Chapter 3

THE IMPACT OF WATERLESS HAND SANITIZER IN A LARGE ANIMAL TEACHING HOSPITAL

3.1 Abstract

The Centers for Disease Control and Prevention (CDC) cite handwashing as the most effective means for preventing the spread of infection. Although this fact is widely known, compliance with hand hygiene protocols remains low in many healthcare facilities. In October 2002, the CDC released guidelines recommending the use of WHS in addition to handwashing with soap and water in an effort to increase adherence with hand hygiene protocols in human healthcare facilities. The question arises whether WHS may be as effective in veterinary clinical settings given the dissimilarities in environmental conditions.

A 16-week study was conducted at Virginia-Maryland Regional College of Veterinary Medicine Large Animal Hospital (LAH) to evaluate the effectiveness of hand hygiene programs. Hand bacterial counts of 10 LAH personnel were measured weekly using the standard test methodology for determining bacterial load on the hands of healthcare personnel, referred to as “glove juice sampling”. In addition, bacterial surface contamination on 30 environmental sites was measured weekly using Solar Cult® Contact Slides (Solar Biologicals Inc., Ogdensburg, NY). Soap and WHS volume of use were measured in order to reveal any relationship with in-house patient days and/or motivational interventions. An additional experiment testing the efficacy of WHS was performed with 20 LAH personnel. Hand bacterial counts were determined as described before and 1 min after the use of WHS.

The bacterial counts on the hands of the 10 personnel sampled were averaged and ranged from 378 to 23,120 CFU/ml with a geometric mean of 3,577 CFU/ml. Bacterial counts from environmental samples varied from no growth to too numerous to count (CFU/12 cm²). “No growth” values were reported as 19 CFU/ml, one CFU/ml below the limit of detection. An arbitrary value of 200 CFU/12 cm² was assigned to growth
determined to numerous to count in order to produce descriptive statistics for environmental counts. Growth on all sites ranged from 6 to 151 CFU/12 cm² with a mean of 40 CFU/12 cm². Neither hand bacterial counts nor environmental bacterial counts appeared to decrease after the installation of WHS dispensers.

WHS usage ranged from 254 to 910 ml/wk with a mean of 553 ml/wk. Soap usage varied from 839 ml/wk to 1680 ml/wk with a mean of 1199 ml/wk. Short-term increases in soap and WHS product use were seen after the introduction of motivational and/or educational materials. No apparent relationship was seen between hand hygiene product consumption and patient-days.

When measured immediately after use, WHS reduced bacterial loads on the hands of 20 LAH personnel (P < 0.001). Before WHS use, HBC ranged from less than to 20 to 48,800 CFU/ml with a geometric mean of 6,926 CFU/ml. Counts after WHS use ranged from less than 20 to 23,400 with a geometric mean of 1,152 CFU/ml. Differences in before and after ranged from -4,000 to 48,200 CFU/ml with a median of 9,700 CFU/ml.

Although WHS effectively reduced bacterial loads on the hands of personnel when measured immediately following usage, the effect over an extended period of time on the hands and environmental surfaces was not clearly apparent.

KEY WORDS --- hand hygiene, hand sanitizer, large animal teaching hospital
3.2 Introduction

Billions of dollars have been spent on research in order to determine effective ways to decrease the transfer of infectious agents in places such as human hospitals, nursing homes and other similar institutions (Brown et al., 2002; Johnson, 2002; Morley, 2002; Spearing et al., 2000). In all cases, it was realized that a significant reduction in transmission would likely occur if personnel adhered to the hand hygiene protocols of their institutions (Boyce and Pittet, 2002; Johnson, 2002; Morley, 2002; Voss and Widmer, 1997). The Centers for Disease Control and Prevention (CDC) report, "hand washing is the single most important means of preventing the spread of infection (CDC, 2003)". Although this fact is widely known, hand hygiene protocol compliance remains unacceptably low in many healthcare facilities, with compliance levels generally not exceeding 40% (range 5-81%) (Boyce and Pittet, 2002; Goldrick et al., 2002; Naikoba and Hayward, 2001; Rao et al., 2002).

A study was conducted by Voss and Widmer (1997) to determine whether 100% compliance with institutionally mandated hand hygiene protocols was truly attainable and if infection control personnel are being realistic in their demands on healthcare workers. The authors felt that 100% compliance could not be achieved because standard protocols consumed a considerable amount of time, and might therefore negatively impact patient care. Because of the decreased amount of time needed for use, the authors supported the replacement of traditional handwashing with bedside waterless hand sanitizer (WHS) units in order to increase hand hygiene compliance.

Since then, several researchers have reported increased compliance as well as effective decreases in hand bacterial contamination after the introduction of WHS in human medical facilities (Fendler et al., 2002; Kampf et al., 2002; Marena et al., 2002; Mody et al., 2003). Paulson et al., (1999) concluded that the use of WHS in addition to traditional handwashing provided the most effective results in microorganism reduction.

In an effort to increase adherence with hand hygiene protocols in human healthcare facilities, the CDC released guidelines recommending the use of WHS in addition to handwashing with soap and water (CDC, 2003).
Veterinary clinics differ greatly from any human healthcare facility in regard to environmental conditions. It is not uncommon to regularly encounter manure, hay and other contaminated materials in facilities servicing farm animals. Based on current research evaluating WHS and the newly released recommendations of the CDC, it is prudent to access the efficacy of WHS in veterinary medical environments where zoonotic pathogens such as *Escherichia coli* and *Salmonella* spp. are common. No research currently exists regarding the impact of WHS and their effect on hand hygiene protocol compliance in veterinary environments.

It was hypothesized that WHS would be effective in reducing the bacterial load on the hands of personnel in the large animal hospital (LAH) as well as on the surfaces that come in contact with their hands. Such a reduction in bacterial load would most likely decrease infection among animal patients and their human caretakers.

The introductions of motivational and educational tools focusing on hand hygiene were expected to have a positive effect on WHS and soap usage as well as overall adherence to hand hygiene protocols. Research has shown that educational tools usually have a short-term effect on behavior (Naikoba and Hayward, 2001).

### 3.3 Materials and Methods

#### 3.3.1 Large Animal Teaching Hospital

Research was conducted at the Virginia-Maryland Regional College of Veterinary Medicine (VMRCVM) Large Animal Teaching Hospital, located in Blacksburg, VA, between June 6 and October 6, 2003 (16 weeks). The study area included 3 LAH wards (barns), the radiology suite, personnel offices, 2 student conference rooms, equine receiving and standing surgery, storage and feed rooms, the surgical preparation, surgery, and recovery areas and bathrooms. A layout of the hospital is shown in Figure 3.1. Of the three wards, Ward A is used for large animal medicine cases, which consist primarily of equine patients. There is also a food animal and nuclear recovery stall and two intensive care units in this ward that are occasionally used for neonates. Ward B is used for large animal surgery cases and typically houses equine patients. Ward C is predominately used for food animal patients.
Large animal hospital personnel, including clinicians, residents, interns, technicians, husbandry staff, and veterinary students participated in the study. Due to academic schedule, the population of veterinary students (n= 6-10) changed every 3 weeks.
Figure 3.1. Floor plan of the Virginia-Maryland’s Regional College of Veterinary Medicine Large Animal Teaching Hospital
3.3.2 Hand Hygiene Products

Two hand hygiene products were used in this research. The first, Prestige™ Lotion Skin Cleanser soap (Pro·link, Canton, MA) was already being used prior to initiation of the study. The second, Purell® Instant Hand Sanitizer (GOJO Industries, Inc., Akron, OH), a WHS, was introduced during the study. The active ingredient in the latter is 62% ethyl alcohol. Both products (14 soap and 23 WHS bags) were cased in dispensers and weighed weekly in order to measure volume change (VM). Both products are shown in their mounted dispensers in Figure 3.2.
Figure 3.2.  Hand hygiene products used in the Large Animal Hospital.
a.) A traditional handwashing station with soap dispenser (arrow).  b.) A waterless hand sanitizer dispenser mounted on a stall door.
3.3.3 Hand Bacterial Counts

Hand sampling was performed using a modification of a method described in the Annual Book of the American Society for Testing and Materials. The technique, known as glove juice sampling (GJS), is a standard methodology for determining bacterial load on the hands of healthcare personnel (Baldini et al., 2001).

Sampling solution was prepared by dissolving 0.4 g of monobasic anhydrous potassium phosphate (KH$_2$PO$_4$, Sigma Chemical Company, St. Louis, MO), 10.1 g of tribasic, dodecahydrate sodium phosphate (Na$_2$PO$_4$, Sigma Chemical Company, St. Louis, MO) and 1.0 g of isoctylphenoxy-polyethoxyethanol (Triton X-100, LabChem, Inc., Pittsburgh, PA) in 1 L of distilled water. The solution was then adjusted to a pH of 7.8 and autoclaved (Baldini et al., 2001). Seventy-five ml aliquots were transferred to 100 ml sterile specimen containers (Fisher Scientific, Pittsburgh, PA).

Subjects were asked to insert their dominant hand into a sterile non-powdered glove. Seventy-five ml of the sampling solution was added to the glove and the participant’s hand was massaged for 1 min uniformly covering all hand surfaces. The remaining “glove juice” was then transferred back into the container (Figure 3.3).

Within 1 hr of sampling, ten-fold dilutions (up to a final dilution of 1:10$^{-6}$) were made by serial transfers of 100 µl of the “glove juice” into 900 µl of sterile phosphate buffered saline, pH 7.4 (Sigma Chemical Company, St. Louis, MO. The Miles- Misra technique as described by Quinn et al., (1994) was used to determine the number of colony forming units (CFU). Briefly, five 10 µl drops of each dilution were plated onto both Columbia blood agar (Becton, Dickinson and Company, Sparks, MD) and MacConkey agar (Becton, Dickinson and Company, Sparks, MD). After twenty-four hours, at 37º C, colonies were counted to CFU per ml. Based on morphology, distinct colonies were sub-sampled, isolated onto Tryptic Soy agar (Becton, Dickinson and Company, Sparks, MD) and submitted to the VMRCVM’s Clinical Bacteriology Laboratory for identification. Systems such as API 20E (bioMérieux, Inc., Hazelwood, MO), Sensititre (TREK
Diagnostic Systems, Cleveland, OH) or Biolog ID (Biolog, Inc., Hayward, CA) were used for this purpose. Statistical analysis was performed using the Wilcoxon signed rank test in the SAS®9 (SAS Institute, Inc., Cary, NC) statistical software program.
Figure 3.3. Glove Juice Sampling method used to remove bacteria from hands.

a.) Participant inserts his/her dominant hand into a sterile powderless glove.
b.) Seventy-five ml of sampling solution is added to the glove. c.) The hand is massaged in a uniform motion covering all hand surfaces for 1 min. d.) The “glove juice” is collected in a sterile container for culture.
3.3.4 Environmental Sampling

A complete description of the sites sampled during the study is given in Table 3.1. Visual representations of sample sites are shown in Figure 3.4.

Thirty different sites were selected for environmental sampling during the study. They included: a microwave oven, telephones, chairs, shovel, broom, and rake handles, door handles, a computer mouse, a water fountain handle, an equine standing stock, a bovine head chute and stall door handles. The same microwave oven, telephone, chair, computer mouse, water fountain handle, equine standing stock and bovine head chute sites were repeatedly sampled over the course of the study. The shovel, broom and rake handles were picked at random from those distributed around the LAH. The stall handles were sampled with preference given to those stalls occupied on the sampling day.

Environmental “paddle” sampling (EPS) was performed using Flex-Paddle Solar-Cult® contact slides (Solar Biologicals, Inc., Ogdensburg, NY) coated on one side with Microbial Content Test Agar and the other side with MacConkey Agar (Figure 3.5). The side coated with Microbial Test Content Agar was first used on a selected site and then an adjacent spot was sampled with the MacConkey Agar. The paddles were then incubated at 33°C for 24 hours. Results were expressed as CFU/12 cm² (area of 1 paddle side) with respect to the type of agar. Based on morphology, distinct colonies were sub-sampled, isolated onto Tryptic Soy agar, and submitted for identification as previously described.
Table 3.1  Environmental sites: location, part of object sampled and sampling preference.

<table>
<thead>
<tr>
<th>Sample Site</th>
<th>Location of Object</th>
<th>Part of Object Sampled</th>
<th>Sampling Preference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Microwave</td>
<td>Clininians’ Telephone Room</td>
<td>Buttons 1, 2, and 3</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Phone</td>
<td>Clininians’ Telephone Room</td>
<td>Receiver</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Keyboard</td>
<td>Interns’ Office</td>
<td>Space bar</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Chair Arm Rest</td>
<td>Technicians’ Office</td>
<td>End of arm rest</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Phone</td>
<td>Equine Receiving</td>
<td>Receiver</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Shovel/Broom/Rake Handle</td>
<td>Storage/Feed Room</td>
<td>Top of handle</td>
<td>Random</td>
</tr>
<tr>
<td>Shovel/Broom/Rake Handle</td>
<td>Storage/Feed Room</td>
<td>Top of handle</td>
<td>Random</td>
</tr>
<tr>
<td>Door Handle</td>
<td>Conference Room (149A)</td>
<td>Above and below knob</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Computer Mouse</td>
<td>Conference Room (149A)</td>
<td>Receiver</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Telephone</td>
<td>Conference Room (143)</td>
<td>Left and right click buttons</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Door Handle</td>
<td>Scrub Room (150A)</td>
<td>Receiver</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Door Handle</td>
<td>Large Animal Prep Room (140)</td>
<td>Above and below knob</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Broom Handle</td>
<td>Ward A</td>
<td>Top of handle</td>
<td>Random</td>
</tr>
<tr>
<td>Phone</td>
<td>Ward A</td>
<td>Receiver</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Stall Handle</td>
<td>Ward A</td>
<td>Front and back of handle</td>
<td>Preference given to occupied stalls</td>
</tr>
<tr>
<td>Stall Handle</td>
<td>Ward A</td>
<td>Front and back of handle</td>
<td>Preference given to occupied stalls</td>
</tr>
<tr>
<td>Stock Stall</td>
<td>Ward A</td>
<td>Top of stock release door</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Broom Handle</td>
<td>Ward B</td>
<td>Top of handle</td>
<td>Random</td>
</tr>
<tr>
<td>Phone</td>
<td>Ward B</td>
<td>Receiver</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Stall Handle</td>
<td>Ward B</td>
<td>Front and back of handle</td>
<td>Preference given to occupied stalls</td>
</tr>
<tr>
<td>Stall Handle</td>
<td>Ward B</td>
<td>Front and back of handle</td>
<td>Preference given to occupied stalls</td>
</tr>
<tr>
<td>Equine Stock Stall</td>
<td>Ward B</td>
<td>Top of stock release door</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Stall Handle</td>
<td>Ward C</td>
<td>Front and back of handle</td>
<td>Preference given to occupied stalls</td>
</tr>
<tr>
<td>Stall Handle</td>
<td>Ward C</td>
<td>Front and back of handle</td>
<td>Preference given to occupied stalls</td>
</tr>
<tr>
<td>Bovine Head Chute</td>
<td>Ward C</td>
<td>Chute release handle</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Women's Bathroom Door</td>
<td>LAH Main Corridor</td>
<td>Above and below knob</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Entryway to Wards</td>
<td>LAH Main Corridor</td>
<td>Right side of door</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Water Fountain Handle</td>
<td>LAH Main Corridor</td>
<td>Above and below handle</td>
<td>Consistent throughout study</td>
</tr>
<tr>
<td>Radiology Stall Handle</td>
<td>LAH Main Corridor</td>
<td>Front and back of handle</td>
<td>Consistent throughout study</td>
</tr>
</tbody>
</table>
Figure 3.4. Surfaces sampled on selected environmental sites. Arrows in the pictures show the exact surface on the objects sampled. a) Microwave oven. b) Telephone. c) Keyboard and mouse. d) Water fountain e) Chair arm rest. f) Rake, broom and shovel. g, h) Two different types of patient stall handles in Wards A and B. i, j) Two different types of patient stall handles in Ward C. k) Doorknob showing rolling sampling method. l, m) Doorknobs showing the location of front and rear sampling sites.
Figure 3.4 (continued). Surfaces sampled on selected environmental sites. 
a) Equine standing stock b) Bovine head chute.
Figure 3.5. Flex-Paddle Solar-Cult® contact slide used for environmental sampling. Side 1 is shown, coated with microbial test content agar. Each side of the paddle is 12 cm².
3.3.5 Stall Entry Sheets and Daily Census Records

It was expected that personnel would practice hand sanitation after coming in contact with a patient. In an effort to monitor the number of contacts between caregivers and patients, stall entry sheets were placed on stall doors. Personnel were asked to record the date and the number of people entering. Sheets were changed every other day. An example of a stall entry sheet is shown in Figure 3.6. This procedure as well as other components of the study was explained to LAH personnel in 3 oral presentations and through posters and pamphlets located throughout the hospital.

A census of in-house patients was taken daily. This was used to calculate “patient-days”, which was defined as the number of in-house patients in the LAH on a given day. Patient mothers (e.g. mares, sows, etc.) and each individual offspring were counted separately even if housed in the same stall. The daily totals were added to produce weekly totals (patient days/week).
Stall ____________________________

Please mark one circle per person, for each entry into the stall. (If you enter the stall and exit to get medications, thermometers, etc., and immediately re-enter the stall that counts as one entry.)

| DATE |
|------|---|---|---|---|---|---|---|---|---|
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |
|     |   |   |   |   |   |   |   |   |   |

Figure 3.6. Stall entry sheet.
3.3.6 Pre-study Cleansing and Disinfection Procedure

On Day -23 of the study, cleansing and disinfection was performed on selected environmental sites, to rid them of soil accumulated over time. All selected sites that had the possibility of being sampled (all stall door handles of the 3 wards as well as all visible broom, shovel, and rake handles) were cleansed using Roccal® - D Plus (Pharmacia & Upjohn Co., Kalamazoo, MI) followed by 70% ethanol. Afterwards, 10 sites were randomly selected and sampled using the EPS procedure. The cleansing and disinfection procedure was repeated on Day -22 due to growth on 4 of the 10 sites sampled.

3.3.7 Pre-Study Period Timeline

Day -21: EPS of all environmental sites and GJS of 10 LAH personnel. In addition, all fourteen soap dispensers were filled with full packs of Prestige™ Lotion Skin Cleanser soap.

Day -15: VM was performed for soap.

Day -14: EPS and GJS were performed.

Day -8: VM was performed for soap.

Day -1: EPS and GJS were performed. Five glove juice samples were performed before 12 pm and 5 were performed after 12 pm.

3.3.8 Study Period Timeline

Day 0: WHS units were installed on all stall doors in Wards A, B and C, with the exception of the radiology stall and the food animal stall in Ward A. New bags of WHS were added to the dispensers. Cleansing and disinfection of environmental sites was performed using the same method described in section 3.3.6. Informational brochures were distributed throughout the LAH (Figure 3.7). In addition, an oral presentation explaining the study and expectations of participants was given.

Day 1: Cleansing and disinfection was performed again on all environmental sites due to growth on 8 of the 10 sites sampled. EPS was performed on 10 randomly chosen sites to validate disinfection.
Day 2: The study proceeded with only 1 of the sites sampled exhibiting 1 CFU/12cm². EPS and GJS were performed. The oral presentation explaining the study was repeated for personnel unable to attend the first orientation.

Day 6: VMs were taken for soap and WHS.

Day 8: A third presentation was given to personnel unable to attend the previous orientations.

Day 9: EPS and GJS were performed.

Day 13: VMs were taken.

Day 16: EPS and GJS were performed.

Day 20: VMs were taken.

Day 21: EPS and GJS were performed.

Day 27: VMs were taken.

Day 28: EPS and GJS were performed. “Informational” posters about the study were placed in 4 locations: next to the entrance of the LAH, on the door leading to the office areas, and in both student conference rooms. The poster is shown in Figure 3.8.

Day 34: VMs were taken.

Day 35: EPS and GJS were performed.

Day 41: VMs were taken.

Day 43: EPS and GJS were performed.

Day 48: VMs were taken.

Day 50: EPS and GJS were performed.

Day 55: VMs were taken.

Day 57: EPS and GJS were performed.

Day 62: One or the other of 2 different motivational posters, emphasizing personal welfare and patient care, were placed in 4 locations: above the microwave oven in the clinicians’ telephone room, on the door exiting the LAH, near the entrance of the interns’ office and in Equine Receiving. VMs were taken. Poster designs are shown in Figures 3.9 and 3.10.

Day 64: EPS and GJS were performed.
Day 64: Four additional laminated motivational posters, 2 more of each design, were placed throughout the hospital. These posters were located in Equine Standing Surgery, and on the walls in front of the student conference rooms. A poster was placed on the door exiting the LAH hospital to replace 1 that had been removed.

Day 69: VMs were taken.

Day 70: EPS and GJS were performed.

Day 76: VMs were taken.

Day 77: EPS and GJS were performed. Only 15 sites were sampled for EPS due an unexpected delay in the shipment of sampling products.

Day 83: VMs were taken.

Day 84: EPS and GJS were performed. VMs were taken

Day 90: VMs were taken.

Day 91: EPS and GJS were performed.

Day 97: VMs were taken. The study was concluded.
Figure 3.7. Informational brochure. Side “A” of the brochure showing from left to right: explanation of stall entry sheets, hand hygiene crossword puzzle, and the title page.
**WHAT AM I DOING?**

This summer I will be conducting a research project here in the Large Animal Hospital (LAH). The objectives of the study are to determine whether the introduction of waterless hand sanitizers in the LAH will decrease the bacterial load on the hands of personnel working in the LAH as well as on the surfaces that come in contact with their hands.

A decrease in the bacterial load on the hands of personnel will ultimately decrease the occurrence of nosocomial infections in the LAH. It is a well-known fact that nosocomial infections are usually transferred via the hands of caretakers in the hospital. The best way to decrease the transfer of pathogens on the hands is with frequent washing, before and after attending a patient. Everyone knows that this can be a cumbersome task. Nevertheless, it has to be done.

**SAMPLING**

During the course of this study, you will see me sampling different surfaces throughout the LAH such as phones, stall handles, etc... This will be done to get an estimate of the bacterial load in the LAH during the time of sampling.

In addition to environmental sampling, with your assistance, I will be conducting what is termed “Glove Juice Sampling (GJS)”. This procedure is done in order to get an estimate of the bacteria on the hands of the individual sampled at that particular time. For those of you that have already partaken in GJS you know that it is a relatively simple procedure that takes only minutes. Thank you for your help! For those that haven’t participated yet, I would really appreciate your assistance and support in my study. You will remain anonymous.

Have Questions?? A meeting will be called to discuss this project stay tuned. Or feel free to contact:

Naya McMillan -- nayam@vt.edu
Ernest Hovingh -- ehovingh@vt.edu
Bill Pierson -- pierson@vt.edu

Figure 3.7 (continued). Informational brochure. Side ‘B’ of the brochure showing from left to right: an explanation of study, sampling procedures and investigator contact information.
The Efficacy of Waterless Hand Sanitizers in Animal Settings

What Is Going On?
This summer I will be conducting a research project here in the Large Animal Hospital (LAH). The objectives of the study are to determine whether the introduction of waterless hand sanitizers in the LAH will decrease the bacterial load on the hands of personnel working in the LAH as well as on the surfaces that come in contact with their hands. A decrease in the bacterial load on the hands of personnel will ultimately decrease the occurrence of nosocomial infections in the LAH. The best way to decrease the transfer of pathogens on the hands is with frequent cleansing. Everyone knows that this can be a cumbersome task. Nevertheless, it has to be done. Thank goodness for waterless hand sanitizers. Waterless hand sanitizers kill 99% of most common pathogens in as little as 15 seconds. The Center for Disease Control and Prevention released in October 2002 recommendations for their use in human hospitals. Perhaps after this study, there will be a recommendation for veterinary hospitals. Purell® distributes the waterless hand sanitizer used in this experiment. The hand sanitizer’s active ingredient is 62% ethyl alcohol in addition to moisturizers and vitamin E.

Sampling
During the course of this study, you will see me sampling different surfaces throughout the LAH such as phones, stall handles, etc... This will be done to get an estimate of the bacterial load in the LAH during the time of sampling. In addition to environmental sampling, with your assistance, I will be conducting what is termed “Glove Juice Sampling (GJS)”. This procedure is done in order to get an estimate of the bacteria on the hands of the individual sampled at that particular time. For those of you that have already partaken in GJS you know that it is a relatively simple procedure that takes only minutes. Thank you for your help! For those that haven’t participated yet, I would really appreciate your assistance and support in my study. You will remain anonymous.

Stall Entry Records
In addition to the sampling, I will be monitoring the number of times each individual LAH personnel enters a stall. This will be recorded on a sheet hanging on each stall. I ask that every entry be recorded by a check in one of the circles on the sheet.

POSSIBLE SCENARIOS

Answers Below

1.) Jane and Joe want to bandage a foal’s leg. They both enter the stall and Joe leaves to get more bandage material and immediately re-enters the stall. How many checks should they put on the sheet? 2.) Patty enters the stall to get a mare for her daily exercise routine. She walks the mare and returns her to her stall. How many checks should she put on the sheet?

Answers
1) 2 2) 1

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Figure 3.8. Informational poster. This poster explained the purpose of the study, the sampling procedures and directions for proper use of the stall entry sheets.
This poster targets the welfare of the individual as a means to encourage hand hygiene.

Figure 3.9. Motivational poster (design 1). This poster targets the welfare of the individual as a means to encourage hand hygiene.
Figure 3.10. Motivational poster (design 2). This poster encourages hand hygiene by emphasizing patient welfare.
3.3.9 Waterless Hand Sanitizer Efficacy Study

Twenty LAH personnel participated in this study. Glove juice sampling was performed in the same manner as described in section 3.3.3. The participants’ first hand to be sampled (left or right) was selected at random. The hand was then sampled and dried, making every effort not to touch the unsampled hand. Two packs of WHS (1.33 ml/pack) were emptied into the cupped hands of the participant. The participant was then instructed to rub their hands together in a fashion mimicking handwashing and reminded to include all surfaces. This was done for 1 min. Glove juice sampling was then performed on the unsampled hand. The “glove juice” was transferred to a sterile container and then plated as described in section 3.3.3.

3.3.10 Personnel Questionnaire

A questionnaire was administered to all personnel who wished to participate. The questions were:

1. What are you classified as:
   - [ ] Male
   - [ ] Faculty
   - [ ] Female
   - [ ] Staff
   - [ ] Student

2. While in the LAH do/did you use the WHS:
   - [ ] never
   - [ ] rarely
   - [ ] occasionally
   - [ ] frequently

   *If respondent answered "never" or "rarely" proceed to question 3. If they answered "occasionally" or "frequently" proceed to question 4.*

3. Why do you use WHS "never" or "rarely"? Is it because of:
   - [ ] of skin irritation
   - [ ] forget
   - [ ] don’t like WHS
   - other_____________________________________________________

4. Why do you use the WHS "occasionally" or "frequently"?
   ___________________________________________________________________

5. Do you think your “soap and water” handwashing frequency while working in the LAH changed with the availability of WHS?
   - [ ] Yes
   - [ ] No
6. Where are the other places you use WHS?

7. Do you think it would be beneficial to continue using WHS in the LAH?

[ ] yes, if a significant reduction in bacterial load can be demonstrated
[ ] yes, even if a significant reduction in bacterial load can not be demonstrated
[ ] no, I don’t think it would be worthwhile to continue

The first question grouped LAH personnel into categories of faculty, staff or student. “Faculty” included tenure-track faculty and clinical instructors. “Staff” included large animal technicians and husbandry employees. “Student” included those in years 1-4 of their clinical studies and interns or residents. Answers given in response to the fourth and sixth questions were collated and summarized.

3.3.11 Analysis of Data

Descriptive statistics are provided for most data. Formal statistical analysis could not be performed on most of the data due to lack of independence in regard to the people and objects sampled. The results of the WHS Efficacy Study were analyzed with the Wilcoxon signed rank test in the SAS®9 (SAS Institute, Inc., Cary, NC) statistical software program.