

Investigation of zoonotic pathogen exposure & prevention among veterinary professionals and students at veterinary schools

Ellen R.E. Heinrich

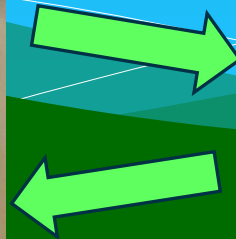
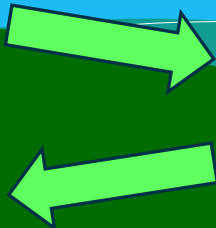


Zoonotic Risk in CVMs



- * Veterinary students may be exposed to zoonotic pathogens in pre-clinical & clinical years of schooling
- * Fourth-year students often first to see a new patient in veterinary teaching hospital (VTH)
- * Team approach to case management at VTHs
- * Multiple services for a single patient in VTH

What zoonotic pathogen exposures have been documented at CVMs?



CVM = College of Veterinary Medicine

Cryptosporidium parvum

Scand J Infect Dis 18: 173–178, 1986

Outbreak of Cryptosporidiosis among Veterinary Students

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We describe an outbreak of human cryptosporidiosis in 5 veterinary students in contact with experimentally infected calves. All persons experienced symptoms of gastroenteritis, with the main complaint of diarrhoea lasting for 1–13 days. The persons recovered spontaneously; one was hospitalized for 10 days. The diagnosis was based on the demonstration of *Cryptosporidium* oocysts from stools by the smear method and the formalin-ether concentration method, both combined with the acid-fast staining technique. Both methods gave almost equal results. The role of *Cryptosporidium* as an occupational risk is discussed.

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JAVMA, Vol 193, No. 11, December 1, 1988

Methicillin-Resistant *Staphylococcus aureus* (MRSA)

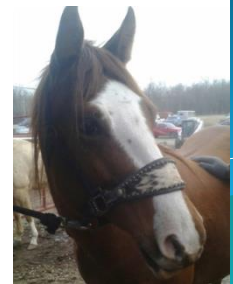
- * Humans are natural reservoirs for *S. aureus*
 - * General public 0.84%.
 - * Large-animal veterinarians (15/96, 15.6%)
 - * Small-animal veterinarians (12/271, 4.4%)
 - * Veterinary technicians (4/34, 12%).
 - * Human healthcare workers 1.8% (4.4% excluding Netherlands)
 - * Nurses (6.9%)

Graham PL 3rd, Lin SX, Larson EL. A U.S. population-based survey of *Staphylococcus aureus* colonization. *Ann Intern Med* 2006; 144(5):318-325..

Hanselman BA, Kruth SA, Rousseau J, et al. Methicillin-resistant *Staphylococcus aureus* colonization in veterinary personnel. *Emerg Infect Dis* 2006; 12(12):1933-1938.

Dulon M, Peters C, Schablon A, et al. MRSA carriage among healthcare workers in non-outbreak settings in Europe and the United States: a systematic review. *BMC infectious diseases* 2014;14(1):363-363.

An outbreak of methicillin-resistant *Staphylococcus aureus* skin infections resulting from horse to human transmission in a veterinary hospital



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Abstract

There are increasing reports of methicillin-resistant *Staphylococcus aureus* (MRSA) infection and colonization in horses and evidence that MRSA can be transmitted between horses and humans. The objective of this study was to investigate reports of skin infection in personnel working with a foal with community-associated MRSA colonization and subsequent infection. Clinical diagnostic specimens were collected from individuals reporting skin lesions following contact with the affected foal. Nasal and groin screening swabs were collected from other veterinary personnel that attended a voluntary screening clinic. MRSA skin infections were identified in three neonatal intensive care unit personnel. Nasal colonization was subsequently identified in 10/103 (9.7%) other veterinary hospital personnel. Isolates were indistinguishable by pulsed field gel electrophoresis, classified as Canadian epidemic MRSA-5, possessed SCCmecIV, were negative for the Pantom-Valentine leukocidin and were multidrug resistant. Transmission to veterinary personnel despite short-term contact with standard protective barriers highlights the potential importance of MRSA as an emerging zoonotic pathogen, and indicates that further evaluation of interspecies transmission of MRSA and means to prevent zoonotic infection are required.

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Zoonotic Transmission of MRSA from Dogs in VTHs



- * One study at VTH statistically analyzed:
 - * Nasal swabs from veterinary personnel & students
 - * VTH environmental samples
 - * MRSA behavior risk survey
- * Contact with MRSA infected patient found to be an independent factor associated with MRSA carriage among veterinary personnel

Ishihara K, Shimokubo N, Sakagami A, et al. Occurrence and molecular characteristics of methicillin-resistant *Staphylococcus aureus* and methicillin-resistant *Staphylococcus pseudintermedius* in an academic veterinary hospital. *Appl Environ Microbiol* 2010; 76(15):5165-5174.

MRSA in VTH Environment

Julian et al. BMC Research Notes 2012, 5:193
<http://www.biomedcentral.com/1756-0500/5/193>



RESEARCH ARTICLE

Open Access

Methicillin-resistant staphylococcal contamination of cellular phones of personnel in a veterinary teaching hospital

Timothy Julian¹, Ameet Singh^{2*}, Joyce Rousseau¹ and J Scott Weese¹

Abstract

Background: Hospital-associated infections are an increasing cause of morbidity and mortality in veterinary patients. With the emergence of multi-drug resistant bacteria, these infections can be particularly difficult to eradicate. Sources of hospital-associated infections can include the patients' own flora, medical staff and inanimate hospital objects. Cellular phones are becoming an invaluable feature of communication within hospitals, and since they are frequently handled by healthcare personnel, there may be a potential for contamination with various pathogens. The objective of this study was to determine the prevalence of contamination of cellular phones (hospital issued and personal) carried by personnel at the Ontario Veterinary College Health Sciences Centre with methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) and methicillin-resistant *Staphylococcus aureus* (MRSA).

Results: MRSP was isolated from 1.6% (2/123) and MRSA was isolated from 0.8% (1/123) of cellular phones. Only 21.9% (27/123) of participants in the study indicated that they routinely cleaned their cellular phone.

Conclusions: Cellular phones in a veterinary teaching hospital can harbour MRSP and MRSA, two opportunistic pathogens of significant concern. While the contamination rate was low, cellular phones could represent a potential source for infection of patients as well as infection of veterinary personnel and other people that might have contact with them. Regardless of the low incidence of contamination of cellular phones found in this study, a disinfection protocol for hospital-issued and personal cellular phones used in veterinary teaching hospitals should be in place to reduce the potential of cross-contamination.

Keywords: Cellular phone, Methicillin-resistant staphylococcus, Veterinary, Contamination

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VTH = veterinary Teaching Hospital

MRSA = Methicillin-resistant *Staphylococcus aureus*

Methicillin-Resistant *Staphylococcus pseudintermedius* (MRSP)

- * **First described in 2005** Devriese LA, Vancanneyt M, Baele M, et al. *Staphylococcus pseudintermedius* sp. nov., a coagulase-positive species from animals. *Int J Syst Evol Microbiol* 2005; 55(4):1569-1573.
- * **Very similar to *S. aureus***
- * **Isolates previously described as *S. intermedius* are actually part of *S. intermedius* group (SIG)**
 - * **SIG includes:** Sasaki T, Kikuchi K, Tanaka Y, et al. Reclassification of phenotypically identified *Staphylococcus intermedius* strains. *J Clin Microbiol* 2007; 45(9):2770-2778.
 - * *S. intermedius*
 - * *S. pseudintermedius*
 - * *S. delphini*
- * ***S. pseudintermedius* predominantly infects dogs & cats** Devriese LA, Hermans K, Baele M, et al. *Staphylococcus pseudintermedius* versus *Staphylococcus intermedius*. *Vet Microbiol* 2009; 133(1-2):206-207.

Zoonotic Potential of MRSP

- * **Leading cause of skin & post-operative infections in dogs & cats** Weese JS, van Duijkeren E. Methicillin-resistant *Staphylococcus aureus* and *Staphylococcus pseudintermedius* in veterinary medicine. *Vet Microbiol* 2009; 140(3-4):418-429.
- * **Dog-bite wounds in people** Lee J. *Staphylococcus intermedius* isolated from dog-bite wounds. *J Infect* 1994; 29(1):105-105.
- * **Study found MRSP in dog owners was significantly higher than that of controls**
 - * **46% of owners carried MRSP strains identical to those isolated from their dogs**
 - * **Shown by pulsed field gel electrophoresis (PFGE)**

Guardabassi L, Loeber ME, Jacobson A. Transmission of multiple antimicrobial-resistant *Staphylococcus intermedius* between dogs affected by deep pyoderma and their owners. *Vet Microbiol* 2004; 98(1):23-27.

MRSP = Methicillin-resistant *Staphylococcus pseudintermedius*

MRSP Zoonotic Transmission in VTHs

APPLIED AND ENVIRONMENTAL MICROBIOLOGY, Aug. 2010, p. 5165–5174
0099-2240/10/\$12.00 doi:10.1128/AEM.02780-09
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Vol. 76, No. 15

Occurrence and Molecular Characteristics of Methicillin-Resistant *Staphylococcus aureus* and Methicillin-Resistant *Staphylococcus pseudintermedius* in an Academic Veterinary Hospital[▽]

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Received 17 November 2009/Accepted 30 May 2010

Recently, methicillin-resistant *Staphylococcus aureus* (MRSA) and methicillin-resistant *Staphylococcus pseudintermedius* (MRSP) have been increasingly isolated from veterinarians and companion animals. With a view to preventing the spread of MRSA and MRSP, we evaluated the occurrence and molecular characteristics of each in a veterinary college. MRSA and MRSP were isolated from nasal samples from veterinarians, staff members, and veterinary students affiliated with a veterinary hospital. Using stepwise logistic regression, we identified two factors associated with MRSA carriage: (i) contact with an identified animal MRSA case (odds ratio [OR], 6.9; 95% confidence interval [95% CI], 2.2 to 21.6) and (ii) being an employee (OR, 6.2; 95% CI, 2.0 to 19.4). The majority of MRSA isolates obtained from individuals affiliated with the veterinary hospital and dog patients harbored *spa* type t002 and a type II staphylococcal cassette chromosome *mec* (SCC*mec*), similar to the hospital-acquired MRSA isolates in Japan. MRSA isolates harboring *spa* type t008 and a type IV SCC*mec* were obtained from one veterinarian on three different sampling occasions and also from dog patients. MRSA carriers can also be a source of MRSA infection in animals. The majority of MRSP isolates (85.2%) carried hybrid SCC*mec* type II-III, and almost all the remaining MRSP isolates (11.1%) carried SCC*mec* type V. MRSA and MRSP were also isolated from environmental samples collected from the veterinary hospital (5.1% and 6.4%, respectively). The application of certain disinfection procedures is important for the prevention of nosocomial infection, and MRSA and MRSP infection control strategies should be adopted in veterinary medical practice.

VTH = Veterinary Teaching Hospital MRSA = Methicillin-resistant *Staphylococcus aureus*
MRSP = Methicillin-resistant *Staphylococcus pseudintermedius*

S. pseudintermedius Incidence in Humans Likely Under Represented

JOURNAL OF CLINICAL MICROBIOLOGY, Jan. 1989, p. 78-81
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Vol. 27, No. 1

Staphylococcus intermedius in Canine Gingiva and Canine-Inflicted Human Wound Infections: Laboratory Characterization of a Newly Recognized Zoonotic Pathogen

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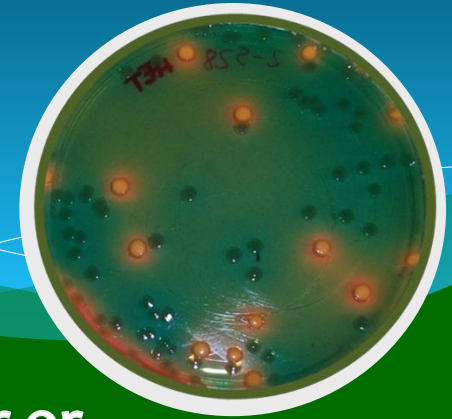
Received 25 July 1988/Accepted 13 October 1988

Staphylococcal gingival flora was characterized in cultures from 135 dogs. *Staphylococcus intermedius* was isolated in 39% of the cultures, *S. aureus* was isolated in 10%, and both were isolated in 2.0%. *S. aureus* was isolated more often from dogs of working breeds with weights of >40 lb (ca. 18 kg) and with outdoor habitats than was *S. intermedius*, which was associated with dogs of nonworking breeds with weights of <40 lb and indoor habitats. *S. intermedius* was distinguished from *S. aureus* by the following characteristics: coagulation of rabbit plasma at 4 h (26 versus 100%, respectively), hemolysis of sheep blood at 24 h (30 versus 79%, respectively), and mannitol fermentation at 24 h (4 versus 93%, respectively). A clear separation of the two species was apparent only with the acetoin (modified Voges-Proskauer) reaction (100% of the *S. aureus* isolates versus 0% of the *S. intermedius* isolates) and β -galactosidase activity on the API Staph-Ident strip (0% of the *S. aureus* isolates and 100% of the *S. intermedius* isolates). Susceptibilities of *S. intermedius* and *S. aureus* were 72 and 7%, respectively, to penicillin G, and 100% of both species to oxacillin. Fourteen previously collected strains of coagulase-positive staphylococci from infected canine-inflicted human wounds were reanalyzed; 3 of 14 (21%) isolates were *S. intermedius*. We conclude that *S. intermedius* is a common canine gingival flora and is responsible for some canine-inflicted human wound infections, thus representing a newly recognized zoonotic pathogen.

MRSA = M
Staphylococcus aureus

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Salmonella enterica subspecies *enterica*



- * Transmitted by contaminated food & water or through fecal-oral route
- * Contact with several species is a well-recognized risk factor for salmonellosis
- * Skin of reptiles, amphibians, and fish
- * Shed in feces of domestic mammals

Sanchez S, Hofacre CL, Lee MD, et al. Animal sources of salmonellosis in humans. *J Am Vet Med Assoc* 2002; 221(4):492-497.

Multidrug-resistant *Salmonella* Typhimurium in Four Animal Facilities

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In 1999 and 2000, 3 state health departments reported 4 outbreaks of gastrointestinal illness due to *Salmonella enterica* serotype Typhimurium in employees, clients, and client animals from 3 companion animal veterinary clinics and 1 animal shelter. More than 45 persons and companion animals became ill. Four independent investigations resulted in the testing of 19 human samples and >200 animal samples; 18 persons and 36 animals were culture-positive for *S. Typhimurium*. One outbreak was due to multidrug-resistant *S. Typhimurium* R-type ACKSSuT, while the other 3 were due to multidrug-resistant *S. Typhimurium* R-type ACSSuT DT104. This report documents nosocomial transmission of *S. Typhimurium* and demonstrates that companion animal facilities may serve as foci of transmission for salmonellae between animals and humans if adequate precautions are not followed.

Zoonotic transmission of *Salmonella* in VTHs

Zoonotic salmonellosis may be underreported among veterinary personnel due to the sometimes transient and non-specific symptoms associated with such infection and lack of diagnostics for gastrointestinal disturbances obtained by physicians

dents to minimize the risk of human infection. During the 6-month outbreak of nosocomial salmonellosis described in the present report, only 1 individual, a veterinary student, was found to have developed a zoonotic infection. The *Salmonella* Typhimurium isolate from this student had an antimicrobial resistance pattern identical to that for the isolate from the point-source foal, and although not identical, the PFGE pattern of the isolate (2e) suggested that it was likely related to the outbreak strain. The prevalence of human

VTH = Veterinary Teaching Hospital

Perception of Zoonotic Pathogen Exposure Risk Among Veterinarians

Infection control practices and zoonotic disease risks among veterinarians in the United States

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Zoonotic disease risk perception and infection control practices of Australian veterinarians in work culture

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^b School of Medicine, University of Western Australia, Perth, Australia
^c Centre for Values, Ethics and the Law in Medicine, University of Western Australia, Perth, Australia

Objective—To assess the knowledge and use of infection control practices (ICPs) among US veterinarians.

Design—Anonymous mail-out population survey.

Procedures—In 2005 a questionnaire was mailed to US small animal, large animal, and equine veterinarians who were randomly selected from the AVMA membership to assess precaution awareness (PA) and veterinarians' perceptions of zoonotic disease risks. Respondents were assigned a PA score (0 to 4) on the basis of their responses (higher scores representing higher stringency of ICPs); within a practice type, respondents' scores were categorized as being within the upper 25% or lower 75% of scores (high and low PA ranking, respectively). Characteristics associated with low PA rankings were assessed.

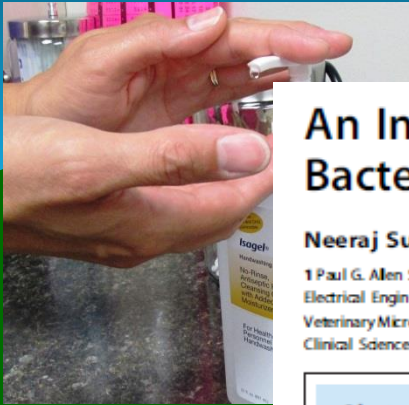
Results—Generally, respondents did not engage in protective behaviors or use personal protective equipment considered appropriate to protect against zoonotic disease transmission. Small animal and equine veterinarians employed in practices that had no written infection control policy were significantly more likely to have low PA ranking. Male gender was associated with low PA ranking among small animal and large animal veterinarians; equine practitioners not working in a teaching or referral hospital were more likely to have low PA ranking than equine practitioners working in such institutions.

Conclusions and Clinical Relevance—Results indicated that most US veterinarians are not aware of appropriate personal protective equipment use and do not engage in practices that may help reduce zoonotic disease transmission. Gender differences may influence personal choices for ICPs. Provision of information and training on ICPs and establishment of written infection control policies could be effective means of improving ICPs in veterinary practices. (*J Am Vet Med Assoc* 2008;232:1863–1872)

zoonotic disease risk among Australian veterinarians. To protect themselves from zoonotic disease, veterinarians should adopt protective practices. A questionnaire comprised of 100 questions was analyzed to determine factors for veterinarians' perceptions of zoonotic disease risk.

which 63.7% were women, ranked in private veterinary practices. During their careers, veterinarians reported zoonotic disease incidence. Around 10% of veterinarians were very likely in a variety of practices, the reported use of PPE (personal protective equipment) postmortem, surgery or in treating respiratory and dermatological cases. Veterinarians did not have isolation facilities for staff, and 57.1% did not use PPE if they had exposure from animals and in case they dealt with and contrast, those working in teaching hospitals were less likely to use PPE. To reduce zoonotic disease, practice policies and culture should encourage veterinarians to protect themselves and their staff.

Individual Zoonotic Infection Risk Mitigation



An Individual-Based Model of Transmission of Resistant Bacteria in a Veterinary Teaching Hospital

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Abstract

Veterinary nosocomial infections caused by antibiotic resistant bacteria cause increased morbidity, higher cost and length of treatment and increased zoonotic risk because of the difficulty in treating them. In this study, an individual-based model was developed to investigate the effects of movements of canine patients among ten areas (transmission points) within a veterinary teaching hospital, and the effects of these movements on transmission of antibiotic susceptible and resistant pathogens. The model simulates contamination of transmission points, healthcare workers, and patients as well as the effects of decontamination of transmission points, disinfection of healthcare workers, and antibiotic treatments of canine patients. The model was parameterized using data obtained from hospital records, information obtained by interviews with hospital staff, and the published literature. The model suggested that transmission resulting from contact with healthcare workers was common, and that certain transmission points (housing wards, diagnostics room, and the intensive care unit) presented higher risk for transmission than others (lobby and surgery). Sensitivity analyses using a range of parameter values demonstrated that the risk of acquisition of colonization by resistant pathogens decreased with shorter patient hospital stays ($P < 0.0001$), more frequent decontamination of transmission points and disinfection of healthcare workers ($P < 0.0001$) and better compliance of healthcare workers with hygiene practices ($P < 0.0001$). More frequent decontamination of heavily trafficked transmission points was especially effective at reducing transmission of the model pathogen.

Citation: Suthar N, Roy S, Call DR, Besser TE, Davis MA (2014) An Individual-Based Model of Transmission of Resistant Bacteria in a Veterinary Teaching Hospital. PLoS ONE 9(6): e98589. doi:10.1371/journal.pone.0098589

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Competing Interests: The authors have declared that no competing interests exist.

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VTH = Veterinary Teaching Hospital

Individual



- * Proper use of PPE
- * Examples of PPE: gloves, aprons, masks, and eye protection
- * Importance of PPE in preventing zoonotic disease transmission
- * The Comp. of Veterinary Standard Precautions for Zoonotic Disease Prevention

Compendium of Veterinary Standard Precautions for Zoonotic Disease Prevention in Veterinary Personnel

National Association of State Public Health Veterinarians

Veterinary Infection Control Committee
2010

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JAVMA, Vol 237, No. 12, December 15, 2010

NASPHV Compendium of Veterinary Standard Precautions 1403

Precaution Risk



Precaution (PPE)
Laboratory coats,
and covers

Precautions
Veterinary Personnel

- * Available for free from JAVMA online:
<http://avmajournals.avma.org/toc/javma/237/12>

JAVMA = Journal of the American Veterinary Medical Association

Institutional Zoonotic Infection Risk Mitigation

Characteristics of biosecurity and infection control programs at veterinary teaching hospitals

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Objective—To characterize biosecurity and infection control practices at veterinary teaching hospitals located at institutions accredited by the AVMA.

Design—Cross-sectional survey.

Population—50 biosecurity experts at 38 veterinary teaching hospitals.

Procedures—Telephone interviews were conducted between July 2006 and July 2007, and questions were asked regarding policies for hygiene, surveillance, patient contact, education, and awareness. Respondents were also asked their opinion regarding the rigor of their programs.

Results—31 of 38 (82%) hospitals reported outbreaks of nosocomial infection during the 5 years prior to the interview, 17 (45%) reported > 1 outbreak, 22 (58%) had restricted patient admissions to aid mitigation, and 12 (32%) had completely closed sections of the facility to control disease spread. Nineteen (50%) hospitals reported that zoonotic infections had occurred during the 2 years prior to the interview. Only 16 (42%) hospitals required personnel to complete a biosecurity training program, but 20 of the 50 (40%) respondents indicated that they believed their hospitals ranked among the top 10% in regard to rigor of infection control efforts.

Conclusions and Clinical Relevance—Results suggested that differences existed among infection control programs at these institutions. Perceptions of experts regarding program rigor appeared to be skewed, possibly because of a lack of published data characterizing programs at other institutions. Results may provide a stimulus for hospital administrators to better optimize biosecurity and infection control programs at their hospitals and thereby optimize patient care. (*J Am Vet Med Assoc* 2008;233:767–773)

- a. Eligible institutions that were contacted to solicit their participation included the VTHs at Auburn University, the University of California at Davis, Colorado State University, Cornell University, the University of Edinburgh, the University of Florida, the University of Georgia, the University of Glasgow, the University of Guelph, the University of Illinois, Iowa State University, Kansas State University, the University of London, Louisiana State University, the University of Melbourne, Massey University, Michigan State University, the University of Minnesota, Mississippi State University, the University of Missouri, the University of Montreal, Murdoch University, North Carolina State University, The Ohio State University, Oklahoma State University, Oregon State University, the University of Prince Edward Island, Purdue University, the University of Saskatchewan, the University of Sydney, the University of Tennessee, Texas A&M University, Tufts University, Tuskegee University, the University of Pennsylvania, Utrecht University, Virginia Polytechnic Institute and State University, Washington State University, and the University of Wisconsin.

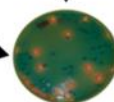
JAVMA, Vol 233, No. 5, September 1, 2008

Institutional Zoonotic Infection Risk Mitigation

- * Consider active surveillance and/or improved passive surveillance as part of infection control programs
- * Evaluate training programs to see if they convey the importance of infection control protocols in a believable way
- * Conduct studies of pathogen movements within VTHs
 - * May be different for individual CVMs

Public Health Campaign to Promote Hand Hygiene before Meals in a College of Veterinary Medicine

Ellen R.E. Heinrich,
Kate S. KuKanich,
Elizabeth Davis,
Brad J. White



Research Questions

- * How well do veterinary students clean their hands before eating at K-State College of Veterinary Medicine?
- * Can we improve hand hygiene among vet students with a targeted hand hygiene campaign?
- * What kinds of bacteria are present at these meetings? Are there any with zoonotic potential?

Study Goals

1. Determine baseline hand hygiene percentages
2. Create a multi-faceted educational hand hygiene campaign
3. Statistically compare hand hygiene practices during baseline, post-intervention, and 3-month follow-up
4. Determine if zoonotic pathogens could be cultured from meeting areas

What About Hand Washing in the Bathroom?

- * Hand contamination between bathroom and food line
- * Recent college-town hand washing study

Hand Washing Practices in a College Town Environment

April 2013 • Journal of Environmental Health

Carl P. Borchgrevink, PhD
JaeMin Cha, PhD
Seunghyun Kim, PhD
The School of Hospitality Business
Michigan State University



Abstract Many people do not wash their hands when the behavior in which they engage would warrant it. Most research of hand washing practices to date has taken place in high-traffic environments such as airports and public attraction venues. These studies have established a persistent shortcoming and a gender difference in hand washing compliance. Using field observations of 3,749 people in a college town environment, the research described in this article replicates and extends earlier work while identifying potential environmental and demographic predictors of hand washing compliance. Additionally, the authors' research suggests that proper hand washing practices, as recommended by the Centers for Disease Control and Prevention, are not being practiced. Finally, the authors' research raises a question as to the accuracy of earlier measurements of "proper" hand washing practices, suggesting that compliance rates are inflated. The results can help increase hand washing rates for the general public and thus decrease the risk of transmitting disease.

Methods: Sample

- * Observational study of hand hygiene among veterinary students attending extracurricular meetings at KSU-CVM (Kansas State University College of Veterinary Medicine)
- * 9 out of 25 recognized extracurricular student organizations at KSU-CVM were enrolled
- * Membership majority in their pre-clinical years (first, second, and third years of veterinary training)
- * Some students were members of multiple organizations

Methods: Data Collection

1. Baseline HHOs observed Oct. – Dec. 2012



**Hand
Hygiene
Opportunity
(HHO) =**

Meeting attendee approaches buffet line, has opportunity to use sanitizer and either uses it or does not use it

Methods: Data Collection

2. Intervention: video & poster



+



Link to video:

<http://www.vet.k-state.edu/jwplayer/handhygienevideo.html>

KSU-CVM = Kansas State University College of Veterinary Medicine

Methods: Data Collection

3. Post-intervention HHOs observed: Jan. – Mar. 2013



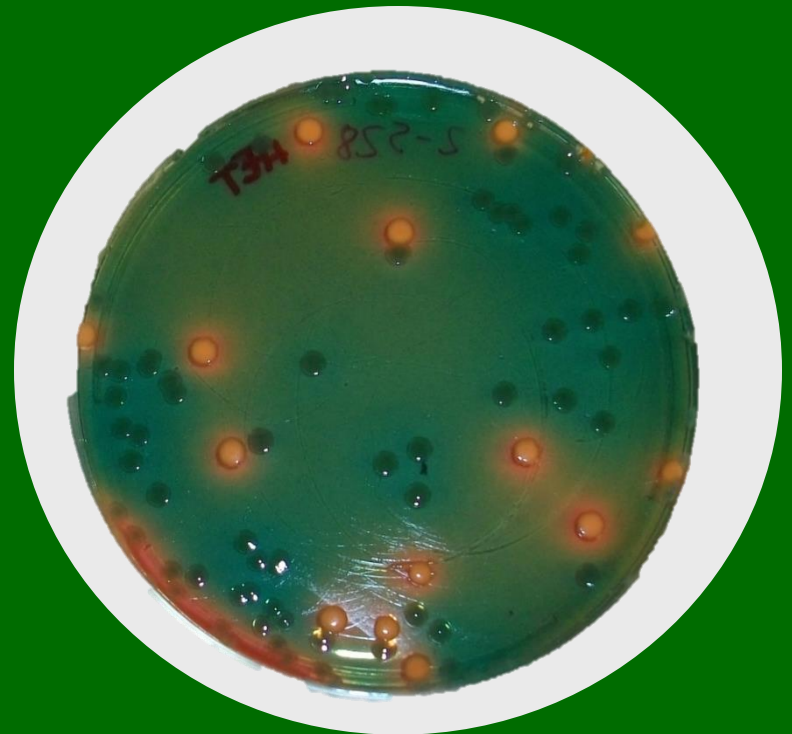
4. Follow-up: Posters no longer displayed at meetings HHOs observed: Apr. – May 2013



HHO = Hand Hygiene Opportunity

Methods: Environmental Sampling

- * High-traffic sites around meeting areas
- * 10cm x 10cm area
- * Submitted to KSU VDL
- * Identified using standard biochemical testing

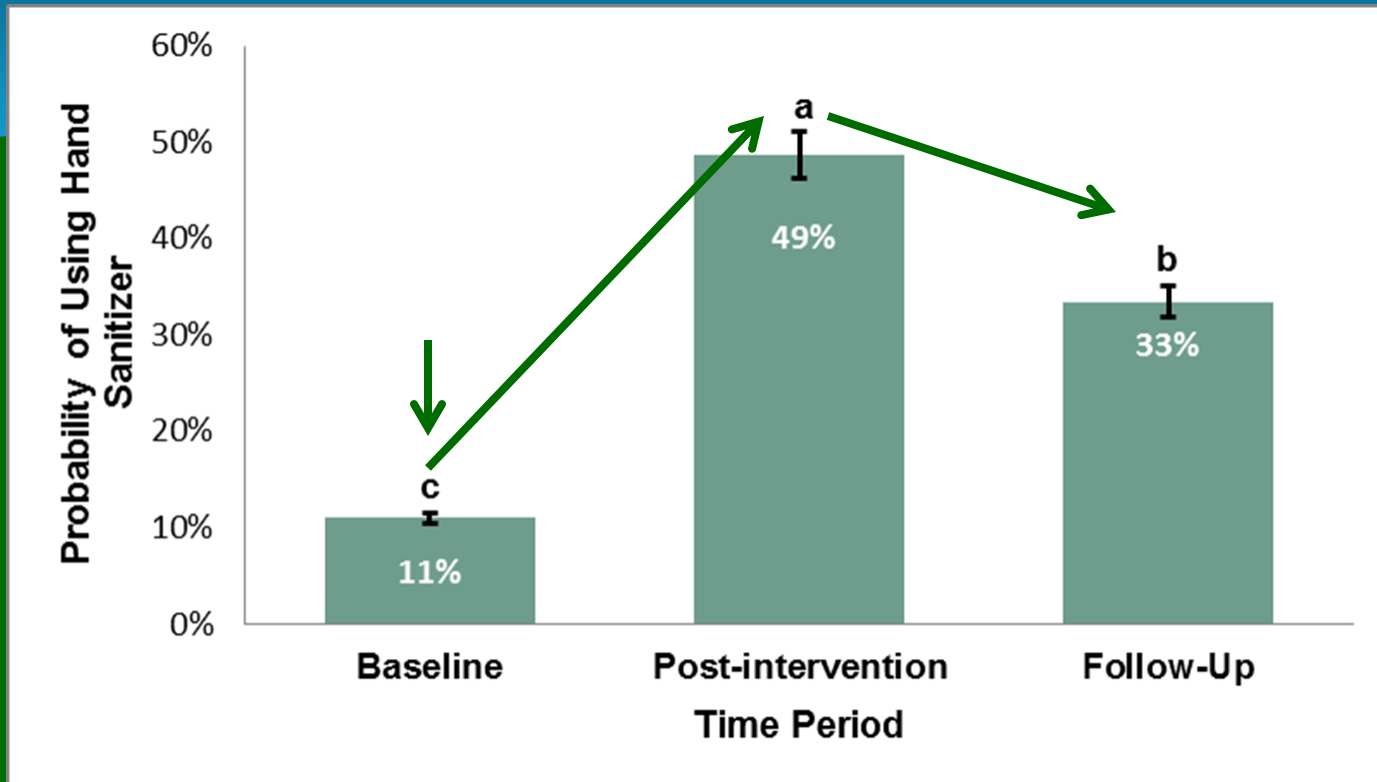


KSU VDL = Kansas State University Veterinary Diagnostic Laboratory

Results: General Information

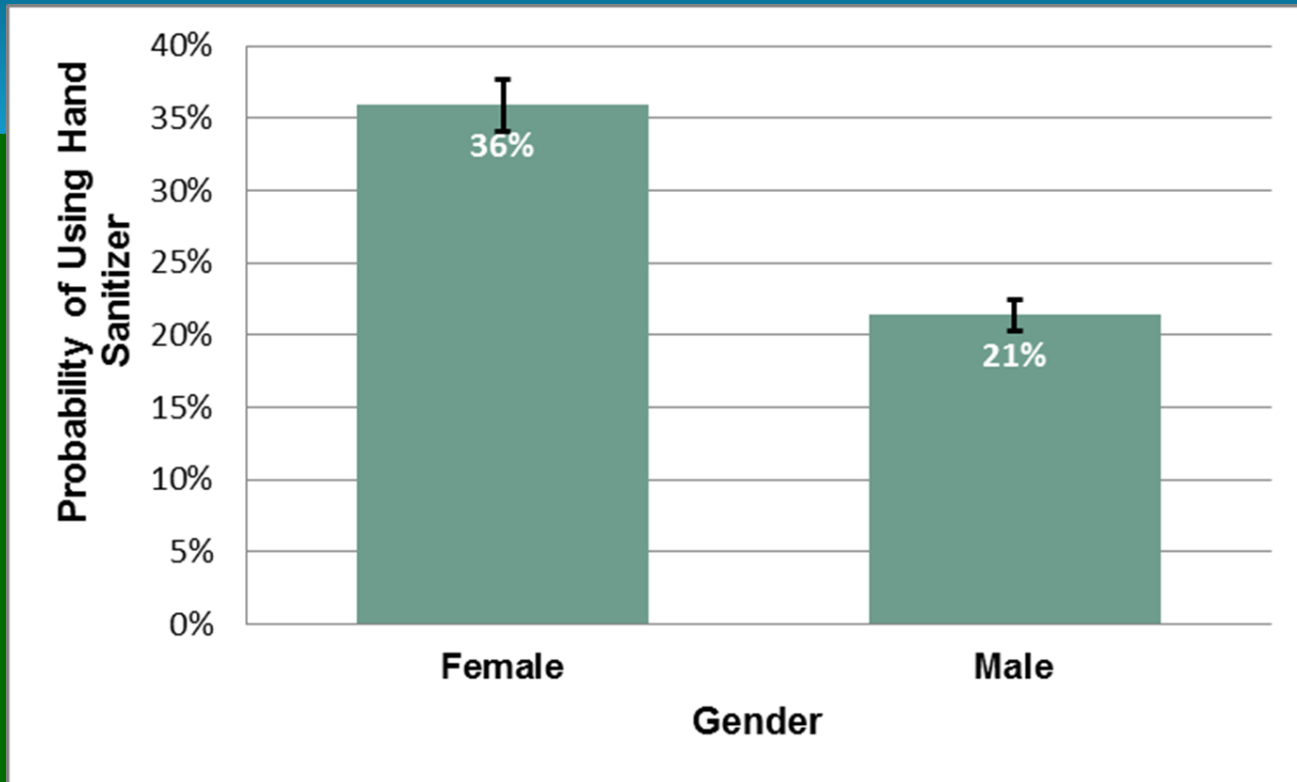
- * Baseline: **678** observations, **17** meetings
- * Post-intervention: **780** observations, **20** meetings
- * Follow-up: **486** observations, **11** meetings
- * Average Observations Per Organization: **204**
- * Average Observed Meetings Per Organization: **5**
- * Average Females Per Meeting: **29**
- * Average Males Per Meeting: **10**
- * Average Total Students Per Meeting: **39**

Results: Hand Hygiene Rates



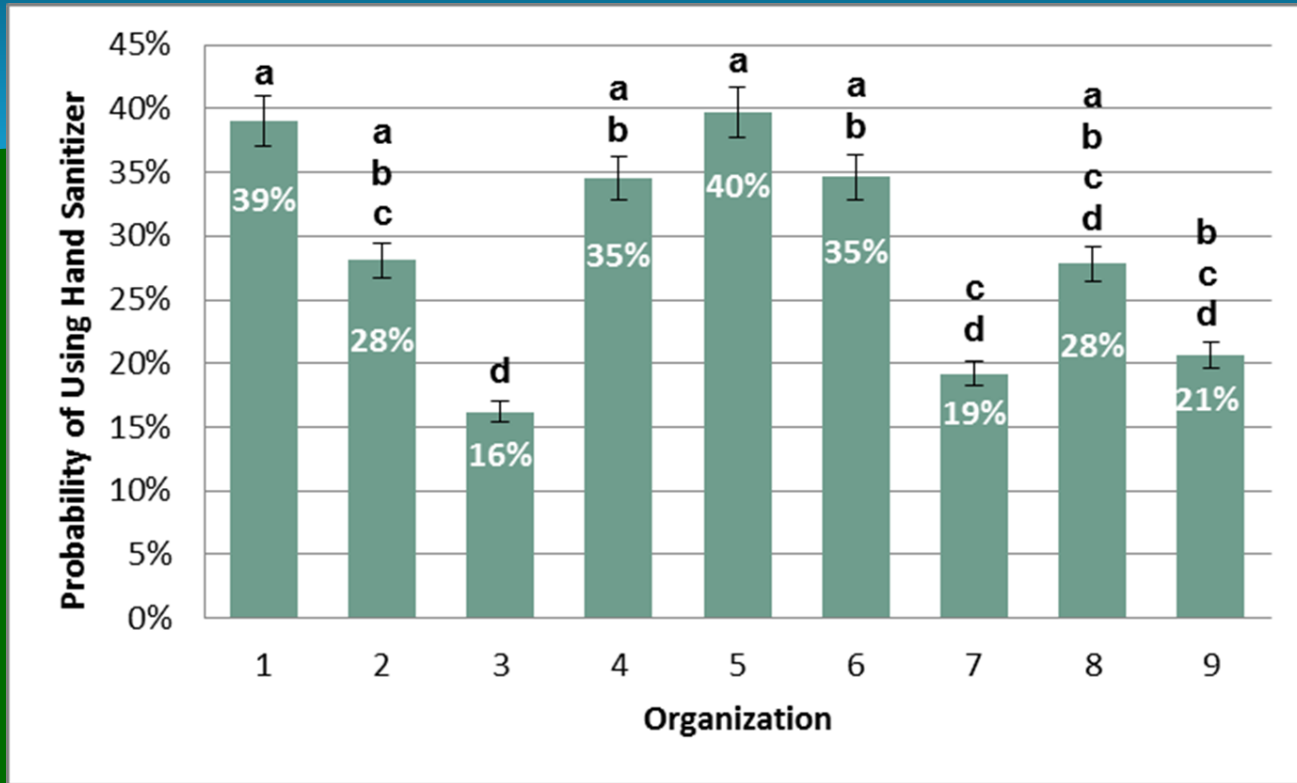
The model-adjusted probability (+/- standard error) of using hand sanitizer differed statistically ($p < .01$) during the three study periods of the educational hand-hygiene campaign. The statistical model included effects for gender, organization type, observation timing, and a unique number for each event identification. Columns with different letters (a, b, c) were statistically ($p < .01$) different.

Results: Hand Hygiene Rates



During all 3 observation periods (baseline, post-intervention, follow-up) combined, the model estimated probability (+/- standard error) of hand sanitizer use was consistently greater in female compared to male attendees ($P < 0.01$). The statistical model included effects for gender, organization type, observation timing, and a unique number for each event identification.

Results: Hand Hygiene Rates



The model-adjusted probability (+/- standard error) of using hand sanitizer differed statistically ($p < .01$) by organization (labeled 1–9) across all three periods (baseline, post-intervention, and follow-up). The statistical model included effects for gender, organization type, observation timing, and a unique number for each event identification. Columns with different letters (a, b, c, d) were statistically ($p < .05$) different.

Results: Environmental Sampling

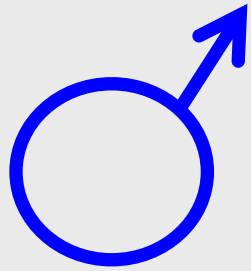
- * Bacteria were cultured from 14/42 samples collected in & around meeting rooms
- * *Clostridium perfringens* was cultured from 2/42 samples, from areas where food was served
- * *Salmonella* was cultured from 4/42 samples including:
 - * Door handle
 - * Stairwell handle
 - * Light switch
 - * Pizza box
- * *Staphylococcus* spp. cultured from 5/42 samples
- * *Streptococcus* spp. cultured from 1/42 samples
- * *Bacillus* spp. cultured from 3/42 samples



Discussion: General Comments



- * Results consistent with other studies done in healthcare settings and among medical and nursing students
- * Women consistently shown to have better hand hygiene rates compared to men
- * Hand hygiene is important especially right before eating in public places



Discussion: Effect of Gender



- * Being male has been documented in other studies as a contributing factor to poor hand hygiene rates
- * Little research has been done as to why this gender difference exists
- * Our hand hygiene campaign did not appear to effect females & males differently
- * Studies have shown females & males respond differently to health messages

Sax H, Uçkay I, Richet H, et al. Determinants of good adherence to hand hygiene among healthcare workers who have extensive exposure to hand hygiene campaigns. *Infect Control Hosp Epidemiol* 2007; 28(11):1267-1274.

Pittet D. Improving adherence to hand hygiene practice: a multidisciplinary approach. *Emerg Infect Dis* 2001; 7(2):234-240.

Judah G, Aunger R, Schmidt WP, et al. Experimental pretesting of hand-washing interventions in a natural setting. *Am J Public Health* 2009; 99 Suppl 2:S405-S411.



Discussion: Group Effects



- * Relationship between evaluation timing and probability of hand sanitation was not influenced by specific organizations
- * Likely unavoidable lack of independence among observations
- * What effect do group situations have on hand hygiene behavior?
- * Social influence is important

Huis A, van Achterberg T, de Bruin M, et al. A systematic review of hand hygiene improvement strategies: a behavioural approach. *Implementation science* 2012;7:92-92

Wilson S, Jacob C, Powell D. Behavior-change interventions to improve hand-hygiene practice: a review of alternatives to education. *Critical public health* 2011;21(1):119-127



Discussion: Environmental Sampling

- * Identified bacteria with potential to cause zoonotic disease
- * *Clostridium perfringens* & *Salmonella* spp.
 - * Isolated from tables where food was served & a pizza box
- * *Staphylococcus* spp.
 - * Isolated from various areas near where food served
 - * Speciation & antimicrobial susceptibility not performed
- * *Bacillus* spp.
 - * Unknown significance due to lack of species identification
 - * Benign? *B. cereus*? *B. anthracis*?
- * More specific environmental contamination studies needed

Limitations

- * Hand hygiene behaviors may differ among other organizations within the veterinary school or among other veterinary schools
- * Lack of independence of observations
- * Short time gap between post-intervention and follow-up data collection times
- * Unknown long-term effects of hand hygiene campaign
- * Possible influence of 4th year attendance at organization meetings

Major Points



1. Practicing good hand hygiene is an area where veterinary students need improvement
2. Simple reminders such as posters & short movies may actually help!
3. Hand sanitizer & sinks with soap need to be available at CVMs
4. Good hand hygiene needs to be encouraged among veterinary students & veterinary professionals because of increased risk of encountering zoonotic pathogens

Right before you eat

Clean your hands
It's easy to do, so why not?

Future Directions of Research in Risk of Zoonotic Pathogen Exposure and Preventative Measures at Colleges of Veterinary Medicine

Environmental Contamination & Risk

- * What kinds of bacteria are most commonly found in CVMs both in the VTH environment and in areas outside of clinics?
- * How commonly are zoonotic pathogens cultured?
- * What sites in CVMs have the highest zoonotic pathogen load?
- * How does the presence of zoonotic pathogens correlate to clinical illness in veterinary personnel, students & patients?

Prevention of Zoonotic Pathogen Exposure at CVMs by Individuals

- * Why is there a disconnect between veterinarians' perceived risk of zoonotic pathogen exposure and their actions to prevent such exposure?
- * What is the risk perception among veterinary students for contacting zoonotic pathogens?
- * Factors that influence hand hygiene behavior by veterinary personnel before & after patient contact at VTHs?
- * Factors that influence veterinarians' decision to clean stethoscope before and after patient contact at VTHs?
- * Factors that influence when veterinary personnel at VTHs decide to use personal protective equipment (PPE)?

VTH = Veterinary Teaching Hospital

Prevention of Zoonotic Pathogen Exposure at CVMs by Institutions

- * What are the most effective ways to educate veterinary students about minimizing their risk of zoonotic pathogen exposure?
- * How can surveillance programs at CVMs be improved?
 - * Passive & Active Surveillance
 - * Encourage reporting & diagnostic testing to confirm suspected zoonotic infections
- * How can infection control programs at CVMs be improved?
 - * Monitoring cases at admission
 - * Isolation protocols
 - * Disinfecting protocols
 - * Outbreak protocols
- * What are the best ways to make infection control a priority among all veterinary personnel and staff who work at CVMs?

CVM = College of Veterinary Medicine

Concluding Remarks

- * CVMs are locations where veterinary students and veterinary personnel may be exposed to zoonotic pathogens
- * Need an improved understanding of the risk zoonotic pathogen exposure at CVMs & causal link to zoonotic infections & disease
- * Need improved education of veterinarians & veterinary students on prevention practices

CVM = College of Veterinary Medicine

Field Experience



Lafene Health Center Hand Hygiene Campaign



*Keeping our hands clean
is what we do at Lafene!*

- * 6 week hand hygiene campaign for healthcare professionals aimed at improving hand hygiene before and after interaction with patients
- * Created novel posters using photos of healthcare professionals from Lafene engaged in good hand hygiene behaviors
- * Distributed a survey about the perceived effectiveness of the campaign



Keeping our hands clean



Lafene
Health Center



is what we do at Lafene!



*Don't forget to clean your hands
Before & After
Patient Care*



*Keeping our hands clean
is what we do at Lafene!*





**Where has *your* stethoscope
been today?**

*Don't forget to
clean it!
Before & after
each patient!*



& stethoscopes!

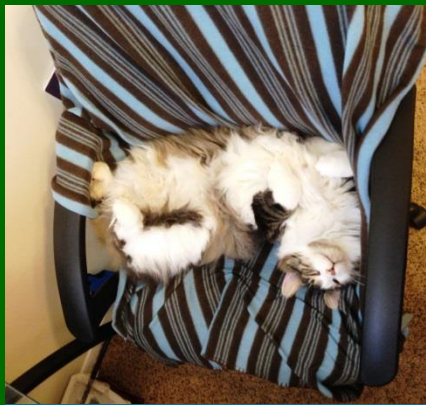
*Keeping our hands [✓] clean
is what we do at Lafene!*

Survey Questions

1. Do you clean your hands BEFORE touching a patient?
(Always, Sometimes, Never)
2. Do you clean your hands AFTER touching a patient?
(Always, Sometimes, Never)
3. How often do you believe your fellow healthcare providers clean their hands BEFORE touching a patient?
(Always, Sometimes, Never)
4. How often do you believe your fellow healthcare providers clean their hands AFTER touching a patient?
(Always, Sometimes, Never)
5. How often do you clean your stethoscope?
(Before & after using it to examine a patient, Once or twice daily, Once or twice a week, A few times a month, I don't remember the last time I cleaned my stethoscope, Other (explain))
6. How have the hand hygiene posters influenced how often you clean your stethoscope?
(Increased, Unchanged, Decreased)
7. How have the hand hygiene posters influenced your awareness of hand hygiene?
(Increased, Unchanged, Decreased)
8. What parts of the hand hygiene campaign were MOST effective at reminding you to clean your hands? (Short answer)
9. What parts of the hand hygiene campaign were LEAST effective at reminding you to clean your hands? (Short answer)
10. How would you rate the overall effectiveness of the hand hygiene campaign?
(Very effective, Effective, Somewhat effective, Not effective)

THANK YOU SO MUCH!

- * Dr. Kate KuKanich
- * Dr. Beth Davis
- * Dr. Brad White
- * Dr. Mike Sanderson
- * Dr. Michael Cates
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- * Ana Paula Ruebelo
- * Monica Farfan
- * Joseph Chapes
- * Kent Nelson
- * KSU CVM Graduating Classes of 2016, 2015, 2014, 2013
- * Julie Gibbs & Health Promotion Team at Lafene
- * Matthew Heinrich



Thank you for listening!
Any Questions?

