Solving Problematic Device Disinfection to Eliminate Disease Outbreaks in a Preclinical Research Setting Within an Academic Medical Center

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The challenge of preventing infection in a preclinical research setting

In a preclinical research setting, specific pathogen free rodents are housed in specially designed facilities for biomedical research. Utilizing strict biosecurity practices, it is crucial to prevent the introduction of opportunistic and pathogenic organisms or facilitate their eradication if introduced. Disease outbreaks among genetically modified and immunodeficient rodent colonies can confound research results by introducing variables or wiping out months or even years of research progress. In addition to rodent specific pathogens and pests, zoonotic organisms also create concerns for both staff and animal health. Yet, beyond the modern marvel of genetically modified research animals, cutting edge biomedical research requires a wide variety of expensive and precise scientific equipment. Rarely, does Original Equipment Manufacturer (OEM) equipment come with recommendations on disinfection processes that provide a high level of assurance. As a result, disinfection can be a high risk, yet required barrier to disease introduction into rodent facilities. Equipment damage from initial, and even serial disinfection requirements can directly contribute to compromised research results or even delays in potentially lifesaving discoveries reaching publication or market.

A large institution with complex medical research programs

These were the challenges at the University of Colorado Anschutz Medical Campus. The institution is considered by the Carnegie Classification of Institutions of Higher Education to have "very high research activity" with a basic classification of *Research Universities (RU/VH) (very high research activity)*. As of 2018, research grants totaled $553 million.

But in 2008, there was a major outbreak causing the temporary shutdown of the rodent facility. Specifically, greater than 90% of the rodent colonies housed in a vivarium at the Anschutz Medical Campus, serving the labs of more than 250 principal investigators, tested positive for multiple infective agents including mouse parvovirus, fur mites, pinworms and epizootic diarrhea of infant mice. This risked the loss of millions of dollars of research effort and put future projects and support in jeapardy[1]. In 2010, the shutdown and full decontamination of the facility cost $4 million. Increased vigilance and a new more practical and consistent method of disinfecting a wide variety of potential fomites (clinical and non-clinical equipment) had to be found.

Enter Dr.'s Mark and Czes Golkowski. The Golkowski's research on the anti-microbial effectiveness of combining cold plasma and hydrogen peroxide is widely published[2,3,4]. The Golkowski's had uncovered a method to miniaturize this type of technology and make it compatible to a range of materials. Their device, the AURA prototype allowed disinfection of handheld equipment and hardware in just a few minutes. Dr. Mark Golkowski, who is a professor and Associate Dean at the University of Colorado Denver, discussed the potential for this technology with Dr. Jori Leszczynski, DVM, DACLAM and Dr. Chris Manuel DVM, PhD, DACLAM at Anschutz Medical Campus. Dr Leszczynski is a widely published research expert and serves as an Assistant Vice Chancellor for Animal Resources at the Anschutz Medical Campus. Dr. Manuel manages an intensive health surveillance program to ensure that animals are free of pathogens and pests that can impact research outcomes. In support of his biosecurity role, Dr. Manuel's research program is focused on methods to rapidly detect, treat, and eliminate endemic bacterial infections in rodent colonies.

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A new solution and new results

In 2015 Drs. Leszczynski and Manuel identified devices and other equipment as potential fomites for outbreaks as facility decontamination, PPE, handwashing, and other aseptic techniques had high adherence. After performing research to document AURA's anti-microbial efficacy[2] they instituted a new program where items entering or exiting the rodent facility would be treated in the Golkowski's automated AURA Disinfection System.

This system has a shelved chamber where multiple items are placed and automatically disinfected at the touch of a button. This new protocol eliminated the manual, variable disinfection protocols that busy staff had endeavored to follow. The types of devices and equipment routinely disinfected include sensitive electronics like micro-MRI coils, laptop computers, camera equipment, tablet computers as well as smaller fomites like keys, pens, cell phones, and access badges. Versus the previous manual device disinfection protocols compliance dramatically improved. The safety of the AURA's Disinfection System was also preferred by Dr. Manuel over other gas disinfection methods that have a higher risk of corrosion on electronic components, and the more time intensive spray or wipe based manual disinfection methods. With the aid of AURA, the Anschutz Medical Campus is one of two academic institutions in the country to eliminate the opportunistic bacteria, *Corynebacterium bovis* from endemically infected immunodeficient mouse colonies. Since the implementation of AURA into routine disinfection processes, the time for equipment process into and out of the facility has dramatically decreased and there have been no outbreaks of viral or bacterial infections from the rodent facility in the last six-years.

Using previous outbreak data this created a savings of millions of dollars and the protection of years of irreplaceable research.

What this means for other medical facilities - discussion

Using AURA resulted in enhanced control of pathogenic organisms through the automated disinfection of potential fomites in the veterinary setting. By extension, these results may create similar benefits in other healthcare settings. These benefits may be derived from both the compliance and ease of use that results from using an automated system. There are a few potential factors to examine.

Most facilities have device disinfection policies stating that devices will be disinfected per OEM Instructions for Use. In practice, these well intentioned polices leave a significant infection prevention gap. This gap is generated by a general lack of OEM recommendations on best practices for equipment disinfection, the time-consuming nature of traditional manual decontamination processes, a wide variety of disinfectants on the market that are inappropriately used with inadequate contact times to maximize efficacy, and the occupational health concerns with exposure to disinfection chemicals. Bottom line, AURA has eliminated these concerns with a simple and elegant design for one touch disinfection of high value equipment that could be potential fomites for infectious agents.

Like Anschutz Medical Campus with the AURA system, your facility can potenitally:

1. Increase compliance with device disinfection – devices will actually be disinfected when the process is automated. Eliminate reliance on busy staff knowing/ following the disinfection instruction for every device and piece of equipment they use.
2. Protect your equipment from disinfectant damage.
3. Protect your staff from disinfectant exposure – a JAMA research study showed a 25-38% increase of COPD in female nurses with regular exposure to common hospital disinfectants[5]
4. Reduce a portion of the ~7 billion plastic disinfectant wipes that US acute care hospitals discard each year.
5. Have a secure domestic supply chain – one AURA-D cartridge replaces up to 22 cannisters of disinfectant wipes.

AURA will be available upon EPA registration and individual state approvals, where applicable.

For additional information about AURA please contact:

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