MISSION IMPOSSIBLE: 
Clean Linen from a Dirty Facility

By Esther Marr

When assessing the laundry’s role in infection prevention, there are many facts to consider. Textile cleaning and processing is only half of the battle to presenting a customer with hygienically clean linens. The other vital part of the process, infection prevention, starts with a clean processing facility. But what constitutes this type of environment?

There are certain requirements, guidelines, and recommendations for providing the type of clean laundry environment that will reduce the risk of infection for the individuals using the textiles, as well as the employees working in the laundry processing facility.

Knowing the correct level of cleanliness that should be achieved, defining a frequency for cleaning and how to assess the cleanliness are the major factors involved in maintaining an optimal laundry facility.

Providing a Clean Processing Facility

While there is no universal standard for providing a clean facility, experts agree there are certain practices that should be followed.

One essential factor in preventing recontamination of clean linens is having a clear separation between where soiled laundry is being sorted and washed and where clean laundry is being folded, processed and packaged for storage.

“Staff shouldn’t be floating back and forth (from the clean to soiled side) to talk to people without having some process of how to keep from contaminating their uniforms and clothes,” explained Dr. Fontaine Sands, associate professor of baccalaureate and graduate nursing at Eastern Kentucky University and Board Member of APIC Bluegrass.

Frequency of Cleaning

Undoubtedly, the soiled side of the processing facility will need to be cleaned and disinfected more often than the clean side. If the laundry is maintaining its environment as recommended by the Healthcare Laundry Accreditation Council Standards, the laundry determines the frequency. There are, however, some basic recommendations for cleaning frequency that should be noted.

As a general rule, experts advise that if an aspect of the processing facility—on the clean or soiled side—becomes visibly soiled during the day; it should be cleaned as soon as possible. The soiled side of the facility should be cleaned and disinfected in its entirety at the end of each work day. The clean side is also typically cleaned and disinfected daily, but it is ultimately up to the laundry manager to come up with a standard operating procedure.

Laundry Layout Standards

The size of the laundry processing area should be determined by the volume of textiles to be processed, the types and size of the equipment required to process this volume, and the overall needs of the laundry’s customers. Each functional area of the laundry should have adequate space to provide for the systems, equipment, and work load of that area. Areas of the laundry should be designed in such a way as to provide functional and physical separation between soiled and clean textile processing areas. In addition, traffic control and restricted access to areas in which contamination could occur should be provided.

ANSI/AAMI ST 65:2008 Section 3.3.1
“When linen is clean, it shouldn’t be contaminating the surfaces (on the clean side of the facility), but I would still disinfect (the clean side) at the end of the day,” said Sands. “You’ve got employees going in and out… and they’re dragging stuff in from outside on their shoes, so it’s just a good cleaning process to make sure you clean and disinfect everything at the end of the day.”

Nancy Bjerke, BSN, RN, MPH, CIC who is on the Healthcare Laundry Accreditation Council board, recommends that when setting a schedule for cleaning frequency, one should take into consideration the age of the physical plant; whether it maintains environmental control with temperature and humidity; and whether doors and windows are frequently closed, causing cross currents and insect infestations.

Other factors to consider when setting a cleaning schedule include the volume of textiles that are processed in that particular area of the facility; how much lint is generated; and how many employees are present.

All the equipment on the soiled side of a laundry processing facility, such as the opening to the washer and the belt used to move soiled linen through the soil sort process, should also be cleaned on a regular schedule determined by management.

Attention should be given to carts used to move soiled linens throughout various stages of the soiled side of the processing operation. “If you don’t clean them at least daily, the organisms keep growing; the colony count gets higher and higher if it has a place to grow and feed on,” said Sands. “Also, a high colony count is going to be harder to remove versus a low colony count.”

The canvas/nylon bags used in overhead monorail systems as slings to contain soiled linen should be cleaned on a regular basis according to the instructions on the material’s label. “They should be cleaned with whatever the chemical, time, and temperature (the label) says they need to go through to be hygienically clean,” said Sands.

Sands noted that special attention should be paid to removing dust or lint from floors, walls, ceilings, touch surfaces on the clean side. She explained that if clean linens are accidentally contaminated by dust or lint, and then brought into the hospital, patients with weakened immune systems may come into contact with them and contract infections.

“Until there’s a standard out there, processing facilities should develop a policy that’s reasonable, but always weigh on the side that you’re there to protect the patient,” said Sands. “If something is visibly soiled, it should be cleaned. If it’s not, there should be a policy for (frequency of) general cleaning.”

Regarding the clean linen transport carts, Sands said the reusable liners within those carts should be removed and examined at the end of each day. “If there’s a soiled spot you visibly see, you definitely need to clean it, but if you pull the liner out and there’s nothing there, you might have a process where those get cleaned at the end of a week,” she explained.

The same goes for linen belts and shelving on the clean side, which may also be cleaned on a weekly or bi-weekly basis if there is nothing visibly soiled on the surface at the end of each day.

The covers used to protect/cover the clean linen from lint during blown down from the equipment/ceiling should be cleaned as needed. “If it has lint all over it, then you want to clean it immediately so someone doesn’t touch it and then put their hands on clean linen,” said Sands. Once again, regardless of whether or not the covers look visibly soiled, they should still be cleaned on a regular schedule set by the laundry manager.

The trucks that transport clean and dirty linens also need to be cleaned and disinfected once a day, especially if they have been carrying soiled linen. Some states, through public health statute, forbid laundry trucks to transport soiled and clean laundry in the same truck at the same time.

The only aspect of the laundry processing facility that does not need to be regularly disinfected is the floors. “You consider a floor always contaminated (since people are walking on it all day), so you’re never going to disinfect it,” said Sands. Floors should be swept and mopped daily with regular cleaning agents, but since they’re considered contaminated surfaces, if anything touches them—especially clean linen—it’s considered soiled and needs to be re-washed.

Effectiveness of Cleaning

Measuring the effectiveness of cleaning is an important step for laundry managers to ensure their employees are following the processing facility’s standard operating procedures and providing a safe environment.

There are various methods that can be used to monitor whether the environment has been sufficiently cleaned and/or disinfected to meet the standards that facility has set.
One method is for the laundry supervisor to convert the specific steps required to clean all aspects of a facility into a checklist. The list can serve as a guide for the supervisor to periodically visually assess whether employees are keeping the environment adequately cleaned.

Another option is for a supervisor to observe employees as they’re actually performing the work to see if they’re appropriately following the standard operating procedures for cleaning and disinfecting.

**ATP Testing**

While ATP testing is an additional form of measuring the effectiveness of cleaning, some may question the validity of this practice. The ATP test is a process of rapidly measuring actively growing microorganisms through detection of adenosine triphosphate, or ATP. There are around five companies in the United States that manufacture ATP testing devices. While the technology provides different ranges of numbers as to what is considered a pass or fail, there is currently no set national standard for ATP testing.

“In my experience, the facilities that decide they’re going to use ATP may follow what the manufacturer of their device recommends, and in some cases, they raise the bar,” said Bjerke. “So they set their own benchmark of what the ATP must read for their workers to pass.”

The advantage of ATP testing over traditional culture tests are that the results have a rapid turnaround time — it can take as little as five minutes from when a sample is obtained and processed to when a result is obtained.

The results of ATP tests are also complex (rather than the small fraction that will grow on culture media), and the methods are generally field- and user-friendly. However, none of these advantages will provide any value unless the results produced are reliable and accurate. Investing in the most up-to-date ATP technology will help ensure the best results.

To obtain an accurate ATP reading, there must also be good sampling and incorporation of that sample into the test; it is critical that ATP from all cells in a sample is recovered.

If a processing facility decides it’s going to use ATP testing as its standard of measuring the effectiveness of cleaning, it should go through a couple months of pilot testing to determine an adequate frequency for that evaluation.

If the facility supervisor finds that after the first month or so, all the employees are passing the test based on a chosen frequency such as twice a week, then it’s obvious they are well-trained and doing an adequate job. “That may reduce the beta testing of two months down to one, and they may decide, ‘Okay, this is what our standard is going to be,’” said Bjerke.

Supervisors may reduce the frequency of ATP testing per week if their employees are consistently maintaining high scores. “(Frequency of ATP testing) is dependent on how well your workers are trained,” said Bjerke. “If you have a lot of turnover in your environmental services people, then you may not always have high scores.”

The one method for measuring the effectiveness of cleaning Bjerke does not recommend is the aforementioned culture tests. “If you’re using culturing, there is no national standard of the number of colony-forming units that should remain and still be safe on a surface,” she explained.

**Using the Right Products**

There are multiple products that would classify as hospital-grade disinfectants, meaning they are on the list of the United States Environmental Protection Agency’s Registered Tuberculocide Products (a complete list can be found [here](#)).

Tuberculocidal products will kill the most common infectious organisms, like hepatitis, Human immunodeficiency virus (HIV), and other bloodborne pathogens. Methicillin-resistant Staphylococcus aureus (MRSA), a contagious staph bacteria can be killed by basic home cleaning products such as Lysol.

In order to clean a surface as well as remove any pathogens, a two-step process must be followed. “You cannot disinfect without cleaning first,” said Sands. “In order for a disinfectant to work, it can’t get to the surface you’re trying to disinfect to kill the organisms if there’s a layer of debris in the way.”

The first part of the process is to use a basic cleaning agent to remove everything on the surface—dust, dirt, and even blood and body fluids.

Lynne M. Sehulster, PhD, M (ASCP) with the Division of Healthcare Quality in the Center for Disease Control and Prevention reiterates Sands’ points in the CDC’s Guidelines for Environmental Infection Control in Healthcare Facilities, of which she is the primary author.
In the publication, it is stressed that cleaning is the first essential step in removing the majority of soil and bio-burden from a surface. “If the surface needs to be disinfected, the cleaning step will help that disinfectant be more effective by getting rid of the protein material that tends to use up the disinfectant’s active ingredient,” notes Sehulster. After the surface is fully cleared of debris, the disinfectant can be applied.

The CDC publication notes how low-level disinfection is sufficient to disinfect pre-cleaned surfaces, while intermediate-level disinfection should be used to decontaminate surfaces with blood or body substance contamination and disinfect these surfaces after cleaning.

**Bleach**

Bleach is a very harsh chemical and is not recommend to be used routinely on all surfaces unless there is an infectious organism that requires bleach to kill it.

“The reality is that some facilities are using a bleach solution on all surfaces and what they’re finding is that it’s going to corrode and shorten the life cycle of your particular surface is going to decrease because bleach is a very toxic agent,” said Bjerke.

If needed and used at the right dilution, however, there are some EPA products that are chlorine-based and are designated to kill organisms, even the highly infectious spore clostridium difficile (C-diff) on surfaces.

“It all goes back to the kind of patient that facility dealing with,” said Bjerke. “If the facility (is processing laundry) for an endemically high rate of patients that are infected with C-diff, then they may decide that chlorine on all surfaces is the practice they follow recommended because of their particular patient population. “But if there’s only one or two (C-diff cases), they it makes no sense that you would use it on all surfaces there.”

**Reading and Understanding EPA Labels**

When examining labels on cleaning products, one should always check to see if there’s an EPA registered number on the label in order to validate whether it’s actually an EPA-registered product.

Next, one should determine what category that disinfectant is in, and then read the instructions to be sure the way they’re using it in that facility is what is recommended by the manufacturer. “If they’re following those directions consistently, then they should have no adverse results that should come from using that particular product,” said Bjerke.

According to the CDC publication Guidelines for Disinfection and Sterilization in Healthcare Facilities, reading product labels carefully is especially important due to the fact “incorrect concentrations and inappropriate disinfectants can result in excessive costs.”

The publication also states that because occupational diseases among cleaning personnel have been associated with use of several disinfectants, precautions such as gloves and proper ventilation should be used to minimize exposure.

“Asthma and reactive airway disease can occur in sensitized persons exposed to any airborne chemical, including germicides. Clinically important asthma can occur at levels below the ceiling levels regulated by OSHA or recommended by NIOSH. The preferred method of control is elimination of the chemical (through engineering controls or substitution) or relocation of the worker.”

**Using the Correct Contact Time**

Each disinfectant has a specific “contact time” stated on the label, which means the product must be wet on that surface for that specific amount of time. According the EPA, what’s written on the label is required by the law and users of that product must comply with it.

“If the product says the contact time is one minute, you must have sufficient amounts of the disinfectant on the surface to remain wet for one minute,” Sands explained.

“The use conditions are designed to give you the best performance of the products,” added Sehulster. “For example, applying a disinfectant to a surface and wiping it right away is not disinfecting. In order to get the best performance, you need to let the disinfectant remain wet on the surface for the duration of the contact time as stated on the label.”

That being said, some independent studies have been conducted that prove a one-minute dwell is sufficient time for all products—even those that recommend a five- or 10-minute dwell time.

“However if someone from EPA or the federal government discovers you’re not complying with (what EPA requires), they can cite you and you can be fined,” said Bjerke. “In reality, in a practical clinical environment, the surfaces are cleaned first before they’re actually disinfected. So as a result, it seems there should be a shorter contact time (for the disinfectant product) because you do a two-step method. But that is not what EPA
Effect of Disinfectants on Various Surfaces

Part of reading and understanding disinfectant labels is making sure those products are compatible with the surface material. If not, the effects could be damaging.

“Some disinfectants are going to eventually corrode metal surfaces, and dry out and crack the rubber and vinyl surfaces,” said Bjerke.

Laundry management should thoroughly research products and how they should be used to safely clean various surfaces and pieces of equipment, while still getting the full life cycle out of them. If not, they may be liable for the fact that particular surface didn’t hold up as expected.

Debunking Myths

In the laundry practice, there are several myths, statements, and inadequate misconceptions that have resulted from people lacking the full knowledge of a cleaning product.

“The big thing is that we think we’re disinfecting when we’re actually just cleaning,” said Sands. “A lot of people don’t understand the contact time is different depending on the product. For some products, the contact time is 10 minutes. To saturate a surface long enough to last for 10 minutes, it’s more than using a little sanitation wipe. There’s no way to clean a whole surface with something like that, because you’re not going to get enough product on the surface for the correct contact time.”

Another misconception people may have is that disinfectants must be wiped up following the correct contact time.

“When you’re disinfecting, you’re spraying and you can just let it air dry,” said Sands. “You don’t really need to wipe up the disinfectant, because you’ve already cleaned the surface and removed any debris.”

Learning from Mistakes

Sehulster was involved in studying and determining the cause of the Zygomycosis outbreak in 2009, which tied contaminated linen to pediatric deaths. The results from her study have helped shape the way safety practices within the laundry have been changed and improved in recent years.

The Zygomycosis outbreak occurred in New Orleans during the summertime in hot and humid conditions, which are ideal for fungal growth.

“Five patients, all of whom were severely immunocompromised due to either illness or purposeful therapy (such as wiping out one’s immune system in advance of receiving a bone marrow transplant) were very susceptible to the Rhizopus spores that contaminated the clean textiles,” Sehulster explained. “The outbreak reminded us of the importance of taking all possible steps to keep the final laundry product clean.”

Both the client hospital and the laundry contractor played a role in this particular situation. Rhizopus spores were detected on the textiles, in the laundry storage area of the hospital, on the clean laundry carts at the laundry, and on the hospital loading dock.

“The outbreak demonstrated that the transition period (from the time the clean textile bundles are created until the time the textiles are used) can be the most vulnerable to inadvertent environmental contamination,” said Sehulster.

Following are five things Sehulster outlined for laundry professionals to consider for preventing this type of outbreak from happening again:

1. Ventilation in the laundry facility: The clean side should be under positive air pressure to minimize particulate contamination of the clean textiles. Ideally, the facility should be designed to minimize the need for outdoor air to come into the plant for climate control. We are aware that many plants cannot do this, but it’s something to consider in the future.

2. Ensure that the textiles are thoroughly dry before bundling, especially if the textiles are wrapped in plastic. Any residual moisture in the textile bundle can condense on the underside of the wrapping with temperature changes. Moisture is essential for microbial growth and proliferation.

3. Ensure that bundles in delivery carts are protected from inadvertent environmental contamination.

4. In the hospital, ensure that the storage area for clean, bundled textiles is kept clean. Ideally this area would benefit from positive air pressure, but at the very least keep the area closed, with limited traffic. This is especially important if the textile storage area is close to the loading dock for the hospital. The goal is to prevent particulate (dust particle) contamination of the clean textiles.

5. If bundles have condensation on the underside of the wrapping, it may be prudent to have these re-laundered. Textiles should be dry to the touch before they are sent to the patient care areas and used.

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