APPENDIX I: TABLE OF CONTENTS

1. INTRODUCTION

This appendix presents various aspects of the experimental stages of this project. The main body of the appendix is split into four sections:

Cage Condition: This section presents calibration procedures, experimental data, and justification of the sizing of the Simulated Mouse Heater (SMO).

CO_2, NH_3, H_20, and Heat Generation Measurements at Low and High Humidities: This section presents an introduction to direct and indirect calorimetry, calibration procedures, measurement procedures, and experimental data, in both tabulated and graphical forms.

Room Conditions: This section presents the justification of air velocity sampling frequency, and justification of steady-state for temperature and air velocity fields.

Photographs from Experimental Test: This section presents a series of photographs from each of the three experimental stages listed above.

2. CAGE CONDITIONS

2.1 Calibration Procedures

2.1.1 Temperature Sensor Calibration for Type T Thermocouples

Fill a temperature regulated water bath approximately 2/3 to 3/4 full of water and heat to first desired temperature.

Place thermocouples about two or three inches below the water surface near to center of the water bath.

Verify water temperature by placing a SAMA thermometer next to the thermocouples.

Monitor water bath temperature with the SAMA thermometer to ensure that it is stable (+/- 1.5 °C) for approximately two minutes before taking each reading.

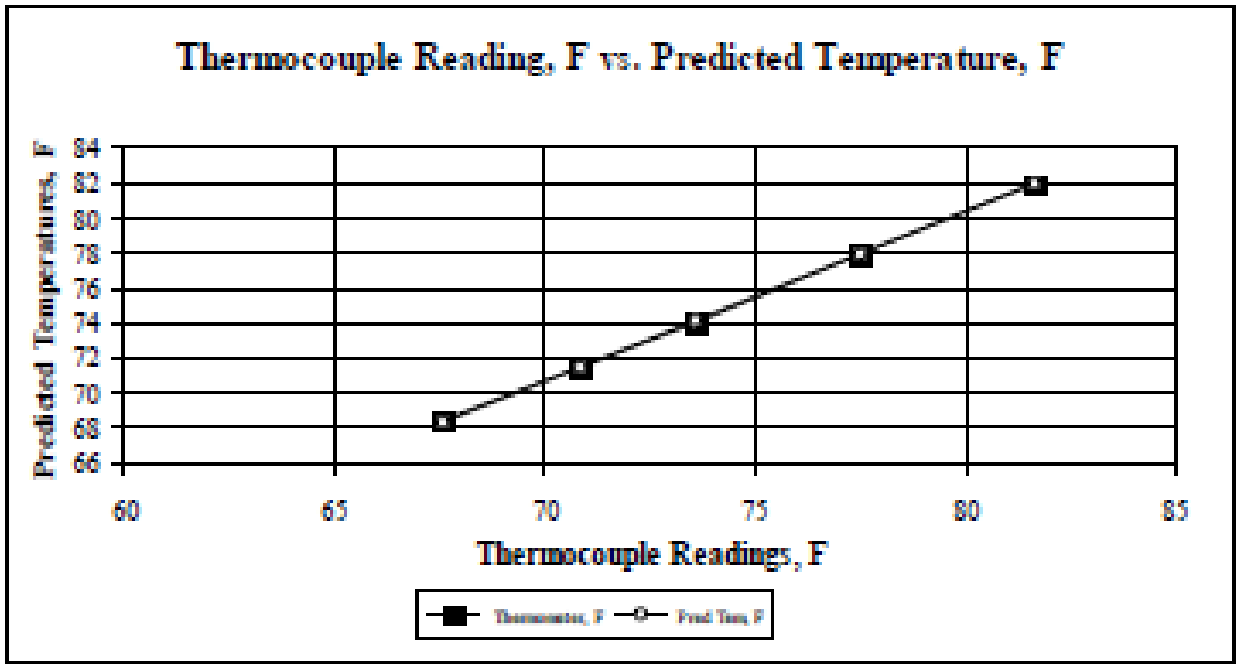
Take the thermocouple reading and record on the attached calibration sheet.

Repeat steps four and five for at least three different temperatures. The mid-calibration temperature should be near the anticipated average experimental temperature. The lowest and highest calibration temperatures should be around 5 °F below and 5 °F above the anticipated temperature range.

2.1.1.1 Typical Calibration Results

Comparison of Thermocouple and Thermometer Results

Thermocouple (°F)	Thermometer (°F)	Pred. Temperature (°F)
67.6	68.5	68.4
70.9	71.5	71.5
73.6	74.0	74.2
77.5	78.0	77.9
81.7	82.0	82.0



2.1.2 Air Velocity Sensor Calibration

Every morning turn on the sink in the back of the fan test chamber. Allow the water to run for at least 10 minutes. This is necessary because the cooling unit will overheat if hot water is introduced into it.

Remove the large duct on top of the blue chamber. Open the damper below it. Replace the duct.

Check the barometric pressure and the zero of the pressure gauge.

Turn on the long gray chamber using the computer
Pick “2” (Controls) [Return]
Pick “1” (Run/Standby) [Return]
Pick “1” (Run) [Return] [Return]

Allow the blue chamber to cool for at least 10 minutes.

Remove the large duct again and open the blue foam damper on it.

Close the damper, which was below it.

Turn on the calibrator fan and adjust it to the desired pressure (listed pressure + zero pressure),

Turn off the environmental test chamber by picking Standby instead of Run. You should hear the compressor turn off if this step is done correctly.

Turn on the Campbell by typing *1A2A*6.

Let the Campbell run for five minutes.

Plug in the heater.

Let the Campbell run until the inside temperature reaches 85 degrees (the first Fahrenheit temperature listed on the Campbell).

Stop the Campbell by pressing *1A0A*7.

Unplug the heater and turn off the calibrator fan.

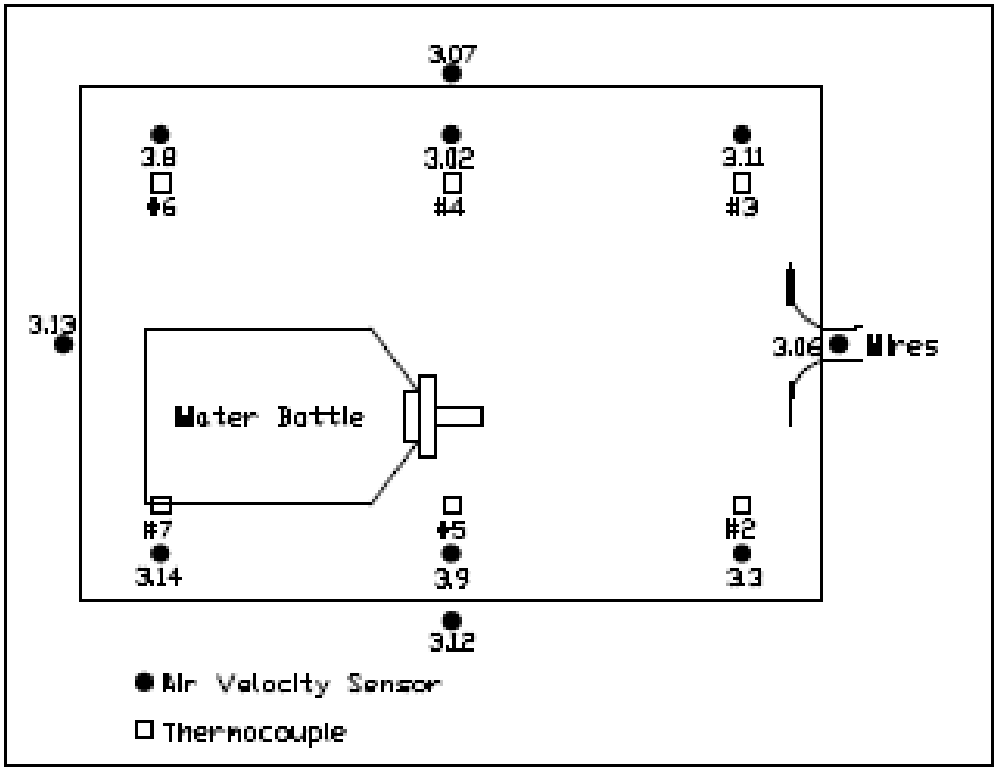
Download the data using the computer. Use the TELCOM program. Name the file in this format: month–day–test#. For example, 3–27–1 would be the first test on March 27.

Clear the Campbell by pressing *AA128A*6.

Repeat steps 2-16 for each velocity.

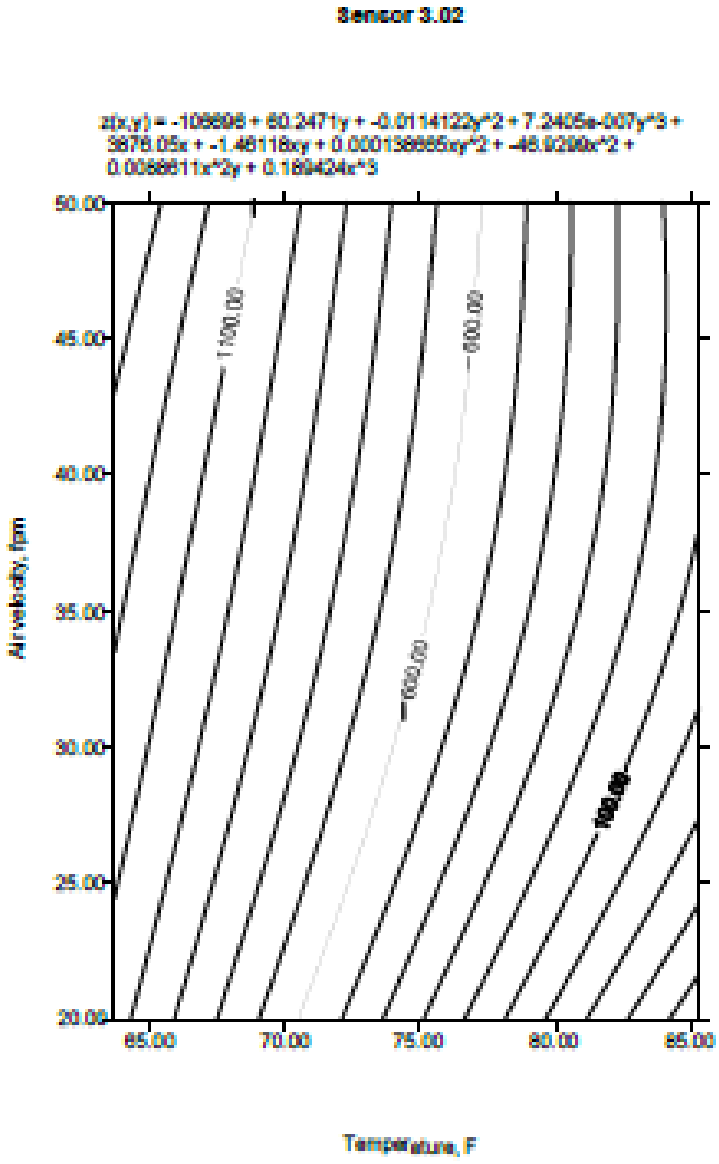
2.1.2.1 Typical Calibration Results

Locations of Velocity Sensors and Thermocouples within the Cage



Temperature and voltage data were analyzed to form trend lines for each velocity. The trend lines were used to generate predicted voltage values. The velocity data, temperature data, and predicted voltage values were then combined and plotted to form a contour map that had axes of velocity, temperature, and contours of voltage. The map was made using a third order polynomial regression. A third order polynomial regression was chosen because it provided an equation that could easily be used to determine velocity values within a spreadsheet and because it displayed contour lines that closely followed those lines displayed by other curve-fit methods. The contour map was made as a visual means of finding if values were not outside the calibration range, i.e. greater than 0.25 m/s (50 fpm) or less than 0.10 m/s (20 fpm).

Typical Contour Map



2.2 Experimental Data

The experimental data sets for the cage condition section of work are summarized below:

Series Set	Tracer Gas	Injection Rate (L/ min)	Sampling Method	Mouse Heater Type	Cage Orientation	Tunnel Air Velocity Range (fpm)
Base	CO_2	1.0	Steady	DMH (On/ Off)	Par, Perp, Vert	15 – 100
One	CO_2	0.1	Steady	DMH (On only)	Par, Perp	15 – 50
Two	SF_6	0.1	Steady	DMH (On only)	Par, Perp	15 – 50
Three	CO_2	0.1	Steady	DMH (On/ Off)	Par, Perp, Vert	20, 40
Four	CO_2	0.1	Steady	SMO (On only)	Par, Perp, Vert	20, 30, 40
Five	CO_2	0.1	Decay	SMO (On only)	Par, Perp, Vert	20, 30, 40
Six	CO_2	0.1	Steady	DMH (On/ Off); SMO (On Only)	Par, Perp	20,40
Seven	CO_2	0.1	Steady	DMH (On/ Off); SMO (On Only)	Par, Perp	20, 40
Eight	CO_2	0.1	Steady	SMO (On Only)	Par, Perp	30

2.2.1 Series Set Base

Parallel Cage Orientation

Tabulated Data:

Air Vel.	Bar Pres	Temp	F CO_2	B CO_2	K	CFM (w/o K)	CFM (w/K)	Pred. CFM	Act./Pred
15	29.40	72.0	15.56	0.23	0.98	0.19	0.19	0.17	1.11
20	29.39	71.0	15.19	0.24	0.98	0.20	0.20	0.19	1.05
30	29.39	71.5	14.58	0.54	0.98	0.21	0.21	0.22	0.98
40	29.39	72.0	14.02	0.18	0.98	0.22	0.21	0.24	0.88
50	29.13	70.8	11.19	0.08	0.97	0.28	0.27	0.27	1.00
60	29.14	70.5	10.29	0.08	0.97	0.31	0.30	0.30	1.00
70	29.15	70.5	9.50	0.07	0.97	0.34	0.33	0.33	1.00
80	29.37	71.0	9.13	0.37	0.98	0.37	0.36	0.36	1.00
90	29.37	70.0	8.38	0.16	0.98	0.39	0.39	0.39	0.99
100	29.37	70.0	7.55	0.15	0.98	0.44	0.43	0.42	1.04

Perpendicular Cage Orientation

Tabulated Data:

Air Vel.	Bar Pres	Temp	F CO_2	B CO_2	K	CFM w/o K	CFM w/K	Pred. CFM	Act./Pred
15	29.45	71.0	15.53	0.17	0.98	0.19	0.19	0.19	0.99
20	28.29	71.5	15.55	0.21	0.94	0.19	0.18	0.19	0.94
30	29.45	71.5	13.80	0.11	0.98	0.22	0.22	0.20	1.07
40	28.88	71.5	13.56	0.12	0.96	0.23	0.22	0.22	0.99
50	29.41	73.0	11.79	0.27	0.98	0.27	0.26	0.25	1.07
60	29.89	72.0	11.34	0.11	1.00	0.28	0.28	0.28	0.98
70	29.43	73.0	9.95	0.09	0.98	0.32	0.32	0.32	0.97
80	29.43	73.5	8.59	0.06	0.98	0.38	0.37	0.38	0.98
90	29.44	73.0	7.52	0.08	0.98	0.44	0.43	0.44	0.99
100	28.92	71.2	7.01	0.86	0.96	0.53	0.51	0.50	1.02

Vertical Cage Orientation

Tabulated Data:

Air Vel.	Bar Pres	Temp	F CO_2	B CO_2	K	CFM w/o K	CFM w/K	Pred. CFM	Act./Pred
15	28.82	71.0	16.00	0.12	0.96	0.19	0.18	0.17	1.06
20	29.21	70.5	16.17	0.07	0.98	0.18	0.18	0.18	1.02
30	28.81	73.0	15.78	0.09	0.96	0.19	0.18	0.19	0.96
40	29.20	74.9	14.87	0.09	0.97	0.20	0.20	0.20	0.98
50	29.25	71.2	13.89	0.07	0.98	0.22	0.21	0.21	1.01
60	28.82	73.5	13.63	0.10	0.96	0.23	0.22	0.23	0.95
70	29.20	71.5	12.85	0.07	0.97	0.24	0.23	0.24	0.98
80	29.20	74.5	11.67	0.08	0.97	0.27	0.26	0.25	1.04
90	28.82	74.9	11.55	0.10	0.95	0.27	0.26	0.26	0.99
100	29.19	71.7	10.88	0.07	0.97	0.29	0.28	0.28	1.02

Where:

Air Vel. - Approach air velocity, fpm

Bar press - Barometric pressure, inches of mercury

Temp - Approach air temperature, F

F CO_2 - Carbon dioxide concentration at sampling tube "F"

B CO_2 - Carbon dioxide concentration at sampling tube "B"

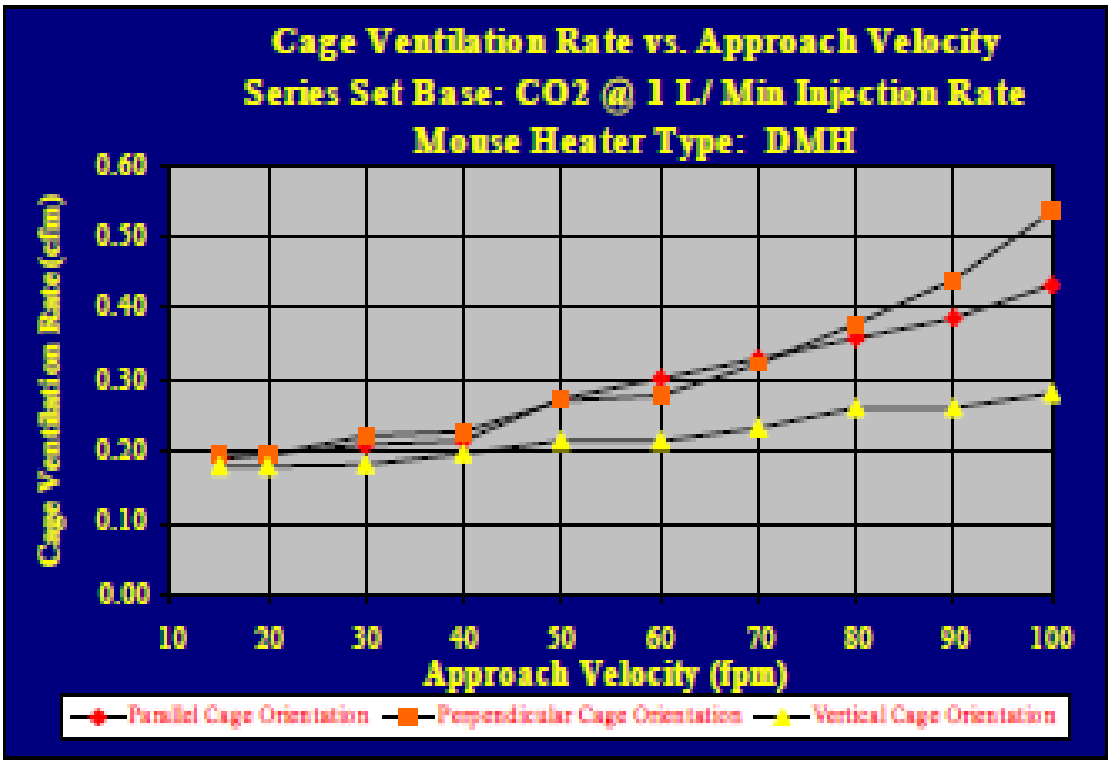
K - K factor for adjusting cage ventilation rate for standard conditions

CFM w/o K - Cage air exchange rate without correction to standard conditions, cfm

CFM w K - Cage air exchange rate with correction to Standard conditions, cfm

Pred. CFM - Predicted cage air exchange based on regression of corrected values, cfm

Graphical Representation:



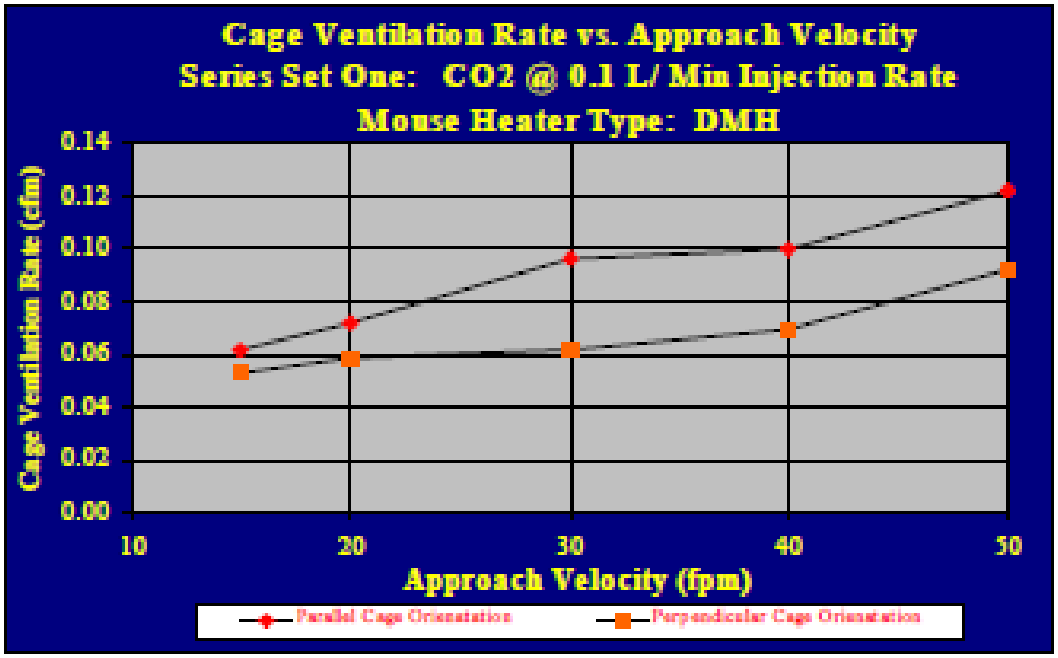
2.2.2 Series Set One - CO_2 used as tracer gas

Parallel Cage Orientation

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
15	6.02	0.06
20	5.31	0.07
30	5.13	0.10
40	5.19	0.10
50	5.08	0.12

Perpendicular Cage Orientation

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
15	5.56	0.05
20	5.17	0.06
30	5.96	0.06
40	5.18	0.07
50	4.49	0.09



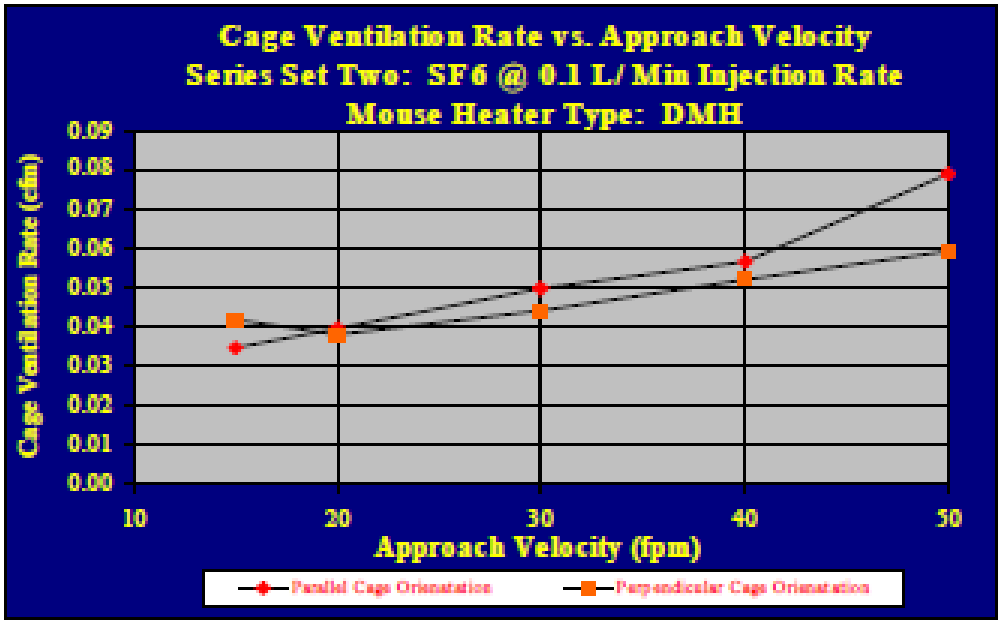
2.2.3 Series Set Two - SF6 used as tracer gas

Parallel Cage Orientation

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
15	2.77	0.04
20	3.97	0.04
30	5.39	0.05
40	5.30	0.06
50	3.72	0.08

Perpendicular Cage Orientation

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
15	5.42	0.04
20	5.71	0.04
30	4.71	0.04
40	5.05	0.05
50	5.40	0.06



2.2.4 Series Set Three

Parallel Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	3.90	0.08
30	3.00	0.11
40	5.45	0.13

Parallel Cage Orientation: Heater Off

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	2.16	0.09
30	2.63	0.12
40	1.97	0.15

Perpendicular Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	3.78	0.08
30	4.45	0.14
40	3.66	0.24

Perpendicular Cage Orientation: Heater Off

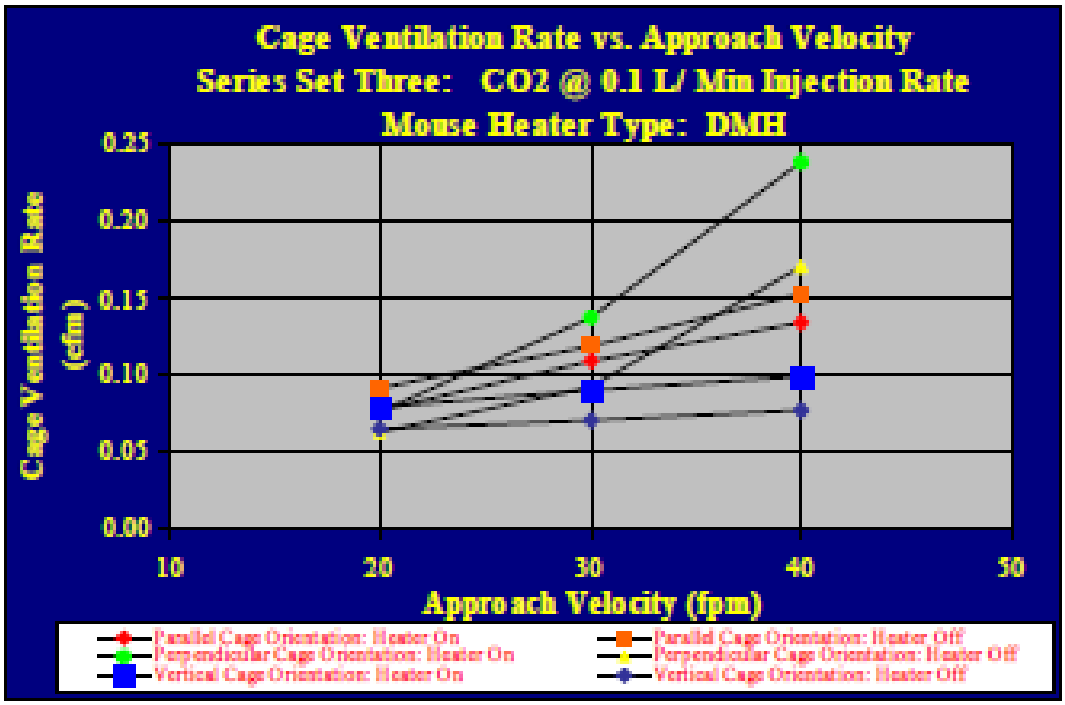
Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	3.16	0.06
30	2.37	0.09
40	3.04	0.17

Vertical Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	6.36	0.08
30	4.54	0.09
40	5.66	0.10

Vertical Cage Orientation: Heater Off

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	4.04	0.07
30	4.20	0.07
40	4.95	0.08


Cage Ventilation Rate vs. Approach Velocity
Series Set Three: CO2 @ 0.1 L/ Min Injection Rate
Mouse Heater Type: DMH
Cage Ventilation Rate (cfm)
0.25
0.20
0.15
0.10
0.05
0.00
10
20
30
40
50
Approach Velocity (fpm)
Parallel Cage Orientation: Heater On
Perpendicular Cage Orientation: Heater On
Vertical Cage Orientation: Heater On
Parallel Cage Orientation: Heater Off
Perpendicular Cage Orientation: Heater Off
Vertical Cage Orientation: Heater Off

2.2.5 Series Set Four - Steady State Injection Rate

Parallel Cage Orientation

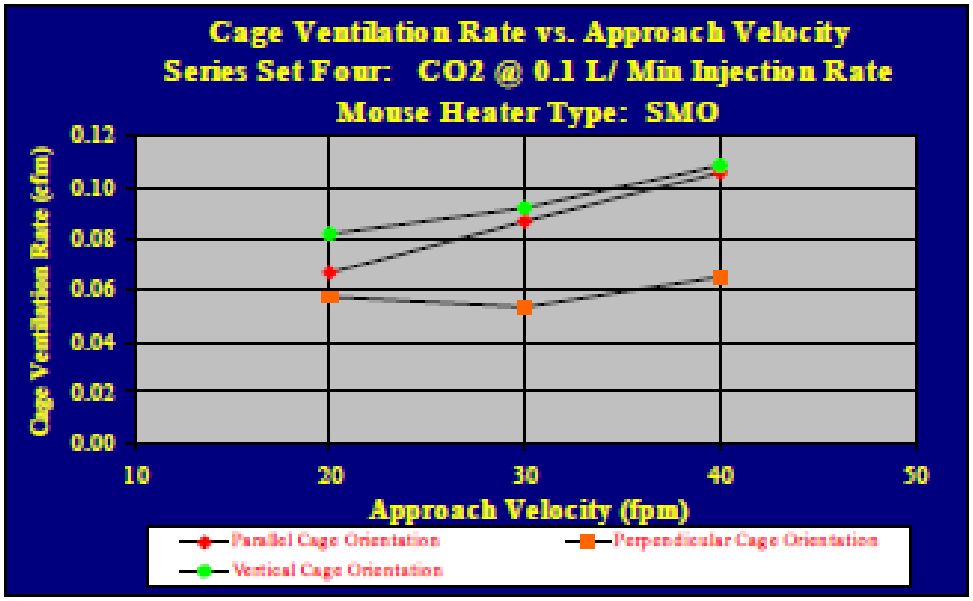
Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	7.40	0.07
30	7.36	0.09
40	7.62	0.11

Perpendicular Cage Orientation

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	8.41	0.06
30	8.92	0.05
40	9.08	0.07

Vertical Cage Orientation

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	3.91	0.08
30	5.52	0.09
40	6.89	0.11

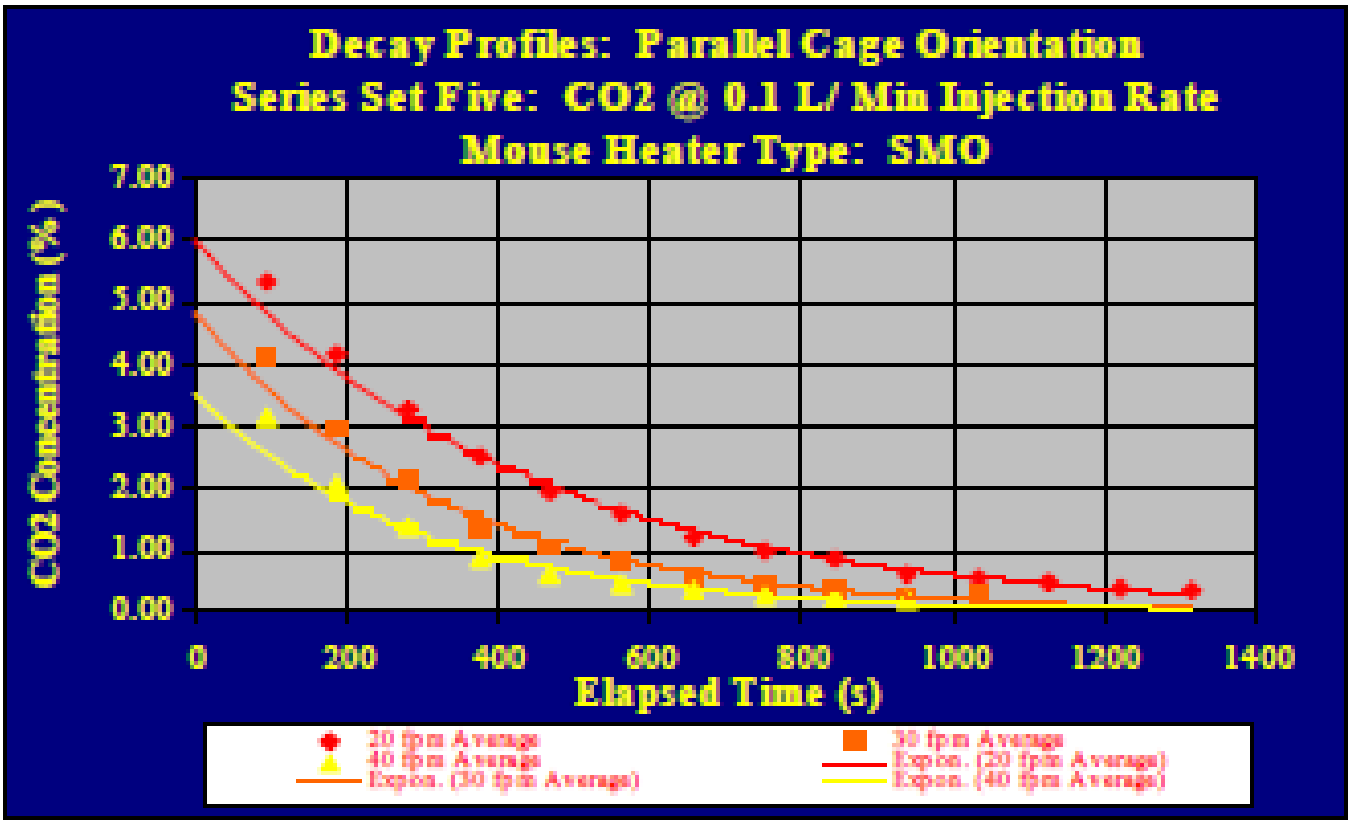


2.2.6 Series Set Five - Decay Results

Parallel Cage Orientation

Summary

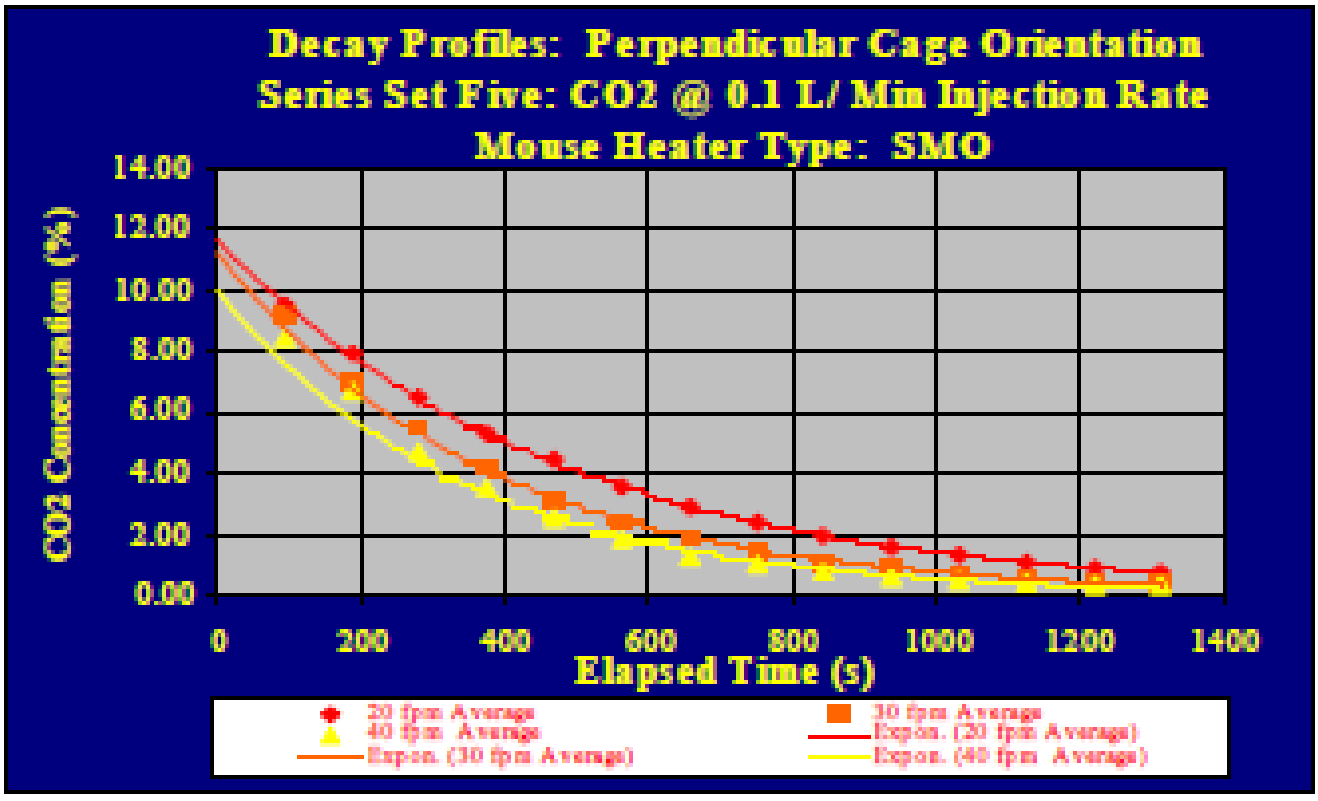
Tunnel Velocity (fpm)	Time to Decay (min)		
	90 percent	95 percent	99 percent
Keller,White, Synder and Lang Paper @ 16 fpm (May 1989)	18.27	23.77	36.54
20	16.69	21.27	33.37
30	12.38	16.11	24.76
40	11.29	14.68	22.57



Perpendicular Cage Orientation

Summary

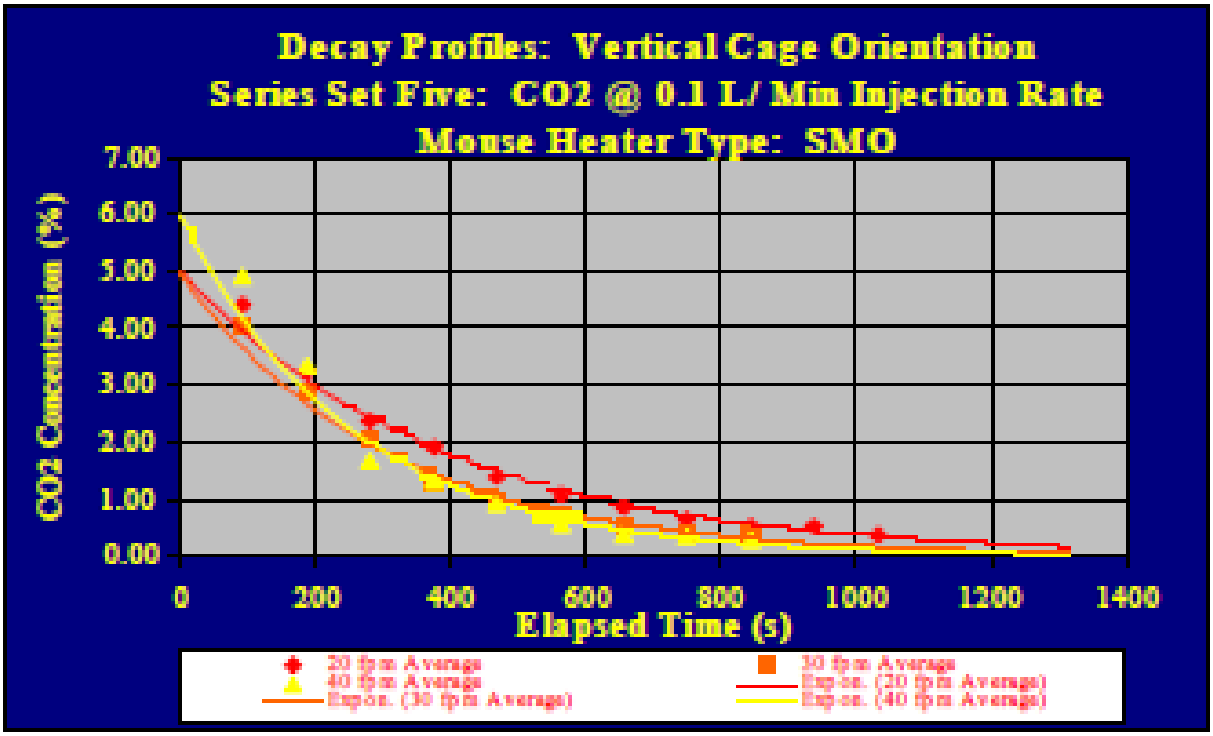
Tunnel Velocity (fpm)	Time to Decay (min)		
	90 percent	95 percent	99 percent
20	18.27	23.77	36.54
30	14.21	18.49	28.43
40	13.23	17.22	26.47



Vertical Cage Orientation

Summary

Tunnel Velocity (fpm)	Time to Decay (min)		
	90 percent	95 percent	99 percent
20	14.26	19.20	29.52
30	11.63	15.13	23.26
40	9.84	12.81	19.68



2.2.7 Series Set Six - Sealed Cage Lips

Parallel Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)		Ventilation Rate (cfm)	
	DMH	SMO	DMH	SMO
20	5.34	8.85	0.07	0.04
40	4.47	6.23	0.07	0.04

Parallel Cage Orientation: Heater Off

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	2.09	0.04
40	2.96	0.05

Perpendicular Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)		Ventilation Rate (cfm)	
	DMH	SMO	DMH	SMO
20	5.68	8.45	0.05	0.05
40	5.08	8.96	0.06	0.05

Perpendicular Cage Orientation: Heater Off

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	4.04	0.04
40	2.76	0.04

2.2.8 Series Set Seven - Sealed Filter Top

Parallel Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)		Ventilation Rate (cfm)	
	DMH	SMO	DMH	SMO
20	3.72	6.45	0.03	0.05
40	3.02	7.96	0.05	0.11

Parallel Cage Orientation: Heater Off

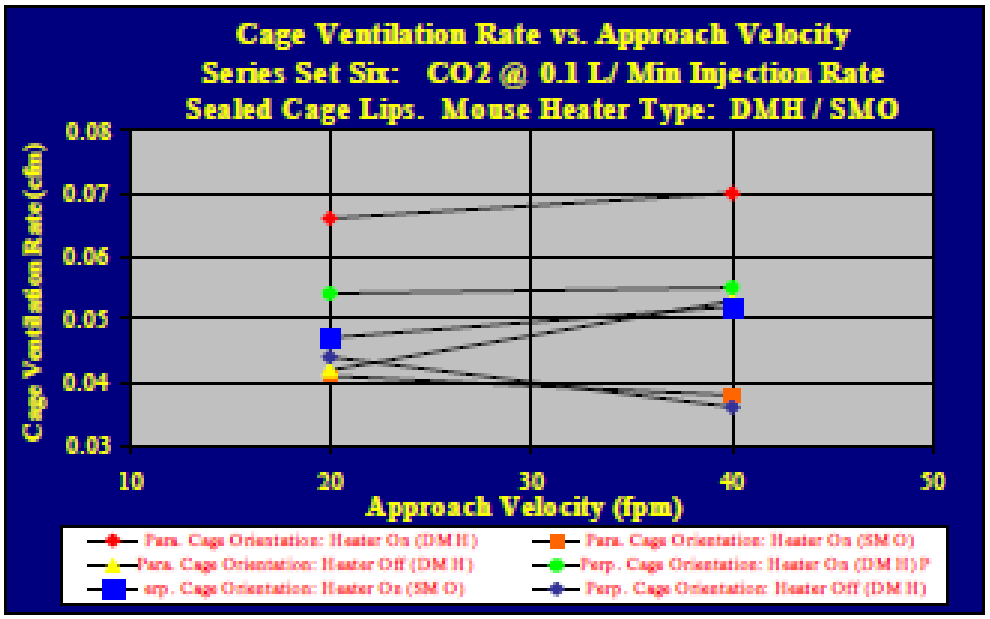
Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	6.45	0.04
40	7.96	0.05

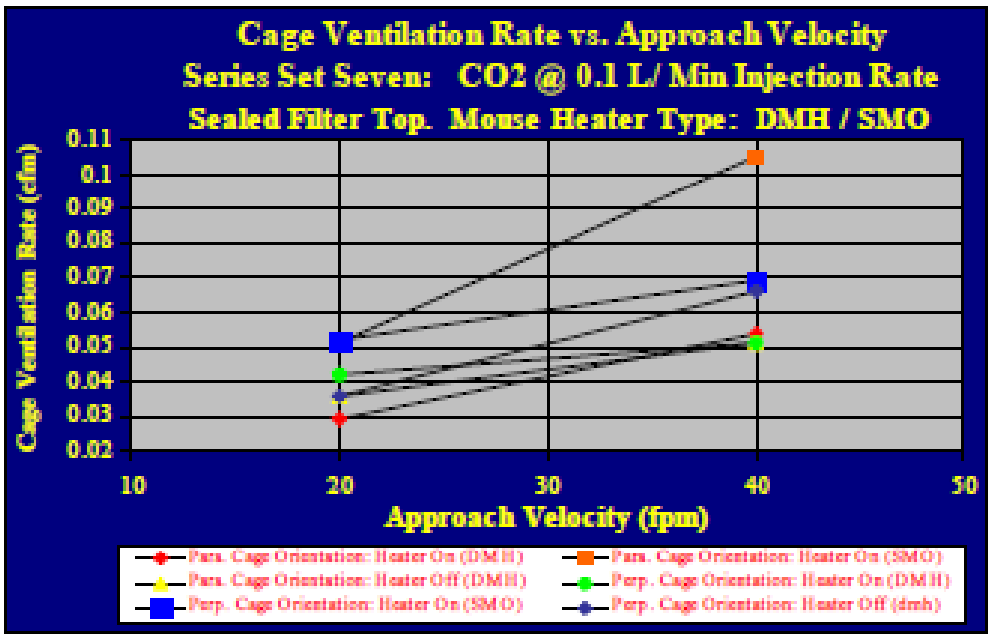
Perpendicular Cage Orientation: Heater On

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)		Ventilation Rate (cfm)	
	DMH	SMO	DMH	SMO
20	6.00	10.21	0.04	0.05
40	4.17	11.13	0.05	0.07

Perpendicular Cage Orientation: Heater Off

Desired Air Velocity (fpm)	Temperature Rise in Cage (°F)	Ventilation Rate (cfm)
20	10.21	0.04
40	11.13	0.07


Cage Ventilation Rate vs. Approach Velocity
Series Set Six: CO2 @ 0.1 L/ Min Injection Rate
Sealed Cage Lips. Mouse Heater Type: DMH / SMO
Cage Ventilation Rate (cfm)
0.08
0.07
0.06
0.05
0.04
0.03
10
20
30
40
50
Approach Velocity (fpm)
Para. Cage Orientation: Heater On (DMH)
Para. Cage Orientation: Heater On (SMO)
Para. Cage Orientation: Heater Off (DMH)
Perp. Cage Orientation: Heater On (DMH) P
arp. Cage Orientation: Heater On (SMO)
Perp. Cage Orientation: Heater Off (DMH)


Cage Ventilation Rate vs. Approach Velocity
Series Set Seven: CO2 @ 0.1 L/ Min Injection Rate
Sealed Filter Top. Mouse Heater Type: DMH / SMO
Cage Ventilation Rate (cfm)
0.11
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
10
20
30
40
50
Approach Velocity (fpm)
Para. Cage Orientation: Heater On (DMH)
Para. Cage Orientation: Heater On (SMO)
Para. Cage Orientation: Heater Off (DMH)
Perp. Cage Orientation: Heater On (DMH)
Perp. Cage Orientation: Heater On (SMO)
Perp. Cage Orientation: Heater Off (dmh)

2.2.9 Series Set Eight - Double Cage Scenarios

Parallel and Perpendicular Double Cage Scenarios (30 fpm Only): Heater On

Cage Orientation	Ventilation Rate (cfm)
Parallel	0.09
Perpendicular	0.08

2.3 Justification of Dimensions of Simulated Mouse Object

From Gordon, C.J. 1993. *Temperature Regulation in Laboratory Rodents*, page 57.

"…Because heat exchange between an animal and its environment occurs over its exposed surface area, expressing metabolic rate in terms of surface area is often preferred. Whereas body mass obviously is a simple parameter to measure, surface area must be estimated using a power relationship with certain assumptions:

$$SA \quad kW^{0.67}$$

where SA is surface area in square centimeters, W is the species weight in grams, and the constant k, termed the Meeb coefficient, is species-dependent, with a wide range of intraspecies values, ranging from 6.9 to 13.3 for mouse, 7.2 to 13.0 for rat, and 7.1 to 10.8 for guinea pig (Altman and Dittmer, 1962). These are incredibly wide variations, and they imply that a rodent of a given weight could have as much as double the surface area as another of the same weight, depending on which value of k is used in the calculation. Clearly, there has been considerable error in the determination of surface area. For rodents such as the mouse, rat, and guinea pig, a k value of 9.0 appears to be most accurate for calculating surface area (Herrington, 1940).

One problem with using surface area as a denominator in metabolic calculations is that the exposed area (i.e.. the skin where heat is transferred from the animal to the environment) can vary depending on the animal's behavior. For example, in a hot environment, rodents assume a sprawled posture to maximize surface area, whereas in the cold, the limbs are pulled close to the body to minimize the exposed surface area. Thus, the animal's thermoregulatory behavior affects heat loss per unit of exposed surface area, while heat loss per unit body mass remains relatively constant."

Using k=9, which is most accurate for rodents, the surface area will be:

$$SA \quad 9.0 \quad 20^{0.67} \quad 67 cm^2$$
$$67 cm^2 \quad 0.155 \quad 10.38 in^2$$

If use 7/8" diameter PVC pipe to represent mouse diameter, therefor two ends would be:

$$2 \quad \frac{0.875}{2}^2 \quad 1.2 in^2$$
$$10.38 \quad 1.2 \quad 9.18 in^2$$

9.18 in^2 is for pipe side area.

$$h \quad 0.875 \quad 9.18 \qquad h \quad 3.34in$$

Therefore each mouse is made of a PVC pipe 7/8"diameter by 3 3/8" long.

3. CO_2, NH_3, H_2O AND HEAT GENERATION MEASUREMENTS AT LOW AND HIGH HUMIDITIES

Introduction to Direct and Indirect Calorimetry

3.1.1 The Definition and Measurement Techniques of Metabolic Rate

Calorimetry is used to estimate nutritional requirements of humans and farm livestock and to evaluate different foods. It is also a powerful research tool used to study fundamental nutritional and physiological life processes, and to evaluate stresses imposed by abnormal or severe environments. It is, lastly, used in clinics as a diagnostic tool for the investigation of metabolic disorders.

There are two principle types of animal calorimetry methods, direct and indirect. Direct calorimetery is the partitioned measurement of radiant, conductive, convective, and evaporative energy expenditure from animals. Indirect calorimetry determines energy expenditure from the chemical reactions that happen as oxygen is consumed and carbon dioxide is produced.

The metabolic rate in homeothermic animals is a function of ambient thermal conditions. Measurement of energy expenditure has been a powerful tool to study fundamental physiological processes, and to evaluate stresses imposed by abnormal or severe environments. Indirect calorimetry involves the measurement of respiratory gaseous exchange (O_2 consumption and CO_2 production) to calculate heat production. There are now numerous indirect calorimeters around the world (Nienaber et al. 1985; Meo 1989; Mathison et al. 1991), although there are only two known laboratories with convective calorimeters, which control air velocity as well as temperature. In comparative physiology, the metabolic rate of an animal is defined to be its rate of energy consumption, that is, the rate at which it converts chemical energy to heat and external work. One reason that the metabolic rate of an animal is significant is that the heat and external work exported from the animal reflect quantitatively the overall activity of its physiological machinery. Heat, in particular, is liberated by every process in the body that uses energy. Thus, the rate of heat production is a reflection of the sum total of the rates of all such processes. Heat is always the principal component of the metabolic rate. Therefore, for measurement of heat, the device used is called a calorimeter. Heat is one of the most conveniently handled forms of energy.

3.1.2 Direct Measurement of Metabolic Rate - Direct Calorimetry

An animal's metabolic rate can be measured in a device called a direct calorimeter**,** which by definition assays the rate at which heat is dissipated from the animal's body. Direct calorimetery is the partitioned measurement of radiant, conductive, convective, and evaporative energy expenditure from animals. The name calorimeter is derived from the calorie, a unit of measure for heat. Direct calorimeters are technically complex. They are designed to be especially accurate, sensitive, and versatile. Antoine Lavoisier used one in the first measurements of animal heat production in late 1700's. In his experiment, the animal was surrounded by an ice-filled

jacket. Ice melted by animal heat yielded water, which dripped out. A requirement for all direct calorimeters is that heat from the general environment must be excluded from the measurement of animal heat production. In Lavoisier's device, heat entering from the air surrounding the calorimeter was intercepted by a second ice-filled jacket that enclosed the first jacket that immediately surrounded the animal. Heat entering the animal area melted ice. Lavoisier was able to calculate the rate of heat output from the animal by collecting the water produced over measured periods of time, and by knowing the amount of heat required to melt each gram.

3.1.3 Indirect Measurement of Metabolic Rate - Indirect Calorimetry

Another method for measuring metabolic rates is an indirect method that has two advantages: relatively low cost and technical simplicity. An indirect calorimeter determines energy expenditure from the amounts of oxygen consumed and carbon dioxide produced in the chemical reactions that produce the energy expenditure. Heat production is based on using a mixed respiratory quotient (RQ). In indirect calorimetry, the gas analyzers take direct measurements of gas concentration in the calorimeter air stream. Thus the calculation of both oxygen consumption and carbon dioxide production can be determined by using the following relationships:

O_2 (L/min) = O_2 percent x Flow Rate of Exhaust Air From Calorimeter (L/min) x Barometric Pressure (mmHg) x 273 /(760 x (273+C)

CO_2 (L/min) = CO_2 percent x Flow Rate of Exhaust Air From Calorimeter (L/min) x Barometric Pressure (mmHg) x 273 /(760 x (273+C)

Where:

O_2 (L/min) = percent O_2 entering calorimeter minus percent O_2 leaving calorimeter

CO_2 (L/min) = percent CO_2 leaving calorimeter minus percent CO_2 entering calorimeter

C = Calorimeter inside temperature (°C)

The respiration quotient is defined as:

RQ = CO_2 (carbon dioxide production L/min)/ O_2 (oxygen consumption L/min)

Calculation of heat production is based on CO_2 and O_2 production and a fixed RQ value of 0.82. The heat production is calculated based on O_2 consumption calculated from a mixed RQ =0.82 which is for a caloric equivalent of 4.825 Kcal/LO_2. This is generally accurate within a 3 percent range regardless of actual RQ (R=0.7 with caloric equivalent of 4.686 Kcal/L O_2 and R= 1.0 with caloric equivalent of 5.047 Kcal/L O_2).

Heat production is calculated as follows:

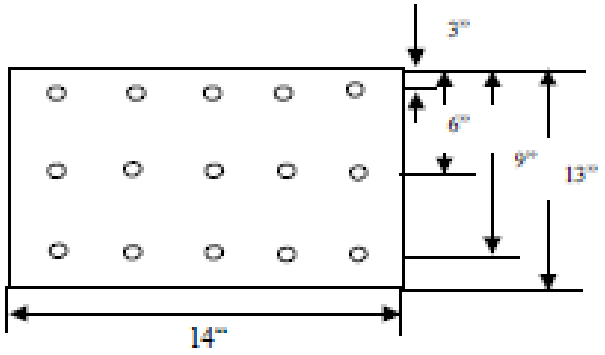
Hp (Kcal lkglhr)= O_2 consumption (L/min) x 60 x TE(KcalI/L O_2)

where:

TE = Thermal equivalent calories per liter of O_2 consumed (Value of 4.825 (Kcal/L O_2) is typically used)

3.2 Calibration Procedures

3.2.1 Calorimeter Approach Air Velocity Calibration: (Calibration Data Prior to Test 1)



Calorimeter #1							
	58	54	63	53	59		Av. =
Air velocity =	59	49	52	48	64	(fpm)	55 fpm
	62	51	52	44	62		
Voltage Regulated Setting = 10							

Calorimeter #2							
	72	48	50	57	66		Av. =
Air velocity =	68	51	47	56	63	(fpm)	58 fpm
	74	50	52	56	59		
Voltage Regulated Setting = 64							

Calorimeter #3							
	55	47	51	55	59		Av. =
Air velocity =	53	44	44	50	65	(fpm)	51 fpm
	58	39	38	43	58		
Voltage Regulated Setting = 61							

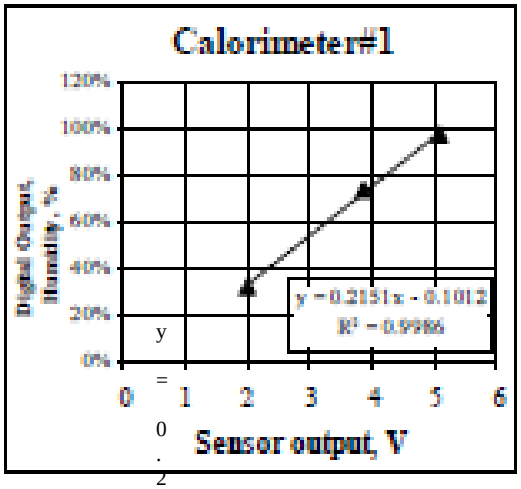
3.2.2 Calorimeter Approach Air Velocity Calibration: (Calibration Data Prior to Test 2)

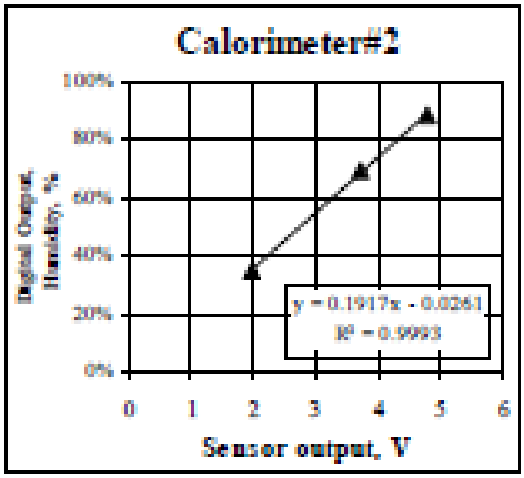
Calorimeter #1								
		69	48	50	47	56		Av. =
Air velocity =		55	44	47	51	51	(fpm)	51fpm
		64	48	47	45	46		
Voltage Regulated Setting = 106								

Calorimeter #2								
		67	52	53	54	65		Av. =
Air velocity =		65	43	40	58	62	(fpm)	54 fpm
		71	43	40	54	47		
Voltage Regulated Setting = 62								

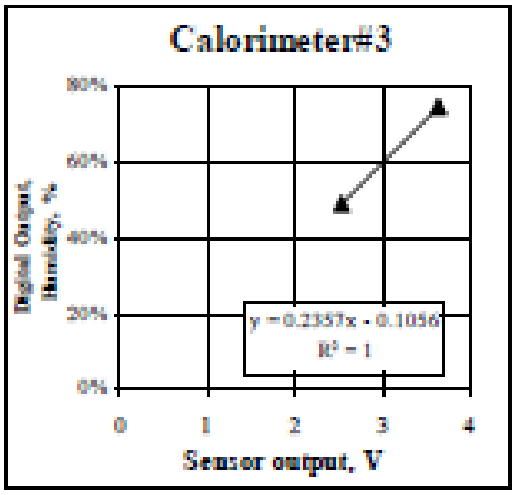
Calorimeter #3							
	63	45	40	49	64		Av. =
Air velocity =	51	44	39	51	59	(fpm)	50 fpm
	60	41	39	45	55		
Voltage Regulated Setting = 61							

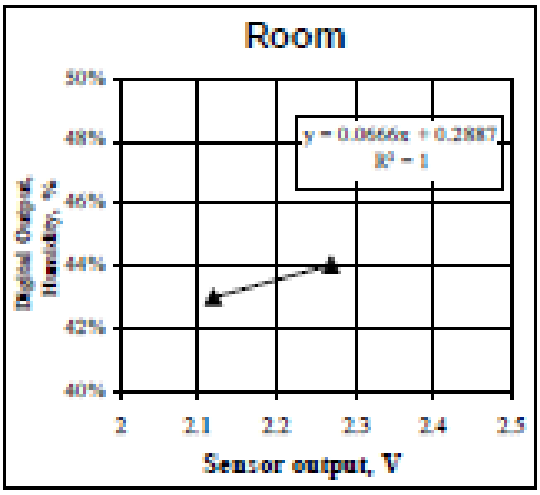
3.2.3 Calibration of Humidity Sensors: (Calibration Data Prior to Test 1)



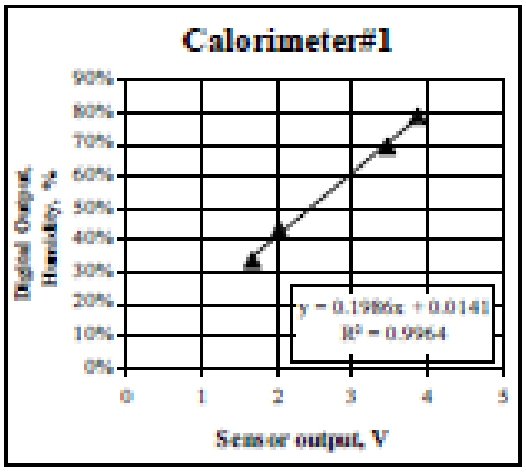


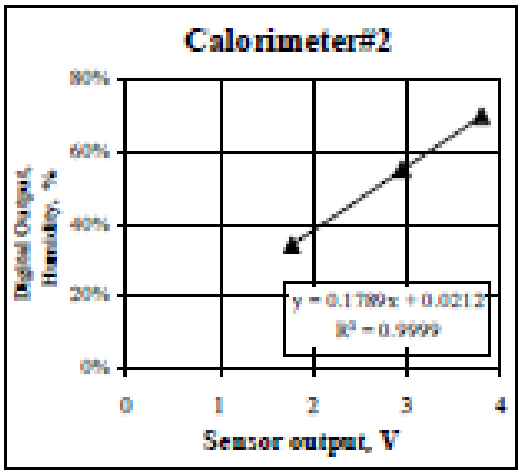
y = 0.2151x - 0.1012

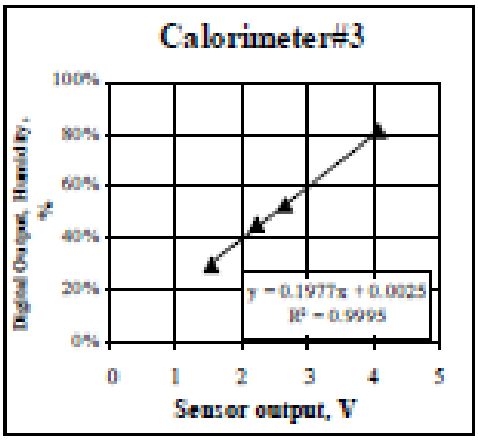


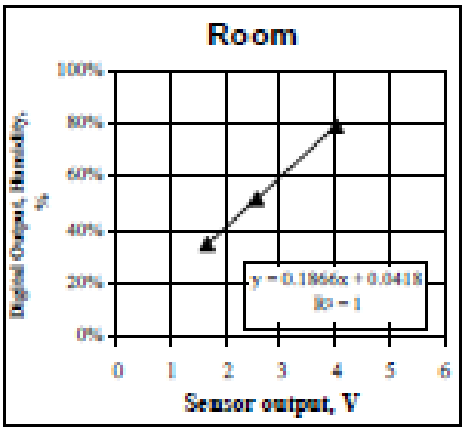


Calibration of Humidity Sensors: (Calibration Data Prior to Test 2)

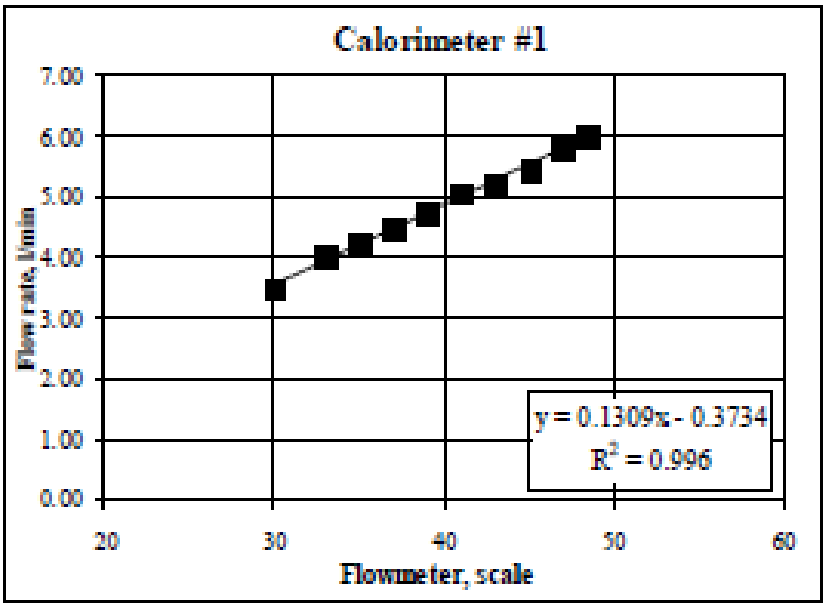


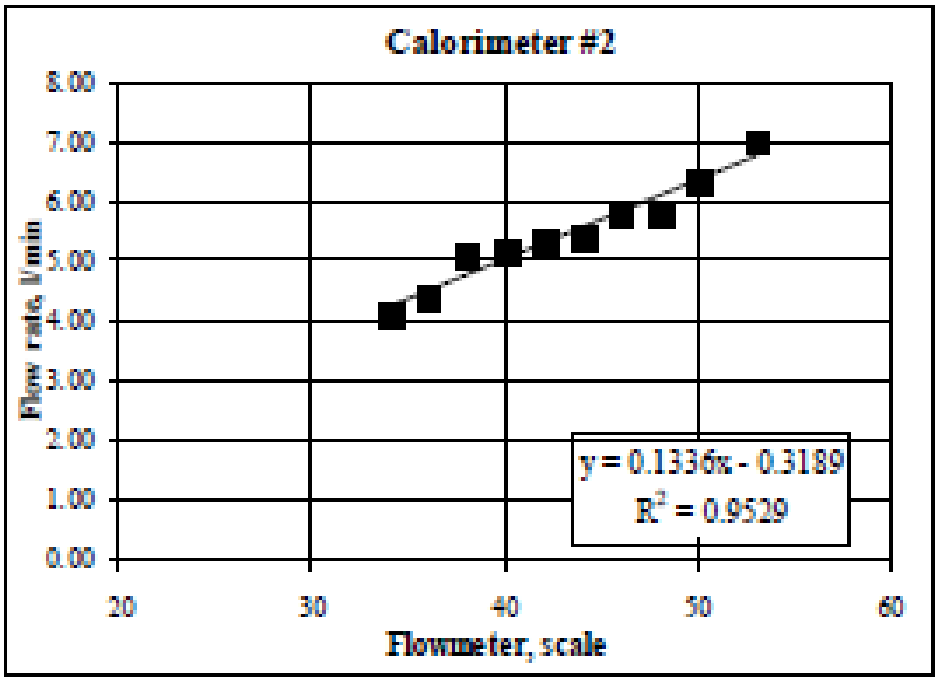


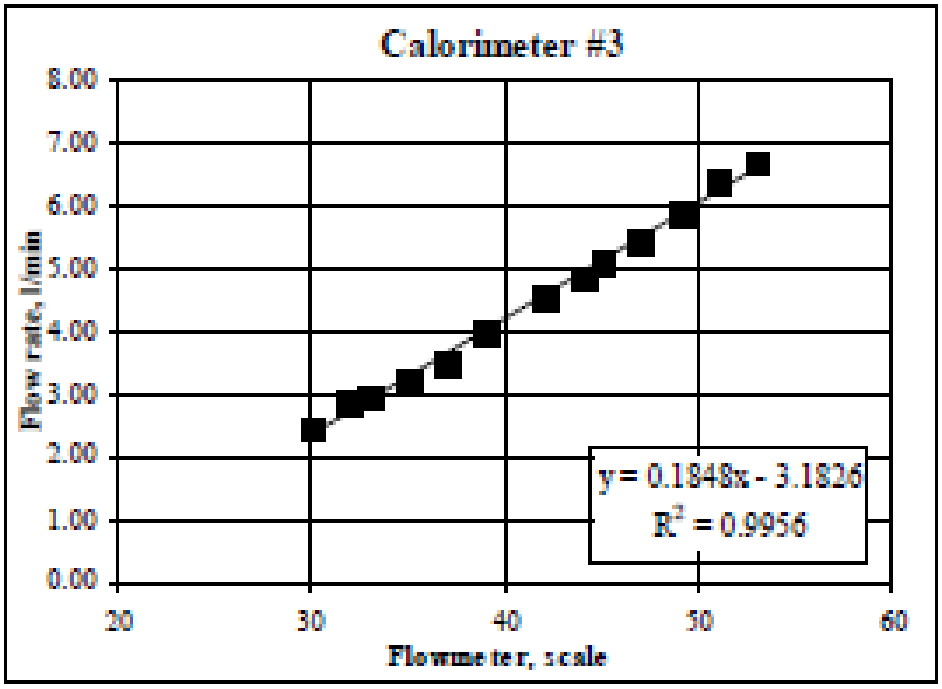




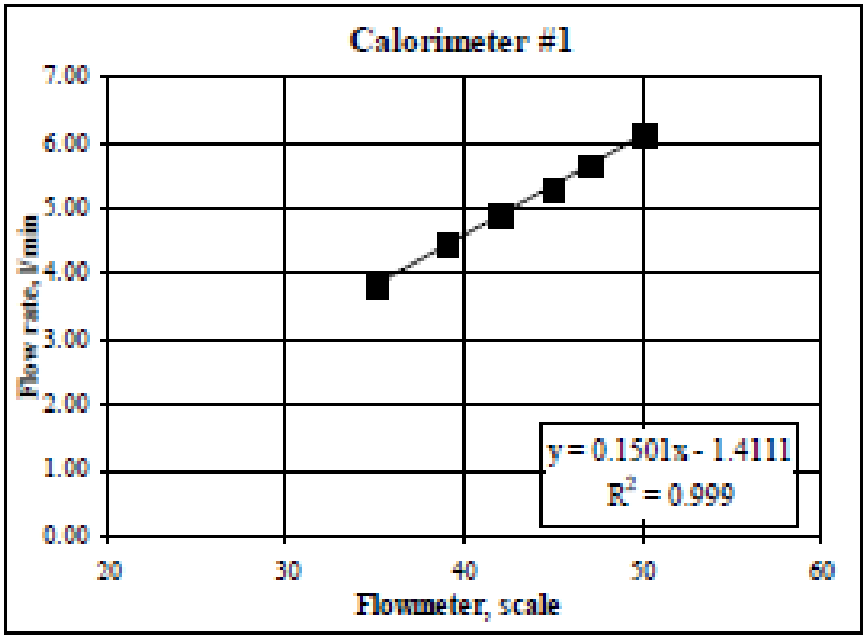
3.2.5 Calibration of Calorimeter Fresh Airflow Meter (Calibration Data Prior to Test 1)

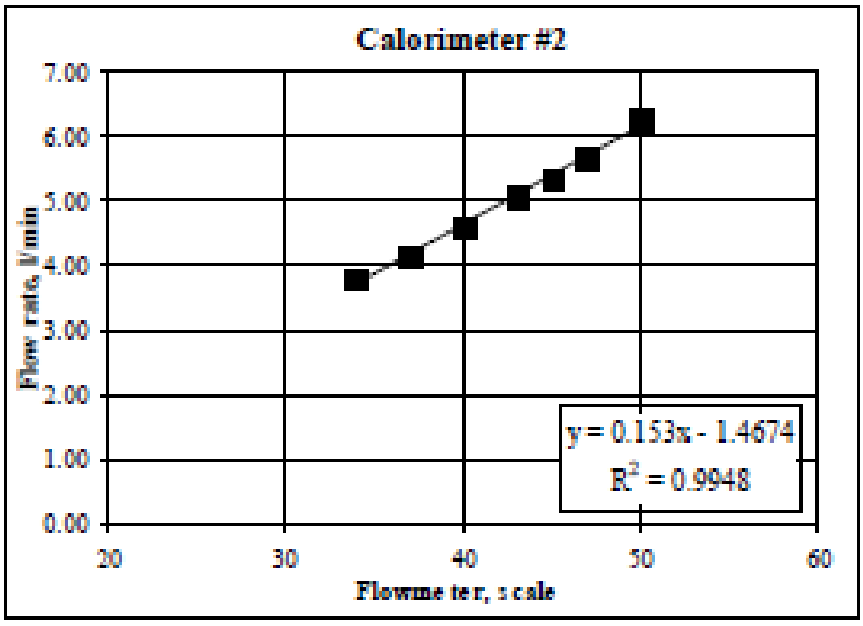


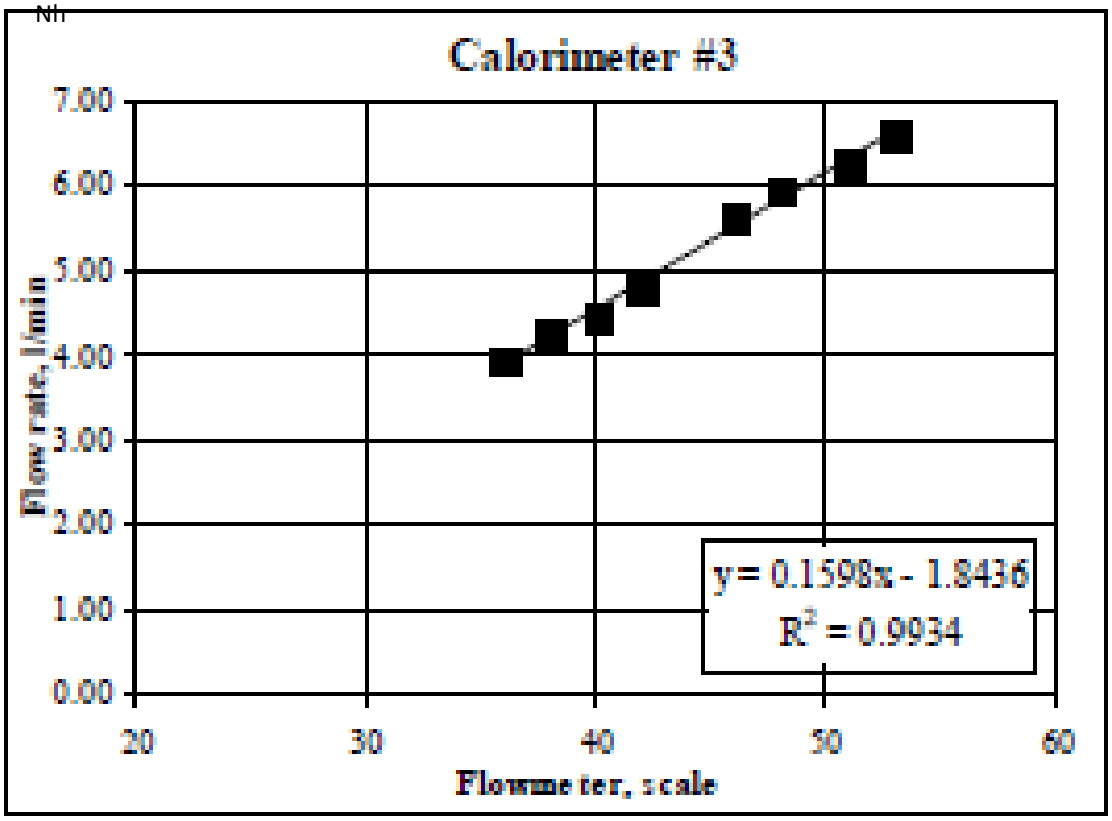

Calorimeter #2
Flow rate, l/min
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20
30
40
50
60
Flowmeter, scale
y = 0.1336x - 0.3189
R2 = 0.9529


Calorimeter #3
Flow rate, l/min
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
20
30
40
50
60
Flowmeter, scale
y = 0.1848x - 3.1826
R2 = 0.9956

3.2.6 Calibration of Calorimeter Fresh Airflow Meter (Calibration Data Prior to Test 2)






Calorimeter #3
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
Flow rate, l/min
20
30
40
50
60
Flowmeter, scale
y = 0.1598x - 1.8436
R² = 0.9934

3.2.7 Calorimeter CO_2 and O_2 Recovery Calibration: (Calibration Data Prior to Test 1)

Calorimeter #1

Time (min)	CO_2 (percent)	Room CO_2 (percent)	Gen. CO_2[a] (L/min)	O_2 (percent)	Room O_2 (percent)	Con O_2[b] (L/min)	Ethanol wt[c] (g)
0	1.00	0.10	0.0497	19.2	20.5	0.072	156.64
10	1.00	0.10	0.0497	19.2	20.5	0.072	156.17
20	1.00	0.10	0.0497	19.2	20.5	0.072	155.67
30	1.00	0.10	0.0497	19.2	20.5	0.072	155.20
40	1.00	0.10	0.0497	19.2	20.5	0.072	154.72
50	1.01	0.10	0.0502	19.1	20.5	0.077	154.27
60	1.01	0.10	0.0502	19.1	20.5	0.077	153.72

Flow rate=5.52 l/min

Calorimeter #2

Time (min)	CO_2 (percent)	Room CO_2 (percent)	Gen. CO_2[a] (L/min)	O_2 (percent)	Room O_2 (percent)	Con O_2[b] (L/min)	Ethanol wt[c] (g)
0	1.13	0.11	0.0563	19.0	20.4	0.0773	167.35
10	1.13	0.11	0.0563	19.0	20.5	0.0828	166.84
20	1.14	0.11	0.0569	19.0	20.5	0.0828	166.32
30	1.14	0.11	0.0569	19.0	20.5	0.0828	165.82
40	1.13	0.11	0.0563	19.0	20.5	0.0828	165.32
50	1.13	0.11	0.0563	19.1	20.5	0.0773	164.82
60	1.14	0.11	0.0569	19.0	20.6	0.0883	164.32
70	1.14	0.11	0.0569	19.1	20.6	0.0828	163.81

Flow rate=5.52 l/min

Calorimeter #3

Time (min)	CO_2 (percent)	Room CO_2 (percent)	Gen. CO_2[a] (L/min)	O_2 (percent)	Room O_2 (percent)	Con O_2[b] (L/min)	Ethanol wt[c] (g)
0	1.28	0.07	0.0668	18.9	20.6	0.0938	167.65
10	1.29	0.07	0.0673	18.9	20.6	0.0938	166.97
20	1.29	0.07	0.0673	18.9	20.6	0.0938	166.30
30	1.29	0.07	0.0673	18.9	20.6	0.0938	165.62
40	1.29	0.07	0.0673	18.9	20.5	0.0883	164.95
50	1.29	0.07	0.0673	18.9	20.5	0.0883	164.29
60	1.29	0.07	0.0673	18.9	20.5	0.0883	163.58
70	1.29	0.07	0.0673	19.0	20.5	0.0828	162.90

Flow rate=5.52 l/min

Calorimeter #1

Time (min)	Different wt[d] (g)	P CO_2[e] (L/min)	P O_2[f] (L/min)	RQ[g]	O_2 Recovery Ratio (percent)	CO_2 Recovery Ratio (percent)
0				0.69		
10	0.47	0.0457	0.0686	0.69	104.61	108.63
20	0.50	0.0487	0.0730	0.69	98.33	102.11
30	0.47	0.0457	0.0686	0.69	104.61	108.63
40	0.48	0.0467	0.0701	0.69	102.43	106.37
50	0.45	0.0438	0.0657	0.65	117.66	114.72
60	0.55	0.0535	0.0803	0.65	96.27	93.86

Calorimeter #2

Time (min)	Different wt[d] (g)	P CO_2[e] (L/min)	P O_2[f] (L/min)	RQ[g]	O_2 Recovery Ratio (percent)	CO_2 Recovery Ratio (percent)
0				0.73		
10	0.51	0.0496	0.0744	0.68	111.23	113.46
20	0.52	0.0506	0.0759	0.69	109.09	112.37
30	0.50	0.0487	0.0730	0.69	113.46	116.86
40	0.50	0.0487	0.0730	0.68	113.46	115.73
50	0.50	0.0487	0.0730	0.73	105.89	115.73
60	0.50	0.0487	0.0730	0.64	121.02	116.86
70	0.51	0.0496	0.0744	0.69	111.23	114.57

Calorimeter #3

Time (min)	Different wt[d] (g)	P CO_2[e] (L/min)	P O_2[f] (L/min)	RQ[g]	O_2 Recovery Ratio (percent)	CO_2 Recovery Ratio (percent)
0				0.71		
10	0.68	0.0662	0.0993	0.72	94.55	101.78
20	0.67	0.0652	0.0978	0.72	95.96	103.30
30	0.68	0.0662	0.0993	0.72	94.55	101.78
40	0.67	0.0652	0.0978	0.76	90.31	103.30
50	0.66	0.0642	0.0963	0.76	91.68	104.86
60	0.71	0.0691	0.1036	0.76	85.23	97.48
70	0.68	0.0662	0.0993	0.81	83.42	101.78

a. CO_2 generation rate based on CO_2 concentration and air exchange flow rate.
b. O_2 generation rate based on O_2 concentration and air exchange flow rate.
c. Weight of ethanol for every 10 minutes.
d. Different weight of ethanol based on 10 minutes /production of CO_2 due to burning ethanol.
e. CO_2 generation rate based on burning ethanol.
f. O_2 generation rate based on burning ethanol.
g. Respiration quotient.

3.2.8 Calorimeter CO_2 and O_2 Recovery Calibration: (Calibration Data Prior to Test 2)

Calorimeter #1

Time (min)	CO_2 (percent)	Room CO_2 (percent)	Gen. CO_2[a] (L/min)	O_2 (percent)	Room O_2 (percent)	Con O_2[b] (L/min)	Ethanol wt[c] (g)
0	1.53	0.06	0.0697	18.8	20.7	0.0901	153.83
10	1.53	0.06	0.0697	18.6	20.6	0.0949	153.15
20	1.53	0.06	0.0697	18.6	20.6	0.0949	152.49
30	1.53	0.06	0.0697	18.6	20.7	0.0996	151.83
40	1.53	0.05	0.0702	18.6	20.7	0.0996	151.16
50	1.54	0.05	0.0707	18.5	20.6	0.0996	150.49
60	1.54	0.05	0.0707	18.6	20.6	0.0949	149.82
70	1.54	0.05	0.0707	18.6	20.7	0.0996	149.15

Flow rate = 4.743 l/min

Calorimeter #2

Time (min)	CO_2 (percent)	Room CO_2 (percent)	Gen. CO_2[a] (L/min)	O_2 (percent)	Room O_2 (percent)	Con O_2[b] (L/min)	Ethanol wt[c] (g)
0	1.53	0.05	0.0740	18.6	20.7	0.1050	163.95
10	1.53	0.05	0.0740	18.6	20.7	0.1050	163.26
20	1.53	0.05	0.0740	18.6	20.7	0.1050	162.58
30	1.53	0.05	0.0740	18.6	20.8	0.1100	161.89
40	1.54	0.05	0.0745	18.6	20.8	0.1100	161.18
50	1.54	0.05	0.0745	18.6	20.8	0.1100	160.51
60	1.54	0.05	0.0745	18.6	20.8	0.1100	159.81
70	1.54	0.05	0.0745	18.6	20.8	0.1100	159.12

Flow rate = 5 l/min

Calorimeter #3

Time (min)	CO_2 (percent)	Room CO_2 (percent)	Gen. CO_2[a] (L/min)	O_2 (percent)	Room O_2 (percent)	Con O_2[b] (L/min)	Ethanol wt[c] (g)
0	1.57	0.05	0.0608	18.7	20.6	0.0760	151.03
10	1.57	0.04	0.0612	18.6	20.6	0.0800	150.41
20	1.57	0.04	0.0612	18.7	20.6	0.0760	149.82
30	1.57	0.04	0.0612	18.6	20.7	0.0840	149.21
40	1.57	0.04	0.0612	18.7	20.6	0.0760	148.62
50	1.58	0.03	0.0620	18.6	20.8	0.0880	148.03
60	1.58	0.03	0.0620	18.6	20.8	0.0880	147.43
70	1.58	0.03	0.0620	18.6	20.8	0.0880	146.83

Flow rate = 4 l/min

Calorimeter #1

Time (min)	Different wt[d] (g)	P CO_2[e] (L/min)	P O_2[f] (L/min)	RQ[g]	O_2 Recovery Ratio (percent)	CO_2 Recovery Ratio (percent)
10	0.68	0.0662	0.0993	0.74	95.58	105.37
20	0.66	0.0642	0.0963	0.74	98.47	108.56
30	0.66	0.0642	0.0963	0.70	103.40	108.56
40	0.67	0.0652	0.0978	0.70	101.85	107.67
50	0.67	0.0652	0.0978	0.71	101.85	108.40
60	0.67	0.0652	0.0978	0.75	97.00	108.40
70	0.67	0.0652	0.0978	0.71	101.85	108.40

Calorimeter #2

Time (min)	Different wt[d] (g)	P CO_2[e] (L/min)	P O_2[f] (L/min)	RQ[g]	O_2 Recovery Ratio (percent)	CO_2 Recovery Ratio (percent)
0						
10	0.69	0.0671	0.1007	0.70	104.26	110.22
20	0.68	0.0662	0.0993	0.70	105.79	111.84
30	0.69	0.0671	0.1007	0.70	109.22	110.22
40	0.71	0.0691	0.1036	0.67	106.15	107.84
50	0.67	0.0652	0.0978	0.68	112.48	114.27
60	0.70	0.0681	0.1022	0.68	107.66	109.38
70	0.69	0.0671	0.1007	0.68	109.22	110.96

Calorimeter #3

Time (min)	Different wt[d] (g)	P CO_2[e] (L/min)	P O_2[f] (L/min)	RQ[g]	O_2 Recovery Ratio (percent)	CO_2 Recovery Ratio (percent)
0				0.80		
10	0.62	0.0603	0.0905	0.77	88.40	101.44
20	0.59	0.0574	0.0861	0.81	88.25	106.60
30	0.61	0.0594	0.0890	0.73	94.35	103.11
40	0.59	0.0574	0.0861	0.81	88.25	106.60
50	0.59	0.0574	0.0861	0.70	102.19	107.99
60	0.60	0.0584	0.0876	0.70	100.49	106.19
70	0.60	0.0584	0.0876	0.70	100.49	106.19

a. CO_2 generation rate based on CO_2 concentration and air exchange flow rate.
b. O_2 generation rate based on O_2 concentration and air exchange flow rate.
c. Weight of ethanol for every 10 minutes.
d. Different weight of ethanol based on 10 minutes /production of CO_2 due to burning ethanol.
e. CO_2 generation rate based on burning ethanol.
f. O_2 generation rate based on burning ethanol.
g. Respiration quotient.

3.2.9 Cage/Calorimeter Assignment for Test 1

Day	Calorimeter	Relative Humidity (percent)	Cages	Date
1	1 2 3	35 75 35	1,2,3,4, 5,6,7,8, 9,10,11,12,	10/18/97
2	1 2 3	75 35 35	5,6,7,8, 9,10,11,12, 1,2,3,4,	10/19/97
3	1 2 3	35 35 75	9,10,11,12, 1,2,3,4, 5,6,7,8,	10/20/97
4	1 2 3	35 75 35	1,2,3,4, 5,6,7,8, 9,10,11,12,	10/21/97
5	1 2 3	75 35 35	5,6,7,8, 9,10,11,12, 1,2,3,4,	10/22/97
6	1 2 3	35 35 75	9,10,11,12, 1,2,3,4, 5,6,7,8,	10/23/97
7	1 2 3	35 75 35	1,2,3,4, 5,6,7,8, 9,10,11,12,	10/24/97
8	1 2 3	75 35 35	5,6,7,8, 9,10,11,12, 1,2,3,4,	10/25/97
9	1 2 3	35 35 75	9,10,11,12, 1,2,3,4, 5,6,7,8,	10/26/97
10	1 2 3	35 75 35	1,2,3,4, 5,6,7,8, 9,10,11,12,	10/27/97

3.2.10 Cage/Calorimeter Assignment for Test 2

Day	Calorimeter	Relative Humidity (percent)	Cages	Date
1	1 2 3	35 75 75	1,2,3,4, 5,6,7,8, 9,10,11,12,	12/13/97
2	1 2 3	75 75 35	5,6,7,8, 9,10,11,12, 1,2,3,4,	12/14/97
3	1 2 3	75 35 75	9,10,11,12, 1,2,3,4, 5,6,7,8,	12/15/97
4	1 2 3	35 75 75	1,2,3,4, 5,6,7,8, 9,10,11,12,	12/16/97
5	1 2 3	75 75 35	5,6,7,8, 9,10,11,12, 1,2,3,4,	12/17/97
6	1 2 3	75 35 75	9,10,11,12, 1,2,3,4, 5,6,7,8,	12/18/97
7	1 2 3	35 75 75	1,2,3,4, 5,6,7,8, 9,10,11,12,	12/19/97
8	1 2 3	75 75 35	5,6,7,8, 9,10,11,12, 1,2,3,4,	12/20/97
9	1 2 3	75 35 75	9,10,11,12, 1,2,3,4, 5,6,7,8,	12/21/97
10	1 2 3	35 75 75	1,2,3,4, 5,6,7,8, 9,10,11,12,	12/22/97

3.3 Measurement Procedures

3.3.1 Operating Procedure for Starting Calorimeters

Make sure the room furnace or air conditioner is working.

Turn on environmental chamber (EC) #1 power switch on front outside panel and make sure the right knob is rotated to the correct temperature, around 70 °F.

Turn on CO_2 and O_2 analyzers. Use the proper procedure.

Turn on EC #2 power switch on front panel outside the chamber and flip the switch up on the box at left-hand side of front panel. Check thermostat inside the chamber so it is around 68 °F.

Turn on the duct fans for the calorimeter temperature control systems.

Turn on the calorimeter temperature control panels inside EC #1. Adjust it to the correct temperature if this has not already been done.

Turn on the calorimeter recirculating fans with the control inside EC #1.

Turn on the sample pumps outside EC #1.

Turn on the solenoid valve control system.

To shut off calorimeters, reverse this order.

3.3.2 Operating Procedure for Using the CO_2 Analyzer

1. Turning on:

Press in the top button on the left of the analyzer.

Wait one minute.

Press in the bottom button.

Wait 30 minutes for the machine to warm up.

2. Adjust the lower concentration standard gas using the zero dial to the concentration on the tank. The flow rate from the tank should read 2.5L/min on the gauge.

3. Adjust the higher concentration standard gas using the gain dial to the concentration on the tank the flow rate from the tank should read 2.5L/min on the gauge.

4. Move the intake tube from the standard gas tube to the sample tube.

5. Record values.

6. Do not turn the machine off until the end of the day because it takes 30 minutes to warm it up.

Turning off:

Press the bottom button on the left of the analyzer.

Wait one minute.

Press the top button on the left of the analyzer.

3.3.3 Operating Procedures for Relative Humidity Measurement

Turn computer on and do not touch the keyboard until you get the C prompt (C:\>).

At the C prompt (C:\>), type "viewdac" and then hit the enter key.

At the viewdac copyright window, click "START."

At the menu bar at the top of the screen, click "File." Then click "Open" and then click "Sequence."

You should see a window in the center of the screen that says "File open for sequence."

Go down the list of files until you see the one that says "Humidical.seq." Click on it once and then click "OK."

At the "Humidical.seq" window, highlight task of "ASCII write," change name of ASCII file by clicking the "edit" button on the "Humidical.seq" window. Name the file: morningdate or afternoondate.

Click "Start" button on the "Humidical.seq" window to run the program.
When finished measuring the task, click once on the "Stop" button on the "Humidical.seq" window.

At the menu bar, click on "System" and then click on "Shell DOS." At the C prompt, copy the ASCII file onto a floppy disk.

At the menu bar at the top of the screen, click on "File" and then click on "Close." On the menu bar, click on "System" and then click on "Bye." You should be back at the C prompt.

Shut off the CPU and monitor.

3.3.4 Operating Procedures for Humidification System

Every morning:

Disconnect the graduated cylinder from its tubing (directly below the needle valve at the bottom of the fitting that connects the tubing to the solenoid). Some water may drip out of the needle valve.

Take the graduated cylinder to the sink in the main lab.

Open the needle valve all the way and fill the graduated cylinder with water. Allow the cylinder to drain and repeat until water flows freely through the needle valve.

Close the needle valve all the way and fill the graduated cylinder with water to check for leaks. If there is a leak, patch it with the sealer.

Open the valve until there is a very slow drip, about one drip every five seconds.

Empty the cylinder and refill to 30 mL. Check if there is a slow drip with the cylinder filled to 30 mL. If there is, fill the cylinder to about 90mL. If there is not, open the valve until it starts dripping slowly. Refill the cylinder and repeat steps five and six until a steady flow is achieved at both 30 and 90 mL.

Reattach the cylinder to the calorimeter. Repeat steps one through seven for all three calorimeters.

Turn the solenoids on and off 10 times. Turn the solenoids on and be sure that water is flowing out of the needle valves. If no water is flowing out, turn the solenoids on and off 10 more times. If water still does not flow, open the needle valve four turns. If water still does not flow out, seek assistance.

Record the current water volume within the cylinders. Make sure the cylinder is almost vertical.

Record the water volume at the end of each run.

3.3.5 Operating Procedures for Baking Drierite

1. Set oven to about 425 °F. Match up black lines under the broken knob.

2. Place drierite in large pans to a depth of around ½ inch and place pans on the three shelves in oven.

3. Bake for 1.5 hours.

4. Remove and dump into shoebox cage.

5. Refill pans and place in oven.

6. Immediately fill jars from the shoebox cage and put on lids snugly, but not tightly. Leave jars on floor to cool.

7. When done, turn oven knob counterclockwise to shut off.

3.3.6 Operating Procedures for NH_3, CO_2, and O_2 Measurements

There are three calorimeters (#1, #2, and #3) running at the same time. They all run at 24 1.5 °C. The humidities in the three calorimeters are 35 percent, 35 percent, and 75 percent, for the first test and 75 percent, 75 percent, and 35 percent for the second test. The fresh airflow rate for the calorimeter is 5L/min. This is increased in the 8th, 9th, and 10th test day. The air recirculation system moves air past the cages at 0.25m/s. NH_3 and CO_2 levels will be monitored to ensure that the CO_2 concentration does not exceed 6,000 ppm and the NH_3 levels does not exceed 100 ppm for long periods. The calorimeter static pressure is kept negative. The samples are taken when the ammonia concentrations inside calorimeters reach a stable state.

Time a.m.	Actions
7:00	Turn on all the calorimeter environmental control systems including CO_2, O_2 analyzer (see procedure for start calorimeter and CO_2 analyzer).
	Weigh the new recycling drierite, new fresh air drierite and new humidification water.
	Weigh and record the mouse weight, water, feed, and litter. Add water and feed to the mouse cages.
	Reweigh, record the water, and feed.
7:40	Put the mice into the calorimeter (four cages per calorimeter).
	Turn on recycling pumps in 35 percent calorimeter for one hour.

Turn on humidification solenoid if 75 percent calorimeter has a lower humidity and turn on dehumidification pump if it has higher humidity.

Check fresh airflow going into drierite with the bubble flow meter.

Put old drierite into oven and bake (see detailed procedures).

8:40 Turn off the dehumidifier and record the humidity values of each calorimeter.

10:30 Calibrate the PhD meter with NH_3 by using a standard ammonia gas (52.7 ppm) and the fresh air.

Calibrate CO_2 and O_2 analyzer by using two standard gases (CO_2 0.55 percent, O_2 17.5 percent and CO_2 1.58 percent, O_2 18.9 percent).

Record the atmospheric pressure from mercurial barometer (Fortin Type, model 469).

10:40 Record the CO_2, O_2, RH (see other detailed procedures), temperature, and airflow. Measure NH_3 of each calorimeter and room using PhD meter and calorimetric tube, respectively.

11:20 Start the second sample period, in which NH_3 is measured only using PhD.

p.m.

12:00 Start the third sample period, which is same as second one.

12:30 Turn off the white light. Start the dehumidification system in the 35 percent calorimeter.

1:30 Turn off the dehumidification system.

3:00 Calibrate the PhD meter with standard NH_3 gas (52.7 ppm) and fresh air.

Calibrate CO_2 and O_2 analyzer.

Record the atmospheric pressure.

3:15 Record the CO_2, O_2, RH, temperature, and airflow for all three calorimeters.

Measure NH_3 using PhD meter and calorimetric tube.

4:00 Start the second sample period of the afternoon, in which NH_3 is measured only with PhD meter.

4:40 Start the third sample period, which is the same as the second one.

5:20 Put the mice back into the environmental chamber.

Weigh drierite and humidification water.

Turn off all the calorimeter environmental control systems (including CO_2, O_2 analyzer).

The test period is 10 days. Every day the same procedures will be repeated, except on the 11th day when we weigh the mice, water, and food, but do not add additional water and food.

3.4 Experimental Data

3.4.1 Tabulated Data

Index of tabulated data

3.4.1.1 Raw Data Test 1

Date: OCT 18,1997 **Day**: 1

Barometric pressure: 30.22 (in) **Desired temperature:** 24+-1.5 ^{o}C

Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp (^{o}C)	Actual RH (percent)
1	19.9	0.72	-1	41	4.99	69.20	20.67	71.69
2	20.1	0.75	0	41	4.99	70.40	21.33	74.48
3	19.9	0.76	0	40	4.86	70.60	21.44	75.00
Average	20.0	0.74	0	41	4.95	70.10	21.15	73.72
4	20.0	0.76	6	42	5.12	70.90	21.61	71.00
5	19.9	0.76	8	43	5.26	70.80	21.56	71.00
6	20.0	0.76	10	42	5.12	69.80	21.00	72.00
Average	20.0	0.76	8	42	5.20	70.50	21.40	71.33

Mice weight=401.6 (g). Thermocouple of Calorimeter-1 has problem. Actual temperature is not right.

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp (^{o}C)	Actual RH (percent)
1	19.9	0.67	-1	39	4.89	74.40	23.56	86.30
2	20.0	0.63	2	37	4.62	73.90	23.28	87.43
3	20.1	0.63	0	39	4.89	73.70	23.17	86.70
Average	20.0	0.64	0	38	4.80	74.00	23.33	86.81
4	20.0	0.68	6	31	3.82	74.50	23.61	69.00
5	20.0	0.69	7	42	5.29	74.30	23.50	70.00
6	20.1	0.67	9	41	5.16	74.00	23.33	70.00
Average	20.0	0.68	7	38	4.80	74.30	23.50	69.67

Mice weight=409.8 (g)

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp (^{o}C)	Actual RH (percent)
1	19.9	0.73	-1	50	6.06	73.30	22.94	72.59
2	20.0	0.61	1	50	6.06	73.80	23.22	72.50
3	20.1	0.61	0	50	6.06	73.40	23.00	71.67
Average	20.0	0.65	0	50	6.06	73.50	23.06	72.25
4	20.1	0.73	6	53	6.61	74.40	23.56	67.00
5	20.2	0.72	9	52	6.43	74.30	23.50	67.00
6	20.0	0.72	9	53	6.61	74.00	23.33	70.00
Average	20.1	0.72	8	53	6.60	74.20	23.50	68.00

Mice weight=421 (g)

Room (desired RH 35-40percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.5	0.06	0	-	-	66.00	18.89	34.10
2	20.7	0.06	2	-	-	66.00	18.89	36.47
3	20.7	0.06	-1	-	-	66.70	19.28	-
Average	20.6	0.06	0			66.23	19.02	35.29
4	20.7	0.06	8	-	-	67.20	19.56	38.00
5	20.6	0.06	7	-	-	67.10	19.50	37.00
6	20.7	0.06	11	-	-	67.00	19.44	38.00
Average	20.7	0.06	9			67.10	19.50	37.67

Date: OCT 19,1997 **Day:** 2
Barometric pressure: 30.02 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 5,6,7,8				Calorimeter – 1 (desired RH 75 –80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0	0.60	3	40	4.863	73.35	22.97	84.50
2	19.9	0.65	6	40	4.863	75.06	23.92	85.67
3	19.8	0.69	12	40	4.863	72.58	22.54	86.70
Average	19.9	0.65	7	40	4.860	73.66	23.15	85.62
4	19.8	0.76	5	40	4.863	70.55	21.42	85.46
5	19.7	0.72	12	40	4.863	70.14	21.19	84.88
6	19.8	0.68	12	40	4.863	68.89	20.49	83.93
Average	19.8	0.70	10	40	4.860	69.86	21.00	84.76

Mice weight = 410.1 (g) Thermocouple of calorimeter-1 has problem.

Cage: 9,10,11,12				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow	Actual temperature			
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.51	3	36	4.424	76.64	24.80	59.00
2	20.1	0.55	5	36	4.491	76.16	24.53	61.60
3	20.0	0.58	11	36	4.491	75.79	24.33	63.00
Average	20.1	0.55	6	36	4.470	76.20	24.55	61.20
4	19.9	0.66	4	40	5.025	77.01	25.01	66.00
5	19.9	0.65	11	40	5.025	76.40	24.67	68.15
6	19.9	0.66	14	40	5.025	76.11	24.51	68.90
Average	19.9	0.66	10	40	5.030	76.51	24.73	67.68

Mice weight=422.7 (g)

Cage: 1,2,3,4				Calorimeter – 3 (desired RH 30-35percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.50	3	43.0	4.76	75.50	24.17	56.00
2	20.1	0.52	5	43.0	4.76	74.90	23.83	58.95
3	20.1	0.56	10	43.5	4.86	74.86	23.81	61.02
Average	20.1	0.53	6	43.2	4.79	75.09	23.94	58.66
4	20.0	0.62	5	44.5	5.04	73.44	23.02	63.78
5	20.0	0.64	11	44.5	5.04	72.53	22.52	66.54
6	20.0	0.66	13	44.5	5.04	72.37	22.43	67.87
Average	20.0	0.64	10	44.5	5.04	72.78	22.66	66.06

Mice weight = 408 (g)

Room (desired RH 35-40percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.4	0.07	3	-	-	70.20	21.22	36.00
2	20.5	0.10	6	-	-	70.77	21.54	36.90
3	20.5	0.11	12	-	-	70.70	21.50	37.20
Average	20.5	0.09	7			70.56	21.42	36.70
4	20.4	0.07	5	-	-	70.20	21.22	38.60
5	20.5	0.09	14	-	-	70.22	21.23	39.16
6	20.4	0.09	18	-	-	68.29	20.16	41.99
Average	20.5	0.09	9			70.13	21.19	38.08

Date: OCT 20,1997 **Day:** 3
Barometric pressure: 30.12 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 9,10,11,12				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.55	5	41.0	4.99	61.68	16.49	50.70
2	20.1	0.62	8	41.0	4.99	53.10	11.72	53.37
3	20.0	0.65	10	41.0	4.99	53.87	12.15	55.21
Average	20.1	0.61	8	41.0	4.99	56.22	13.45	53.09
4	19.9	0.79	10	40.5	4.93	61.30	16.28	58.77
5	19.9	0.83	14	40.5	4.93	60.60	15.89	63.61
6	19.9	0.86	16	40.5	4.93	60.02	15.57	66.13
Average	19.9	0.83	13	40.5	4.93	60.64	15.91	62.84

Mice weight = 428.3 (g) Thermocouple of calorimeter-1 has problem.

Cage: 1,2,3,4				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.42	9	40	5.03	73.76	23.20	53.13
2	20.2	0.47	9	40	5.03	73.67	23.15	56.73
3	20.1	0.49	12	40	5.03	73.72	23.18	58.04
Average	20.2	0.46	10	40	5.03	73.72	23.18	55.97
4	20.0	0.63	11	40	5.03	75.90	24.39	67.36
5	20.0	0.67	16	40	5.03	75.40	24.11	71.48
6	20.0	0.69	18	40	5.03	75.31	24.06	72.37
Average	20.0	0.66	15	40	5.03	75.54	24.19	70.40

Mice weight=413.9 (g)

Cage: 5,6,7,8				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.50	6	45.5	5.23	-	-	75.06
2	20.1	0.50	9	45.5	5.23	74.00	23.33	75.58
3	20.1	0.54	11	45.5	5.23	74.80	23.78	77.66
Average	20.1	0.51	9	45.5	5.23	74.40	23.56	76.10
4	20.0	0.69	16	45.0	5.13	74.68	23.71	82.55
5	20.0	0.71	28	45.0	5.13	72.40	22.44	80.82
6	19.9	0.73	34	45.0	5.13	72.80	22.67	87.90
Average	20	0.71	26	45.0	5.13	73.29	22.94	83.76

Mice weight=417.5 (g)

Room (desired RH 35-40percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.07	5	-	-	65.60	18.67	46.58
2	20.7	0.06	11	-	-	65.80	18.78	46.29
3	20.7	0.07	13	-	-	67.47	19.71	47.60
Average	20.67	0.07	10			66.29	19.05	46.82
4	20.5	0.07	7	-	-	72.83	22.68	43.55
5	20.5	0.10	17	-	-	66.56	19.20	50.24
6	20.5	0.10	19	-	-	68.52	20.29	45.00
Average	20.50	0.09	14			69.30	20.72	46.26

Date: OCT 21,1997 **Day:** 4
Barometric pressure: 30.18 (in) **Desired temperature:** 24+-1.5 ^{o}C
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp(^{o}C)	Actual RH (percent)
1	20.1	0.58	13	41	4.99	75.74	24.30	53.50
2	20.0	0.58	17	41	4.99	77.54	25.30	52.27
3	20.0	0.59	22	41	4.99	77.18	25.10	56.60
Average	20.0	0.58	17	41	4.99	76.82	24.90	54.12
4	19.9	0.78	15	41	4.99	77.18	25.10	61.98
5	19.9	0.81	27	41	4.99	75.92	24.40	62.71
6	20.0	0.85	28	41	4.99	76.64	24.80	64.03
Average	20.0	0.81	23	41	4.99	76.58	24.77	62.91

Mice weight=420.3 (g)

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp(^{o}C)	Actual RH (percent)
1	20.1	0.55	29	39.5	4.96	73.73	23.18	74.05
2	20.0	0.55	40	39.0	4.89	75.03	23.91	72.41
3	20.1	0.55	47	39.0	4.89	74.97	23.87	74.70
Average	20.1	0.55	39	39.2	4.91	74.58	23.65	73.72
4	20.1	0.67	59	39.0	4.89	75.47	24.15	79.25
5	20.1	0.67	75	39.0	4.89	76.45	24.69	78.26
6	20.1	0.66	78	39.5	4.96	77.56	25.31	77.23
Average	20.1	0.67	71	39.2	4.91	76.49	24.72	78.25

Mice weight=424.7 (g)

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 30 –35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp(^{o}C)	Actual RH (percent)
1	20.1	0.56	8	44	4.95	73.40	23.00	61.25
2	20.1	0.58	15	44	4.95	74.93	23.85	61.65
3	20.1	0.57	21	44	4.95	72.64	22.58	64.94
Average	20.1	0.57	15	44	4.95	73.66	23.14	62.61
4	20.3	0.63	16	44.0	4.95	73.74	23.19	64.76
5	20.1	0.65	28	43.5	4.86	75.19	23.99	65.74
6	20.1	0.73	28	44.0	4.95	76.70	24.83	68.04
Average	20.2	0.67	24	44.0	4.92	75.21	24.01	66.18

Mice weight=437.1 (g)

Room (desired RH 35-40percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.06	9	-	-	71.14	21.744	42.67
2	20.6	0.06	16	-	-	70.86	21.589	40.33
3	20.5	0.06	22	-	-	70.77	21.539	43.16
Average	20.6	0.06	16			70.92	21.62	42.05
4	20.6	0.07	14	-	-	72.63	22.572	37.20
5	20.5	0.10	29	-	-	74.23	23.461	34.86
6	20.5	0.10	34	-	-	74.25	23.472	33.30
Average	20.5	0.09	26			73.70	23.17	35.12

Date: OCT 22,1997 **Day:** 5
Barometric pressure: 30.19 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 5,6,7,8				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.59	40	41	4.99	75.84	24.36	76.84
2	20.1	0.58	44	41	4.99	77.36	25.20	78.21
3	20.0	0.60	48	41	4.99	77.54	25.30	77.36
Average	20.1	0.59	44	41	4.99	76.91	24.95	77.47
4	19.8	0.82	68	41	4.99	77.90	25.50	77.63
5	19.9	0.81	73	41	4.99	77.54	25.30	78.32
6	19.9	0.82	88	41	4.99	77.19	25.11	77.11
Average	20.0	0.82	76	41	4.99	77.54	25.30	77.69

Mice weight=427.8 (g)

Cage: 9,10,11,12				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.43	22	39.5	4.96	76.59	24.77	49.85
2	20.2	0.45	27	40.0	5.03	78.90	26.06	48.26
3	20.2	0.47	31	40.0	5.03	75.96	24.42	54.20
Average	20.2	0.45	27	39.8	5.00	77.15	25.08	50.77
4	20	0.61	23	39.5	4.96	76.57	24.76	56.64
5	20	0.58	25	39.5	4.96	76.37	24.65	56.78
6	20	0.58	28	39.5	4.96	77.19	25.11	57.11
Average	20	0.59	25	39.5	4.96	76.71	24.84	56.84

Mice weight=445.5 (g)

Cage: 1,2,3,4						Calorimeter – 3 (desired RH 30-35 percent)		
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.49	14	44.0	4.95	76.42	24.68	49.74
2	20.2	0.49	18	44.0	4.95	77.90	25.50	52.62
3	20.3	0.47	22	43.5	4.86	75.78	24.32	52.73
Average	20.2	0.48	18	43.8	4.92	76.70	24.83	51.70
4	20.2	0.73	-4	44.0	4.95	75.63	24.24	60.90
5	20.1	0.68	0	43.5	4.86	75.96	24.42	61.49
6	20.1	0.68	4	43.5	4.86	76.82	24.90	61.77
Average	20.1	0.70	0	43.7	4.89	76.14	24.52	61.39

Mice weight=429.5 (g) PhD meter has problem

Room (desired RH 35-40percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.4	0.05	10	-	-	74.45	23.58	28.32
2	20.4	0.06	18	-	-	68.10	20.06	33.01
3	20.5	0.06	20	-	-	72.75	22.64	33.78
Average	20.4	0.06	16			71.77	22.09	31.70
4	20.3	0.06	6	-	-	68.76	20.42	37.21
5	20.3	0.06	8	-	-	73.67	23.15	35.12
6	20.3	0.06	10	-	-	74.83	23.79	33.41
Average	20.3	0.06	8			72.42	22.46	35.25

Date: OCT 23,1997 **Day:** 6
Barometric pressure: 29.89 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min) **PhD meter has problem in the morning.**

Cage: 9,10,11,12						Calorimeter – 1 (desired RH 30-35 percent)		
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20	0.62	-	41.0	4.99	74.84	23.80	52.30
2	20	0.62	-	41.5	5.06	75.02	23.90	52.40
3	20	0.62	-	41.0	4.99	75.02	23.90	52.95
Average	20	0.62		41.2	5.02	74.96	23.87	52.55
4	20	0.76	31	41	4.99	75.92	24.40	55.21
5	20	0.75	31	41	4.99	76.28	24.60	56.36
6	20	0.75	33	41	4.99	77.18	25.10	55.05
Average	20	0.75	32	41	4.99	76.46	24.70	55.54

Mice weight=454.1 (g)

Cage: 1,2,3,4				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.48	-	36	4.49	75.74	24.30	53.20
2	20.1	0.48	-	36	4.49	75.20	24.00	53.70
3	20.1	0.47	-	36	4.49	75.38	24.10	53.90
Average	20.1	0.48		36	4.49	75.44	24.13	53.60
4	20	0.64	26	39	4.89	78.95	26.08	50.74
5	20	0.64	26	39	4.89	77.00	25.00	56.41
6	20	0.64	27	39	4.89	77.77	25.43	56.17
Average	20	0.64	26	39	4.89	77.91	25.50	54.44

Mice weight=437.1 (g)

Cage: 5,6,7,8				Calorimeter – 3 (desired RH 75 –80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	19.8	0.73	-	44	4.9486	76.46	24.70	74.60
2	19.8	0.72	-	44	4.9486	73.58	23.10	75.50
3	19.8	0.70	-	44	4.9486	75.74	24.30	73.90
Average	19.8	0.72		44	4.950	75.26	24.03	74.67
4	19.9	0.81	73	45	5.1334	78.70	25.94	76.39
5	20.0	0.84	81	45	5.1334	76.03	24.46	81.56
6	20.0	0.82	83	45	5.1334	76.97	24.98	80.82
Average	20.0	0.82	79	45	5.130	77.23	25.13	79.59

Mice weight=433.2 (g)

Room (desired RH 35-40percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.05	-	-	-	65.40	18.56	40.57
2	20.6	0.05	-	-	-	66.20	19.00	40.80
3	20.6	0.05	-	-	-	64.80	18.22	41.20
Average	20.6	0.05				65.47	18.59	40.86
4	20.6	0.07	0	-	-	71.86	22.14	32.52
5	20.0	0.07	0	-	-	74.11	23.39	32.71
6	20.0	0.07	0	-	-	75.16	23.98	31.30
Average	20.2	0.07	0			73.71	23.17	32.18

Date: OCT 24,1997 **Day:** 7
Barometric pressure: 29.79 (in) **Desired temperature:** 24+-1.5 °C
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.2	0.46	30	41	4.99	81.68	27.60	39.82
2	20.2	0.46	37	41	4.99	81.68	27.60	40.92
3	20.1	0.49	40	41	4.99	82.04	27.80	43.86
Average	20.2	0.47	36	41	4.99	81.80	27.67	41.53
4	19.9	0.79	30	41	4.99	78.98	26.10	51.32
5	19.9	0.83	41	41	4.99	79.52	26.40	53.06
6	20.0	0.84	43	41	4.99	79.52	26.40	53.52
Average	19.9	0.82	38	41	4.99	79.34	26.30	52.63

Mice weight=441.1 (g)

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.0	0.49	67	39	4.89	76.60	24.78	74.94
2	20.1	0.51	71	39	4.89	76.50	24.72	75.92
3	20.0	0.53	70	39	4.89	76.60	24.78	76.62
Average	20.0	0.51	69	39	4.89	76.57	24.76	75.83
4	20.0	0.70	99	39	4.89	76.27	24.59	76.27
5	20.0	0.68	105	39	4.89	76.14	24.52	76.14
6	20.2	0.64	107	39	4.89	76.38	24.66	76.38
Average	20.1	0.67	104	39	4.89	76.26	24.59	76.26

Mice weight=442.8 (g)

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.1	0.54	51	44	4.9486	76.40	24.67	54.23
2	20.1	0.55	64	44	4.9486	76.40	24.67	55.50
3	20.1	0.55	67	44	4.9486	76.40	24.67	56.65
Average	20.1	0.55	61	44	4.9500	76.40	24.67	55.46
4	20.0	0.81	52	43	4.7638	74.76	23.76	61.31
5	20.0	0.86	52	43	4.7638	75.31	24.06	62.92
6	20.0	0.78	55	46	5.3182	75.31	24.06	62.86
Average	20.00	0.82	53	44	4.9500	75.13	23.96	62.36

Mice weight=461.2 (g)

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.7	0.05	11	-	-	71.7	22.06	31.49
2	20.7	0.05	10	-	-	71.4	21.89	31.93
3	20.7	0.05	12	-	-	71.5	21.94	32.81
Average	20.7	0.05	11			71.53	21.96	32.08
4	20.8	0.07	0	-	-	70.60	21.44	44.43
5	20.5	0.07	0	-	-	70.52	21.40	43.75
6	20.8	0.07	3	-	-	69.43	20.79	43.79
Average	20.7	0.07	1			70.18	21.21	43.99

Date: OCT 25,1997 **Day:** 8
Barometric pressure: 29. 68 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 5,6,7,8				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.63	90	40	4.86	76.58	24.77	89.44
2	20.0	0.64	86	40	4.86	76.50	24.72	89.71
3	20.1	0.68	83	40	4.86	77.34	25.19	90.28
Average	20.1	0.65	86	40	4.86	76.81	24.89	89.81
4	20.2	0.77	132	43	5.26	-	-	80.41
5	20.1	0.79	140	41	4.99	-	-	81.41
6	20.2	0.79	146	43	5.26	-	-	81.46
Average	20.2	0.78	139	42	5.17			81.09

Mice weight=449.4 (g)

Cage: 9,10,11,12				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.3	0.44	38	39.0	4.89	76.36	24.64	49.62
2	20.3	0.46	36	39.0	4.89	76.19	24.55	50.83
3	20.4	0.47	37	39.5	4.96	76.30	24.61	50.79
Average	20.3	0.46	37	39.2	4.91	76.28	24.60	50.41
4	20.3	0.58	34	40	5.03	76.45	24.69	51.53
5	20.3	0.61	44	41	5.16	76.50	24.72	55.23
6	20.3	0.63	45	40	5.03	76.25	24.58	55.58
Average	20.3	0.61	41	40	5.07	76.40	24.67	54.11

Mice weight=464.1 (g)

Cage: 1,2,3,4				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.4	0.44	30	41	4.39	75.79	24.33	46.52
2	20.3	0.44	33	41	4.39	75.44	24.13	49.97
3	20.3	0.47	31	41	4.39	75.67	24.26	49.98
Average	20.3	0.45	31	41	4.39	75.63	24.24	48.82
4	20.3	0.75	34	44	4.95	74.87	23.82	53.89
5	20.1	0.86	36	44	4.95	74.83	23.79	59.57
6	20.1	0.93	41	44	4.95	76.01	24.45	61.83
Average	20.2	0.85	37	44	4.95	75.24	24.02	58.43

Mice weight=449.9 (g)

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.09	3	-	-	69.75	20.97	41.50
2	20.6	0.09	3	-	-	71.16	21.76	41.21
3	20.6	0.09	5	-	-	70.78	21.54	41.74
Average	20.6	0.09	4			70.56	21.42	41.48
4	21.0	0.05	0	-	-	70.84	21.58	42.13
5	21.0	0.05	1	-	-	70.08	21.16	41.70
6	20.9	0.06	0	-	-	71.99	22.22	40.82
Average	21.0	0.05	0			70.97	21.65	41.55

Date: OCT 26,1997 **Day:** 9
Barometric pressure: 29.52 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 9,10,11,12				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.55	56	41	4.99	-	-	52.10
2	20.1	0.57	56	43	5.26	-	-	52.47
3	20.0	0.60	52	43	5.26	-	-	53.94
Average	20.1	0.57	55	42	5.17			52.84
4	20.1	0.74	99	41	4.99	77.15	25.08	59.67
5	20.1	0.74	97	41	4.99	76.90	24.94	59.30
6	20.1	0.75	97	41	4.99	77.05	25.03	61.56
Average	20.1	0.74	98	41	4.99	77.03	25.02	60.18

Mice weight=471.9 (g)

Cage: 1,2,3,4				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.3	0.46	56	40	5.15	76.28	24.60	57.20
2	20.2	0.47	54	40	5.15	76.40	24.67	56.59
3	20.2	0.47	49	40	5.15	76.37	24.65	55.98
Average	20.2	0.47	53	40	5.15	76.35	24.64	56.59
4	20.2	0.54	88	39.5	5.08	76.03	24.46	60.24
5	20.2	0.56	82	40.0	5.15	76.16	24.53	60.33
6	20.2	0.57	80	39.5	5.08	75.97	24.43	63.66
Average	20.2	0.56	83	39.7	5.10	76.05	24.47	61.41

Mice weight=449.7 (g)

Cage: 5,6,7,8				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	19.9	0.70	72	44	4.95	74.60	23.67	82.60
2	19.8	0.73	74	44	4.95	74.44	23.58	80.41
3	19.9	0.74	72	44	4.95	74.40	23.56	79.72
Average	19.9	0.72	73	44	4.95	74.48	23.60	80.91
4	20.1	0.82	134	44	4.95	75.23	24.02	82.66
5	20.1	0.79	135	44	4.95	75.08	23.93	84.04
6	20.0	0.77	130	44	4.95	74.71	23.73	83.64
Average	20.1	0.79	133	44	4.95	75.01	23.89	83.45

Mice weight=454.7 (g)

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.1	3	-	-	71.24	21.80	41.20
2	20.5	0.1	7	-	-	70.50	21.39	40.23
3	20.6	0.1	7	-	-	70.64	21.47	39.89
Average	20.6	0.1	6			70.79	21.55	40.44
4	20.7	0.10	14	-	-	70.35	21.31	41.21
5	20.7	0.10	15	-	-	70.31	21.28	41.69
6	20.7	0.11	13	-	-	70.75	21.53	41.50
Average	20.7	0.10	14			70.47	21.37	41.47

Date: OCT 27,1997 **Day:** 10
Barometric pressure: 29.98 (in) **Desired temperature:** 24+-1.5 °C
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp (°C)	Actual RH (percent)
1	20.2	0.48	96	41.0	4.99	76.69	24.83	50.40
2	20.1	0.52	94	41.5	5.06	77.09	25.05	53.11
3	20.1	0.54	100	41.5	5.06	76.38	24.66	54.63
Average	20.1	0.51	97	41.3	5.04	76.72	24.84	52.71
4	20.1	0.63	125	41.5	5.06	77.04	25.02	56.05
5	20.1	0.64	108	41.5	5.06	77.89	25.49	56.73
6	20.1	0.67	103	41.5	5.06	76.95	24.97	58.57
Average	20.1	0.65	112	41.5	5.06	77.29	25.16	57.12

Mice weight=459.4 (g)

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp (°C)	Actual RH (percent)
1	20.2	0.48	70	40	5.03	76.09	24.49	78.40
2	20.1	0.51	68	40	5.03	76.08	24.49	80.46
3	20.1	0.55	71	40	5.03	76.14	24.52	82.01
Average	20.1	0.51	70	40	5.03	76.10	24.50	80.29
4	20.1	0.60	105	40	5.03	76.09	24.49	79.66
5	20.1	0.60	103	40	5.03	76.14	24.52	80.60
6	20.1	0.56	95	40	5.03	76.14	24.52	81.68
Average	20.1	0.59	101	40	5.03	76.12	24.51	80.65

Mice weight=461.1 (g)

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp (°C)	Actual RH (percent)
1	20.2	0.52	50	44	4.95	75.36	24.09	51.36
2	20.2	0.54	45	44	4.95	75.39	24.11	53.65
3	20.1	0.57	54	44	4.95	75.31	24.06	55.67
Average	20.2	0.54	50	44	4.95	75.35	24.09	53.56
4	20.2	0.72	85	44	4.95	75.27	24.04	59.30
5	20.1	0.71	68	44	4.95	75.30	24.06	59.64
6	20.1	0.71	65	44	4.95	75.21	24.01	62.41
Average	20.1	0.713	73	44	4.95	75.26	24.03	60.45

Mice weight=478.3 (g)

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Scale**	**Rate (l/min)**	**Temp (^oF)**	**Temp(^oC)**	**Actual RH (percent)**
1	20.6	0.08	10	-	-	71.41	21.89	39.50
2	20.6	0.07	12	-	-	71.66	22.03	40.67
3	20.6	0.07	14	-	-	70.36	21.31	40.03
Average	20.6	0.07	12			71.14	21.75	40.07
4	20.7	0.06	10	-	-	69.96	21.09	39.25
5	20.7	0.06	8	-	-	70.69	21.49	39.80
6	20.7	0.06	10	-	-	71.06	21.70	37.69
Average	20.7	0.06	9			70.57	21.43	38.91

3.4.1.2 Raw Data for Test 2

Date: DEC 13,1997 **Day:** 1

Barometric pressure: 29.77 (in) **Desired temperature:** 24+-1.5 ^{o}C

Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp(^{o}C)	Actual RH (percent)
1	20.1	0.61	0	42.8	5.01	72.15	22.31	65.21
2	20.1	0.64	-1	42.0	4.89	72.05	22.25	68.00
3	20.3	0.63	0	43.0	5.04	71.83	22.13	68.50
Average	20.2	0.63	0	42.6	4.98	72.01	22.23	67.24
4	20.0	0.75	1	43.0	5.04	72.24	22.36	69.48
5	20.0	0.75	2	42.0	4.89	72.03	22.24	70.06
6	20.0	0.72	2	43.0	5.04	71.95	22.19	69.67
Average	20.0	0.74	2	42.7	4.99	72.07	22.26	69.74

Mice weight=411.7 (g) Morning: NH_3(tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp(^{o}C)	Actual RH (percent)
1	20.0	0.60	1	42.2	4.99	73.28	22.93	73.80
2	20.0	0.68	1	42.9	5.10	73.80	23.22	77.10
3	20.2	0.64	0	42.5	5.04	73.49	23.05	75.60
Average	20.1	0.64	1	42.5	5.04	73.52	23.07	75.50
4	19.9	0.70	2	42.0	4.96	73.42	23.01	74.15
5	19.9	0.70	2	42.5	5.04	73.38	22.99	74.52
6	20.0	0.70	3	42.2	4.99	73.30	22.94	73.14
Average	19.9	0.70	2	42.2	4.99	73.37	22.98	73.94

Mice weight=415.9 (g) Morning: NH_3 (tube)=1 ppm Afternoon: NH_3 (tube)=0ppm

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^{o}F)	Temp(^{o}C)	Actual RH (percent)
1	20.0	0.67	0	42.5	4.95	72.13	22.29	70.00
2	20.0	0.67	0	43.0	5.03	74.21	23.45	73.20
3	20.2	0.68	0	42.7	4.98	73.34	22.97	75.90
Average	20.1	0.67	0	42.7	4.99	73.23	22.90	73.03
4	20.0	0.73	2	42.8	5.00	72.91	22.73	74.38
5	19.9	0.77	2	42.0	4.87	73.20	22.89	73.86
6	19.9	0.76	3	42.0	4.87	74.12	23.40	74.53
Average	19.9	0.75	2	42.3	4.91	73.41	23.01	74.26

Mice weight=415.9 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm.

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.8	0.04	-1	-	-	66.39	19.11	37.90
2	20.7	0.03	-1	-	-	65.00	18.33	38.30
3	20.7	0.03	0	-	-	64.74	18.19	38.10
Average	20.7	0.03	-1			65.38	18.54	38.10
4	20.8	0.04	3	-	-	65.91	18.84	39.53
5	20.8	0.05	3	-	-	65.63	18.68	39.62
6	20.8	0.05	3	-	-	64.79	18.22	39.25
Average	20.8	0.05	3			65.44	18.58	39.47

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)= 0 ppm

Date: DEC 14,1997 **Day:** 2
Barometric pressure: 29.77 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0	0.64	3	42.8	5.00	73.87	23.26	54.00
2	20.0	0.60	3	42.7	4.98	73.30	22.94	62.00
3	19.9	0.62	3	42.7	4.98	74.70	23.72	65.80
Average	20.0	0.62	3	42.7	4.99	73.96	23.31	60.60
4	20.2	0.80	0	42.6	4.96	74.74	23.74	57.00
5	19.8	0.75	0	42.5	4.95	74.62	23.68	61.00
6	19.8	0.72	0	42.8	5.00	73.88	23.27	60.70
Average	19.9	0.76	0	42.6	4.97	74.41	23.56	59.57

Mice weight=417.1 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Cage: 5,6,7,8				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0	0.65	3	42.7	5.00	72.24	22.36	82.80
2	20.0	0.66	3	42.5	4.97	72.58	22.54	81.60
3	20.0	0.63	3	42.8	5.01	72.61	22.56	80.90
Average	20.0	0.65	3	42.7	4.99	72.48	22.49	81.77
4	19.7	0.78	0	43.5	5.12	73.24	22.91	82.60
5	19.6	0.84	1	42.7	5.00	73.24	22.91	84.20
6	19.7	0.75	1	42.7	5.00	72.85	22.69	83.70
Average	19.7	0.79	1	43.0	5.04	73.11	22.84	83.50

Mice weight=415.2 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Cage: 9,10,11,12				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0	0.6	3	42.5	5.04	73.64	23.13	83.30
2	20.4	0.61	4	42.2	4.99	73.45	23.03	83.10
3	20.2	0.68	4	42.5	5.04	73.59	23.11	82.60
Average	20.2	0.63	4	42.4	5.02	73.56	23.09	83.00
4	19.6	0.75	0	40.0	4.65	74.40	23.56	74.30
5	19.9	0.68	1	42.2	4.99	74.41	23.56	83.70
6	19.7	0.76	1	42.3	5.00	74.06	23.37	83.30
Average	19.7	0.73	1	41.5	4.88	74.29	23.49	80.43

Mice weight=420.6 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.8	0.06	2	-	-	66.50	19.17	37.50
2	20.7	0.05	3	-	-	66.78	19.32	37.00
3	20.7	0.07	3	-	-	66.86	19.37	37.40
Average	20.7	0.06	3			66.71	19.29	37.30
4	20.6	0.05	1	-	-	67.57	19.76	37.80
5	20.6	0.05	1	-	-	67.49	19.72	38.30
6	20.6	0.05	1	-	-	67.16	19.53	38.00
Average	20.60	0.05	1			67.41	19.67	38.03

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3=0 ppm

Date: DEC 15,1997 **Day:** 3
Barometric pressure: 29.84 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.55	1	43	5.11	76.81	24.89	53.68
2	20.1	0.54	2	42	4.96	76.80	24.89	54.14
3	20.1	0.55	2	42	4.96	76.32	24.62	55.57
Average	20.1	0.55	2	42	5.01	76.64	24.80	54.46
4	19.9	0.80	0	42	4.96	77.28	25.16	61.06
5	19.9	0.77	1	42	4.96	77.09	25.05	63.04
6	20.0	0.75	2	42	4.96	76.38	24.66	63.83
Average	19.9	0.77	1	42	4.96	76.92	24.95	62.64

Mice weight=426.9 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Cage: 5,6,7,8				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0	0.60	1	44.0	5.19	75.12	23.96	75.35
2	20.0	0.61	2	44.0	5.19	73.97	23.32	73.66
3	19.9	0.63	3	43.5	5.11	72.74	22.63	75.16
Average	20.0	0.61	2	43.8	5.16	73.94	23.30	74.72
4	20.0	0.77	1	43.0	5.03	75.02	23.90	77.91
5	19.9	0.77	2	43.0	5.03	75.12	23.96	80.42
6	20.0	0.75	2	43.5	5.11	75.22	24.01	80.13
Average	20.0	0.76	2	43.2	5.05	75.12	23.96	79.49

Mice weight=418.1 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Cage: 9,10,11,12				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.62	1	43.0	5.04	76.96	24.98	82.96
2	20.1	0.62	2	42.5	4.97	76.19	24.55	83.45
3	20.0	0.61	2	42.0	4.89	76.33	24.63	82.19
Average	20.1	0.62	2	42.5	4.97	76.49	24.72	82.87
4	19.8	0.91	0	42.0	4.89	78.08	25.60	83.06
5	19.9	0.87	2	42.0	4.89	77.59	25.33	84.22
6	19.8	0.86	2	42.0	4.89	77.56	25.31	85.83
Average	19.8	0.88	1	42.0	4.89	77.74	25.41	84.37

Mice weight=424.9 (g) Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.05	1	-	-	69.33	20.74	35.84
2	20.6	0.04	2	-	-	70.14	21.19	34.79
3	20.6	0.04	2	-	-	70.42	21.34	36.89
Average	20.6	0.04	2			69.96	21.09	35.84
4	20.7	0.06	1	-	-	70.90	21.61	35.25
5	20.7	0.06	2	-	-	70.08	21.16	35.80
6	20.7	0.06	2	-	-	70.97	21.65	36.07
Average	20.7	0.06	2			70.65	21.47	35.71

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 16,1997 **Day:** 4
Barometric pressure: 29.94 (in) **Desired temperature:** 24+-1.5 °C
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.1	0.54	2	42.0	4.89	76.69	24.83	57.36
2	20.1	0.55	2	42.5	4.97	76.83	24.91	56.05
3	20.1	0.57	2	42.0	4.89	76.84	24.91	57.89
Average	20.1	0.55	2	42.2	4.92	76.79	24.88	57.10
4	19.9	0.81	5	42.0	4.89	77.57	25.32	62.12
5	19.9	0.79	6	42.0	4.89	77.24	25.13	63.67
6	19.9	0.79	6	42.0	4.89	76.95	24.97	65.31
Average	19.9	0.80	6	42.0	4.89	77.25	25.14	63.70

Mice weight=437.4 (g) Morning: NH_3 (tube)=1 ppm Afternoon: NH_3 (tube)=1ppm

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.0	0.58	2	42.5	5.04	76.30	24.61	77.94
2	19.9	0.60	2	42.0	4.96	76.19	24.55	78.99
3	20.0	0.60	2	42.0	4.96	76.19	24.55	79.60
Average	20.0	0.59	2	42.2	4.98	76.23	24.57	78.84
4	19.9	0.72	6	42.0	4.96	76.38	24.66	83.70
5	19.9	0.72	7	42.0	4.96	75.96	24.42	83.32
6	20.0	0.74	8	42.0	4.96	75.89	24.38	84.44
Average	19.9	0.73	7	42.0	4.96	76.08	24.49	83.82

Mice weight=427.1 (g) Morning: NH_3 (tube) = 1.5 ppm Afternoon: NH_3 (tube) = 8ppm

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.0	0.59	2	44.5	5.27	74.28	23.49	73.42
2	20.1	0.59	2	43.0	5.03	74.45	23.58	73.37
3	19.9	0.62	3	43.0	5.03	75.21	24.01	75.35
Average	20.0	0.60	2	43.5	5.11	74.65	23.69	74.05
4	19.8	0.82	8	43.0	5.03	74.50	23.61	78.59
5	19.7	0.83	10	43.0	5.03	74.28	23.49	78.49
6	19.7	0.85	12	43.0	5.03	75.29	24.05	81.24
Average	19.7	0.83	10	43.0	5.03	74.69	23.72	79.44

Mice weight=433 (g) Morning: NH_3 (tube)=8 ppm Afternoon: NH_3 (tube)=10 ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.7	0.06	2	-	-	69.44	20.80	36.07
2	20.7	0.06	2	-	-	69.45	20.81	36.12
3	20.7	0.06	2	-	-	69.36	20.76	35.98
Average	20.7	0.06	2			69.42	20.79	36.06
4	20.7	0.06	6	-	-	69.51	20.84	37.89
5	20.7	0.06	6	-	-	69.43	20.79	38.07
6	20.6	0.06	7	-	-	69.14	20.63	38.02
Average	20.7	0.06	6			69.36	20.76	37.99

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 17,1997 **Day:** 5
Barometric pressure: 30.04 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1		9	43.5	5.11	75.41	24.12	58.89
2	20.1		9	43.5	5.11	75.80	24.33	60.05
3	20.0		11	43.0	5.03	75.54	24.19	62.46
Average	20.1		10	43.3	5.08	75.58	24.21	60.47
4	19.7	0.68	11	44.0	5.19	75.67	24.26	62.61
5	19.7	0.62	11	43.0	5.03	74.06	23.37	64.78
6	19.7	0.57	12	43.0	5.03	74.87	23.82	65.94
Average	19.7	0.62	11	43.3	5.08	74.87	23.81	64.44

Mice weight=442 (g) Morning: NH_3 (tube)=1 ppm Afternoon: NH_3 (tube)=1.5 ppm

Cage: 5,6,7,8				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	19.9		9	42.5	4.97	74.37	23.54	77.63
2	20.0		15	42.5	4.97	75.11	23.95	77.44
3	20.1		19	43.0	5.04	75.17	23.98	78.94
Average	20.0		14	43.0	4.99	74.88	23.82	78.00
4	19.6	0.73	39	43.0	5.04	76.38	24.66	85.53
5	19.7	0.71	41	43.0	5.04	76.52	24.73	84.90
6	19.6	0.70	42	43.0	5.04	73.83	23.24	90.14
Average	19.6	0.71	41	43.0	5.04	75.58	24.21	86.86

Mice weight=434.2 (g) Morning: NH_3 (tube)=21 ppm Afternoon: NH_3 (tube)=46 ppm

Cage: 9,10,11,12				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0		36	42.5	5.04	76.55	24.75	75.17
2	19.9		47	43.0	5.11	76.76	24.87	77.43
3	19.9		45	43.0	5.11	76.00	24.44	79.14
Average	19.9		43	42.8	5.09	76.44	24.69	77.25
4	19.6	0.69	69	42.0	4.96	77.88	25.49	80.61
5	19.7	0.67	67	42.0	4.96	76.65	24.81	82.37
6	19.7	0.68	60	42.0	4.96	75.52	24.18	85.46
Average	19.7	0.68	65	42.0	4.96	76.68	24.82	82.81

Mice weight=441.2 (g) Morning: NH_3 (tube)=57 ppm Afternoon: NH_3 (tube)=76 ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.7		4	-	-	70.95	21.64	35.93
2	20.8		5	-	-	68.95	20.53	36.34
3	20.8		7	-	-	72.13	22.29	38.71
Average	20.7		5			70.68	21.49	36.99
4	20.6	0.06	8	-	-	72.32	22.40	35.61
5	20.6	0.03	8	-	-	66.16	18.98	41.22
6	20.6	0.03	9	-	-	65.85	18.81	42.49
Average	20.6	0.04	8			68.11	20.06	39.77

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 18,1997 **Day:** 6
Barometric pressure: 29.82 (in) **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.49	12	42.0	4.89	79.30	26.28	50.91
2	20.1	0.52	16	42.0	4.89	79.35	26.31	51.79
3	19.7	0.54	18	42.0	4.89	78.25	25.69	52.85
Average	20.0	0.52	15	42.0	4.89	78.97	26.09	51.85
4	19.8	0.86	19	42.0	4.89	76.79	24.88	56.22
5	19.8	0.65	22	42.0	4.89	76.67	24.82	59.03
6	19.8	0.47	22	42.5	4.97	76.59	24.77	58.61
Average	19.8	0.66	21	42.2	4.92	76.68	24.82	57.95

Mice weight=447.1 (g) Morning: NH_3 (tube)=4 ppm Afternoon: NH_3 (tube)=5 ppm

Cage: 5,6,7,8				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.0	0.49	84	43.0	5.11	75.75	24.31	73.04
2	19.8	0.50	81	43.0	5.11	75.00	23.89	73.52
3	19.9	0.52	76	43.0	5.11	74.20	23.44	73.91
Average	19.9	0.50	80	43.0	5.11	74.98	23.88	73.49
4	19.9	0.88	115	44.0	5.26	75.17	23.98	76.66
5	19.8	0.56	130	43.0	5.11	75.53	24.18	74.34
6	19.9	0.56	135	43.5	5.19	76.01	24.45	76.22
Average	19.9	0.67	127	43.5	5.19	75.57	24.21	75.74

Mice weight=444.1 (g) Morning: NH_3 (tube)=85 ppm Afternoon: NH_3 (tube)=90 ppm

Cage: 9,10,11,12				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	19.9	0.45	109	43.0	5.03	77.18	25.10	75.55
2	19.9	0.49	107	43.0	5.03	77.19	25.11	75.93
3	19.8	0.48	100	43.0	5.03	76.42	24.68	75.89
Average	19.9	0.47	105	43.0	5.03	76.93	24.96	75.79
4	19.8	0.86	113	43.0	5.03	75.45	24.14	80.54
5	19.7	0.83	132	43.0	5.03	75.45	24.14	81.41
6	19.9	0.56	130	43.0	5.03	75.42	24.12	81.36
Average	19.8	0.75	125	43.0	5.03	75.44	24.13	81.10

Mice weight=448.8 (g) Morning: NH_3 (tube)=90 ppm Afternoon: NH_3 (tube)=105 ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.7	0.06	12	-	-	66.39	19.11	37.90
2	20.5	0.06	17	-	-	65.00	18.33	38.30
3	20.3	0.07	15	-	-	64.74	18.19	38.10
Average	20.5	0.06	15			65.38	18.54	38.10
4	20.5	0.05	22	-	-	65.91	18.84	39.53
5	20.5	0.03	24	-	-	65.63	18.68	39.62
6	20.5	0.04	24	-	-	64.79	18.22	39.25
Average	20.5	0.04	23			65.44	18.58	39.47

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 19,1997 **Day:** 7
Barometric pressure: 29.78 (in) **Desired temperature:** 24+-1.5 °C
Desired airflow: 6 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.1	0.50	10	48.0	5.83	75.27	24.04	49.90
2	20.1	0.50		49.0	5.99	75.29	24.05	56.10
3	20.1	0.49		49.0	5.99	75.32	24.07	57.26
Average	20.1	0.50	10	48.7	5.93	75.29	24.05	54.42
4	20.1	0.72	8	48.0	5.83	73.40	23.00	63.81
5	20.0	0.73	20	48.0	5.83	74.76	23.76	63.47
6	20.0	0.72	24	48.0	5.83	73.91	23.28	64.83
Average	20.0	0.72	17	48.0	5.83	74.02	23.35	64.04

Mice weight=453 (g) Morning: NH_3 (tube)=2 ppm Afternoon: NH_3 (tube)=2 ppm

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.2	0.45	85	51.0	6.24	76.56	24.76	73.80
2	20.1	0.46	89	51.0	6.24	76.49	24.72	84.48
3	20.1	0.46	89	50.0	6.09	76.61	24.78	87.43
Average	20.1	0.46	88	50.7	6.19	76.55	24.75	81.90
4	19.9	0.74	122	49.0	5.94	75.96	24.42	88.26
5	19.9	0.75	135	49.0	5.94	76.38	24.66	87.53
6	19.9	0.72	147	49.0	5.94	75.64	24.24	86.79
Average	19.9	0.74	135	49.0	5.94	75.99	24.44	87.53

Mice weight=447.2 (g) Morning: NH_3 (tube)=84 ppm Afternoon: NH_3 (tube)=110 ppm

Cage: 9,10,11,12				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.0	0.46	87	48.0	5.88	74.97	23.87	72.07
2	20.0	0.63	89	50.0	6.18	75.20	24.00	73.37
3	20.1	0.52	92	49.0	6.03	75.02	23.90	72.31
Average	20.0	0.54	89	49.0	6.03	75.06	23.92	72.58
4	19.9	0.75	139	49.0	6.03	74.99	23.88	77.14
5	19.9	0.73	153	49.0	6.03	74.95	23.86	77.23
6	19.9	0.74	149	49.0	6.03	73.80	23.22	75.20
Average	19.9	0.74	14	49.0	6.03	74.58	23.66	76.52

Mice weight=449.3 (g) Morning: NH_3 (tube)=86 ppm Afternoon: NH_3 (tube)=105 ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.8	0.06	2	-	-	66.50	19.17	37.50
2	20.7	0.05	3	-	-	66.78	19.32	37.00
3	20.7	0.07	3	-	-	66.86	19.37	37.40
Average	20.7	0.06	3			66.71	19.29	37.30
4	20.6	0.05	1	-	-	67.57	19.76	37.80
5	20.6	0.05	1	-	-	67.49	19.72	38.30
6	20.6	0.05	1	-	-	67.16	19.53	38.00
Average	20.6	0.05	1			67.41	19.67	38.03

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 20,1997 **Day:** 8
Barometric pressure: 29.92 (in)q **Desired temperature:** 24+-1.5 ^oC
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 3 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.3	0.29	12	60	7.71	73.20	22.89	46.10
2	20.3	0.29	22	60	7.71	73.08	22.82	46.39
3	20.3	0.31	28	60	7.71	73.12	22.84	47.41
Average	20.3	0.30	21	60	7.71	73.13	22.85	46.63
4	20.3	0.42	-	60.0	7.71	73.80	23.22	44.70
5	20.2	0.40	-	60.5	7.79	73.03	22.79	51.65
6	20.2	0.60	-	60.0	7.71	72.99	22.77	54.55
Average	20.2	0.47	-	60.2	7.74	73.27	22.93	50.30

Mice weight=459.2 (g) Morning: NH_3 (tube)=2 ppm Afternoon: NH_3 (tube)=5 ppm

Cage: 5,6,7,8				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.33	119	61.0	7.90	72.57	22.54	78.98
2	20.2	0.37	123	60.5	7.82	72.49	22.49	77.53
3	20.1	0.36	120	61.0	7.90	72.55	22.53	75.45
Average	20.2	0.35	121	60.8	7.88	72.54	22.52	77.32
4	20.1	0.44	122	61.0	7.90	72.63	22.57	76.66
5	20.1	0.43	132	60.5	7.82	72.51	22.51	77.63
6	20.0	0.66	128	60.0	7.74	72.55	22.53	77.53
Average	20.1	0.51	127	60.5	7.82	72.56	22.54	77.27

Mice weight=453.5 (g) Morning: NH_3 (tube)=104 ppm Afternoon: NH_3 (tube)=126 ppm

Cage: 9,10,11,12				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.1	0.29	135	60.5	7.67	74.66	23.70	80.79
2	20.1	0.37	139	60.5	7.67	74.71	23.73	78.68
3	20.1	0.33	142	60.0	7.59	74.72	23.73	76.18
Average	20.1	0.33	139	60.3	7.64	74.70	23.72	78.55
4	20.1	0.39	142	61.0	7.75	74.89	23.83	75.72
5	20.0	0.44	144	61.0	7.75	74.66	23.70	76.83
6	20.0	0.68	153	61.0	7.75	74.13	23.41	77.89
Average	20.0	0.50	146	61.0	7.75	74.56	23.64	76.81

Mice weight=453.4 (g) Morning: NH_3 (tube)=108.5 ppm Afternoon: NH_3 (tube)=126

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.7	0.16	9	-	-	68.30	20.17	42.99
2	20.7	0.14	16	-	-	69.69	20.94	41.28
3	20.6	0.13	22	-	-	69.88	21.04	41.90
Average	20.7	0.14	16			69.29	20.72	42.06
4	20.7	0.12	-	-	-	70.18	21.21	41.50
5	20.7	0.04	-	-	-	69.00	20.56	40.53
6	20.6	0.01	-	-	-	69.74	20.97	40.12
Average	20.7	0.06	-			69.64	20.91	40.72

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 21,1997 **Day:** 9
Barometric pressure: 29.79 (in) **Desired temperature:** 24+-1.5 ^oC
Desired temperature: 24+-1.5 ^oC

Cage: 1,2,3,4				Calorimeter – 2 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.4	0.23	10	70.0	9.10	74.55	23.64	46.71
2	20.4	0.23	9	70.0	9.10	74.52	23.62	46.99
3	20.4	0.24	9	69.0	8.95	74.59	23.66	47.22
Average	20.4	0.23	9	69.7	9.05	74.55	23.64	46.97
4	20.3	0.36	27	68.0	8.80	74.75	23.75	49.99
5	20.2	0.42	47	68.0	8.80	74.85	23.81	51.47
6	20.3	0.33	54	68.0	8.80	74.66	23.70	50.36
Average	20.3	0.37	43	68.0	8.80	74.75	23.75	50.61

Mice weight=464.8 (g) Morning: NH_3 (tube)=8.5 ppm Afternoon: NH_3 (tube)=11 ppm

Cage: 5,6,7,8				Calorimeter – 3 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.33	162	70.0	9.24	72.67	22.59	68.21
2	20.2	0.32	131	70.0	9.24	72.66	22.59	69.41
3	20.1	0.32	120	70.0	9.24	72.71	22.62	68.54
Average	20.2	0.32	138	70.0	9.24	72.68	22.60	68.72
4	20.2	0.39	140	70.0	9.24	72.63	22.57	74.63
5	20.1	0.38	156	70.0	9.24	72.54	22.52	75.06
6	20.2	0.39	158	70.0	9.24	72.64	22.58	75.93
Average	20.2	0.39	151	70.0	9.24	72.60	22.56	75.21

Mice weight=459.9 (g)] Morning: NH_3 (tube)=123.3 ppm Afternoon: NH_3 (tube)=125 ppm

Cage: 9,10,11,12				Calorimeter – 1 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.2	0.31	115	70.0	9.34	72.37	22.43	78.69
2	20.3	0.31	122	69.0	9.18	72.19	22.33	80.24
3	20.1	0.31	118	69.0	9.18	72.23	22.35	78.16
Average	20.2	0.31	118	69.3	9.24	72.26	22.37	79.03
4	20.2	0.33	122	69.0	9.18	72.35	22.42	75.40
5	20.1	0.48	132	69.0	9.18	72.36	22.42	77.82
6	20.0	0.53	135	69.0	9.18	72.42	22.46	79.47
Average	20.1	0.45	130	69.0	9.18	72.38	22.43	77.56

Mice weight=460.2 (g) Morning: NH_3 (tube)=120 ppm Afternoon: NH_3 (tube)=145 ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.7	0.2	6	-	-	69.63	20.91	30.51
2	20.7	0.16	3	-	-	70.07	21.15	30.69
3	20.7	0.15	4	-	-	68.35	20.19	28.14
Average	20.7	0.17	4			69.35	20.75	29.78
4	20.7	0.15	40	-	-	69.87	21.04	30.97
5	20.7	0.14	54	-	-	69.87	21.04	31.33
6	20.7	0.15	58	-	-	68.90	20.50	32.33
Average	20.7	0.15	51			69.55	20.86	31.54

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

Date: DEC 22,1997 **Day:** 10
Barometric pressure: 29.73 (in) **Desired temperature:** 24+-1.5 °C
Desired airflow: 5 (l/min)

Cage: 1,2,3,4				Calorimeter – 1 (desired RH 30-35 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.3	0.23	7	69.0	9.18	72.66	22.59	50.33
2	20.3	0.17	25	69.0	9.18	72.49	22.49	50.14
3	20.4	0.38	30	69.0	9.18	72.50	22.50	44.51
Average	20.3	0.26	21	69.0	9.18	72.55	22.53	48.33
4	20.3	0.37	15	69.0	9.18	72.71	22.62	51.42
5	20.3	0.37	35	69.0	9.18	72.66	22.59	52.42
6	20.3	0.35	43	69.0	9.18	72.67	22.59	53.29
Average	20.3	0.36	31	69.0	9.18	72.68	22.60	52.38

Mice weight=471.8 (g) Morning: NH_3 (tube)=11.5 ppm Afternoon: NH_3 (tube)=12 ppm

Cage: 5,6,7,8				Calorimeter – 2 (desired RH 75-80 percent)				
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.3	0.28	117	68.0	8.80	74.40	23.56	78.20
2	20.1	0.27	127	68.0	8.80	74.98	23.88	81.17
3	20.1	0.56	145	68.0	8.80	74.80	23.78	80.38
Average	20.2	0.37	130	68.0	8.80	74.73	23.74	79.92
4	20.1	0.36	118	68.0	8.80	74.64	23.69	73.70
5	20.1	0.38	139	68.0	8.80	74.56	23.64	78.86
6	20.1	0.41	142	69.0	8.95	74.63	23.68	80.61
Average	20.1	0.38	133	68.3	8.85	74.61	23.67	77.72

Mice weight=463.7 (g) Morning: NH_3 (tube)=140ppm Afternoon: NH_3 (tube)=150 ppm

Cage: 9,10,11,12				Calorimeter - 3(desired RH 75-80 percent)				
	Concentration			Airflow		Act ual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (°F)	Temp(°C)	Actual RH (percent)
1	20.1	0.30	85	69.0	9.09	73.00	22.78	75.00
2	20.1	0.43	102	69.0	9.09	74.23	23.46	75.59
3	20.1	0.53	98	69.0	9.09	73.10	22.83	78.00
Average	20.1	0.42	95	69.0	9.09	73.44	23.02	76.20
4	20.1	0.51	98	69.0	9.09	72.83	22.68	80.27
5	20.0	0.43	121	69.0	9.09	72.81	22.67	81.15
6	20.1	0.40	128	69.0	9.09	72.85	22.69	81.68
Average	20.1	0.45	116	69.0	9.09	72.83	22.68	81.03

Mice weight=465.2 (g) Morning: NH_3 (tube)=86 ppm Afternoon: NH_3 (tube)=96 ppm

Room (desired RH 35-40 percent)								
	Concentration			Airflow		Actual temperature		
Time	O_2 (percent)	CO_2 (percent)	NH_3 (ppm)	Scale	Rate (l/min)	Temp (^oF)	Temp(^oC)	Actual RH (percent)
1	20.6	0.13	17	-	-	68.40	20.22	42.90
2	20.6	0.02	34	-	-	68.54	20.30	42.31
3	20.6	0.17	43	-	-	69.90	21.06	41.00
Average	20.6	0.11	31			68.95	20.53	42.07
4	20.6	0.02	30	-	-	69.37	20.76	44.54
5	20.6	0.13	45	-	-	69.85	21.03	43.49
6	20.6	0.12	60	-	-	68.61	20.34	43.54
Average	20.6	0.09	45			69.28	20.71	43.86

Morning: NH_3 (tube)=0 ppm Afternoon: NH_3 (tube)=0 ppm

3.4.1.3 Individual Calorimeter Data (O_2 percent, CO_2 percent, and NH_3 ppm) for Test 1

For cages: 1,2,3,4

Desired temperature: 24+-1.5 ^oC **Desired humidity:** 30-35 percent

Lights on								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^oC)**	**Bar. press (in)**
1	1	19.97	0.74	0	4.95	73.72	21.15	30.22
2	3	20.13	0.53	6	4.79	58.66	23.94	30.02
3	2	20.17	0.46	10	5.03	55.97	23.18	30.12
4	1	20.03	0.58	17	4.99	54.12	24.90	30.18
5	3	20.23	0.48	18	4.92	51.70	24.83	30.19
6	2	20.10	0.48	-	4.49	53.60	24.13	29.89
7	1	20.17	0.47	36	4.99	41.53	27.67	29.97
8	3	20.33	0.45	31	4.39	48.82	24.24	29.68
9	2	20.23	0.47	53	5.15	56.59	24.64	29.52
10	1	20.13	0.51	97	5.04	52.71	24.84	29.98

Light off								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^oC)**	**Bar. press (in)**
1	1	19.97	0.76	8	5.17	71.33	21.39	30.22
2	3	20.00	0.64	10	5.04	66.06	22.66	30.02
3	2	20.00	0.66	15	5.03	70.40	24.19	30.12
4	1	19.93	0.81	23	4.99	62.91	24.77	30.18
5	3	20.13	0.70	0	4.89	61.39	24.52	30.19
6	2	20.00	0.64	26	4.89	54.44	25.50	29.89
7	1	19.93	0.82	38	4.99	52.63	26.30	29.97
8	3	20.17	0.85	37	4.95	58.43	24.02	29.68
9	2	20.20	0.56	83	5.10	61.41	24.47	29.52
10	1	20.10	0.65	112	5.06	57.12	25.16	29.98

For cages: 5,6,7,8
Desired temperature: 24+-1.5 ^{o}C **Desired humidity**: 75-80 percent

Lights on								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	2	20.00	0.64	0	4.80	86.81	23.33	30.22
2	1	19.90	0.65	7	4.86	85.62	23.15	30.02
3	3	20.10	0.51	9	5.23	76.10	23.56	30.12
4	2	20.07	0.55	39	4.91	73.72	23.65	30.18
5	1	20.07	0.59	44	4.99	77.47	24.95	30.19
6	3	19.80	0.72	-	4.95	74.67	24.03	29.89
7	2	20.03	0.51	69	4.89	75.83	24.76	29.97
8	1	20.10	0.65	86	4.86	89.81	24.89	29.68
9	3	19.87	0.72	73	4.95	80.91	23.60	29.52
10	2	20.13	0.51	70	5.03	80.29	24.50	29.98

Light off								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	2	20.03	0.68	7	4.76	69.67	23.48	30.22
2	1	19.77	0.72	10	4.86	84.76	21.03	30.02
3	3	19.97	0.71	26	5.13	83.76	22.94	30.12
4	2	20.07	0.67	71	4.91	78.25	24.72	30.18
5	1	19.87	0.82	76	4.99	77.69	25.30	30.19
6	3	19.97	0.82	79	5.13	79.59	25.13	29.89
7	2	20.07	0.67	104	4.89	76.26	24.59	29.97
8	1	20.17	0.78	140	5.17	81.09	-	29.68
9	3	20.07	0.79	133	4.95	83.45	23.89	29.52
10	2	20.10	0.59	101	5.03	80.65	24.51	29.98

For cages: 9,10,11,12

Desired temperature: 24+-1.5 ^{o}C **Desired humidity**: 30-35 percent

Lights on								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp.(^{o}C)**	**Bar. press (in)**
1	3	20.00	0.65	0	6.06	72.25	23.06	30.22
2	2	20.10	0.55	6	4.47	61.20	24.55	30.02
3	1	20.07	0.61	8	4.99	53.09	13.45	30.12
4	3	20.10	0.57	15	4.95	62.61	23.14	30.18
5	2	20.20	0.45	27	5.00	50.77	25.08	30.19
6	1	20.00	0.62	-	5.02	52.55	23.87	29.89
7	3	20.10	0.55	61	4.95	55.46	24.67	29.97
8	2	20.33	0.46	37	4.91	50.41	24.60	29.68
9	1	20.07	0.57	55	5.17	52.84	-	29.52
10	3	20.17	0.54	50	4.95	53.56	24.09	29.98

Light off								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	3	20.10	0.72	8	6.55	68.00	23.46	30.22
2	2	19.90	0.66	10	5.03	67.68	24.73	30.02
3	1	19.90	0.83	13	4.93	62.84	15.91	30.12
4	3	20.17	0.67	24	4.92	66.18	24.01	30.18
5	2	20.00	0.59	25	4.96	56.84	24.84	30.19
6	1	20.00	0.75	32	4.99	55.54	24.70	29.89
7	3	20.00	0.82	53	4.95	62.36	23.96	29.97
8	2	20.30	0.61	41	5.07	54.11	24.67	29.68
9	1	20.10	0.74	98	4.99	60.18	25.02	29.52
10	3	20.13	0.71	73	4.95	60.45	24.03	29.98

For room

Desired temperature: 24+-1.5 ^{o}C **Desired humidity**: 35-40 percent

Lights on								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	-	20.63	0.06	0	-	35.29	19.02	30.22
2	-	20.47	0.09	7	-	36.70	21.42	30.02
3	-	20.67	0.07	10	-	46.82	19.05	30.12
4	-	20.57	0.06	16	-	42.05	21.62	30.18
5	-	20.43	0.06	16	-	31.70	22.09	30.19
6	-	20.60	0.05		-	40.86	18.59	29.89
7	-	20.70	0.05	11	-	32.08	21.96	29.97
8	-	20.60	0.09	4	-	41.48	21.42	29.68
9	-	20.57	0.10	6	-	40.44	21.55	29.52
10	-	20.60	0.07	12	-	40.07	21.75	29.98

Light off								
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^oC)**	**Bar. press (in)**
1	-	20.67	0.06	9	-	37.67	19.50	30.22
2	-	20.45	0.09	9	-	38.08	21.19	30.02
3	-	20.50	0.09	14	-	46.26	20.72	30.12
4	-	20.53	0.09	26	-	35.12	23.17	30.18
5	-	20.30	0.06	8	-	35.25	22.46	30.19
6	-	20.20	0.07	0	-	32.18	23.17	29.89
7	-	20.70	0.07	1	-	43.99	21.21	29.97
8	-	20.97	0.05	0	-	41.55	21.65	29.68
9	-	20.70	0.10	14	-	41.47	21.37	29.52
10	-	20.70	0.06	9	-	38.91	21.43	29.98

For cages: 1,2,3,4
Desired temperature: 24+-1.5 ^oC **Desired humidity**: 30-35 percent

	Light on		Generation rate			
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g bw)**	**NH_3 (g/hr/100g)**	**Max NH_3 (g/hr/100g)**	**Mice wt (g)**
1	-3.30E-02	3.38E-02	9.92E-01	-1.87E-05	0.00E+00	401.6
2	-1.60E-02	2.08E-02	6.00E-01	3.21E-04	5.36E-04	408.0
3	-2.51E-02	1.98E-02	5.63E-01	5.53E-04	6.64E-04	413.9
4	-2.66E-02	2.61E-02	7.33E-01	9.39E-04	1.19E-03	420.3
5	-9.84E-03	2.10E-02	5.76E-01	9.40E-04	1.15E-03	429.5
6	-2.25E-02	1.92E-02	5.17E-01	-	-	437.1
7	-2.66E-02	2.10E-02	5.60E-01	1.84E-03	2.06E-03	441.1
8	-1.17E-02	1.58E-02	4.14E-01	1.40E-03	1.47E-03	449.9
9	-1.72E-02	1.89E-02	4.94E-01	2.76E-03	2.92E-03	449.7
10	-2.35E-02	2.22E-02	5.69E-01	4.83E-03	5.00E-03	459.4

Light off			Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g bw)	NH_3 (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-3.62E-02	3.62E-02	1.06E+00	4.69E-04	5.87E-04	401.6
2	-2.28E-02	2.78E-02	8.02E-01	5.44E-04	7.32E-04	408.0
3	-2.51E-02	2.88E-02	8.20E-01	8.30E-04	9.96E-04	413.9
4	-3.00E-02	3.61E-02	1.01E+00	1.26E-03	1.52E-03	420.3
5	-8.15E-03	3.11E-02	8.54E-01	0.00E+00	2.07E-04	429.5
6	-9.78E-03	2.79E-02	7.52E-01	1.34E-03	1.38E-03	437.1
7	-3.83E-02	3.75E-02	1.00E+00	1.96E-03	2.22E-03	441.1
8	-3.96E-02	3.93E-02	1.03E+00	1.86E-03	2.06E-03	449.9
9	-2.55E-02	2.31E-02	6.06E-01	4.31E-03	4.55E-03	449.7
10	-3.04E-02	2.97E-02	7.61E-01	5.62E-03	6.28E-03	459.4

For cages: 5,6,7,8

Desired temperature: 24+-1.5 ^{o}C **Desired humidity**: 75-80 percent

Light on			Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g bw)	NH_3 (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-3.04E-02	2.80E-02	8.06E-01	1.78E-05	1.07E-04	409.8
2	-2.76E-02	2.69E-02	7.73E-01	3.78E-04	6.49E-04	410.1
3	-2.96E-02	2.33E-02	6.59E-01	4.95E-04	6.28E-04	417.5
4	-2.46E-02	2.41E-02	6.68E-01	2.04E-03	2.48E-03	424.7
5	-1.83E-02	2.66E-02	7.34E-01	2.34E-03	2.55E-03	427.8
6	-3.96E-02	3.30E-02	8.97E-01	-	-	433.2
7	-3.26E-02	2.25E-02	5.99E-01	3.49E-03	3.58E-03	442.8
8	-2.43E-02	2.72E-02	7.14E-01	4.26E-03	4.44E-03	449.4
9	-3.46E-02	3.08E-02	7.99E-01	3.61E-03	3.67E-03	454.7
10	-2.35E-02	2.21E-02	5.65E-01	3.46E-03	3.53E-03	461.1

Light off			Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g bw)	NH_3 (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-3.01E-02	2.95E-02	8.48E-01	3.88E-04	4.76E-04	409.8
2	-3.33E-02	3.07E-02	8.82E-01	5.23E-04	6.49E-04	410.1
3	-2.74E-02	3.18E-02	8.98E-01	1.46E-03	1.91E-03	417.5
4	-2.29E-02	2.83E-02	7.86E-01	3.73E-03	4.11E-03	424.7
5	-2.16E-02	3.78E-02	1.04E+00	4.06E-03	4.68E-03	427.8
6	-1.20E-02	3.87E-02	1.05E+00	4.27E-03	4.48E-03	433.2
7	-3.10E-02	2.95E-02	7.85E-01	5.22E-03	5.39E-03	442.8
8	-4.13E-02	3.77E-02	9.89E-01	7.30E-03	7.65E-03	449.4
9	-3.13E-02	3.41E-02	8.85E-01	6.60E-03	6.70E-03	454.7
10	-3.02E-02	2.65E-02	6.76E-01	5.02E-03	5.22E-03	461.1

For cages: 9,10,11,12
Desired temperature: 24+-1.5 ^{o}C **Desired humidity**: 30-35 percent

Light on			Generation rate			
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g bw)**	**NH_3 (g/hr/100g)**	**Max NH_3 (g/hr/100g)**	**Mice wt (g)**
1	-3.84E-02	3.57E-02	1.00E+00	0.00E+00	6.56E-05	421.0
2	-1.64E-02	2.03E-02	5.65E-01	3.05E-04	5.30E-04	422.7
3	-3.00E-02	2.70E-02	7.42E-01	3.99E-04	5.32E-04	428.3
4	-2.31E-02	2.52E-02	6.80E-01	7.57E-04	1.08E-03	437.1
5	-1.17E-02	1.97E-02	5.21E-01	1.37E-03	1.59E-03	445.5
6	-3.01E-02	2.86E-02	7.42E-01	-	-	454.1
7	-2.97E-02	2.46E-02	6.28E-01	2.97E-03	3.28E-03	461.2
8	-1.31E-02	1.80E-02	4.57E-01	1.79E-03	1.83E-03	464.1
9	-2.58E-02	2.45E-02	6.11E-01	2.73E-03	2.80E-03	471.9
10	-2.14E-02	2.33E-02	5.73E-01	2.34E-03	2.55E-03	478.3

Light off			Generation rate			
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g bw)**	**NH_3 (g/hr/100g)**	**Max NH_3 (g/hr/100g)**	**Mice wt (g)**
1	-3.71E-02	4.34E-02	1.22E+00	5.67E-04	6.38E-04	421.0
2	-2.78E-02	2.85E-02	7.95E-01	5.24E-04	7.59E-04	422.7
3	-2.96E-02	3.63E-02	9.99E-01	6.99E-04	8.39E-04	428.3
4	-1.80E-02	2.85E-02	7.69E-01	1.23E-03	1.44E-03	437.1
5	-1.49E-02	2.63E-02	6.95E-01	1.29E-03	1.42E-03	445.5
6	-9.99E-03	3.41E-02	8.85E-01	1.59E-03	1.65E-03	454.1
7	-3.46E-02	3.69E-02	9.44E-01	2.59E-03	2.69E-03	461.2
8	-3.38E-02	2.81E-02	7.12E-01	2.04E-03	2.24E-03	464.1
9	-3.00E-02	3.20E-02	7.98E-01	4.71E-03	4.78E-03	471.9
10	-2.80E-02	3.23E-02	7.97E-01	3.43E-03	4.01E-03	478.3

3.4.1.4 Individual Calorimeter Data (O_2 percent, CO_2 percent, and NH_3 ppm) for Test 2

For cages: 1,2,3,4
Desired temperature: 24+-1.5 ^oC **Desired humidity:** 30-35 percent

Lights on										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^oC)**	**Bar. press (in)**
1	1	20.17	0.63	0	0	0	4.98	67.24	22.23	29.77
2	3	19.97	0.62	0	3	3	4.99	60.60	23.31	29.77
3	2	20.10	0.55	0	2	2	5.01	54.46	24.80	29.83
4	1	20.10	0.55	1	2	2	4.92	57.10	24.88	30.06
5	3	20.07	-	1	10	11	5.08	60.47	24.21	30.04
6	2	20.00	0.52	4	15	18	4.89	51.85	26.09	29.83
7	1	20.10	0.50	2	10	10	5.93	54.42	24.05	29.72
8	3	20.30	0.30	2	21	28	7.71	46.63	22.85	29.92
9	2	20.40	0.23	9	9	10	9.05	46.97	23.64	29.79
10	1	20.33	0.26	12	21	30	9.18	48.33	22.53	29.72

Light off										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^oC)**	**Bar. press (in)**
1	1	20.00	0.74	0	2	2	4.99	69.74	22.26	29.77
2	3	19.93	0.76	0	0	0	4.97	59.57	23.56	29.77
3	2	19.93	0.77	0	1	2	4.96	62.64	24.95	29.86
4	1	19.90	0.80	1	6	6	4.89	63.70	25.14	29.82
5	3	19.70	0.62	2	11	12	5.08	64.44	23.81	30.04
6	2	19.80	0.66	5	21	22	4.92	57.95	24.82	29.80
7	1	20.03	0.72	2	17	24	5.83	64.04	23.35	29.83
8	3	20.23	0.47	5	-	-	7.74	50.30	22.93	29.92
9	2	20.27	0.37	11	43	54	8.80	50.61	23.75	29.79
10	1	20.30	0.36	12	31	43	9.18	52.38	22.60	29.74

For cages: 5,6,7,8
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Lights on										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	2	20.07	0.64	1	1	1	5.04	75.50	23.07	29.77
2	1	20.00	0.65	0	3	3	4.99	81.77	22.49	29.77
3	3	19.97	0.61	1	2	3	5.16	74.72	23.30	29.83
4	2	19.97	0.59	2	2	2	4.98	78.84	24.57	30.06
5	1	20.00	-	21	14	19	4.99	78.00	23.82	30.04
6	3	19.90	0.50	85	80	84	5.11	73.49	23.88	29.83
7	2	20.13	0.46	84	88	89	6.19	81.90	24.75	29.72
8	1	20.17	0.35	104	121	123	7.88	77.32	22.52	29.92
9	3	20.17	0.32	123	138	162	9.24	68.72	22.60	29.79
10	2	20.17	0.37	140	130	145	8.80	79.92	23.74	29.72

Light off										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	2	19.93	0.70	0	2	3	4.99	73.94	22.98	29.77
2	1	19.67	0.79	0	1	1	5.04	83.50	22.84	29.77
3	3	19.97	0.76	0	2	2	5.05	79.49	23.96	29.86
4	2	19.93	0.73	8	7	8	4.96	83.82	24.49	29.82
5	1	19.63	0.71	46	41	42	5.04	86.86	24.21	30.04
6	3	19.87	0.67	90	127	135	5.19	75.74	24.21	29.80
7	2	19.90	0.74	110	135	147	5.94	87.53	24.44	29.83
8	1	20.07	0.51	126	127	132	7.82	77.27	22.54	29.92
9	3	20.17	0.39	125	151	158	9.24	75.21	22.56	29.79
10	2	20.10	0.38	150	133	139	8.85	77.72	23.67	29.74

For cages: 9,10,11,12
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Lights on										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	3	20.07	0.67	0	0	0	4.99	73.03	22.90	29.77
2	2	20.20	0.63	0	4	4	5.02	83.00	23.09	29.77
3	1	20.07	0.62	0	2	2	4.97	82.87	24.72	29.83
4	3	20.00	0.60	8	2	3	5.11	74.05	23.69	30.06
5	2	19.93	-	57	43	47	5.09	77.25	24.69	30.04
6	1	19.87	0.47	90	105	109	5.03	75.79	24.96	29.83
7	3	20.03	0.54	86	89	92	6.03	72.58	23.92	29.72
8	2	20.10	0.33	109	139	142	7.64	78.55	23.72	29.92
9	1	20.20	0.31	120	118	122	9.24	79.03	22.37	29.79
10	3	20.10	0.42	86	95	102	9.09	76.20	23.02	29.72

Light off										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	3	19.93	0.75	0	2	3	4.91	74.26	23.01	29.77
2	2	19.73	0.73	0	1	1	4.88	80.43	23.49	29.77
3	1	19.83	0.88	0	1	2	4.89	84.37	25.41	29.86
4	3	19.73	0.83	10	10	12	5.03	79.44	23.72	29.82
5	2	19.67	0.68	76	65	69	4.96	82.81	24.82	30.04
6	1	19.80	0.75	105	125	132	5.03	81.10	24.13	29.80
7	3	19.90	0.74	105	147	153	6.03	76.52	23.66	29.83
8	2	20.03	0.50	126	146	153	7.75	76.81	23.64	29.92
9	1	20.10	0.45	145	130	135	9.18	77.56	22.43	29.79
10	3	20.07	0.45	96	116	128	9.09	81.03	22.68	29.74

For room
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 35-40 percent

Lights on										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	-	20.73	0.03	0	-1	0	-	38.10	18.54	29.77
2	-	20.73	0.06	0	3	3	-	37.30	19.29	29.77
3	-	20.60	0.04	0	2	2	-	35.84	21.09	29.83
4	-	20.70	0.06	0	2	2	-	36.06	20.79	30.06
5	-	20.77	-	0	5	7	-	36.99	21.49	30.04
6	-	20.50	0.06	0	15	17	-	38.10	18.54	29.83
7	-	20.73	0.06	0	3	3	-	37.30	19.29	29.72
8	-	20.67	0.03	0	16	22	-	42.06	20.72	29.92
9	-	20.70	0.03	0	4	6	-	29.78	20.75	29.79
10	-	20.60	0.03	0	31	43	-	42.07	20.53	29.72

Light off										
Day	**Calor.**	**O_2 (percent)**	**CO_2 (percent)**	**Tube NH_3 (ppm)**	**NH_3 (ppm)**	**Max NH_3 (ppm)**	**Airflow (l/min)**	**Actual RH (percent)**	**Temp. (^{o}C)**	**Bar. press (in)**
1	-	20.80	0.05	0	3	3	-	39.47	18.58	29.77
2	-	20.60	0.05	0	1	1	-	38.03	19.67	29.77
3	-	20.70	0.06	0	2	2	-	35.71	21.47	29.86
4	-	20.67	0.06	0	6	7	-	37.99	20.76	29.82
5	-	20.60	0.04	0	8	9	-	39.77	20.06	30.04
6	-	20.50	0.04	0	23	24	-	39.47	18.58	29.80
7	-	20.60	0.05	0	1	1	-	38.03	19.67	29.83
8	-	20.67	0.03	0	-	-	-	40.72	20.91	29.92
9	-	20.70	0.03	0	51	135	-	31.54	20.86	29.79
10	-	20.60	0.03	0	45	60	-	43.86	20.71	29.74

For cages: 1,2,3,4 a. data based on calorimetric tube. b. data based on PhD meter
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 30-35 percent

Light on				Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 [a] (g/hr/100g)	NH_3 [b] (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-2.81E-02	2.97E-02	8.51E-01	0.00E+00	-1.84E-05	0.00E+00	411.7
2	-3.81E-02	2.79E-02	7.89E-01	0.00E+00	1.63E-04	1.63E-04	417.1
3	-2.50E-02	2.54E-02	7.01E-01	0.00E+00	8.91E-05	1.07E-04	426.9
4	-2.95E-02	2.43E-02	6.54E-01	5.13E-05	1.03E-04	1.03E-04	437.4
5	-3.57E-02	-	-	5.24E-05	5.07E-04	5.76E-04	442.0
6	-2.45E-02	2.23E-02	5.89E-01	2.00E-04	7.65E-04	8.98E-04	447.1
7	-3.74E-02	2.59E-02	6.74E-01	1.19E-04	5.97E-04	5.97E-04	453.0
8	-2.85E-02	2.06E-02	5.28E-01	1.53E-04	1.58E-03	2.14E-03	459.2
9	-2.71E-02	1.84E-02	4.66E-01	7.54E-04	8.28E-04	8.87E-04	464.8
10	-2.45E-02	2.11E-02	5.28E-01	1.02E-03	1.83E-03	2.66E-03	471.8

Light off				Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 [a] (g/hr/100g)	NH_3 [b] (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-3.99E-02	3.45E-02	9.86E-01	0.00E+00	9.21E-05	1.11E-04	411.7
2	-3.31E-02	3.51E-02	9.92E-01	0.00E+00	0.00E+00	0.00E+00	417.1
3	-3.80E-02	3.54E-02	9.76E-01	0.00E+00	5.30E-05	1.06E-04	426.9
4	-3.77E-02	3.60E-02	9.71E-01	5.10E-05	2.89E-04	3.06E-04	437.4
5	-4.57E-02	2.96E-02	7.90E-01	7.86E-05	5.94E-04	6.29E-04	442.0
6	-3.44E-02	3.05E-02	8.04E-01	2.51E-04	1.05E-03	1.10E-03	447.1
7	-3.30E-02	3.92E-02	1.02E+00	1.17E-04	1.02E-03	1.41E-03	453.0
8	-3.38E-02	3.43E-02	8.80E-01	3.84E-04	-	-	459.2
9	-3.81E-02	2.99E-02	7.58E-01	9.49E-04	3.68E-03	4.66E-03	464.8
10	-2.75E-02	3.06E-02	7.65E-01	1.06E-03	2.75E-03	3.82E-03	471.8

For cages: 5,6,7,8 a. data based on calorimetric tube. b. data based on PhD meter.
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Light on				Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 [a] (g/hr/100g)	NH_3 [b] (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-3.34E-02	3.07E-02	8.71E-01	5.52E-05	3.68E-05	5.52E-05	415.9
2	-3.65E-02	2.93E-02	8.31E-01	0.00E+00	1.64E-04	1.64E-04	415.2
3	-3.27E-02	2.96E-02	8.34E-01	0.00E+00	1.13E-04	1.69E-04	418.1
4	-3.66E-02	2.66E-02	7.33E-01	7.98E-05	1.06E-04	1.06E-04	427.1
5	-3.84E-02	-	-	1.10E-03	7.51E-04	9.96E-04	434.2
6	-3.07E-02	2.27E-02	6.01E-01	4.46E-03	4.22E-03	4.41E-03	444.1
7	-3.70E-02	2.46E-02	6.47E-01	5.30E-03	5.54E-03	5.62E-03	447.2
8	-3.97E-02	2.55E-02	6.62E-01	8.24E-03	9.56E-03	9.74E-03	453.5
9	-4.93E-02	2.71E-02	6.95E-01	1.13E-02	1.26E-02	1.48E-02	459.9
10	-3.81E-02	2.99E-02	7.60E-01	1.21E-02	1.12E-02	1.25E-02	463.7

Light off				Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 [a] (g/hr/100g)	NH_3 [b] (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-4.33E-02	3.25E-02	9.20E-01	0.00E+00	1.28E-04	1.64E-04	415.9
2	-4.70E-02	3.73E-02	1.06E+00	0.00E+00	3.69E-05	5.53E-05	415.2
3	-3.71E-02	3.55E-02	1.00E+00	0.00E+00	9.19E-05	1.10E-04	418.1
4	-3.65E-02	3.31E-02	9.12E-01	4.24E-04	3.71E-04	4.24E-04	427.1
5	-4.88E-02	3.40E-02	9.22E-01	2.44E-03	2.15E-03	2.22E-03	434.2
6	-3.29E-02	3.25E-02	8.63E-01	4.79E-03	6.75E-03	7.19E-03	444.1
7	-4.16E-02	4.08E-02	1.08E+00	6.67E-03	8.16E-03	8.91E-03	447.2
8	-4.72E-02	3.76E-02	9.76E-01	9.91E-03	1.00E-02	1.04E-02	453.5
9	-4.93E-02	3.30E-02	8.45E-01	1.15E-02	1.39E-02	1.45E-02	459.9
10	-4.42E-02	3.13E-02	7.94E-01	1.30E-02	1.16E-02	1.21E-02	463.7

For cages: 9,10,11,12 a. data based on calorimetric tube. b. data based on PhD meter.

Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Light on				Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 [a] (g/hr/100g)	NH_3 [b] (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-3.31E-02	3.21E-02	9.09E-01	0.00E+00	0.00E+00	0.00E+00	415.9
2	-2.66E-02	2.86E-02	8.02E-01	0.00E+00	1.99E-04	2.18E-04	420.6
3	-2.65E-02	2.86E-02	7.95E-01	0.00E+00	8.88E-05	1.07E-04	424.9
4	-3.58E-02	2.76E-02	7.51E-01	4.30E-04	1.25E-04	1.61E-04	433.0
5	-4.26E-02	-	-	3.00E-03	2.24E-03	2.47E-03	441.2
6	-3.18E-02	2.08E-02	5.46E-01	4.60E-03	5.38E-03	5.57E-03	448.8
7	-4.20E-02	2.87E-02	7.54E-01	5.26E-03	5.47E-03	5.63E-03	449.3
8	-4.36E-02	2.29E-02	5.96E-01	8.34E-03	1.07E-02	1.09E-02	453.4
9	-4.62E-02	2.59E-02	6.62E-01	1.10E-02	1.08E-02	1.12E-02	460.2
10	-4.54E-02	3.54E-02	8.98E-01	7.66E-03	8.46E-03	9.09E-03	465.2

Light off				Generation rate			
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 [a] (g/hr/100g)	NH_3 [b] (g/hr/100g)	Max NH_3 (g/hr/100g)	Mice wt (g)
1	-4.26E-02	3.45E-02	9.79E-01	0.00E+00	1.26E-04	1.61E-04	415.9
2	-4.23E-02	3.32E-02	9.30E-01	0.00E+00	3.53E-05	5.29E-05	420.6
3	-4.24E-02	4.01E-02	1.11E+00	0.00E+00	7.00E-05	1.05E-04	424.9
4	-4.71E-02	3.89E-02	1.06E+00	5.29E-04	5.29E-04	6.35E-04	433.0
5	-4.63E-02	3.17E-02	8.48E-01	3.89E-03	3.35E-03	3.54E-03	441.2
6	-3.52E-02	3.57E-02	9.37E-01	5.36E-03	6.38E-03	6.74E-03	448.8
7	-4.22E-02	4.16E-02	1.09E+00	6.42E-03	8.99E-03	9.36E-03	449.3
8	-4.93E-02	3.67E-02	9.53E-01	9.81E-03	1.14E-02	1.19E-02	453.4
9	-5.51E-02	3.83E-02	9.80E-01	1.32E-02	1.18E-02	1.23E-02	460.2
10	-4.85E-02	3.79E-02	9.59E-01	8.55E-03	1.03E-02	1.14E-02	465.2

3.4.1.5 Water Production Data: Data Used for Calculating Water Production for Test 1

For cages: 1,2,3,4
Desired temperature: 24+-1.5 C Desired humidity: 30-35 percent

Day	Average RH (percent)	Room RH (percent)	Actual T (^oC)	Room T (^oC)	Actual[1] (g/kg)	Room[2] (g/kg)	Airflow[3] (l/min)	Dried airflow[4] (l/min)	Mice wt (g)
1	55.30	36.45	21.27	19.26	8.75	5.00	5.06	2.28	401.6
2	53.07	36.77	23.30	21.30	9.50	5.50	4.92	0.73	408.0
3	53.95	47.03	23.68	19.89	9.75	6.75	5.03	1.08	413.9
4	47.22	41.31	24.83	22.40	9.25	7.00	4.99	0.97	420.3
5	47.05	34.15	24.68	22.27	9.00	5.75	4.90	0.75	429.5
6	48.75	38.07	24.82	20.88	9.40	5.75	4.69	1.07	437.1
7	39.90	35.67	26.98	21.59	9.00	5.75	4.99	1.46	441.1
8	46.72	40.66	24.13	21.54	8.50	6.75	4.67	0.87	449.9
9	53.43	39.85	24.56	21.46	10.25	6.25	5.12	1.04	449.7
10	46.36	38.93	25.00	21.59	9.00	6.25	5.05	0.61	459.4

For cages: 5,6,7,8
Desired temperature: 24+-1.5 C Desired humidity: 75-80 percent

Day	Average RH (percent)	Room RH (percent)	Actual T (^oC)	Room T (^oC)	Actual[1] (g/kg)	Room[2] (g/kg)	Airflow[3] (l/min)	Dried airflow[4] (l/min)	Mice wt (g)
1	71.98	36.45	23.41	19.26	13.00	5.00	4.78	1.27	409.8
2	77.34	36.77	22.09	21.30	12.75	5.50	4.86	2.26	410.1
3	76.67	47.03	23.25	19.89	13.5	6.75	5.18	0.19	417.5
4	71.30	41.31	24.19	22.40	13.25	7.00	4.91	1.22	424.7
5	77.28	34.15	25.13	22.27	15.25	5.75	4.99	1.36	427.8
6	74.11	38.07	24.58	20.88	14.75	5.75	5.04	0.88	433.2
7	76.78	35.67	24.68	21.59	14.75	5.75	4.89	0.90	442.8
8	79.46	40.66	24.89	21.54	15.75	6.75	5.02	0.61	449.4
9	75.20	39.85	23.75	21.46	14.00	6.25	4.95	0.81	454.7
10	73.22	38.93	24.51	21.59	14.25	6.25	5.03	1.15	461.1

For cages: 9,10,11,12
Desired temperature: 24+-1.5 °C Desired humidity: 30-35 percent

Day	Average RH (percent)	Room RH (percent)	Actual T (°C)	Room T (°C)	Actual[1] (g/kg)	Room[2] (g/kg)	Airflow[3] (l/min)	Dried airflow[4] (l/min)	Mice wt (g)
1	57.77	36.45	23.26	19.26	10.5	5.00	6.30	0.95	421
2	56.10	36.77	24.64	21.30	10.75	5.50	4.75	0.81	422.7
3	49.21	47.03	14.68	19.89	5.00	6.75	4.96	2.37	428.3
4	55.95	41.31	23.57	22.40	10.00	7.00	4.93	-	437.1
5	50.01	34.15	24.96	22.27	10.00	5.75	4.98	1.24	445.5
6	46.66	38.07	24.28	20.88	8.75	5.75	5.00	1.73	454.1
7	49.72	35.67	24.31	21.59	9.50	5.75	4.95	0.86	461.2
8	47.54	40.66	24.63	21.54	9.25	6.75	4.99	1.22	464.1
9	48.03	39.85	25.02	21.46	9.50	6.25	5.08	0.76	471.9
10	47.88	38.93	24.06	21.59	9.00	6.25	4.95	0.78	478.3

1. Humidity ratio (w) grams moisture per kilogram dry air for calorimeter
2. Humidity ratio (w) grams moisture per kilogram dry air for chamber
3. Total measured fresh air exchange rate for calorimeter
4. Portion of fresh air that passed through a column of desiccant

Water Production Data for Test 1

For cages: 1,2,3,4
Desired temperature: 24+-1.5 C Desired humidity: 30-35 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100 bw)	Total water (g/hr/100g bw)
1	2.41E-01	7.68E-01	6.92E-01	-	1.22E+00
2	3.93E-01	7.98E-01	6.76E-01	-	1.08E+00
3	4.49E-01	8.25E-01	5.70E-01	-	9.46E-01
4	4.67E-01	7.66E-01	5.26E-01	-	8.24E-01
5	3.87E-01	7.16E-01	4.56E-01	-	7.85E-01
6	3.32E-01	7.03E-01	4.83E-01	-	8.54E-01
7	3.21E-01	7.10E-01	4.19E-01	-	8.08E-01
8	3.98E-01	6.15E-01	4.91E-01	-	7.09E-01
9	3.95E-01	8.14E-01	2.78E-01	-	6.97E-01
10	4.20E-01	6.89E-01	4.61E-01	-	7.30E-01

For cages: 5,6,7,8
Desired temperature: 24+-1.5 C Desired humidity: 75-80 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100g bw)	Total water (g/hr/100g bw)
1	2.98E-01	1.06E+00	1.78E-01	1.54E+00	-6.01E-01
2	2.43E-01	1.05E+00	6.22E-01	2.93E-01	1.14E+00
3	5.62E-01	1.17E+00	1.87E-01	0.00E+00	7.92E-01
4	4.25E-01	1.07E+00	1.77E-01	0.00E+00	8.20E-01
5	3.40E-01	1.24E+00	4.68E-03	3.74E-01	5.31E-01
6	3.85E-01	1.20E+00	9.70E-02	0.00E+00	9.08E-01
7	3.61E-01	1.14E+00	6.10E-02	2.60E-01	5.75E-01
8	4.61E-01	1.22E+00	4.78E-01	4.67E-01	7.75E-01
9	3.96E-01	1.06E+00	4.18E-01	2.64E-01	8.20E-01
10	3.66E-01	1.08E+00	3.73E-01	0.00E+00	1.09E+00

For cages: 9,10,11,12
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 30-35 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100 bw)	Total water (g/hr/100g bw)
1	4.43E-01	1.10E+00	8.31E-01	-	1.48E+00
2	3.57E-01	8.41E-01	6.01E-01	-	1.09E+00
3	2.85E-01	4.04E-01	7.70E-01	-	8.89E-01
4	5.51E-01	7.86E-01	6.13E-01	-	8.49E-01
5	3.36E-01	7.79E-01	7.30E-01	-	1.17E+00
6	2.89E-01	6.72E-01	4.76E-01	-	8.58E-01
7	3.55E-01	7.10E-01	4.71E-01	-	8.26E-01
8	3.82E-01	6.93E-01	4.29E-01	-	7.40E-01
9	3.99E-01	7.13E-01	2.69E-01	-	5.83E-01
10	3.80E-01	6.49E-01	4.75E-01	-	7.44E-01

3.4.1.6 Water Production Data: Data Used for Calculating Water Production for Test 2

For cages: 1,2,3,4
Desired temperature: 24+-1.5 °C Desired humidity: 30-35 percent

Day	Average RH (percent)	Room RH (percent)	Actual T (°C)	Room T (°C)	Actual[1] (g/kg)	Room[2] (g/kg)	Airflow[3] (l/min)	Dried airflow[4] (l/min)	Mice wt (g)
1	63.42	38.29	22.25	18.56	10.75	5.00	4.99	1.88	411.7
2	52.05	37.58	23.44	19.48	9.50	5.00	4.98	1.13	417.1
3	51.42	35.39	24.88	21.28	10.00	5.50	4.98	1.42	426.9
4	53.80	36.42	25.01	20.78	11.00	5.25	4.91	0.70	437.4
5	56.41	40.29	24.01	20.78	10.50	6.50	5.08	0.83	442.0
6	49.15	35.65	25.46	18.56	10.25	4.75	4.91	1.38	447.1
7	52.18	42.37	23.70	19.48	10.00	6.00	5.88	0.54	453.0
8	43.07	41.29	22.89	20.82	7.75	6.25	7.73	1.56	459.2
9	44.55	31.62	23.70	20.81	8.50	4.75	8.92	2.11	464.8
10	45.33	43.04	22.56	20.62	7.75	6.75	9.18	0.95	471.8

For cages: 5,6,7,8
Desired temperature: 24+-1.5 °C Desired humidity: 75-80 percent

Day	Average RH (percent)	Room RH (percent)	Actual T (°C)	Room T (°C)	Actual[1] (g/kg)	Room[2] (g/kg)	Airflow[3] (l/min)	Dried airflow[4] (l/min)	Mice wt (g)
1	72.82	38.29	23.03	18.56	13.25	5.00	5.02	1.51	415.9
2	80.59	37.58	22.66	19.48	14.25	5.00	5.02	0.87	415.2
3	73.85	35.39	23.63	21.28	13.75	5.50	5.11	1.07	418.1
4	80.46	36.42	24.53	20.78	15.75	5.25	4.97	1.31	427.1
5	81.55	40.29	24.02	20.78	15.24	6.50	5.02	0.48	434.2
6	73.43	35.65	24.04	18.56	14.00	4.75	5.15	0.97	444.1
7	79.63	42.37	24.60	19.48	15.50	6.00	6.07	1.52	447.2
8	75.70	41.29	22.53	20.82	13.00	6.25	7.85	0.88	453.5
9	69.52	31.62	22.58	20.81	12.00	4.75	9.24	1.54	459.9
10	76.08	43.04	23.70	20.62	14.00	6.75	8.82	2.23	463.7

For cages: 9,10,11,12
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Day	Average RH (percent)	Room RH (percent)	Actual T (^{o}C)	Room T (^{o}C)	Actual[1] (g/kg)	Room[2] (g/kg)	Airflow[3] (l/min)	Dried airflow[4] (l/min)	Mice wt (g)
1	70.91	38.29	22.95	18.56	12.50	4.75	4.95	1.09	415.9
2	80.86	37.58	23.29	19.48	14.75	5.00	4.95	1.41	420.6
3	78.90	35.39	25.07	21.28	16.00	5.50	4.93	0.71	424.9
4	74.99	36.42	23.70	20.78	14.00	5.25	5.07	1.00	433.0
5	78.41	40.29	24.76	20.78	15.25	6.50	5.02	1.07	441.2
6	76.71	35.65	24.55	18.56	15.00	4.75	5.03	0.67	448.8
7	72.75	42.37	23.79	19.48	13.50	6.00	6.03	1.27	449.3
8	75.97	41.29	23.68	20.82	14.00	6.25	7.69	1.82	453.4
9	75.10	31.62	22.40	20.81	12.75	4.75	9.21	0.93	460.2
10	75.45	43.04	22.85	20.62	13.50	6.75	9.09	1.77	465.2

1. Humidity ratio (w) grams moisture per kilogram dry air for calorimeter
2. Humidity ratio (w) grams moisture per kilogram dry air for chamber
3. Total measured fresh air exchange rate
4. Portion of fresh air that pass through a column of desiccant

Water Production Data for Test 2
For cages: 1,2,3,4
Desired temperature: 24+-1.5 ^{o}C Desired humidity: 30-35 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100 bw)	Total water (g/hr/100g bw)
1	2.63E-01	9.08E-01	3.84E-01	-	1.03E+00
2	3.21E-01	7.90E-01	6.28E-01	-	1.10E+00
3	3.20E-01	8.14E-01	3.79E-01	-	8.73E-01
4	3.52E-01	8.60E-01	3.52E-01	-	8.60E-01
5	4.35E-01	8.41E-01	3.87E-01	-	7.93E-01
6	2.61E-01	7.84E-01	3.76E-01	-	8.99E-01
7	4.93E-01	9.05E-01	2.36E-01	-	6.48E-01
8	5.85E-01	9.09E-01	4.16E-01	-	7.40E-01
9	4.85E-01	1.14E+00	2.97E-01	-	9.49E-01
10	8.21E-01	1.05E+00	3.48E-01	-	5.78E-01

For cages: 5,6,7,8

Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100g bw)	Total water (g/hr/100g bw)
1	2.94E-01	1.11E+00	2.40E-03	0.00E+00	8.22E-01
2	3.48E-01	1.20E+00	0.00E+00	4.34E-01	4.18E-01
3	3.70E-01	1.17E+00	0.00E+00	7.18E-02	7.29E-01
4	3.14E-01	1.28E+00	8.90E-02	0.00E+00	1.05E+00
5	4.73E-01	1.23E+00	2.30E-03	0.00E+00	7.57E-01
6	3.11E-01	1.13E+00	6.76E-03	2.25E-01	6.02E-01
7	4.26E-01	1.47E+00	3.02E-01	5.81E-01	7.61E-01
8	6.69E-01	1.57E+00	8.82E-03	4.41E-02	8.64E-01
9	5.54E-01	1.68E+00	0.00E+00	3.91E-01	7.35E-01
10	6.68E-01	1.86E+00	6.47E-03	5.82E-01	6.12E-01

For cages: 9,10,11,12

Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100 bw)	Total water (g/hr/100g bw)
1	3.07E-01	1.04E+00	5.29E-02	0.00E+00	7.82E-01
2	2.94E-01	1.21E+00	0.00E+00	1.43E-01	7.74E-01
3	3.80E-01	1.29E+00	2.52E-01	2.35E-01	9.30E-01
4	3.44E-01	1.14E+00	1.18E-01	0.00E+00	9.16E-01
5	4.06E-01	1.21E+00	0.00E+00	0.00E+00	8.04E-01
6	3.21E-01	1.17E+00	0.00E+00	6.68E-02	7.83E-01
7	4.43E-01	1.26E+00	2.23E-03	0.00E+00	8.22E-01
8	5.64E-01	1.66E+00	0.00E+00	2.21E-01	8.71E-01
9	5.96E-01	1.78E+00	0.00E+00	8.69E-02	1.10E+00
10	7.40E-01	1.84E+00	0.00E+00	9.46E-01	1.52E-01

3.4.1.7 Raw Weight Data Test 1

Mice Weight Data

Mice weight (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Cage1	99.8	101.5	103.5	105.0	107.1	107.8	108.8	110.8	110.4	113.4	115.5
Cage2	99.4	101.7	103.1	103.9	105.2	107.6	108.5	109.2	110.1	111.3	114.3
Cage3	103.3	104.2	104.9	106.5	109.4	110.4	113.2	116.3	114.8	119.1	119.7
Cage4	99.1	100.6	102.4	104.9	107.8	111.3	110.6	113.6	114.4	115.6	117.1
Total wt	**401.6**	**408.0**	**413.9**	**420.3**	**429.5**	**437.1**	**441.1**	**449.9**	**449.7**	**459.4**	**466.6**
Cage5	104.7	107.5	109.4	112.1	114.5	115.7	118.3	120.4	121.3	123.3	124.8
Cage6	100.5	100.6	103	104.4	104.8	106.6	109.4	111.3	113.4	115.7	117.7
Cage7	102.2	98.2	99.2	99.5	99.4	99.2	101.2	102.9	104.4	106.3	107.6
Cage8	102.4	103.8	105.9	108.7	109.1	111.7	113.9	114.8	115.6	115.8	116.3
Total wt	**409.8**	**410.1**	**417.5**	**424.7**	**427.8**	**433.2**	**442.8**	**449.4**	**454.7**	**461.1**	**466.4**
Cage9	104	103.5	103.7	105.6	108	108.5	110.2	110.8	112.0	112.7	114.5
Cage10	105.6	106.9	109.3	111.1	112.8	115.0	116.9	117.9	119.5	122	123.4
Cage11	105.7	106.5	107.6	109.7	112.4	114.0	114.4	114.7	117.4	117.9	119.2
Cage12	105.7	105.8	107.7	110.7	112.3	116.6	119.7	120.7	123.0	125.7	127.4
Total wt	**421**	**422.7**	**428.3**	**437.1**	**445.5**	**454.1**	**461.2**	**464.1**	**471.9**	**478.3**	**484.5**

Litter Weight

Litter weight (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7***	**8***	**9***	**10**	**11**
Cage1	98.7	110.4	134.6	136.7	136.5	144.8	146.9	-44.8	169.4	179.5	180.1
Cage2	91.6	95.6	104.7	117.4	126.9	130.0	142.5	150.6	162.7	164.7	173.0
Cage3	99.7	102.2	112.0	126.6	128.2	135.8	154	167.6	183.7	189.5	192.3
Cage4	120.1	120.2	132.6	147.1	151.1	153.9	167.9	-16.4	194.2	192.7	200.9
Total litter wt	**410.1**	**428.4**	**483.9**	**527.8**	**542.7**	**564.5**	**611.3**		**710**	**726.4**	**746.3**
Cage5	93.3	110.8	132.0	160.2	157.0	174.7	192.6	20.0	226.1	226.8	239.4
Cage6	113.2	123.5	139.2	150.6	156.5	180.3	188.3	198.6	213.6	227.2	238.0
Cage7	88.1	102.4	119.0	130.2	136	140.8	149.7	159.7	176.2	185.3	187.7
Cage8	111.1	122.4	138.1	151.9	155.9	161.1	173.7	-438.8	197.7	211.5	215.0
Total litter wt	**405.7**	**459.1**	**528.3**	**592.9**	**605.4**	**656.9**	**704.3**		**813.6**	**850.8**	**880.1**
Cage9	81.2	89.2	102.0	117.6	114.0	126.7	148.4	142.8	152.4	162.5	169.5
Cage10	96.5	105.3	118.8	136.6	135.4	141.7	152.9	152.0	162.1	174.4	184.5
Cage11	106.5	110.5	119.3	129.9	142.4	151.3	-59.8	175.6	189.0	192.1	198.2
Cage12	111.3	113.4	122.4	133.5	144.9	150.7	164.9	177.8	198.4	199.4	205.1
Total litter wt	**395.5**	**418.4**	**462.5**	**517.6**	**536.7**	**570.4**		**648.2**	**701.9**	**728.4**	**757.3**

*weights were recorded wrong on day #8 which affected the data on days #7-#9

Daily Litter Weight Gain

Daily litter weight gain (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7***	**8***	**9***	**10**	**Ave.**
Cage1	11.7	24.2	2.1	-0.2	8.3	2.1	-191.7	214.2	10.1	0.6	
Cage2	4.0	9.1	12.7	9.5	3.1	12.5	8.1	12.1	2.0	8.3	
Cage3	2.5	9.8	14.6	1.6	7.6	18.2	13.6	16.1	5.8	2.8	
Cage4	0.1	12.4	14.5	4.0	2.8	14.0	-184.3	210.6	-1.5	8.2	
Total litter wt gain	**18.3**	**55.5**	**43.9**	**14.9**	**21.8**	**46.8**			**16.4**	**19.9**	**29.7**
Cage5	17.5	21.2	28.2	-3.2	17.7	17.9	-172.6	206.1	0.7	12.6	
Cage6	10.3	15.7	11.4	5.9	23.8	8.0	10.3	15.0	13.6	10.8	
Cage7	14.3	16.6	11.2	5.8	4.8	8.9	10.0	16.5	9.1	2.4	
Cage8	11.3	15.7	13.8	4.0	5.2	12.6	-612.5	636.5	13.8	3.5	
Total litter wt gain	**53.4**	**69.2**	**64.6**	**12.5**	**51.5**	**47.4**			**37.2**	**29.3**	**45.6**
Cage9	8.0	12.8	15.6	-3.6	12.7	21.7	-5.6	9.6	10.1	7.0	
Cage10	8.8	13.5	17.8	-1.2	6.3	11.2	-0.9	10.1	12.3	10.1	
Cage11	4.0	8.8	10.6	12.5	8.9	-211.1	235.4	13.4	3.1	6.1	
Cage12	2.1	9.0	11.1	11.4	5.8	14.2	12.9	20.6	1.0	5.7	
Total litter wt gain	**22.9**	**44.1**	**55.1**	**19.1**	**33.7**			**53.7**	**26.5**	**28.9**	**35.5**

*weights were recorded wrong on day #8 which affected the data on days #7-#9

3.4.1.8 Raw Weight Data Test 2

Mice Weight

Mice weight (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Cage1	106.6	104.6	106.4	109.4	111.8	111.7	112.5	114.0	114.4	116.4	115.6
Cage2	103.1	105.8	109.1	110.6	110.7	113.9	115.0	116.7	118.8	121.0	121.9
Cage3	103.5	105.8	108.8	110.8	112.2	113.0	115.3	116.2	117.7	118.1	118.7
Cage4	98.5	100.9	102.6	106.6	107.3	108.5	110.2	112.3	113.9	116.3	115.8
Total wt	**411.7**	**417.1**	**426.9**	**437.4**	**442.0**	**447.1**	**453.0**	**459.2**	**464.8**	**471.8**	**472.0**
Cage5	105.8	105.5	104.3	105.7	107.2	109.8	110.8	112.7	112.7	114.6	115.4
Cage6	104.1	105.4	107.1	110.2	112.7	116	116.9	119.0	121.4	120.1	119.7
Cage7	101.8	102.7	104.7	107.2	108.9	111.5	112.1	112.8	114	116.7	117.4
Cage8	104.2	101.6	102.0	104.0	105.4	106.8	107.4	109.0	111.8	112.3	112.8
Total wt	**415.9**	**415.2**	**418.1**	**427.1**	**434.2**	**444.1**	**447.2**	**453.5**	**459.9**	**463.7**	**465.3**
Cage9	103.8	102.2	103.3	105.1	107.8	109.7	110.2	110.5	111.8	112.7	115.6
Cage10	103.7	107.1	105.7	107.9	109.2	110.6	111.0	110.2	111.8	113.7	115.1
Cage11	103.2	103.5	104.3	105.1	107.4	108.9	109.0	111.5	112.3	113.8	115.2
Cage12	105.2	107.8	111.6	114.9	116.8	119.6	119.1	121.2	124.3	125.0	125.4
Total wt	**415.9**	**420.6**	**424.9**	**433.0**	**441.2**	**448.8**	**449.3**	**453.4**	**460.2**	**465.2**	**471.3**

Litter Weight

Litter weight (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Cage1	70.7	82.6	93.5	105.2	122.9	125.0	131.8	140.6	153.9	160.4	177
Cage2	76.8	87.5	96.3	109.2	125.8	127.5	134.8	149.3	149.9	159.6	172.1
Cage3	89.5	99.0	109.4	120.8	136.7	141.8	153.4	165.6	176.3	180.6	192.2
Cage4	77.0	85.6	95.1	106.0	124.1	126.2	135.6	146.5	158.1	162.7	175.5
Total litter wt	**314.0**	**354.7**	**394.3**	**441.2**	**509.5**	**520.5**	**555.6**	**602.0**	**638.2**	**663.3**	**716.8**
Cage5	62.2	79.0	940	110.3	126.6	133.2	146.6	162.0	181.5	203.7	207.4
Cage6	67.9	85.0	101.6	124.6	140.3	146.8	160.2	178.2	207.8	230.4	233.2
Cage7	68.1	88.5	106.5	125.3	142.4	151.7	168.8	186.2	210.7	235.7	253.8
Cage8	70.8	88.4	110.2	127.7	146.7	158.5	172.3	188.1	208.2	219.3	225.9
Total litter wt	**269.0**	**340.9**	**412.3**	**487.9**	**556.0**	**590.2**	**647.9**	**714.5**	**808.2**	**889.1**	**920.3**
Cage9	93.6	115.6	135.8	151.2	171.1	178.2	191.6	206.3	226.2	237.6	259.9
Cage10	75.9	103.3	120.7	139.5	165.0	165.4	173.9	189.6	208.4	218.7	234.7
Cage11	65.8	88.0	105.3	123.3	142.5	154.0	168.4	183.5	204.4	217.5	233.1
Cage12	57.7	84.0	105.3	127.1	148.9	162.8	181.9	202.1	230.7	250.4	270.2
Total litter wt	**293.0**	**390.9**	**467.1**	**541.1**	**627.5**	**660.4**	**715.8**	**781.5**	**869.7**	**924.2**	**997.9**

Daily Litter Weight Gain

Daily litter weight gain (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Ave.**
Cage1	11.9	10.9	11.7	17.7	2.1	6.8	8.8	13.3	6.5	16.6	
Cage2	10.7	8.8	12.9	16.6	1.7	7.3	14.5	0.6	9.7	12.5	
Cage3	9.5	10.4	11.4	15.9	5.1	11.6	12.2	10.7	4.3	11.6	
Cage4	8.6	9.5	10.9	18.1	2.1	9.4	10.9	11.6	4.6	12.8	
Total litter wt gain	**40.7**	**39.6**	**46.9**	**68.3**	**11.0**	**35.1**	**46.4**	**36.2**	**25.1**	**53.5**	**40.3**
Cage5	16.8	15.0	16.3	16.3	6.6	13.4	15.4	19.5	22.2	3.7	
Cage6	17.1	16.6	23.0	15.7	6.5	13.4	18.0	29.6	22.6	2.8	
Cage7	20.4	18.0	18.8	17.1	9.3	17.1	17.4	24.5	25.0	18.1	
Cage8	17.6	21.8	17.5	19.0	11.8	13.8	15.8	20.1	11.1	6.6	
Total litter wt gain	**71.9**	**71.4**	**75.6**	**68.1**	**34.2**	**57.7**	**66.6**	**93.7**	**80.9**	**31.2**	**65.1**
Cage9	22.0	20.2	15.4	19.9	7.1	13.4	14.7	19.9	11.4	22.3	
Cage10	27.4	17.4	18.8	25.5	0.4	8.5	15.7	18.8	10.3	16.0	
Cage11	22.2	17.3	18.0	19.2	11.5	14.4	15.1	20.9	13.1	15.6	
Cage12	26.3	21.3	21.8	21.8	13.9	19.1	20.2	28.6	19.7	19.8	
Total litter wt gain	**97.9**	**76.2**	**74.0**	**86.4**	**32.9**	**55.4**	**65.7**	**88.2**	**54.5**	**73.7**	**70.5**

3.4.1.9 Average Mass Generation Rate for All Experimental Units in Test 1

Desired temperature: 24+-1.5 °C Desired humidity: 30-35 percent

Light on			Generation rate		
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g bw)**	**NH_3 (g/hr/100g bw)**	**Maximum NH_3 (g/hr/100g bw)**
1	-3.57E-02	3.48E-02	9.00E-01	-9.36E-06	3.28E-05
2	-1.62E-02	2.05E-02	5.26E-01	3.13E-04	5.33E-04
3	-2.75E-02	2.34E-02	5.89E-01	4.76E-04	5.98E-04
4	-2.49E-02	2.57E-02	6.38E-01	8.48E-04	1.14E-03
5	-1.08E-02	2.03E-02	4.95E-01	1.15E-03	1.37E-03
6	-2.63E-02	2.39E-02	5.68E-01	-	-
7	-2.82E-02	2.28E-02	5.36E-01	2.40E-03	2.67E-03
8	-1.24E-02	1.69E-02	3.94E-01	1.59E-03	1.65E-03
9	-2.15E-02	2.17E-02	4.99E-01	2.75E-03	2.86E-03
10	-2.25E-02	2.27E-02	5.15E-01	3.59E-03	3.77E-03

Light off			Generation rate		
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g bw)**	**NH_3 (g/hr/100g bw)**	**Maximum NH_3 (g/hr/100g bw)**
1	-3.66E-02	3.98E-02	1.03E+00	5.18E-04	6.13E-04
2	-2.53E-02	2.81E-02	7.21E-01	5.34E-04	7.45E-04
3	-2.73E-02	3.26E-02	8.21E-01	7.65E-04	9.18E-04
4	-2.40E-02	3.23E-02	8.04E-01	1.25E-03	1.48E-03
5	-1.15E-02	2.87E-02	6.99E-01	6.43E-04	8.14E-04
6	-9.88E-03	3.10E-02	7.39E-01	1.47E-03	1.52E-03
7	-3.65E-02	3.72E-02	8.78E-01	2.28E-03	2.45E-03
8	-3.67E-02	3.37E-02	7.86E-01	1.95E-03	2.15E-03
9	-2.77E-02	2.75E-02	6.34E-01	4.51E-03	4.66E-03
10	-2.92E-02	3.10E-02	7.03E-01	4.53E-03	5.14E-03

Desired temperature: 24+-1.5 °C Desired humidity: 75-80 percent

Light on			Generation rate		
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g bw)**	**NH_3 (g/hr/100g bw)**	**Maximum NH_3 (g/hr/100g bw)**
1	-3.04E-02	2.80E-02	7.27E-01	1.78E-05	1.07E-04
2	-2.76E-02	2.69E-02	6.98E-01	3.78E-04	6.49E-04
3	-2.96E-02	2.33E-02	5.95E-01	4.95E-04	6.28E-04
4	-2.46E-02	2.41E-02	6.03E-01	2.04E-03	2.48E-03
5	-1.83E-02	2.66E-02	6.62E-01	2.34E-03	2.55E-03
6	-3.96E-02	3.30E-02	8.10E-01	-	-
7	-3.26E-02	2.25E-02	5.41E-01	3.49E-03	3.58E-03
8	-2.43E-02	2.72E-02	6.45E-01	4.26E-03	4.44E-03
9	-3.46E-02	3.08E-02	7.22E-01	3.61E-03	3.67E-03
10	-2.35E-02	2.21E-02	5.10E-01	3.46E-03	3.53E-03

	Light off		Generation rate		
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g bw)	NH_3 (g/hr/100g bw)	Maximum NH_3 (g/hr/100g bw)
1	-3.01E-02	2.95E-02	7.66E-01	3.88E-04	4.76E-04
2	-3.33E-02	3.07E-02	7.96E-01	5.23E-04	6.49E-04
3	-2.74E-02	3.18E-02	8.11E-01	1.46E-03	1.91E-03
4	-2.29E-02	2.83E-02	7.10E-01	3.73E-03	4.11E-03
5	-2.16E-02	3.78E-02	9.40E-01	4.06E-03	4.68E-03
6	-1.20E-02	3.87E-02	9.50E-01	4.27E-03	4.48E-03
7	-3.10E-02	2.95E-02	7.09E-01	5.22E-03	5.39E-03
8	-4.13E-02	3.77E-02	8.93E-01	7.30E-03	7.65E-03
9	-3.13E-02	3.41E-02	7.99E-01	6.60E-03	6.70E-03
10	-3.02E-02	2.65E-02	6.11E-01	5.02E-03	5.22E-03

Desired temperature: 24+-1.5 ^{o}C Desired humidity: 30-35 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100 bw)	Total water (g/hr/100g bw)
1	3.42E-01	9.32E-01	7.62E-01	-	1.35E+00
2	3.75E-01	8.20E-01	6.39E-01	-	1.08E+00
3	3.67E-01	6.14E-01	6.70E-01	-	9.18E-01
4	5.09E-01	7.76E-01	5.69E-01	-	8.37E-01
5	3.62E-01	7.47E-01	5.93E-01	-	9.79E-01
6	3.11E-01	6.87E-01	4.79E-01	-	8.56E-01
7	3.38E-01	7.10E-01	4.45E-01	-	8.17E-01
8	3.90E-01	6.54E-01	4.60E-01	-	7.24E-01
9	3.97E-01	7.63E-01	2.74E-01	-	6.40E-01
10	4.00E-01	6.69E-01	4.68E-01	-	7.37E-01

Desired temperature: 24+-1.5 ^{o}C Desired humidity: 75-80 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100g bw)	Total water (g/hr/100g bw)
1	2.98E-01	1.06E+00	1.78E-01	1.54E+00	-6.01E-01
2	2.43E-01	1.05E+00	6.22E-01	2.93E-01	1.14E+00
3	5.62E-01	1.17E+00	1.87E-01	0.00E+00	7.92E-01
4	4.25E-01	1.07E+00	1.77E-01	0.00E+00	8.20E-01
5	3.40E-01	1.24E+00	4.68E-03	3.74E-01	5.31E-01
6	3.85E-01	1.20E+00	9.70E-02	0.00E+00	9.08E-01
7	3.61E-01	1.14E+00	6.10E-02	2.60E-01	5.75E-01
8	4.61E-01	1.22E+00	4.78E-01	4.67E-01	7.75E-01
9	3.96E-01	1.06E+00	4.18E-01	2.64E-01	8.20E-01
10	3.66E-01	1.08E+00	3.73E-01	0.00E+00	1.09E+00

3.4.1.10 Average Gas Mass Generation Rate for All Experimental Units in Test 2

Desired temperature: 24+-1.5 °C Desired humidity: 30-35 percent

light on				Generation rate		
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g)**	**Tube NH_3 (g/hr/100g)**	**NH_3 (g/hr/100g)**	**Max NH_3 (g/hr/100g)**
1	-2.81E-02	2.97E-02	7.68E-01	0.00E+00	-1.84E-05	0.00E+00
2	-3.81E-02	2.79E-02	7.12E-01	0.00E+00	1.63E-04	1.63E-04
3	-2.50E-02	2.54E-02	6.32E-01	0.00E+00	8.91E-05	1.07E-04
4	-2.95E-02	2.43E-02	5.90E-01	5.13E-05	1.03E-04	1.03E-04
5	-3.57E-02	-	-	5.24E-05	5.07E-04	5.76E-04
6	-2.45E-02	2.23E-02	5.32E-01	2.00E-04	7.65E-04	8.98E-04
7	-3.74E-02	2.59E-02	6.08E-01	1.19E-04	5.97E-04	5.97E-04
8	-2.85E-02	2.06E-02	4.76E-01	1.53E-04	1.58E-03	2.14E-03
9	-2.71E-02	1.84E-02	4.21E-01	7.54E-04	8.28E-04	8.87E-04
10	-2.45E-02	2.11E-02	4.76E-01	1.02E-03	1.83E-03	2.66E-03

Light off				Generation rate		
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g)**	**Tube NH_3 (g/hr/100g)**	**NH_3 (g/hr/100g)**	**Max NH_3 (g/hr/100g)**
1	-3.99E-02	3.45E-02	8.90E-01	0.00E+00	9.21E-05	1.11E-04
2	-3.31E-02	3.51E-02	8.96E-01	0.00E+00	0.00E+00	0.00E+00
3	-3.80E-02	3.54E-02	8.81E-01	0.00E+00	5.30E-05	1.06E-04
4	-3.77E-02	3.60E-02	8.77E-01	5.10E-05	2.89E-04	3.06E-04
5	-4.57E-02	2.96E-02	7.13E-01	7.86E-05	5.94E-04	6.29E-04
6	-3.44E-02	3.05E-02	7.26E-01	2.51E-04	1.05E-03	1.10E-03
7	-3.30E-02	3.92E-02	9.21E-01	1.17E-04	1.02E-03	1.41E-03
8	-3.38E-02	3.43E-02	7.95E-01	3.84E-04	-	-
9	-3.81E-02	2.99E-02	6.84E-01	9.49E-04	3.68E-03	4.66E-03
10	-2.75E-02	3.06E-02	6.90E-01	1.06E-03	2.75E-03	3.82E-03

Desired temperature: 24+-1.5 °C Desired humidity: 75-80 percent

Light on				Generation rate		
Day	**O_2 (l/min)**	**CO_2 (l/min)**	**CO_2 (g/hr/100g)**	**Tube NH_3 (g/hr/100g)**	**NH_3 (g/hr/100g)**	**Max NH_3 (g/hr/100g)**
1	-3.84E-02	3.14E-02	8.03E-01	2.76E-05	1.84E-05	2.76E-05
2	-4.17E-02	2.90E-02	7.37E-01	0.00E+00	1.82E-04	1.91E-04
3	-3.49E-02	2.91E-02	7.35E-01	0.00E+00	1.01E-04	1.38E-04
4	-3.65E-02	2.71E-02	6.70E-01	2.55E-04	1.16E-04	1.34E-04
5	-4.36E-02	-	-	2.05E-03	1.50E-03	1.73E-03
6	-3.18E-02	2.17E-02	5.18E-01	4.53E-03	4.80E-03	4.99E-03
7	-3.93E-02	2.67E-02	6.32E-01	5.28E-03	5.50E-03	5.62E-03
8	-4.34E-02	2.42E-02	5.68E-01	8.29E-03	1.01E-02	1.03E-02
9	-4.93E-02	2.65E-02	6.12E-01	1.11E-02	1.17E-02	1.30E-02
10	-4.12E-02	3.27E-02	7.48E-01	9.88E-03	9.84E-03	1.08E-02

Light off				Generation rate		
Day	O_2 (l/min)	CO_2 (l/min)	CO_2 (g/hr/100g)	Tube NH_3 (g/hr/100g)	NH_3 (g/hr/100g)	Max NH_3 (g/hr/100g)
1	-4.29E-02	3.35E-02	8.57E-01	0.00E+00	1.27E-04	1.63E-04
2	-4.47E-02	3.52E-02	8.97E-01	0.00E+00	3.61E-05	5.41E-05
3	-3.97E-02	3.78E-02	9.55E-01	0.00E+00	8.09E-05	1.08E-04
4	-4.18E-02	3.60E-02	8.89E-01	4.76E-04	4.50E-04	5.29E-04
5	-4.75E-02	3.28E-02	7.99E-01	3.16E-03	2.75E-03	2.88E-03
6	-3.40E-02	3.41E-02	8.12E-01	5.08E-03	6.56E-03	6.97E-03
7	-4.19E-02	4.12E-02	9.78E-01	6.54E-03	8.58E-03	9.13E-03
8	-4.83E-02	3.71E-02	8.71E-01	9.86E-03	1.07E-02	1.11E-02
9	-5.22E-02	3.56E-02	8.23E-01	1.23E-02	1.28E-02	1.34E-02
10	-4.64E-02	3.46E-02	7.92E-01	1.08E-02	1.09E-02	1.17E-02

Desired temperature: 24+-1.5 ^oC Desired humidity: 30-35 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100 bw)	Total water (g/hr/100g bw)
1	2.63E-01	9.08E-01	3.84E-01	-	1.03E+00
2	3.21E-01	7.90E-01	6.28E-01	-	1.10E+00
3	3.20E-01	8.14E-01	3.79E-01	-	8.73E-01
4	3.52E-01	8.60E-01	3.52E-01	-	8.60E-01
5	4.35E-01	8.41E-01	3.87E-01	-	7.93E-01
6	2.61E-01	7.84E-01	3.76E-01	-	8.99E-01
7	4.93E-01	9.05E-01	2.36E-01	-	6.48E-01
8	5.85E-01	9.09E-01	4.16E-01	-	7.40E-01
9	4.85E-01	1.14E+00	2.97E-01	-	9.49E-01
10	8.21E-01	1.05E+00	3.48E-01	-	5.78E-01

Desired temperature: 24+-1.5 ^oC Desired humidity: 75-80 percent

Day	Water from air in (g/hr/100g bw)	Water from air out (g/hr/100g bw)	Water from drierite (g/hr/100g bw)	Water added (g/hr/100g bw)	Total water (g/hr/100g bw)
1	3.01E-01	1.08E+00	2.77E-02	0.00E+00	8.02E-01
2	3.21E-01	1.20E+00	0.00E+00	2.88E-01	5.96E-01
3	3.75E-01	1.23E+00	1.26E-01	1.54E-01	8.29E-01
4	3.29E-01	1.21E+00	1.03E-01	0.00E+00	9.84E-01
5	4.39E-01	1.22E+00	1.15E-03	0.00E+00	7.80E-01
6	3.16E-01	1.15E+00	3.38E-03	1.46E-01	6.92E-01
7	4.34E-01	1.36E+00	1.52E-01	2.91E-01	7.91E-01
8	6.16E-01	1.61E+00	4.41E-03	1.32E-01	8.68E-01
9	5.75E-01	1.73E+00	0.00E+00	2.39E-01	9.15E-01
10	7.04E-01	1.85E+00	3.23E-03	7.64E-01	3.82E-01

3.4.1.11 Averaged Data for All Experimental Units From Both Test 1 and Test 2: NH_3 Generation Rate

Light on								
Day	**30-35 percent for test 1 NH_3 (g/hr/100g)**	**30 –35 percent for test 2 NH_3 (g/hr/100g)**	**Average 30 –35 percent generation rate[1] NH_3 (g/hr/100g)**	**75 –80 percent for test 1 NH_3 (g/hr/100g)**	**75 –80 percent for test 2 NH_3 (g/hr/100g)**	**Average75 –80 percent generation rate[1] NH_3 (g/hr/100g)**	**30 –35 percent generation rate[2] Tube NH_3 (g/hr/100g)**	**75 –80 percent generation rate[2] Tube NH_3 (g/hr/100g)**
1	-9.36E-06	-1.84E-05	-1.39E-05	1.78E-05	1.84E-05	1.81E-05	0.00E+00	2.76E-05
2	3.13E-04	1.63E-04	2.38E-04	3.78E-04	1.82E-04	2.80E-04	0.00E+00	0.00E+00
3	4.76E-04	8.91E-05	2.83E-04	4.95E-04	1.01E-04	2.98E-04	0.00E+00	0.00E+00
4	8.48E-04	1.03E-04	4.75E-04	2.04E-03	1.16E-04	1.08E-03	5.13E-05	2.55E-04
5	1.15E-03	5.07E-04	8.29E-04	2.34E-03	1.50E-03	1.92E-03	5.24E-05	2.05E-03
6	-	7.65E-04	7.65E-04	-	4.80E-03	4.80E-03	2.00E-04	4.53E-03
7	2.40E-03	5.97E-04	1.50E-03	3.49E-03	5.50E-03	4.50E-03	1.19E-04	5.28E-03
8	1.59E-03	1.58E-03	1.59E-03	4.26E-03	1.01E-02	7.18E-03	1.53E-04	8.29E-03
9	2.75E-03	8.28E-04	1.79E-03	3.61E-03	1.17E-02	7.66E-03	7.54E-04	1.11E-02
10	3.59E-03	1.83E-03	2.71E-03	3.46E-03	9.84E-03	6.65E-03	1.02E-03	9.88E-03

Light off								
Day	**30 –35 percent for test 1 NH_3 (g/hr/100g)**	**30-35 percent for test 2 NH_3 (g/hr/100g)**	**Average 30-35 percent generation rate[1] NH_3 (g/hr/100g)**	**75-80 percent for test 1 NH_3 (g/hr/100g)**	**75-80 percent for test 2 NH_3 (g/hr/100g)**	**Average 75-80 percent generation rate[1] NH_3 (g/hr/100g)**	**30-35 percent generation rate[2] Tube NH_3 (g/hr/100g)**	**75-80 percent generation rate[2] Tube NH_3 (g/hr/100g)**
1	5.18E-04	9.21E-05	3.05E-04	3.88E-04	1.27E-04	2.57E-04	0.00E+00	0.00E+00
2	5.34E-04	0.00E+00	2.67E-04	5.23E-04	3.61E-05	2.79E-04	0.00E+00	0.00E+00
3	7.65E-04	5.30E-05	4.09E-04	1.46E-03	8.09E-05	7.69E-04	0.00E+00	0.00E+00
4	1.25E-03	2.89E-04	7.68E-04	3.73E-03	4.50E-04	2.09E-03	5.10E-05	4.76E-04
5	6.43E-04	5.94E-04	6.18E-04	4.06E-03	2.75E-03	3.41E-03	7.86E-05	3.16E-03
6	1.47E-03	1.05E-03	1.26E-03	4.27E-03	6.56E-03	5.42E-03	2.51E-04	5.08E-03
7	2.28E-03	1.02E-03	1.65E-03	5.22E-03	8.58E-03	6.90E-03	1.17E-04	6.54E-03
8	1.95E-03	-	1.95E-03	7.30E-03	1.07E-02	9.00E-03	3.84E-04	9.86E-03
9	4.51E-03	3.68E-03	4.10E-03	6.60E-03	1.28E-02	9.71E-03	9.49E-04	1.23E-02
10	4.53E-03	2.75E-03	3.64E-03	5.02E-03	1.09E-02	7.98E-03	1.06E-03	1.08E-02

1. Data from PhD gas detector

2. Data from colormetric tubes

3.4.1.12 Averaged Data for All Experimental Units From Both Test 1 and Test 2: Water Production

Day	30-35 percent for test 1 Total water (g/hr/100g)	30-35 percent for test 2 Total water (g/hr/100g)	Average 30-35 percent Total water (g/hr/100g)	75-80 percent for test 1 Total water (g/hr/100g)	75-80 percent for test 2 Total water (g/hr/100g)	Average75-80 percent Total water (g/hr/100g)
1	1.35E+00	1.03E+00	1.19E+00	-6.01E-01*	8.02E-01	8.02E-01
2	1.08E+00	1.10E+00	1.09E+00	1.14E+00	5.96E-01	8.68E-01
3	9.18E-01	8.73E-01	8.95E-01	7.92E-01	8.29E-01	8.11E-01
4	8.37E-01	8.60E-01	8.48E-01	8.20E-01	9.84E-01	9.02E-01
5	9.79E-01	7.93E-01	8.86E-01	5.31E-01	7.80E-01	6.56E-01
6	8.56E-01	8.99E-01	8.77E-01	9.08E-01	6.92E-01	8.00E-01
7	8.17E-01	6.48E-01	7.32E-01	5.75E-01	7.91E-01	6.83E-01
8	7.24E-01	7.40E-01	7.32E-01	7.75E-01	8.68E-01	8.21E-01
9	6.40E-01	9.49E-01	7.94E-01	8.20E-01	9.15E-01	8.67E-01
10	7.37E-01	5.78E-01	6.58E-01	1.09E+00	3.82E-01	7.36E-01
Average =	**8.94E-01**	**8.46E-01**	**8.70E-01**	**8.28E-01**	**7.64E-01**	**7.95E-01**

*Erroneous value: not included in Average Values.

3.4.1.13 Miscellaneous

Feed Weight Test 1

	Feed weight (g)										
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7***	**8***	**9***	**10**	**11**
Cage1 Feed	190.5	163.0	144.2	125.0	104.0	84.2	217.2	196.7	178.5	160.2	141.4
Cage2 Feed	205.6	184.3	161.6	142.6	121.8	101.9	215.1	194.9	176.2	158.3	138.4
Cage3 Feed	183.6	159.4	139.8	120.3	99.0	79.7	232.9	210.8	191.3	170.8	150.9
Cage4 Feed	189.3	165.8	143.8	125.0	103.7	82.0	194.3	171.8	152.8	133.9	114.3
Total feed wt	**769.0**	**672.5**	**589.4**	**512.9**	**428.5**	**347.8**	**859.5**	**774.2**	**698.8**	**623.2**	**545**
Cage5 Feed	196.5	176.4	155.6	128.9	104.3	83.9	203.9	181.2	158.0	135.0	111.7
Cage6 Feed	188.9	171	147.1	123.2	101.2	81.2	173.8	151.8	126.9	103.4	81.0
Cage7 Feed	197.5	182.1	164.1	142.6	124.0	111.0	221.9	202.4	181.0	162.6	141.2
Cage8 Feed	193.3	174.7	153.3	128.1	106.1	86.5	194.4	-402.8	150.6	129.0	108.7
Total feed wt	**776.2**	**704.2**	**620.1**	**522.8**	**435.6**	**362.6**	**794.0**		**616.5**	**530.0**	**442.6**
Cage9 Feed	193.5	168.8	147.7	126.7	103.6	84.0	197.4	176.6	154.2	134.3	114.7
Cage10 Feed	192.1	166.6	143.9	121.7	100.3	78.7	207.5	187.3	165.5	144.8	124.2
Cage11 Feed	193.0	166.3	143.7	121.5	97.9	74.6	182.2	160.2	138.3	118.8	98.5
Cgae12 Feed	181.2	157.7	137.7	115.4	94.9	71.7	167.7	146.1	124.6	104.4	83.7
Total feed wt	**759.8**	**659.4**	**573.0**	**485.3**	**396.7**	**309.0**	**754.8**	**670.2**	**582.6**	**502.3**	**421.1**

*weights were recorded wrong on day #8 which affected the data on days #7-#9

Feed Weight Test 2

	Feed weight (g)										
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Cage1 Feed	180.0	155.0	132.2	110.1	87.7	176.1	155.0	134.8	114.3	94.1	75.5
Cage2 Feed	221.8	195.5	173.3	151.3	132.2	206.1	184.7	164.3	144.4	122.5	102.8
Cage3 Feed	243.4	218.5	194.3	168.8	146.6	227.4	203.4	181.2	158.7	139.3	118.7
Cage4 Feed	220.5	196.8	175.1	152.2	130.8	196.5	175.0	153.6	132.3	110.7	91.0
Total feed wt	**865.7**	**765.8**	**674.9**	**582.4**	**497.3**	**806.1**	**718.1**	**633.9**	**549.7**	**466.6**	**388**
Cage5 Feed	255.7	236.3	217.3	194.4	170.2	223.7	202.3	179.4	158.8	133.7	112.2
Cage6 Feed	301.1	281.4	258.9	231.9	206.3	177.7	155.1	129.9	105.3	82.3	60.3
Cage7 Feed	243.7	222.6	197.4	171.1	144.3	212.6	187.3	163.8	137.0	101.5	70.7
Cage8 Feed	299.2	282.2	258.2	230.9	202.6	251.1	227.1	203.1	179.2	155.6	135.2
Total feed wt	**1099.7**	**1022.5**	**931.8**	**828.3**	**723.4**	**865.1**	**771.8**	**676.2**	**580.3**	**473.1**	**378.4**
Cage9 Feed	286.6	266.7	243.3	218.8	193.6	264.4	241.8	219.2	197.4	172.3	145.8
Cage10 Feed	279.1	254.0	231.5	207.3	181.0	232.7	213.5	190.9	169.9	145.4	121.8
Cage11 Feed	241.4	219.0	195.9	170.3	145.4	222.7	204.5	182.4	160.8	136.7	113.5
Cgae12 Feed	261.4	235.4	207.0	176.7	147.4	253.5	227.3	197.2	162.8	132.1	105.2
Total feed wt	**1068.5**	**975.1**	**877.7**	**773.1**	**667.4**	**973.3**	**887.1**	**789.7**	**690.9**	**586.5**	**486.3**

Daily Feed Disappearance Test 1

Daily feed disappearance (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7***	**8***	**9***	**10**	**Ave.**
Cage1	27.5	18.8	19.2	21.0	19.8	21.9	20.5	18.2	18.3	18.8	
Cage2	21.3	22.7	19.0	20.8	19.9	24.4	20.2	18.7	17.9	19.9	
Cage3	24.2	19.6	19.5	21.3	19.3	24.3	22.1	19.5	20.5	19.9	
Cage4	23.5	220	18.8	21.3	21.7	23.6	22.5	19.0	18.9	19.6	
TAFD	**96.5**	**83.1**	**76.5**	**84.4**	**80.7**	**94.2**	**85.3**	**75.4**	**75.6**	**78.2**	**83.0**
Cage5	20.1	20.8	26.7	24.6	20.4	23.2	22.7	23.2	23.0	23.3	
Cage6	17.9	23.9	23.9	22.0	20.0	22.3	22.0	24.9	23.5	22.4	
Cage7	15.4	18.0	21.5	18.6	13.0	17.6	19.5	21.4	18.4	21.4	
Cage8	18.6	21.4	25.2	22.0	19.6	21.2	597.2	-553.4	21.6	20.3	
TAFD	**72.0**	**84.1**	**97.3**	**87.2**	**73.0**	**84.3**			**86.5**	**87.4**	**84.0**
Cage9	24.7	21.1	21.0	23.1	19.6	25.3	20.8	22.4	19.9	19.6	
Cage10	25.5	22.7	22.2	21.4	21.6	25.3	20.2	21.8	20.7	20.6	
Cage11	26.7	22.6	22.2	23.6	23.3	24.2	22.0	21.9	19.5	20.3	
Cage12	23.5	20.0	22.3	20.5	23.2	26.3	21.6	21.5	20.2	20.7	
TAFD	**100.4**	**86.4**	**87.7**	**88.6**	**87.7**	**101.1**	**84.6**	**87.6**	**80.3**	**81.2**	**88.6**

*weights were recorded wrong on day #8 which affected the data on days #7-#9

TFD Total Feed Disappearance

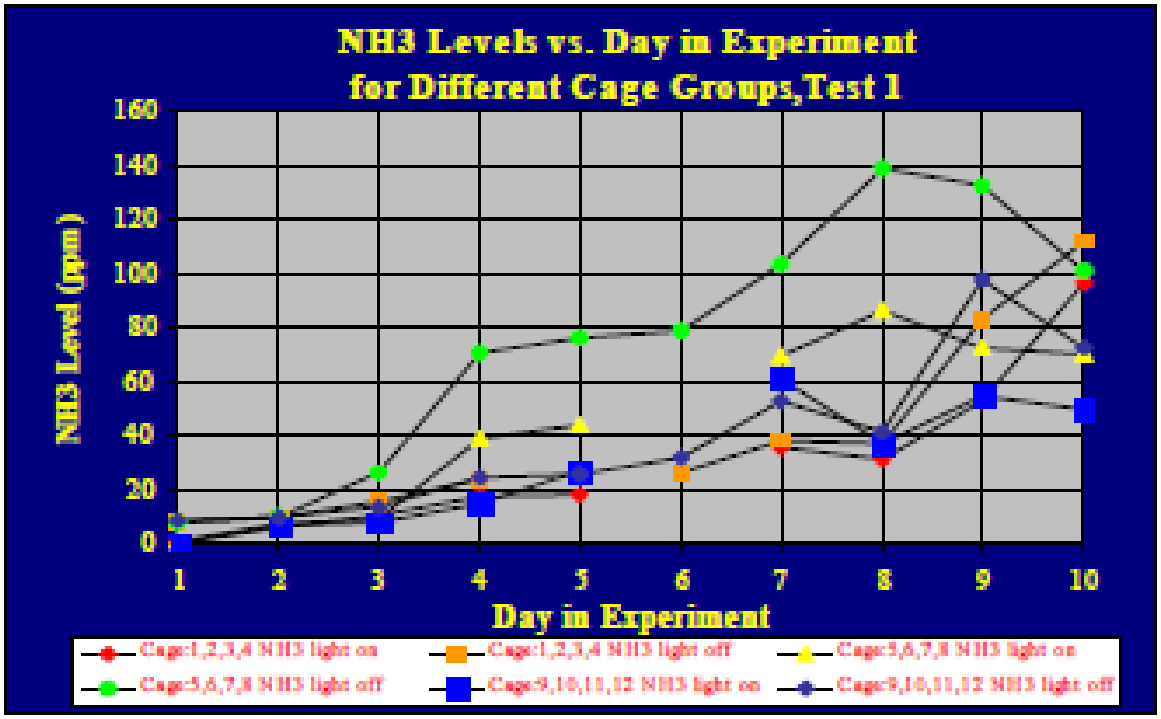
Daily Feed Disappearance Test 2

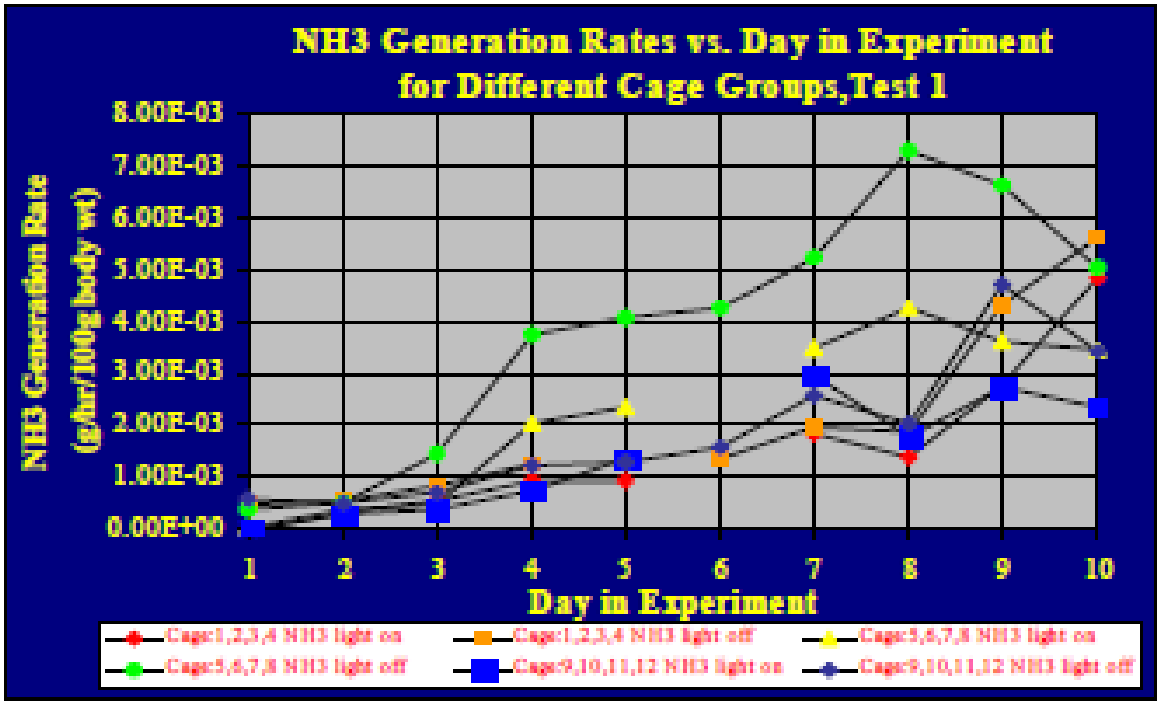
Daily feed disappearance (g)											
Day	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**Average**
Cage1	25.0	22.8	22.1	22.4	27.4	21.1	20.2	20.5	20.2	18.6	
Cage2	26.3	22.2	22.0	19.1	24.7	21.4	20.4	19.9	21.9	19.7	
Cage3	24.9	24.2	25.5	22.2	27.4	24.0	22.2	22.5	19.4	20.6	
Cage4	23.7	21.7	22.9	21.4	24.4	21.5	21.4	21.3	21.6	19.7	
TAFD	**99.9**	**90.9**	**92.5**	**85.1**	**103.9**	**88.0**	**84.2**	**84.2**	**83.1**	**78.6**	**89.0**
Cage5	19.4	19.0	22.9	24.2	23.8	21.4	22.9	20.6	25.1	21.5	
Cage6	19.7	22.5	27.0	25.6	28.6	22.6	25.2	24.6	23.0	22.0	
Cage7	21.1	25.2	26.3	26.8	27.0	25.3	23.5	26.8	35.5	30.8	
Cage8	17.0	24.0	27.3	28.3	28.1	24.0	24.0	23.9	23.6	20.4	
TAFD	**77.2**	**90.7**	**103.5**	**104.9**	**107.5**	**93.3**	**95.6**	**95.9**	**107.2**	**94.7**	**97.1**
Cage9	19.9	23.4	24.5	25.2	25.9	22.6	22.6	21.8	25.1	26.5	
Cage10	25.1	22.5	24.2	26.3	25.7	19.2	22.6	21.0	24.5	23.6	
Cage11	22.4	23.1	25.6	24.9	25.5	18.2	22.1	21.6	24.1	23.2	
Cage12	26.0	28.4	30.3	29.3	28.6	26.2	30.1	34.4	30.7	26.9	
TAFD	**93.4**	**97.4**	**104.6**	**105.7**	**105.7**	**86.2**	**97.4**	**98.8**	**104.4**	**100.2**	**99.4**

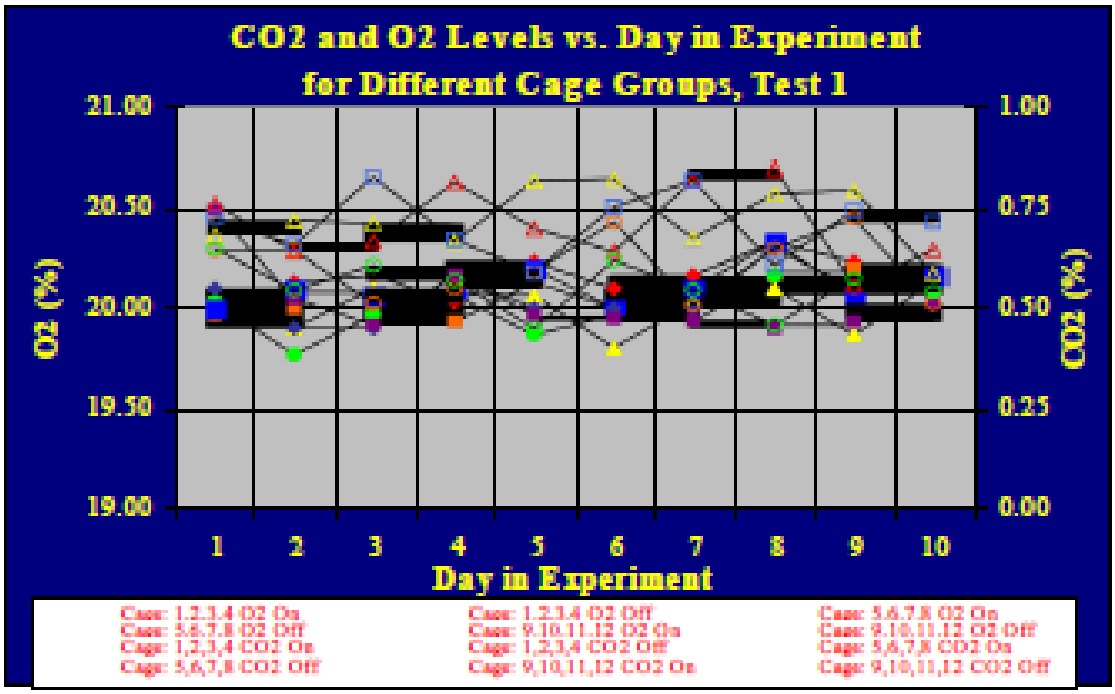
TFD Total Feed Disappearance

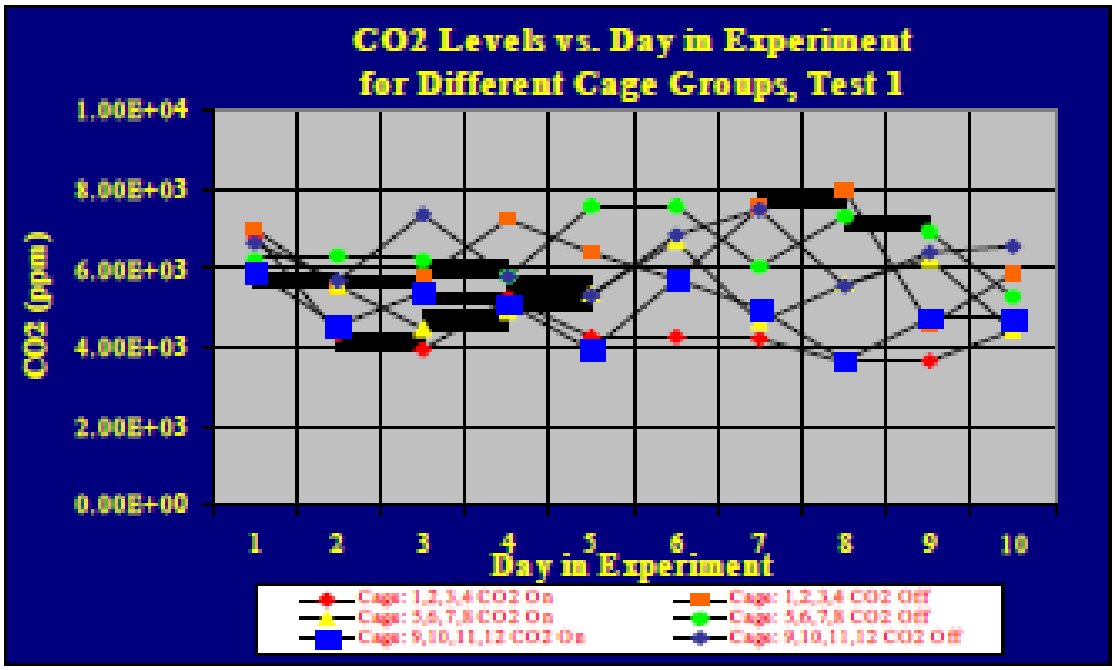
3.4.2 Graphical Representation of Data

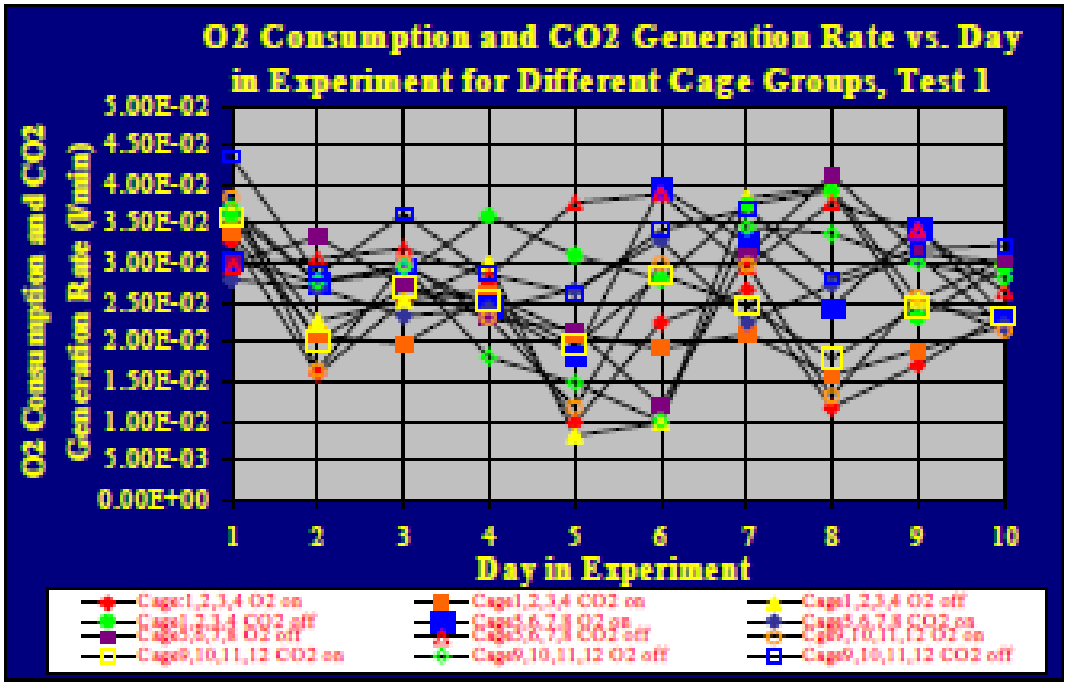
3.4.2.1 Gas Concentration and Mass Generation Rates: Individual Calorimeter Data (CO_2 and NH_3) for Test 1

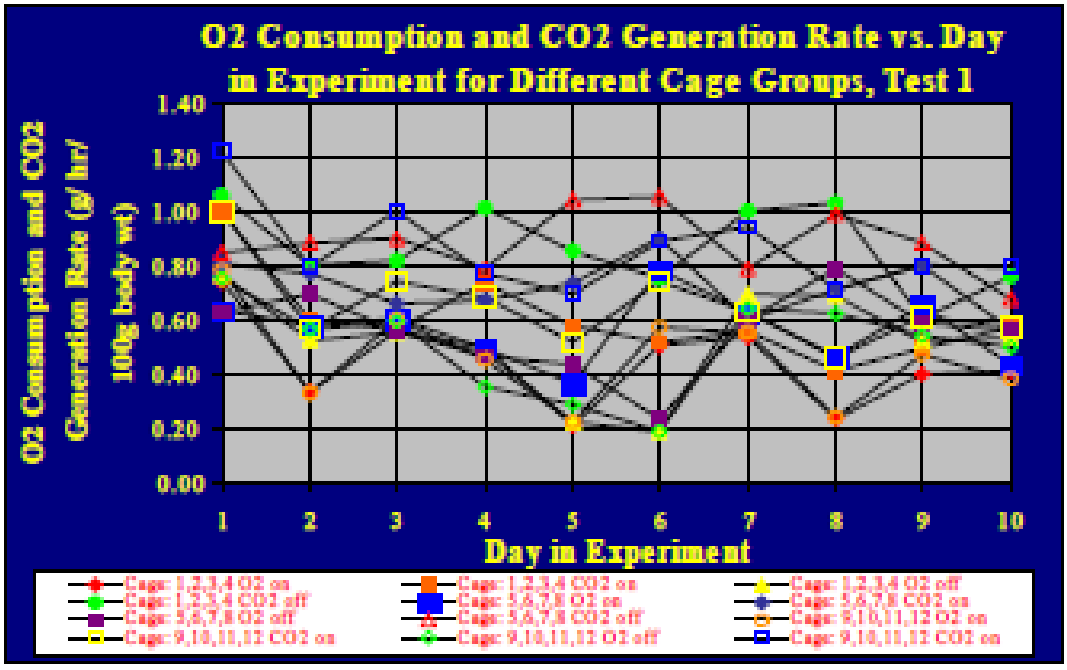


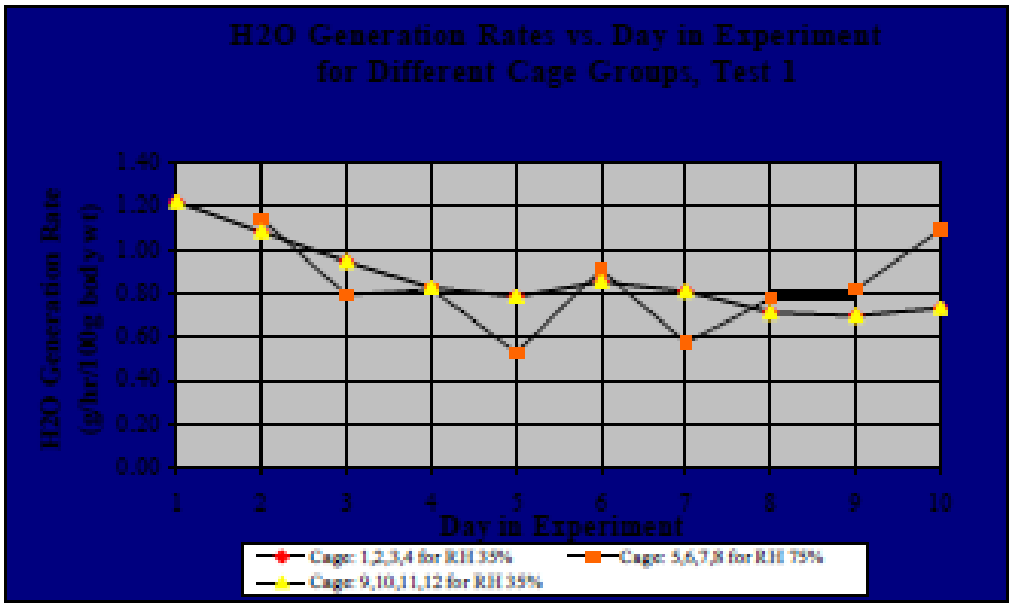



CO2 and O2 Levels vs. Day in Experiment
for Different Cage Groups, Test 1
21.00
20.50
20.00
19.50
19.00
O2 (%)
1.00
0.75
0.50
0.25
0.00
CO2 (%)
1 2 3 4 5 6 7 8 9 10
Day in Experiment
Cage: 1,2,3,4 O2 On
Cage: 5,6,7,8 O2 Off
Cage: 1,2,3,4 CO2 On
Cage: 5,6,7,8 CO2 Off
Cage: 1,2,3,4 O2 Off
Cage: 9,10,11,12 O2 On
Cage: 1,2,3,4 CO2 Off
Cage: 9,10,11,12 CO2 On
Cage: 5,6,7,8 O2 On
Cage: 9,10,11,12 O2 Off
Cage: 5,6,7,8 CO2 On
Cage: 9,10,11,12 CO2 Off

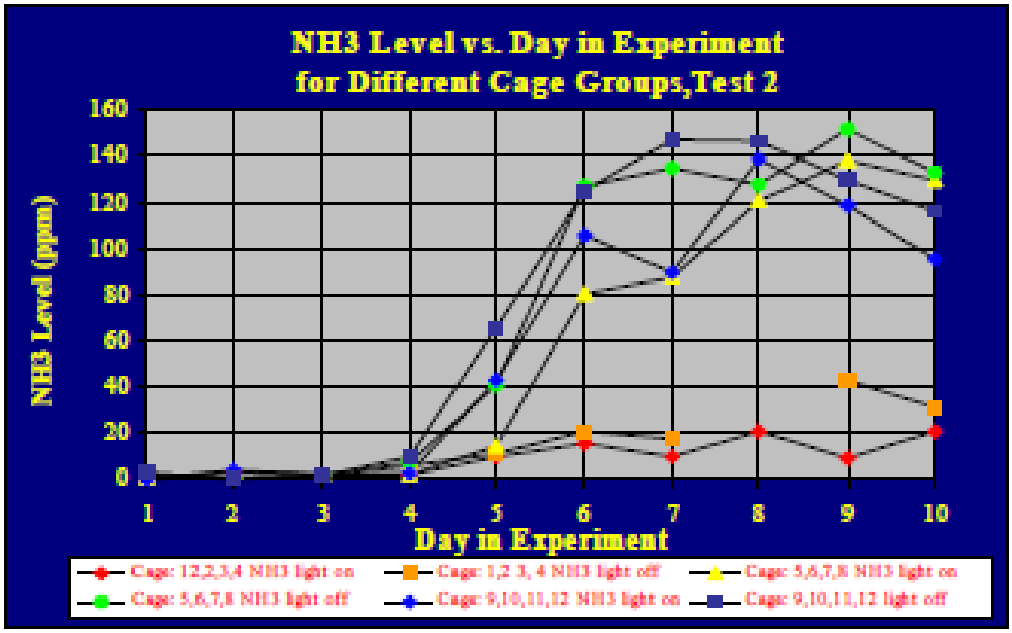

CO2 Levels vs. Day in Experiment
for Different Cage Groups, Test 1
1.00E+04
8.00E+03
6.00E+03
4.00E+03
2.00E+03
0.00E+00
CO2 (ppm)
1 2 3 4 5 6 7 8 9 10
Day in Experiment
Cage: 1,2,3,4 CO2 On
Cage: 5,6,7,8 CO2 On
Cage: 9,10,11,12 CO2 On
Cage: 1,2,3,4 CO2 Off
Cage: 5,6,7,8 CO2 Off
Cage: 9,10,11,12 CO2 Off

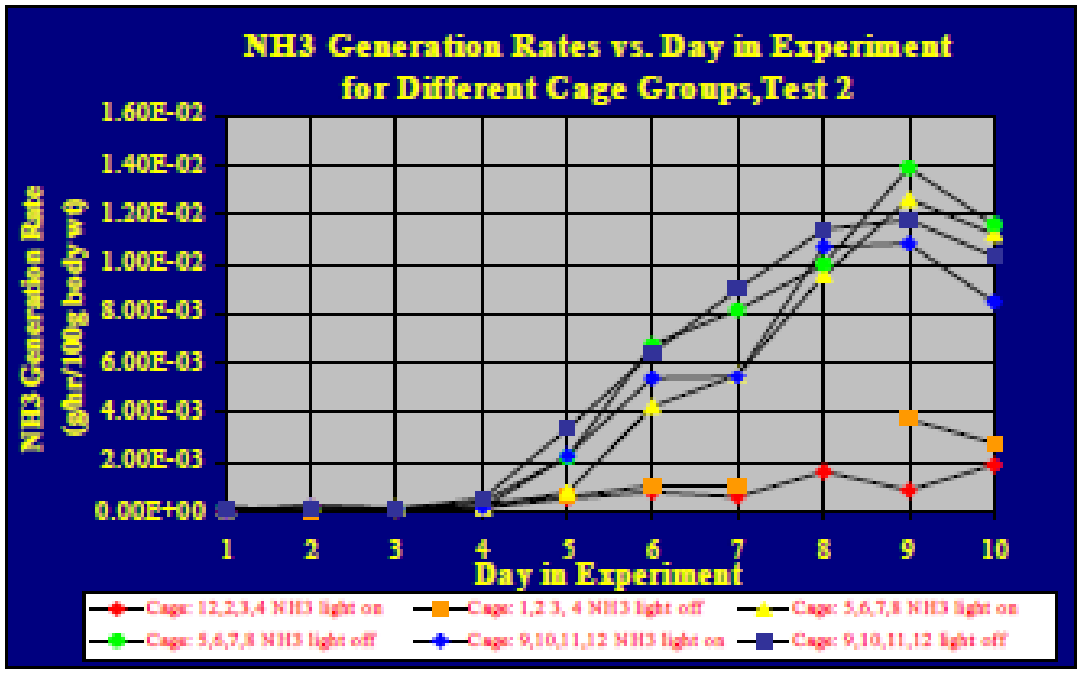

O2 Consumption and CO2 Generation Rate vs. Day in Experiment for Different Cage Groups, Test 1
O2 Consumption and CO2 Generation Rate (l/min)
5.00E-02
4.50E-02
4.00E-02
3.50E-02
3.00E-02
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage1,2,3,4 O2 on
Cage1,2,3,4 CO2 on
Cage1,2,3,4 O2 off
Cage1,2,3,4 CO2 off
Cage5,6,7,8 O2 on
Cage5,6,7,8 CO2 on
Cage5,6,7,8 O2 off
Cage5,6,7,8 CO2 off
Cage9,10,11,12 O2 on
Cage9,10,11,12 CO2 on
Cage9,10,11,12 O2 off
Cage9,10,11,12 CO2 off

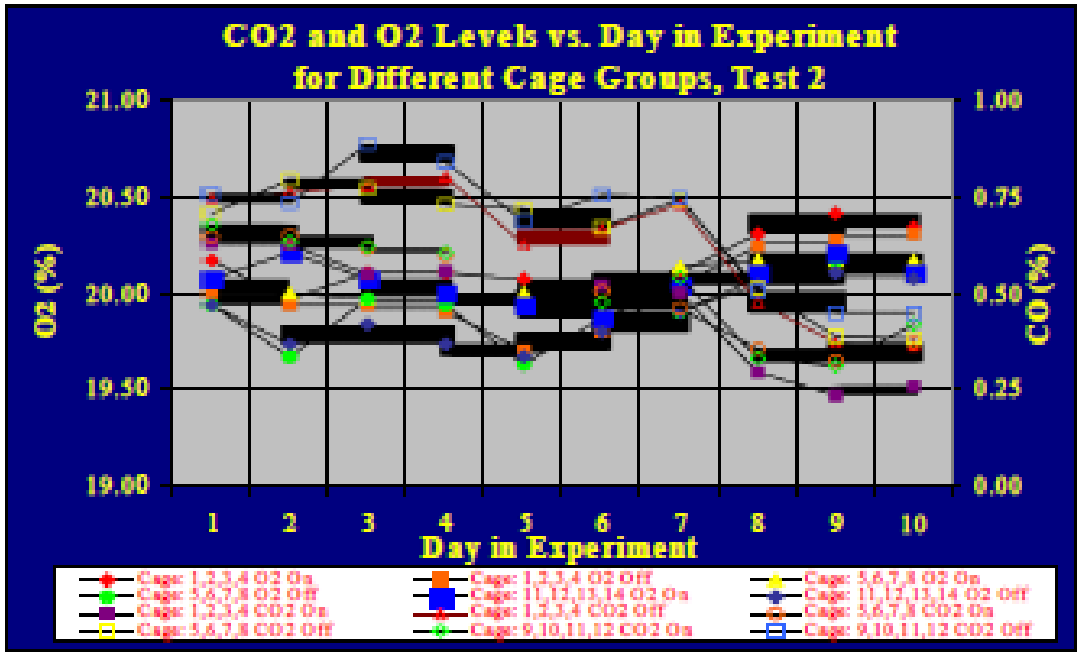

O2 Consumption and CO2 Generation Rate vs. Day in Experiment for Different Cage Groups, Test 1
O2 Consumption and CO2 Generation Rate (g/ hr/ 100g body wt)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage: 1,2,3,4 O2 on
Cage: 1,2,3,4 CO2 on
Cage: 1,2,3,4 O2 off
Cage: 1,2,3,4 CO2 off
Cage: 5,6,7,8 O2 on
Cage: 5,6,7,8 CO2 on
Cage: 5,6,7,8 O2 off
Cage: 5,6,7,8 CO2 off
Cage: 9,10,11,12 O2 on
Cage: 9,10,11,12 CO2 on
Cage: 9,10,11,12 O2 off
Cage: 9,10,11,12 CO2 off

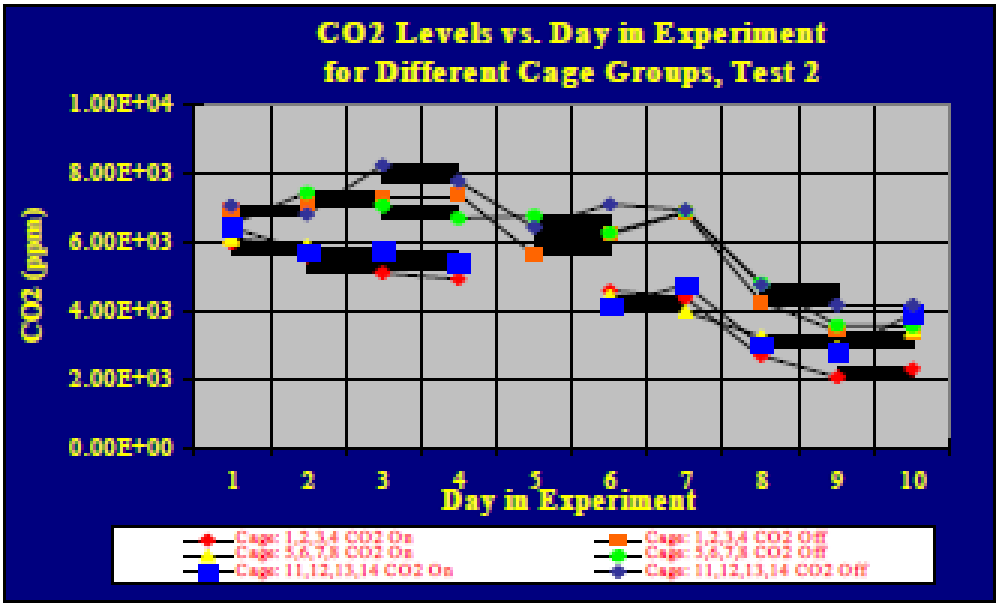


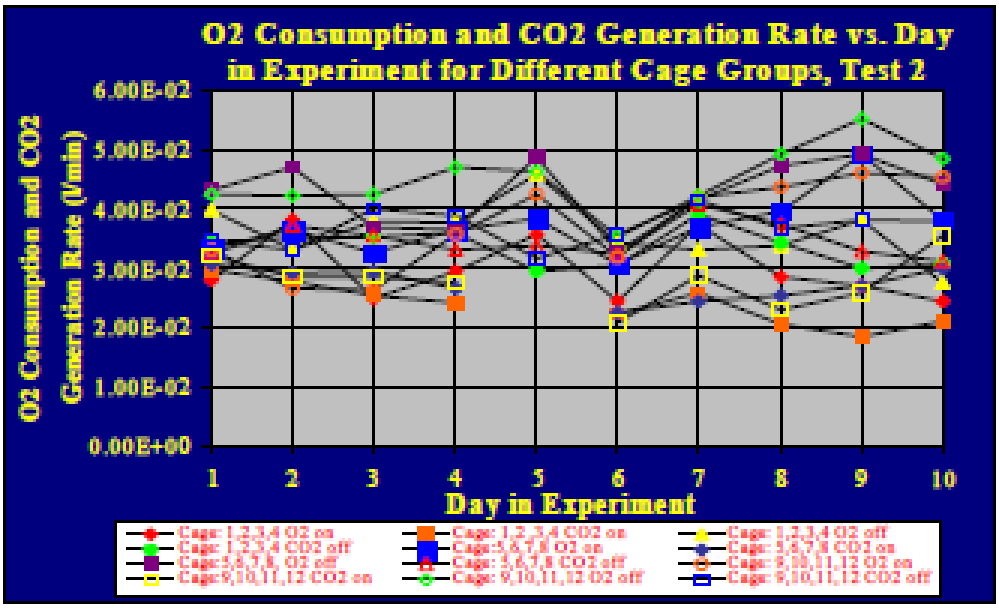
3.4.2.2 Gas Concentration and Mass Generation Rates: Individual Calorimeter Data (O_2, CO_2, and NH_3) for Test 2

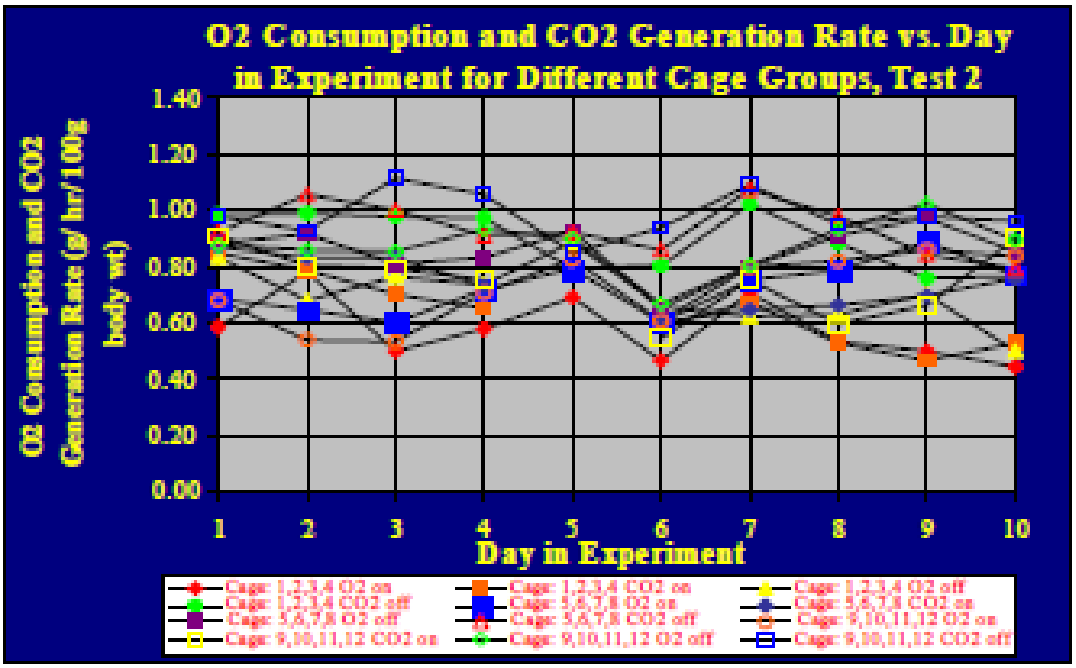


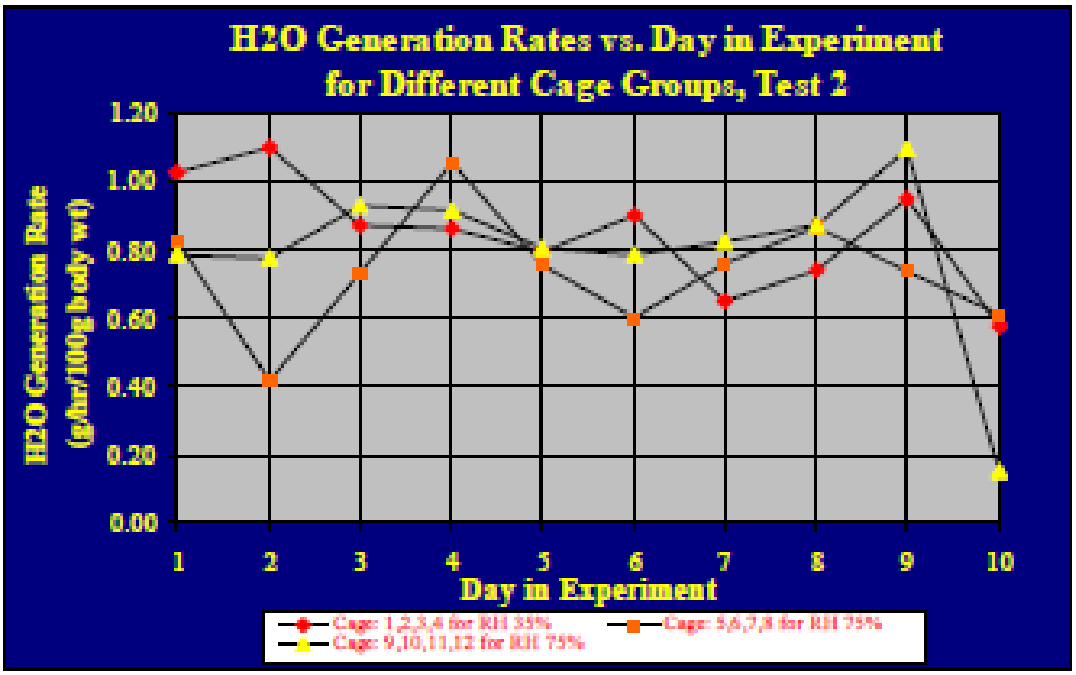

NH3 Generation Rates vs. Day in Experiment
for Different Cage Groups,Test 2
NH3 Generation Rate
(g/hr/100g body wt)
1.60E-02
1.40E-02
1.20E-02
1.00E-02
8.00E-03
6.00E-03
4.00E-03
2.00E-03
0.00E+00
1 2 3 4 5 6 7 8 9 10
Day in Experiment
Cage: 12,2,3,4 NH3 light on
Cage: 1,2 3, 4 NH3 light off
Cage: 5,6,7,8 NH3 light on
Cage: 5,6,7,8 NH3 light off
Cage: 9,10,11,12 NH3 light on
Cage: 9,10,11,12 light off


CO2 and O2 Levels vs. Day in Experiment
for Different Cage Groups, Test 2
O2 (%)
21.00
20.50
20.00
19.50
19.00
CO (%)
1.00
0.75
0.50
0.25
0.00
1 2 3 4 5 6 7 8 9 10
Day in Experiment
Cage: 1,2,3,4 O2 On
Cage: 1,2,3,4 O2 Off
Cage: 5,6,7,8 O2 On
Cage: 5,6,7,8 O2 Off
Cage: 11,12,13,14 O2 On
Cage: 11,12,13,14 O2 Off
Cage: 1,2,3,4 CO2 On
Cage: 1,2,3,4 CO2 Off
Cage: 5,6,7,8 CO2 On
Cage: 5,6,7,8 CO2 Off
Cage: 9,10,11,12 CO2 On
Cage: 9,10,11,12 CO2 Off

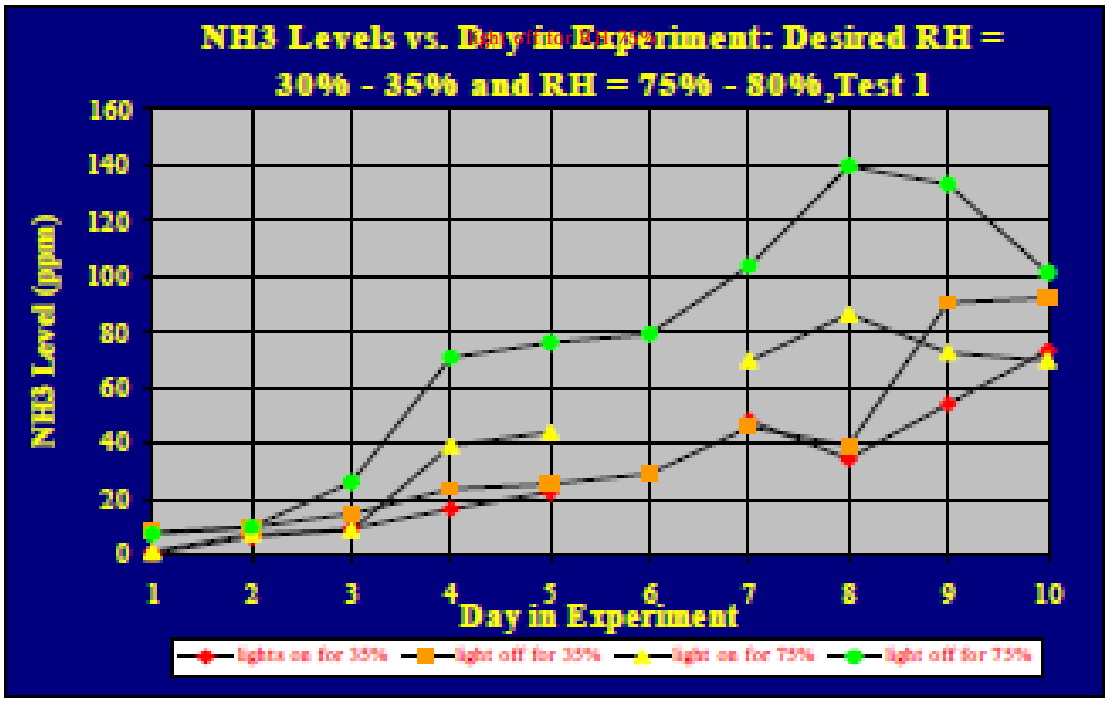

CO2 Levels vs. Day in Experiment
for Different Cage Groups, Test 2
CO2 (ppm)
1.00E+04
8.00E+03
6.00E+03
4.00E+03
2.00E+03
0.00E+00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage: 1,2,3,4 CO2 On
Cage: 5,6,7,8 CO2 On
Cage: 11,12,13,14 CO2 On
Cage: 1,2,3,4 CO2 Off
Cage: 5,6,7,8 CO2 Off
Cage: 11,12,13,14 CO2 Off

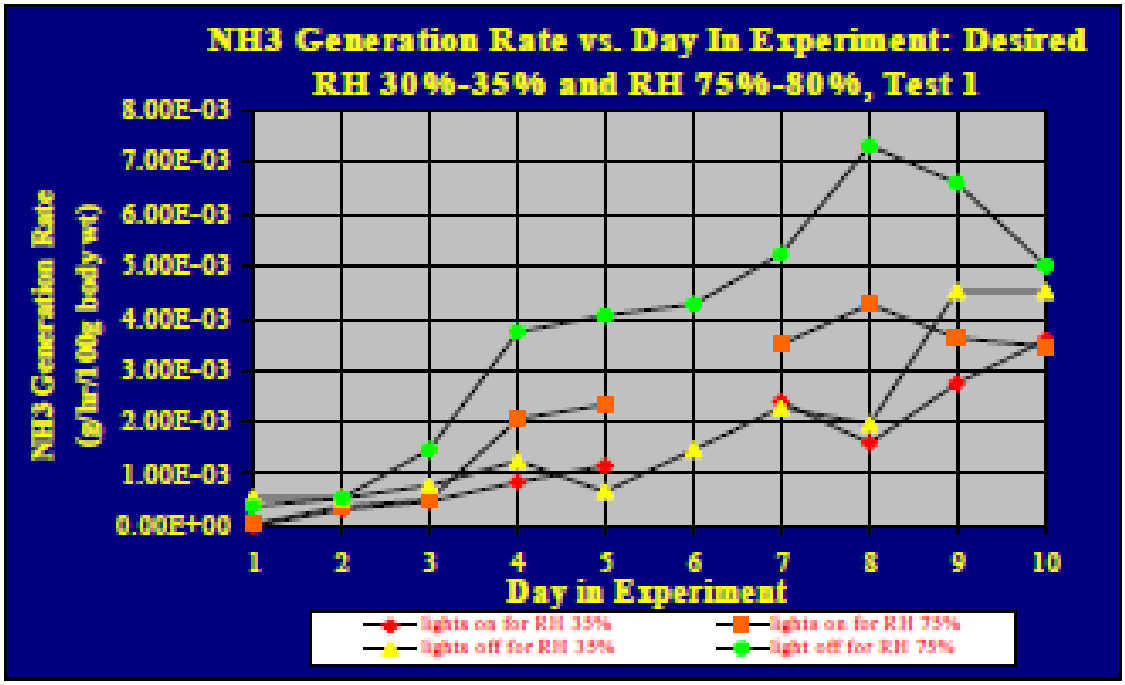

O2 Consumption and CO2 Generation Rate vs. Day
in Experiment for Different Cage Groups, Test 2
O2 Consumption and CO2 Generation Rate (l/min)
6.00E-02
5.00E-02
4.00E-02
3.00E-02
2.00E-02
1.00E-02
0.00E+00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage: 1,2,3,4 O2 on
Cage: 1,2,3,4 CO2 off
Cage:5,6,7,8, O2 off
Cage:9,10,11,12 CO2 on
Cage: 1,2,3,4 CO2 on
Cage:5,6,7,8 O2 on
Cage: 5,6,7,8 CO2 off
Cage: 9,10,11,12 O2 off
Cage: 1,2,3,4 O2 off
Cage: 5,6,7,8 CO2 on
Cage: 9,10,11,12 O2 on
Cage: 9,10,11,12 CO2 off

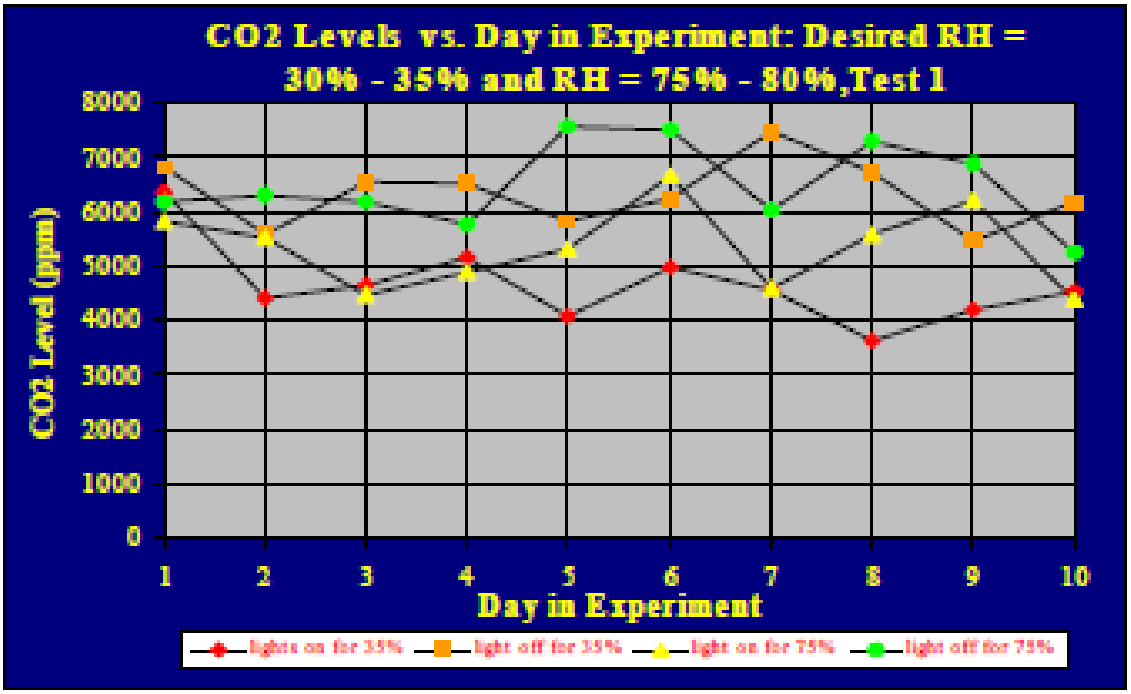

O2 Consumption and CO2 Generation Rate vs. Day in Experiment for Different Cage Groups, Test 2
O2 Consumption and CO2 Generation Rate (g/ hr/100g body wt)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage: 1,2,3,4 O2 on
Cage: 1,2,3,4 CO2 on
Cage: 1,2,3,4 O2 off
Cage: 1,2,3,4 CO2 off
Cage: 5,6,7,8 O2 on
Cage: 5,6,7,8 CO2 on
Cage: 5,6,7,8 O2 off
Cage: 5,6,7,8 CO2 off
Cage: 9,10,11,12 O2 on
Cage: 9,10,11,12 CO2 on
Cage: 9,10,11,12 O2 off
Cage: 9,10,11,12 CO2 off

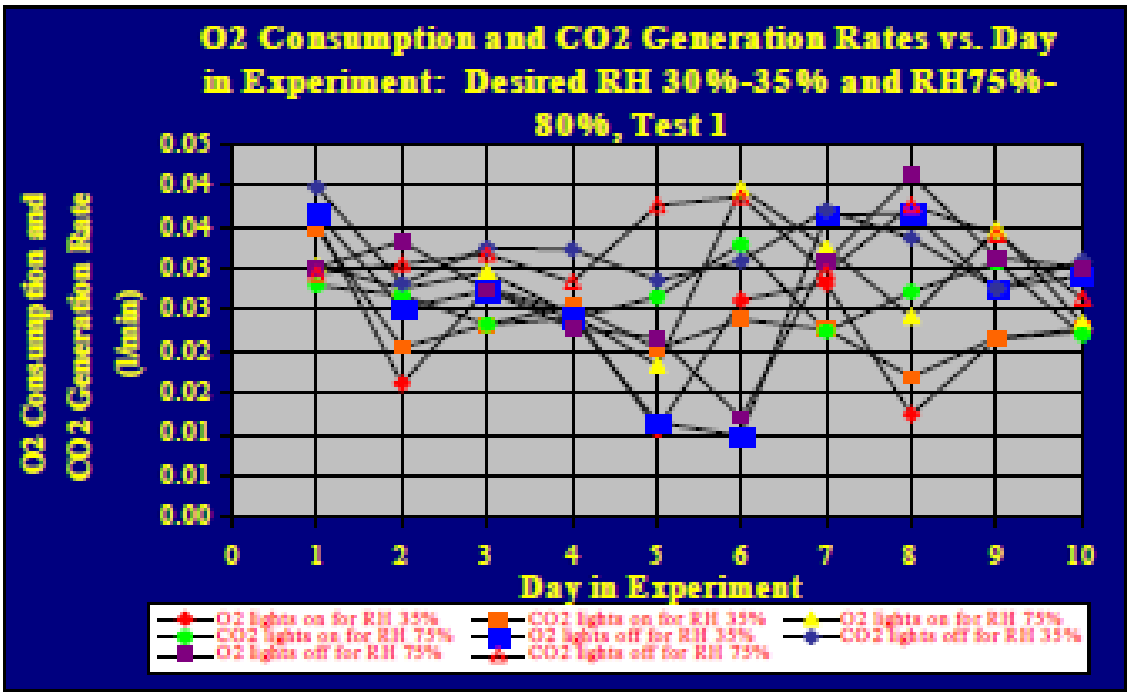

H2O Generation Rates vs. Day in Experiment for Different Cage Groups, Test 2
H2O Generation Rate (g/hr/100g body wt)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage: 1,2,3,4 for RH 55%
Cage: 5,6,7,8 for RH 75%
Cage: 9,10,11,12 for RH 75%

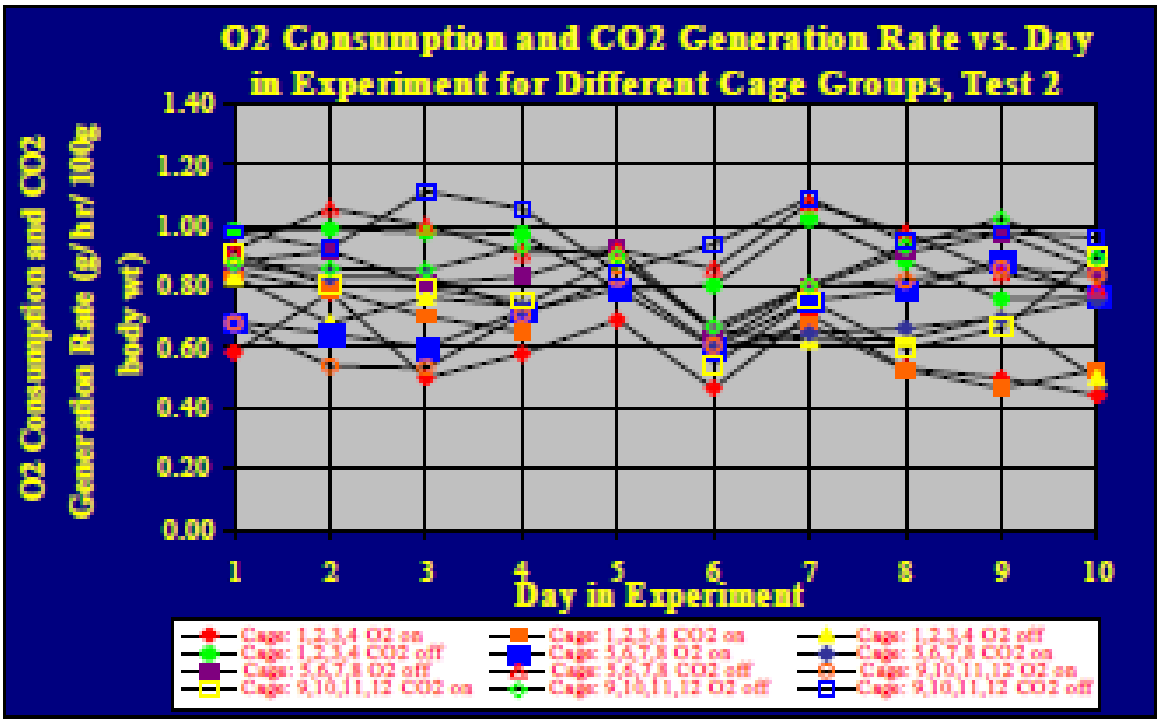
3.4.2.3 *Average Gas Mass Generation Rate for All Experimental Units in Test 1*

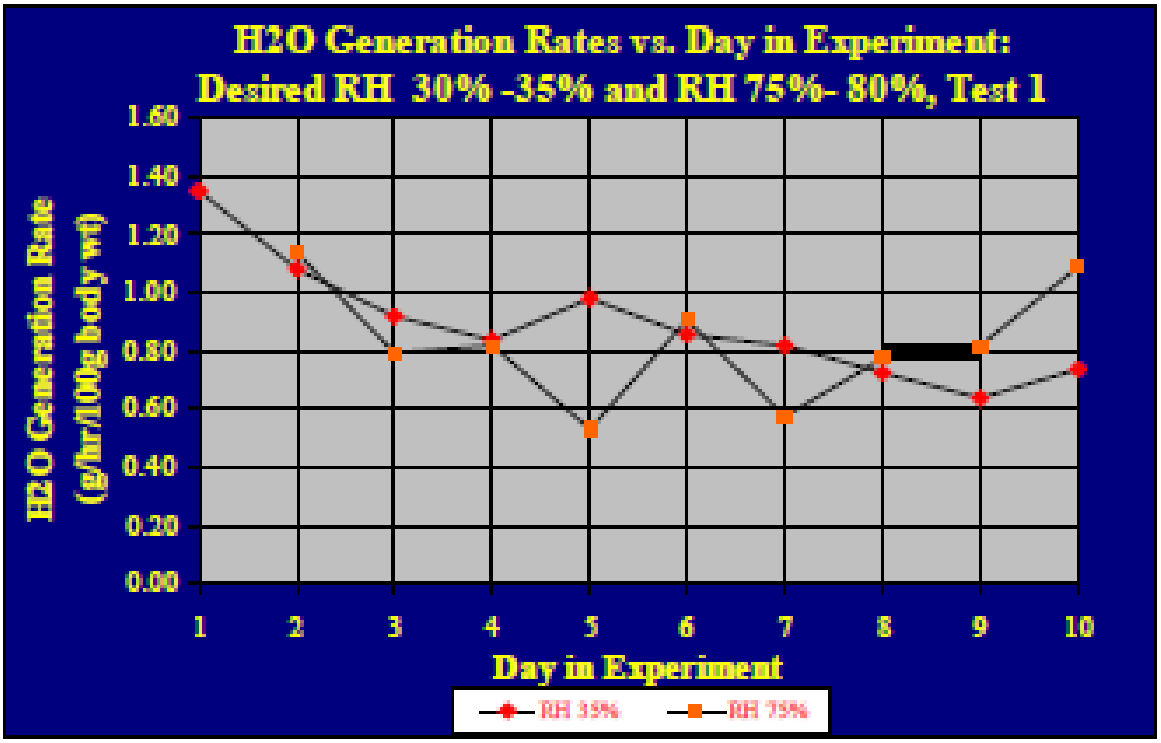




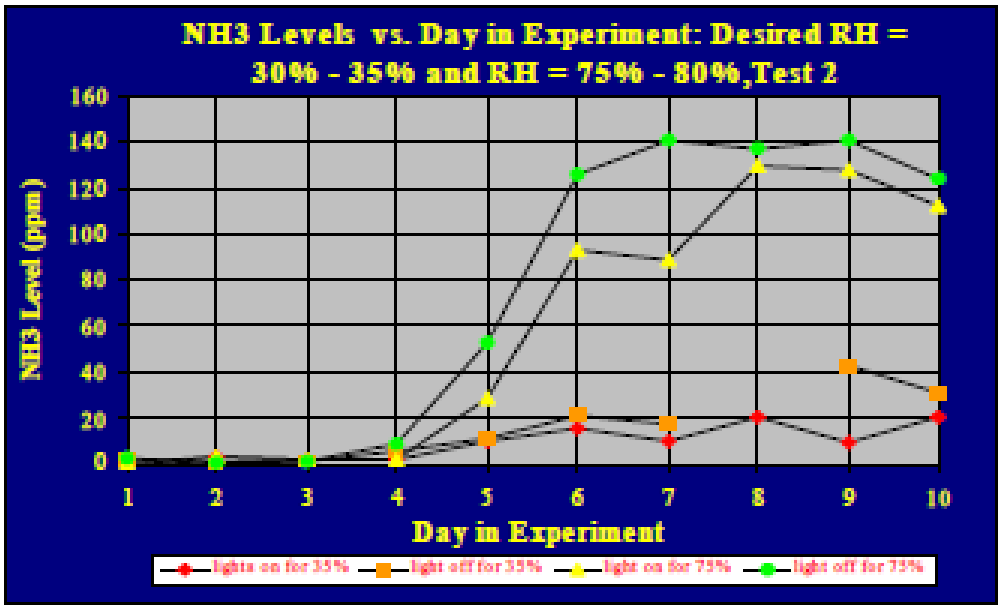

CO2 Levels vs. Day in Experiment: Desired RH = 30% - 35% and RH = 75% - 80%,Test 1
CO2 Level (ppm)
8000
7000
6000
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
Day in Experiment
lights on for 35%
light off for 35%
light on for 75%
light off for 75%

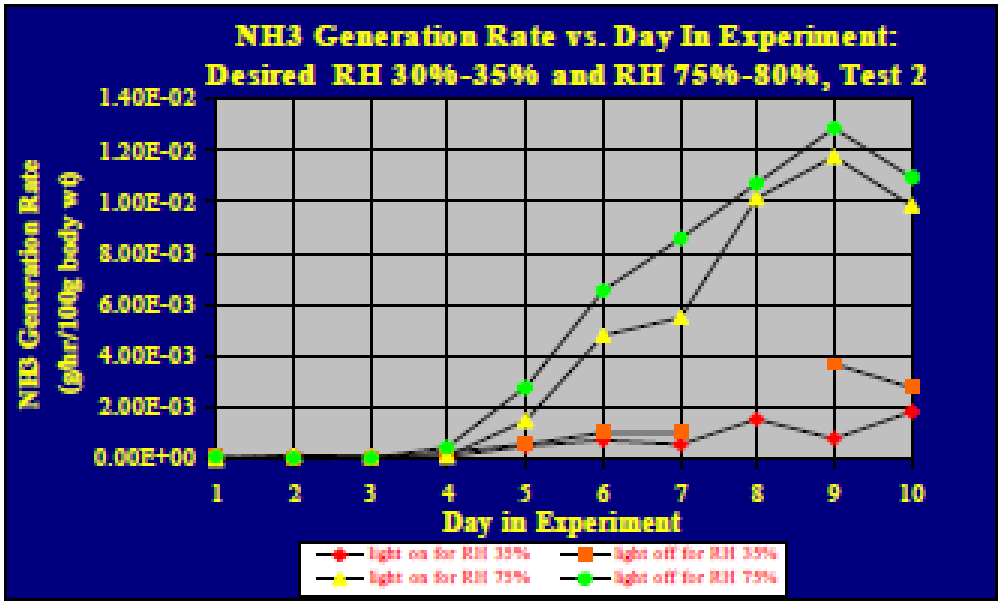

O2 Consumption and CO2 Generation Rates vs. Day in Experiment: Desired RH 30%-35% and RH75%-80%, Test 1
O2 Consumption and CO2 Generation Rate (l/min)
0.05
0.04
0.04
0.03
0.03
0.02
0.02
0.01
0.01
0.00
0
1
2
3
4
5
6
7
8
9
10
Day in Experiment
O2 lights on for RH 35%
CO2 lights on for RH 35%
O2 lights on for RH 75%
CO2 lights on for RH 75%
O2 lights off for RH 35%
CO2 lights off for RH 35%
O2 lights off for RH 75%
CO2 lights off for RH 75%

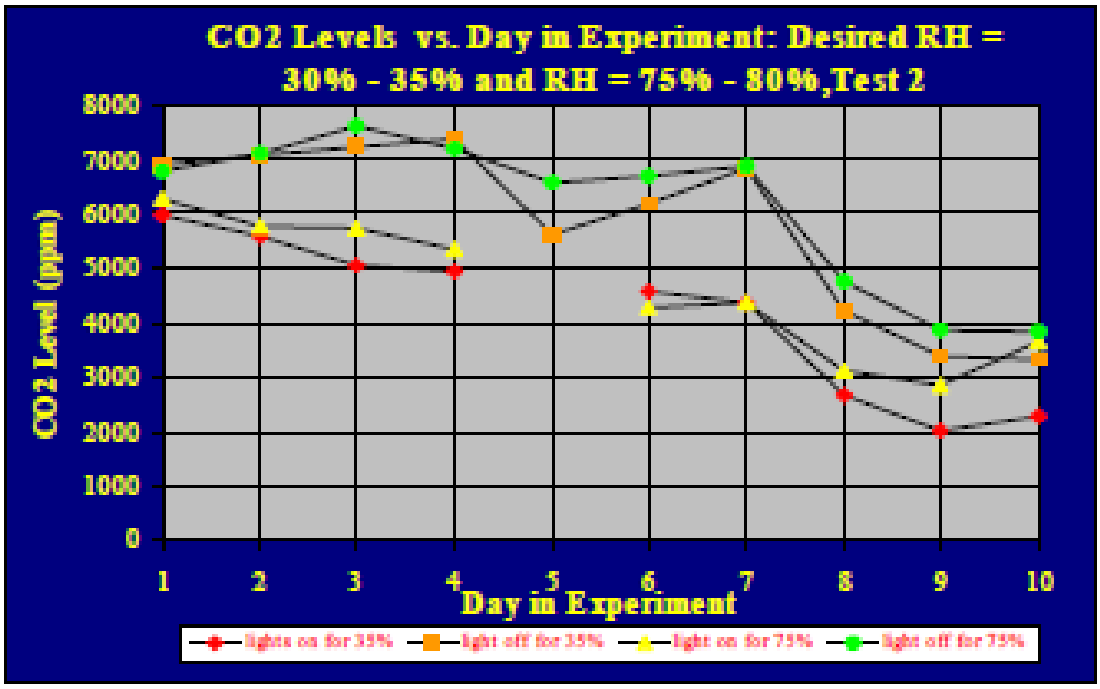

O2 Consumption and CO2 Generation Rate vs. Day in Experiment for Different Cage Groups, Test 2
O2 Consumption and CO2 Generation Rate (g/hr/100g body wt)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Cage: 1,2,3,4 O2 on
Cage: 1,2,3,4 CO2 off
Cage: 5,6,7,8 O2 off
Cage: 9,10,11,12 CO2 on
Cage: 1,2,3,4 CO2 on
Cage: 5,6,7,8 O2 on
Cage: 5,6,7,8 CO2 off
Cage: 9,10,11,12 O2 off
Cage: 1,2,3,4 O2 off
Cage: 5,6,7,8 CO2 on
Cage: 9,10,11,12 O2 on
Cage: 9,10,11,12 CO2 off

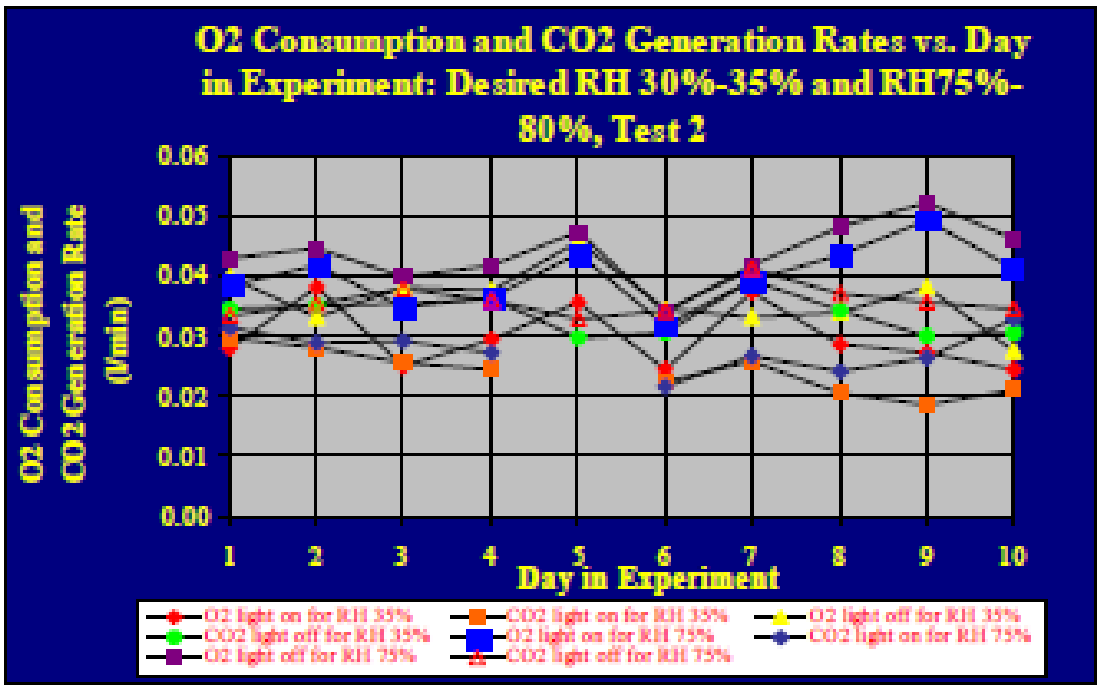

H2O Generation Rates vs. Day in Experiment: Desired RH 30% -35% and RH 75%- 80%, Test 1
H2O Generation Rate (g/hr/100g body wt)
1.60
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
RH 35%
RH 75%

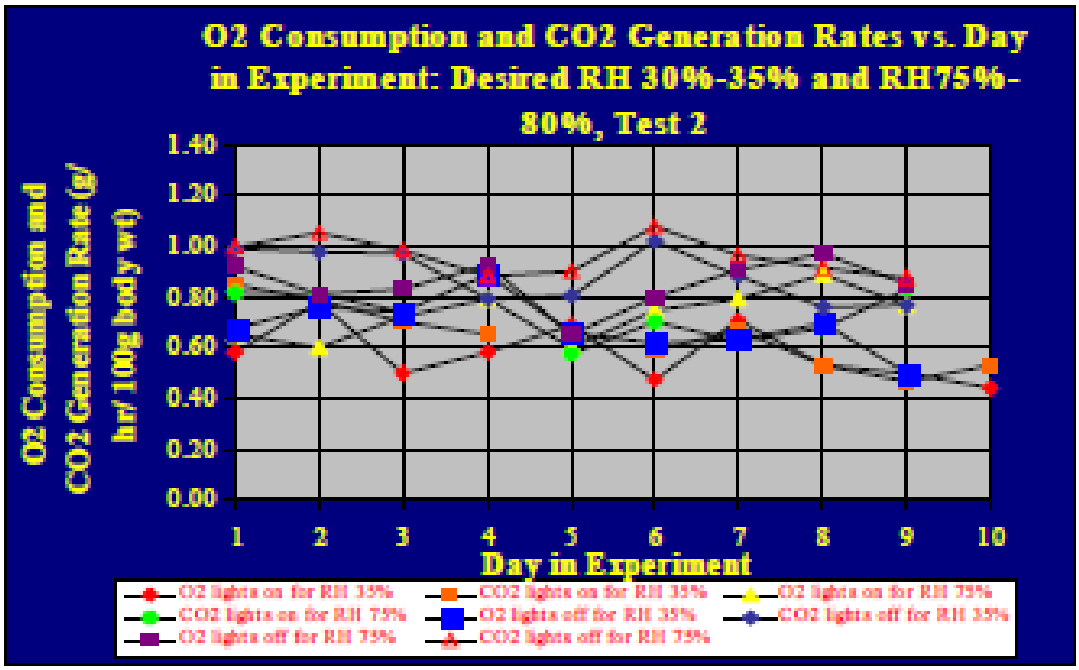
3.4.2.4 Average Gas Mass Generation Rate for All Experimental Units in Test 2

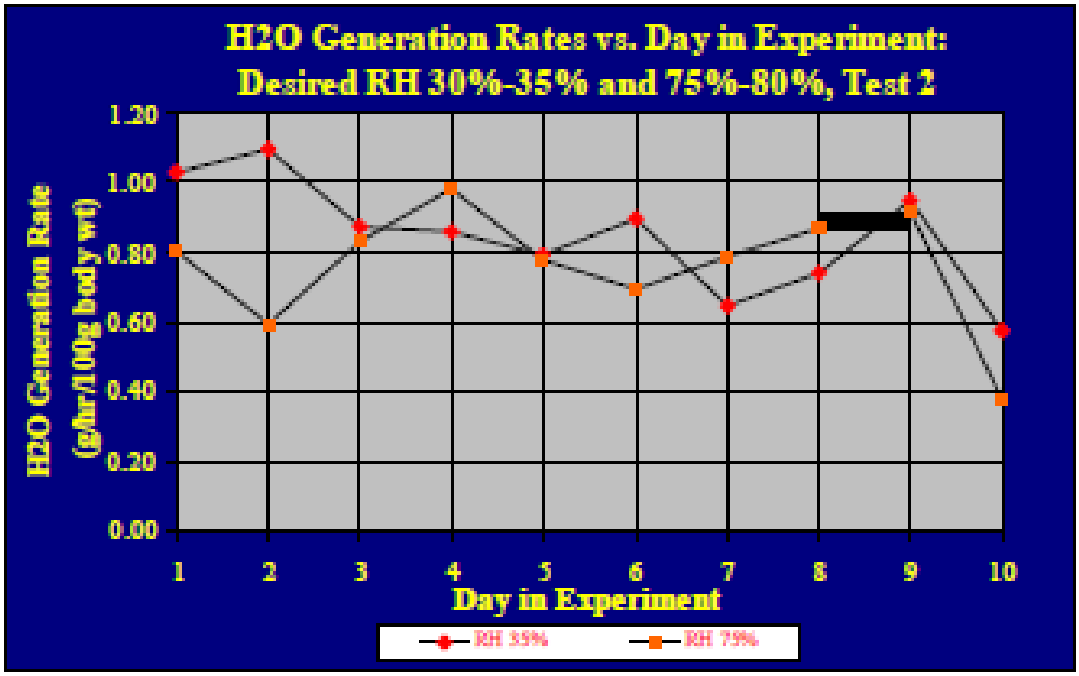




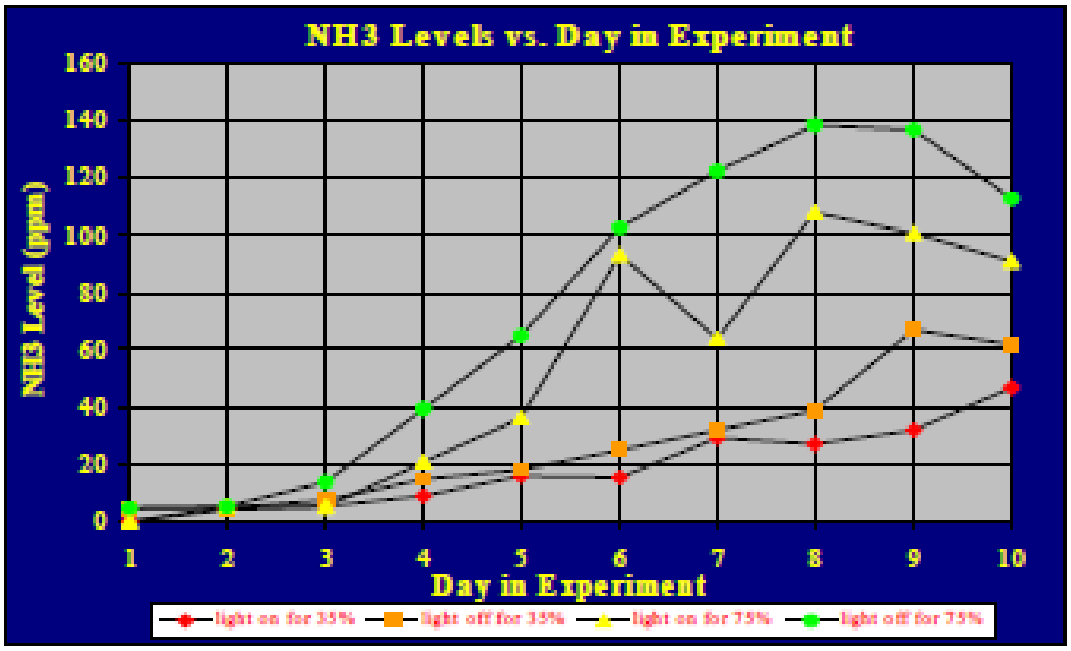

CO2 Levels vs. Day in Experiment: Desired RH = 30% - 35% and RH = 75% - 80%,Test 2
CO2 Level (ppm)
8000
7000
6000
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
Day in Experiment
lights on for 35%
light off for 35%
light on for 75%
light off for 75%

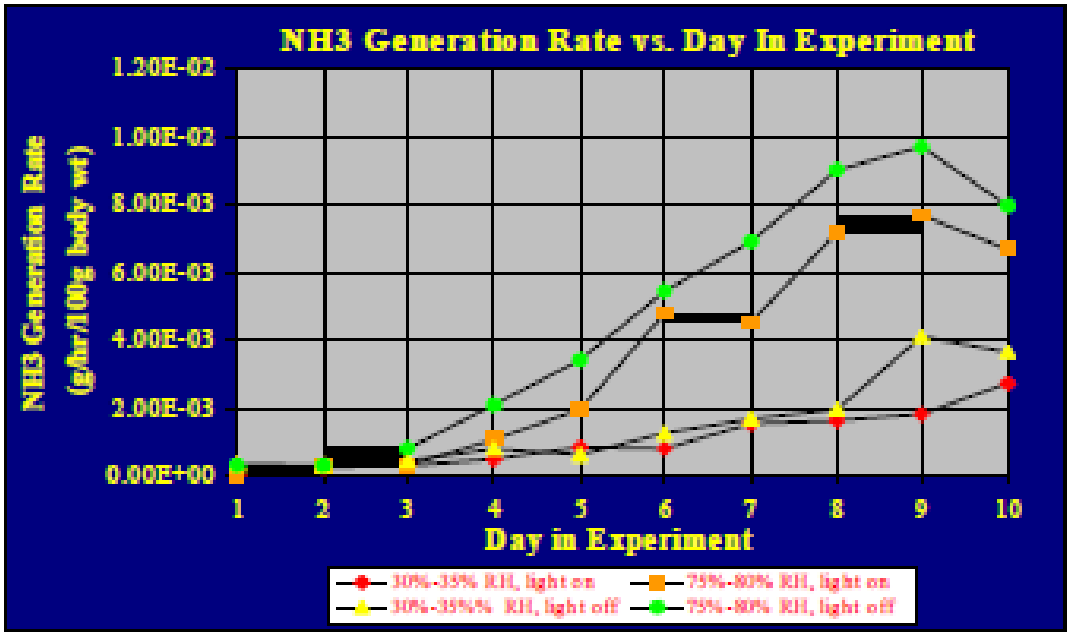

O2 Consumption and CO2 Generation Rates vs. Day in Experiment: Desired RH 30%-35% and RH75%-80%, Test 2
O2 Consumption and CO2 Generation Rate (l/min)
0.06
0.05
0.04
0.03
0.02
0.01
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
O2 light on for RH 35%
CO2 light on for RH 35%
O2 light off for RH 35%
CO2 light off for RH 35%
O2 light on for RH 75%
CO2 light on for RH 75%
O2 light off for RH 75%
CO2 light off for RH 75%

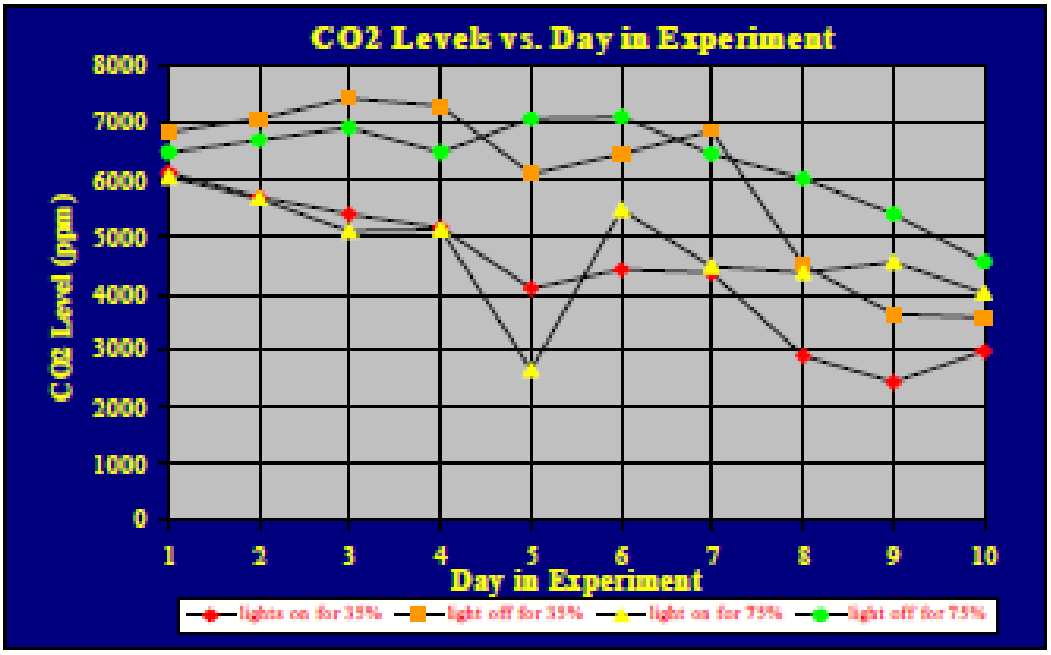

O2 Consumption and CO2 Generation Rates vs. Day in Experiment: Desired RH 30%-35% and RH75%-80%, Test 2
O2 Consumption and CO2 Generation Rate (g/hr/100g body wt)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
O2 lights on for RH 35%
CO2 lights on for RH 35%
O2 lights on for RH 75%
CO2 lights on for RH 75%
O2 lights off for RH 35%
CO2 lights off for RH 35%
O2 lights off for RH 75%
CO2 lights off for RH 75%

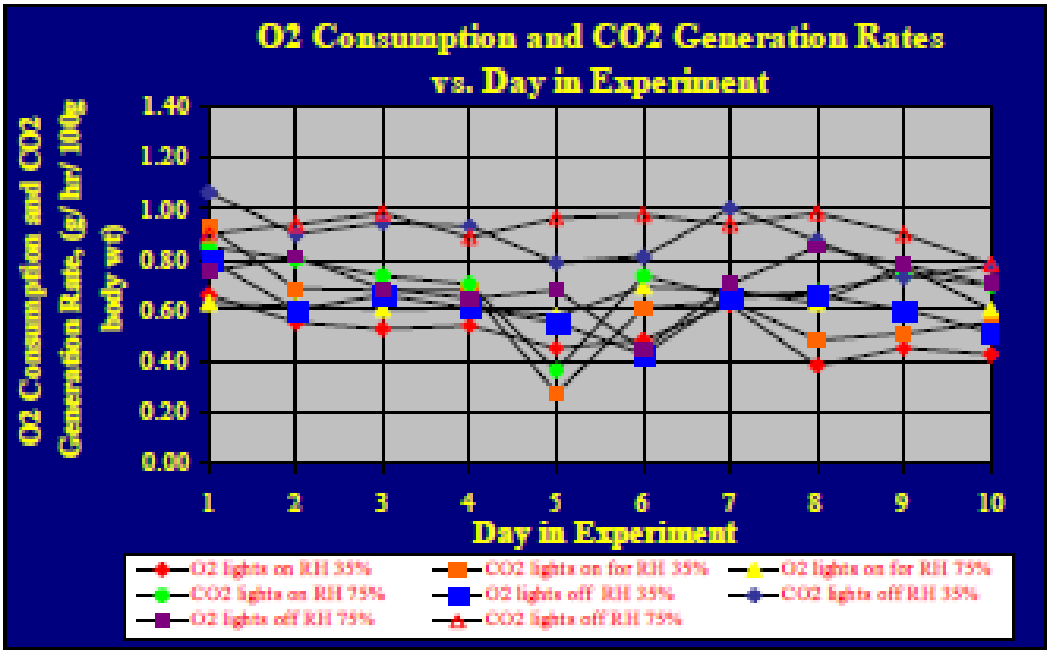

H2O Generation Rates vs. Day in Experiment: Desired RH 30%-35% and 75%-80%, Test 2
H2O Generation Rate (g/hr/100g body wt)
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
RH 35%
RH 75%

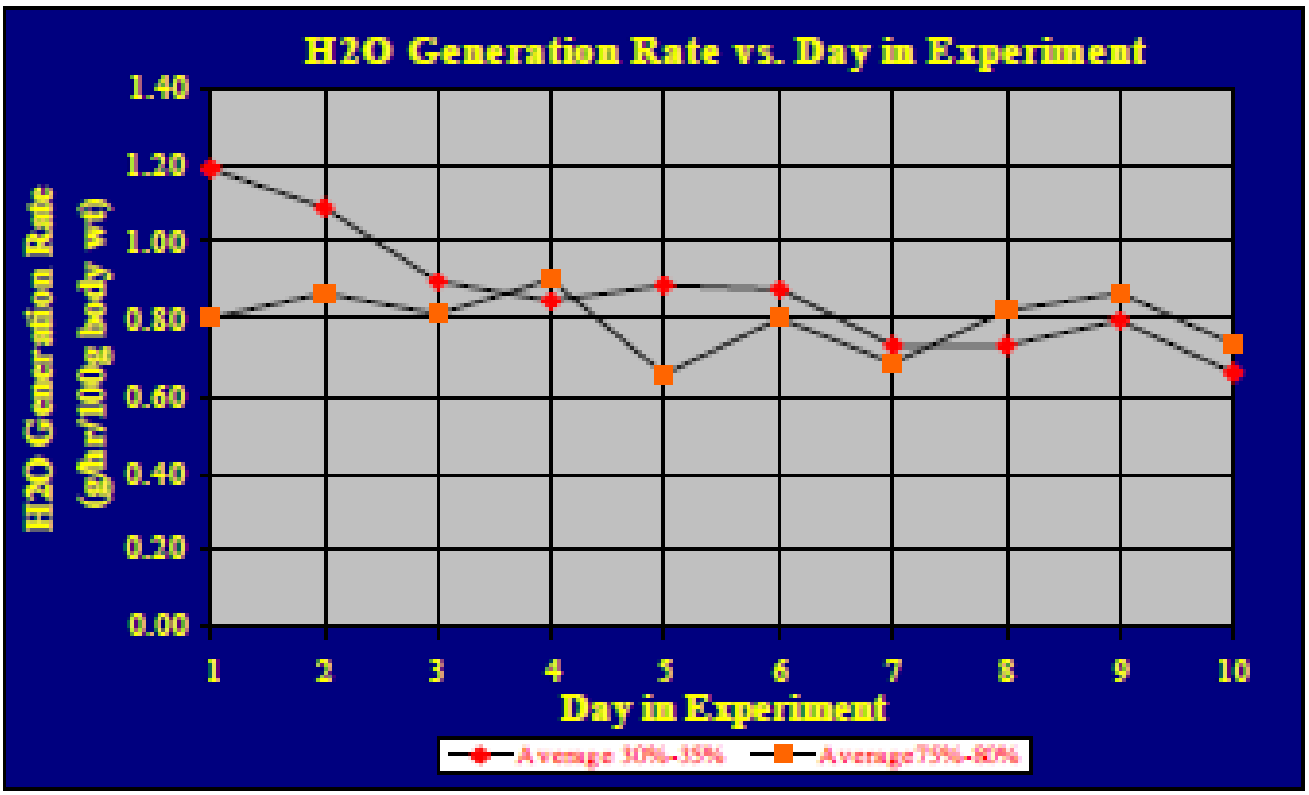
3.4.2.5 Averaged Data for All Experimental Units from Test 1 and Test 2



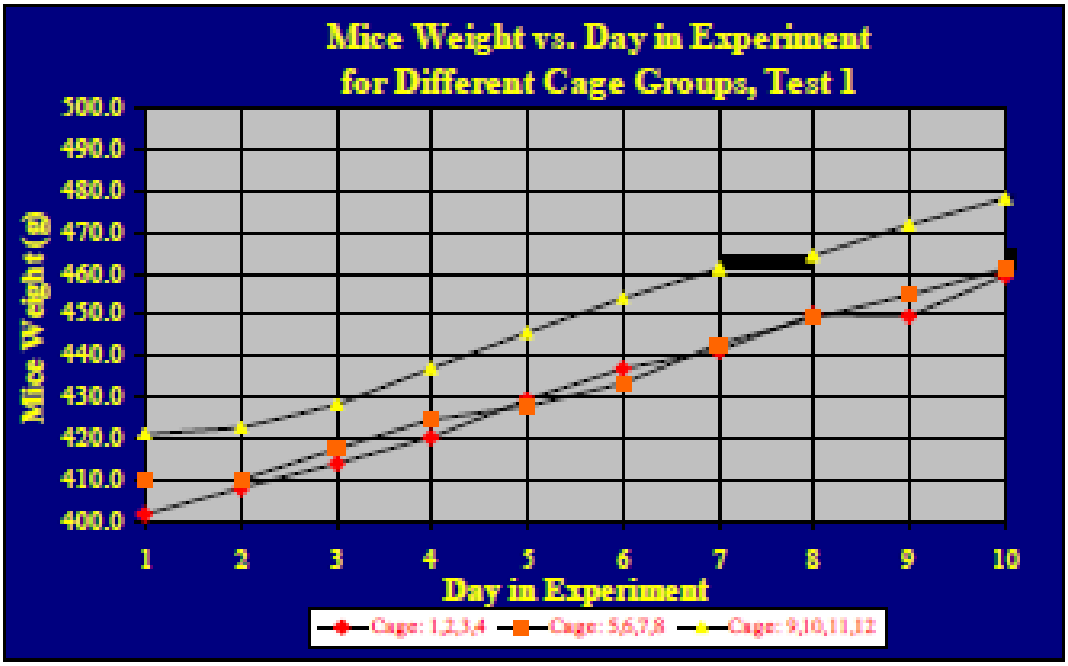


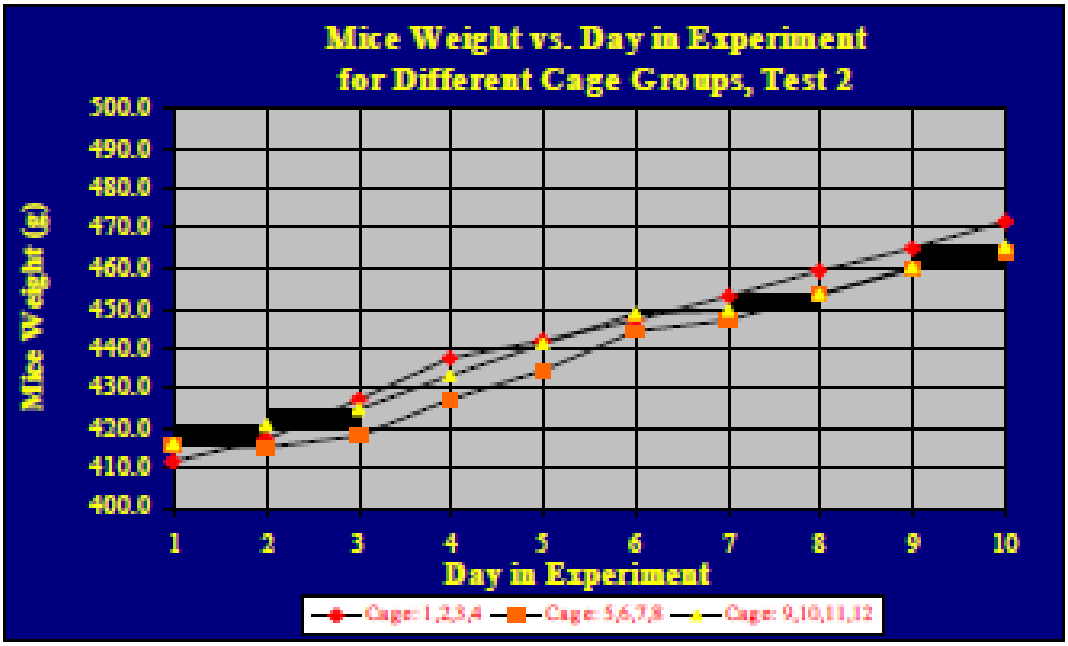

CO2 Levels vs. Day in Experiment
CO2 Level (ppm)
8000
7000
6000
5000
4000
3000
2000
1000
0
1
2
3
4
5
6
7
8
9
10
Day in Experiment
lights on for 35%
light off for 35%
light on for 75%
light off for 75%


O2 Consumption and CO2 Generation Rates vs. Day in Experiment
O2 Consumption and CO2 Generation Rate, (g/ hr/ 100g body wt)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
O2 lights on RH 35%
CO2 lights on for RH 35%
O2 lights on for RH 75%
CO2 lights on RH 75%
O2 lights off RH 35%
CO2 lights off RH 35%
O2 lights off RH 75%
CO2 lights off RH 75%


H2O Generation Rate vs. Day in Experiment
H2O Generation Rate (g/hr/100g body wt)
1.40
1.20
1.00
0.80
0.60
0.40
0.20
0.00
1
2
3
4
5
6
7
8
9
10
Day in Experiment
Average 30%-35%
Average 75%-80%

3.4.2.6 Mice Weights for Different Groups for Tests 1 and 2





4. ROOM CONDITION

4.1 Justification of Air Velocity Sampling Frequency

4.1.1 Minimum Sampling Frequency

To measure the turbulence intensity in an airflow field, air velocity sampling frequency must be sufficiently high so that the original air velocity fluctuation patterns can be reconstructed. The minimum sampling frequency (f_s) should be twice as much as the fluctuation frequency of the measured variable (f_v), air velocity in this case, i.e.,

$$f_s > 2 f_v \qquad (4.1)$$

The fluctuation frequency of air velocity is affected by at least the following factors: air velocity, boundary conditions of the airflow field, and the jet momentum. In this study, there are two subzones: jet zone or Zone 2 (within 0.30m (12") of the diffuser) and occupied zone or Zone 1 (the rest of the room airspace).

4.1.2 Air Velocity of Jet Zone and Occupied Zone

For the jet zone, the air discharge from the perforated diffuser is a free jet. Thus, only the discharge velocity and the jet momentum are considered to be key factors affecting the turbulence intensity.

For the given perforated diffuser, the diameter of each discharge hole is 2.38e-3m (3/32"). There are 10,890 holes with a total discharge opening of 4.85 m^2 (0.52 ft^2). The dimension of the diffuser discharging area is 0.38m^2 (4.13 ft^2) (0.69m (27") long and 0.56m (22") wide)). The air supply rate is 10 air changes per hour (ACH) which is 6.04e-2 m^3/s (128 cfm). Because the effect of the vena contracta, the effective discharge opening is smaller than the actual area of the hole. This effect can be accounted for by applying a discharge coefficient C_d. Considering the flow as a flow in a virtual cylinder before being discharged from the hole, the area ratio A_2 to A_1 is 12.7 percent, the same as the opening ratio of the diffuser, where A_2 is the opening area of hole, and A_1 is the cross-section area of the virtual cylinder. Thus the ratio of D_2 to D_1 is 0.36 and the *Cd* is 0.6 (McQuiston and Parker, 1977). Thus the mean discharge air velocity from each hole is

$$U_i = 128/(C_d \ A_2) = 128/(0.6 \ 0.522) = 409 \ fpm \qquad (4.2)$$

Since this discharge velocity from the free jet has a very small momentum, the air velocity will attenuate quickly. Using the free jet theory, the jet velocity (U_x) at a distance (x) from the discharge opening is given by (Wilson, Ed: Hellickson and Walker, 1983)

$$U_x = 7.6\, U_i\, A/x \qquad (4.3)$$

Where A is the opening area of the jet: 0.0000479 ft^2.

The first measurement point is two inches from the diffuser. The vena contracta from the discharging surface is less than 0.5 $D_2 = 3/64$" and therefore is negligible compared with the x. At 5.0e-2m (2") distance from the opening, the air jet velocity will be reduced to

$$U_{x=2"} = 7.6 \quad 409 \quad 0.0000479^{1/2} \quad 0.1667 = 129\ fpm \qquad (4.4)$$

Thus, the air velocity will not exceed 129 fpm at any measurement point in the jet zone (Zone 2) unless the airflow field is disturbed. Compared with the conventional air diffusers, the air velocity of this perforated diffuser is very low, and hence, low turbulence intensities.

At an outside measurement point in the jet zone (x = 12"), the jet velocity will be:

$$U_{x=12"} = 7.6 \quad 409 \quad 0.0000479^{1/2} \quad 1 = 22\ fpm \qquad (4.5)$$

Thus, on average, the air velocity will not exceed 22 fpm at any measurement point in the occupied zone (Zone 1), except in vicinity of the exhaust outlet, unless the airflow field is disturbed.

4.1.3 Air Velocity Fluctuation in the Jet Zone

Air velocities in a jet zone of a room air space have a strong random feature. The air velocities in the jet zone contains more high fluctuation frequencies and more turbulence compared to those in occupied zones (Zhang, 1991). Using a hot wire anemometer and at a sampling frequency of 250 Hz, figures 4.1.01 and 4.1.02 (Zhang, 1991) illustrate examples of air velocity fluctuations in jet zones with a discharge velocity (U_d) of 350 fpm and 150 fpm, respectively.

Within each primary velocity fluctuation cycle (time period between two peak to peak values), there are high frequency fluctuations containing negligible energy that can be considered to be secondary velocity fluctuation. By the definition of the turbulence intensity, which is the ratio of the standard deviation of velocity fluctuations to the mean velocity, the secondary velocity fluctuation has only negligible influence on the turbulence intensity, i.e., the secondary high frequency fluctuations contribute very little to the overall variation of the velocity fluctuation. This can be further explained in the following example.

If the secondary velocity fluctuation were filtered out, the velocities in figures 4.1.01 and 4.1.02 can be reconstructed as in figure 4.1.03, which only contains the primary velocity fluctuation. The turbulence intensities yielded from figures 4.1.01 and 4.1.03 will be approximately the same. From figure 4.1.03, the primary velocity fluctuations have a frequency of 3.7 Hz for U_d = 350 fpm and 3.5 Hz for U_d = 150 fpm. Therefore, the velocity fluctuation frequency (f_v) for U_d = 350 fpm can be considered as 4 Hz (>3.7).

It has been proven that the energy density in a turbulent flow attenuates quickly at high frequencies (typically higher than 10 Hz). The relationship between the energy density and the frequency of the air velocity fluctuation is approximately in the order of $f_v^{-5/3}$ (Hinze, 1975). Examples of energy density spectra of air velocities are shown in figures 4.1.04 and 4.1.05 (Zhang, 1991). In the case of figure 4.1.01, in which the sampling frequency was 250 Hz, the secondary velocity fluctuation had a frequency of approximately 60 Hz. Compared with the primary velocity fluctuations at approximately 4 Hz, the energy density (E_d) in the secondary velocity fluctuation, a negligible fluctuation, was:

$$\frac{E_d|_{f=60}}{E_d|_{f=4}} \quad \frac{60^{-5/3}}{4^{-5/3}} \quad 1\%$$

Other error sources such as anemometer time response and instrumentation accuracy are usually well over 1 percent of error range and should be greater concerns than the secondary high frequency velocity fluctuations.

Since the air jet in this study has a discharge velocity of 282 fpm (from Eqn. 4.2), which is less than 350 fpm and has a much smaller jet momentum than that in figure 4.1.01, the velocity fluctuation frequency should be smaller than 4 Hz. Therefore, a sampling frequency of

$$f_s > 2 f_v = 8 \ (Hz) \qquad (4.6)$$

should be sufficiently high for this application. Thus, an anemometer with a time response of less than 0.125s is required, i.e., the anemometer should be capable of sampling 8 times per second. The BERL thermister type anemometer is capable of measuring velocity fluctuations at 20 Hz sampling frequency. This thermister omni-directional anemometer was compared with two commercially available anemometers: a hot wire anemometer (TSI, model IFA 100) and an omni-directional anemometer (TSI, model 8470-13E-V).

Comparison results are shown in figures 4.1.06 and 4.1.07. The thermister and the TSI hot wire anemometer yielded approximately the same results (figures 4.1.07 to 4.1.09), but the TSI omni-directional anemometer could only respond at very low frequencies. From figure 4.1.07, the thermister anemometer responds to the velocity within 0.5 percent of error what the TSI hot wire anemometer does when the air velocity is higher than 20 fpm. In figures 4.1.08 and 4.1.09, the thermister anemometer gives a very similar frequency response to that of the TSI hot wire anemometer. These data show that the thermister omni-directional anemometer is suitable for this application.

4.1.4 Verification Using the TSI-IFA Hot Wire Anemometer

Air velocity fluctuations were measured using a fast response TSI IFA-100 anemometer. The IFA-100 is capable of measuring air velocity fluctuations up to 5,000 Hz. Due to the turbulence nature of the air diffuser, most of the energy of the airflow is carried by the low frequency (less than 5 Hz) flows. Figures 4.1.10, 4.1.11, and 4.1.12 show the airflow fluctuation patterns using sampling frequency 100, 40, and 20 Hz, respectively, within 2.5 second sampling period. Statistical comparisons of these three sampling frequencies are show in table 4.1.01.

Table 4.1.01 Statistics of air velocity fluctuations at sampling frequencies 100, 40, and 20 Hz.

	Sampling Frequency		
	100 Hz	**40 Hz**	**20 Hz**
Mean air velocity (fpm)	263.1	264.3	265.5
Turbulence intensity	0.123	0.124	0.129

The differences in mean air velocity were less than 0.5 percent between 100 Hz and 40 Hz; less than 1 percent between 100 Hz and 20 Hz; and less than 0.5 between 40 Hz and 20 Hz. The differences in turbulence intensity were 0.8 percent between 100 Hz and 40 Hz; 4.9 percent between 100 Hz and 20 Hz; and 4 percent between 40 Hz and 20 Hz. In this project, sampling frequency of 40 Hz was used.

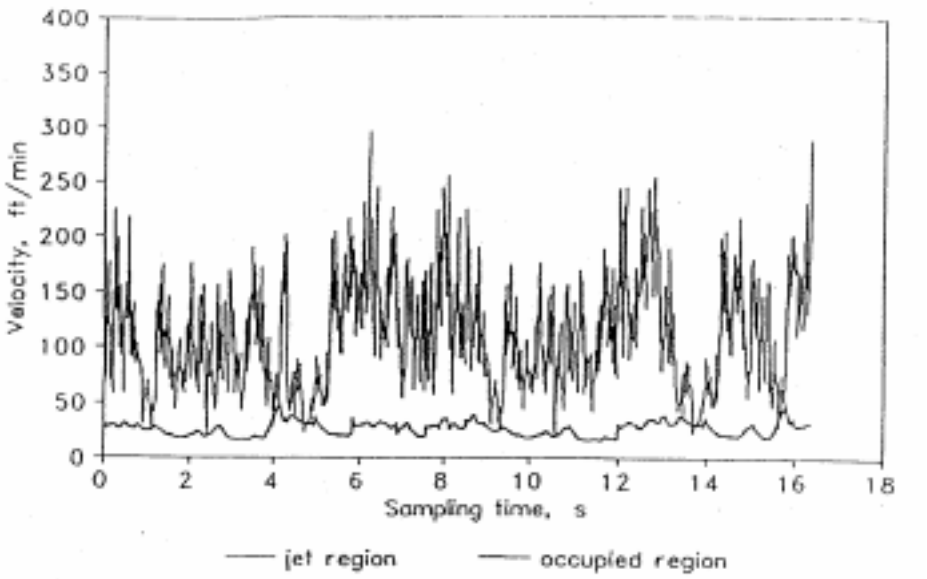


Figure 4.1.01. *Sample velocity signals: U_d = 350 fpm, T_{fd} = 0°F (jet region: x/w = 0.125, y/H = 0.0521; occupied region: x/w = 0.375, y/H = 0.6771). (Zhang, 1991)*

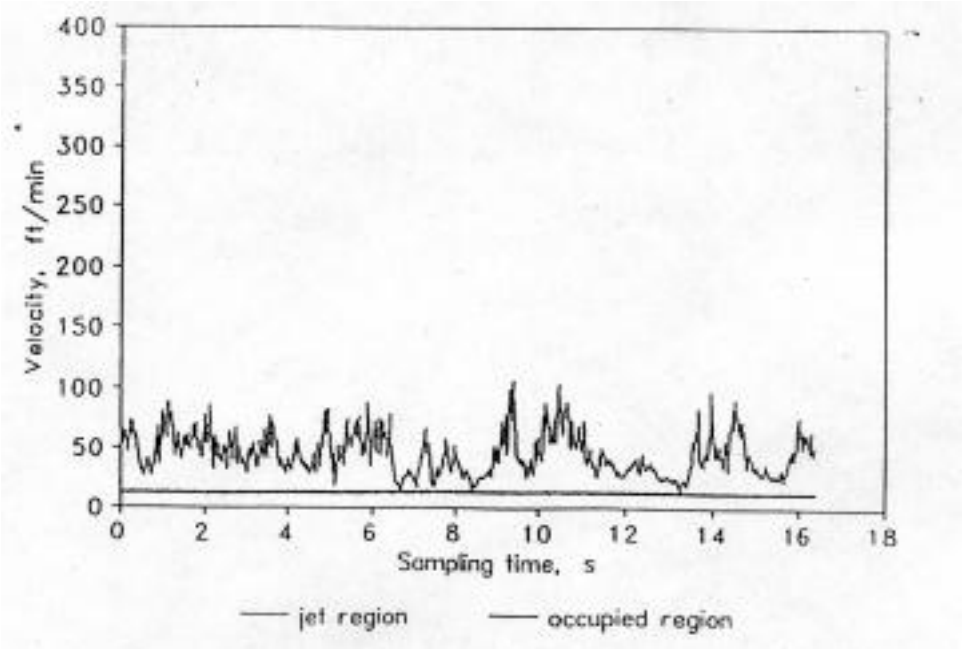


Figure 4.1.02. *Sample velocity signals: U_d = 150 fpm, T_{fd} = 0°F (jet region: x/w = 0.125, y/H = 0.0521; occupied region: x/w = 0.375, y/H = 0.6771). (Zhang, 1991)*

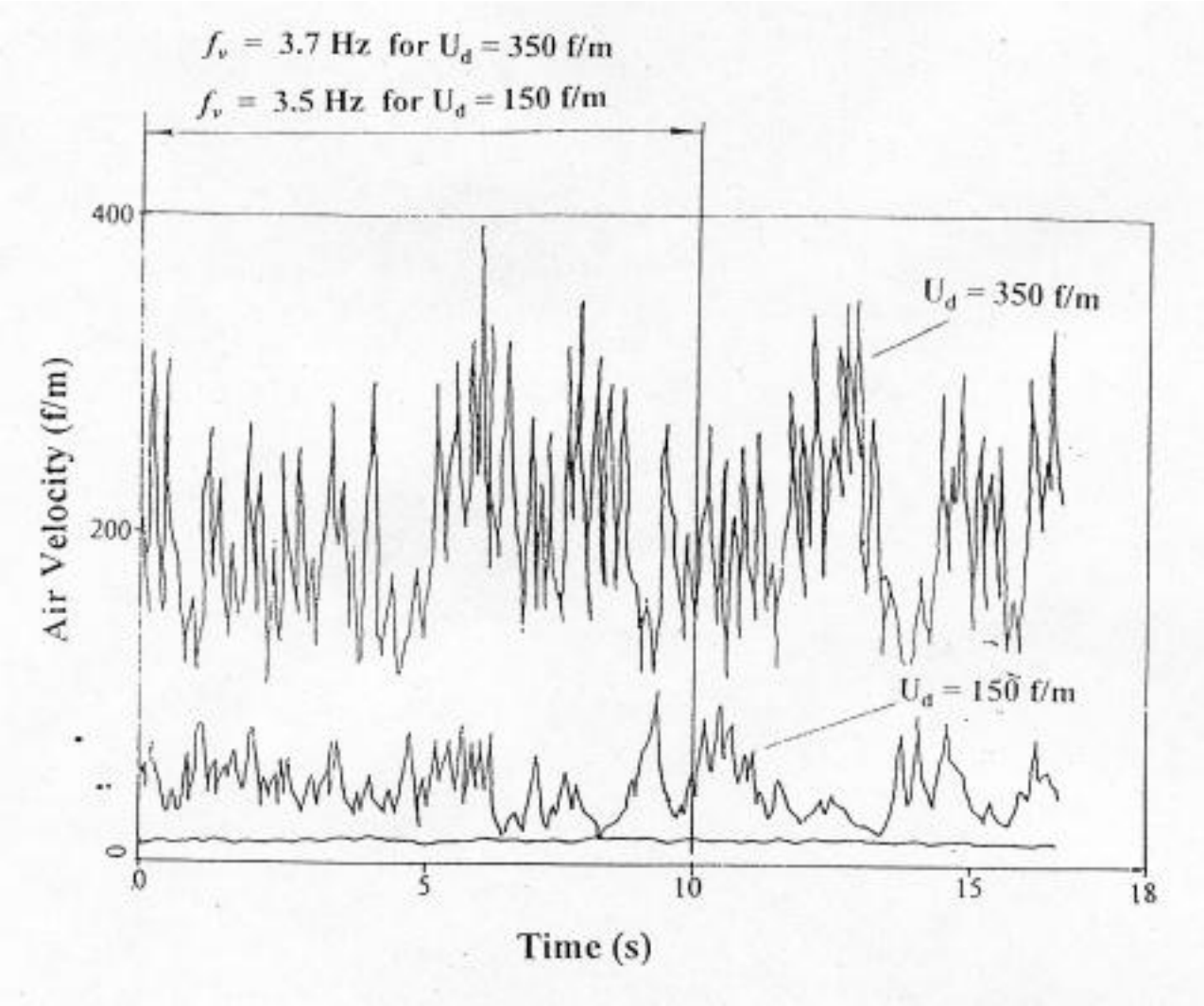


Figure 4.1.03. *Air velocity fluctuations in figures 4.1.01 and 4.1.02 through a low-pass filter. Secondary high frequency velocities were filtered out. Only primary flows with low frequencies are shown. Air velocity fluctuations in both primary flows (diffuser air velocity U_d = 350 fpm and 150 fpm) were less than 4 Hz.*

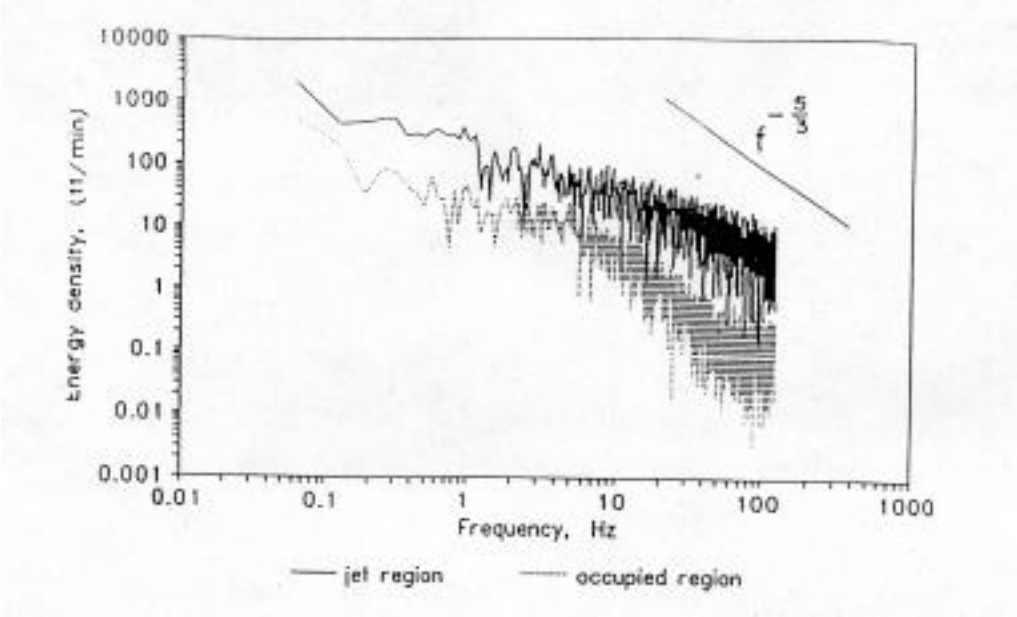


Figure 4.1.04. *Energy spectra or power spectra distribution (PSD) of air velocity: U_d = 500 fpm, T_{fd} = 0 ^oF (jet region: x/w = 0.125, y/H = 0.0521; occupied region: x/w = 0.375, y/H = 0.6771), (Zhang, 1991)*

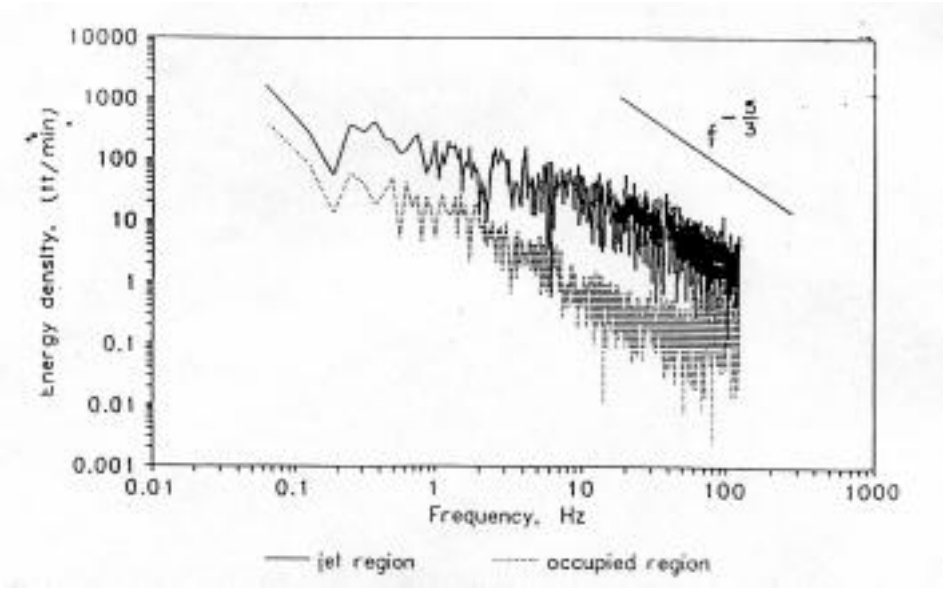


Figure 4.1.05. *Energy spectra or power spectra distribution (PSD) of air velocity: U_d = 350 fpm, T_{fd} = 0 ^oF (jet region: x/w = 0.125, y/H = 0.0521; occupied region: x/w = 0.375, y/H = 0.6771), (Zhang, 1991).*

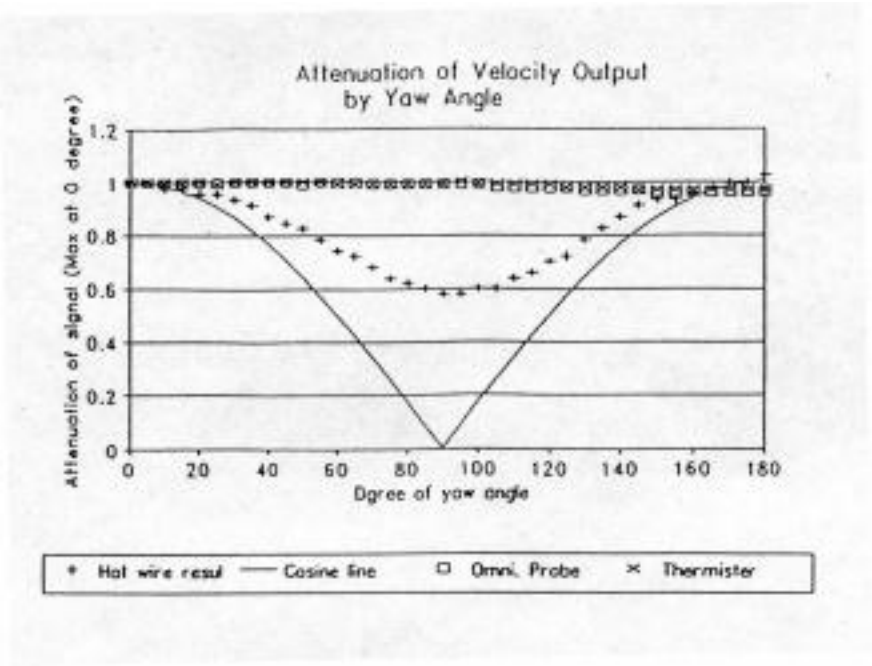


Figure 4.1.06. *Directional responses of a hot wire anemometer and a thermistor anemometer. (Li, 1994)*

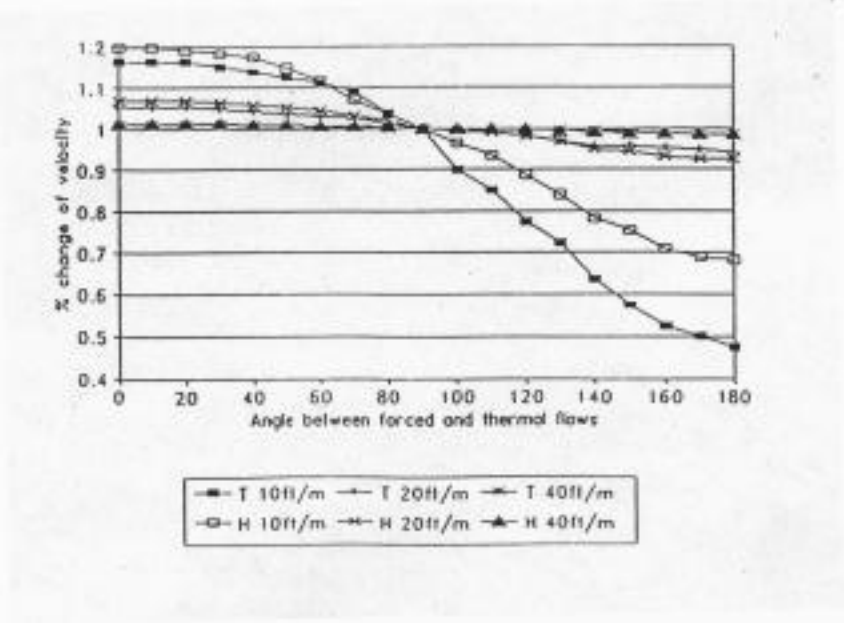


Figure 4.1.07. *Comparison of self-heating errors between the hot wire and the BERL thermistor anemometers. (Li, 1994).*

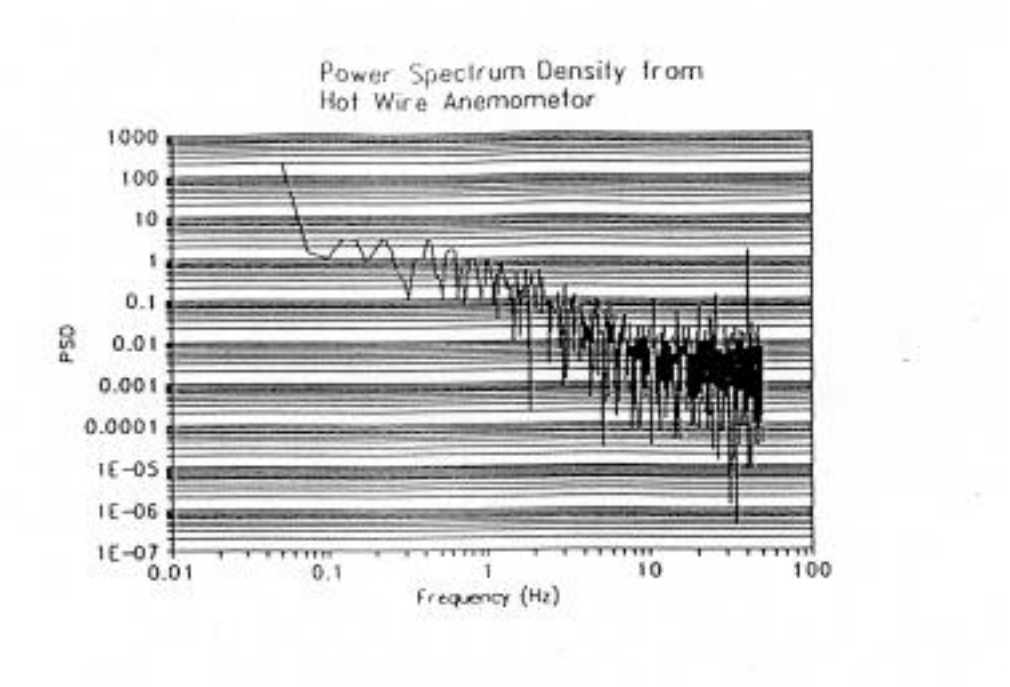


Figure 4.1.08. *Power spectra distribution from a TSI-IFA hot wire anemometer. (Li, 1994)*

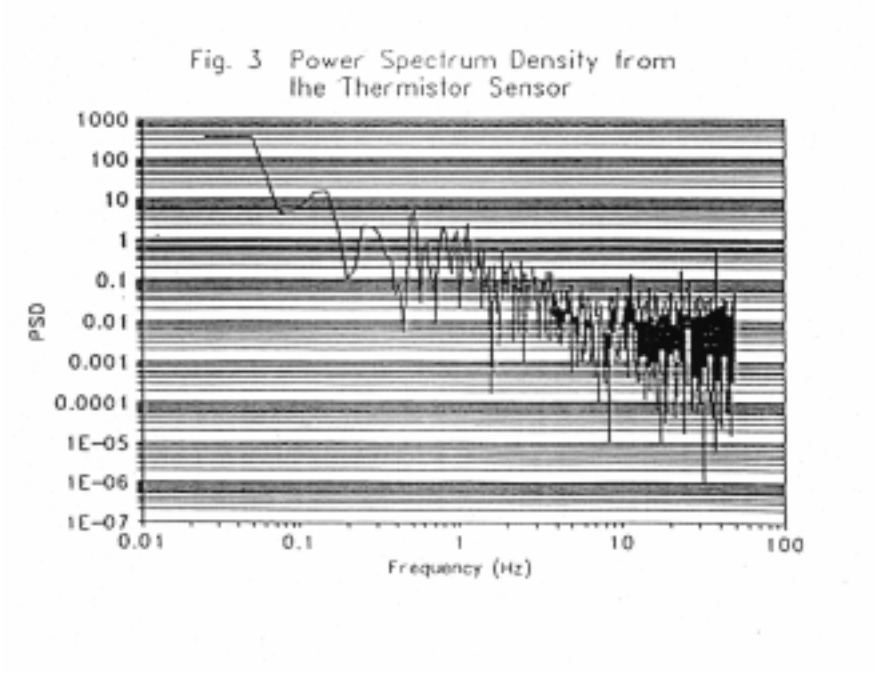


Figure 4.1.09. *Power spectra distribution from a BERL thermister anemometer. (Li, 1994)*

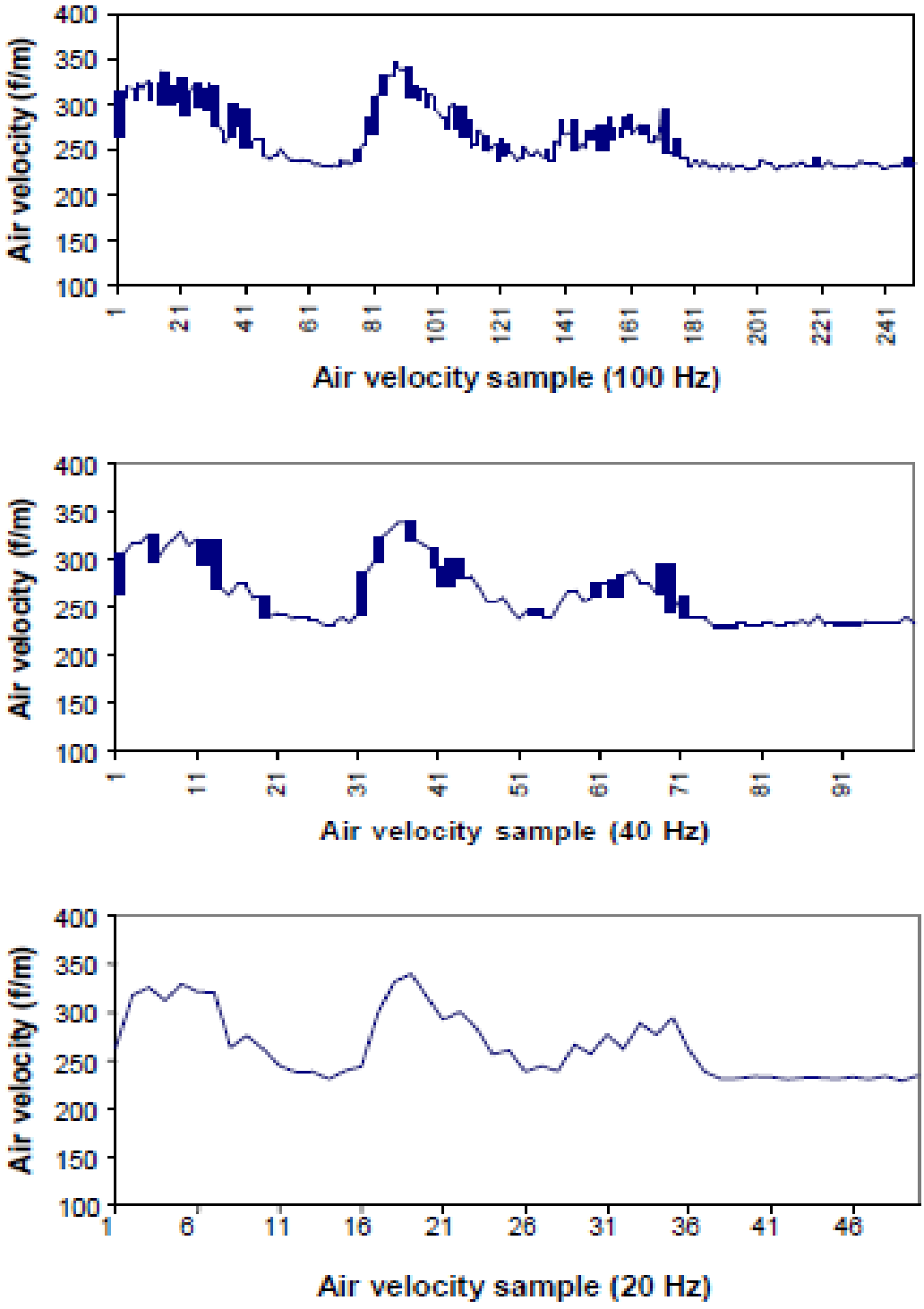


Figure 4.1.10. Comparison of air velocity fluctuations at different sampling frequencies. Upper: 100 Hz; Middle: 40 Hz; and Lower: 20 Hz.

4.2 Justification of Steady-State for Temperature and Air Velocity Field

4.2.1 Definition of Steady-State

In this project, steady-state is defined as when the fluctuation of mean air velocity and room temperature are less than 7 percent of the target value. The target value is the expected steady-state values over an extended period of time (in this case, mean values of over approximately two hours). For example, the target room temperature is 22.0 °C. Room temperatures within 22.0 1.5 °C (71.6 2.7 °F) (1.5 °C is 7 percent of 22.0 °C) is considered steady-state.

4.2.2 Justification

Air velocity responses:

Even at a very low air velocity, e.g., 0.05m/s (10 fpm), it only takes less than three minutes for a given air sample to travel from one location to any other location in the room and return. Thus, once the ventilation system is actuated and the door is closed, it is expected that a steady state-airflow field will be established within three minutes. To verify this assumption, air velocity fluctuations at one point (P_s) were measured. The point was near the end of traveling path of an air stream exiting from the exhaust: 0.61m (24") above floor, 0.61m (24") from west wall and 1.22m (48") from north wall. Figure 4.2.01 illustrates the air velocity fluctuations at this point 1, 4, 7, and 10 minutes after the door was closed, respectively.

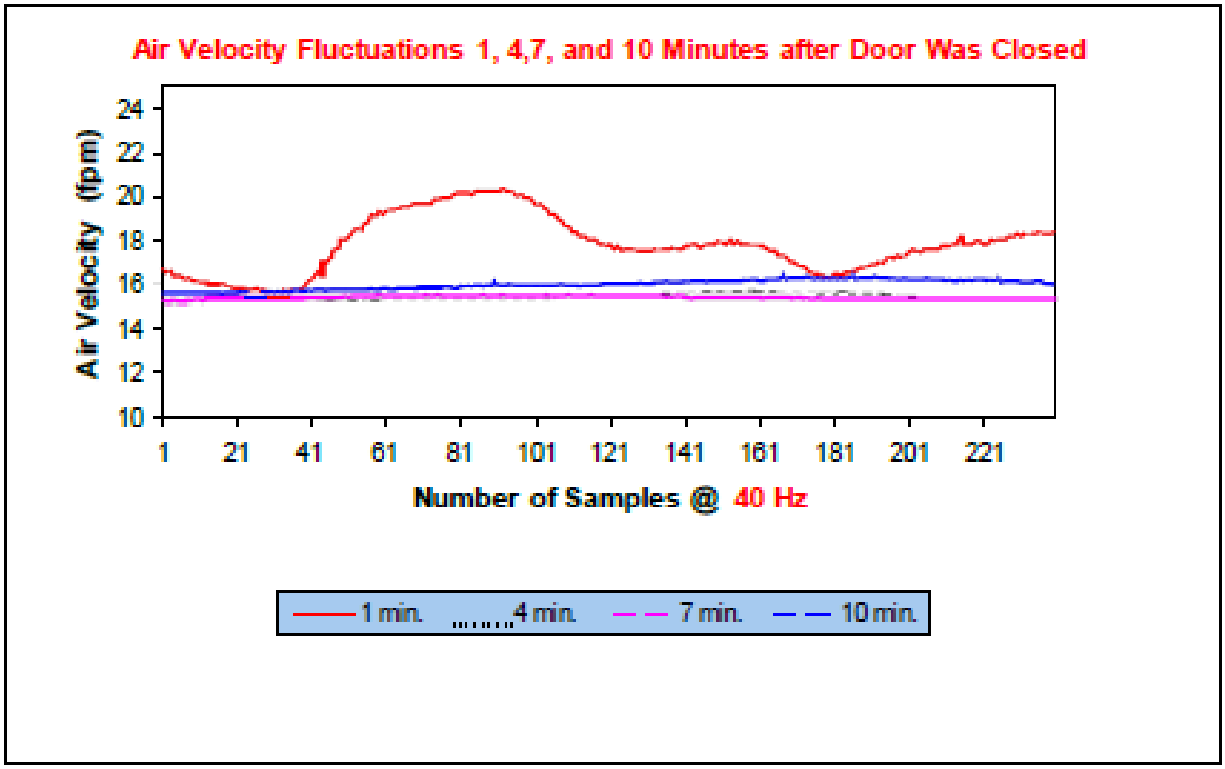


Figure 4.2.01. *Air velocity fluctuations 1, 4, 7, and 10 minutes after the door was closed, respectively*

The room air velocity field varied when the door closed for one minute. The mean air velocity became very consistent four minutes after the door was closed. The target air velocity at point P_s was 7.75e-2 m/s (15.5 fpm). The statistics for the mean air velocity are shown in table 4.2.01. The variation in mean air velocity was less than 1 percent after the door was closed for four minutes. Therefore, the airflow field was steady-state when the door was closed for four minutes and after.

Table 4.2.01. Variables measured after the door was closed for 1, 4, 7, and 10 minutes

	1 min	4 min	7 min	10 min	Target
U_{mean} (fpm)	17.77	15.41	15.39	15.99	15.50
SE for U_{mean} (fpm)	1.280	0.132	0.072	0.233	
TI (fpm)	0.072	0.0086	0.0047	0.0146	
U_{median} (fpm)	17.70	15.35	15.39	16.04	
Range of U_{mean} (fpm)	4.66	0.44	0.25	0.90	
Temperature (C)	22.89	22.99	22.88	23.01	22.78

Turbulence intensity

Because of the random nature of a turbulent flow in a room airspace (Zhang, 1991), the turbulence intensity can not be defined the same as the mean air velocity, i.e., turbulence intensity varies randomly as shown in table 4.2.01.

Room temperature

In general, steady-state for room temperature can take a few hours because of the large mass involved. However, the testing room is located within an air conditioned outer room in which the temperature is maintained at 22.0 1.5 °C (71.6 2.7 °F) regardless of the weather. Thus, the testing room is considered to be at a steady-state all the time. When the testing room door is opened, there may be a slight disturbance to the room temperature (usually a fraction of degree Celsius). Temperature response after the door was closed for 1, 4, 7, and 10 minutes are shown in table 4.2.01. The target room temperature was approximately 22.8 °C (73.0 °F). The testing room temperature elevation compared to the outer room temperature (22.0 °C) was due to the heating load of step motors and thermisters in the testing room. Temperatures in the testing room varied less than 1 percent of the target temperature for all four measurement periods. Therefore, the room temperature was in steady state after the door was closed for one minute.

4.2.3 Conclusion

A steady state both for velocity and temperature in the testing room can be achieved after the door was closed for 4 minutes. Data collection in this project was started 10 minutes after the door was closed to ensure steady state.

4.3 Empty Room Data

4.3.1 Surface Temperature and Ventilation System Data

Data Files	Z1up-e8 to Z1up-e12	Z1up-e1 to Z1up-e7	Z1up-m8 to Z1up-m15	Z1up-m4 to Z1up-m7	Z1up-m1 to Z1up-m3	Z1up-w1 to Z1up-w7	Z1up-w8 to Z1up-w15
Room Surface Temp (F)							
Walls:							
South (Center)	68	68	71	70	69	70	70
West (Center)	70	69	69	70	68	70	70
North (East of Door)	71	70	69	69	69	70	70
North (West of Door)	70	69	69	70	69	70	70
East (Center)	70	69	68	70	68	70	70
Floor (Center)	69	69	65	68	68	69	69
Ceiling:							
South	68	68	69	69	68	70	70
West	70	69	70	70	68	70	70
North	70	70	70	70	69	70	71
East	70	69	70	68	69	70	70
Room Airflow (cfm)							
Supply Fan	128	128	128	128	128	129	128
Exhaust Fan	102	102	105	103	103	104	103
Pressure Difference (in. water)	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Barometric Pressure (mm Hg)	29.13	29.03	29.16	29.13	29.28	29.38	29.35

Data Files	**Z1lw-w8 to Z1lw-w15**	**Z1lw-w1 to Z1lw-w7**	**Z1lw-m8 to Z1lw-m15**	**Z1lw-m1 to Z1lw-m7**	**Z1lw-e1 to Z1lw-e15**	**Z2se-1 to Z2se-7**	**Z2sw-1 to Z2sw-7**
Room Surface Temp (F)							
Walls:							
South (Center)	70	71	70	71	70	72	70
West (Center)	71	72	70	71	71	72	70
North (East of Door)	70	72	71	71	71	72	70
North (West of Door)	70	72	71	71	71	72	70
East (Center)	70	72	70	71	71	72	70
Floor (Center)	70	71	70	71	70	70	68
Ceiling:							
South	70	72	70	70	71	71	69
West	70	72	70	71	71	72	70
North	71	72	71	71	71	72	70
East	71	72	71	71	71	72	69
Room Airflow (cfm)							
Supply Fan	128	128	128	128	127	127	130
Exhaust Fan	99	101	102	102	100	100	101
Pressure Difference (in. water)	0.04	0.04	0.04	0.04	0.04	0.02	0.03
Barometric Pressure (mm Hg)	29.18	29.17	29.05	29.03	29.15	29.15	29.39

Data Files	Z2nw-1 to Z2nw-7	Z2ne-1 to Z2ne-7	Z2nm-1 to Z2nm-13	Z3ex-n15 to n16; s1 to s4	Z3ex-n1 to Z3ex-n14	Z3ex-s5 to Z3ex-s7	Z3ex-s8
Room Surface Temp (F)							
Walls:							
South (Center)	71	70	69	70	68	68	69
West (Center)	71	70	69	70	69	69	69
North (East of Door)	71	71	69	70	68	68	69
North (West of Door)	70	70	68	70	68	69	69
East (Center)	71	71	69	70	69	68	69
Floor (Center)	70	70	68	69	68	68	67
Ceiling:							
South	71	70	69	70	70	68	70
West	72	70	70	71	70	69	69
North	71	71	70	71	70	69	70
East	71	71	70	70	70	70	70
Room Airflow (cfm)							
Supply Fan	129	129	130	129	129	129	128
Exhaust Fan	96	103	98	103	103	102	102
Pressure Difference (in. water)	0.05	0.04	0.06	0.04	0.04	0.04	0.04
Barometric Pressure (mm Hg)	29.59	28.87	29.47	29.06	29.06	29.05	29.1

4.3.2 Zone 1

Zone 1 (the room airspace) was divided into three sections: East (E), Middle (M) and West (W) (figure 4.3.01). Each section was divided into two parts: upper (UP) and lower (LW). Upper part (30" above floor to ceiling, data point distances: 30, 36, 42, and 90" from floor) contains 11 vertical points, and lower part (from floor to 24" above the floor, data point distances: 6, 12, 18, and 24" above floor) contains 4 vertical points. Data were collected six inches from walls, ceiling and floor, and at six inch intervals within the room airspace.

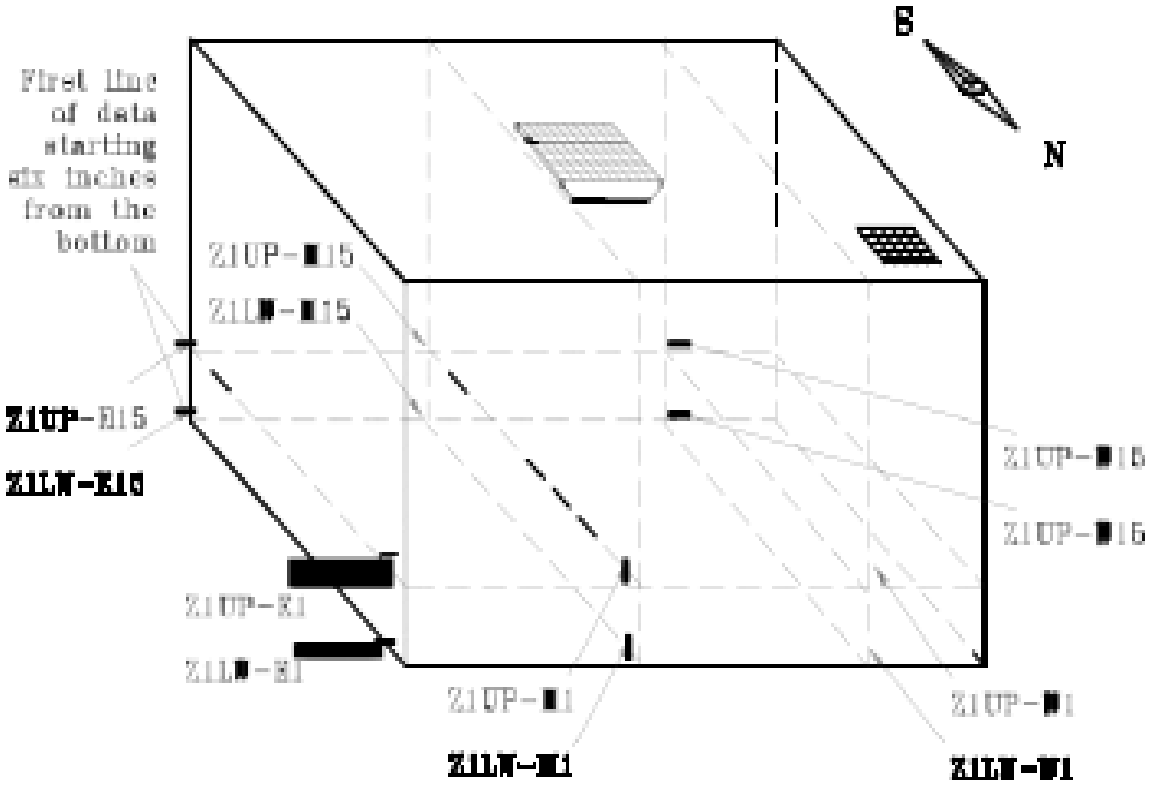
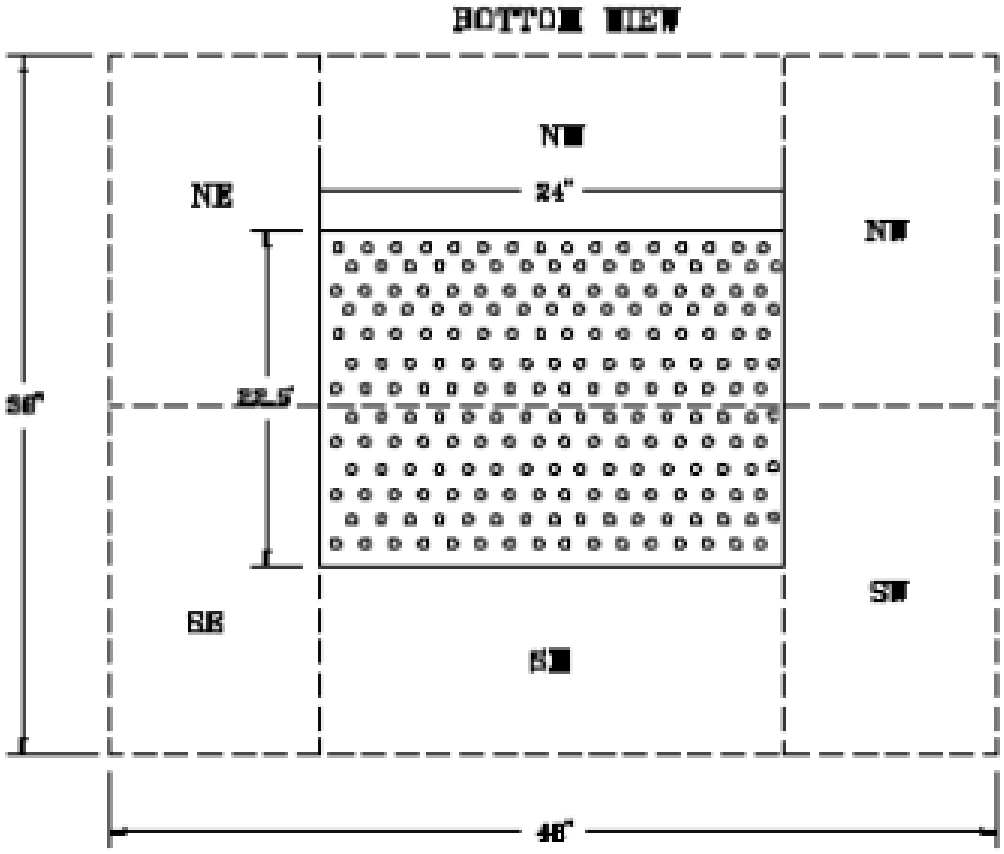


Figure 4.3.01. Data file location in Zone 1. Arrows point at the first data in the file.

4.3.3 Zone 2

Zone 2 was divided into six sections: north-east (NE), north-middle (NM), north-west (NW), south-east (SE), south-middle (SM), and south-west (SW) (figure 4.3.02). The number (figure 4.3.02: Lower) in the filename starts from the far east location. Lowest points were 12" from the ceiling for NE, NW, SE and SW sections. For NM and SM sections, lowest points were 16" below the ceiling due to the projection of the diffuser discharge surface. Data were collected two inches from the ceiling, and at 2" intervals within Zone 2.



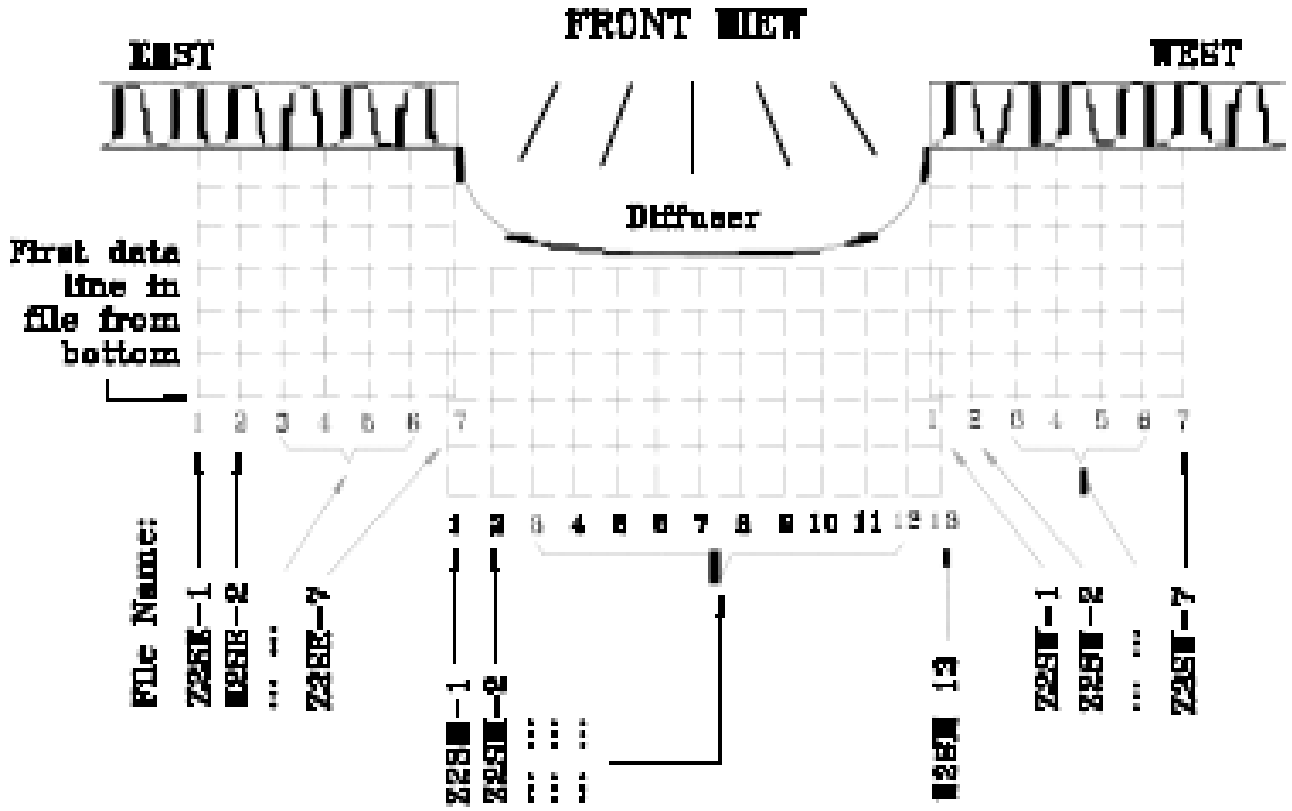


Figure 4.3.02. Data file location in Zone 2. Upper: Bottom view of sections used for data collection, e.g., NW = north west. Lower: Front view from north.

4.3.4 Zone 3

Zone 3 was divided into 2 sections: south (S) and north (N). Number in a data file starts from the east side of zone 3 and indicates the distance from the east side of the zone. Lowest points (first row of data) were 12" below the ceiling. Data were collected 2" from the ceiling, and at 2" intervals within Zone 3.

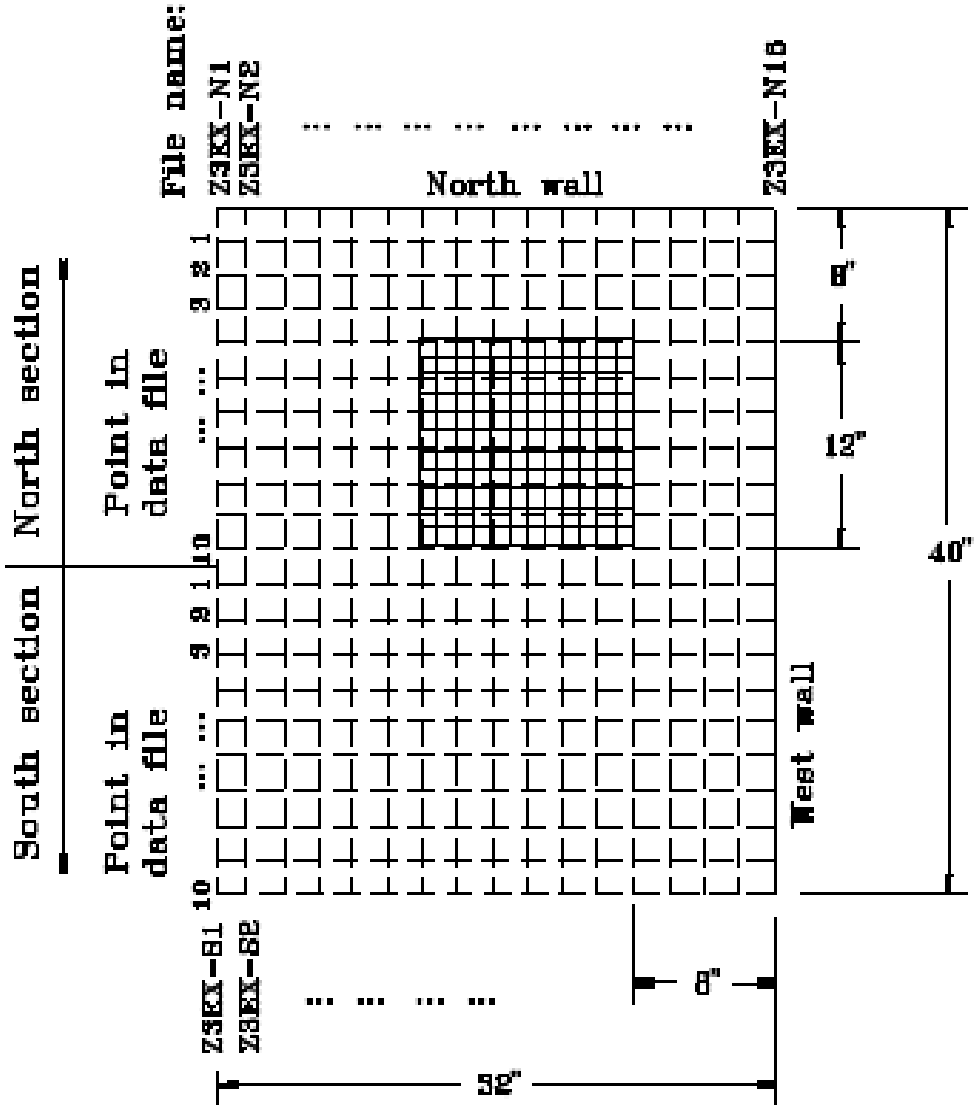


Figure 4.3.03. A bottom view of Zone 3 and data file locations

4.4 Populated Room Data

4.4.1 General Details

The overview of the measurement zones are shown in figure 4.4.01, the starting locations of the measurement zones are shown in figure 4.4.02, and the start and end measuring points are tabulated in table 4.4.01.

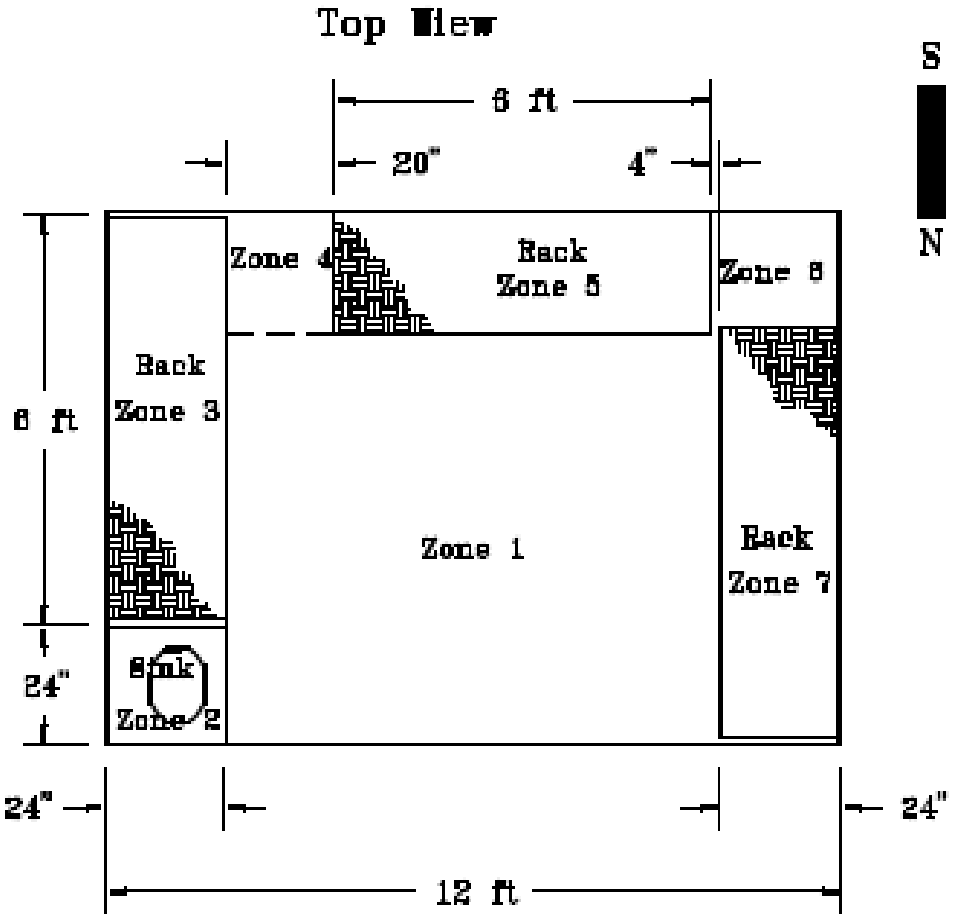


Figure 4.4.01. Top view of zones in the room: three racks are identical, each rack has six shelves and each shelf supports seven mouse cages.

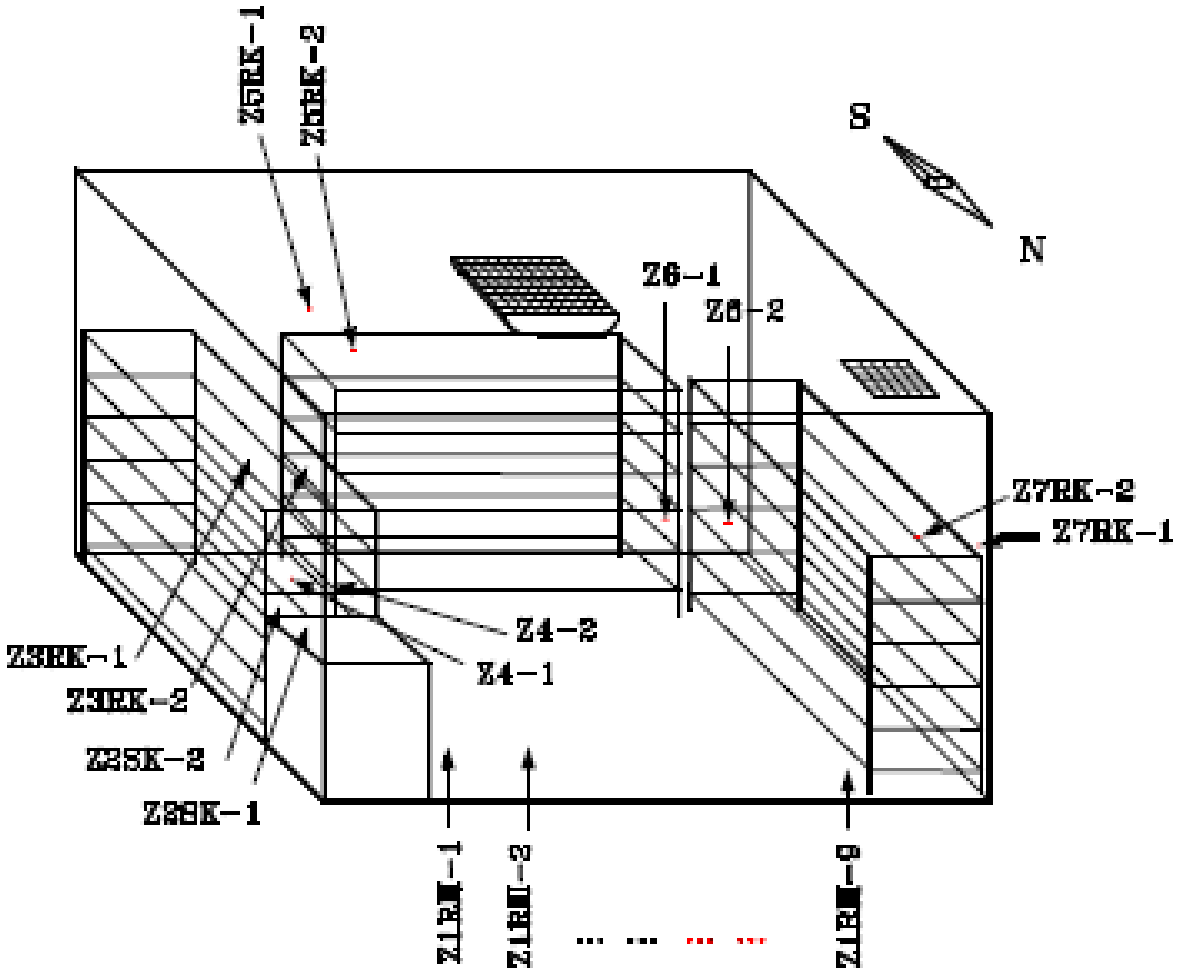


Figure 4.4.02. Illustration of data point locations in each zone

Table 4.4.01 Data Locations for Populated Room

Zone	File	Location of First Data Point	Location of Last Data Point
1	Z1RM-1	2” to N wall, 26” to E wall, 12” to floor	2” to N wall, 26” to E wall, 12” to ceil.
	Z1RM-2	2” to N wall, 38” to E wall, 12” to floor	2” to N wall, 38” to E wall, 12” to ceil.
	Z1RM-3	2” to N wall, 50” to E wall, 12” to floor	2” to N wall, 50” to E wall, 12” to ceil.
	Z1RM-4	2” to N wall, 62” to E wall, 12” to floor	2” to N wall, 62” to E wall, 12” to ceil.
	Z1RM-5	2” to N wall, 74” to E wall, 12” to floor	2” to N wall, 74” to E wall, 12” to ceil.
	Z1RM-6	2” to N wall, 86” to E wall, 12” to floor	2” to N wall, 86” to E wall, 12” to ceil.
	Z1RM-7	2” to N wall, 98” to E wall, 12” to floor	2” to N wall, 98” to E wall, 12” to ceil.
	Z1RM-8	2” to N wall, 110” to E wall, 12” to floor	2” to N wall, 110” to E wall, 12” to ceil.
	Z1RM-9	2” to N wall, 122” to E wall, 12” to floor	2” to N wall, 122” to E wall, 12” to ceil.
2	Not Measured		
3	Z3RK-1	2” to N wall, 14” to E wall, 24” to ceil.	2” to N wall, 14” to E wall, 12” to ceil.
	Z3RK-2	2” to N wall, 2” to E wall, 24” to ceil.	2” to N wall, 2” to E wall, 12” to ceil.
4	Not Measured		
5	Z5RK-1	2” to S wall, 2” to E wall, 24” to ceiling	2” to S wall, 2” to E wall, 12” to ceiling
	Z5RK-2	2” to S wall, 14” to E wall, 24” to ceiling	2” to S wall, 14” to E wall, 12” to ceiling
	Z5RK-3	2” to S wall, 26” to E wall, 24” to ceiling	2” to S wall, 26” to E wall, 12” to ceiling
	Z5RK-4	2” to S wall, 38” to E wall, 24” to ceiling	2” to S wall, 38” to E wall, 12” to ceiling
	Z5RK-5	2” to S wall, 50” to E wall, 24” to ceiling	2” to S wall, 50” to E wall, 12” to ceiling
	Z5RK-6	2” to S wall, 62” to E wall, 24” to ceiling	2” to S wall, 62” to E wall, 12” to ceiling
	Z5RK-7	2” to S wall, 74” to E wall, 24” to ceiling	2” to S wall, 74” to E wall, 12” to ceiling
	Z5RK-8	2” to S wall, 86” to E wall, 24” to ceiling	2” to S wall, 86” to E wall, 12” to ceiling
	Z5RK-9	2” to S wall, 98” to E wall, 24” to ceiling	2” to S wall, 98” to E wall, 12” to ceiling
	Z5RK-10	2” to S wall, 110” to E wall, 24” to ceiling	2” to S wall, 110” to E wall, 12” to ceiling
	Z5RK-11	2” to S wall, 122” to E wall, 24” to ceiling	2” to S wall, 122” to E wall, 12” to ceiling
	Z5RK-12	2” to S wall, 134” to E wall, 24” to ceiling	2” to S wall, 134” to E wall, 12” to ceiling
	Z5RK-13	2” to S wall, 144” to E wall, 24” to ceiling	2” to S wall, 144” to E wall, 12” to ceiling
6	Not Measured		
7	Z7RK-1	2” to N wall, 2” to W wall, 24” to ceil.	2” to N wall, 2” to W wall, 12” to ceil.
	Z7RK-2	2” to N wall, 14” to W wall, 24” to ceil.	2” to N wall, 14” to W wall, 12” to ceil.

5. PHOTOGRAPHS FROM EXPERIMENTAL TESTS

Presented below are a series of plates taken during the experimental phases of the project.

5.1 Cage Condition

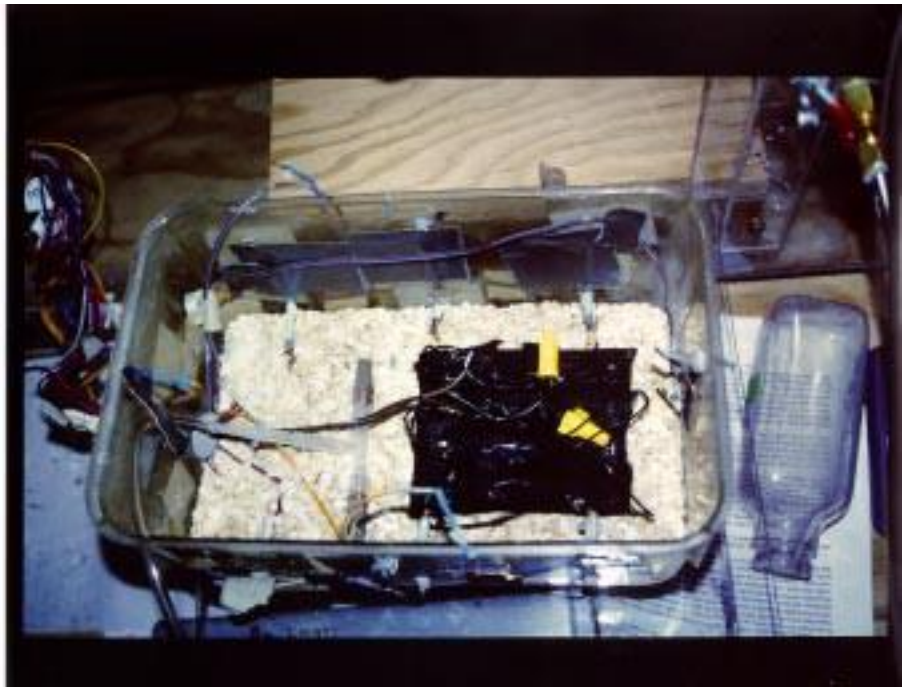


Figure 5.1.01 *Simulated Mice Obstruction (SMO)*

Figure 5.1.02 *Default Mice Heater (DMH)*

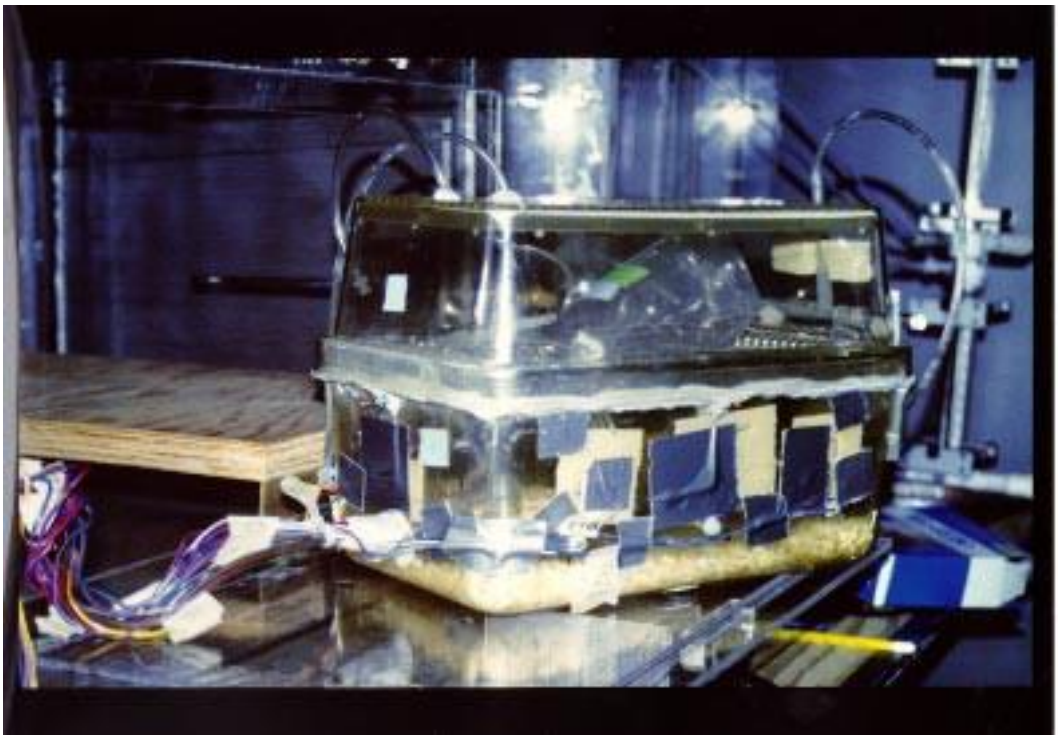


Figure 5.1.03 *Sealed Lip Microisolator*

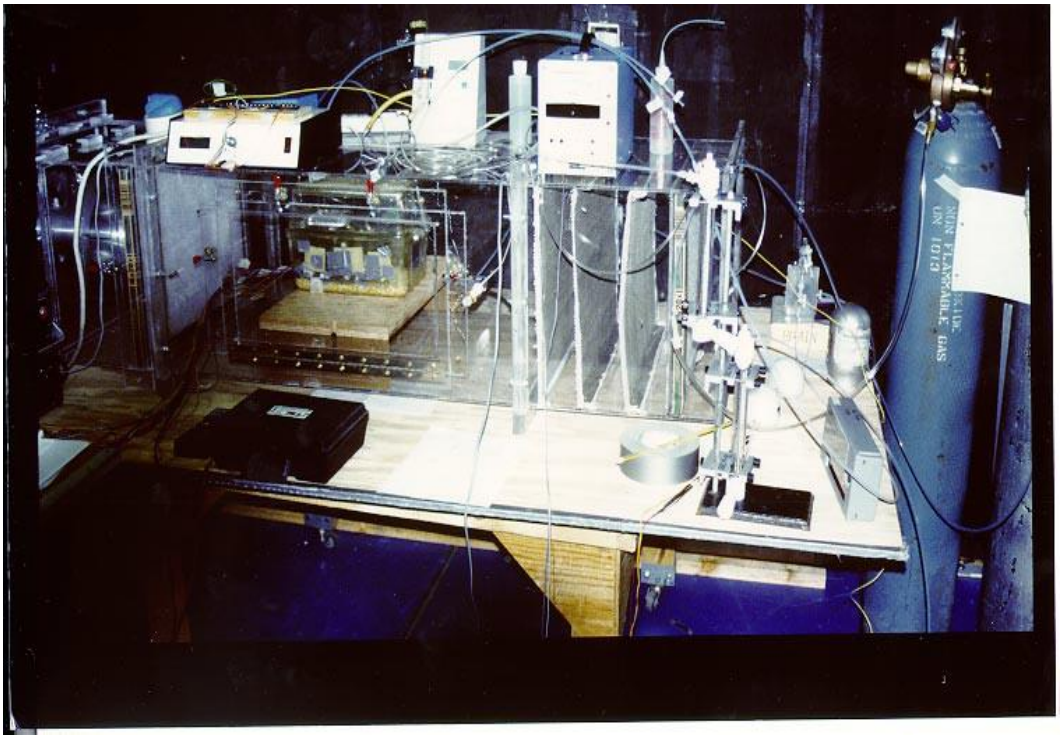


Figure 5.1.04 *Wind Tunnel in Parallel Cage Orientation*

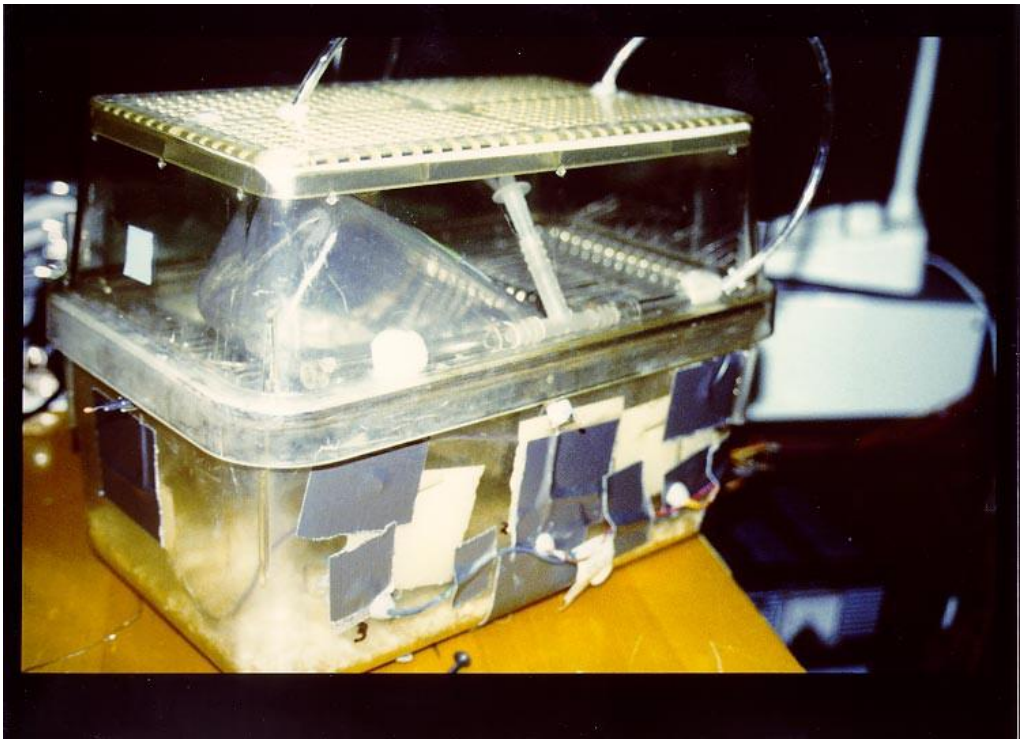


Figure 5.1.05 *Microisolator Cage with Sampling Tube*

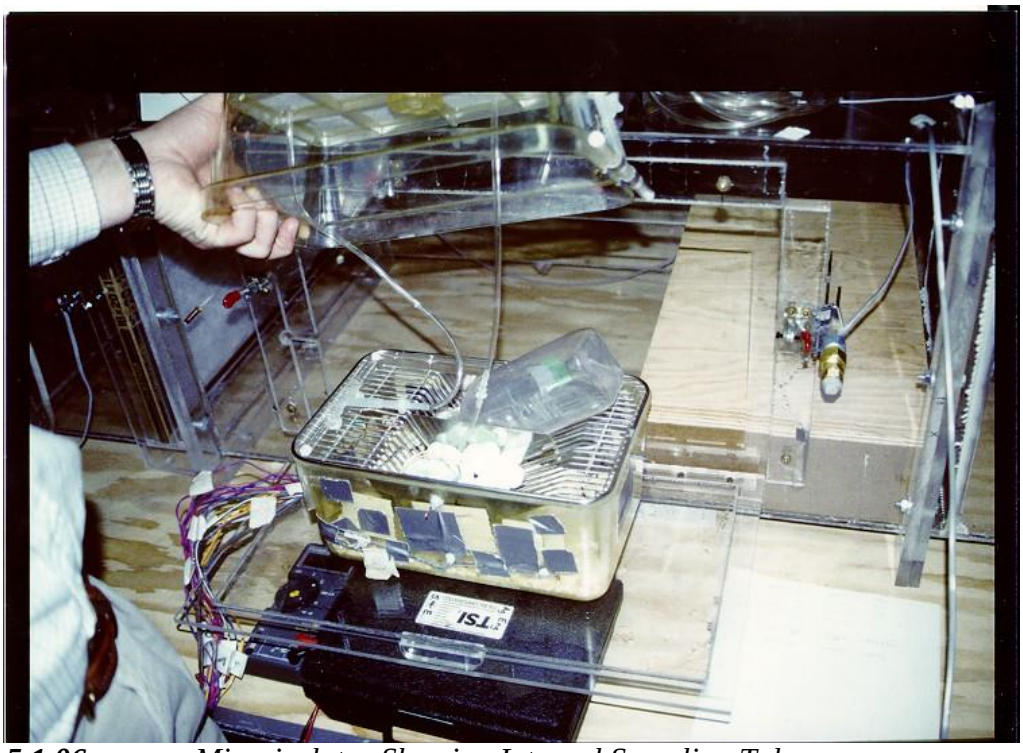


Figure 5.1.06 *Microisolator Showing Internal Sampling Tubes*

Figure 5.1.07 *Microisolator Cage Used in Wind Tunnel*

Figure 5.1.08 *Tedlar, Polyvinyl Fluoride – CO2 Gas Sampling Bags*

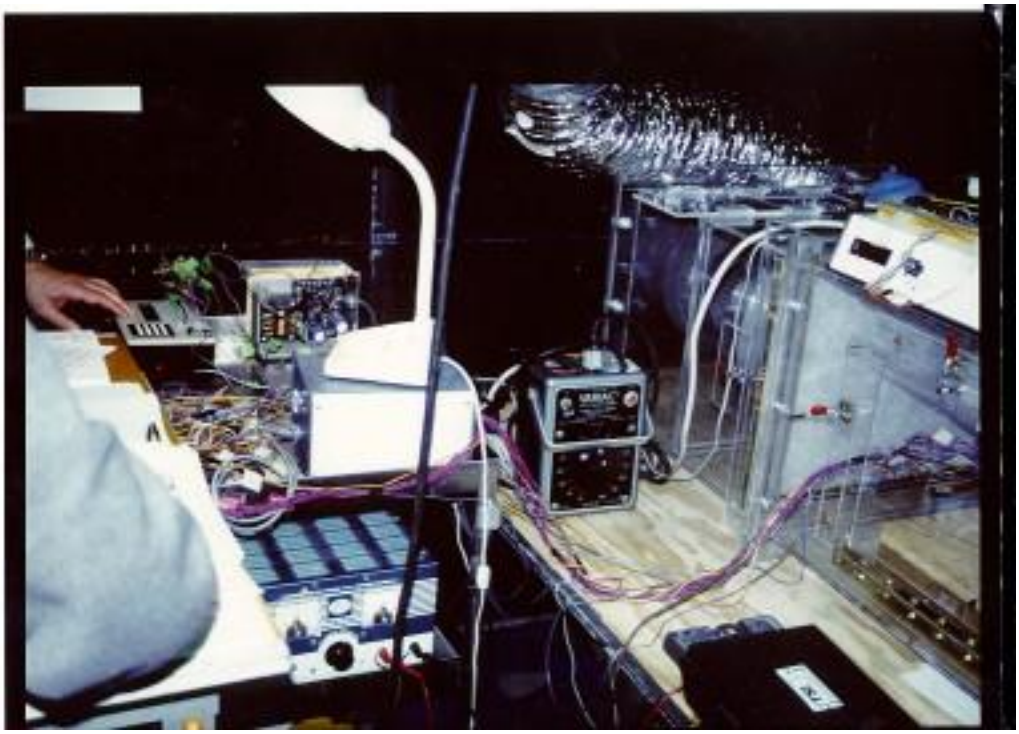


Figure 5.1.09 *Wind Tunnel Data Logger and Airflow Controller*

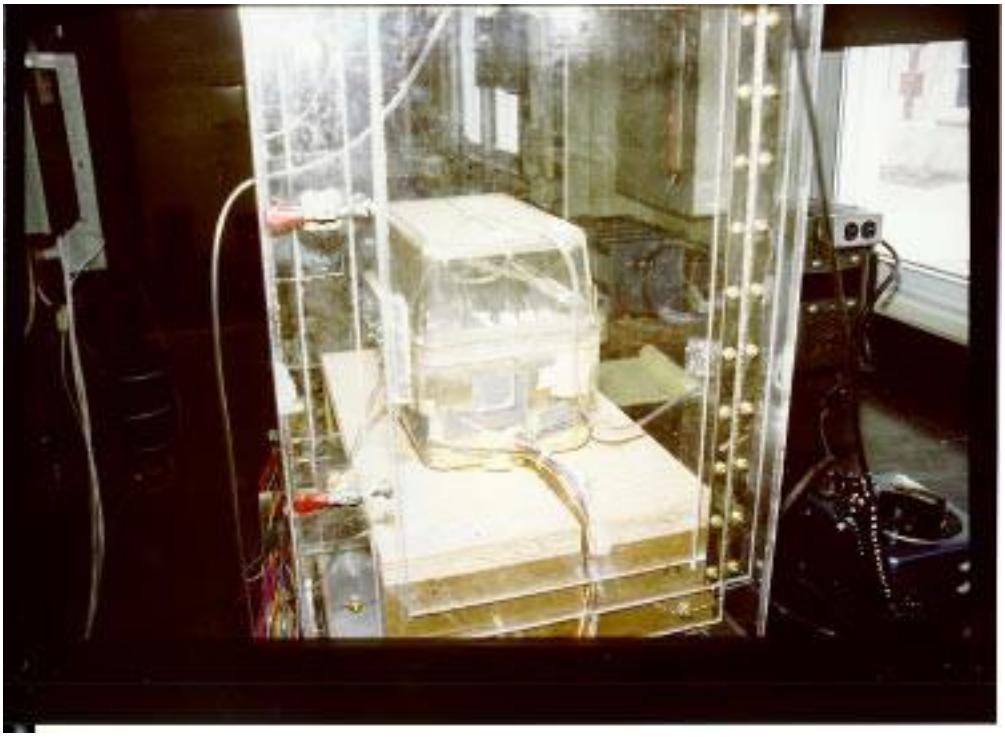


Figure 5.1.10 *Vertically Orientated Wind Tunnel*

Figure 5.1.11 *Drawing Gas Samples Using Gas Chromatography*

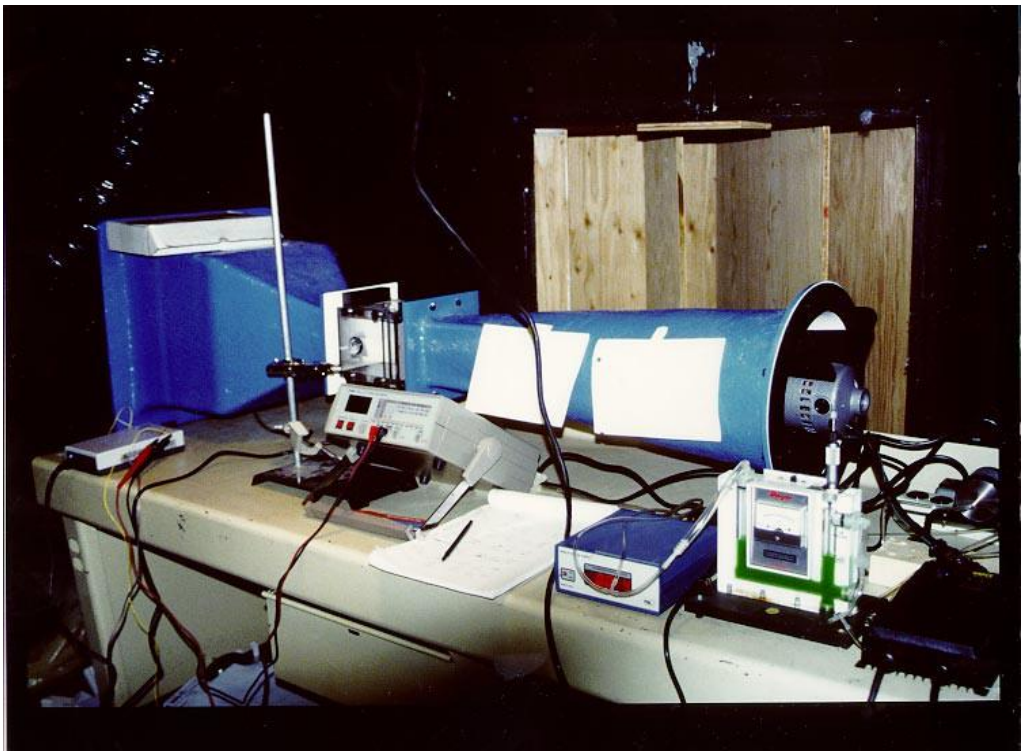


Figure 5.1.12 *Velocity Calibration Device*

Figure 5.1.13 *Data Logger for Temperature and Velocity*

Figure 5.1.14 *Microisolator Outside Sampling Tube*

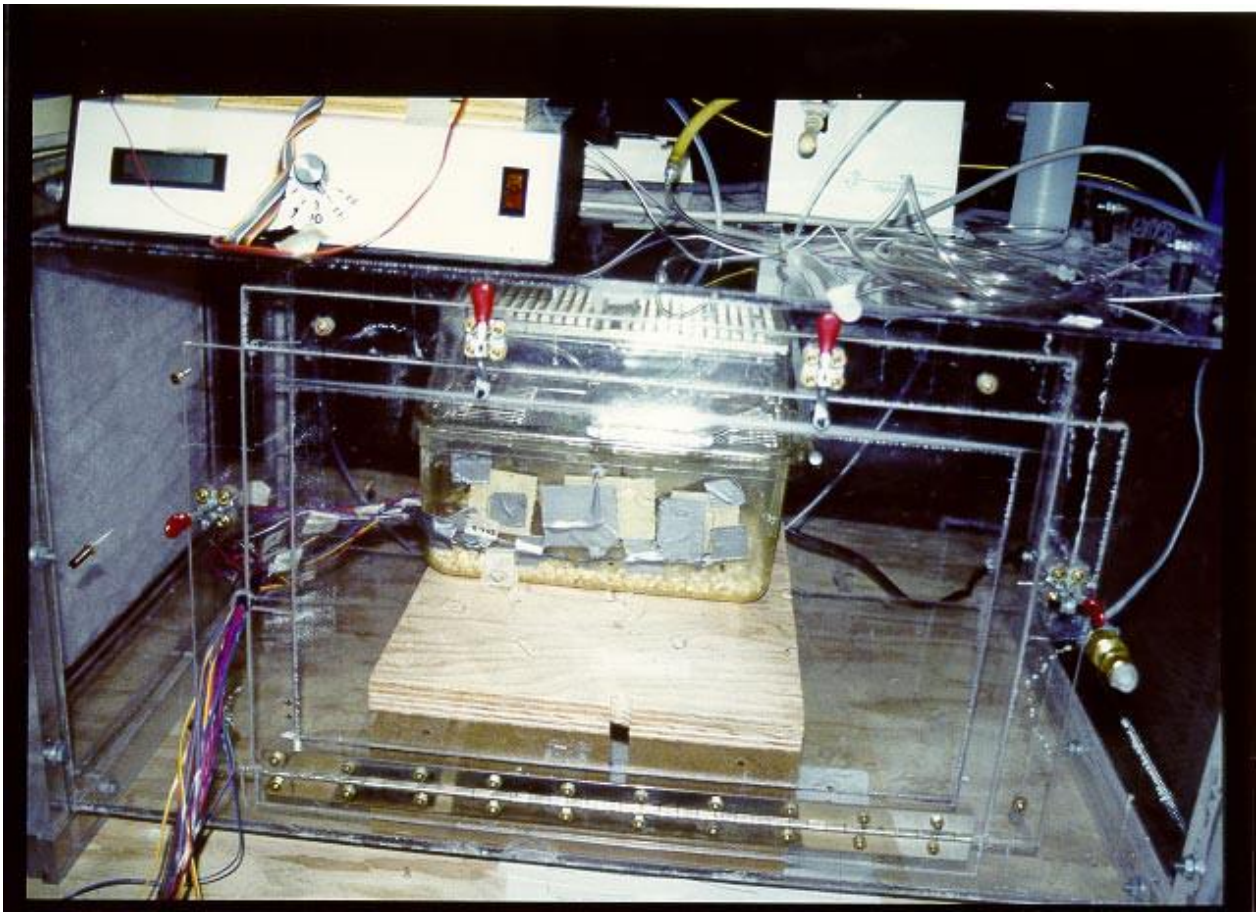


Figure 5.1.15 *Microisolator Cage in Wind Tunnel: Parallel Cage Orientation*

5.2 CO2, NH3, H2O and Heat Generation Measurements at Low and High Humidities

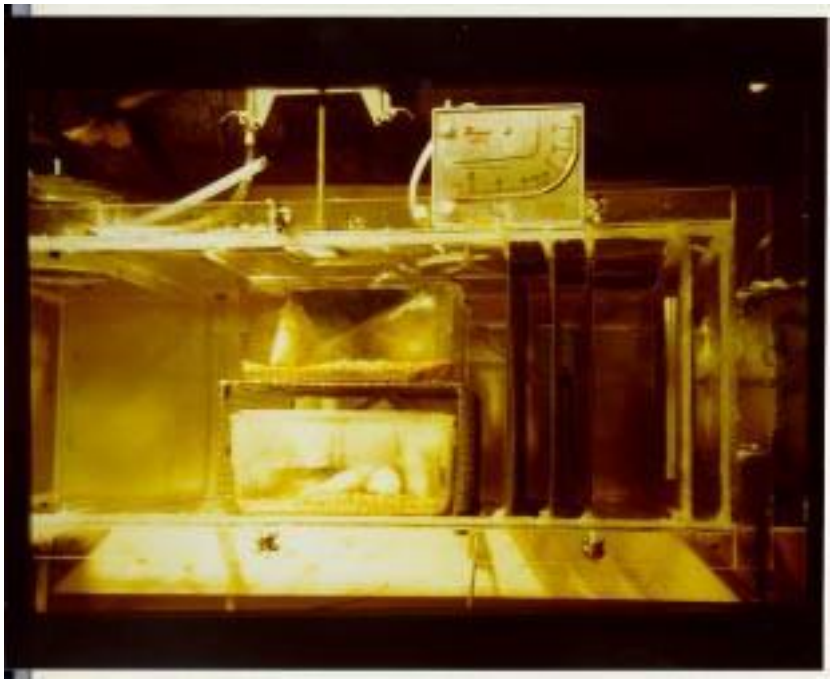


Figure 5.2.01 *An Indirect Convective Calorimeter*

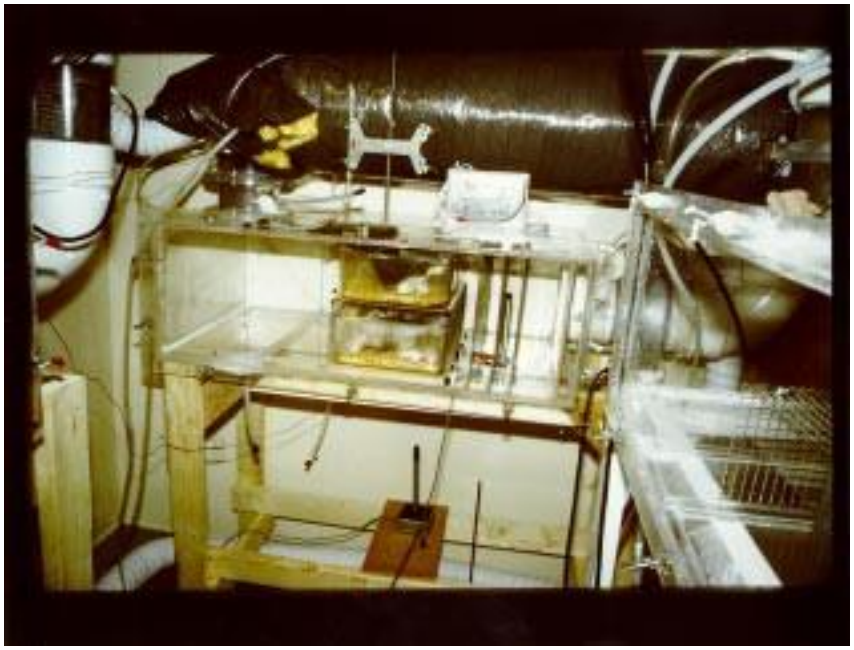


Figure 5.2.02 *An Indirect Convective Calorimeter #2*

Figu!Y! 5.2.03 An Indirect Calorimeter #3

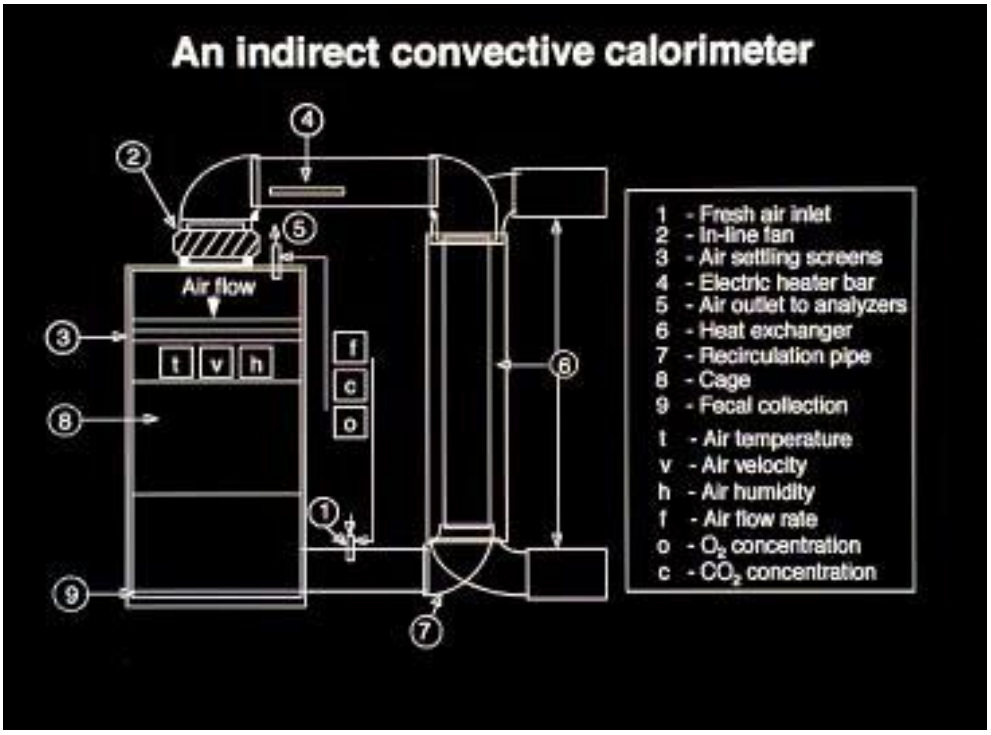


Figure 5.2.04 *Flow Diagram - Indirect Convective Calorimeter*

Figure 5.2.05 *Outbred Mice: Female – HSD – ICR*

Figure 5.2.06 *Outbred Mice: Female – HSD – ICR #2*

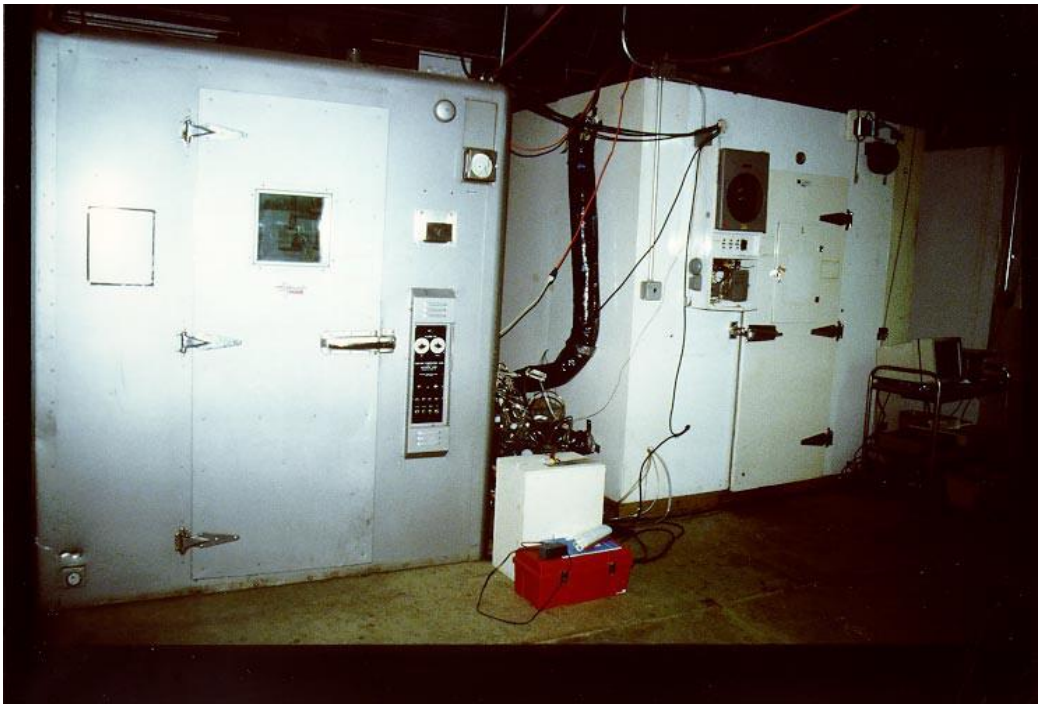


Figure 5.2.07 *Environmental Chamber Used for Housing Mice*

Figure 5.2.08 *Inside of Environmental Chamber*

5.3 Room Condition

Figure 5.3.01 *Total Air Distribution (TAD) Diffuser, and Velocity and Temperature Measuring Sensors*

Figure 5.3.02 *Automatic Traverse System*

Figure 5.3.03 *Automatic Traverse System*

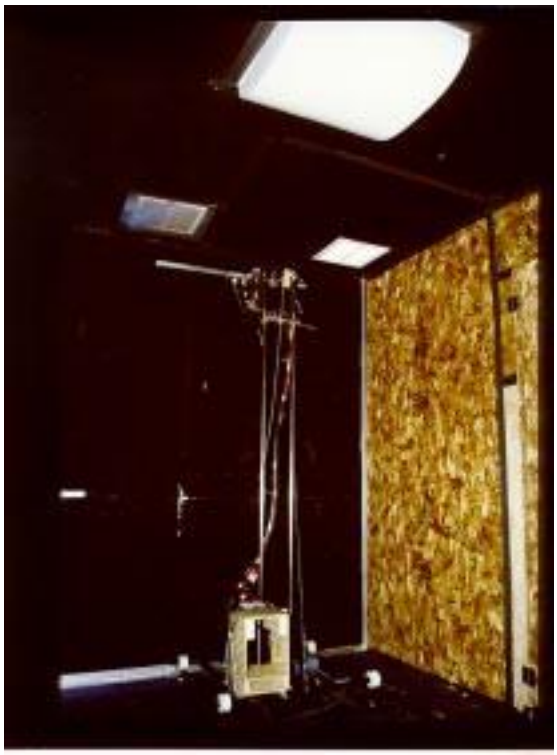


Figure 5.3.04 *Empty Room Data Collection*

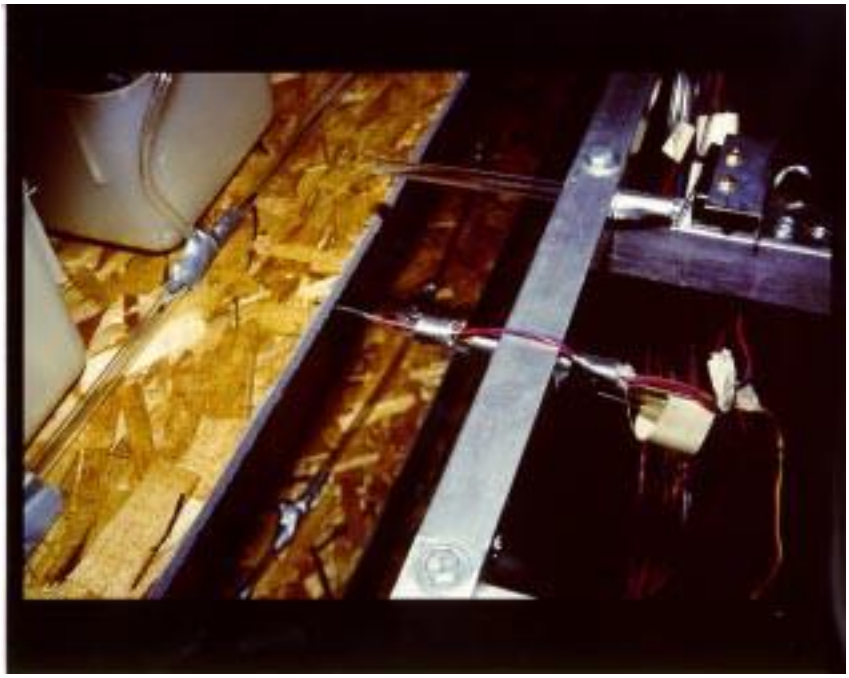


Figure 5.3.05 *Measurement Sensors for Populated Room*

Figure 5.3.06 *Typical Rack: Populated Room*

Figure 5.3.07 *'JYpical Rack_- Populated Room #2*

Figure 5.3.08 *Typical Rack: Populated Room #3*