



Maximising Operational and Research Activities through the Use of Disposable Caging

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Abstract

In 2005 a novel approach for rodent housing was introduced in the form of the disposable cage. The use of disposable caging has proven to simplify operational workflows and reduce the risk of personnel ergonomic issues. In addition, space for research activities can be maximised through a reduction in washroom and storage footprint and lower capital and operating costs achieved.

Pfizer has selected the disposable cage as the primary Individually Ventilated Caging (IVC) option for a new 52,000ft² research facility with a 7,500+ rodent housing capacity. This poster describes our experiences using disposable cages.

Introduction

Disposable cages are manufactured from recycled Polyethylene terephthalate (PET) BPA-free material. Cages are supplied ready for use: irradiated, pre-bedded and double bagged. They are ideal for use with immune-deficient animals and for work involving hazardous materials up to BSL3. In this application, high risk cage processing activities are eliminated as the cage is bagged, tagged and disposed of after use.

Cage Specs	Mouse Disposable	Rat Disposable
Dimensions (in)	14.7 L x 9.2 W x 5.5 H	17L x 13.4W x 7.8H
Floor surface area	81 in ²	141 in ²
Maximum Capacity	5	2
Change Frequency	14 days	7 days



Table 1: Cage specifications for the mouse and rat disposable cage.

Water bottles are irradiated and filled with reverse osmosis water treated by UV sterilization. Water testing has demonstrated bottles remain free from bacteria for at least one year after filling. Disposable water bottles also remain micro-biologically cleaner during seven days of use compared to conventional bottles¹.

Space & Cost Savings

Vivarium planning using the disposable caging has permitted a reduction in washroom and cage storage footprint, maximising the space available for animal holding, procedure rooms and research activities. It is not practical to entirely eliminate all washroom equipment, however several standard pieces need not be included (See Table 2).

Conventional Washroom	Disposable Washroom
Rack Washer	Rack Washer
Bulk Autoclave	Cabinet Autoclave
Bottle Washer	Glass Washer
Bottle Filler	Bottle Crusher
Dumping Station	
Bedding Disposal System	
Tunnel Washer	
Bedding Dispenser	
Reverse Osmosis System	

Table 2: Comparison of equipment installed in a conventional versus disposable washroom.

A lower capital investment is required during facility construction due to the omission of a number of key pieces of equipment. We estimate our savings to be in excess of \$500,000. Capital savings ranging from tens of thousands up to multi-million dollars for larger operations have been reported in the literature².

The reduction in washroom equipment and cage processing is predicted to yield annual savings of at least \$100,000 in washroom utilities, maintenance and supplies. Furthermore, both cage replacement and depreciation costs are avoided through implementing a disposable system. Lower washroom labour costs and increases in workforce productivity are also expected but still to be evaluated.

Disposable cages permit a greatly increased storage density as the thin walled cages and cage components nest easily. Up to 800 cage bottoms or 1200 filter lids can be stored on a single bulk truck. Additional space savings are achieved as bedding materials do not need to be stored. The high nesting density of the disposable cage coupled with the implementation of lean processes and a Just In Time ordering system has reduced storage requirements by 2,000ft².

Simplified Workflows

Considerable ergonomic benefits can be achieved using the disposable model. Clean and dirty side cage processing activities are eliminated and operational workflows simplified. Traditional cage processing methods have a high ergonomic risk due to the frequency of repetitive movements and high lifting factor. The disposable system eliminates these tasks and allergen exposure associated with cage dumping.

The process chart below illustrates the workflows using disposable versus conventional cages.

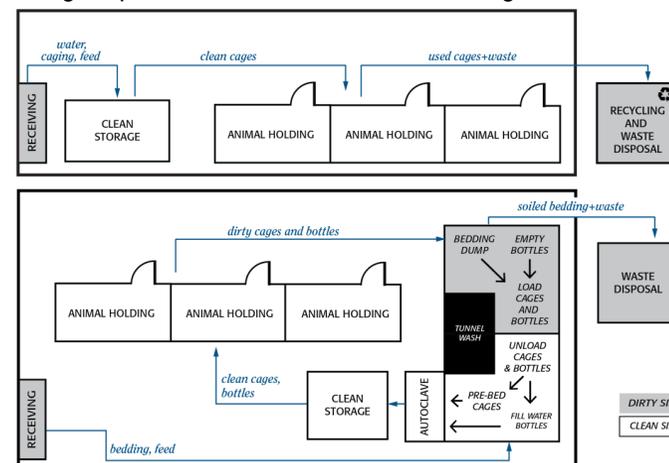


Figure 1: Process chart comparing workflows, image taken from article "Disposable Caging"¹²

Further ergonomic benefits are achieved during cage changing.

- ❖ Disposable cages are lighter than our conventional choice by 49% for mice and 19% for rats.
- ❖ The average in use cage weight is 1039g for mice and 3259g for rats.
- ❖ An animal technician changing 200 cages per day will lift 434lbs less for mice and 334lbs less for rats.
- ❖ Weight lifting water bottles is reduced by 88%. Our standard crate containing 36 full bottles weighs 30lbs compared to 3.5lbs for disposable bottles.

We have established a waste to energy program for processing disposable cages after use.

Conclusions

Working with disposable cages creates a highly flexible space and maximises the footprint for research activities. The disposable model offers a low cost option for construction or renovation projects due to reduced capital expenditure and is most effective in facilities housing only rodents. In addition, faster turnover of research programs and equipment can be achieved whilst avoiding depreciation costs.

The implementation of a disposable system requires a considerable shift in perception to support operational process change. Although visually very different, internal validation studies show cages do not negatively impact animal welfare or experimental variables providing other best practices such as ensuring an enriched environment are maintained.

The disposable model establishes unidirectional workflows supporting efficiency and cost savings. Literature suggests productivity increases up to 20% can be achieved during cage changing³ and reductions in washroom labour by 2 to 3 FTE are predicted. Importantly, the disposable cage reduces the ergonomic and animal allergen exposure risk associated with routine husbandry procedures.

The disposable cage is successfully in use within our smaller facilities. The performance metrics on a large scale will need full evaluation when the new building is occupied in 2014. To date, the disposable cage has proved to be a flexible and valuable addition to our vivarium planning and operations.

References

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2. Fallon, J. (2011) Disposable Caging. *ALN magazine* [Online].
3. Gagneron, R. (2011) Disposable vs Conventional Caging. Poster. AALAS 20th Educational Symposium