## Verification of Cleaning & Disinfection for Healthcare and Other Indoor Environments

Cleaning and disinfecting surfaces that are commonly touched ("high-touch surfaces") are recognized as important to prevent the spread of infectious mold, bacteria and viruses in healthcare settings. Research has shown that proper cleaning and disinfection along with a verification program have significantly reduced the incidence of hospital-acquired infections in many facilities. Verification is important to improve employee performance with the knowledge that their actions and outcomes are being monitored, and to provide feedback for continual improvement of the cleaning and disinfection procedures. It stands to reason that this same cleaning and disinfection should reduce the risk of transmission of viruses that might remain viable on indoor surfaces in the situation of an outbreak of disease, such as with Coronaviruses and COVID-19.

Verification of cleaning and disinfection is very important, since many surfaces may appear clean both before and after cleaning. However, substances like body oils from skin contact and invisible films of organisms (biofilms) can remain on inadequately cleaned surfaces and shield microorganisms from the action of disinfectants. Verification helps to identify these problem surfaces that require extra cleaning effort, as well as cleaning procedures themselves that simply may not be adequate for the goal (thorough disinfection and prevention of disease spread).

According to the Centers for Disease Control (CDC), cleaning procedures themselves may be verified via direct methods including visual observation and use of fluorescent markers. More importantly, the outcome (cleanliness) may be verified by either sampling for viable microorganisms or by measurement of ATP (Adenosine Triphosphate) residue. Sampling for viable microorganisms is time consuming as it relies on culturing the organisms in a laboratory. Measurement of ATP is highly sensitive and very rapid, and presents many advantages when verifying cleaning and disinfection activities during a disease outbreak such as COVID-19, with rapidly developing situations and the need for fast, actionable results.

Measurement of ATP (Adenosine Triphosphate) is one of the methods endorsed by the US Centers for Disease Control (CDC) for assessing cleanliness in healthcare settings. ATP is the universal energy molecule present in all living matter. It may be detected rapidly on environmental surfaces via a bioluminescence assay that has been used successfully in the food industry for over 30 years. Although viruses themselves do not contain ATP, surfaces contaminated with viruses will typically also be contaminated with various bodily fluids containing human cells as well as general mold / fungi and bacteria from peoples' hands and from the environment. Well-cleaned and disinfected surfaces should have minimal to no amounts of these materials and organisms and hence little to no measurable ATP.

This measurement is used as an indication of the level of cleanliness of a surface and, if tested after cleaning and disinfection, can indicate the thoroughness of the cleaning procedure itself. Typically, representative high-touch surfaces (e.g. door handles, phones, keyboards, etc.) are sampled after cleaning and disinfection, and results are available in the field almost immediately. Surfaces that do not meet the strict threshold criteria are re-cleaned, until the entire site has been considered adequately cleaned and sanitized. These measurements are made in conjunction with visual observations as well as an assessment of the overall cleaning and sanitizing operation.

Note that ATP is not a direct measurement of viable organisms and not a measurement of virus presence / absence (including COVID -19). It is not a direct measurement of sterility or safety. Achieving acceptable ATP levels does not guarantee that a surface is free of viable virus (including COVID -19). However, verification methods such as this have been highly regarded by the healthcare industry and the CDC as part of a proper cleaning program. AS mentioned earlier, research has shown that hospitals that have implemented thorough cleaning programs with verification such as ATP measurement have significantly reduced their incidences of hospital-acquired infections.

Air Quality Management is able to use ATP monitoring for verification of cleaning of indoor environments suspected of contamination with COVID-19, and provide rapid turnaround of results and clearance of cleaned and disinfected sites.

References:

Note – there are many references and sites that provide high-quality information related to the above statements on cleaning and disinfection programs and on verification via ATP testing, whether for disease prevention in general or for more specific considerations such as viruses, Coronaviruses and COVID-19. The references below were chosen by AQM as a subset of these sources. Refer to similar articles and to the US CDC website (www.cdc.gov) for more information.

Environmental Cleaning and Disinfection Recommendations, Interim Recommendations for US Community Facilities with Suspected/Confirmed Coronavirus Disease 2019, CDC: https://www.cdc.gov/coronavirus/2019-ncov/community/organizations/cleaning-disinfection.html

Clean & Disinfect, Interim Recommendations for US Households with Suspected/Confirmed Coronavirus Disease 2019, CDC: https://www.cdc.gov/coronavirus/2019-ncov/prepare/cleaning-disinfection.html

Options for Evaluating Environmental Cleaning, Alice Guh, MD, MPH, Philip Carling, MD, October 2010, CDC: https://www.cdc.gov/hai/toolkits/evaluating-environmental-cleaning.html

Best Practices for Environmental Cleaning in Healthcare Facilities in Resource-Limited Settings, November 2019, CDC: https://www.cdc.gov/hai/prevent/resource-limited/environmental-cleaning.html