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ISSA CLEAN STANDARD
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Measuring the Cleanliness of K-12 Schools

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Acknowledgments

The **ISSA Standard for Measuring the Effectiveness of Cleaning in K-12 Schools** was developed through a consensus-based effort involving industry experts, trade and professional associations, educational institutions, and other organizations.** In accordance with a true consensus-based process, all views and objections have been considered, every attempt has been made to resolve those objections that have been raised, and, ultimately, the elements contained herein have been agreed to by a substantial majority of interested parties who elected to participate in the process.

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Executive Committee

- William C. Balek: ISSA
- John P. Garfinkel: ISSA
- Jim Harris Sr.: CIRI
- Jon Scoles: Scoles Floorshine Industries/ ISSA Board of Directors
- Charlie Smith: CIRI
- Dr. Steven Spivak: CIRI

Science Advisory Panel

Co-Principal Investigators

- Gene C. Cole, Dr.PH: Brigham Young University Department of Health Science
- Richard J. Shaughnessy, Ph.D: University of Tulsa – Indoor Air Research Program

Research Team Members

- Alesia Bailey: University of Tulsa – Indoor Air Research Program
- Dr. Ulla Haverinen-Shaughnessy: National Institute for Health and Welfare – Finland
- Keith E. Leese: LRC Indoor Testing and Research, Inc.
- Demetrios J. Moschandreas, Ph.D: Illinois Institute of Technology

- Cathy Richmond: LRC Indoor Testing and Research, Inc.
- Randy Smith: University of Tulsa – Indoor Air Research Program

Development and Stakeholder Committees

Please visit www.issa.com/cleanstandard for the full list of industry experts who participated on the Development and Stakeholder Committees.

**Organizations that participated in the development of the Standard include:

- American Federation of Teachers
- Healthy Facilities Institute (HFI)
- Healthy Schools Campaign (HSC)
- Indiana State Teachers Association
- International Executive Housekeepers Association (IEHA)
- Trade Press Media Group, Inc. (Housekeeping Solutions)
- Minnesota Department of Health
- National Association of State Boards of Education (NASBE)
- National School Plant Management Association

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1. Overview and Background

The goal of the Standard for Measuring the Effectiveness of Cleaning in K-12 Schools (hereinafter referred to as the Clean Standard: K-12) is to provide schools with a tool that will help them measure and monitor the effectiveness of the cleaning processes at their facilities thereby contributing to the quality of the indoor environment for the benefit of students and staff.

The Clean Standard: K-12 is a performance-oriented standard that is focused on:

- The desired levels of cleanliness that can be reasonably achieved;
- Recommended monitoring and inspection procedures designed to measure the effectiveness of cleaning procedures using quantitative measures (i.e., ATP Meters) and traditional methods (i.e., sight, smell, touch); and
- How to use the results of monitoring and inspection to evaluate and improve the cleaning processes and products that are critical to maintaining a safe and healthy learning environment for students and staff.

The Standard is focused on achieving and maintaining an effective cleaning program through the use of a systematic approach and standardized guidelines. As such, the Clean Standard: K-12 provides schools with a framework and protocol for using ATP meters along with qualitative methods to measure and assess cleaning effectiveness on a periodic and consistent basis.

Perhaps more importantly, the Standard provides a structured approach to addressing those situations where the school facility's condition and cleanliness is less than desirable. By assessing cleaning effectiveness, schools can improve the cleaning process and ensure that a desired level of cleanliness is achieved and maintained at school facilities. Effective cleaning is especially important in light of the growing body of evidence that concludes that improved hygiene in schools results in reduced illnesses and reduced absenteeism.

The Standard was developed through a consensus based process designed to garner the input of all major stakeholders in an open and transparent manner. The Clean Standard: K-12 development process allowed for stakeholder involvement by participation on the Development or Stakeholder Committees and by submitting feedback during the public review periods.

The development process was guided by independent and unbiased scientific research, including thousands of ATP measurements from high touch surfaces recognized as posing health risks in schools (i.e.: student desks, cafeteria tables, restroom sinks and stall doors). The ATP measurements were conducted in numerous schools across the United States to account for potential geographic or climatic variations.

The details of the research are set forth in "ATP as a Marker for Surface Contamination of Biological Origin in Schools and as a Potential Approach to the Measurement of Cleaning Effectiveness," as published in the June 2013 issue of *Journal of Occupational and Environmental Hygiene* by Shaughnessy and Cole, et.al. Each school selected its own cleaning method which was then rigorously monitored for compliance by research personnel. Following cleaning, sampling procedures were conducted on the cleaned surface.

The research indicated that standardized measurement of cleaning effectiveness could be used as a practical approach to improve the cleaning practices and contribute to a healthier school environment.[1]

Specifically, the research has validated ATP (adenosine triphosphate) measurement systems as a "…relatively simple, rapid and affordable measure of the level of biologically sourced contamination on the interior surfaces of schools." Further the research concluded that ATP is an "…excellent candidate marker for the monitoring of biologically derived soiling/cleanliness…"

In addition, the research has produced reasonable range values based on ATP measurements (for three different ATP meters) for each surface type tested, and that these ranges "…may be used in a standardized and routine approach to the monitoring of cleaning effectiveness in school buildings based on detection and quantification of biologically derived soiling."[2]

While ATP does not directly measure the total contamination on a surface, the research has concluded ATP luminescence is presently the best available quantitative measure of hard surface cleaning effectiveness. It is hoped that further research and development will yield additional measurement methods for other contaminants.

2. Scope and Purpose

The Clean Standard: K-12 is intended to apply specifically to K-12 school facilities, including both public and private institutions, and may be applied in all geographic regions.

The Clean Standard: K-12 is based on the following: (a) a building audit to assess the level of cleanliness at a school facility; (b) periodic measurement of cleaning effectiveness using ATP meters; and (c) establishment and implementation of corrective actions in the event the school is not achieving the desired level of cleaning effectiveness.

These elements are intended to be used in a systematic process to determine the background condition and cleanliness of a school, and also provide for periodic measurement of cleaning effectiveness at the school facility. This process makes it possible to assess and improve the effectiveness of cleaning processes and

products used at a school facility. In this regard, the Clean Standard: K-12 empowers schools to select a cleaning process that is the most effective and economical.

This is especially important in light of the growing body of studies that indicate effective cleaning has a positive impact on the health and productivity of students. For example, it has been established that level of cleanliness is a key factor involved in the spread of viral disease in crowded indoor establishments including schools. In addition, improved cleaning of floors and desks in schools has been shown to reduce upper respiratory symptoms.[3] Furthermore, the exposure and health benefits associated with a reduction of airborne pollutants - achieved through effective cleaning practices - have been demonstrated in a long-term cleaning effectiveness study,[4] while recent studies collectively indicate that the targeted cleaning of high touch points in schools result in reduced illnesses related to bacterial contamination, reduced sick building syndrome symptoms, and reduced absenteeism due to infectious illness.[5-9]

Consistent with such studies and findings, the K-12 Clean Standard research suggests a reasonable connection between ATP reduction and healthier indoor environments. Concurrent with ATP testing, the researchers tested surfaces for culturable bacteria using a different method – RODAC plates. The simultaneous testing demonstrated that a reduction in ATP was accompanied by a consistent reduction in culturable bacteria. The researchers, therefore, were able to reasonably conclude that a reduction in ATP suggests both a cleaner and healthier surface.

While research has established that cleaning plays a critical role in the quality of the indoor environment, it is well-recognized that there are a number of additional factors that also impact indoor environmental quality. Building maintenance practices such as moisture control, ventilation and air flow, and other factors also play a key role.

3. Defining Current Cleaning Procedures

The implementation of a cleaning effectiveness improvement program involves defining current cleaning procedures and measuring their effectiveness, analyzing the results, considering potential improvements, and then implementing identified improvements. The improvement process is a continuous cycle that requires constant reevaluation. The Clean Standard: K-12 formalizes this process by inserting the requirement to measure the effectiveness of the cleaning process and to ensure an efficient and healthy outcome rather than just a lower initial cost.

Toward that end, the first step in the process is to document the current custodial program for the facility, including an inventory of all materials & equipment used; personnel; and the scope of work for cleaning services (including the specific tasks to be performed and the frequency of service). If outside services are employed as part

of the regular maintenance program (window washing, gym floor refinishing, service to HVAC equipment, etc.) such services should be included as part of the master schedule for the school.

4. Protocol for Measuring and Monitoring Cleaning Effectiveness

This section sets forth a protocol for measuring and monitoring cleaning performance in K-12 school facilities. A standardized protocol of this nature is critical in assessing the effectiveness of a school's cleaning program, geared toward providing a clean healthy indoor environment for the benefit of students, staff and visitors.

Information collected through this process is critical in improving cleaning effectiveness as well as ensuring that a desired level of cleanliness is maintained.

4.1. Written Plan. A school facility or school system shall develop and implement a comprehensive written plan describing the process to be used to measure and monitor the effectiveness of the cleaning processes used by the facility. The written plan shall include, at a minimum, the elements contained in this section.

4.2. Building Audit. A building audit shall be conducted to establish baseline conditions and otherwise assess the level of cleanliness of a school facility. This audit involves a walk through inspection of the school facility and seeks to simply answer the question: "Does the facility look and smell clean?"

Two sample building audit forms are provided in Appendix A: the first of which is a comprehensive format covering cleaning and maintenance activities; the other is a more concise format covering cleaning activities only. These sample building audit forms should be adapted to meet the particular needs of a facility.

The building audit should be conducted:

- Initially upon implementation of the Clean Standard: K-12 to establish baseline conditions;
- Two times per year (once per semester) to be scheduled at the convenience of staff and performed consistently each year. The building audit should be performed while school is in session; and
- Whenever there is a significant change in conditions or procedure (e.g., new cleaning program, significant construction activity, etc.)

A completed building audit provides a record of the conditions of specific locations within the school facility as well as an overall assessment of the facilities.

Audit records should be maintained for 3 years along with a summary of findings and suggested changes. This summary consolidates the findings of the audit into a concise dated document for implementation and follow-up.

4.3. High Touch Points. A school shall identify "high touch points" (HTPs) within the school facility. High touch points shall include, but not be limited to: (a) classroom desks and similar surfaces such as work tables and teacher desks; (b) cafeteria tables, (c) restroom stalls and stall doors, and (d) sink fixtures and sink surroundings, especially in restrooms.

Schools may wish to include other high touch points based on experience or unique circumstances, etc. such as floors, drinking fountains, door handles, doors, student chairs, and gym equipment such as mats.

4.4. Limits for Each High Touch Point Based on ATP-RLU. Once the high touch points have been identified, schools shall establish the desired level of "cleaning effectiveness" or "limits" for each HTP based on the ATP-RLU tables and values that are set forth in Section 5. It is recommended that schools establish the limits at the levels associated with "Effective Cleaning" for the appropriate surfaces or areas within the school as set forth in Section 5.

In the event that a school includes HTPs other than the four required in Section 4.3, the school should use the ATP-RLU tables that are associated with:

- The HTP that is most similar in surface type to the surface actually being tested with the ATP meter; or
- The area in which the surface being tested is located (i.e., the limits for Classroom Desks may be used to set limits for other surfaces in the classroom such as doors or door knobs).

4.5. ATP Testing Protocol for High Touch Points. Schools shall establish an ATP testing protocol based on facility needs. Such protocol should address at a minimum: when and at what frequency ATP testing will occur; as well as the appropriate procedures to be followed. The protocol described below is recommended as a starting point and should be modified to meet specific needs. For example, if ATP measurement suggests a school's cleaning process is "ineffective," the facility may wish to increase the frequency of testing as well as consider corrective actions.

a) Frequency. ATP testing should be conducted:

i. Upon implementation of the Clean Standard: K-12, before and after cleaning. (Note: Conducting ATP testing before cleaning is optional but recommended if a school wishes to establish a baseline so that they can measure improvement after cleaning. If ATP testing is conducted before cleaning, it should be conducted in conjunction with the building audit referenced in Section 4.2.);

ii. Twice a year after cleaning has been performed (i.e., once a semester). Such testing should be conducted during the school year. (Note: The frequency of ATP testing adopted by a school should depend on the school's

conditions, i.e., schools that are unkempt or dirty should test more frequently [i.e. once every two months] while schools that consistently meet their desired level of cleanliness may wish to conduct ATP testing twice a year); and

iii. After a change in cleaning methods, processes, products, or frequencies; or following the selection of a new cleaning service provider, etc.

b) Procedures. In conducting ATP testing, the following procedures should be followed:

i. Manufacturer's Instructions. Unless otherwise indicated below, follow the manufacturer's instructions regarding storage and how to conduct ATP testing for the particular ATP meter.

ii. Sampling. At least 5% of the high touch points referenced in Section 4.3 should be sampled. For example, if a school has 400 desks, at least 20 desks should be tested with the ATP meter. There should be at least ten (10) sample points for each test surface or area being evaluated. The average value of all samples for a high touch point should be calculated and used for determining whether the desired cleaning level has been met.

The selection of the actual high touch points that will be tested should be done randomly and in a manner that ensures the selected areas are located throughout the facility. For example, test 5% of the desks in each of the classrooms.

iii. Sampling Template. Create a template to control the area to be tested with the ATP swabs. The template can be made from cardboard or poster board by cutting out a square 2 inches by 2 inches (5 cm by 5 cm) in dimension, and placing the cardboard/ poster board from which the square has been cut over the surface to be swabbed (the template will resemble a picture frame with the surface to be tested in the middle). Make sure the remaining cardboard/ poster board is used and not the square that has been cut out. The template must be free of contamination that might affect the results.

ATP manufacturer instructions may recommend other template sizes for use with their systems, intended to apply to large surfaces in other facilities (i.e.: food processing). A 2x2 inch (5x5 cm) template is recommended for the variety of surfaces in schools.

For small, irregular surfaces where the standard 2x2 inch (5x5 cm) template does not fit (e.g., door knobs, light switches, faucets), establish an area on the surface as close to 4 sq. in. (25 sq. cm.) as possible and use that area consistently for all other similar size sample points.

iv. Sampling Process. The surface shall be tested using the ATP swabs that are intended to be used with the particular ATP meter that has been chosen. To perform the testing, the ATP swabs should be rubbed over the surface that is inside the template, first left to right, then top to bottom.

v. Recordkeeping. Comprehensive and accurate records and reports of all testing results shall be kept. All records and reports shall be maintained for three years, along with a summary of findings and suggested changes. Recordkeeping shall be consistent with the school's written plan for the maintenance of test results and building audit reports, as required in section 4.8.

4.6. ATP Measurement Evaluation. After ATP testing has been completed, the school shall conduct an evaluation of the effectiveness of its cleaning processes by comparing actual ATP measurements with the ATP-RLU range values listed in Section 5 for the specific surface tested.

In the event that a school's cleaning effectiveness is consistently measured as "Ineffective Cleaning" or falls within the "Needs Improvement" category, the school shall implement the appropriate corrective actions. Alternatively, if the school's cleaning effectiveness is consistently measured as "Effective Cleaning," no corrective action is needed. Surfaces that fall within "Ineffective Cleaning" should be re-cleaned and re-tested.

4.7. Establishment and Implementation of Corrective Actions. If the actual ATP values consistently fall within the "Ineffective Cleaning" or "Needs Improvement" categories, a school shall consider corrective action. The first step in determining appropriate corrective action shall be to identify the cause of the undesired result, which shall at a minimum include a reevaluation of the cleaning processes, frequencies, products and tools. Common causes include: inadequate cleaning frequencies, incomplete cleaning (i.e., not cleaning the entire surface), skipped cleaning, lack of training, and inappropriate products or processes.

Following determination of cause, corrective action shall be taken. The specific corrective action should be based upon a candid dialogue between the cleaning or inspection expert conducting the Clean Standard: K-12 evaluation, and the school's supervisory personnel, school system facilities manager and/or building engineer. In general corrective action may include:

- Modification of cleaning process, products and/or tools and ensuring compliance with cleaning best practices as outlined in ISSA's "Principles of Cleaning," "Facility Cleaning and Disinfecting Checklist," and "Classroom Cleaning Area Guide";
- Ensured adherence to custodial management best practices as defined in the ISSA Cleaning Industry Management Standard (CIMS);
- Comprehensive employee training;
- Change in cleaning times and/or frequencies; or

- Implementation of a hand hygiene program consistent with the guidelines and recommendations of the Centers for Disease Control (CDC) on handwashing.

4.8. Recordkeeping Procedures. A school shall have a written plan for recordkeeping and the maintenance of all documents, test results and audit/survey reports. Records that should be covered by the plan include all documents relating to cleaning and testing protocols, procedures and evaluations.

4.9. Ongoing Analyses and Procedures to Ensure Maintenance and/or Continuous Improvement. A school shall have a written policy for ongoing analysis of all measurements and testing results. Such policy shall include a commitment to continuous improvement.

4.10. Technical Training Requirements. Individuals who will perform testing, measurements, monitoring and evaluation activities shall be trained to effectively perform such activities. The training should cover the technical skills needed to ensure proper testing procedures, consistent results, and to eliminate or reduce tester bias. At a minimum, the training shall address the information necessary to implement Section 4: Protocol for Measuring and Monitoring Levels of Cleaning Effectiveness.

5. Quantitative Measurement of Cleaning Effectiveness

5.1. Understanding the ATP-RLU Tables. The effectiveness of the cleaning processes and products used at a facility may be determined by comparing actual ATP measurements with the tables set forth in this section. The tables below set forth ATP-RLU limits or ranges for specific surface types and ATP metering systems. The limits, ranges, and verbal descriptions reflect the results that can be reasonably attained using cleaning methods readily available today.

The limits and ranges are, therefore, based on what can reasonably be expected to be achieved as demonstrated by the research on which the Standard is based. Specifically, for the Charm Sciences NOVALUM (section 5.3) and the 3M Uni-Lite NG (section 5.4) devices, "Effective Cleaning" represents the top 50% of the thousands of ATP measurements, "Needs Improvement" represents values that fall in the 50th to 75th percentile of all research results, and "Ineffective Cleaning" limits are those that fell in the bottom 25% of the results from the research.

In regard to the Hygiena SystemSure Plus device (section 5.5), "Effective Cleaning" is achieved when the ATP measurements are lower than the 75th percentile, and "Ineffective Cleaning" results when measurements exceed the 90th percentile, with "Needs Improvement" representing the range between the two. The Hygiena system was treated differently for these purposes because of: 1) observed variance associated with the use of this system during the original research (although it was still within acceptable ranges for reliability); and 2) field testing that revealed the ranges currently set forth in 5.5 were reasonable and achievable.

5.2. Using the ATP-RLU Tables. The tables below set forth ranges for each of the levels of "cleaning effectiveness" for specific surfaces within a school. These include classroom desks, restroom stall doors, cafeteria tables, and sink surrounds in restrooms. Separate ranges are provided for three ATP metering systems – Charm Sciences NOVALUM, 3M Uni-Lite NG and Hygiena SystemSure PLUS.

It is recommended that schools strive to provide "Effective Cleaning" for the appropriate surfaces or areas as set forth in the tables below, based on ATP measurements for the metering system being used.

i. ATP Metering System. It is imperative to use the table that matches the specific ATP Metering system that is being used to take the measurements. ***DO NOT*** use the ATP/RLU values for a different ATP system as their scales vary widely.

ii. Other Surfaces and Areas. The ATP-RLU limits specified in this Standard can be applied to non-porous high touch points and areas that are similar in surface type and/ or that are in the same area. For example:

- "Classroom Desk" values may be used for measurements taken of classroom tables, student seating, teacher's desks, and file cabinets. In addition, Classroom Desk values may be used for measuring cleanliness on surfaces such as gymnasium seating.
- "Sink Surrounding" values may be used for measurements taken of urinals, toilets, restroom door handles, hand rails, and gymnasium lockers and shower fixtures.
- "Cafeteria Table" values may be used for measurements taken of serving counters, cafeteria seating, and foodservice trays.
- "Restroom Stall Door" values may be used for measurements taken of other hard vertical surfaces in the facility.

iii. Porous Surfaces. ATP meter systems should not be used on porous, soft, or otherwise distinctly different surfaces or material types. Surfaces such as wrestling mats, carpeted floors/walls, and grout cannot be measured using ATP meters.

5.3. ATP-RLU Limits: Charm Sciences (NOVALUM)

School Surface	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Effective Cleaning	Needs Improvement	Ineffective Cleaning
Classroom Desks	5399 or below	5400 to 17300	17301 or above
Cafeteria Tables	11899 or below	11900 to 32000	32001 or above
Restroom Stall Doors	10799 or below	10800 to 23300	23301 or above
Sink Surroundings	5699 or below	5700 to 17600	17601 or above

5.4. ATP-RLU Limits: 3M (Uni-Lite NG)

School Surface	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Effective Cleaning	Needs Improvement	Ineffective Cleaning
Classroom Desks	109 or below	110 to 250	251 or above
Cafeteria Tables	229 or below	230 to 420	421or above
Restroom Stall Doors	99 or below	100 to 220	221 or above
Sink Surroundings	59 or below	60 to 150	151 or above

5.5. ATP-RLU Limits: Hygiena (SystemSure Plus)

School Surface	Post-Cleaning Effectiveness (ATP Luminescence Level, in RLU)		
	Effective Cleaning	Needs Improvement	Ineffective Cleaning
Classroom Desks	20 or below	21-35	36 or above
Cafeteria Tables	35 or below	36-70	71 or above
Restroom Stall Doors	15 or below	16 to 35	36 or above
Sink Surroundings	15 or below	16-25	26 or above

6. ATP Technology Limitations

While ATP meters have been validated as the preferred quantitative method of measuring biologically derived soiling/cleanliness, their use does have certain limitations that are discussed below. For example, in defining a cleaning process as effective, the Clean Standard: K-12 does not suggest that a surface is absolutely free of contamination or otherwise presents a completely "healthy" surface.

6.1. Non-Biological Soiling. ATP monitoring is not appropriate for the determination of the presence or reduction of specific non-biological pollutants that may be recognized as health hazards such as lead, asbestos, and other such chemical contaminants.

6.2. Infectious Agents. ATP meters are not capable of identifying specific pathogens or infectious agents, and cannot directly detect viruses.

6.3. Biologically Augmented Cleaning Products. The use of ATP meters is incompatible with the use of biologically augmented cleaning products (BACP). BACP is a cleaning product that is augmented with non-pathogenic bacteria. These products provide a residual level of cleaning that is both safe and effective. The use of an ATP meter on a surface cleaned with a BACP will yield a high ATP/RLU reading indicating the surface is "dirty" when in fact it may be clean.

7. Alternative Methodologies.

While the Clean Standard: K-12 is based on the use of ATP measurement, there are a number of alternative methods that are capable of objectively validating the effectiveness of a school's cleaning processes. These methods include direct practice observation, the use of fluorescent markers and others. Such methods may be used in addition to or in lieu of ATP measurement, and are referenced in *Options for Evaluating Environmental Cleaning, Centers for Disease Control (CDC)*, 2010, Appendix B, Objective Methods for Evaluating Environmental Hygiene. However, the use of these methods alone will not be construed as meeting the requirements of the Clean Standard: K-12.

References and Related Documents

Richard J. Shaughnessy, Eugene C. Cole, Demetrios Moschandreas, and Ulla Haverinen-Shaughnessy, (2013); "ATP as a Marker for Surface Contamination of Biological Origin in Schools and as a Potential Approach to the Measurement of Cleaning Effectiveness"; Journal of Occupational and Environmental Hygiene, 10:6, 336-346, June 2013.

Carmen V. Sciortino, PhD, R. Allen Giles, BS, "Validation and Comparison of Three Adenosine Triphosphate Luminometers for Monitoring Hospital Surface Sanitization: A Rosetta Stone for Adenosine Triphosphate Testing," American Journal of Infection Control, Volume 40, Issue 8, October 2012.

[1] **Richard J. Shaughnessy, Eugene C. Cole, Demetrios Moschandreas, and Ulla Haverinen-Shaughnessy, (2013):** "ATP as a Marker for Surface Contamination of Biological Origin in Schools and as a Potential Approach to the Measurement of Cleaning Effectiveness." *Journal of Occupational and Environmental Hygiene 10*:6, 336-346 (2013).

[2] *Id.*

[3] **Walinder, R., D. Norback, G. Wieslander, G. Smedje, C. Erwall and P. Venge:** Nasal patency and lavage biomarkers tin relation to settled dust and cleaning routines in schools. *Scand. J. Work Environ. Health (25)(2)*:137-43 (1999).

[4] **Franke, D.L., E.C. Cole, K.E. Leese, K.K. Foarde, and M.A. Berry:** Cleaning for improved indoor air quality: An initial assessment of effectiveness. *Indoor Air 7*:41–54 (1997).

[5] **Higashiyama, M., T. Ito, X. Han, et al.:** Trial to control an outbreak of Panton-Valentine leukocidin-positive methicillin-resistant *Staphylococcus aureus* at a boarding school in Japan. *Am. J. Infect Control 39*:868-865 (2011).

[6] **Hostetler, K., M. Lux, K. Shelley, J. Drummond, and P. Laguna:** MRSA as a health concern in athletic facilities. *J. Environ. Health 74*:18-25 (2011).

[7] **Nandrup-Bus, I.:** Comparative studies of hand disinfection and hand-washing procedures as tested by pupils in intervention programs. *Am. J. Infect. Control 39*:450-455 (2010).

[8] **Zhang, X., Z. Zhao, T. Nordquist, L. Larsson, A. Sebastian, and D. Norback:** A longitudinal study of sick building syndrome among pupils in relation to microbial components in dust in schools in China. *Sci. Total Environ. 409*:5263-5259 (2011).

[9] **Schulte, J., L. Williams, A. Jawaid, et al.:** How we didn't clean up until we washed our hands: Shigellosis in an elementary and middle school in North Texas. *South. Med. J. 105*:1-4 (2012).