterilization for Preparation of Rodent Microisolation Cages

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Rutgers Dry Heat Sterilizer

Photo: Gruenberg/Thermal Product Solutions

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Large autoclaves

* What dictates autoclave size?

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Disclaimer

Photo: Gruenberg/Thermal Product Solutions

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... for animal facilities (that we know of)

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The “Rutgers” dry heat sterilizer

- Cabinet interior: 139 cu ft
- Wall and door construction
  - –Welded heavy-duty steel frame
  - –Non-continuous struts from inner to outer walls
  - –4” Fiberex® insulation
  - –Chamber interior 304L stainless steel, 18 and 20 ga.
  - –Exterior 304 stainless, 18 and 20 ga.
- Floor: 3/16” plate, 304L stainless, beveled front edge, uninsulated
- Chamber interior dimensions
  - 62” wide
  - 54” deep
  - 70” high

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The Rutgers "oven"

Perforated sidewall panels

One sidewall panel removed

Control panel

Door latch and cut-off switch

Chamber roof removed showing damper

Oven front showing single door

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Heating plenum

- 6,600 CFM circulation fan
- 54 kW heating elements
- HEPA filtered air intake
- HEPA filtered exhaust (290 CFM)

Circulaton fan and heating elements visible during assembly

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Exhaust system

- Exhaust fan on oven - 2 speed up to 290 cfm
- Exhaust duct (chimney) under positive pressure
  - Sealed joints
  - Insulated
  - Exhaust to side of building allowed

Exhaust blower during assembly

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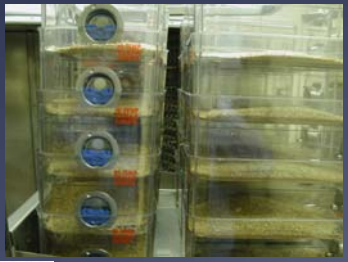
Sterilizer loading carts

25 nested cages/shelf

15 assembled cages/shelf



Note space
between cages

Three-shelf Rutgers carts
Note top bar to support a cart cover

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Dry heat sterilizer validation

- *Bacillus atrophaeus* spores on filter paper
- Color change on culture indicates growth
- No dry heat autoclave tape

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Measured Energy Consumption
300° F Soak: 60 minutes

Stage	Time (min)	Power (kW)	Energy (kWH)	Cost ($)
Ramp up	20	61	20.3	$2.64
Soak	60	12	11.7	$1.53
Cool	100	4	5.4	$0.83
Total	180		37.4	$4.99

Power measurement in progress

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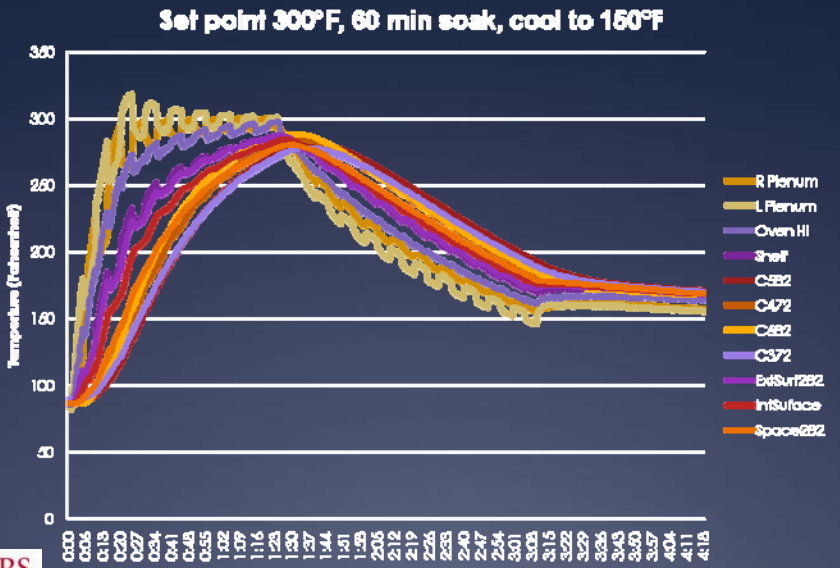
Multiprobe temperature recording



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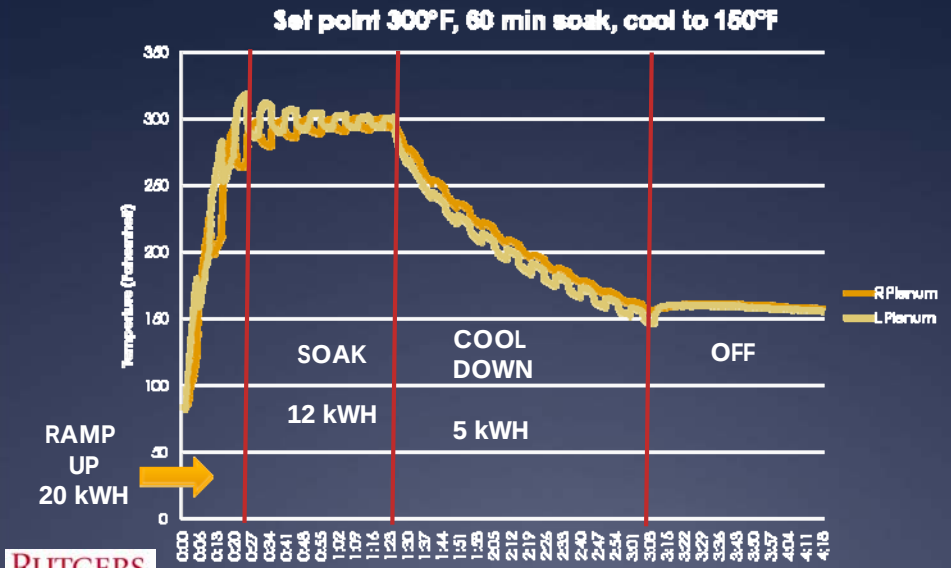

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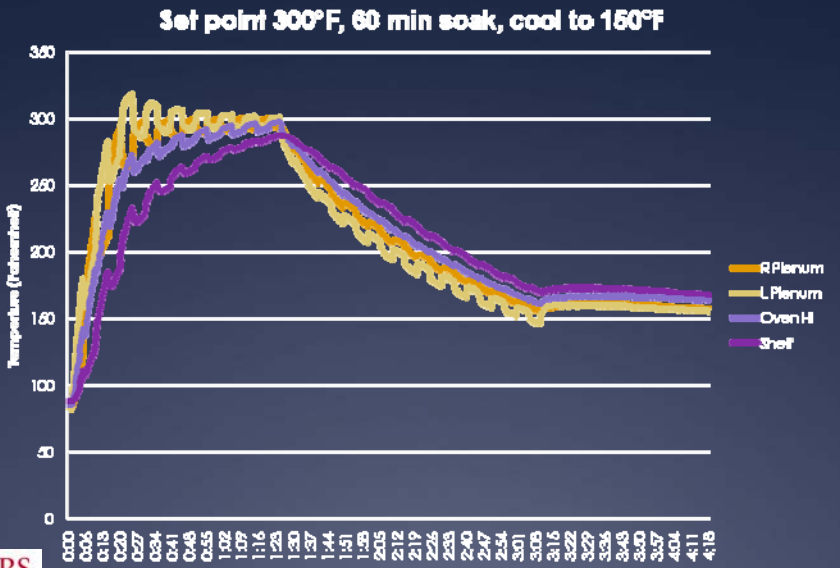

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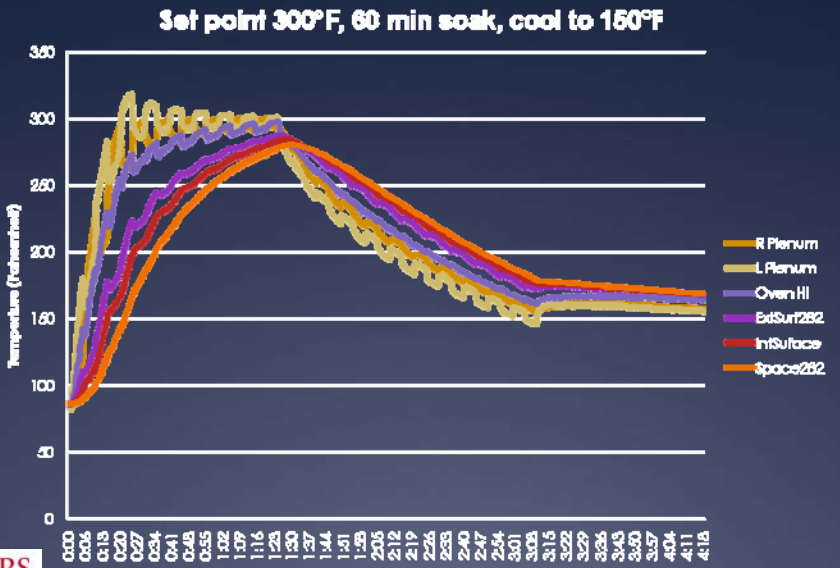

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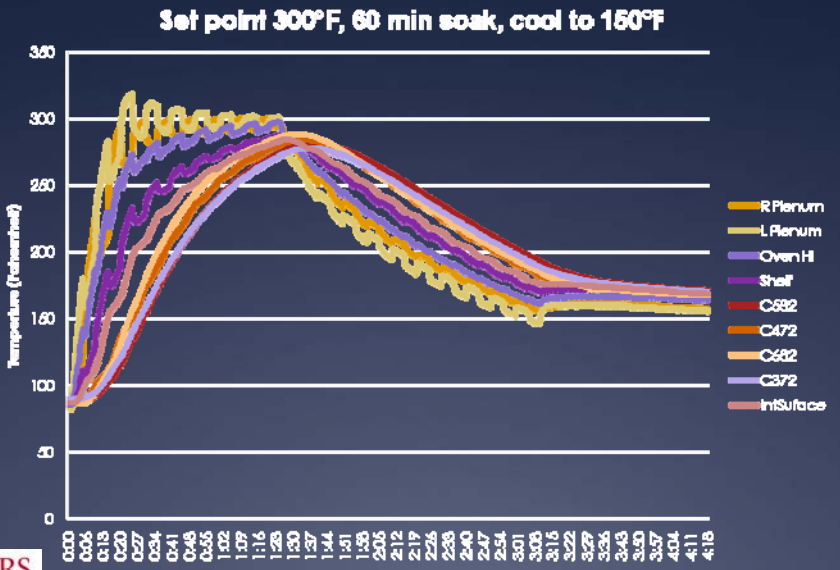

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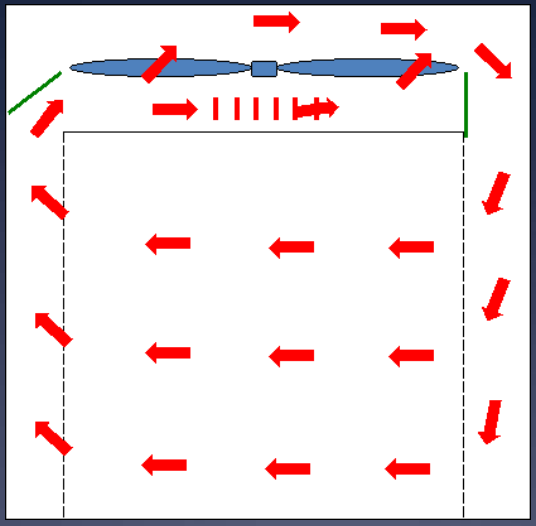

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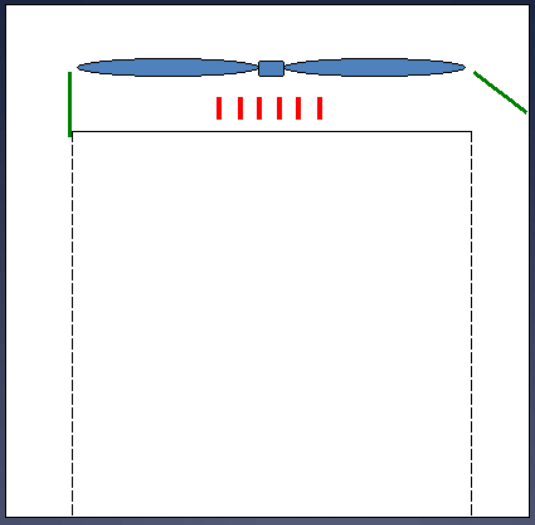

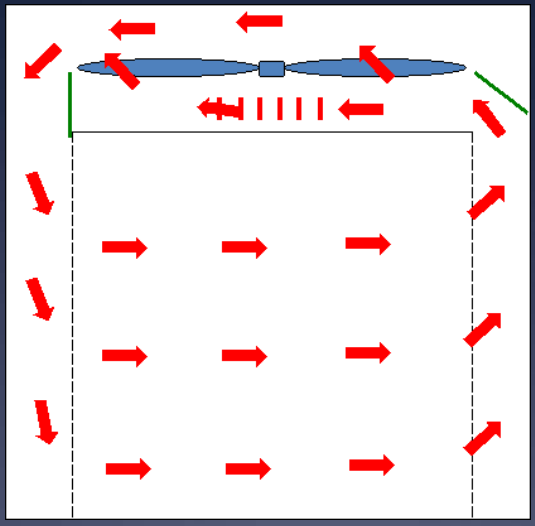

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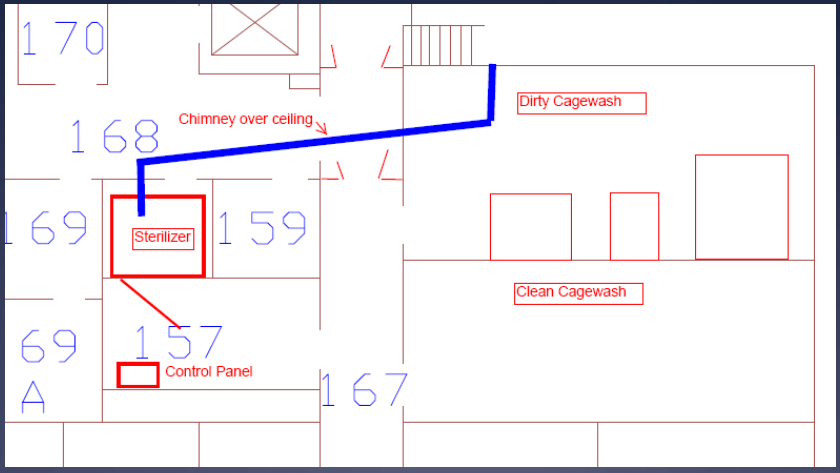
Floor plan



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Installation …

1. Why is the loading dock always the wrong height?

2. The top plenum thru 42” door

3. Hoisting upper assembly

4. View of heater plenum

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… Installation

5. Positioning chamber in wall opening

6. Lowering upper section onto assembled chamber

7. All done!

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Advantages of steam sterilization under pressure

- Effective sterilization
- Short cycle times
- Penetration of surgical packs, assembled cages or stacks of nested cages
- Ability to sterilize liquids
- Decontamination
- Inexpensive "process indicator" (autoclave tape)

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Disadvantages of steam autoclaves

- Purchase price
- Required utilities (steam may be unavailable)
- Weight
- Complexity, cost of maintenance & repair
- Cost of producing steam
- Damp bedding
- One-piece pressure vessel
- Damage to plastic cages

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Advantages of dry heat vs. steam

- Purchase price ~ 60%
- Cheaper to install
  - No steam, no water, no pit, no drain
- Less expensive to maintain
- No moisture added to workplace
- Minimal heat load to workspace
- No apparent damage to plastic cages

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	RUTGERS DRY HEAT STERILIZER	NEW STEAM AUTOCLAVE
VOLUME (CU FT)	139	139
FOOTPRINT (SQ FT)	34.3	STERILIZER 48.5 PIT 91.2
MINIMUM DIMENSION OF PARTS (IN)	31.5	62.4
UTILIITIES	Electric power Compressed air	Steam, cold water, drain, pit, electric, compressed air
WATER USAGE (GAL)	0	700
COST PER CYCLE (CALCULATED)	$4.99	$8.20

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Limitations of dry heat sterilizers

- Not sealed, no hazardous agents
- No liquids
- High temperatures
- Longer cycle times

Loaded with 180 assembled cages

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Limitations of dry heat sterilizers

No such thing as dry heat autoclave tape”

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In summary

- Dry heat sterilization:
  - Cost-effective alternative to steam autoclaves
  - Established, proven technology
  - Kills microbes as effectively as steam
- Cycle length:
  - Minimize with convection oven technology
  - Larger capacity in same footprint and lower cost can offset

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Dave Waldrab, Sean Thornton, Dave Miller

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