

**SEAL SHIELD™**
Prevent Infections. Save Lives.

Infection Research for Computer Keyboards and Input Devices

Research based evidence concludes that computer keyboards and other input devices spread infections in healthcare settings, schools and in communal environments.

According to The Centers for Disease Control and Prevention, Hospital-acquired infections (HAIs) are a leading cause of death in the U.S. healthcare arena, with an overall estimated annual incidence of 1.7 million cases and 100,000 deaths. HAIs in U.S. hospitals generate an estimated \$28.4 billion to \$45 billion in excess healthcare costs annually. Furthermore, the Centers for Medicare and Medicaid Services will no longer provide reimbursement over and above the typical Inpatient Prospective Payment System rate for care required to battle HAIs.

The research abstracts below strongly support that computer keyboards and other input devices are a source of bacteria and cross-contamination that can lead to HAIs. Therefore, washable keyboards, mice, TV remotes and mobile products with antimicrobial product protection should be put in place along with proper disinfection protocols to reduce the risk of infections and cross-contamination.

University of North Carolina Research Study (Keyboards in Hospital Settings)

The study, published in *Infection Control and Hospital Epidemiology*, comes from William Rutala, PhD, MPH, and colleagues at the University of North Carolina (UNC) at Chapel Hill. Researchers took samples from 25 computer keyboards at various locations inside UNC Hospitals and tested the samples for bacterial contamination. They found that each keyboard was contaminated with at least two types of bacteria. In particular, every keyboard tested positive for coagulase-negative staphylococci or CoNS, which is a major cause of bloodstream infections in hospitalized patients. In addition, 13 other types of bacteria were found, with the most common, after CoNS, being diphtheroids (found on 20 computers, or 80 percent), *Micrococcus* species (72 percent) and *Bacillus* species (64 percent). Data suggest that microbial contamination of keyboards is prevalent and that keyboards may be successfully decontaminated with disinfectants. Keyboards should be disinfected daily or when visibly soiled or if they become contaminated with blood.

- 25% of hospital keyboards harbor the Super Bug- MRSA, but daily disinfecting of the keyboards could reduce the risk of cross contamination.

University of Arizona Research Study (Keyboards in Educational Settings)

Microbiology Professor / leading expert on infectious disease, Dr. Charles Gerba conducted a study that found computer keyboards harbor up to 400 times more microbial bacteria than the average toilet seat and are among the dirtiest items in an office. In one study, Dr. Gerba and his team separated office workers into two groups. One group used disinfecting wipes to clean their desks, phones, and computers once a day while the other did not. Within two days, the wipes users were found to have a 99.9% reduction in bacteria levels

Other research data from this study concluded the following:

- In schools, the most germ-laden places are desktops; computer keyboards, mice, and touchpads; pencil sharpeners, water fountains and restrooms.
- Of the professions studied, school teachers had the most germs in their offices by 20 times.
- More germs were found in daycare centers than anywhere else
- Proper cleaning techniques can reduce bacteria by up to 99.9 percent and absenteeism in schools by 50 percent.

American Society for Microbiology Research Study (Keyboards in Hospital Settings)

Discovered that MRSA can survive on computer keyboards for up to 6 weeks. For the study, two strains of MRSA were inoculated in triplicate onto coupons made of bed linen, keyboard covers and acrylic fingernails. At selected times over 8 weeks, the coupons were subcultured and surviving bacteria were counted. MRSA survivors remained at detectable levels for 6 weeks on computer keyboard covers. The results clearly demonstrate the need for frequent hand washing and environmental disinfection in health care settings.

Association for Professionals in Infection Control – APIC (Guide to Preventing C. Diff Infections)

The guide's prevention strategies include "cleaning and disinfection of computers, including keyboards" and goes on to say "check the computer manufacturer's recommendations for acceptable products. Exposure to an environment or patient with CDI can create a challenge especially when there is a highly virulent strain. The use of some of the bleach-containing disinfectants may not be possible due to potential damage."

American Journal of Infection Control - AJIC Report (Keyboards in Hospital Settings)

Recommendations for cleaning and disinfection: Computer equipment used in patient care within a multihospital system. Ensure that working with computer equipment is included in policies/procedures for hand hygiene. Specifically, when working with keyboards or mice in high-risk areas disinfect and glove hands.

Northwestern Memorial Research Study (Keyboards in Hospital Settings)

Samples obtained from the keyboards and keyboard covers revealed growth of MRSA and VRE at 24hrs. Transmission studies revealed that increased contact with the inoculated keyboards (from 1 to 5 touches) increased recovery of bacteria on hands. The transmissibility rate from keyboard covers was not appreciably different. VRE and MRSA are capable of prolonged survival on both computer keyboards and keyboard covers. After any contact with computer keyboards, both gloved and ungloved hands frequently become contaminated. Researchers found that a good way to prevent the transmission of this type of infection is for health care workers to wash their hands and to have computer keyboards disinfected on a regular basis.

Henry Ford Hospital Research Study (Keyboards in Hospital Settings)

Keyboards in non-treatment areas, nearly 32 percent were contaminated, versus less than nine percent in treatment areas. Ten keyboards, or less than 14 percent of the total, were colonized with as many as nine different bacteria. Due to the threat of the germs' potential spread to patients, Henry Ford's Information Technology and Infection Control department recommended exchanging traditional keyboards in the ER for washable, silicone rubber models.

Tripler Army Medical Center Research Study (Keyboards in Hospital Settings)

Cultured 10 computer keyboards in the intensive-care unit eight times over two months. About 25 percent of the samples harbored the bacteria hospital officials fear most – multidrug-resistant staphylococcus aureus.

District of Columbia Department of Health - DCDOH Report (Keyboards in School Settings)

The DCDOH investigation of a Norovirus outbreak in an Elementary School reported that non-cleaned computer equipment (keyboards and mice) and person-to-person contact resulted in illness. Laboratory results from a computer mouse and keyboard in first-grade classroom tested positive for norovirus subtype GII. DCDOH recommended cleaning computer equipment (mice and keyboards) and other shared surfaces that were overlooked during the February 8 cleaning with a 1:50 concentration household bleach solution.

Stanford University Research Study (Cell Phones/Touch Screens)

A cell phone is covered with 18 times more bacteria than a toilet handle. Stanford doctoral student Tim Julian warns, "If you put virus on a surface, like an iPhone, about 30 percent of it will get on your fingertips, and a fair amount of it may go from your fingers to your eyes, mouth or nose, the most likely routes of infection."

University of Arizona Research Report (Touch Screens In Hospital Settings)

Microbiology Professor / leading expert on infectious disease, Dr. Charles Gerba recently reported that "We looked at touch screens in hospitals recently and found them to be heavily contaminated with organisms such as MRSA". He went on to report "You might wipe them down quickly but I don't think they get thoroughly decontaminated in anyway".

University of Arizona Research Study (TV Remotes in Hospital Settings)

Microbiology Professor / leading expert on infectious disease, Dr. Charles ranks the TV remote control as the highest carrier of bacteria in a patient's hospital room compared to the toilet bowl handle, bathroom door and call buttons, among others. Even more disturbing is the detection of Methicillin-Resistant Staphylococcus Aureus (MRSA) on the remote control. As an antibiotic-resistant bacteria, a leading cause of infection and death in hospitals.

University of Houston Research Study (TV Remote in Hotel Rooms)

University of Houston, along with researchers from Purdue University and the University of South Carolina sampled a variety of surfaces from hotel rooms in Texas, Indiana and South Carolina found high levels of aerobic bacteria and coliform (fecal) bacterial contamination on TV remotes. Tests showed bacteria levels between 2 and 10 times higher than levels permissible in hospitals.

SEAL SHIELD CASE STUDY:**Gessel School of Medicine at Dartmouth (Keyboards In Educational Setting)**

During the fall term of 2008 quite a number of students (estimated around 200-300) had contracted a pink-eye infection. According to Pete Fletcher (IT Department for the Medical School at Dartmouth College), among other ways the pink-eye infection was spreading, was through contact with public keyboards. It was found that people were rubbing their eyes and then using the keyboards. This enabled the pink-eye infection to spread. The school first opted to replace keyboards and disinfect machines. However, the cost of replacing keyboards was cost prohibitive. After researching solutions, Seal Shield washable keyboards were installed. Since putting Seal Shield keyboards in place, the number of replacement keyboards was almost zero. There have been no reported cases of pink-eye. Because the keyboards are run through a dishwasher at the end of each term, students and staff are much happier at the cleaner look.

FOREIGN RESEARCH STUDY'S:**Swinburne University of Technology, Australia Research Study (Keyboards In University Settings)**

The keyboards of multiple-user (student) and single-user (staff) computers located on a university campus were sampled to assess microbial contamination. The average number of microorganisms present on multiple-user computer keyboards was significantly greater than on single-user keyboards, and the number of keyboards harboring potential pathogens was also greater for multiple-user computers. It is recommended that regular cleaning and disinfection of computers be used to reduce the microbial load, especially for multiple-user workstations.

Ward of the 21st Century in Calgary Research Study (Keyboards In Hospital Settings)

An investigation into the extent of contamination of computer keyboards in hospitals has shown that 58% are contaminated with harmful bacteria. The study, conducted under the direction of Dr. John Conly at the Ward of the 21st Century in Calgary, sampled 230 keyboards across 3 different ward types in 4 separate hospitals. "People are going from a patient from wound care and then they have to enter information into the computer. They can carry the germs from that procedure onto the keyboard," say Conly. Having a keyboard that is easily cleaned and effectively decontaminated is a valuable first step toward a healthier environment for patient care.

Seal Shield™ is the infection prevention specialist. Seal Shield's unique combination of patent pending infection control waterproof keyboards, mice, TV remotes and iPad shields, along with its antimicrobial product protection, combine to create the most complete infection control solutions available.