




The Dirt On Microfiber:

Going back to school for surface hygiene

CASE STUDY

A woman with blonde hair, wearing glasses, a blue long-sleeved uniform, and blue gloves, is cleaning a wooden desk in a classroom. She is holding a white spray bottle and a white cloth. The classroom has several rows of desks and chairs, and a chalkboard is visible in the background.

Reusable microfiber cloths are a popular choice for cleaning due to their low lint, high absorbency and light weight. They are made from synthetic materials, typically a polyester-nylon blend, and as such, require special laundering to maintain the lifespan of the product as well as ensure that the product remains hygienic.¹ Microfiber can be a great aid to cleaning, but when sanitizing or disinfecting, there are several reasons why microfiber cloths may not be the best choice.

Laundering Introduces Numerous Opportunities for Error

When it comes to re-usable towels or cloths, it is critical that the correct laundering process be followed to ensure all microbes are removed. If any germs are left alive, the towels can become a source of cross-contamination. A common way to ensure laundering efficacy is to use an elevated water pH that can help dislodge dirt and grease from the surfaces of materials. Bleach, which also has antimicrobial effects, is a common way to elevate water pH. However, **microfiber typically needs to be washed at a pH less than 11 to reduce the damage.**^{2,3} Additionally, high heat washing can be hard to achieve by most in-house laundry options and may also compromise the material properties of microfiber.^{3,4}

An additional opportunity for error is the need to isolate microfiber from any linen or cotton products due to the attraction of cotton fibers to the microfiber cloth. Microfiber must therefore be handled separately from other types of laundry.³ **Laundered loads must also be run at only 80% of capacity.** If packed too fully or too lightly, agitation may be reduced leading to inefficient removal of dirt and grease and inefficient treatment of materials if cleaning products like bleach are used.^{4,5} Lastly, special attention should be given to the carts that transport microfiber cloths. They should be disinfected before those carts are used to transport clean laundry.⁶



The CDC recommends that hospital laundry be washed with **bleach at 160°F**.

The Limitations of Microfiber as a Cleaning Tool

It is also important to recognize the strengths and limitations of microfiber as a cleaning tool. When cleaning with the goal of reducing microbes on a surface, it is important to not only remove the microbes, but also sanitize or disinfect the surface. Microfiber itself helps to remove microbes from surfaces, but does not claim to kill them.⁷ Thus, microfiber products cannot sanitize or disinfect surfaces on their own without germicidal chemicals. However, some microfiber materials can reduce the concentration of key germicidal compounds such as quaternary ammonium compounds.

Studies have reported that the concentration of quaternary ammonium compounds can be lowered by as much as 74%,^{8,9,10} even dropping 21% in as little as 5 minutes.⁸ As mentioned previously, high pH chemicals such as bleach are also incompatible with microfiber.^{2,3}



Laundering microfiber may not result in the removal of **microbes** or an acceptable level of cleanliness.

The Environmental Hazards of Microfiber

There are growing concerns regarding microplastics, particularly in our lakes, rivers and oceans. Unfortunately, the domestic and commercial laundering of synthetic textiles has been reported as the main source (up to 90%) of microplastic found in the ocean.¹¹ Wash cycles may lead to the release of microfibers into water systems, while tumble drying microfiber can contribute to microplastic pollution of the air.¹¹

Putting Hygiene to the Test:

How clean is laundered microfiber?



Recently, a school district in the southwestern United States using microfiber to clean their schools asked Kimberly-Clark Professional if any evidence could be provided that microbial bioburden remains after microfiber is laundered.

To answer this question, multiple studies were conducted by a third-party laboratory (Accelerated Analytical Laboratories, Milwaukee, WI) that provided the following summaries of each test:

Study One

First, the lab sought to establish a validated methodology for retrieving microorganisms from the customer's new, unused microfiber so that any subsequent testing on the customer's real-world samples could follow an established methodology.

RESULTS

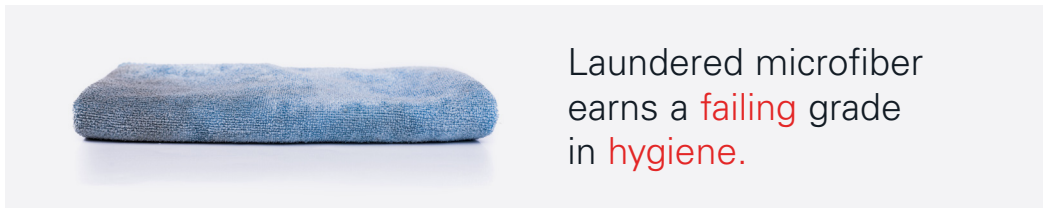
- Initial attempts to validate the study method were complicated by the new/unused microfiber sent directly from the customer having an extremely high bioburden level out of the package. Plate results were "TNTC," or "too numerous to count" for both bacteria and mold.
- The lab sterilized the samples before treating them with known amounts of bacteria and mold for extraction studies.
- The validated method for microbe extraction could be used in subsequent studies with the same microfiber cloth.

Study Two

Once the methodology was validated, a second study was used to test both unlaundered and laundered microfiber cloths.

RESULTS

- The lab created “composite” samples to be tested in triplicate to provide insight into the average bioburden loads for the samples sent by the customer.
- Testing of used, unlaundered samples resulted in “too numerous to count” bioburden levels on both bacteria and mold plates.
- Testing of used, laundered samples also resulted in “too numerous to count” bioburden levels on both bacteria and mold plates.
- Microbial identification of the most predominant morphology on bacteria plates for laundered samples found *Acinetobacter baumannii* on two of the composite samples and *Acinetobacter pittii* on the third. *Bacillus cereus* was also found on one of the laundered samples.



Study Three

A final test was conducted to determine the bioburden of two Kimberly-Clark Professional disposable solutions, WypAll® WetTask™ and WypAll® Multi-Task Cleaning Cloths | X60, as a point of comparison to laundered microfiber.

RESULTS

- The lab created “composite” samples to be tested in triplicate to provide insight into the average bioburden loads for the WypAll® X60 and WypAll® WetTask™ samples. These samples were purchased from a common online distributor and shipped directly to the lab with no handling by Kimberly-Clark Professional during the purchasing or shipping process.
- **WypAll® X60 (34790)** products had an average total aerobic microbial count of 5.22 CFU/g.*
- **WypAll® WetTask™ (06411)** had an average total aerobic microbial count of 1.86 CFU/g.*

* While manufacturers will have specific bioburden levels set by their own internal regulations or guidance, a typical bioburden limit for a medical device is less than or equal to 150 CFU/g.¹²

Conclusion:

Single-use wipes move to the head of the class for hygiene



These studies confirm that the customer's current laundering practices carry significant risks when it comes to potential cross-contamination. The purpose of disinfection is to minimize the spread of germs and microfiber cloths are sub-optimal for this objective.

Test results for the following resulted in "too numerous to count" for bacteria and mold:

- New, unused microfiber cloths
- Used, **unlaundered** microfiber cloths
- Used, **laundered** microfiber cloths

The presence of pathogens implicated in hospital-acquired infections within a school system is particularly troubling. *Bacillus cereus* has been implicated in gastrointestinal and respiratory illnesses and *Acinetobacter* species can cause infections in the blood, urinary tract, lungs (pneumonia) and other parts of the body. If an offsite laundering facility is being utilized, this may indicate a crossover of microbes from healthcare users.

Disadvantages of Microfiber cloths:

- Creates a cross-contamination risk between surfaces and areas.
 - Hidden costs include laundering expense, replacement costs, time and labor.
 - Does not work well for disinfection with chemicals or sanitization.
-



Using disposable wipes such as WypAll® X60 and WypAll® WetTask™ lets cleaners pick up a clean wipe every time. This does not require perfect laundering protocols and, with a system such as WypAll® WetTask™, the user can identify which wiping material works best to ensure disinfection efficacy.

Advantages of disposable wipes:

- Clean, hygienic and effective
- Designed specifically for the task at hand
- Come in a variety of formats to best fit your environment

References

1. <https://www.cleanlink.com/hs/article/Differences-Between-Microfiber-And-Cotton-20239>
2. <https://www.cdc.gov/hai/prevent/resource-limited/supplies-equipment.html>
3. <https://www.cmmonline.com/articles/whats-your-microfiber-program>
4. <https://www.cleanlink.com/hs/article/Tips-To-Laundering-Microfiber-18209>
5. <https://www.cleanlink.com/hs/article/Tips-To-Laundering-Microfiber-18209#:~:text=Manufacturers%20say%20it%20is%20important,not%20exceed%20180%20degrees%20Fahrenheit.>
6. <https://www.cleanlink.com/hs/article/How-To-Properly-Dry-Microfiber-18210#:~:text=After%20the%20wash%20cycle%20is,higher%20can%20harm%20the%20product>
7. https://www.epa.gov/sites/production/files/2013-08/documents/fact_sheet_whats_so_great_about_microfiber.pdf
8. Sullivan L, Boyce JM, Brown A, Baker J, "Quaternary ammonium compounds (QAC) issues encountered in an environmental services department," Antimicrobial Resistance & Infection Control, 2015; 4 (Suppl 1): p42 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4474684/>
9. Gerba CP, "Quaternary Ammonium Biocides: Efficacy in Application," Applied and Environmental Microbiology, 2015; 81(2): 464-469 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4277564/>
10. Grieme LE, Thompson KM, Carbone HL, "Evaluation of Quat Absorption and Efficacy of Cleaning Cloths," American Journal of Infection Control, 2009; 37(5): E23-24. <https://doi.org/10.1016/j.ajic.2009.04.024> <https://www.ecolab.com/expertise-and-innovation/resources/healthcare-clinical-literature-resources/~media/7647482741dc4d09b6a85c9f2c0d424d.ashx>
11. Gaylarde C, Baptista-Neto J, Monteiro da Fonseca E, "Plastic microfibre pollution: how important is clothes' laundering?" Heliyon, 2021; 7(5): e07105 <https://doi.org/10.1016/j.heliyon.2021.e07105>
12. What is bioburden and how can it be controlled? Meridian Medical <https://www.meridian-medical.com/what-is-bioburden-and-how-can-it-be-controlled/>