Case Study:
Netherlands Cancer Institute

This is a case study written by Marco Breuer, Head Lab at the Netherlands Cancer Institute located in Amsterdam, NL

BACKGROUND

The Netherlands Cancer Institute (NKI) was established in 1913 and is the only dedicated cancer center in The Netherlands. As a comprehensive Cancer Center combining a nationwide Cancer Clinic and Cancer Research Institute, NKI plays an important role as a national and international center of scientific and clinical expertise, development and training.

NKI includes a stand-alone, high-end animal facility with a 22,000 disposable cage census that accommodates approximately 650 scientists and scientific support personnel. The accompanying Antoni Van Leeuwenhoek Hospital has 185 medical specialists, 180 beds, an outpatient clinic with around 106,000 visitors, 12 operating theaters and 11 irradiation units for radiotherapy.

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THE CHALLENGE

For nearly a decade NKI faced issues with outdated equipment and procedure rooms in an animal facility that was over 30 years old. Issues included an obsolete HVAC system, old-fashioned and labor intensive washing equipment, inadequate barrier systems, small procedure and animal holding rooms and a health status that wasn't in-line with our research goals.

It was because of these issues NKI set out to build a new stand-alone animal facility intended to facilitate our research questions, as well as fulfill our need for a high microbiological standard (SOPF breeding unit and SPF research units) to be combined with research units in order to access and perform experiments easily. These high standards presented a major challenge, which needed to be addressed during the design process.

THE SOLUTION

Ultimately a philosophy and system was developed in which microbiological barriers were included at the building, floor, room and cage level. These barriers include physical barriers, protective equipment, training & SOP's. In addition, a logistic & risk analysis was done on what type of material enters the facility and research units. Special attention was paid to the logistics and risks of having a cyclic process of washing and autoclaving when using conventional cages.

Innovive disposable cages were initially considered for our radioactive and carcinogenic work, but very quickly became our standard caging for the entire facility. Our decision to fully incorporate disposable cages was based on some of the following reasons:

- Single-use irradiated materials fit the NKI philosophy of barrier protection
- Disposable cages allowed us to outsource our non-essential work and enabled us to focus more on our primary goal of facilitating research
- Our animal care staff and researchers found the cages were better for daily inspections due to the clarity, and were easier to handle because they are lightweight
- They have better stackability and took up less space
- The materials were better to handle under the BSL2 hood

Image – Second level logistics barrier

Image – First level small disinfection chambers

Image - Storage room for disposable cages and components

THE RESULTS

Shortly after implementing the Innovive IVC system we noticed a considerable difference between disposable and washable cages. From a qualitative perspective we could actually see the results, which is very important when doing high-end research. Of course quantitative results like statistics and other metrics are important, but actually experiencing the results made a big difference.

The Impact on Operating Expenses

NKI saw meaningful effects on our operating expenses with a reduction on our upfront capital costs, our ongoing costs and our utility costs. These were enormous savings that helped us pay for our running expenses.

The Impact on Standard Operating Procedures

Another advantage of using Innovive Disposable Cages was the ability to develop new procedures to work in conjunction with our existing standard operating procedures. NKI was able to completely eliminate the stacking and opening of cages outside the BSL2 hood which we accomplished by working with Nu-Air and Innovive to develop a "deep well" within the hood. This development allowed our technicians to complete the cage change process from introducing a full stack of bagged cages into the BSL2 hood, transferring the rodents in fresh cages to stacking and re-bag the used cages; all under the protection of the laminar flow of a BSL2 hood. Ultimately this new way of changing out cages and helped us implement a "full cage level barrier" for our multilevel barrier goal.

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The Impact on Efficiency & Ergonomics

When compared to traditional cage washing procedures, the positive effects disposable cages have had on our workflow and staff have been quite significant. The most noticeable differences on our workflow have been the ability to eliminate the volumes of cages being transported to the washing area, the clean storage of cages in the washing

Image – Second level animal holding room

area before sterilization and storage for sterilized cages that required time to cool down.

Additionally, the stackability feature of disposable cages has made a big difference in the time it takes to change a cage as well as for our staffs well-being. For example, we can transfer a stack of 25 clean cages and/or lids into the BSL2 hood in one movement vs. traditional cages where you can only transfer a maximum of 4 cages at a time into the hood. We estimate that this simple feature equals a time savings of up to 25% in the change process, but more importantly reduces wrist, elbow and back movements for our technicians.

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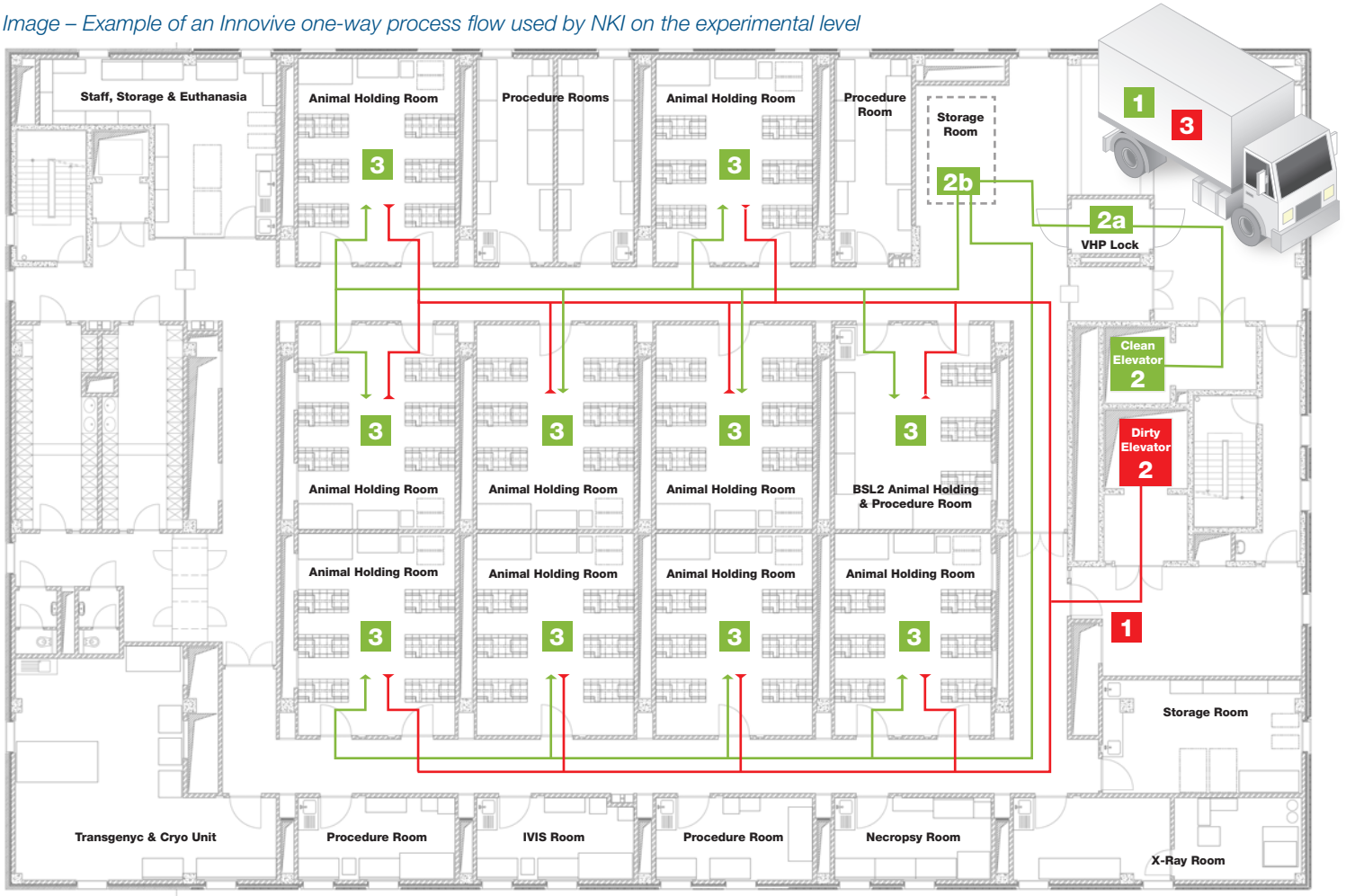
The Impact on Facility Flexibility

Our building was originally designed for a robotized washing area, but once cage washing was no longer part of our plan the area was easily converted into storage. We also have a contingency plan for this storage area which will allow us to convert it into more animal holding rooms if needed. The flexibility of disposable cages enables us to make these changes to our building if needed without major construction or retrofitting.

Image – Example of an Innovive one-way process flow used by NKI on the experimental level



Material Flow (IN)

1. Cages, water, bedding and other Innovive materials enter the facility from the loading dock on the ground floor (ground floor not pictured).
2. The materials are transferred via the 'clean' elevator to their floor and pass through a VHP decon lock (2a), then placed in the storage room until they're ready to use (2b).
3. Materials are pulled from storage and are transported to the animal holding rooms.

Material Flow (OUT)

1. Materials that leave the facility are put in the "OUT" airlock by the animal care takers.
2. Once in the "OUT" airlock, they're picked up by the logistics personnel and transfered to the ground floor using the "dirty" elevator.
3. At the ground floor (ground floor not pictured), bagged dirty cages, lids and bottles are collected and taken to an outside container which are then picked up by truck at regular intervals.

Image – Level 1 animal holding room

Conclusion

The Innovive Disposable IVC System helped us achieve our philosophy in having a microbiological containment at the cage level. Due to the sterility and disposable nature of the product, there is no risk of having a cross contamination via not properly functioning washing or sterilizing equipment.

Based on an extensive 30 year cost analyses of our building that included capital investment costs and running costs, we compared the Innovive system with a robotized washing traditional housing system and found the Innovive system was a cost effective system for us.

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