

# Monitoring the Effectiveness of Cleaning and Disinfecting Practices



*A 2007 norovirus outbreak at an elementary school was linked to computer keyboards that had not been cleaned.*

## Public Health Reasons

Thorough cleaning of all surfaces is important to reduce the spread of microbial pathogens in child-care centers. Even though a surface appears to be clean, it can still be contaminated. Even cleaning materials, such as mops and soapy water can be a source of pathogens, particularly if they are dirty. Facilities and regulators must ensure that cleaning and disinfection or sanitization is done properly and that the proper method is used on the surfaces.

Microbial evaluations of surfaces are useful in monitoring the effectiveness of cleaning and disinfecting practices. While most child-care providers would not use these methods, they are very useful for regulators to perform in the event of repeated violations or after a documented outbreak. As well, visual inspections usually over-estimate the cleanliness of surfaces, so it is important to include some type of monitoring tool in cleaning procedures.

A microbial plate count is a monitoring method that quantifies the amount of microbes present on a surface. The surface is swabbed and then the swab is rubbed on a nutrient medium that encourages the growth of microorganisms. Following this process, the colonies are counted. An adenosine triphosphate (ATP) bioluminescence assay is another monitoring method that measures the amount of ATP (a source of energy for all living things) present on a surface. After the surface is swabbed, the ATP is released from the cells, and a reagent is added to the ATP. This causes a reaction that produces light, which is measured. A study conducted in Texas analyzed samples taken from food-contact surfaces in child-care centers using microbial plate counts to determine the effectiveness of cleaning and disinfecting procedures. Sixty-eight of the surfaces were positive for bacterial contamination, with 88% of those from the Enterobacteriaceae family, which includes a number of pathogenic bacteria. Most of the bacteria isolated were considered opportunistic pathogens that affect compromised immune systems. Two non-opportunistic pathogens were found that can infect healthy individuals (*Klebsiella pneumonia* and *Salmonella Paratyphi A*).

# Practices

## Microbial Plate Counts

### Swabbing surfaces

- Use sterile cotton hygiene swabs pre-moistened in a buffer solution.
- Swab a 10cm X 10cm area on flat surfaces or the entire area on irregular surfaces, using a separate swab for each surface.
- Rotate the swab constantly.
- Swab each surface in multiple directions (up, down, left, right, and diagonally).

### Inoculating plates

- Use a nutrient medium (tryptic soy agar or plate count agar).
- Label each plate on the bottom with the surface swabbed and the date.
- After sampling, use the same swab to streak the nutrient medium in a zigzag pattern.
- Place plate in an incubator at 37°C (98.5°F) for 24 hours to grow the microorganisms.
- Count the number of colonies on the plate.
- Judge whether a surface is “clean” or not by comparing the number of colonies to a set benchmark (usually <math><2.5</math> colony forming units/cm<sup>2</sup> for *Escherichia Coli*).

## ATP Bioluminescence Assay

### Preparation of luminometer

- Measure a “blank” using just the reagent and sample buffer to determine the amount of background relative light units (RLU) that needs to be subtracted from the sample RLU.

### Swabbing surfaces

- Swab a 10cm X 10cm area on flat surfaces or the entire area on irregular surfaces, using a separate swab for each surface.
- Place the swab back in the swab tube.
- Mix luciferase reagent with the swab tip in order to release the ATP from the cells.
- Insert swab into luminometer and take a sample reading.
- Subtract the “blank” from the sample reading to calculate the ATP concentration found on the sampled surface.
- Compare the ATP concentration to a set benchmark (usually <math><500</math> RLU) to determine whether the surface is “clean” or not.

# References

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