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Explora Biolabs was looking to scale up rapidly, and disposable caging offered financial and operational benefits.

Explora Biolabs (Explora), a San Diego-based contract research organization (CRO), was founded in 2004 with a goal to satisfy the *in vivo* research needs of drug discovery researchers. We have used disposable caging from its inception in 2005, attracted by the simplicity of a disposable cage operation, the low capital investment required, the increased consistency and sterility it offered to our processes, and, of course, by the ease of its deployment.

Six years later, having started as a modest operation with just eight vivarium rooms and a facility space of 4,000 square feet, Explora has grown to include 40 vivarium rooms with a total facility space of 25,000 square feet. The ability to add more rodent housing capacity without having to invest in washroom infrastructure has been a driving factor in the successful growth of our business.

Explora provides a suite of *in vivo* efficacy models in a variety of disease areas, including oncology and diabetes, as well as pharmacokinetic and toxicology services. Due to Explora's diverse clientele and research needs, operating efficiency and maintaining high cleanliness standards are critical. As our business has expanded, we have been able to scale our operation to meet our clients' demands quickly and efficiently. Using disposable caging has allowed our business to expand operations, to reduce our staff, to decrease our operating costs and to minimize financial risks while enabling us to deliver the highest level of animal care to our clients.

As one of the first users of a disposable IVC system, I have been exposed to all aspects of its evolution and been in touch with many of the other users of this system. Many of the initial customers deployed the system in quarantine facilities or remote labs where cage washing was either impractical or ill-advised. Once users became comfortable with the performance and benefits of the system, its use was expanded to larger, dedicated facilities. Today there are animal facilities around the world operating without the need of a cage wash, including many that are in excess of 10,000 cages. There are fundamental

reasons for this rapid adoption: the disposable IVC system provides meaningful financial advantages and animal welfare benefits; it improves employee well being, increases operational flexibility and offers a green alternative to the traditional cage wash.

System Financial Analysis

There are two major components of cost associated with operating an animal facility —capital equipment and operation—that were critical factors in our decision to commit to a disposable IVC system.

Capital Equipment and Infrastructure

There is no question that the implementation of disposable IVC caging reduces costs on the front end of a renovation or new vivarium project. Reduction or elimination of the washroom, washers, sterilizers, and other capital equipment dramatically reduces the total cost of the project.^{1,2} The upfront capital savings can be from tens of thousands for small labs, all the way up to multi-million dollar savings for larger operations. One institution reported saving over \$4,000,000 in capital equipment and construction costs by implementing a disposable caging solution.²

The calculations required to compute savings for this category of expenditures is fairly straightforward by simply comparing the space, construction, and equipment expenditures between the two options. These savings accrue directly to the institution and immediately reduce daily costs per cage, especially while the facility is ramping up their operation. These savings have been instrumental in Explora's ability to scale up rapidly as our business grew and we needed to quickly meet the demands of new customers.

Ongoing Cost of Operations

This cost component is less straightforward to compute, but nonetheless it can be done by using a framework that takes all aspects of vivarium operation into account.² There are many factors to consider, including husbandry staff labor, washroom labor, washroom utilities (including washroom HVAC which can account for 50% of an animal facility's HVAC consumption), washroom maintenance contracts/engineering, management time, cost of replacement caging (washable or disposable), choice of watering solution, choice of bedding, average cage change interval, waste handling/recycling, value of increased animal housing capacity per square foot, anticipated rack utilization, employee turnover/grievances/absenteeism, value of increased financial flexibility, value of reduced risk through simplified processes, value of convenience, and others.

Once all these parameters of costs are defined, it's a matter of using commonly available historical data, measurements from current operations, projections, and analysis to determine the total annual cost of operating under both scenarios. This level of detail is required to reach the true cost of operations under both the washable and disposable scenarios.

As a commercial entity, we have focused on controlling costs on an ongoing basis over the last few years. Using disposable cages has helped us increase our housing capacity per square foot while reducing our utilities and our animal husbandry labor.

3rd Party Validations, Related Benefits

Several institutions have done independent studies on the disposable IVC system. Some of these studies have been reported in a variety of publications and conference

proceedings and validate the system's performance in the following areas:

1. Animal Welfare. This is clearly the most important variable when considering the type of caging to be used to house laboratory animals. If the system doesn't meet your minimum standard of performance, other factors such as cost and ergonomics won't matter. My customers need to know their animals are not only receiving excellent care, but are also surrounded by a housing environment that minimizes the likelihood of cross contamination. Following are examples of some of these studies.

In one study,³ ammonia concentrations in disposable cages were measured compared with those in traditional (washable) cages. The results indicated that the disposable cages had significantly less ammonia after nine days. At the end of this assay, the ammonia concentration in the disposable cages was less than 4ppm, compared to readings over 200ppm in the traditional ventilated caging. While these results were not due to the disposable nature of cage, but rather to the design of the ventilation system, they indicate that using disposable cages does not compromise the animal environment. In fact, in this case, the disposable cages produced a better result.

A second study relating to animal welfare examined the breeding of transgenic animals.¹ Again, a side by side comparison indicated that disposable cages outperformed the leading washable cage system in terms of breeding productivity.² Specifically, breeding production of the transgenic animals increased two to threefold in the disposable cages. This is attributed by most to be a function of the highly efficient ventilation system and the low-noise, low-vibration blower units.



At Explora, disposable caging allows us to reduce the number of required processes so we are focused on our customers' specific protocols.

At Explora, we need to demonstrate to our prospective clients that we maintain a consistent animal environment supported by effective processes. We believe that choosing fresh, irradiated, disposable cages (instead of washing them) reduces risk in several ways. First, there is no “dirty side” of these cages that we need to control. All soiled cages can be bagged and taken straight from the animal rooms to the recycling dock. Also, disposable caging allows us to reduce the number of required processes so we are focused on our customers’ specific protocols. The standard change-out interval in our facility is 7-14 days, which works very well and ensures the animals are not over-handled due to poor caging system performance. In total, we are able to provide a healthy animal environment with fewer variables to control.

2. Ergonomics and Employee Health. One consideration of every manager is the well-being of their staff. Working in an animal facility is hard work, and often involves allergen risks, especially in the cage wash area.

There are two primary components in maintaining an animal housing environment when it comes to personnel. The first is the cage wash—this is a difficult job that often has high turnover, absenteeism, work related injuries and health issues.³ The adoption of disposable cages can eliminate the need for this function as it relates to mouse and rat populations, which account for the vast majority of cage wash labor in most research facilities. The individuals employed in these areas will have the opportunity to shift their focus elsewhere in the organization.

The second component is the animal husbandry staff. Perhaps the greatest benefit of the thin-wall disposable cage is the lightweight nature of the cage, which speeds cage changes, reduces repetitive strain, and allows more cages to be changed without tiring.^{2,4,5} In addition to our own experience, all the presentations referenced in this article also cited ergonomics as a key factor for their staff and successful adoption of the product.

Another convenient feature offered by disposables is their high nesting density, which is essential for storage. A time and motion study showed a 20% efficiency gain in the cage change process due to the nesting density provided by thin-wall disposable caging. This allowed four to five times the number of cages on a cart or under a hood at any one time saving time and effort.⁴



3. Facility Management. Traditionally, facility managers spend most of their time managing the cage wash. The advent of disposable caging changes this considerably. Instead of directing a large portion of attention and effort to the cage wash (failed equipment emergencies, absent staff, etc.), this time can be spent focusing on activities more closely related to science, animal health and supporting investigators.^{2,6}

4. Planning Flexibility. When erecting a new building, or conducting a renovation, planners are required to estimate the number of cages of animals the facility will support several years down the road. If one underestimates, the demand for animal capacity will outgrow the facility and the institution may be forced to decline studies or turn away additional researchers. Overestimation, on the other hand, results in a considerable waste of money and resources that could have been better utilized to further the science program in other ways.

Also, during the time the facility is ramping up to full capacity (which could take years), the washroom is generally operated at partial capacity. Underutilizing space and washroom equipment results in a higher per diem cage housing cost during the ramping-up period, even if the long-term size of the facility was estimated accurately. By eliminating the large capital investment in a cage wash, disposable caging eliminates a lot of guesswork from facility planning.¹

5. Green Operations. Disposable caging has been seen by many as a green alternative for their facility by eliminating the very large amount of energy, water, and chemicals associated with washing and sterilizing cages.^{1,2,4}

But large reduction in utilities is not the whole story. The full impact of any product on the environment must be examined by exploring its full product life cycle. This includes raw materials selection, the manufacturing process, recycling, and more. Our disposable caging vendor offers a patented, thin-wall cage made with substantially less plastic than alternative caging. In addition, the source plastic is 50-70% post-consumer material (recycled plastic bottles).

The caging used at Explora is manufactured at a state-of-the-art integrated manufacturing

facility that generates at least 50% of its energy from the largest solar panel array of its type in the country, resulting in extremely low energy consumption per part. In addition, our vendor offers plastics recapture and recycling to the West Coast: the soiled cages are processed, separated, granulated, and turned into new products. Our vendor also employs a full-time recycling coordinator who assists customers with their local recycling initiatives.

Conclusion

Consideration of the variables discussed in this article such as animal welfare, ergonomics, and cost should be made when comparing IVC systems of all types, washable and disposable.

By reducing or eliminating the cage wash, this technology offers the lowest cost option for constructing or renovating a vivarium. It also provides the opportunity to lower operational costs and simplify operations. Ergonomics, ease of management, flexibility in planning and serving as a green alternative are compelling strengths of a disposable caging solution when compared to traditional cage wash operations. Ultimately, disposable IVC technology offers a more controlled and standardized process for animal husbandry, eliminating variables, and reducing risks.

In the case of Explora Biolabs, these factors have allowed us to grow our business more quickly and offer our services to more customers than would have been possible otherwise.

References

1. Piechowiak, Marek , DVM. "Evaluation of Disposable Caging System as a Breeding and Husbandry Solution." Presentation, Commercial study results. 59th AALAS National Meeting, 2008.
2. Geary, Tim. "New 11,300 Cage Vivarium Using Modular Construction and Disposable Caging." Keynote Presentation, analysis. 60th AALAS National Meeting, 2009. Also Keynote Presentation. Tradeline Animal Facilities Conference, 2009.
3. Silverman, Jerald, David W. Bays, Sheldon F. Copper, and Stephen P. Baker. "Ammonia and Carbon Dioxide Concentrations in Disposable and Reusable Ventilated Mouse Cages." JAALAS, Mar. 2008: Vol 47
4. Jenne, Kenneth J, DVM. "The disposable cage equation: Net impact on operating cost and cage density." Keynote Presentation. Tradeline Animal Facilities Conference, 2008.
5. Eide, Dag M, DVM. "Disposable Caging as an End-to-End solution." Presentation, analysis. 59th AALAS National Meeting, 2008.
6. Parnell, Michael J, DVM. "Disposable Caging as a Complete Biocontainment Solution." Presentation, analysis. 59th AALAS National Meeting, 2008.

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