

Disposable vs Conventional Caging



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PURPOSE

There are currently many different housing options for mice. Some of these options include: ventilated or static cages, polyethylene terephthalate or polycarbonate lined cages, disposable or reusable, and different styles of water bottles. The purpose of this study is to analyze and compare the cleanliness of Innovive's™ new disposable caging to conventional static caging in order to see if this caging system would be a useful alternative compared to our standard caging system.

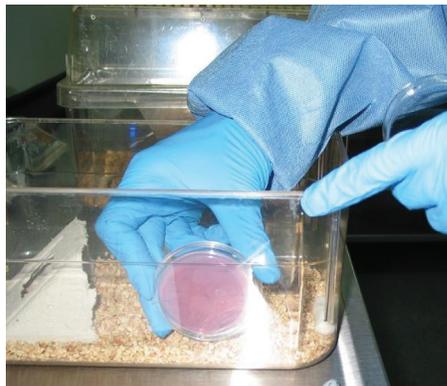
INTRODUCTION

The idea for this study came about due to a lack of equipment required to house an incoming arrival of Nu/Nu+ mice inside the animal facility at XOMA (US) LLC. Time constraints on ordering a new ventilated rack and sets of cages for these mice resulted in a search for an alternate solution. Disposable caging was introduced in order to temporarily fill this void, and it provided some additional benefits by reducing labor due to less required washing and autoclaving. The time saved on labor could then be used to perform other essential tasks in vivo studies.

PROCEDURE

- Compared 2 groups of 7 week old female Nu/Nu+ mice, implanted with HT-29 tumor cells, from Charles River Laboratory in autoclaved disposable cages against 1 group of female Nu/Nu+ mice in an autoclaved conventional cage.
- Used Replicate Organism Detection and Counting (RODAC) plates to count developed colonies in order to quantify the contamination of disposable and conventional cage bottoms and tops that have been in use for 3 to 10 days. Then, identified any discovered colonies [Figure 1].
- Measured the contamination of the feeder water after 7 days. Identified the colonies.
- Measured the amount of water used per day from the water bottles.
- Observed the status of the soiled bedding after 3, 4, and 7 days.

Figure 1. Acquiring RODAC Plate Samples



MATERIALS

- Innovive™ disposable cage bottoms — polyethylene terephthalate, recyclable filled with Diamond Star Products™ Alpha-dry bedding. Dimensions - 14.7" L x 9.2" W x 5.5" H
- Innovive™ disposable cage tops
- Aquavive™ Water Bottle
- Ancare™ conventional static cage bottoms — polycarbonate filled with Diamond Star Products™ Alpha-dry bedding. Dimensions - 11.5" L x 7.5" W x 5" H
- Ancare™ conventional static cage tops
- Ancare™ conventional water bottles (polycarbonate)
- BD BBL™ RODAC (replicate organism detection and counting) plates for testing tops and bottoms
- 10 mL BD Falcon™ test tubes for collecting water samples

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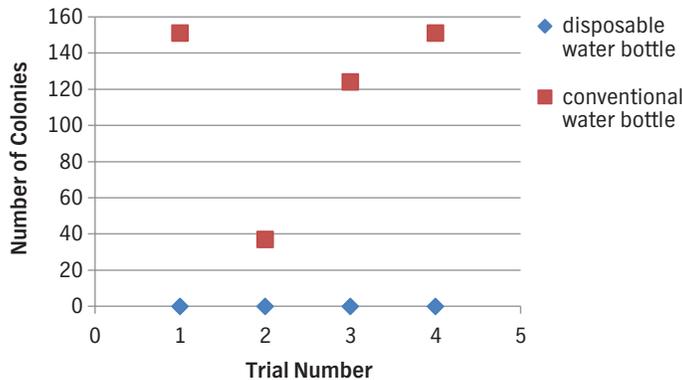
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RESULTS

Water

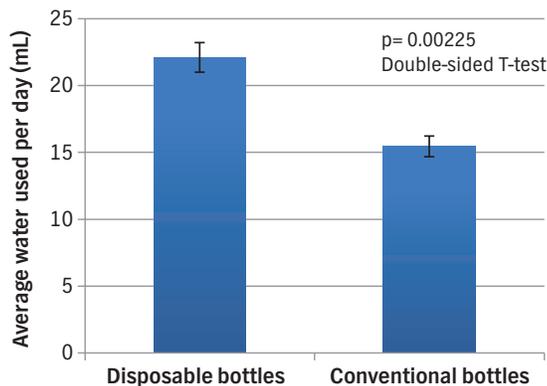
The disposable water bottles did not show contamination at any point of the study, whether fresh or used for 7 days. The conventional water bottles did not show any contamination when tested before use, but showed contamination every time when tested after 7 days of use on 4 separate occasions [Figure 2]. The contaminated bottles were identified to have traces of the bacteria *Sphingomonas paucimobolis* on one occasion and *Staphylococcus saprophyticus* on three other occasions.

Figure 2. Bacterial Colonies Found in Water on Day 7 in 4 Trials



On average, more water was used from the disposable water bottles than the conventional bottles [Figure 3].

Figure 3. Average Water Use per Day



Cage bottoms

The RODAC plates tested positive on the new conventional and disposable cage bottoms on 2 out of 3 occasions prior to being used. When tested on cage bottoms that were used for 3 days, the RODAC plates tested equally positive between all conventional and disposable cages.

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Cage tops

No noticeable difference between conventional and disposable cage tops. All tops tested negative before use and equally positive after use.

DISCUSSION

Water

Throughout the experiment, the disposable water bottles kept a clean record with no bacteria detected during the course of the study. However, the conventional water bottles tested positive for bacteria after 7 days in all 4 tests. The results indicate that disposable water bottles seem to contaminate less easily with bacteria than the conventional water bottles. This may be because the mice tend to grab onto the sipper tubes of the conventional bottles with their paws and thus soiling the water [Figure 4 and 5]. Regardless, mice are exposed to the same bacteria in the cage and it doesn't make a difference.

Figure 4. Conventional Bottle Sipper Tube



Figure 5. Disposable Bottle Top



The bacteria *Sphingomonas paucimobolis* that was found in one of the bottles is commonly found in water and soil and is known to cause a vast array of infections but did not appear to have an effect on the mice on study. The other bacterium that was found in the water, *Staphylococcus saprophyticus*, can infect the skin and mucous membranes of mice and can be cultured in cages, room surfaces, and personnel. Although the bacteria can cause illness, it can be prevented through the sterilization and frequent changing of bedding. Both types of bacteria are commonly found amongst mice in their environment and are not cause for alarm (1).

Water levels were measured to see if one type of bottle caused more leakage and therefore a soggy cage than the other. The tests showed that disposable bottles caused more spillage. However, several variables existed as water may have been spilled due to periodic moving of the cage racks which the cages rested upon or during the handling of individual cages. It is also to be noted that the Nu/Nu mice in the disposable caging were implanted with HT-29 tumor cells and were handled more frequently, which also may have influenced the results.



Cage Tops and Bottoms

The study on fresh cage bottoms for the Nu/Nu mice showed that both types of caging are vulnerable to contamination before they are even used. The contamination possibly occurred because the bags containing autoclaved cages had already been opened the previous week and the unused cages were resealed and stored. To resolve this issue, XOMA plans to revise their Standard Operating Procedures to include re-autoclaving previously opened cage bags, and replacing alcohol spray bottles with Vimoba™ spray bottles when disinfecting equipment during cage changes.

When testing the soiled cage bottoms, neither type of caging showed to be more sanitary than the other as both cages were naturally exposed to mice feces.

CONCLUSION

An important finding from the study was that the disposable water bottles remained cleaner during 7 days of use than the conventional water bottles, once the bottles were used by the mice. Additionally, it was found that previously autoclaved cages in packages that had been opened for use, tested positive for bacteria prior to use. This finding has changed our practices so that opened packages of cages will be re-autoclaved before use. The useful information acquired from this study suggests that disposable cages and bottles are as clean as conventional cages, and can be a viable option for XOMA to use if there is a shortage of equipment in the future.

References

1. Fox, James G., Lynn C. Anderson, Franklin M. Loew, Fred W. Quimby. *Laboratory Animal Medicine 2nd edition* Elsevier Science (USA), 2002. 94.

Acknowledgements

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