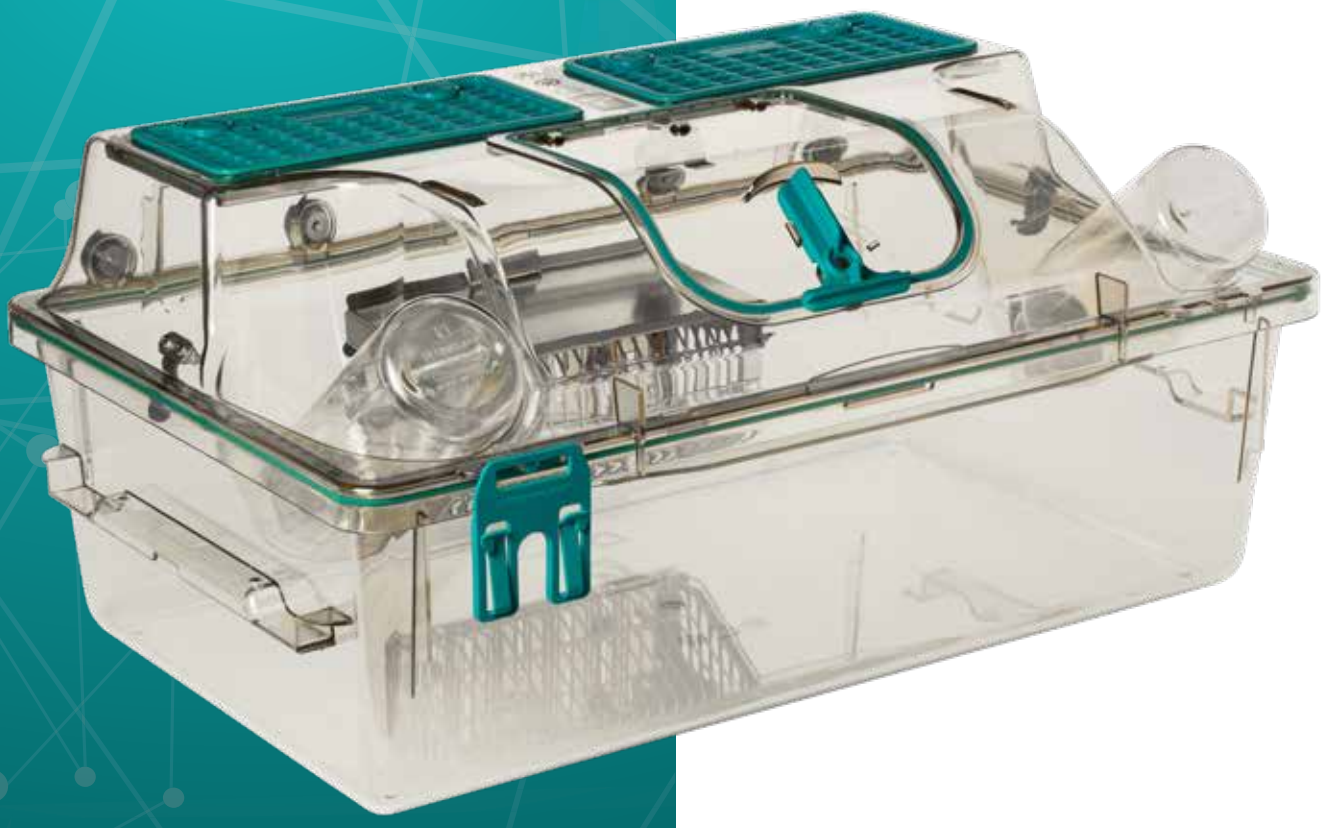
TECNIPLAST

"Performance Standard" assessment for individually ventilated rat cages EMERAT – ER1800

The parameters taken into consideration during this test are those regarding the micro-environment that develops over a week without changing bedding or cage, the cage under test having a medium animal density. The potential effects on certain fundamental physiological parameters were also assessed, i.e., body weight, consumption of water and feed. Lastly, any eventual signs of distress or stereotypical behaviours were also assessed.



ER1800
EMERAT IVC

IVC Emerat ER1800 cage

1. MATERIALS AND METHODS

a) Equipment. Rack IVC ER1810X – Single-sided Ergo Rack (2W x 5H) equipped with 10 ER1800 cages and connected to a WiFlow ventilation unit. Ventilation setting: 75ACH in Positive pressure mode and – 20% differential on negative. Each cage was equipped with 2 ACBT0702SU bottles of 750 ml.

b) Rats. 15 male Hsd:Sprague Dawley® SD® rats with weight on arrival between 200 and 225 g.

4 cages with 3 rats and 1 cage with 4 rats.

Occupied cage positions:

A1 – B1 – A5 – B5 with 3 rats

B3 with 4 rats

c) Feed, water and bedding. Envigo Global Diet for rodents 2018S autoclaved and administered after weighing out 800 g per feeder. The remaining feed in each feeder was weighed at every cage change.

Filtered and autoclaved water in bottles circa 800-820 ml per 2-bottle cage.

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Bedding: ¾ Fasern, Spruce Wood, autoclaved (Rettenmaier, D) 300 g per cage. Environmental enhancement in the form of gnawable and chewable wooden sticks of c. 10cm length and 1 cm thickness (1 per animal).

d) Gas reading tool. Drager X-am 8000. CO_2, NH_3, O_2, sensors. The sensor is inserted through the flap of one of the two bottle hollows. When necessary, the sampling was undertaken from both positions. The sensor was shifted to different heights (min 2 cm from the surface as represented by the bedding and horizontally up to the area below the feeder). Timing of recording: Day 6 and 7 (Day 5 only at first round).

e) Relative Humidity and Temperature.
These two parameters were recorded inside each cage by placing a 174H Data Logger Testo inside the feeder (on the feed surface). A further DL was placed on the rack upper floor for environmental values recording. Recording frequency: 30 minutes.

3 "ROUNDS" of one week each were carried out.

2. RESULTS

2.1 Relative Humidity and Temperature in Room (ENV) and Cage

TEMP. PROGRESS IN ROOM AND CAGE DURING THE 3 ROUNDS AVERAGE (Sd)

	CAGE					
	A1	**A5**	**B1**	**B5**	**B3**	**ENV**
1° ROUND	22,4 (0,57)	22,8 (0,65)	22,0 (0,62)	22,4 (0,63)	23,4 (0,9)	21,0 (0,1)
2° ROUND	22,6 (0,55)	23,1 (0,73)	22,2 (0,7)	22,5 (0,60)	23,8 (0,75)	21,0 (0,16)
3° ROUND	22,8 (0,48)	23,1 (0,64)	22,4 (0,47)	22,6 (0,47)	23,8 (0,74)	21,0 (0,1)

rH% IN ROOM AND CAGE DURING THE 3 ROUNDS AVERAGE (Sd)

	CAGE					
	A1	**A5**	**B1**	**B5**	**B3**	**ENV**
1° ROUND	61,5 (1,68)	61,5 (1,82)	65,7 (1,64)	61,9 (1,81)	61,7 (1,97)	58,3 (1,69)
2° ROUND	61,6 (1,25)	62,1 (1,51)	64,8 (1,69)	63,2 (1,29)	62,9 (2,61)	58,4 (1,44)
3° ROUND	62,3 (1,24)	63,2 (1,44)	65,7 (0,97)	61,6 (1,21)	61,7 (1,97)	57,9 (1,44)

Fig.1

2.2 Feed and water consumption and rat weight

AVERAGE FEED CONSUMPTION RAT/DAY: AVERAGE (g)

CAGE	A1*	A5*	B1*	B5*	B3**
1° ROUND	21,7	20,8	22,0	21,4	21,4
2° ROUND	23,3	22,2	22,7	21,3	21,8
3° ROUND	23,0	21,8	22,2	22,1	21,3

*** 3 Rats** **** 4 Rats**

Fig.2

AVERAGE WATER CONSUMPTION RAT/DAY: AVERAGE (g)

CAGE	A1*	A5*	B1*	B5*	B3**
1° ROUND	30,9	31,5	34,2	32,5	31,1
2° ROUND	28,4	29,6	32,5	30,9	31,4
3° ROUND	28,3	29	33,8	29,4	28,9

*** 3 Rats** **** 4 Rats**

Fig.3

AVERAGE BODY WEIGHT: AVERAGE (Sd)

CAGE	A1*		A5*		B1*		B5*		B3**	
	START	FINISH	START	FINISH	START	FINISH	START	FINISH	START	FINISH
1° ROUND	195,0 (7,8)	259,0 (3,6)	191,7 (7,6)	254,7 (7,2)	195,7 (9)	265,7 (8,4)	189,0 (5,2)	257,0 (2)	190,0 (6,5)	253,3 (9,8)
2° ROUND	259,0 (3,6)	295,7 (7,4)	254,7 (7,2)	291,3 (5,5)	265,7 (8,4)	296,0 (10,4)	257,0 (2)	290,3 (2,5)	253,3 (9,8)	285,3 (10,5)
3° ROUND	295,7 (7,4)	322,3 (8,0)	291,3 (5,5)	321,7 (3,2)	296,0 (10,4)	319,7 (15,7)	290,3 (2,5)	318,7 (4,7)	285,3 (10,5)	310,0 (14,2)

* 3 Rats ** 4 Rats

Fig.4

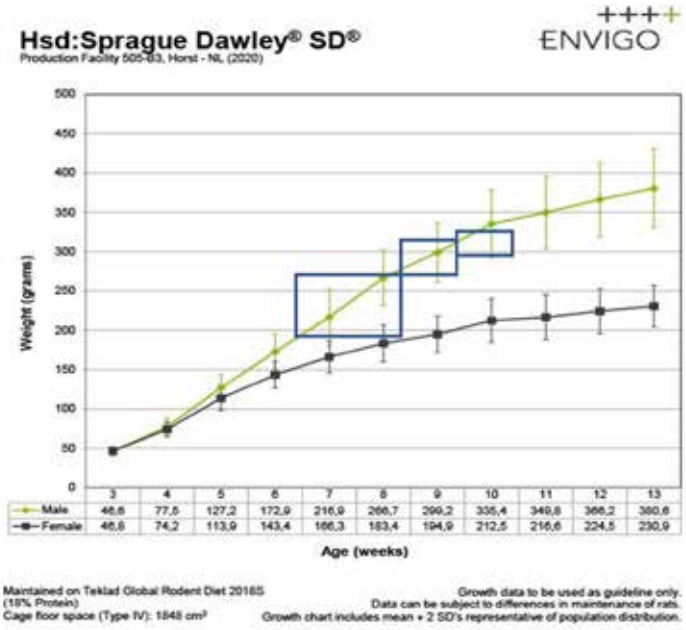

Fig.5 The 3 rectangles plotted along the growth curve provided by the commercial breeder of this strain show the 3 ROUNDS and confirm age/ weight ratio conformity.

2.3 Gases in cage: NH3, CO2, O2

	CAGE	A1*			A5*			B1*			B5*			B3**		
	GAS	NH_3	CO_2	O_2	NH_3	CO_2	O_2	NH_3	CO_2	O_2	NH_3	CO_2	O_2	NH_3	CO_2	O_2
	DAY	ppm	%	%	ppm	%	%	ppm	%	%	ppm	%	%	ppm	%	%
1° ROUND	6	ND	0,04	20,9	ND	0,04	20,9	ND	0,04	20,9	ND	0,06	20,9	ND	0,06	20,9
	7	ND	0,06	20,9	ND	0,025	20,9	8,0	0,1	20,9	ND	0,05	20,9	ND	0,075	20,9
2° ROUND	6	ND	0,065	20,9	ND	0,05	20,9	ND	0,09	20,9	ND	0,09	20,9	7	0,1	20,9
	7	ND	0,09	20,9	8	0,08	20,9	5	0,075	20,9	6	0,08	20,9	56	0,08	20,9
3° ROUND	6	ND	0,08	20,9	ND	0,06	20,9	ND	0,08	20,9	ND	0,08	20,9	ND	0,09	20,9
	7	ND	0,1	20,9	ND	0,1	20,9	5	0,11	20,9	ND	0,08	20,9	6	0,09	20,9

ND: Not detectable

3. COMMENTS AND CONCLUSIONS

The "performance standard" study relating to cage ER 1800 had the aim of verifying the capacity of this equipment to maintain male rats of the most popular strain used in research in physiological conditions. Such conditions, tested in age range from 7 to ten weeks, may be altered by an unsuitable environment.

In view of the above, the principal parameters relating to the environment and the major organic functions of the animals were monitored.

The results obtained deserve some comments.

The feed consumption (including spillage) showed on average and on a daily basis percentage value on body weight of from 6.8 to 9.5 guaranteeing adequate weight increases and in line with the strain for males and that particular age range.

The same holds true for water consumption (including spillage), which when calculated as a percentage on body weight oscillates between 10% and 13%. Such values were precisely as expected and were within the norm.

The monitoring of gases inside the cage came about during the last two days prior to the weekly change, and thus day 6 and day 7. The Drager X-arm 8000 sensor was inserted through the two bottle hollows present in each cage. The sensor could be directed and pushed up to the side areas of the feeder, but it was naturally not possible to investigate the whole surface of the cage. Generally, the identification of individual pockets of ammonia came about sporadically and with concentrations of very little or no interest from the viewpoint of any clinical impact on the animals. One sole recording in Cage B3, 4 rats and on day 7 of the second ROUND proved abnormal (56 ppm). This value was clearly due to the presence of a latrine point subsequently identified visually. Investigation of the contralateral sensor insertion position did not in fact show any ammonia presence. CO_2 concentration did not represent a problem over the 3-week study period and whenever values slightly above the average occurred, this was due to the interference of rats curious about the sensor connected to the Drager that had insinuated itself into their cage. Oxygen, perfectly stable at a value of 20.9% (no oscillation) confirmed the very low concentration of the other two gases, which were thus unable to play the role of "scavenger" as regards the oxygen itself.

From a behavioural viewpoint, throughout the test period the animals showed a keen interest in the feeder roof, on which they were seen resting during the light-time phase. Furthermore, and recorded several times, the rats' attention was drawn to the points (valves) for the introduction and expulsion of air, which was confirmation of the natural curiosity that is a feature of this species, which wants to explore and investigate everything in its environment.

Summing up: the ER1800 cage allowed the rats within to maintain excellent physiological conditions without impacting their behaviour or being detrimental to their physical condition.