Bleach Exposure in Child Care Settings: Strategies for Elimination or Reduction

Report of the San Francisco Asthma Task Force

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Produced in collaboration with
Regional Asthma Management and Prevention (RAMP)

SAN FRANCISCO
Asthma Task Force
Asthma Education, Healthy Environments & Community Empowerment

Financial support provided by:

- The San Francisco Foundation
- Regional Asthma Management and Prevention
- Neil Gendel, Director of former Healthy Children Organizing Project
- The San Francisco Public Health Foundation

Project staffing and supervision provided by:

- San Francisco Department of Public Health Children's Environmental Health Promotion

Ongoing project collaboration and in-kind support provided by:

- Gateway to Quality
- San Francisco Department of Public Health Child Care Health Project
- San Francisco Department of the Environment Toxics Reduction Program and consultant Green Purchasing Institute
- Breathe California Golden Gate Public Health Partnership
- California Department of Public Health Occupational Health Branch, Occupational Health Surveillance and Evaluation Program's Work-Related Asthma Project
- California Childcare Health Program
- Regional Asthma Management and Prevention
- San Francisco Child Care Planning and Advisory Council

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I. Background

This report is for those who want to improve the working conditions of child care workers by reducing or eliminating bleach exposures and associated asthma risks. The goal of this project was to find substitutes for bleach that allow operators to maintain compliance with California Child Care Licensing[1] (CCL) disinfecting and sanitizing requirements.

Why is this important?

Asthma is exacerbated by bleach exposure, and there is evidence of new asthma cases following work exposure to bleach and to cleaning products. The San Francisco Asthma Task Force (SFATF) considers this effort to reduce or eliminate bleach exposures to child care workers a health equity issue. The majority of child care workers in this city are women of color with low earning potential and low educational attainment, as compared to the median wage and education of the city's adult working population.[2-4] Implementing the recommendations issued in this report will also reduce bleach exposure and the associated asthma impacts to young children in child care. Additionally, child care operators will improve the accuracy and consistency of their compliance with state-required infection control practices by adopting the report recommendations.

Who will this report benefit?

This project was conducted in San Francisco with the intention of impacting the city's 883 licensed child care facilities and 1179 license-exempt home providers in San Francisco. Based on 2005 estimates, there are approximately 3236 full time-equivalent jobs in licensed child care facilities.[5] But, the recommendations in the report have the potential to benefit child care providers and the children they care for throughout California and possibly nationwide.

How did the project come about?

All of the licensed facilities are subject to complying with California CCL disinfecting and sanitizing requirements specified for the age groups they serve. In order to comply with infection control regulations, bleach is widely used since the product works in a reasonable amount of time for child care purposes and is cost-effective. Many San Francisco child care providers expressed a desire to replace bleach as their main disinfectant and sanitizer due to their health and safety concerns about its properties as a corrosive and an irritant, its impact on workers and children with asthma, and its growing association with new asthma. They spoke as a community to their advocates—the San Francisco Department of Public Health's Child Care Health Project which provides early childhood health consultation and screening, and the Gateway to Quality Project whose goal is to improve the quality of early child care and education in San Francisco. To address child care providers' concerns, Gateway to Quality convened stakeholders in April 2008 to discuss how providers could change disinfecting and sanitizing practices to reduce health risks while maintaining compliance with state child care licensing regulations. Neil Gendel, an advocate knowledgeable of the association between bleach and work-related asthma (WRA), asked the San Francisco Asthma Task Force to lead this effort.

What is the asthma risk associated with bleach?

New-onset work-related asthma case finding and the exacerbation of asthma in the workplace substantiate the concerns of stakeholders. Ongoing statewide surveillance from 1993 to the present links bleach to work-related asthma (77 WRA cases of 4417).[6] Forty percent of the WRA cases had pre-existing asthma that was exacerbated by bleach exposure, while 60% were cases of new-onset asthma. Nationwide surveillance of WRA conducted from 1993-1997, found that 12% of reported WRA cases (236 out of 1915) were associated with exposure to cleaning products. California contributed 92 of the 236 WRA cases; with 72% of the cases being new-onset asthma.[7] These data validate the need to promote asthma-safe disinfectants and sanitizers, safer bleach dilution systems, and consistent use of protective equipment.

Additionally, surveillance data collected from 1993-2000 in educational settings serving children over five years of age show that cleaning staff in these settings are at the greatest risk for developing asthma in the workplace.[8] Cleaning staff had the highest proportion of new-onset asthma, with bleach being among the most commonly reported exposures. Since staff members in child care settings are continually spraying bleach throughout the day, some of their exposures can be thought of as similar to cleaning staff. However, WRA for staff in child care settings is unlikely to make it into reporting systems for several reasons: limited health care access as low wage earners, lack of knowledge connecting new-onset asthma with their work environment, and lack of reporting to employers for fear of losing their job, deportation, or other consequences.

What was the project methodology?

The project field tested new bleach dilution and dispensing methods and tools, bleach-free US Environmental Protection Agency (USEPA)-registered disinfecting and sanitizing products, and a USEPA registered sanitizing device to confirm feasibility, operator ease of use, and acceptability of the changed practices. Hands-on training of site staff was conducted prior to all field testing.

II. What We Did

Step 1: Observed typical child care operations for baseline conditions

In order to make appropriate recommendations to reduce overexposure to bleach, the first step executed by the SFATF was to observe common practices in child care settings. Observation was performed to determine training needs, preferences and concerns of staff members with current practices and products in use, assess current bleach procedures, and inform selection of bleach-free disinfectants and sanitizers that would be convenient to use. Twenty child care sites consisting of 18 centers and two family daycare providers in San Francisco were recruited with the help and recommendations from Gateway to Quality and the Child Care Health Project nurses (CCHP). Sites were selected to provide a representative sample based on the age of children, subsidized and non-subsidized status of children served, ethnicity of staff and children, geographic location, and size of center in terms of the number of classrooms (*See Appendix Table A1 for more information about the project sites)*. SFATF project staff observed each site's classroom staff in each room of every center from the time the center opened until after lunch or afternoon snack to assess infection control practices. SFATF also observed custodial staff during their work hours.

Based on initial observation in the 18 centers, disinfecting and sanitizing practices varied widely among centers, among staff within the same center, as well as staff within the same classroom. None of the sites observed were using bleach or other registered products according to the USEPA label instructions. The legal mandate of USEPA registered disinfectants and sanitizers dictates the exact dilution and method of application to qualify as a disinfectant or as a sanitizer against specific microbial agents on specific surfaces.[9] Therefore, this also placed these sites out of compliance with the CCL requirements to use disinfectants and sanitizers according to the USEPA label.

SFATF staff found that the centers' staff members were over-exposing themselves to bleach by using disinfecting level bleach solutions for all surfaces, diluting without the use of tools to aid in correct measurements, using bottles that were smaller than quart-size, using personal protective equipment inconsistently, and spraying bleach solution in mist form close to the breathing zone. Additionally, center staff did not ensure proper infection control measures by omitting or using the incorrect procedure for the pre-clean step that precedes sanitizing and disinfecting; wiping the bleach solution before the specified contact time had elapsed; and by cleaning areas soiled with bodily fluids with soap and water or water only rather than disinfecting properly with the appropriate bleach solution. Finally, the classroom staff put themselves at risk for other toxic exposures and accidents by recycling spray bottles from other products, inconsistently labeling bottles containing bleach solution, and using bottles for water play that looked identical to the bottles used for soap/water and bleach/water solutions. *See Appendix Table A2 and A3 for more information on observed practices at the sites.*

Custodial staff are also at risk for overexposure to toxics since they use multiple products containing ingredients known to cause or exacerbate asthma.[10] Custodians were frequently mixing multiple incompatible products, using multiple products applied in an aerosol spray, performing dilutions without tools to aid in the process, and using personal protective equipment inconsistently.

Step 2: Identified opportunities for reduction of exposure to bleach and other chemicals

A. Quantifying child care worker occupational exposure to bleach

Based on observations during the pilot project, SFATF staff found that exposure to disinfectants or sanitizers varies greatly depending on the specified duties for each classroom staff member. These estimates are only for disinfecting diaper changing tables and sanitizing food contact surfaces and may underestimate total exposure since they do not account for disinfecting/sanitizing all required surfaces including mouthed objects, potty-training chairs, napping equipment, disposable diaper containers, sinks, partitions/walls, and areas soiled with bodily fluids. In the case where each staff person in an infant/toddler room changed only the diapers of the children in her/his care, possible exposure occurs approximately 25-28 times per day. For a child care provider or in a center setting where a single staff person is responsible for all disinfecting/sanitizing, the exposure increases to approximately 63-96 times per day. In a pre-school setting, the exposure decreases to approximately 9-15 times per day since diaper changing is not performed and the regulations for disinfecting various areas are not as specific for this age-group.

B. Identifying exposure to other chemicals of concern

In addition to bleach, multiple cleaning, sanitizing, and disinfecting products for use by classroom and custodial staff were observed in all centers. These products included aerosols, ammonia-based, and alcohol-based products. Most of these products contained synthetic fragrances and required a dwell time of 10 to 15 minutes. Incompatible products were used in the same areas in some centers. Active ingredients of concern and examples of commonly used products in child care centers are listed in Table 1 (page 7). Note that asthmagens are defined as “agents known or suspected to cause occupational asthma”.[10]

Table 1. Potential Chemical Exposures in Child Care Settings

Active Ingredient	Examples of Products with these Ingredients in Child Care Settings	Potential Health Risks
Quaternary ammonium compounds Includes alkyl dimethyl benzyl ammonium chloride and didecyl dimethyl benzyl ammonium chlorides Ingredients to look for: • Benzalkonium chloride • Benzyl-C10-16-alkyldimethyl, chlorides • Dodecyl-dimethyl-benzyl ammonium chloride • Lauryl dimethyl benzyl ammonium chloride • Benzyl-C12-18-alkyldimethyl, chlorides • Benzyl-C12-16-alkyldimethyl, chlorides • Benzyl-C12-16-alkyldimethyl, chlorides • Benzyl-C16-18-alkyldimethyl, chlorides)	• Lysol® Disinfectant Spray • Clorox® Disinfecting Wipes, Bleach-Free • Lysol® Brand Dual Action Disinfecting Wipes • Fantastik® Antibacterial All-Purpose Cleaner • Formula 409® Kitchen Antibacterial All-Purpose Cleaner • Cling Free® Fabric Softener, Static Stopping Sheets	These compounds are listed as asthmagens in the database maintained by the Association of Occupational and Environmental Clinics (AOEC).[10]
Thymol	• Seventh Generation® Disinfecting Multi-Surface Cleaner • Benefect® Botanical Disinfectant • Sol-U-Guard Botanical® (Melaleuca)	
Ethylene glycol butyl ether (2-butoxyethanol)	• Simple Green® All-Purpose Cleaner • Windex® Glass Cleaner Powerized Formula (institutional)	This ingredient is a possible carcinogen, and animals studies have associated 2-butoxyethanol with: • liver damage/cancer [11-13] • red blood cell damage causing anemia[14] • impaired fertility • reproductive and developmental toxicity[11-13]
Triclosan	• Ultra Dawn Dishwashing Liquid and Antibacterial Hand Soap • Dial® Antibacterial Liquid Hand Soap • Softsoap® 2 in 1 Antibacterial Hand Soap Plus Moisturizing Lotion • Softsoap® Aquarium Antibacterial Liquid Hand Soap	Studies show there are no additional benefits using antibacterial soap containing triclosan.[15] This ingredient is currently under review by the FDA as an additive.[16] Animal studies suggest triclosan may enable the spread of antibiotic-resistant bacteria,[17] and may mimic hormones resulting in possible health risks such as: • reproductive harm[18-20] • developmental effects on the nervous and endocrine systems[18-22]

Step 3: Designed and conducted site training

The observations informed the need to review infection control, CCL regulations, and the proper use of bleach. An interactive, two-hour training was developed to illustrate these topics and each center was offered and participated in the training before commencing testing. In addition to the educational topics, SFATF staff used a light-sensitive meter that measures levels of bacteria to demonstrate a pre- and post-level of bacteria on one of the classroom surfaces following proper disinfecting practice. An informal interactive quiz show format was also developed to assess what was learned from the training.

Training Tools

❶ Trilingual (English, Spanish, Cantonese) PowerPoint slideshow trainings for managerial and classroom staff, which included education on the following:

a) project goals
b) asthma environmental triggers
c) occupational health risks from bleach exposure
d) the importance of proper infection control practices
e) disinfecting/sanitizing requirements per CCL
f) personal protective equipment
g) proper use of bleach per USEPA registration and introduction to the bleach pumps
h) proper use and introduction to alternative antimicrobial products
i) regulating/guiding bodies USEPA, CCL, American Academy of Pediatrics (AAP),23 and Gateway to Quality
j) testing procedure and expectations

❷ Hands-on demonstration of disinfecting and sanitizing products, dilution equipment, properly-sized and labeled spray bottles, personal protective equipment and timers.

❸ An AccuPoint ATP Hygiene Monitoring System (bacteria meter) used during an interactive demonstration showing bacteria readings on surfaces chosen by center staff that appeared “clean”. The bacteria levels exceeded the bacteria level threshold in hospitals by as much as 3- to 200-fold. After demonstrating the proper practice using bleach and Oxivir®TB in a single trial to disinfect, the staff observed a reduction level of 10-fold.

❹ An informal Jeopardy-style quiz show competition at the end of the presentation was a test of knowledge and an indication of the success of the in-service training. Overall, the centers’ staff members reported positive feedback of the training on evaluations.

Training tools are available to download in English, Spanish, and Chinese. *See the Appendix for website information on where to access materials.*

Step 4: Researched new disinfecting and sanitizing methods and products for site-based assessment

According to the USEPA, disinfecting means to “destroy or irreversibly inactivate infectious fungi and bacteria but not necessarily their spores”; and sanitizing means to “reduce, but not necessarily eliminate, microorganisms from the inanimate environment.”[9] All disinfectants and sanitizers are antimicrobial pesticides due to their ability to reduce,

destroy, or inactivate microorganisms such as bacteria, viruses, and fungi. Therefore, by law they require registration with the USEPA and the California Department of Pesticide Regulation. Additionally, the USEPA must approve a product's label for intended and proper use prior to authorizing registration.[9]

USEPA registered bleach-free disinfectants and sanitizers were chosen primarily because they are safer for asthma than bleach, are not known to be respiratory sensitizers, and there are no data associating the products with WRA. SFATF staff chose products with convenient dwell times necessary to effectively reduce or mitigate viruses and bacteria as specified in the USEPA registration, and based on the product's label and compliance with CCL regulations. Additional consideration was taken with regard to national guidance for child care health and safety. All products selected for use as sanitizers or disinfectants require a pre-cleaning step. Due to the limited number of commercial bleach-free products available on the market that are safer alternatives for asthma, project staff had limited options for no-rinse sanitizers for use on meal/snack tables (food-contact surfaces), and instead chose a USEPA-registered device approved for sanitizing food contact surfaces.

Vinegar (5% acetic acid), 3-3.5% hydrogen peroxide (drugstore) and other household recipes and cleaning products were not considered for this project. These products are not compliant with CCL since they are not registered with the USEPA as antimicrobial pesticides since they are not intended to prevent, destroy, repel, or mitigate microorganisms on inanimate surfaces.

Step 5: Field testing to assess feasibility, operator ease of use and acceptability for new methods and products

Project staff realized early on that not all child care operators would be able to or willing to replace bleach as their primary disinfectant or sanitizer. Therefore, the pilot project included new methods to dilute and dispense bleach and bleach-free USEPA-registered sanitizers and disinfectants for the purpose of determining ease of implementation into child care settings, and to determine which products were accepted the most by the operators. Over the course of two weeks, different methodologies were introduced to 15 centers and two family child care providers.

During testing, each staff member who used the bleach dispensing method or the bleach-free sanitizers and disinfectants completed daily surveys and an overall evaluation regarding proper use of products, ease of use, health effects, perceptions of the products (e.g., residue and scent), preference of each alternative product in comparison to bleach, and recommendations for use of the method/products in the center. Additionally, SFATF staff maintained an open dialogue with the centers' staff and some of their perceptions and concerns not captured on the survey were documented with their permission.

Throughout the testing period, linguistically compatible project staff remained onsite and provided training on an individual classroom basis. While onsite, SFATF project staff were able to provide suggestions to enhance process efficiency, provide suggestions for setting up classroom environments, and ensure proper use of products. To further assure the proper use of products in compliance with USEPA and to reinforce proper infection control in compliance with CCL, each classroom was provided with trilingual placards (English, Spanish, Chinese) containing dilution-specific and product specific area of use, bleach/product instructions, and CCL requirements for the bleach dispensing method and bleach-free disinfectants and sanitizers. *See the Appendix for website information on where to download materials.*

5A. Field testing of uniform bleach dispensing method and contact times

There are many manufacturers of bleach, however Clorox® bleach is used as an example since this was the most widely used brand observed during the project. The active ingredient for bleach is Sodium Hypochlorite; Ultra Clorox® is considered regular bleach and contains 6.0% Sodium Hypochlorite (5.7% available chlorine). To reduce overexposure, the SFATF used fragrance-free bleach containing 6.0% Sodium Hypochlorite. All instructions included in training tools and materials for distribution are based on the November 25, 2009, EPA registration for Clorox® regular bleach (EPA Registration No. 5813-50).[24]

Pumps calibrated to dispense the exact amounts of bleach were designed for precise dilutions, to reduce overexposure, and to avoid accidents. Pumps could not have metal spring components, which were subject to corrosion by the bleach. Calibrated pumps that dispense the exact amount of bleach required for both disinfecting-level and sanitizing-level bleach solutions were mated with quart-size (32oz.) spray bottles with custom-designed trilingual instructional labels to increase ease of use. Additionally, SFATF staff provided the centers with digital timers to ensure that the proper dwell time of two minutes elapsed before wiping or rinsing the bleach solutions, funnels to aid in pouring bleach into the closed dilution system, protective eyewear, and emergency eye wash stations. *See Table 4A and 4B for recommendations on using bleach and for information on proper dilutions.*

5B. Field testing of selected bleach-free disinfecting and sanitizing products

All products selected require a pre-clean step using diluted triclosan-free soap or the sanitizing device (see below) as a first pass step. Please note that accelerated hydrogen peroxide is not the same as regular hydrogen used as an antiseptic on skin (i.e., 3-3.5% hydrogen peroxide found in the drugstore).

Oxivir®TB

Ready-to-use disinfectant containing the active ingredient accelerated hydrogen peroxide, was introduced for use by classroom staff on hard nonporous surfaces (which includes diaper changing areas, toilets/potty training seats, sinks, and napping equipment), and for bodily fluid spills (which includes human waste, blood, vomit, and discharge). This product has a one minute contact time.

Alpha HP®

Ready-to-dilute concentrated product with the active ingredient accelerated hydrogen peroxide was introduced to custodial staff to sanitize or disinfect. This product was not tested by classroom staff due to the need for a utility sink for dilution, as well as 10 minutes contact time. This product can be used on hard, nonporous surfaces (which includes diaper changing areas, toilets/potty training seats, sinks, and napping equipment and floors), and for bodily fluid spills (which includes human waste, blood, vomit, and discharge). Alpha HP® uses a closed dilution system to dilute product into spray bottles (which has a shelf life of two weeks) or into a mop bucket.

ionatorEXP™

Sanitizing device, which uses tap water and electrolysis and electroporation technology was introduced to all staff for surfaces requiring sanitizing. Specifically, this device was tested by classroom and kitchen staff to sanitize food contact surfaces. The device sanitizes using a six second continuous spray and can also be used instead of soap and water to pre-clean all surfaces, as a first pass step. See the Appendix section on the ionatorEXP™ for additional information.

Pro-San® L

Ready-to-use sanitizer with the active ingredient citric acid was identified towards the end of field testing and introduced to classroom staff of one medium sized (infant/toddler) and one large center (infant/toddler/pre-school) for use on food contact surfaces, and is also appropriate for use by kitchen staff. This product has a one minute contact time.

Seventh Generation® Disinfecting Multi-Surface Cleaner

Ready-to-use sanitizer with the active ingredient thymol was introduced to sanitize food contact surfaces. This product, now widely available in retail stores, was tested by classroom and kitchen staff using a 30 second contact time and a spray application with larger droplet size that was custom-designed to decrease exposure. During the pilot project, the SFATF discontinued field testing this sanitizer as a bleach-free option for food-contact surfaces in response to notification by the State Work-Related Asthma Prevention Program of the current review of thymol's potential sensitizing properties. The Association of Occupational and Environmental Clinics (AOEC) has since designated thymol as a known asthmagen (December 2010).

III. What We Found

During field testing of new tools, methods, disinfectants and sanitizers, SFATF staff confirmed feasibility, ease of use, and operator acceptability. Project staff tested the tools and remained onsite to confirm feasibility of all materials. Ease of use and operator acceptability was confirmed through daily and overall surveys completed by each staff person as well as verbal testimony to onsite project staff. Refer to Table 2 for feedback on the methods and products. *See the Appendix for website information on where to access the survey used and data collected.*

1) Feasibility

All of the new methods and products were usable in the various child care settings. Some of the changes even made following the regulations easier. The main barrier to child care sites adopting the new methods and products would probably be their availability and cost.

For providers or centers choosing to invest in the recommended bleach-free disinfectants and sanitizers, group purchasing will allow for greater discounts. Therefore, groups affiliated with consortia of organizations or centers, neighborhood networks, or other associations may consider purchasing together. Also consider asking parents for small monetary donations, instead of product donations, and use that money to invest in the bleach-free recommended products. For providers or centers continuing to use bleach, the calibrated bleach pumps are not sold as individual units, but only in bulk with a minimum purchase of $500. Therefore, providers and centers continuing to use bleach should also consider group purchasing. See Appendix section on costs and ordering for more information.

2) Ease of use

All sites found the bleach dispensing method and the bleach-free products equally easy or easier to use than their current method using bleach. Over 80% of respondents perceived the bleach dispensing method and the bleach-free sanitizers and disinfectants as similar as or easier to use than their current method using bleach.

3) Operator acceptability *(See Table 2 for comments on products)*

New bleach methods

The staff members responsible for the dilutions at all 14 sites that tested the calibrated dispensing pumps preferred this system to the previous methods used.

Oxivir®TB

Thirteen of the 16 sites would like their center to invest in Oxivir®TB for use on sinks, diaper changing tables, and toilets.

Alpha HP®

Most centers do not influence the products used by the custodial staff since these staff members are often independent contractors who provide their own products. Therefore, only four centers were able to test Alpha HP®. Three of the centers would like to invest in this cleaner/sanitizer/disinfectant for ease-of-use, and to reduce the amount of products currently in use. The other site found the product to be "irritating"; however, project staff used ventilation measurements to discover that the custodial room had inadequate airflow which may have contributed to this concern. As an additional note, Alpha HP® is currently in use by the San Francisco Unified School District custodial staff.

ionatorEXP™

All 10 sites that tested the ionatorEXP™ (commercial use model) provided positive feedback. They expressed interest in their centers investing in the device if they had a better area to store it, and if the device did not leave the surfaces excessively wet which resulted in the use of more paper towels.

Pro-San® L

Both sites that tested Pro-San® L provided positive feedback. They expressed interest in replacing bleach with this sanitizer due to ease-of-use, shorter contact time, and lack of a strong scent. Some staff noted that if the sanitizer was left to air dry, the citric acid crystallized on the surface.

Table 2. Perceptions of the Products as Recorded on Daily and Overall Surveys

Method/Product	Selected Quotes from Surveys
New bleach dispensing method	• "Before I'd avoid making [bleach solutions] or would guesstimate and it would smell. Now it's precise and easier". • "It made sure the correct amount for bleach was used in each solution . . . this [is] the same thing we have been doing, but easier because of the pumps and timers." • "The parents noticed we're using less bleach, they can tell by the difference in smell. They know that we're doing this project, and they're excited we decided to participate."
Oxivir®TB	• "It is fairly odor free, wipes easily (i.e. not greasy or soapy), and it doesn't irritate my skin/eyes like bleach . . . Safe for our children and will kill germs and viruses." • "It's not as strong as Clorox. It doesn't irritate me and doesn't ruin my clothes." • "Already prepared/ less time to wait/ smells much better than bleach."
ionatorEXP™	• "No bleach, covers complete surface, no smell." • "Quick and easy (to fill, to charge, to use)." • "It saves time, is safe to use around infants, is non-toxic, would love to have this on a permanent basis."
Pro-San® L	• "Saves time and is more convenient with the shorter wait time [than bleach]." • "I like it better than bleach because it is easy to use." • "Smells better than bleach. . . no strong smell."
Alpha HP®	No written comments provided.

IV. Recommendations

While the SFATF strongly recommends that child care providers switch to bleach-free disinfecting and sanitizing, some child care businesses cannot afford to, and not all providers desire this change. In those cases, SFATF strongly recommends adopting the practice demonstrated by this project for reducing bleach exposure. Managers of child care centers can facilitate reducing bleach exposure with simple steps that better protect the health of their staff and the children served.

1) Recommendations for centers and providers that switch to USEPA registered bleach-free disinfectants and sanitizers *(See Table 3 on page 16):*

Based on the concerns of the stakeholders, WRA data, and observed current practices with bleach, centers should purchase bleach-free disinfectants and sanitizers that are known to be safer for asthma when financially possible.

A. Minimize the amount of products purchased. A center only needs the following:

1. Triclosan-free soap for pre-cleaning with a soap and water solution.
2. One disinfectant (Oxivir®TB) and one sanitizer (ionatorEXP™ or Pro-San® L) for the classroom staff as multiple products are not more effective in controlling infection
3. One product for the custodial staff (Alpha HP®) to disinfect/sanitize floors and to disinfect toilets, sinks, and walls.

B. Use the following tools and safety equipment to ensure proper use of disinfectants and sanitizers:

1. Digital timers
2. Simple and linguistically appropriate, product-specific instructional postings for parents and staff
3. Specific bottles for the children to use during water play
4. Personal protective equipment: gloves, protective eyewear
5. Emergency eyewash station

See Appendix Table A5 for information on purchasing bleach-free sanitizers and disinfectants.

2) Recommendations for centers and providers that continue to use bleach *(See Tables 4A and 4B)*:

A. In-services and staff meetings are opportunities to reinforce proper bleach practices and ensure dissemination of information:

1. Information to review with staff members:
    a) Definitions for pre-cleaning, sanitizing, and disinfecting and corresponding areas
    b) Proper process for diluting and using bleach
    c) Tailoring classroom spaces to reduce exposure to children

2. Instructional postings:
    a) Minimize the amount of information posted
    b) Update information
    c) Keep the postings simple, explicit, and easy to follow for parents and staff
    d) Make postings linguistically appropriate for parents and staff

B. Use the following tools and safety equipment to ensure proper use of disinfectants and sanitizers:

1. Digital timers
2. Calibrated pumps that dispense the exact amounts for disinfecting (15mL) and sanitizing (~4mL)
3. Quart-size bottles (32oz.)
4. Specific bottles for the children to use during water play
5. Personal protective equipment: gloves, protective eyewear, aprons
6. Emergency eyewash station

C. Minimize the amount of products purchased. A center only needs the following:

1. Purchase triclosan-free soap for pre-cleaning with a soap and water solution.
2. Purchase fragrance-free bleach containing 6.0% Sodium Hypochlorite.
3. Avoid purchasing unnecessary multiple products as bleach can be used for sanitizing, disinfecting, and deodorizing and will satisfy all CCL regulations.
4. Avoid purchasing aerosol sprays and deodorizing sprays, as they both irritate the respiratory system and may cause or exacerbate asthma.

See Appendix Table A6 for information on purchasing tools for safer bleach use.

Table 3. Recommendations for Bleach-Free Disinfectants and Sanitizers *(Recommended for use only as specified in this table)*

NOTE: Disinfecting with Oxivir®TB and sanitizing with the ionatorEXP™ or Pro-San® L require a pre-clean step using either diluted triclosan-free soap, or the ionatorEXP™ as a first pass step.

Product	Active Ingredient	Surface	Contact Time		Notes
			Disinfectant	Sanitize	
Classroom Use					
Oxivir®TB 	Accelerated Hydrogen Peroxide	**Hard Non Porous, Non-Food Contact Surfaces** Infant/Toddler Classrooms: • Diaper Changing Tables * • Potty Training Chairs * • Cots/Cribs **** • Mouthed Objects *** (Including Toys with Hard Surfaces) • Disposable Diaper Containers *** Infant/Toddler/Classrooms with Mildly Ill Children: • Sinks ** • Walls/Partitions ****	1 Minute	Not Registered for Use on Food Contact Surfaces	Per CA Child Care Licensing: Surfaces to **DISINFECT** *After each use **After each use if soiled ***Daily ****Weekly
Classroom, Kitchen, and Custodial Use					
ionatorEXP™ 	Tap Water and Electrolysis & Electroporation Technology	**Pre-Clean Any Surface** **Food Contact Surfaces:** All Classrooms: • Snack/Meal Tables * • High Chair Tables * • Dishes, Utensils, Cups *	Not Registered for Use as a Disinfectant	6 Seconds of Continuous Spray	Per CA Child Care Licensing: Surfaces to **SANITIZE** *** Daily Recommendation for Food Contact Surfaces: **SANITIZE** * After each use
Pro-San® L 	Citric Acid	**Non-Food Contact Surfaces:** Infant/Toddler Classrooms: • Disposable Diaper Containers ***		1 Minute	
Custodial Use					
Alpha HP® 	Accelerated Hydrogen Peroxide	**Hard Non Porous, Non-Food Contact Surfaces** Infant/Toddler Classrooms: • Diaper Changing Tables * • Potty Training Chairs * • Cots/Cribs **** Infant/Toddler/Classrooms with Mildly Ill Children: • Sinks ** • Floors *** • Walls/Partitions ****	10 Minutes All Specified Areas Infant/ Toddler/ Classrooms with Mildly Ill Children 1:64	10 Minutes Floors (Pre-K & Hallways) 1:128	Per CA Child Care Licensing: Surfaces to **DISINFECT** *After each use **After each use if soiled ***Daily ****Weekly

NOTE:
1) Pre-cleaning is performed using a soap and water solution, which is wiped off of the surface before applying sanitizer/disinfectant, in order to remove dirt, grease, wax, or bodily fluids. If the pre-clean step is omitted or not performed properly, the debris acts as a shield for the microorganisms thereby lessening the effectiveness of the products.
2) Spray sanitizers and disinfectants away from the breathing zone.
3) Wait the appropriate contact time as specified on the label before wiping the surface dry.

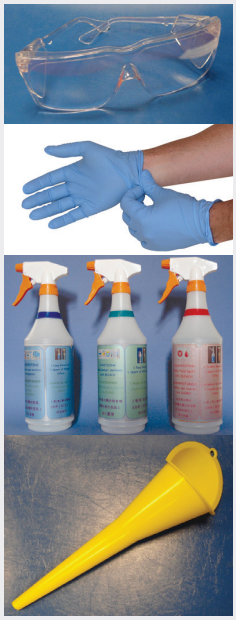
Table 4A. Recommendations for Safer Dilution of Bleach Using Calibrated Dispensing Pumps

NOTE: Disinfecting and sanitizing with bleach requires a pre-clean step using either diluted triclosan-free soap.

Product	Active Ingredient	Surface	Contact Time		Notes
			Disinfectant	Sanitize	
Classroom Use					
Disinfecting Level Pump 	6.0% Sodium Hypochlorite	**Hard Non Porous, Non-Food Contact Surfaces** Infant/Toddler Classrooms: • Diaper Changing Tables * • Potty Training Chairs * • Cots/Cribs **** Infant/Toddler/Classrooms with Mildly Ill Children: • Sinks * • Floors *** • Walls/Partitions ****	2 Minutes Followed by a Rinse Step	Not Applicable	Per CA Child Care Licensing†: Surfaces to **DISINFECT** *After each use **After each use if soiled ***Daily ****Weekly
Classroom, Kitchen, and Custodial Use					
Sanitizing Level Pump 	6.0% Sodium Hypochlorite	**Food Contact Surfaces:** All Classrooms: • Snack/Meal Tables * • High Chair Tables * • Dishes, Utensils, Cups * **Non-Food Contact Surfaces:** Infant/Toddler Classrooms: • Disposable Diaper Containers ***	Not Applicable	2 Minutes	Per CA Child Care Licensing†: Surfaces to **SANITIZE** *** Daily Recommendation for Food Contact Surfaces to **SANITIZE** * After each use

† CALIFORNIA-DSS-MANUAL-CCL, MANUAL LETTER NO. CCL-98-11, Effective 11/1/98

Table 4B. Recommendations for Safer Use of Bleach

Goal	Recommendation
Reduce Exposure 	Use personal protective equipment (PPE) 1) Gloves 2) Safety goggles 3) Aprons Purchase fragrance-free bleach with 6.0% Sodium Hypochlorite a) Avoid industrial strength bleach that exceeds 6.15% concentration b) Avoid purchasing bleach with no concentration specified on the label. Use quart-size (32oz.) spray bottles to properly dilute bleach. Use tools for proper dilution of bleach: a) Calibrated dispensing pumps OR b) Tablespoon and teaspoon. Keep a safe distance from the bleach when diluting. Maximize ventilation by opening windows or doors where possible. Ensure that the children are in another area/room when diluting, sanitizing, and disinfecting. Apply bleach solution onto surfaces while spraying away from breathing zone. Ensure that surfaces are completely dry when children are in the area after sanitizing and disinfecting.
Proper Practice 	Dilute bleach daily. Use dilutions specified on the label for sanitizing and disinfecting. Proper dilutions for 6.0% Sodium Hypochlorite: Sanitizing: ~1 Teaspoon bleach per quart (32oz) of water Disinfecting: 1 Tablespoon bleach per quart (32oz) of water Disinfecting bodily fluid spills*: ~6 Tablespoons bleach per quart (32oz) of water Label spray bottles appropriately. Pre-clean with diluted triclosan-free soap. Ensure proper contact time (2 minutes) by using digital timers. Rinse the surface with water after disinfecting.
Avoid Accidents & Prepare for Emergencies 	Keep bleach or any products out of the reach of children. Do not mix different products or chemicals. Do not recycle spray bottles from other products. Do not recycle concentrated bleach bottles. Avoid using similar spray bottles for diluted bleach as those used for water play. Purchase an Emergency Eye Wash Station.

* Per Cal-OSHA, bodily fluid spills greater than 10mL require disinfection using a 1:10 dilution. When dealing with outbreak situation, please refer to the medical personnel serving the center.

3) Recommendations for special situations:

In addition to daily routine disinfecting and sanitizing requirements, two specific situations have distinct disinfecting requirements:

A. Bodily fluid spills (e.g., when a child has a nosebleed). Body fluid spills are defined by Cal-OSHA as incidents wherein the secretion/excretion of tissue discharge, blood, vomit, diarrhea, human milk exceeds 10mL.

B. Potential outbreak situations (e.g., when vomiting or diarrhea has occurred at the child care setting or when a child has been sent home from the child care setting with vomiting or diarrhea). Outbreak situations are defined by the Centers for Disease Control and Prevention (CDC) as when the observed number of cases with infectious or non-infectious diseases exceeds the number of expected cases.

See the Appendix for website information on where to access information on these distinct disinfection requirements.

4) Recommendations for policy-makers:

The requirements for infection control that distinguish cleaning, sanitizing, and disinfecting products and their specific uses in state-licensed child care settings are often misunderstood. This potentially exposes both children and adults to harmful toxic risks in child care centers. The SFATF would like to make the following policy recommendations:

A. Regulation

CCL should provide a supplemental guide containing information on alternative, bleach-free products that meet regulations for sanitizing and disinfecting. This addendum should specify that alternative products are acceptable for use in child care settings and highlight disinfectants and sanitizers identified as safer for asthma. The findings presented in this report could provide a basis for that information.

B. Assessment Guidelines

The Environment Rating Scales (ECERS-R; ITERS-R and FCCERS-R) are used by Gateway to Quality to assess the quality of child care centers as a means for centers to receive funding. The ECERS assessment protocol should be immediately changed to accurately reflect the USEPA-registered required contact time for antimicrobial effectiveness as being two minutes, rather than 10 seconds (only 8% of the required contact time).

The rating scales have also adopted a guideline suggesting that sanitizing/disinfecting products be applied in a mist spray. However, since the droplets emitted in this fashion are smaller, they can increase exposure to the products by allowing the chemicals to penetrate deeper into the lungs. This can result in irritation or damage to tissues of the respiratory system, which can exacerbate asthma. The SFATF recommends retraction of this guideline.

C. Awareness of Asthmagens

Those involved in policy strategies should reference the current AOEC listings of asthmagens. The California Department of Public Health (CDPH), Work-Related Asthma Prevention Program is one resource for this list.

V. Additional Insights

In the course of this project, project staff realized that technical recommendations alone would not create change. Change occurs when people believe it is needed and have the tools to implement it. If human resources are supported to make change and their needs are met, this will enable and encourage the sustainability of best practices. To achieve this, the SFATF suggests tailored trainings for three specific groups: management, staff, and parents.

1) Training needed for management:

California Occupational Safety and Health Administration (Cal-OSHA) law requires all employers to provide their employees Hazard Communication training, including product safety information for chemical products in use. While this law does not apply specifically to the use of registered antimicrobial pesticides, there is an obvious need for managers to understand the risks of the chemical products in order to prevent injury and illness among their staff and the children in their care.

Managers should be the first to receive training on best practices established for reducing exposure to bleach while maintaining compliance with CCL requirements for disinfecting and sanitizing. This type of training will allow them to understand the best practices to be implemented by their staff, the materials needed, and the means by which they can monitor for consistency of staff practices. If managerial staff becomes more aware of the risks and benefits of the products and practices used in the classroom, they will be better able to help eliminate those risks encountered by classroom staff on a daily basis.

Another role of management is to provide effective, well-organized communication to employees. Postings can be a useful way to share updated instructional material that is easily accessible and linguistically-appropriate. This information can promote standardized best practices for staff and volunteer parents, particularly around the issue of disinfecting and sanitizing. Some suggestions to communicate these important guidelines in a way that might minimize confusion include:

- displaying information that is compliant with regulating bodies such as CCL and the EPA
- establishing instructions that are simple, explicit, and easy to follow
- displaying placards related to the sanitizers or disinfectants in the specific area of use
- clearing the posting space of extraneous flyers and other materials
- reviewing the postings/placards periodically to ensure that the instructions are correct and updated.

2) Training needed for staff and onsite guidance:

Adjusting to the use of new methods and materials requires the transformation of existing practices to which employees have become accustomed. To this end, linguistically-compatible SFATF staff provided two-hour interactive trainings during introduction to the bleach dispensing method and new bleach-free disinfectants and sanitizers. However, these two-hour group trainings were not sufficient to facilitate behavior change.

SFATF staff then provided two weeks of onsite follow-up to guide staff in their transition to using products with instructions that differed from baseline practices. Having SFATF staff readily available in the center, classroom staff received suggestions with regard to tailoring current practices and setting up the classroom environment, developing efficient processes to maintain infection control, and minimizing exposure. Successful implementation of new methods required encouraging modifications of behavior through in-depth, one-on-one interactions.

Additionally, providing onsite guidance on an individual basis ensured dissemination of new information to all staff. Confirmation that all staff members have received the appropriate instructions is imperative in maintaining best practices, avoiding accidents, and providing the essential support to human resources.

3) Education needed for parents:

Parents are important advocates for their children's health and important resources who contribute to the basic functions of the centers. Parental education and awareness regarding asthma triggers, infection control and best practices, and safer products for asthma would facilitate operations where parents are involved.

Parents often change diapers or have their child use the toilet upon arrival to the center. Providing product specific updates on how to properly disinfect would facilitate proper infection control after diaper changing and after accidents should they occur. Parents also donate cleaning products, sanitizers, and disinfectants. Therefore, specific information on disinfectants, sanitizers, and soaps used in the center would avoid donations of products that are not USEPA registered and therefore not in compliance with CCL, that are not chemically compatible, that irritate the skin or respiratory system, and that are more toxic for children. Raising parental awareness and integrating information on disinfecting and sanitizing into regular updates of a child's development and well-being creates an open dialogue with parents that could result in increased awareness of safer products and practices to reduce asthma triggers in the home. Additionally, sustainable standardized practices and use of new methods or products would be invaluably aided by the buy-in and support of parents.

VI. Acknowledgements

These individuals provided additional support to the SFATF project:

David Lo	Health Educator San Francisco Department of Public Health, Children's Environmental Health Promotion	Written Chinese and oral Cantonese support to project's materials and training
Jackie Chan	Industrial Hygienist San Francisco Department of Public Health, Occupational Safety & Health	Support to assess ventilation rates
Barry Heinbaugh & Mallory McCamant	Representatives Laguna Greenworks	Support to establish purchasing rates and research for the ionatorEXP™
Marklin Alford	Representative Waxie Sanitary Supply	Disinfectants Oxivir®TB and Alpha HP® for field testing and bacteria meter for presentations
Dr. Larry Weiss	CEO Clean Well Company	Seventh® Generation Disinfecting Multi-Surface Cleaner product for field testing
Chris Johnson	Distributor Clorox® Professional Products	Disinfecting-level aerator dilution pumps
Shane Almay	Representative Reike Packaging Inc.	Calibrated bleach dispensing pumps
Public Health Nurses	San Francisco Department of Public Health, Child Care Health Project	Support to project's training materials and language translation, and provided safety goggles
Rick Karp & Mia Ehrich	Representatives Cole Hardware	Vendor and product research
Michael Hardy	Special Assistant to the Deputy Office Director Office of Pesticide Programs (7501P) US Environmental Protection Agency	Support in reviewing registrations and documents for recommended sanitizers, disinfectants, and the sanitizing device

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Appendices

Glossary

All disinfectants and sanitizers must be registered with the USEPA as antimicrobial pesticides due to their ability to "reduce, or mitigate growth or development of microbiological organisms".[9] The USEPA authorizes intended and proper use during the registration process as stated on a product's label. USEPA definitions:

Clean: The process of physically removing debris from a surface or area by scrubbing, washing, and rinsing. Sanitizers and disinfectants cannot work on dirty or greasy surfaces.

Sanitize: To reduce, but not necessarily eliminate microorganisms from the inanimate environment. For registration with the USEPA, **sanitizers must kill at least 99.9%** of the three specified bacteria (*Staphylococcus aureus, Pseudomonas aeruginosa,* and *Salmonella enterica*) within a specified time period.

Disinfect: To destroy or irreversibly inactivate infectious fungi and bacteria, but not necessarily their spores. For registration with the USEPA, **disinfectants must kill 99.99%** or more (up to 99.9999%) of the three specified bacteria: *Staphylococcus aureus, Pseudomonas aeruginosa,* and *Salmonella enterica* within a specified time period.

Websites for Project Resources

San Francisco Asthma Task Force:
General site: http://www.sfgov/asthma
Reducing Overuse of Bleach project: http://www.sfgov3.org/index.aspx?page=721

Regional Asthma Management and Prevention: www.rampasthma.org

San Francisco Child Care Planning and Advisory Council: http://sfcpac.org/resources.html

Additional Notes for the ionatorEXP™

The ionatorEXP™ is a USEPA registered pesticide device, rather than a registered pesticide. For this reason, the USEPA does not require the submission of virucidal and bactericidal testing data prior to the manufacturer's marketing claims. Although registered device labels are also regulated by the USEPA, their oversight is limited to requiring that the manufacturer does not make false or misleading claims. These registered devices receive an USEPA establishment number, rather than the registration number issued for antimicrobial pesticides.

Although not required to do antimicrobial testing, the manufacturer, Activeion, has voluntarily submitted testing data to the USEPA according to the Association of Official Agricultural Chemists test methods that are used for a Federal Insecticide, Fungicide, and Rodenticity Act (FIFRA) Section 3, new pesticide registration. Due to some modifications to the study protocol the data for staph, salmonella, and pseudomonas was submitted but deemed unacceptable for approval status even though the results showed that the technology did kill the germs. Activeion has yet to retest the device using the approved protocol.

Additionally, there were concerns posted by individuals on the internet regarding the need for a minimum level of sodium chloride in tap water for adequate conductivity of electric current to effectively sanitize surfaces. Activeion provided information to SFATF staff stating that the most current version of the device (Version 5) does not have this requirement since it is designed to adjust output from the battery as needed to ensure that the required current levels compensate for varying conductivity of water sources. For more information, go to their website: www.activeion.com/HowItWorks.aspx.

Pilot Project Sites

Table A1. Characteristics of Centers in the Pilot Project

All centers served subsidized and non-subsidized children except for three sites (one served all children who were all subsidized, two served children who were all non-subsidized).

Center #	District (ZipCode)	# Classrooms			# Children Licensed		Participated in testing?	Primary Language (Staff and Children)
		Infant (0–18mo.)	Toddler (18–36mo.)	Preschool (3–5yr.)	Infant (0–24mo.)	Preschool (2–5yr.)		
2	Mission (94110)	1	6	1	72	79	Yes	Spanish
3	Bayview (94124)	Combined 3 classrooms		2		80	Yes	English
5	Visitacion Valley (94134)	1	1	1	20	24	Yes	Spanish, Chinese, English
9	Richmond (94121)	√	√	√	6	12	Yes	English
10	Bayview/ Hunter's Point (94124)	1	2	2	33	47	Yes	Spanish, English
11	Mission (94110)			3		24	Yes	Spanish, English
12	Noe Valley (94115)		√			6	Yes	English
13	Vis. Valley (94134)	1	2	3	28	42	Yes	Chinese, English
14	Chinatown (94133)	1	3		28		Yes	Chinese
15	Chinatown (94108)			3		48	Yes	Chinese
16	Tenderloin (94102)			2		32	Yes	Chinese, English
17	North Beach/ Chinatown (94133)			1		23	Yes	Chinese
18	Presidio (94129)	1	1	3	48	109	Yes	Spanish, Chinese, English
19	Tenderloin (94102)	1	1	2	27	45	Yes	Spanish, Chinese, English
20	SOMA (94103)	1	1		25		Yes	English
1	Potrero Hill	Combined 1 class				35	No	English
4	Visitacion Valley (94134)	1	1	1	18	24	No	Chinese, English
6	Visitacion Valley (94134)			4		110	No	Chinese, English
7	Visitacion Valley (94134)			2		40	Dropped Out	English
8	SOMA (94103)	1	1	1	8	23	No	Spanish, Chinese, English

Observed Bleach Practices

Table A2. Observations Across Centers During the Initial Phase of the Project

Observed Practice	Problem	Proper Practice
Over-concentration of bleach by "eyeballing" the volume while diluting	Staff members are risking over-exposure to bleach each time the solution is sprayed since the proper amount of bleach is not used in the dilution	Staff should measure bleach with a tool such as a table/teaspoon to reduce over-concentration and risk over-exposure
Use of spray bottles of various sizes	Staff members are over-concentrating the solution since the bottles were often too small to dilute the bleach properly	Quart-size (32 oz.) bottles are necessary to properly dilute bleach per the product label and USEPA registration[24]
Recycled spray bottles from other cleaning/disinfecting/sanitizing products	Staff are at risk for inhaling toxic gases emitted when different chemicals are combined when bleach mixes with residue from the original product in the bottle	The center could provide the staff members with quart-size spray bottles designated for bleach solutions only in order to avoid recycling bottles and risking the potential production of toxic gases, and in order to avoid accidents by mixing up the spray bottles with those used by the children
Inconsistent labeling of bottles as "Bleach/Water Solution"	Un-labeled bottles pose a risk to the children due to the potential to mistake bleach solution spray bottles for spray bottles used by the children during water play since the bottles looked similar in some centers	
Inconsistent use of Personal Protective Equipment (PPE)	By not using PPE, staff members are exposing themselves to bleach which is corrosive to the skin and eyes and "Causes irreversible eye damage and skin burns"[4]	The center could provide the staff members with the appropriate PPE, and managerial staff should encourage use, in order to protect against potential accidents

Table A3. Additional Practices Validating Training Needs to Review Infection Control and the Proper Use of Bleach

Observed Practice	Proper Practice
Bleach/water solutions were not prepared daily	Bleach should be prepared daily to ensure efficacy in reducing, destroying, or inactivating microorganisms since the diluted solution degrades over time
The pre-clean step was often omitted or performed incorrectly	Pre-cleaning is necessary to remove excess debris, grease, or wax in order for the disinfectant/sanitizer to effectively kill viruses and bacteria; this step should be performed before disinfecting or sanitizing
Bleach solution was applied using a stream method	Diluted bleach should be applied in a spray mist* in order to maximize surface area in contact with the solution; however, the mist should be sprayed away from the breathing zone
The proper dwell time varied widely from the solution immediately wiped to leaving the solution on the surface to air dry; the average contact time was approximately 30 seconds	Surfaces should remain wet with bleach/water solution for 2 minutes, per US Environmental Protection Agency (USEPA) registration[24], in order to ensure maximum kill rate
Lack of disinfection (as required by CCL) observed in areas such as toileting, and occasions such as accidents involving bodily fluids	Soiled areas and bodily fluid spills should be disinfected per CCL in order to minimize infection
Lack of disinfection, as required, of diaper changing tables in centers that used disposable paper	
Lack of disinfection/sanitizing, as required, observed in all areas in some centers with poor air quality where the disinfecting/sanitizing products lingered in the air and were perceived to be "very strong"	Areas specified by CCL should be sanitized and disinfected regularly to ensure proper infection control and to remain compliant
The disinfecting/sanitizing process was performed in close proximity to the children who were either sleeping in their cots during naptime, being held in the arms of the staff member, or seated at meal tables when the bleach solution was sprayed	Disinfectants/sanitizers should not be sprayed close to children in order to reduce exposure. This is important since their organs are still developing, and they breathe more air pound for pound than adults

* NOTE: this is a guideline of the Thelma Harms, Richard Clifford and Debby Cryer, authors of the *Environment Rating Scales: ECERS-R; ITERS-R and FCCERS-R*. These rating scales are used by Gateway to Quality to assess the quality of child care centers in San Francisco as a means for centers to receive funding. The SFATF would like to contest application of bleach in this form.

Cost Calculations

1) Assumptions for Cost Analysis: Volume/number of Products to Purchase

A. Products Used by Classroom Staff

Bleach

The estimation of bleach cost and volumes used is based on information provided by a consortium of five centers (costs per individual centers will likely be different). The cost of bleach varies widely by vendor and bulk purchases. Please note that these cost estimates were based on purchasing 3Qt (96fl. oz.) concentrated bleach, cost of bleach as of August 2010 from a single vendor, and assuming 260 workdays per year.

One bottle of concentrated bleach with 6.0% Sodium Hypochlorite will dilute:

- Approximately 567 quart bottles of bleach-water solution at sanitizing level. This bottle of concentrated bleach to dilute at sanitizing level should last approximately two years for one room regardless of the children's age. Therefore, one average group-size with 12 infant/toddler age children will use approximately two bottles of concentrated bleach (3Qt) per year (approximately $15/year) and spend $9 for spray bottles/year.
- Or, approximately 177 quart bottles of bleach-water solution at disinfecting level. This bottle of concentrated bleach to dilute at disinfecting level should last less than one year for one room with infants/toddlers. The bleach used in rooms with preschoolers for disinfecting varies widely by center. In a preschool setting, the amount of bleach used is, on average, half of that used in infant/toddler settings. Therefore, one average group-size with 24 preschool age children will use approximately one bottle of concentrated bleach (3Qt) per year (approximately $8/year) and spend $9 for spray bottles/year.

Bleach-free Products

Based on observations during the pilot project, the approximate volume of Oxivir®TB used, and the number of ionatorEXP™ devices to consider:

Oxivir®TB (Ready-to-use disinfectant sold as one quart/each)

- One average group-size with 12 infant/toddler age children will use approximately one quart (Qt) bottle of Oxivir®TB/month (12 quart bottles/year).
- One average group-size of 24 preschool age children will use approximately one quart bottle of Oxivir®TB over two months, if not longer (six quart bottles/year).
- Additionally, centers with outdoor play areas and/or gross motor areas should plan for one quart bottle/month for each area with a diaper changing station and one quart bottle/two months in areas with toilets and sinks.

ionatorEXP™ (Device sold as one unit/each)

- Each classroom, should have one ionatorEXP™ unit.
- Each center should consider one unit for the kitchen and if the children eat in the outdoor play/gross motor areas, centers should also consider one ionatorEXP™ unit for these areas.
- The ionatorEXP™ has a shelf life of five years.

Pro-San® L (Ready-to-use sanitizer sold as one quart/each; Ready-to-dilute sanitizer sold as one pouch for dilution into one quart bottle)

- Estimated volumes for product used varied widely since the sanitizer was used not only for food contact surfaces after meals/snacks but also on play surfaces, shelves, and larger toy structures at the end or beginning of the day.
- One average group-size with 12 infants where a disinfectant was used to clean play surfaces and Pro-San® L was used primarily for food contact surfaces would use slightly less than one and a half quart bottles/month (18 quart bottles/year).
- One average group-size of 12 toddlers or 24 preschool age children where Pro-San® L was used on a wider range of surfaces could use anywhere between one and one-half to three bottles/month (approximately 18-36 quart bottles/year).

B. Products Used by Custodial Staff

- The amount of Alpha HP® used by custodial staff varied based on the physical space of the center. NOTE: staff are required to disinfect uncarpeted floors in infant/toddler classrooms and classrooms with mildly ill children daily. Therefore, if a center has more infant/toddler classrooms, there will be more product consumption. However, since Alpha HP® can be used as a general cleaner, sanitizer, and disinfectant, investing in this safer bleach-free product will reduce the overall number of products to purchase.
- Due to positive feedback from house parents and custodial staff, centers might also consider purchasing an ionatorEXP™ device for custodial staff.

Table A4. Direct Cost Based on Quotes from Vendors as of 08/2010

Product/Method	Product Number	Distributor	1–25 Cases/Units	26–50 Cases/Units	51–100 Cases/Units	100–-500 Cases/Units
Disinfecting Level Bleach Pump	RS-5 Shipper Pump	Reike Packaging Systems	-	-	-	$7 min. order $500
Sanitizing Level Bleach Pump	RS-4 Shipper Pump		-	-	-	$1 min. order $500
Oxivir®TB 1 case= 12 x 1Qt. bottles	4277285	Waxie Sanitary Supply	$58	$53	$43	$40
Alpha HP® 1 case= 2 x 1.5L bottles	4339853		$62	$57	$47	$42
Pro-San® L Ready-to-use spray 1 case= 12 x 1Qt. bottles	PSL-32	Microcide, Inc.	$101.52	$91.37	$73.09	_
Pro-San® L Ready-to-dilute 1 case= 100 pouches (1pouch per 1Qt. bottle)	PSPD-32R		$325	$293	$263	_
ionatorEXP™ 1 unit/each	ionatorEXP™	Laguna Greenworks	$305			$289

2) Total Estimated Cost Per Year (based on 08/2010 price quotes): Replacing bleach with Ovixir® TB and the ionatorEXP™

Total upfront cost (i.e., cost for the first year) to purchase alternative products for one average group-size classroom for all age groups using the price bracket for minimum cases/units purchased = $58 (Oxivir®TB) + $305 (ionatorEXP™) = $363.

Since the estimated shelf life of the ionatorEXP™ is five years, the total cost over the course of five years was calculated. For one average group-size with infant/toddler age children (using the price bracket for minimum cases/units purchased), the total cost over five years would be $595. This takes into account that this classroom would need to continue to purchase Oxivir®TB every year. Therefore, the cost of investing in the alternative products would be approximately **$120/year**. If this classroom/provider completely replaces bleach with Oxivir®TB + ionatorEXP™, their cost would go up an additional **$80/year** over the course of five years.

The total cost over five years to purchase alternative products for one average group-size with preschool age children (using the price bracket for minimum cases/units purchased) would be $479. This classroom would need to purchase Oxivir®TB every other year. Therefore, this investment would cost approximately **$96/year**. If this classroom/provider completely replaces bleach with Oxivir®TB + ionatorEXP™, their cost would go up an additional **~$70/year** over the course of five years. Please note that for the preschool age group, this might be an overestimate as the cost depends on the disinfecting practices of the staff.

Although the bleach cost per year is comparatively less, investing in the recommended bleach-free sanitizers and disinfectants is a reasonable additional cost per year. Feedback from family care providers who attended a Child Care Planning and Advisory Council meeting and a San Francisco Child Care Provider's Teachers' meeting validated the feasibility of investing in the bleach-free products. One provider had suggested that if the average size infant/toddler classroom is 12 children, asking parents to donate $10/year, would cover the additional cost for that year. Furthermore, cost consideration could be given to the fact that there are additional benefits from having healthier staff and a safer environment for the children.

3) Total Estimated Cost Per Year (based on 08/2010 price quotes): Replacing bleach with Oxivir® TB and Pro-San® L

The upfront cost of investing in these alternative products for the average infant/toddler classroom would be approximately: $58 (1 case of Oxivir® TB) + $203 (2 cases of Pro-San® L ready-to-use spray) **= $261/year.** This classroom would have to purchase a case of Oxivir® TB every year and one additional case of Pro-San® L ready-to-use spray every second year. Depending on use, the upfront cost for the average preschool classroom could increase from that for infants to approximately: $58 (1 case of Oxivir® TB) + $305 (3 cases of Pro-San® L ready-to-use spray) **= $363/year.** This classroom would need to purchase a case of Oxivir® TB every other year and up to 3 cases of Pro-San® L ready-to-use spray every year.

One case of the Pro-San® L ready-to-dilute pouches would last the average infant/toddler classroom approximately five years and the average preschool classroom approximately 3-5 years depending on use. Therefore, the cost over five years for the average infant/toddler classroom would be approximately: $290 (5 cases of Oxivir® TB) + $325 (1 case of Pro-San® L ready-to-dilute pouches) = $615/5 years **(~$123/year).** This classroom would have to purchase a case of Oxivir® TB every year. If Pro-San® L is used minimally in a preschool classroom, the cost over 5 years would be approximately: $174 (3 cases of Oxivir® TB) + $325 (1 case of Pro-San® L ready-to-dilute pouches) = $499/5 years **(~$100/year)**. If it is used more widely, then the cost over 3 years would be approximately **~$147/year**. Preschool classrooms would need to purchase a case of Oxivir® TB every other year.

Ordering Information

Table A5. Ordering Bleach-free Disinfectants and Sanitizers for Child Care Settings

NOTE: Disinfecting with Oxivir®TB and sanitizing with the ionatorEXP™ or the Pro-San® L each require a pre-clean step using either diluted triclosan-free soap, or the ionatorEXP™ as a first pass step.

Predominant Use	Product	Product Number	Approximate Quantity	Distributor Information
Classroom Use				**Marklin Alford** Sr. Account Executive Waxie Sanitary Supply 901 N. Canyons Parkway Livermore, CA. 94550 Cell: (415) 400-6942 Office: (925) 454-2900 Ext 417 Fax: 925-605-3703-Orders Only email: malford@waxie.com
• Diaper Changing Tables • Sinks • Toilets • Activity Tables	**Oxivir®TB**  Sold as 946mL/ 1 US Qt	4277285	1 Qt. bottle of **Oxivir®TB** per Infant/Toddler Room per Month	
Custodial Use				
• Floors • Sinks • Toilets	**Alpha HP®**  Sold as 1.5L	4339853	1.5 L of **Alpha HP®** produces 25 Diluted Gallons at Sanitizing Level or 50 Diluted Gallons at Disinfecting Level*	
Classroom, Kitchen, and Custodial Use				**Laguna Greenworks** Phone (949) 371-3310 To receive an exclusive discounted kit, mention the promotional code: "We Care for Children- SF" Valid through 06/30/2011 Mallory McCamant: mallory@lagunagreenworks.com
Food Contact Surfaces	**ionatorEXP™**  Sold as 1 Unit	**ionatorEXP™** for Commercial Use	1 Unit per Room	
	Pro-San® L  Sold as 946mL/ 1 US Qt	**Pro-San® L** Ready-to-use spray	1 Qt. bottle of **Pro-San® L** per Infant/Toddler Room per	**Microcide, Inc.** Order by phone: 1-888-342-6279 Order online: http://www.microcide.com/prosan.htm

* NOTE: the average custodial mop bucket and wringer system (on wheels) holds between 6.5–8.75 Gallons.

Table A6. Ordering Tools for Safer Bleach Use

NOTE: Disinfecting and sanitizing with bleach each require a pre-clean step using diluted triclosan-free soap for a soap and water solution.

Predominant Use	Product	Product Number	Use	Distributor Information
Disinfecting Level Pump				**Reike Packaging Systems** 500 West Seventh Street Auburn, Indiana 46706, USA 260 925-3700 Fax: +1 260 925-2493 Email sales@riekecorp.com Shane Alday, extention #226 NOTES: 1) Pumps are sold with a minimum order of $500. Pumps (i.e. 4mL and 5mL) can be combined to meet the $500 requirement. 2) These pumps are specially designed with no metal contact which is necessary to avoid metal corrosion upon bleach contact. 3) The color of the pump may be different, please note the specified volume dispensed.
• Diaper Changing Tables • Sinks • Toilets • Activity Tables	 5mL No metal contact pump	**RS-5 Shipper Pump**	3 Pumps (6.0% Sodium Hypochlorite bleach) = Disinfecting Level	
Sanitizing Level Pump				
Food Contact Surfaces	 4mL No metal contact pump	**RS-4 Shipper Pump**	1 Pump (6.0% Sodium Hypochlorite bleach) = Sanitizing Level	
Disinfecting Level Bottle for Pump System				**Container and Packaging Supply, Inc.** 1345 E State St. Eagle, ID 83616 USA (208) 939-0291 1-800-473-4144 www.ContainerAndPackaging.com NOTES: 1) Bottles should be white to avoid degradation of the concentrated bleach. 2) Bottles should be made of HDPE to withstand bleach storage. 3) Be aware of the neck finish, otherwise the pump may not fit properly on the bottle. 4) Labels are available for download at the San Francisco Asthma Task Force web site.
Fits disinfecting level pump (Neck finish 33-400)	 64 oz HDPE White Industrial Round	**B085**	For the RS-5 Shipper Pump (5mL Pump)	
Sanitizing Level Bottle for Pump System				
Fits sanitizing level pump (Neck finish 28-410)	 32 oz HDPE White Cylinder	**B142A**	For the RS-4 Shipper Pump (4mL Pump)	
Disinfecting and sanitizing	 Loud-Beep Digital Electronic Timer	**JR-3691**	To ensure two minutes has elapsed for bleach use (disinfecting and sanitizing)	**Lions Deal Wholesale Restaurant Supplies** LionsDeal.com 140A Washington Ave Cedarhurst, NY. 11516 Phone: 877-546-6059 or 516-792-9595 Fax: 516-224-7429 Email: contactus@lionsdeal.com

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Asthma Task Force

Asthma Education, Healthy Environments
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March 2011